



Full Line Catalog

Vacuum Components
and Vacuum Technology

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Leybold – Worldwide

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- Rotary Vane Vacuum Pumps **TRIVAC**
- Rotary Vane Vacuum Pumps **SOGEVAC**
- Screw Vacuum Pumps **VACUBE**

Dry Compressing Vacuum Pumps

- Diaphragm Vacuum Pumps **DIVAC**
- Scroll Vacuum Pumps **SCROLLVAC**
- Multistage Roots Vacuum Pump **ECODRY plus**
- Screw Vacuum Pumps **LEYVAC; SCREWLINE, DRYVAC**
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- Roots Vacuum Pumps **RUVAC**

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- Vacuum Gauges, Residual Gas Analyzers
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Ultra High Vacuum Pumps

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- Ion Pump Controllers **DIGITEL™**

Oils / Greases / Lubricants.

- Oils, Special Oils, Pump Fluids, Greases **LEYBONOL**

Services

- Advanced Vacuum Service
- Inquiry Forms

Leybold

Oil Sealed
Vacuum Pumps

Dry Compressing
Vacuum Pumps

Roots
Vacuum Pumps

High
Vacuum Pumps

Vacuum Pump
Systems

Vacuum Measuring,
Controlling

Leak Detecting
Instruments

Flanges and
Fittings

Feedthroughs

Valves

Ultra High
Vacuum Pumps

Oils / Greases /
Lubricants

Services

Leybold – Worldwide

Leybold – Pioneers of Vacuum Technology

In the mid-19th century, the company founder Ernst Leybold laid the foundation in Cologne for what would later become a global high-tech company. Already after a short time, he expanded the range of scientific equipment before selling his business in 1870. His life's work is today continued by Leybold following the proven tradition with a global sales and service network, high competence and expertise.

With over 1600 employees worldwide, the Leybold Group is a guarantor for the development, manufacture and sales of equipment and system solutions for the generation, control and measurement of vacuums. The range of products includes pumps, components and instruments, which are used in a variety of fields of application according to their specific design and the respective area of usage. The main application areas are metallurgy, automotive, coating applications, classic industrial processes, and production processes in the food-processing industry, but also highly technical applications in analysis, as

well as in research and development. Our capabilities include the development of components, standardized as well as application-specific and customer-specific systems for the creation of vacuums, and the management of process gases.

The extensive product portfolio is supplemented by our expertise and consulting know-how in the design and simulation of custom vacuum solutions. It is our aim to offer our customers tailor-made products and systems for their respective vacuum tasks.

In this sense, Leybold understands itself as a close partner of the respective user industries. Our qualified, motivated employees and our high innovative power are elementary factors for the constant development of our world-wide market leadership in our specific spheres of activity. This top position also ensures financial solidity and guarantees our customers around the world the best possible support in solving their particular challenges. Proximity to our customers is an important concern for us. That is why our worldwide service network, the

extensive after-sales services and the training programs of our Leybold Academy have continued to grow in the last few years and perfectly round off our portfolio.

For us, the quality of our products and services is a matter of course. A quality program that is specifically adapted to the structures of the company, and which also includes the entire delivery chain, ensures the continuous improvement of all business processes. The satisfaction and the success of our customers are the benchmark for all our quality efforts:

- Short delivery times,
 - a high degree of delivery punctuality,
 - and highest quality standards
- define our objectives and everything we do.

An important prerequisite is the certification according to DIN EN ISO 9001:2008.

Global Responsibility and Compliance

As a provider of advanced technology products and services, Leybold has established a unique position as a global leader. With our products, systems and services, we always create value for our customers. Furthermore, when it comes to efforts to tackle global challenges, we take on a pioneering role. Compliance is a great asset for us and an important guide for our corporate culture. For us, this

means that we adhere to the relevant laws, regulations and internal policies. In addition, it is our desire that in the pursuit of business activities we particularly live up to our ethical and legal responsibility. A stable set of values is the basis for our behavior towards all parties and for the maintenance of internal as well as external relations. This can be seen clearly both in the

interaction with all of our employees as well as with our customers all over the world. We attach great importance to long-term and stable relationships, characterized by respect at all times.



Quality Management System
DIN EN ISO 9001 : 2008



Authorized Economic Operator AEO



Customs-Trade Partnership Against
Terrorism C-TPAT

The Sales and Service Network

Think Global – Act Local

Our vision is to develop innovative industry solutions for better living conditions. That is why we want to be the world's leading provider of premium high-tech products and services in our industry.

On the basis of close, collaborative customer relationships, we are able to have a substantial effect on the productivity and the value of applications through our solutions. We achieve a high measure of customer satisfaction through market proximity, high reliability and the ability to implement the correct solutions rapidly.

In addition to our production sites in Europe and China, we count on our comprehensive worldwide sales and service network that is precisely tailored to the regional requirements in the respective markets. With our own sales companies, an international service, and representations in over 90 countries, Leybold has one of the largest sales and service networks in the vacuum industry.

With our presence on location, our competent consultation, comprehensive instruction and quick service, we have achieved a competitive advantage, which has been impressively confirmed by our business development over the last years.

Leybold has an area-wide presence in all regions that are relevant for the vacuum market, with its own companies, branch offices and service hubs.

In addition, an online shop provides the possibility of finding and immediately ordering vacuum pumps, spare parts and accessories. The simple order process and quick shipment of the articles also supports our customers' business processes.



Leybold GmbH, Cologne



Leybold (Tianjin), P.R. China



Leybold France S.A., Valence, France



Leybold Dresden GmbH



Leybold USA Inc., Export, Pa., USA

The ideal connection

Your current source of information
www.leybold.com

Vacuum Components

Vacuum Systems

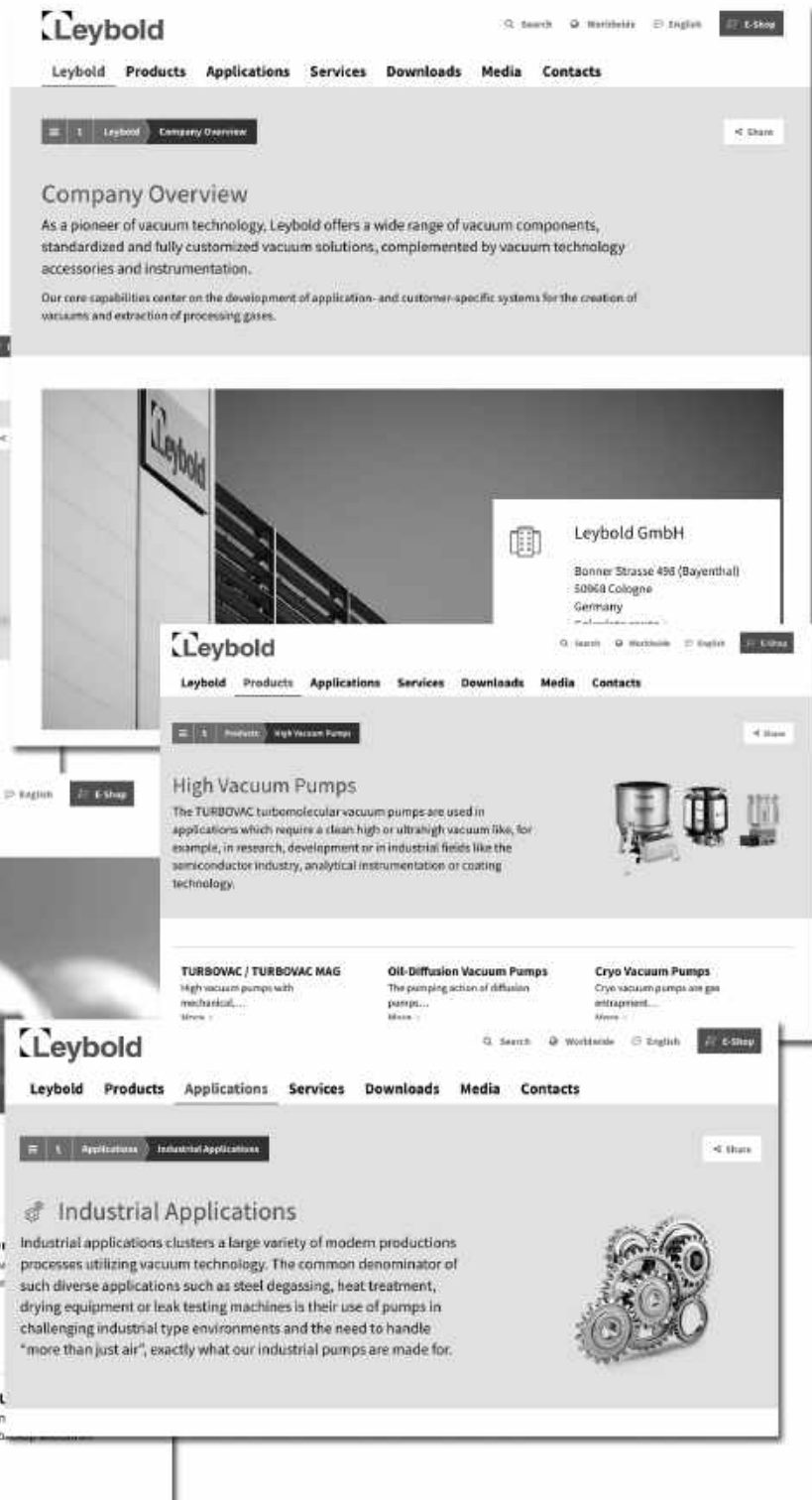
Vacuum Service

Online Catalog

Documentation

Contact Data

Microsites



Leybold Vacuum Academy

For further information on a wide range of courses in vacuum technology please contact the Leybold Training Center in Cologne:

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We would like to point out that also courses are given in the Leybold Training Center in Great Britain:

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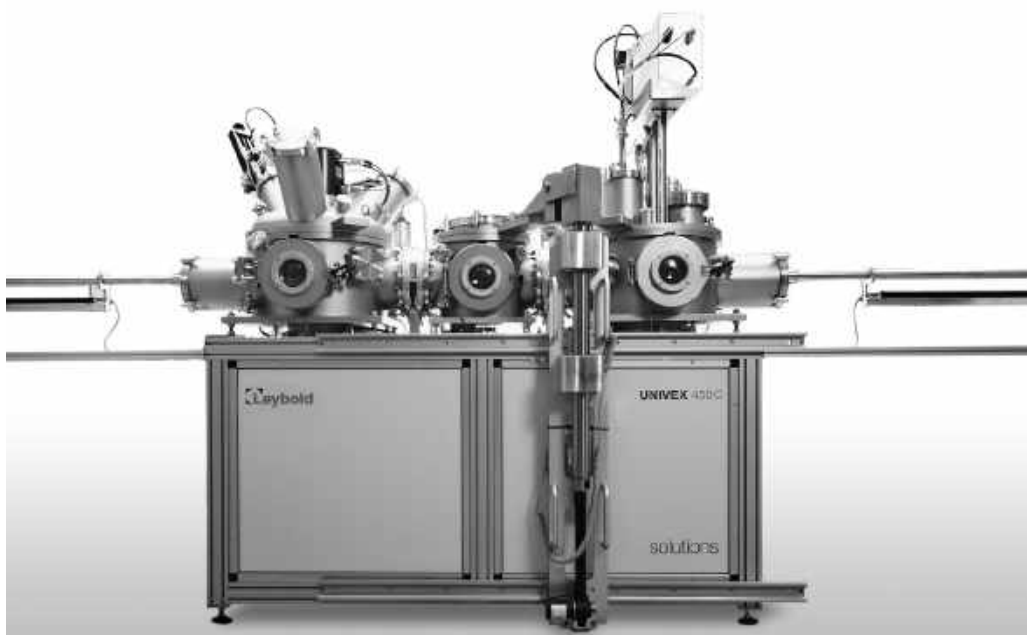
The latest information about our seminars including content and time schedule is available on the Internet: "www.Leybold.com".

Intelligent solutions begin with a good discussion...

We develop individual offers for the implementation of our technology in complete solutions in close cooperation with our customers.

This is where our range of services includes everything from customized bundling of individual products and services to entire value creation processes.

For this, we offer you the best solution for your technical vacuum tasks and accompany you throughout the entire process from engineering to after-sales service.



Special requirements require individual solutions

The quality of the selected vacuum system has a decisive influence on the function and efficiency of the application.

The space simulation chambers for the technical evaluation of materials for space shuttle flights and for the largest

mass spectrometer in the world are only two sample applications for which highest demands have to be fulfilled. Both show equally well that complex systems require assistance, design and technology at the highest level.

World-wide uniform quality standard

Owing to our global outlook, there will always be an expert at your side. Our tightly-knit network of customer service sites and workshops guarantees direct contact with our customers and also ensures a worldwide uniform standard of quality.

This applies to all our services. Because we know that service is a fundamental aspect for users who integrate our complex vacuum systems.



... and by no means stop there.

Individual system approaches require understanding and experience

With our comprehensive application experience, we can accompany you from A to Z to implement your product and process innovations. Experience is crucial, and covers everything from the exact understanding of the system requirements to the needs-based design of the after-sales support.

Based on our extensive project management and engineering expertise, we already support customers prior to the development and implementation of the system. Thanks to our copious know-how in

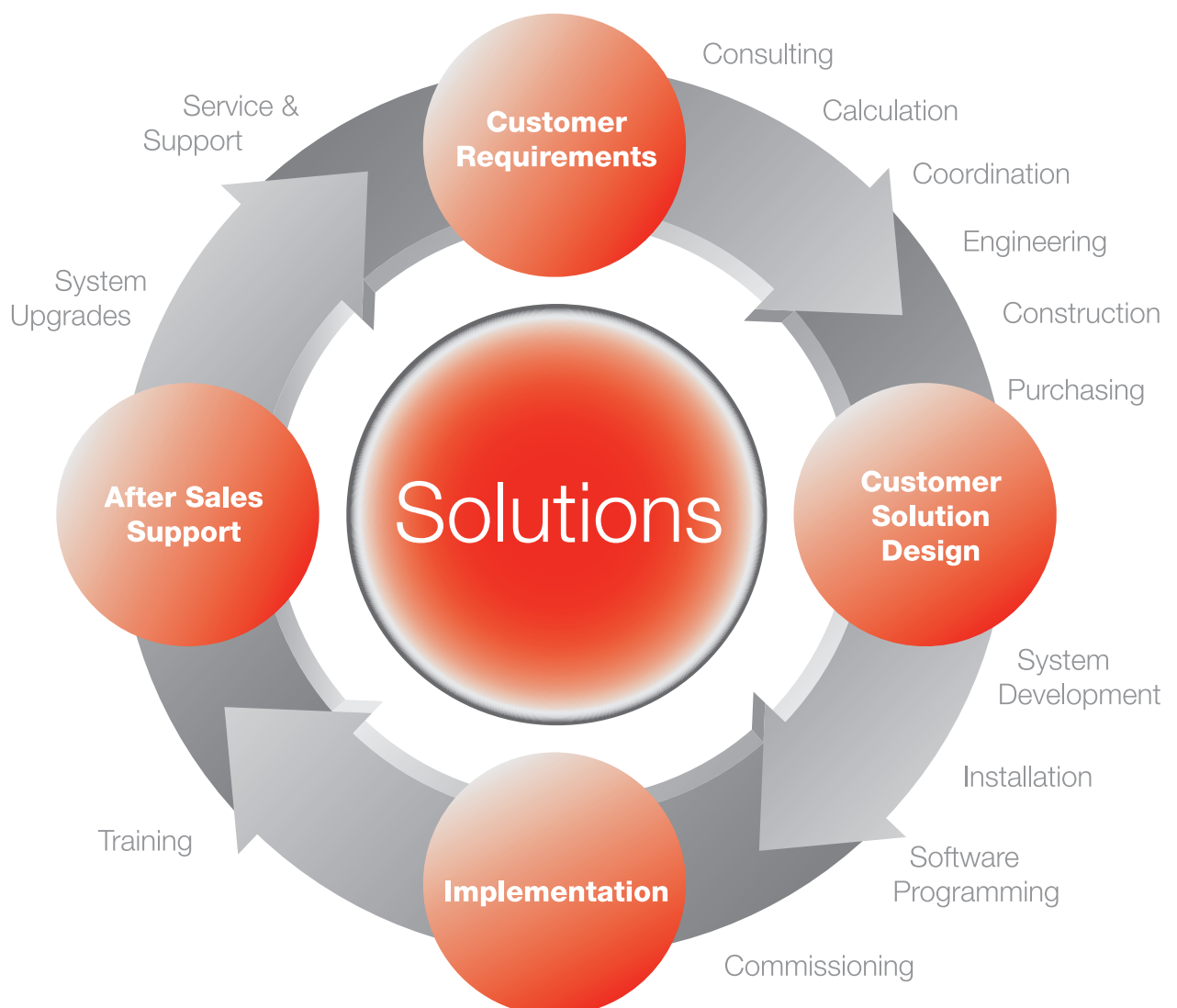
consultation, calculation, engineering and construction, we are able to identify and define accurately the customer's requirements for the system.

This process includes industry-specific, economic and technical aspects too, as they are the basis for the development of a future-proof vacuum system.

With our proprietary software PASCAL, we are able to simulate complex systems already in the planning phase of the application process and are thus ideally set up to provide an ideal system. This is where we make the cumulative expertise of our engineers available to our customers.

Leybold also has interesting solutions for experimental plants, whether standardized or adapted to the respective project:

- Universal systems for the production of function layers
- Modular system design, extensive range of accessories
- Individual system solutions according to customer specifications
- Variable chamber sizes
- Manual or fully automatic process control and plant control



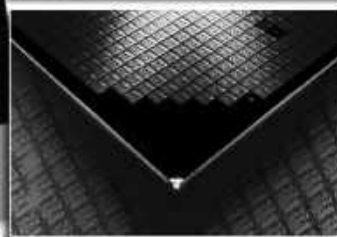
Areas of Application

Many things are possible with vacuum

The pleasure of beautiful things, the enjoyment provided by perfect sound quality, the demand for high load capacity and the requirements for ever more powerful products. These are only some of the many demands that can be satisfied only through the targeted use of vacuum technology - be it the finishing of surfaces, the coating of CDs, the manufacturing of heavy-duty components or the production of compact high-performance computers.

With vacuum technology by Leybold, goods and products that enrich our daily lives can be produced more precisely, more economically and much more sustainably. For instance, the titanium coating of watches, the anti-reflective coating on eyeglass lenses, or storage media with ever-increasing capacities. Hermetically sealed food packing, heavy-duty turbine blades, which make our airplanes more reliable and more economical, and flat screens too.

A vacuum that is intelligently produced and applied, is thus able to meet different requirements for the production of things that surround us in everyday life - for a sustainable, better future.





Members of the Leybold staff from sales, marketing, applications consulting and product development are in continuous contact with technology specialists. This guarantees that any application-specific requirements are considered in advance and can be incorporated at an early stage during product development.

Our customers are not buying just vacuum components – they are buying functional, application oriented products for individual solutions.

Products

	Applications																	
	Semiconductor production	Vacuum coating	Research and development	Loadlock and transfer chambers	Chemistry / Pharmaceutical	Metallurgy / Furnaces	Lamps and tubes manufacture	Automotive industry	Laser technology	Packaging	Space simulation	Analytical engineering	Environmental engineering	Cooling and air-conditioning	Electrical engineering	Mechanical engineering	Paper / Printing	Solar energy
TRIVAC B and E Rotary vane vacuum pumps	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
SOGEVAC Rotary vane vacuum pumps		■	■	■		■	■	■	■	■	■	■	■	■	■	■	■	■
VACUBE Screw Vacuum Pumps		■							■					■		■		
DIVAC Diaphragm vacuum pumps			■		■	■	■				■				■	■		
SCROLLVAC Scroll Vacuum pumps		■	■	■		■		■			■		■	■				
ECODRY plus Multistage roots vacuum pumps			■						■	■								
LEYVAC Dry compressing vacuum pumps		■	■	■	■	■			■	■		■		■	■			■
SCREWLINE Dry compressing vacuum pumps		■	■	■	■	■			■	■		■		■	■			■
DRYVAC Dry compressing vacuum pumps		■	■	■		■			■	■			■	■				
CLAWVAC Claw vacuum and overpressure pumps									■			■				■		
RUVAC Roots vacuum pumps	■	■	■		■	■	■	■	■	■		■		■	■	■	■	■
Magnetically suspended turbomolecular pumps	■	■	■	■							■							■
Mechanically suspended turbomolecular pumps	■	■	■	■		■	■				■							■
DIP, DIJ, OB and LEYBOJET Oil diffusion pumps		■	■		■	■	■			■	■			■				
Refrigerator cryopumps	■	■	■	■		■				■	■							■
RUTA vacuum pump systems	■	■	■	■	■	■	■		■	■		■	■	■	■			■
TURBOLAB High vacuum pump system		■	■		■	■				■	■			■	■			
UNIVEX high vacuum experimentation systems		■	■								■			■				
Total pressure gauges	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■		■
Leak detecting instruments	■	■	■		■	■	■		■	■	■	■	■	■	■	■		■
Valves and flange components (ISO-KF, ISO-K, ISO-F, CF)	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Ultra high vacuum pumps	■		■								■	■						

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Symbols used in Vacuum Technology






















Vacuum Symbols

All symbols, except those marked ¹⁾ may be used in any orientation.

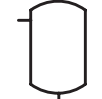

The symbols for vacuum pumps should always be so positioned that the narrowing lines point to the side of higher pressure.

¹⁾ These symbols must only be used in the indicated position (tip of the triangle pointing downwards)










Vacuum Pumps

	Vacuum pump, general		Piston vacuum pump		Diaphragm vacuum pump
	Rotary positive displacement pump		Rotary piston vacuum pump		Sliding vane rotary vacuum pump
	Rotary plunger vacuum pump		Liquid ring vacuum pump		Roots vacuum pump
	Turbine vacuum pump, general		Turboradial vacuum pump		Turboaxial vacuum pump
	Turbomolecular pump		Ejector vacuum pump		Diffusion pump
	Adsorption pump		Getter pump		Sputter-ion pump
	Cryopump		Scroll vacuum pump		Screw vacuum pump











Container

	Vessel with crowned ends, general		Vacuum bell jar
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



Accessories

	Seperator, general		Seperator with heat exchange, (e. g. cooled)		Gas filter, air filter, general
	Filter or filter device, general		Vapour baffle, general		Vapour baffle, cooled (with heat exchange)
	Cold trap, general		Cold trap with supply reservoir		Cold trap




















Isolating Devices

	Shut-off fitting, general		Gate valve		Shut-off valve, Straight-line valve
	Right-angle valve		Shut-off device with safety function		Stopcock
	Butterfly valve		Right-angle stopcock		Three-way stopcock
	Check valve				








Valve Actuation

	Manual operation		Metering valve		Fluid drive (hydraulic or magnetic)
	Solenoid operation		Electric motor drive		Weight-actuated

Connections and Piping

	Flange connector, general		Flange connector, bolted		Small flange connector
	Clamped flange connector		Threaded pipe connector		Ball-and-socket joint
	Spigot-and-socket joint		Connection by taper ground joint		Flange connector, general
	Change in pipe cross section (e.g. reducer nipple)		Junction of two pipes with communication		Cross-over of two pipes without communication
	Branch point		Bundle pipes		Port allowing sliding motion, with flange
	Linear motion feedthrough		Rotary and linear motion feedthrough		Rotary motion feedthrough
	Electric current feedthrough				

Vacuum Measurement and Gauges

	1) Vacuum (to indicate the presence of a vacuum)		1) Vacuum measurement, Vacuum measurement point		1) Vacuum gauge
	1) Recording vacuum gauge (writing)		1) Vacuum gauge with analogue display		1) Vacuum gauge with digital display
	Flow measurement				

1) These symbols must only be used in the indicated position (tip of the triangle pointing downwards)

Pressure Units

	bar	mbar (hPa)	Pa	atm	Torr	mTorr
1 bar	1	10 ³	10 ⁵	0.987	0.750 x 10 ³	0.750 x 10 ⁶
1 mbar (hPa)	10 ⁻³	1	10 ²	0.987 x 10 ⁻³	0.750	0.750 x 10 ³
1 Pa ¹⁾ (N · m ⁻²)	10 ⁻⁵	10 ⁻²	1	0.987 x 10 ⁻⁵	0.750 x 10 ⁻²	0.750 x 10 ¹
1 atm = 760 Torr	1.01	1.01 x 10 ³	1.01 x 10 ⁵	1	0.760 x 10 ³	0.760 x 10 ⁶
1 Torr	1.33 x 10 ⁻³	1.33	1.33 x 10 ²	1.32 x 10 ⁻³	1	10 ³
1 mTorr	1.33 x 10 ⁻⁶	1.33 x 10 ⁻³	1.33 x 10 ⁻¹	1.32 x 10 ⁻⁶	10 ⁻³	1

1) Pa = Pascal, hPa (Hectopascal) whereat 1 hPa = 1 mbar
The mbar is widely used in research, particularly in the vacuum technology.

All dimensions given in the technical drawings are stated in mm.

Dimensions in () are stated in inch.

The products of Leybold are subject to continual further development; thus the technical data or the dimensional drawings are subject to change without prior notice.

On the basis of international agreements (ISO/R 1000) and the regulations which apply in the Federal Republic of Germany based on these (laws on the units used in metrology) as well as the Vacuum Engineering Standards (DIN 28 400 and subsequent numbers) we have adapted the characteristic quantities stated in this catalog to the current regulations.

The table gives the conversion factors between commonly used pressure units.

$$1 \text{ mbar} \times l \times s^{-1} = 60 \text{ sccm}$$

Pressure Units

Conversion Factors

1 inch	2.54 cm
1 ft	30.48 cm
1 sq inch	6.45 cm ²
1 sqft	0.0929 m ²
1 cu inch	923.03 cm ³
1 cu ft	28.32 liter
1 US gallon	3.78 liter
1 Imp gallon	4.54 liter
1 micron	1.33 x 10 ⁻³ mbar
1 US qt	0.946 liter
1 Imp qt	1.137 liter
1 lb	0.453 kg
1 hp	735 W
1 r.p.m.	1 min ⁻¹

Temperature

°C	°F
0	32
10	50
20	68
30	86
40	104
50	122
60	140
70	158
80	176
90	194
100	212

$$^{\circ}\text{F} = 1.8 \times ^{\circ}\text{C} + 32$$

Pressure

psi	bar
1.0	0.07
10	0.70
14.5	1.00
20	1.38
30	2.07
40	2.76
50	3.45
60	4.14
70	4.83
80	5.51
90	6.20
100	6.90

Various pressure units

mbar (millibar)	Torr	inches Hg vacuum
1013	760	0
400	300	18.12
133	100	25.98
4	3	29.80
1	0.75	29.89
0	0	29.92

Various pumping speed units

	m ³ x h ⁻¹	l x s ⁻¹	cfm
m ³ x h ⁻¹ = m ³ /h	1.0	0.278	0.589
l x s ⁻¹ = l/s	3.60	1.0	2.12
cfm (cubic feet per minute)	1.699	0.472	1.0

$$\text{Example: } 1 \text{ m}^3 \times \text{h}^{-1} = 0.589 \text{ cfm}$$

Please note: The nominal pumping speed of a pump at 60 Hz is 20% higher than at 50 Hz

Dimensions

Inches	Inches	mm
1/8	0.1250	3.1750
1/4	0.2500	6.3500
3/8	0.3750	9.5250
1/2	0.5000	12.7000
3/4	0.7500	19.0500
1/1	1.0000	25.4000

Various flow rate units

	mbar x l x s ⁻¹	kg x h ⁻¹	cm ³ x s ⁻¹	slm
mbar x l x s ⁻¹	1.0	4.28 x 10 ⁻³	0.987	59.2 x 10 ⁻³
kg x h ⁻¹ (0 °C)	218	1.0	215	12.91
cm ³ x s ⁻¹ (NTP)	2.81 x 10 ⁻⁴	1.2 x 10 ⁻⁶	1.0	1.66 x 10 ⁻⁵
slm (standard liter per minute)	16.88	72.15 x 10 ⁻³	16.67	1.0

The booklet “Fundamentals of Vacuum Technology” covers on 234 pages in an easily comprehensible and clear manner all relevant aspects of vacuum technology.

Through 16 chapters the reader learns about all important aspects of handling “vacuum”.

Besides the fundamentals of vacuum physics, the field of vacuum technology beginning with vacuum generation, vacuum measurement and ending with leak detection and vacuum coating processes is described in detail.

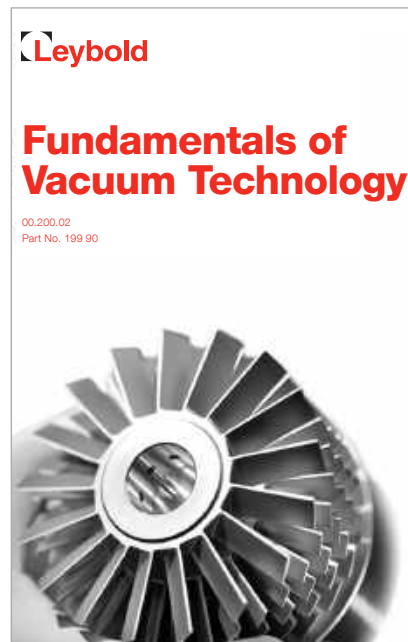
The compilation explains the different pumping principles employed for generating a vacuum, assists in the selection of a suitable pumping process, dimensioning of the necessary pump size as well as designing a vacuum system.

A separate chapter deals with the measurement of low pressures, pressure monitoring, pressure regulation and control.

Further fields of vacuum technology like mass spectrometric gas analysis at low pressures, leak detection or vacuum engineering applications like coating processes and film thickness measurements are described too. Also recommended and indispensable are the numerous practice related operating hints for vacuum systems.

This booklet is of interest to beginners and vacuum experts alike.

Numerous tables, formulae and diagrams, as well as the explanation of vacuum engineering standards, supplement the material for a deeper understanding of all vacuum technology aspects.



Ordering Information

Fundamentals of Vacuum Technology

	Part No.
Fundamentals of Vacuum Technology	199 90

Note on data protection

You will find detailed information about privacy on our Web site: “www.leybold.com/en/legal-and-data-privacy/”.

Please note: from beginning May 25th, 2018 the EU-Privacy regulations will apply. There will be no significant changes in regard of processing your data in our systems. Detailed information will be available latest on 05.25.2018 on our Web site.

Oil Sealed Vacuum Pumps

TRIVAC

Rotary Vane Vacuum Pumps

SOGEVAC

Rotary Vane Vacuum Pumps

VACUBE

Screw Vacuum Pumps

Contents

Oil Sealed Vacuum Pumps

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Applications for TRIVAC pumps

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Applications																		
Production of semiconductors											■	■	■	■	■	■		
Vacuum coating				■	■	■	■				■	■	■	■	■	■		
Research and development	■	■	■	■	■	■	■	■		■		■	■	■	■	■	■	
Chemistry/pharmaceuticals		■		■	■	■	■	■			■	■	■	■	■	■		
Metallurgy/furnaces						■	■											
Lamps and tubes manufacture		■	■	■	■		■	■										
Automotive industry		■		■	■				■	■								
Laser engineering	■																	
Space simulation						■	■											
Analytical engineering		■	■	■	■	■												
Environment engineering		■	■	■	■	■	■	■										
Cooling and air-conditioning	■		■	■	■	■	■			■								
Electrical engineering	■	■	■	■	■	■	■	■										
Mechanical engineering	■	■	■	■	■	■	■	■										
Medicine technology		■	■	■	■	■												
Vacuum drying cabinets		■	■	■	■	■												
Chemistry and research labs		■	■	■	■	■					■	■	■					
Freeze drying systems		■	■	■	■	■	■	■										
Backing pump for high vacuum pump systems	■	■	■	■	■	■	■	■		■	■	■	■	■	■	■	■	■
Leak detectors		■			■	■	■	■										

Accessories for TRIVAC pumps

Pumps	S 1.5	TRIVAC D 2.5 E	TRIVAC D 4 B	TRIVAC D 8 B	TRIVAC D 16 B	TRIVAC D 25 B	TRIVAC D 40 B	TRIVAC D 65 B	TRIVAC D 16 B-DOT + D 25 B-DOT	TRIVAC 40 B-DOT	TRIVAC D 65 B ¹⁾ He	TRIVAC D 16 B-Ex	TRIVAC D 16 BCS + D 25 BCS	TRIVAC D 40 BCS	TRIVAC D 65 BCS	TRIVAC D 16 + D 25 BCS-PPPE	TRIVAC D 40 BCS-PPPE	TRIVAC D 65 BCS-PPPE
Accessories																		
Exhaust filters AF(-DOT)		■	■	■	■	■	■	■	■		■	■	■					
Condensate traps / separators AK	■	■	■	■	■	■	■	■	■		■	■	■	■	■	■	■	■
Exhaust filters with lubricant return ARP / AR			■	■	■	■	■	■	■		■	■	■					
Exhaust filters with lubricant return ARS											■	■	■	■	■	■	■	■
Exhaust filter drain tap		■																
Oil drain tap	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Oil drain kit	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Oil suction facility AR-V ¹⁾ , magnetic AR-M ¹⁾ , manual		■																
Dustfilter FH/DF DN 16 to 40 KF	■	■	■	■	■	■	■	■			■	■	■	■	■	■	■	■
Adsorption trap FH/RF DN 16 to 40 KF	■	■	■	■	■	■	■	■			■	■	■	■	■	■	■	■
Cold trap TK		■	■	■														
Dust separators AS	■	■	■	■	■	■	■	■			■	■	■	■	■	■	■	■
Molecular filters MF	■	■	■	■	■	■	■	■			■	■	■	■	■	■	■	■
Mechanical oil filters OF			■	■	■	■	■	■										
Chemical oil filters CF			■	■	■	■	■	■			■	■	■	■	■	■	■	■
Chemical filters with safety isolation valve CFS		■	■	■	■	■					■	■	■	■	■	■	■	■
Inert gas system IGS											■	■	■	■	■	■	■	■
Limit switch system LSS											■	■	■	■	■	■	■	■
Roots pump adaptor						■	■					■	■		■	■		
Flange components, valves	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■

¹⁾ For pumps with gas ballast only

Oil for TRIVAC pumps for different fields of application

Applications	Semiconductor production	Vacuum coating	Research and development	Chemistry/Pharmaceutical	Metallurgy/Furnaces	Lamps and tubes manufactures	Automotive industry	Laser technology	Space simulation	Analytical engineering	Environment technologies	Oxygen applications	Cooling and air-conditioning	Electrical engineering	Mechanical engineering	Medicine engineering	Vacuum technology	Chemistry drying cabinets	Freeze drying	Backing pump for research labs	Food industry
LEYBONOL Oils																					
LVO 100	▲	■	■	■	■	■	■	■	■	■	■	■	■	■	■	●	■	■			
LVO 210		■	■	■	■	■	■		■	■		■	■	■	■	●	■	●	●		
LVO 240			■	■																	
LVO 300																				■	
LVO 310			■		■	■	■				■		■							▲	
LVO 400	■	●	■	■						■						▲	●		●		
LVO 600			■	■										■							
DOT 4			●				■														

- = Standard
- = Possible
- ▲ = Please contact Leybold

The table only lists general applications. Your specific requirements might be subject to deeper analysis.
For further questions, please contact our technical Sales support.

**For information on oil specifications please refer to Catalog Part
"Oils / Greases / Lubricants LEYBONOL®".**

Oil for TRIVAC pumps for different pump types

Pumps	S 1.5	TRIVAC D 2.5 E	TRIVAC D 4 B	TRIVAC D 8 B	TRIVAC D 16 B	TRIVAC D 25 B	TRIVAC D 40 B	TRIVAC D 65 B	TRIVAC D 16 B-DOT and D 25 B-DOT	TRIVAC 40 B-DOT	TRIVAC D 65 B *He	TRIVAC D 16 B-Ex	TRIVAC D 16 BCS and D 25 BCS	TRIVAC D 40 BCS	TRIVAC D 65 BCS	TRIVAC D 16 and D 25 BCS-PFPE	TRIVAC D 40 BCS-PFPE	TRIVAC D 65 BCS-PFPE
LEYBONOL Oils																		
LVO 100	■	■	■	■	■	■	■	■		■	■	■	■	■				
LVO 210	●	●	●	●	●	●	●	●			●	●	●	●				
LVO 240	●	●	●	●	●	●	●	●			▲			●				
LVO 300			●	●	●	●	●	●										
LVO 310	●	●	●	●	●	▲				▲								
LVO 400		▲	▲												■	■	■	
LVO 600	●	●	●	●	●	●	●	●			▲	●	●	●				
DOT 4									■	■								

- = Standard
- = Possible
- ▲ = Please contact Leybold

The table only lists general applications. Your specific requirements might be subject to deeper analysis.
For further questions, please contact our technical Sales support..

**For information on oil specifications please refer to Catalog Part
"Oils / Greases / Lubricants LEYBONOL®".**

Products

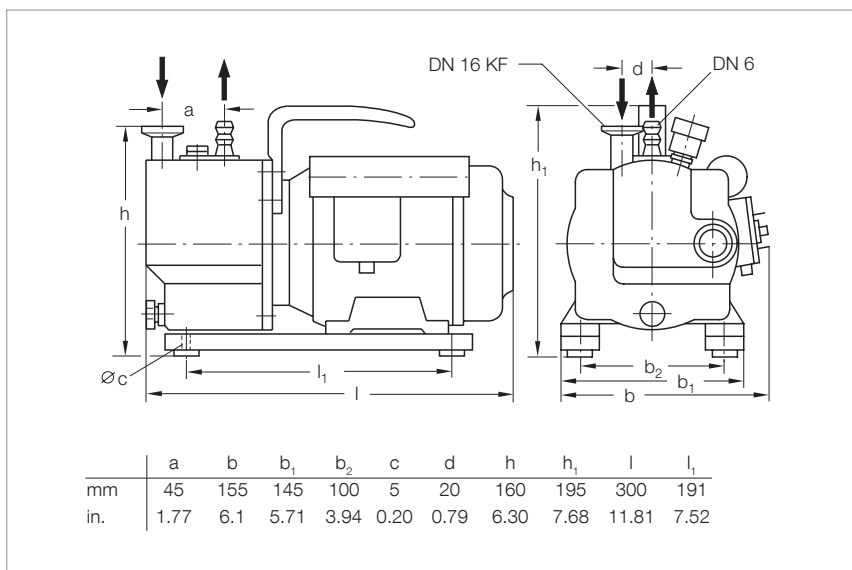
Small Compact Pump S 1,5



The S 1,5 is a single-stage, oil sealed rotary vane pump with a gas ballast valve. It is driven by a flange mounted AC motor. The shaft of the pump and the shaft of the motor are linked by means of a pinned coupling.

Advantages to the User

- Very small and light-weight
- Low ultimate pressure
- High water vapor tolerance
- Low noise operation
- Simple to connect
- Easy to maintain and use



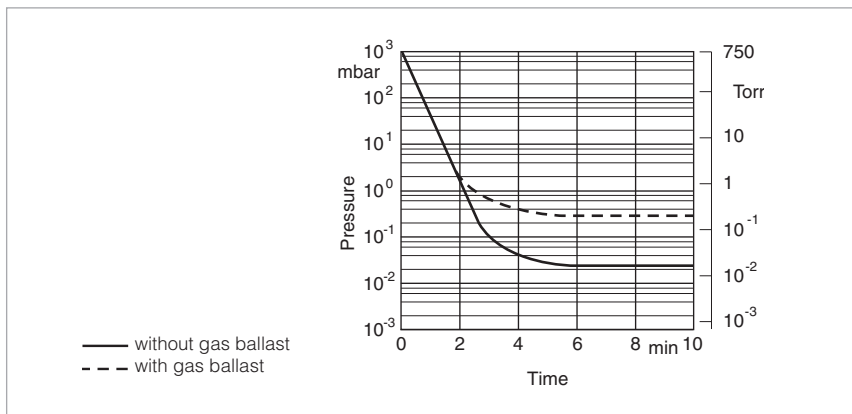
Dimensional drawing for the S 1,5

Typical Applications

- In all areas of vacuum engineering where a low intake pressure is required
- Evacuation of refrigerant circuits
- For suction, lifting, emptying, filling and tensioning
- For installation in mobile instruments

Supplied Equipment

- DN 16 small flange connection on the intake side
- Centering ring and clamping ring
- Exhaust port designed as a DN 6 hose nozzle
- Carrying handle
- Built-in ON/OFF switch and overcurrent circuit breaker
- Oil filling



Pump-down characteristics of a 10 l vessel at 50 Hz

Technical Data

S 1,5

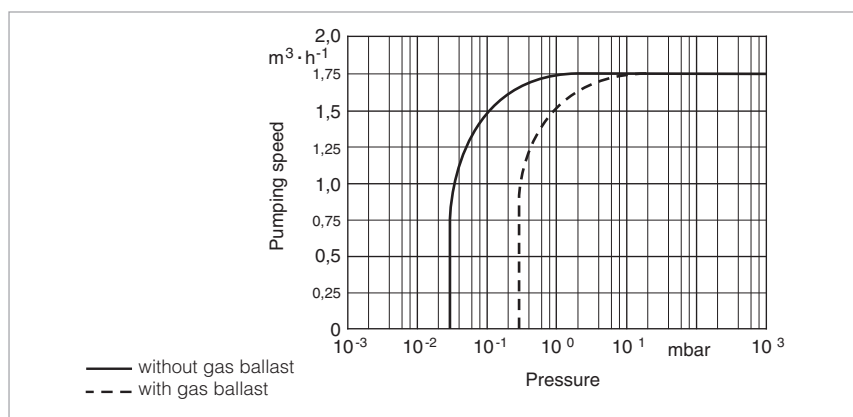
		50 Hz	60 Hz
Nominal pumping speed ¹⁾	m ³ /h (cfm)	1.9 (1.1)	2.3 (1.3)
Pumping speed ¹⁾	m ³ /h (cfm)	1.75 (1)	2.1 (1.2)
Ultimate partial pressure without gas ballast ¹⁾	mbar (Torr)	3 x 10 ⁻² (2.3 x 10 ⁻²)	3 x 10 ⁻² (2.3 x 10 ⁻²)
Ultimate total pressure with gas ballast ¹⁾	mbar (Torr)	5 x 10 ⁻¹ (3.8 x 10 ⁻¹)	5 x 10 ⁻¹ (3.8 x 10 ⁻¹)
Water vapor tolerance ¹⁾	mbar (Torr)	> 15 (> 11.3)	> 15 (> 11.3)
Water vapor capacity	g/h (lbs/h)	19 (42)	23 (50)
Oil filling, min. / max.	l (qt)	0.11/0.14 (0.12/0.15)	0.11/0.14 (0.12/0.15)
Noise level to DIN 45 635	dB(A)	50	50
Admissible ambient temperature	°C (°F)	12 – 40 (53.6 – 104)	40 (53.6 – 104)
Max. permanent inlet pressure	mbar (Torr)	30 (22.5)	30 (22.5)
Motor rating	W (hp)	80 (0.11)	80 (0.11)
Nominal speed	rpm	1500	1800
Weight	kg (lbs)	8.8 (19.4)	8.8 (19.4)
Connections			
Intake	DN	16 KF	16 KF
Exhaust		6 mm hose nipple	6 mm hose nipple

Ordering Information

S 1,5

	Part No.
S 1,5 with AC motor, 230 V (208 – 252 V ± 5%), 50/60 Hz, with 2 m long mains cord and EURO plug	101 01
Transition connector (250 V AC, 10 A, L+N+PE) only necessary in Switzerland for 1~ pumps	800 001 274
AK 8 condensate trap	190 60
Exhaust filter drain tap (G 1/4")	190 95
Connection components	
Elbow (1x) DN 16 KF	184 36
Centering ring with O-ring (2x) DN 16 KF	183 26
Clamping ring (2x) DN 16 KF	183 41

¹⁾ To DIN 28 400 and following numbers



Pumping speed characteristics at 50 Hz

TRIVAC E, Two-Stage, Oil Sealed Rotary Vane Vacuum Pump



TRIVAC D 2,5 E

The TRIVAC E pump is an oil sealed vacuum pump operating according to the rotary vane principle. Oil which is injected into the pump chamber is used for sealing, lubrication and cooling purposes.

The result is the TRIVAC E rotary vane vacuum pump.

Beyond the usual quality and reliability of the B series pumps, the TRIVAC E pump offers improvements in the area of quieter operation, smaller size and improved service-friendliness.

The intake and exhaust ports are equipped with small flanges. Besides standard voltages and frequencies, Leybold offers world motors, which are specially required by OEMs.

Advantages to the User

- Highly reliable
- Small and compact
- Quiet operation
- Environmentally compatible (low oil consumption, EMI compatible; IP 54 protection)
- Process quality (low backstreaming of oil)
- Motor for all standard supply voltages and frequencies
- Safe and intelligent vacuum protection (hermetically sealed)
- Free of yellow metals
- Compliance with international standards (CE)
- Suitable for continuous operation at 1000 mbar (750 Torr)
- Low power consumption
- Better individual performance given by 3 stage gas ballast device
- High water vapor tolerance
- Simplified customizing ability

Typical Applications

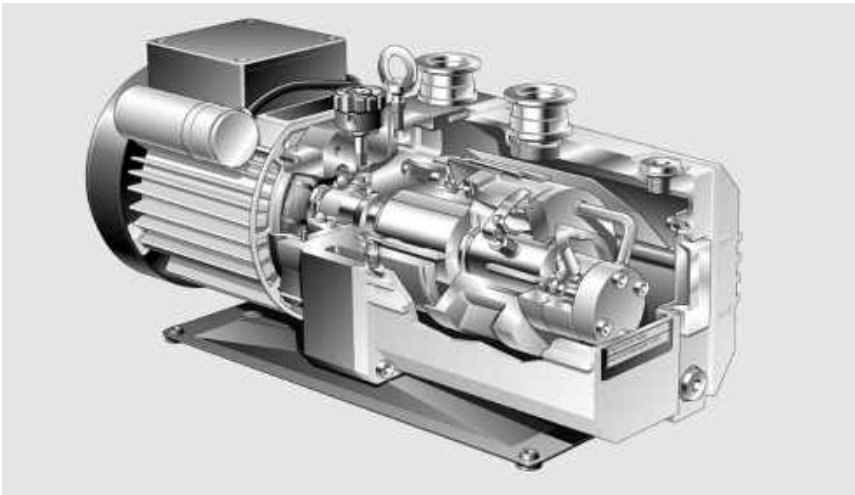
- Mass and X-ray spectrometers
- Electron beam microscopes
- Leak detectors
- Sterilizers
- Freeze-drying systems
- Chemical and research labs
- General vacuum engineering
- Backing pump for high vacuum pump systems

Supplied Equipment

- Dirt trap
- Oil filling included separately (standard LVO 100)
- Gas ballast device
- Mains cord with the specific plug for EURO, US and Japan motors
- Optional: Mains cord with country specific plug for the world motor
- With handle

All pumps are 100% subjected to a vacuum test before delivery!

TRIVAC D 2,5 E



TRIVAC E

Dimensional drawing of the TRIVAC D 2,5 E showing front, side, and top views with dimension lines labeled A through Q.

	A		B	
	EURO	World	EURO	World
	Jap, US	1 ~	Jap, US	1 ~
mm	388.5	393.5	210.5	227.5
in.	15.3	15.5	8.29	8.96

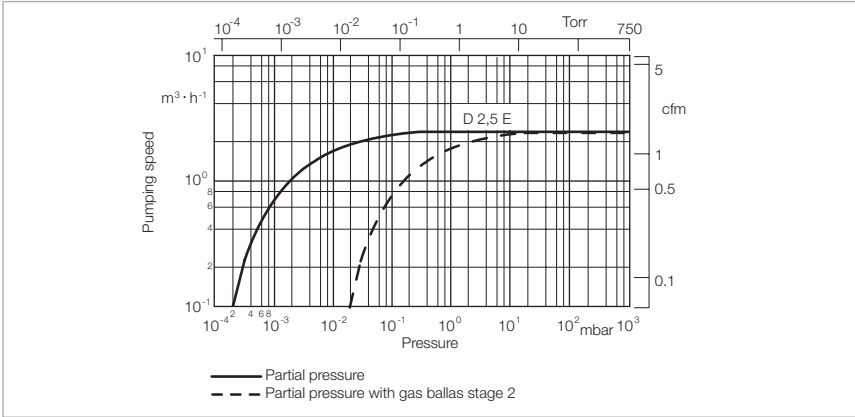
	C			
	EURO	World	EURO	World
	Jap, US	1 ~		1 ~
mm	127	127	148.5	¹⁾
in.	5	5	5.85	¹⁾

	E	F	G	H	J	K
mm	162.5	75.5	119.5	225	231.5	225
in.	6.4	2.97	4.7	8.86	9.90	8.86

	L	M	N	O	P	Q	R	DN
mm	182	177	113	27	15	83	84.5	16 KF
in.	7.16	6.97	4.45	1.06	0.59	3.27	3.33	16 KF

¹⁾ Capacitors in the connection box

Dimensional drawing for the TRIVAC D 2,5 E



Pumping speed of the TRIVAC D 2,5 E at 50 Hz (60 Hz curves at the end of the chapter)

Technical Data

TRIVAC D 2,5 E

		50 Hz	60 Hz
Nominal pumping speed ¹⁾	m³/h (cfm)	3.2 (1.9)	3.6 (2.1)
Pumping speed ¹⁾	m³/h (cfm)	2.7 (1.6)	3.3 (1.9)
Ultimate partial pressure without gas ballast	mbar (Torr)	$\leq 5 \times 10^{-4}$ ($\leq 3.8 \times 10^{-4}$)	$\leq 5 \times 10^{-4}$ ($\leq 3.8 \times 10^{-4}$)
Ultimate total pressure without gas ballast ²⁾	mbar (Torr)	$\leq 2 \times 10^{-3}$ ($\leq 1.5 \times 10^{-3}$)	$\leq 2 \times 10^{-3}$ ($\leq 1.5 \times 10^{-3}$)
Ultimate total pressure with gas ballast Stage 2 ²⁾	mbar (Torr)	$\leq 3 \times 10^{-2}$ ($\leq 2.3 \times 10^{-2}$)	$\leq 3 \times 10^{-2}$ ($\leq 2.3 \times 10^{-2}$)
Water vapor tolerance			
Stage 1	mbar (Torr)	10 (7.5)	10 (7.5)
Stage 2	mbar (Torr)	20 (15)	20 (15)
Stage 3	mbar (Torr)	30 (22.5)	30 (22.5)
Water vapor capacity			
Stage 1	g/h (lbs/h)	20 (0.044)	20 (0.044)
Stage 2	g/h (lbs/h)	40 (0.088)	40 (0.088)
Stage 3	g/h (lbs/h)	60 (0.132)	60 (0.132)
Oil filling, min. / max.	l (qt)	0.4 / 0.7 (0.42 / 0.74)	0.4 / 0.7 (0.42 / 0.74)
Noise level	dB(A)	≤ 47	≤ 49
Admissible ambient temperature	°C (°F)	+10 to +50 (+50 to +122) (EURO motor) / +10 to +40 (+50 to +104) (US/Japan motor)	+10 to +50 (+50 to +122) (EURO motor) / +10 to +40 (+50 to +104) (US/Japan motor)
Motor rating	W (HP)	250 (0.34)	300 (0.41)
Nominal speed	rpm	1400	1600
Type of protection	IP	54	54
Weight (with oil filling)	kg (lbs)	16.1 (35.4)	16.1 (35.4)
Connections (Intake and Exhaust)	DN	16 KF	16 KF

¹⁾ To DIN 28 426 T1

²⁾ To DIN 28 400 and following numbers

Motor Dependent Data

Motors for D 2,5 E	Voltage (V)	Frequency (Hz)	Voltage tolerance	Power consumption (W (HP))	Nominal current (A)	Protection	Nominal speed (rpm)
EURO 1 ~	220–240/230	50/60	± 5%	250/300 (0.34/0.41)	1.8/1.4	IP 54	1400/1600
World 1 ~	100–120 200–240	50/60	± 5%	250/300 (0.34/0.41)	4.4/3.0 2.2/1.5	IP 54	1400/1600

Ordering Information

TRIVAC D 2,5 E

	Part No.
TRIVAC E with 1.8 m (6 ft.) long mains cord EURO version, 1-ph., 220 – 240 V, 50 Hz; 230 V, 60 Hz Schuko plug	140 000
CH plug	140 005
Single phase world motor, 100 – 120 V, 200 – 240 V 50/60 Hz (without mains cord)	140 001
Further variants upon request	
Accessories	
Connection cable for single phase world motor	
230 V Schuko plug	200 81 091
230 V UK plug	200 81 097
230 V CH plug	200 81 099
230 V NEMA plug (200 – 240 V)	200 81 141
115 V NEMA plug (100 – 120 V)	200 81 090
Exhaust filter AF 8	190 50
Replacement filter elements FE 8 for AF 8 (pack of 5)	190 80
Exhaust filter drain tap (G 1/4")	190 95
Manual oil return AR-M via gas ballast inlet (kit for AF 8-16)	190 93
Oil suction AR-V controlled by a solenoid valve via the gas ballast inlet (kit for AF 8-16)	190 92
Condensate trap AK 8	190 60
Oil drain tap (M 16 x 1.5)	190 90
Oil drain kit (M 16 x 1.5)	190 94
Connection components	
Elbow (1x) DN 16 KF	184 36
Centering ring with O-ring (2x) DN 16 KF	183 26
Clamping ring (2x) DN 16 KF	183 41
Spare Parts	
Maintenance kit 1 (oil demister, oil box seal)	200 40 022
Repair kit 1 (motor side sealing, shaft sealing ring, coupling sleeves, compression spring)	E 100 000 351
Repair kit 2 (valves, oil demister, oil box seal)	200 40 024
Repair kit 3 (oil demister, sealing, wearing parts)	E 100 000 347

For further accessories see Chapter "Accessories for TRIVAC E, B and BCS"

TRIVAC B, Two-Stage Rotary Vane Vacuum Pumps TRIVAC D 4 B to D 65 B



The TRIVAC B is part of the well-proven TRIVAC concept.

The TRIVAC B pumps with their comprehensive range of accessories have proven themselves time and again as rugged pumps in many and varied applications.

The inner body is assembled from individual parts without sealing components. The parts are pinned in order to ensure easy disassembly and reassembly of the parts.

All pumps from the D 4 B to the D 25 B model are equipped either with single-phase or three-phase motors. D 40 - 65 B models are equipped with three-phase motors. In the TRIVAC B, the pump unit and the motor are linked by an elastic coupling.

The TRIVAC B range is a modular system which divides into three groups:

TRIVAC 4/8 Series
TRIVAC 16/25 Series
TRIVAC 40/65 Series

Advantages to the User

- All basic models (single-phase and three-phase motor) are certified in accordance with 2014/34/EU (ATEX) (Category 3 inside)
- High water vapor tolerance
- Continuous operation even at 1000 mbar
- Built-in oil pump; pressure-lubricated sliding bearings
- All controls as well as the oil sight glass are located on the front face
- Either vertical or horizontal intake and exhaust ports
- Exchangeable inner body
- Anti-suckback valve controlled via the oil pressure
- Free of yellow metals
- Service-friendly
- Ideal as backing pump for medium and high vacuum applications, because of low oil backstreaming
- Highly leaktight (⁴He-capable)

Typical Applications

See chapter "General, Applications and Accessories".

Supplied Equipment

Small flanges, centering and clamping rings. The intake flange contains a dirt trap.

A carrying handle is standard for all pumps up to the D 25 B. TRIVAC B pumps with single-phase motors are delivered with ON/OFF switch, mains cord and main plug, ready for immediate operation.

Standard TRIVAC B pumps come with a filling of oil LEYBONOL LVO 100, others with special oil fillings can be specified.

All pumps are 100% subjected to a vacuum test before delivery!

Custom Models

- ATEX (Category 3 inside and 3 outside)
- Brake fluid
- Oils for refrigerating machines, e.g. ester oils for refrigerant circuits with R 134 a
- Pressure burst resistant (for the new refrigerants propane and isobutane)
- ³He-tight (for cryostats)
- Special motors

TRIVAC D 16 B-DOT to D 40 B-DOT



The TRIVAC B-DOT pumps operate with brake fluid (DOT 4) as the sealing and lubricating agent. Therefore these pumps are equipped with EPDM seals. EPDM is highly compatible with brake fluid.

Advantages to the User

- Matching exhaust filters with EPDM gaskets (AF-DOT)
- Except for the seals and the fluid the TRIVAC B-DOT pumps are identical to the oil sealed TRIVAC B pumps

Typical Applications

- For filling of brake fluid circuits in the automotive industry

Supplied Equipment

- The brake fluid is inside the pump when shipped

TRIVAC D 65 B ^3He



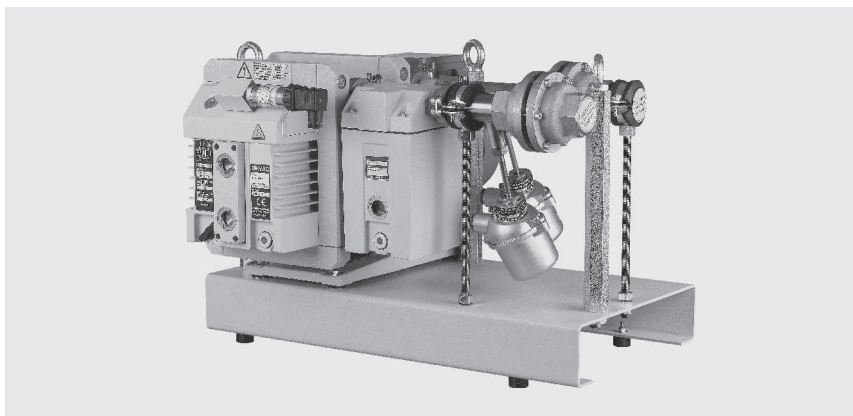
Advantages to the User

- Leak rates below 1×10^{-7} mbar x l/s, also while the pump is running
- Low pressures of 100 mbar in the oil box are permitted during operation
- No gas ballast facility
- Pump is FPM (FKM)-sealed

Typical Applications

- Pumping of continuously or discontinuously ^3He operated cryostats, also on ^3He and ^4He mixed cryostats
- In these cryostats the very expensive helium isotope ^3He , respectively mixtures consisting of ^3He and ^4He are pumped and this is generally done continuously in cycles running over weeks. The gas must neither be lost nor contaminated. For this reason exhaust lines are frequently operated at low pressures of 100 mbar (absolute)

TRIVAC D 16 B-Ex, Explosion Protected and Pressure Burst Resistant



ATEX

**Category 1 inside and
2 outside**

Typical Applications

- Pumping of gases belonging to Group IIB3 and IIC ¹⁾ from Zone 0

Vacuum pumps TRIVAC D 16 B-Ex meet the requirements of the European Directive 94/9/EG (ATEX Directive). TRIVAC D 16 B-Ex pumps are classified inside as Category 1, outside as Category 2. Thus these pumps are suited for pumping explosive gases from Zone 0, the pump itself may be located in Zone 1.

The vacuum pumps TRIVAC D 16 B-Ex are qualified for gases of Explosion Groups IIC ¹⁾ and IIB3. The temperature class is T4. TRIVAC D 16 B-Ex pumps are explosion resistant and correspond to the state-of-the-art. They are equipped as standard with one each temperature sensor on the intake and delivery side.

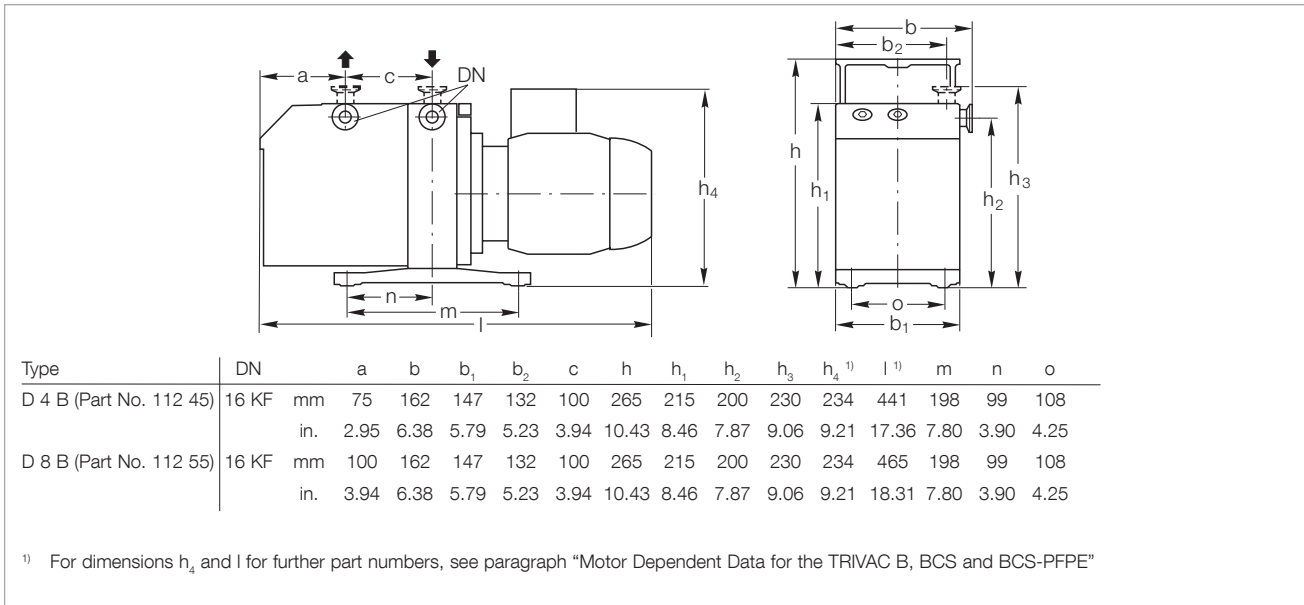
Moreover, the pressure inside the pump is monitored. Flame arresters on the intake and delivery side protect the upstream and downstream system sections. Also provided as standard is an exhaust filter for every pump.

¹⁾ With the exception of acetylene and carbon bisulphide

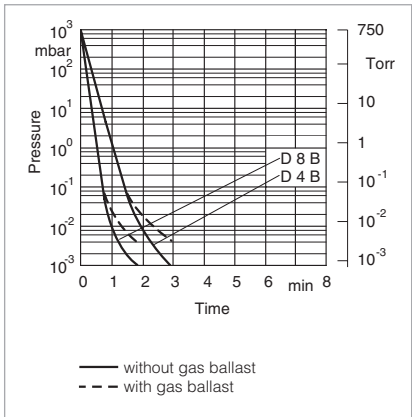
TRIVAC D 4 B and D 8 B



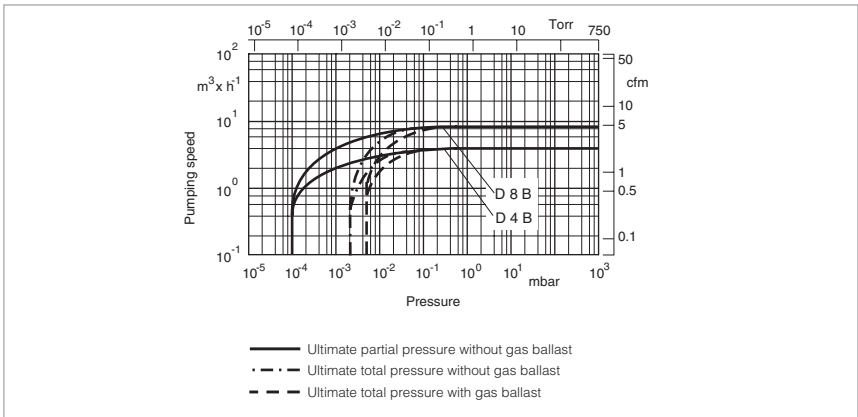
TRIVAC D 4 B (left) and TRIVAC D 8 B (right)



Dimensional drawing for the TRIVAC D 4 B and D 8 B



Pump-down characteristics of a 10 l vessel at 50 Hz



Pumping speed characteristics at 50 Hz (60 Hz curves at the end of the chapter)

Technical Data**TRIVAC D 4 B****two-stage****TRIVAC D 8 B****two-stage**

		50 Hz	60 Hz	50 Hz	60 Hz
Nominal pumping speed ¹⁾	m ³ /h (cfm)	4.8 (2.8)	5.8 (3.4)	9.7 (5.7)	11.6 (6.9)
Pumping speed ¹⁾	m ³ /h (cfm)	4.2 (2.5)	5.0 (3.0)	8.5 (5)	10.2 (6)
Ultimate partial pressure without gas ballast ¹⁾	mbar (Torr)	10 ⁻⁴ (0.75 x 10 ⁻⁴)	10 ⁻⁴ (0.75 x 10 ⁻⁴)	10 ⁻⁴ (0.75 x 10 ⁻⁴)	10 ⁻⁴ (0.75 x 10 ⁻⁴)
Ultimate total pressure without gas ballast ¹⁾	mbar (Torr)	< 2 x 10 ⁻³ (< 1.5 x 10 ⁻³)	< 2 x 10 ⁻³ (< 1.5 x 10 ⁻³)	< 2 x 10 ⁻³ (< 1.5 x 10 ⁻³)	< 2 x 10 ⁻³ (< 1.5 x 10 ⁻³)
Ultimate total pressure with gas ballast ¹⁾	mbar (Torr)	< 5 x 10 ⁻³ (< 3.8 x 10 ⁻³)	< 5 x 10 ⁻³ (< 3.8 x 10 ⁻³)	< 5 x 10 ⁻³ (< 3.8 x 10 ⁻³)	< 5 x 10 ⁻³ (< 3.8 x 10 ⁻³)
Water vapor tolerance ¹⁾	mbar (Torr)	30.0 (22.5)	30.0 (22.5)	25.0 (18.8)	25.0 (18.8)
Water vapor capacity	g/h (lbs/h)	95 (0.209)	110 (0.243)	160 (0.353)	190 (0.419)
Oil filling, min. / max.	l (qt)	0.3 / 0.8 (0.3 / 0.85)	0.3 / 0.8 (0.3 / 0.85)	0.3 / 0.9 (0.3 / 0.95)	0.3 / 0.9 (0.3 / 0.95)
Noise level ²⁾ to DIN 45 635, without / with gas ballast	dB(A)	50 / 52	50 / 52	50 / 52	50 / 52
Admissible ambient temperature	°C (°F)	+12 to +40 (+54 to +104)	+12 to +40 (+54 to +104)	+12 to +40 (+54 to +104)	+12 to +40 (+54 to +104)
Motor rating ²⁾	W (HP)	370 (0.50)	370 (0.50)	370 (0.50)	370 (0.50)
Nominal speed	rpm	1500	1800	1500	1800
Type of protection	IP	3)	3)	3)	3)
Weight ²⁾	kg (lbs)	17.9 (39.4)	17.9 (39.4)	18.9 (41.6)	18.9 (46.7)
Connections, Intake and Exhaust	DN	16 KF	16 KF	16 KF	16 KF

¹⁾ To DIN 28 400 and following numbers

²⁾ Motor rating and noise levels for the pumps with AC motor 50 Hz.

Any data that deviate from the above for pumps with other motors, and other motor-dependent data are given in chapter "Products", paragraph "Motor Dependent Data for the TRIVAC B, BCS and BCS-PFPE"

³⁾ See paragraph "Motor Dependent Data for the TRIVAC B, BCS and BCS-PFPE"

Ordering Information

TRIVAC D 4 B two-stage

TRIVAC D 8 B two-stage

	Part No.	Part No.
TRIVAC B		
with 1-phase motor 230 V, 50 Hz ¹⁾	112 45	112 55
with dual voltage motor ²⁾ 110-115/210-230 V, 50/60 Hz	140 081 ²⁾	140 082 ²⁾
with 3-phase motor 200 – 240/380 – 400 V, 50 Hz / 200 – 240/380 – 480 V, 60 Hz ¹⁾ 230/400 V, 50 Hz,	112 46 140 140	112 56 140 150
ATEX Category 3 inside and 3 outside inside: II (i) 3G IIC T4 (50 Hz) outside: II (o) 3G IIC T3 (50 Hz)		
Mains cord for dual voltage motor ²⁾ 230 V Schuko plug 230 V UK plug 230 V CH plug 230 V NEMA plug (200-240 V) 115 V NEMA plug (100-120 V)	200 81 091 200 81 097 200 81 099 200 81 141 200 81 090	200 81 091 200 81 097 200 81 099 200 81 141 200 81 090
Transition connector (250 V AC, 10 A, L+N+PE) only necessary in Switzerland for 1~ pumps	800 001 274	800 001 274
Accessories		
Dust filter Filter pot FH 16 Dust filter insert DF 16-25	140 116 T 140 117 S	140 116 T 140 117 S
Adsorption trap Filter pot FH 16 Adsorption filter insert RF 16-25	140 116 T 140 118 A	140 116 T 140 118 A
Accessories for dust filter and adsorption trap Active charcoal Zeolite Activated aluminium oxide, 1.3 kg (2 l approx.)	178 10 854 20 854 10	178 10 854 20 854 10
TK 4-8 cold trap	188 20	188 20
AF 4-8 exhaust filter	189 06	189 06
AR 4-8 exhaust filter with lubricant return	189 20	189 20
AK 4-8 condensate trap	188 06	188 06
OF 4-25 mechanical oil filter	101 91	101 91
CF 4-25 chemical oil filter	101 96	101 96
Connector for gas ballast inlet M 16 x 1.5 – DN 16 KF	168 40V01	168 40V01
Oil drain tap M 16 x 1.5	190 90	190 90
Spare Parts		
Inner body	E 200 10 989	E 200 10 991
Major maintenance kit (without oil)	EK 110 002 622	EK 110 002 620
Minor maintenance kit (without oil)	EK 110 002 628	EK 110 002 627
Shaft sealing replacement kit	EK 110 002 631	EK 110 002 631
Small parts kit	EK 110 002 634	EK 110 002 634
Seal kit	197 20	197 20

For further accessories see section “Accessories for TRIVAC E, B and BCS”

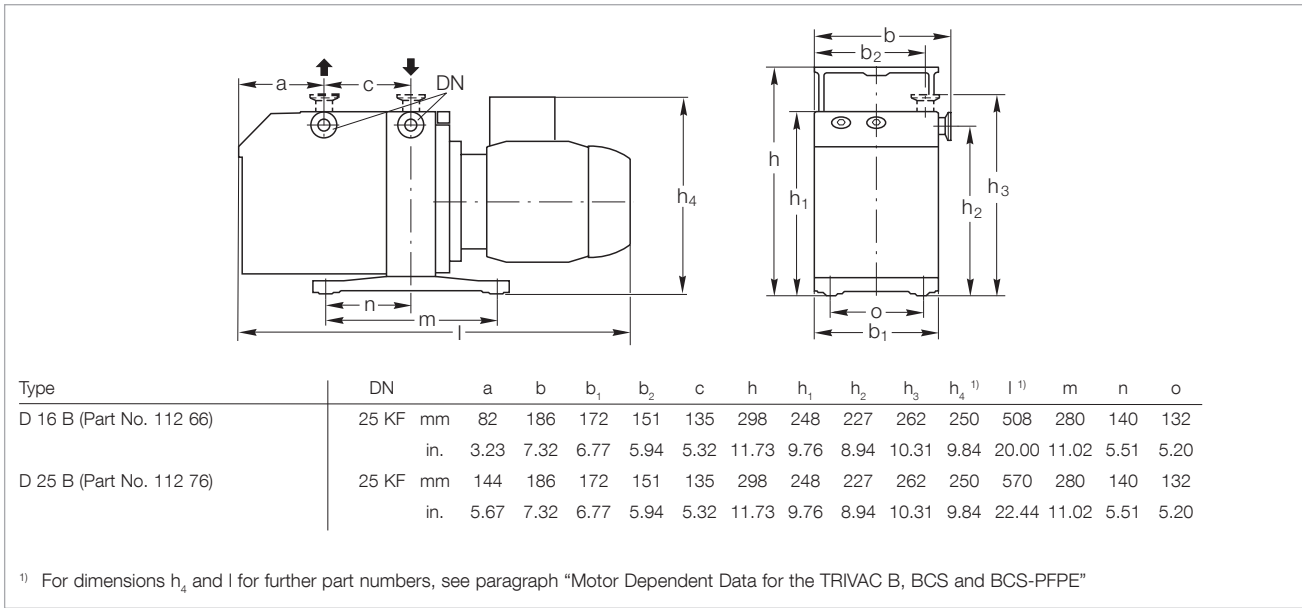
¹⁾ Certification after 94/9/EG (ATEX), Category 3 inside. Inside: II (i) 3G IIC T4 (50 Hz), T3 (60 Hz)

²⁾ Mains cord 20081091 (Schuko) in delivery included. Other mains cords must be ordered additionally

TRIVAC D 16 B and D 25 B



TRIVAC D 16 B (left) and TRIVAC D 25 B (right)



Dimensional drawing for the TRIVAC D 16 and D 25 B

Technical Data

TRIVAC D 16 B

two-stage

TRIVAC D 25 B

two-stage

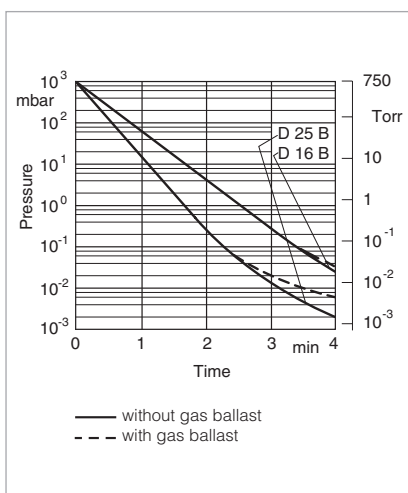
		50 Hz	60 Hz	50 Hz	60 Hz
Nominal pumping speed ¹⁾	m ³ /h (cfm)	18.9 (11.1)	22.7 (13.4)	29.5 (17.4)	35.4 (20.9)
Pumping speed ¹⁾	m ³ /h (cfm)	16.5 (9.7)	19.8 (11.7)	25.7 (15.1)	30.8 (18.2)
Ultimate partial pressure without gas ballast ¹⁾	mbar (Torr)	10 ⁻⁴ (0.75 x 10 ⁻⁴)	10 ⁻⁴ (0.75 x 10 ⁻⁴)	10 ⁻⁴ (0.75 x 10 ⁻⁴)	10 ⁻⁴ (0.75 x 10 ⁻⁴)
Ultimate total pressure without gas ballast ¹⁾	mbar (Torr)	< 2 x 10 ⁻³ (< 1.5 x 10 ⁻³)	< 2 x 10 ⁻³ (< 1.5 x 10 ⁻³)	< 2 x 10 ⁻³ (< 1.5 x 10 ⁻³)	< 2 x 10 ⁻³ (< 1.5 x 10 ⁻³)
Ultimate total pressure with gas ballast ¹⁾	mbar (Torr)	< 5 x 10 ⁻³ (< 3.8 x 10 ⁻³)	< 5 x 10 ⁻³ (< 3.8 x 10 ⁻³)	< 5 x 10 ⁻³ (< 3.8 x 10 ⁻³)	< 5 x 10 ⁻³ (< 3.8 x 10 ⁻³)
Water vapor tolerance ¹⁾	mbar (Torr)	25.0 (18.8)	25.0 (18.8)	25.0 (18.8)	25.0 (18.8)
Water vapor capacity	g/h (lbs/h)	305 (0.672)	370 (0.816)	480 (1.058)	570 (1.257)
Oil filling, min. / max.	l (qt)	0.5 / 1.0 (0.5 / 1.1)	0.5 / 1.0 (0.5 / 1.1)	0.6 / 1.4 (0.6 / 1.5)	0.6 / 1.4 (0.6 / 1.5)
Noise level ²⁾ to DIN 45 635, without / with gas ballast	dB(A)	54 / 56	54 / 56	54 / 56	54 / 56
Admissible ambient temperature	°C (°F)	+12 to +40 (+54 to +104)	+12 to +40 (+54 to +104)	+12 to +40 (+54 to +104)	+12 to +40 (+54 to +104)
Motor rating ²⁾	W (HP)	550 – 750 (0.75 – 1.0)	550 – 750 (0.75 – 1.0)	750 (1)	750 (1)
Nominal speed	rpm	1500	1800	1500	1800
Type of protection	IP	3)	3)	3)	3)
Weight ²⁾	kg (lbs)	28 (61.7)	28 (61.7)	32.3 (71.2)	32.3 (71.2)
Connections, Intake and Exhaust	DN	25 KF	25 KF	25 KF	25 KF

¹⁾ To DIN 28 400 and following numbers

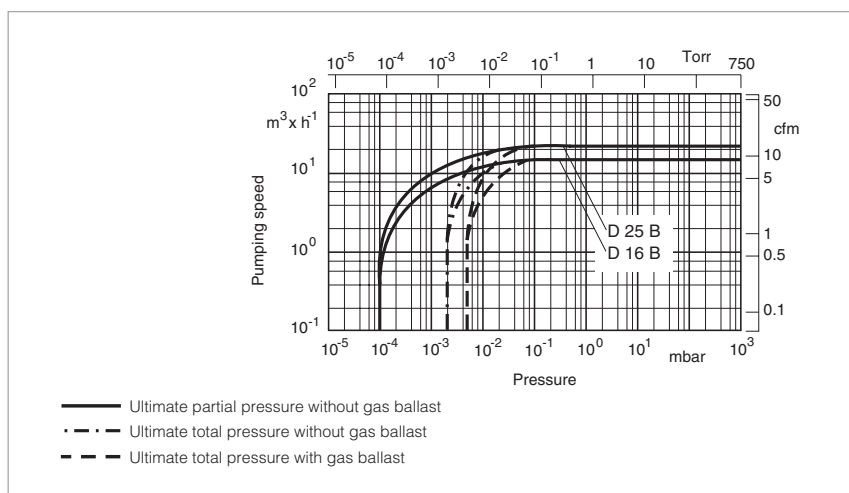
²⁾ Motor rating and noise levels for the pumps with AC motor 50 Hz.

Any data that deviate from the above for pumps with other motors, and other motor-dependent data are given in chapter "Products", paragraph "Motor Dependent Data for the TRIVAC B, BCS and BCS-PFPE"

³⁾ See paragraph "Motor Dependent Data for the TRIVAC B, BCS and BCS-PFPE"



Pump-down characteristics of a 100 l vessel at 50 Hz



Pumping speed characteristics at 50 Hz (60 Hz curves at the end of the chapter)

Ordering Information

TRIVAC D 16 B two-stage

TRIVAC D 25 B two-stage

	Part No.	Part No.
TRIVAC B		
with 1-phase motor		
230 V, 50 Hz ¹⁾	112 65	112 75
218 – 242 V, 50/60 Hz ¹⁾	113 25 ²⁾	113 35 ²⁾
110/220 V, 50 Hz / 115/208 – 230 V, 60 Hz ³⁾	898 698	–
with 3-phase motor		
200 – 346 V (200 V IE3) /		
380 – 400 V (380 – 400 V IE3), 50 Hz /		
200 – 240 (208 – 240 V IE3) /		
380 – 480 V (416 – 480 V IE3), 60 Hz ¹⁾	112 66	112 76
	113 33 (LVO 210)	
200 – 240 V (IE3, Japan), 50 Hz /		
200 – 380 V (IE3, Japan), 60 Hz	112 66J (LVO 100)	112 76J (LVO 100)
	113 33J (LVO 210)	–
230/400 V, 50 Hz,		
ATEX Category 3 inside and 3 outside		
inside: II (i) 3G IIC T4 (50 Hz)		
outside: II (o) 3G IIC T3 (50 Hz)	140 160	140 170
Accessories		
Mains cord for Part No. 898 698		
115 V	E 721 27 874	–
230 V	E 721 27 875	–
Dust filter		
Filter pot FH 16	140 125 T	140 125 T
Dust filter insert DF 16-25	140 117 S	140 117 S
Adsorption trap		
Filter pot FH 25	140 125 T	140 125 T
Adsorption filter insert RF 16-25	140 118 A	140 118 A
Accessories for dust filter and adsorption trap		
Active charcoal		
Zeolite	178 10	178 10
Activated aluminium oxide,	854 20	854 20
1.3 kg (2 l approx.)	854 10	854 10
AF 16-25 exhaust filter	189 11	189 11
AR 16-25 exhaust filter with lubricant return	189 21	189 21
AK 16-25 condensate trap	188 11	188 11
OF 4-25 mechanical oil filter	101 91	101 91
CF 4-25 chemical oil filter	101 96	101 96
Connector for gas ballast inlet		
M 16 x 1.5 – DN 16 KF	168 40V01	168 40V01
Oil drain tap M 16 x 1.5	190 90	190 90
Spare Parts		
Inner body	E 200 10 956	E 200 10 960
Major maintenance kit (without oil)	EK 110 002 618	EK 110 002 616
Minor maintenance kit (without oil)	EK 110 002 626	EK 110 002 625
Shaft sealing ring replacement kit	EK 110 002 630	EK 110 002 630
Small parts kit	EK 110 002 635	EK 110 002 635
Seal kit	197 21	197 21

For further accessories see section “Accessories for TRIVAC E, B and BCS”

¹⁾ Certification after 94/9/EG (ATEX), Category 3 inside. Inside: II (i) 3G IIC T4 (50 Hz), T3 (60 Hz)

²⁾ With cable EURO Schuko. Other cables for wide range motor upon request

³⁾ Mains cord for dual voltage motor see paragraph “Motor Dependent Data for the TRIVAC B, BCS and BCS-PFPE”; TRIVAC D 16 B / D 25 B

Only available for purchase in North and South America

Ordering Information

TRIVAC D 16 B two-stage

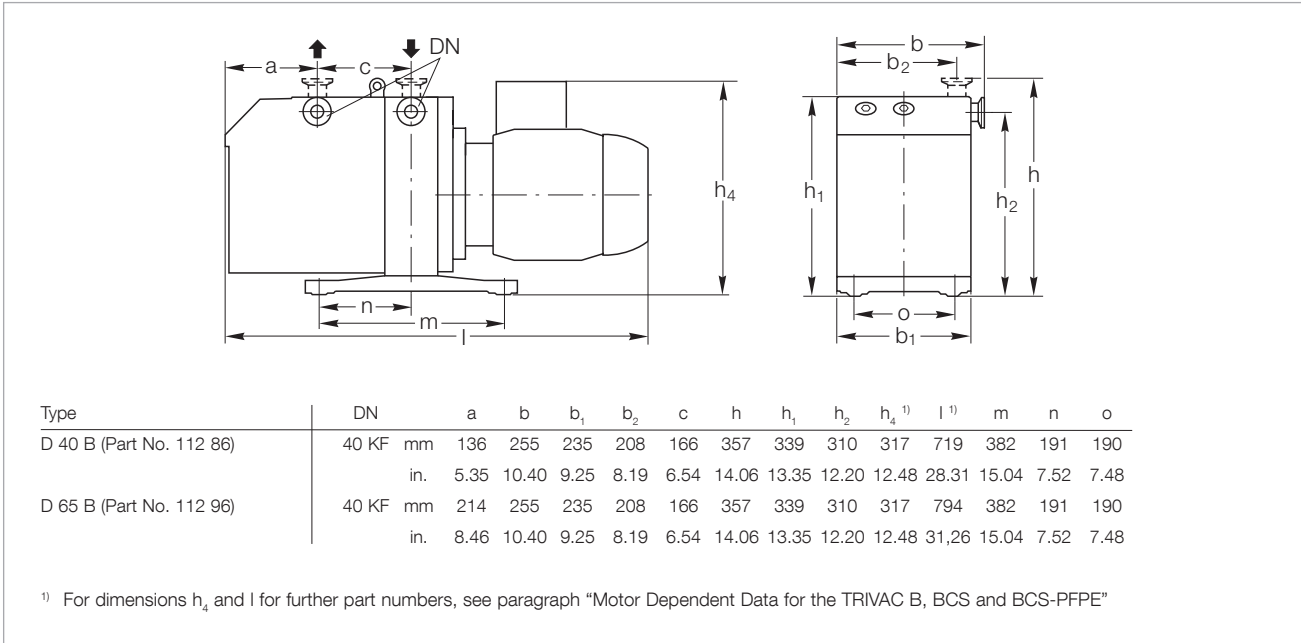
TRIVAC D 25 B two-stage

	Part No.	Part No.
TRIVAC B		
with 1-phase motor		
110 V, 50 Hz, NEMA plug /		
115 V, 60 Hz, NEMA plug	912 65-1	-
208 – 230 V, 60/50 Hz, NEMA plug	912 65-2	-
208 – 230 V, 60/50 Hz, NEMA plug	-	912 75-2

TRIVAC D 40 B and D 65 B



TRIVAC D 40 B (left) and TRIVAC D 65 B (right)



Dimensional drawing for the TRIVAC D 40 and D 65 B

Technical Data

TRIVAC D 40 B

TRIVAC D 65 B

two-stage

two-stage

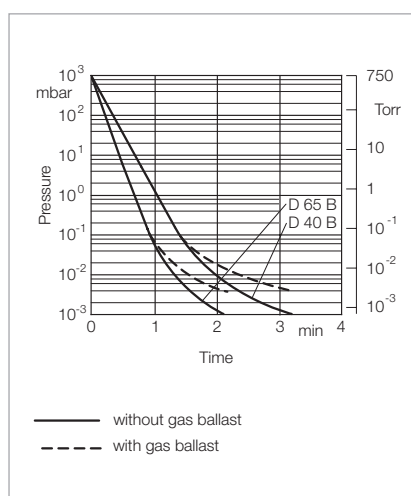
		50 Hz	60 Hz	50 Hz	60 Hz
Nominal pumping speed ¹⁾	m ³ /h (cfm)	46 (27)	55 (32.5)	75 (44)	90 (53)
Pumping speed ¹⁾	m ³ /h (cfm)	40 (24)	48 (28)	65 (38)	78 (46)
Ultimate partial pressure without gas ballast ¹⁾	mbar (Torr)	10 ⁻⁴ (0.75 x 10 ⁻⁴)	10 ⁻⁴ (0.75 x 10 ⁻⁴)	10 ⁻⁴ (0.75 x 10 ⁻⁴)	10 ⁻⁴ (0.75 x 10 ⁻⁴)
Ultimate total pressure without gas ballast ¹⁾	mbar (Torr)	< 2 x 10 ⁻³ (< 1.5 x 10 ⁻³)	< 2 x 10 ⁻³ (< 1.5 x 10 ⁻³)	< 2 x 10 ⁻³ (< 1.5 x 10 ⁻³)	< 2 x 10 ⁻³ (< 1.5 x 10 ⁻³)
Ultimate total pressure with gas ballast ¹⁾	mbar (Torr)	< 5 x 10 ⁻³ (< 3.8 x 10 ⁻³)	< 5 x 10 ⁻³ (< 3.8 x 10 ⁻³)	< 5 x 10 ⁻³ (< 3.8 x 10 ⁻³)	< 5 x 10 ⁻³ (< 3.8 x 10 ⁻³)
Water vapor tolerance ¹⁾	mbar (Torr)	40 (30)	40 (30)	40 (30)	40 (30)
Water vapor capacity	g/h (lbs/h)	1185 (2.612)	1420 (3.131)	1925 (4.244)	2310 (5.093)
Oil filling, min. / max.	l (qt)	1.7 / 2.6 (1.8 / 2.7)	1.7 / 2.6 (1.8 / 2.7)	2.0 / 3.3 (2.1 / 3.5)	2.0 / 3.3 (2.1 / 3.5)
Noise level ²⁾ to DIN 45 635, without / with gas ballast	dB(A)	57 / 59	57 / 59	57 / 59	57 / 59
Admissible ambient temperature	°C (°F)	+12 to +40 (+54 to +104)	+12 to +40 (+54 to +104)	+12 to +40 (+54 to +104)	+12 to +40 (+54 to +104)
Motor rating ²⁾	W (HP)	2200 (3.0)	2200 (3.0)	2200 (3.0)	2200 (3.0)
Nominal speed	rpm	1420	1710	1420	1710
Type of protection	IP	3)	3)	3)	3)
Weight ²⁾	kg (lbs)	75.3 (166)	75.3 (166)	84.5 (186.3)	84.5 (186.3)
Connections, Intake and Exhaust	DN	40 KF	40 KF	40 KF	40 KF

¹⁾ To DIN 28 400 and following numbers

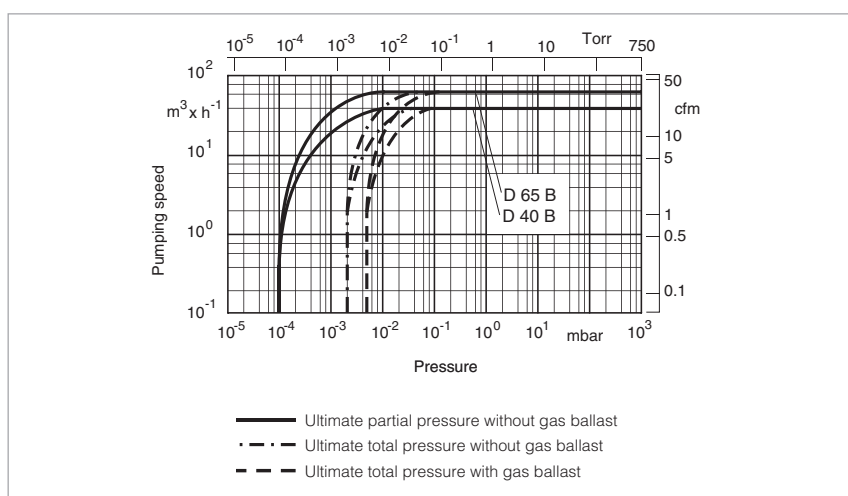
²⁾ Motor rating and noise levels for the pumps with AC motor 50 Hz.

Any data that deviate from the above for pumps with other motors, and other motor-dependent data are given in chapter "Products", paragraph "Motor Dependent Data for the TRIVAC B, BCS and BCS-PFPE"

³⁾ See paragraph "Motor Dependent Data for the TRIVAC B, BCS and BCS-PFPE"



Pump-down characteristics of a 100 l vessel at 50 Hz



Pumping speed characteristics at 50 Hz (60 Hz curves at the end of the chapter)

Ordering Information

TRIVAC D 40 B two-stage

TRIVAC D 65 B two-stage

	Part No.	Part No.
TRIVAC B		
with 3-phase motor		
200 – 240 V (200 V IE3) /		
380 – 400 V (380 – 400 V IE3), 50 Hz /		
200 – 240 V (208 – 240 V IE3) /		
380 – 480 V (416 – 480 V IE3), 60 Hz ¹⁾	112 86	112 96
200 – 346 V (IE3 Japan), 50 Hz		
220 – 380 V (IE3 Japan), 60 Hz	112 86J	112 96J
219 – 242/380 – 420 V, 50 Hz		
ATEX Category 3 inside and 3 outside		
inside: II (i) 3G IIC T4 (50 Hz)		
outside: II (o) 3G IIC T3 (50 Hz)	140 180	140 190
Accessories		
Roots pump adaptor	168 30	168 30
AS 30-60 dust separator	186 16	186 16
MF 30-60 molecular filter	186 17	186 17
Dust filter		
Filter pot FH 40-65	140 140 T	140 140 T
Dust filter insert DF 40-65	140 141 S	140 141 S
Adsorption trap		
Filter pot FH 40-65	140 140 T	140 140 T
Adsorption filter insert RF 40-65	140 142 A	140 142 A
Accessories for dust filter and adsorption trap		
Active charcoal	178 10	178 10
Zeolite	854 20	854 20
Activated aluminium oxide, 1.3 kg (2 l approx.)	854 10	854 10
AF 40-65 exhaust filter	189 16	189 16
AR 40-65 exhaust filter with lubricant return	189 22	189 22
AK 40-65 condensate trap	188 16	188 16
OF 40-65 mechanical oil filter	101 92	101 92
CF 40-65 chemical oil filter	101 97	101 97
Connector for gas ballast inlet		
M 16 x 1.5 – DN 16 KF	168 40V01	168 40V01
Oil drain tap M 16 x 1.5	190 90	190 90
Spare Parts		
Inner body	E 200 10 933	E 200 10 944
Major maintenance kit (without oil)	EK 110 002 613	EK 110 002 612
Minor maintenance kit (without oil)	EK 110 002 624	EK 110 002 624
Shaft sealing ring replacement kit	EK 110 002 629	EK 110 002 629
Small parts kit	EK 110 002 636	EK 110 002 636
Seal kit	197 22	197 22

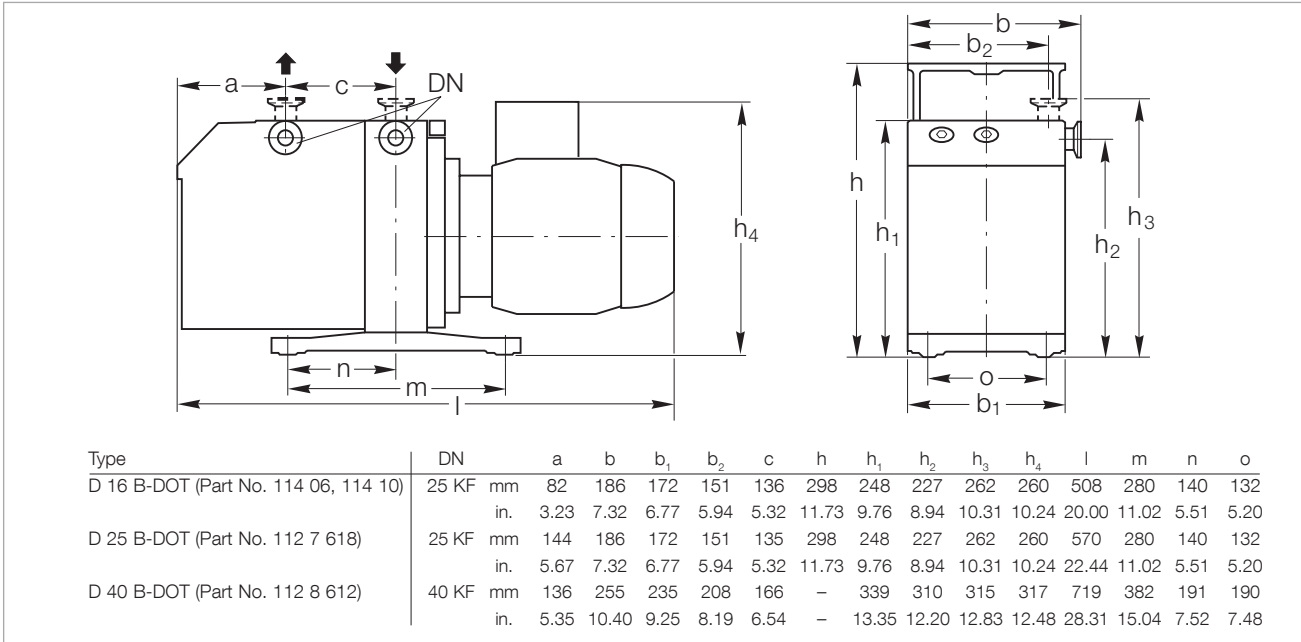
For further accessories see section “Accessories for TRIVAC E, B and BCS”

¹⁾ Certification after 94/9/EG (ATEX), Category 3 inside. Inside: II (i) 3G IIC T4 (50 Hz), T3 (60 Hz)

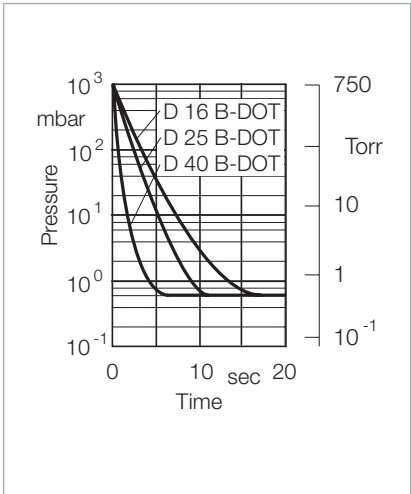
TRIVAC D 16 B-DOT to D 40 B-DOT



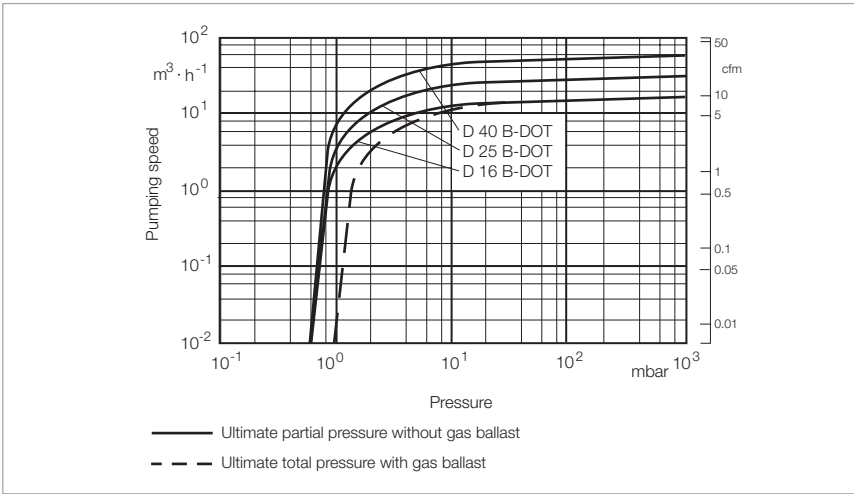
TRIVAC D 16 B-DOT



Dimensional drawing for the TRIVAC D B-DOT pumps



Pump-down characteristics of a 10 l vessel at 50 Hz



Pumping speed characteristics at 50 Hz (60 Hz curves at the end of the chapter)

Technical Data

TRIVAC D 16 B-DOT

two-stage

		50 Hz	60 Hz
Nominal pumping speed ¹⁾	m ³ /h (cfm)	18.9 (11.1)	22.7 (13.4)
Pumping speed ¹⁾	m ³ /h (cfm)	16.5 (9.7)	19.8 (11.7)
Ultimate total pressure without gas ballast ¹⁾	mbar (Torr)	< 6 x 10 ⁻¹ (< 4.5 x 10 ⁻¹)	< 6 x 10 ⁻¹ (< 4.5 x 10 ⁻¹)
Ultimate total pressure with gas ballast ¹⁾	mbar (Torr)	< 9 x 10 ⁻¹ (< 6.75 x 10 ⁻¹)	< 9 x 10 ⁻¹ (< 6.75 x 10 ⁻¹)
Water vapor tolerance ¹⁾	mbar (Torr)	25.0 (18.8)	25.0 (18.8)
Water vapor capacity	g/h (lbs/h)	305 (0.672)	370 (0.816)
Brake fluid filling, min. / max.	l (qt)	0.45 / 1.0 (0.5 / 1.1)	0.45 / 1.0 (0.5 / 1.1)
Noise level ²⁾ to DIN 45 635, without / with gas ballast	dB(A)	54 / 56	54 / 56
Admissible ambient temperature	°C (°F)	+12 to +40 (+54 to +104)	+12 to +40 (+54 to +104)
Motor rating	W (HP)	550 (0.75)	550 (0.75)
Nominal speed	rpm	1500	1800
Type of protection	IP	2)	2)
Weight ²⁾	kg (lbs)	28.2 (62.2)	28.2 (62.2)
Connections, Intake and Exhaust	DN	25 KF	25 KF

¹⁾ To DIN 28 400 and following numbers²⁾ See paragraph "Motor Dependent Data for the TRIVAC B, BCS and BCS-PFPE"

Ordering Information

TRIVAC D 16 B-DOT
two-stage

	Part No.
TRIVAC B-DOT with 3-phase motor 200 – 240 V (200 V IE3) / 380 – 400 V (380 – 400 V IE3), 50 Hz / 200 – 240 (208 – 240 V IE3) / 380 – 480 V (416 – 480 V IE3), 60 Hz	114 06 114 10 (with limit switch system LSS 16-25)
AF 16-25 DOT exhaust filter	124 16
AK DOT condensate trap	110 78
Seal kit DOT	200 39 059

Technical Data

TRIVAC D 25 B-DOT two-stage

		50 Hz	60 Hz
Nominal pumping speed ¹⁾	m³/h (cfm)	29.5 (17.4)	35.4 (20.9)
Pumping speed ¹⁾	m³/h (cfm)	25.7 (17.4)	30.8 (18.2)
Ultimate total pressure without gas ballast ¹⁾	mbar (Torr)	$< 6 \times 10^{-1}$ ($< 4.5 \times 10^{-1}$)	$< 6 \times 10^{-1}$ ($< 4.5 \times 10^{-1}$)
Ultimate total pressure with gas ballast ¹⁾	mbar (Torr)	$< 9 \times 10^{-1}$ ($< 6.75 \times 10^{-1}$)	$< 9 \times 10^{-1}$ ($< 6.75 \times 10^{-1}$)
Water vapor tolerance ¹⁾	mbar (Torr)	25.0 (18.8)	25.0 (18.8)
Water vapor capacity	g/h (lbs/h)	480 (1.058)	570 (1.257)
Brake fluid filling, min. / max.	l (qt)	0.6 / 1.4 (6.3 / 1.5)	0.6 / 1.4 (6.3 / 1.5)
Noise level ²⁾ to DIN 45 635, without / with gas ballast	dB(A)	54 / 56	54 / 56
Admissible ambient temperature	°C (°F)	+12 to +40 (+54 to +104)	+12 to +40 (+54 to +104)
Motor rating	W (HP)	550 (0.75)	550 (0.75)
Nominal speed	rpm	1500	1800
Type of protection	IP	²⁾	²⁾
Weight ²⁾	kg (lbs)	32.5 (71.7)	32.5 (71.7))
Connections, Intake and Exhaust	DN	25 KF	25 KF

¹⁾ To DIN 28 400 and following numbers

²⁾ See paragraph "Motor Dependent Data for the TRIVAC B, BCS and BCS-PFPE"

Ordering Information

TRIVAC D 25 B-DOT two-stage

	Part No.
TRIVAC B-DOT with 3-phase motor 200 – 240 V (200 V IE3) / 380 – 400 V (380 – 400 V IE3), 50 Hz / 200 – 240 (208 – 240 V IE3) / 380 – 480 V (416 – 480 IE3), 60 Hz	112 76 18
200 – 346 V (IE3 Japan), 50 Hz / 200 – 380 V (IE3 Japan), 60 Hz	112 76 18J
AF 16-25 DOT exhaust filter	124 16
AK DOT condensate trap	110 78
Seal kit DOT	200 39 059

Technical Data

TRIVAC D 40 B-DOT
two-stage

		50 Hz	60 Hz
Nominal pumping speed ¹⁾	m ³ /h (cfm)	46.0 (27.0)	55.0 (32.5)
Pumping speed ¹⁾	m ³ /h (cfm)	40.0 (24.0)	48.0 (28.0)
Ultimate total pressure without gas ballast ¹⁾	mbar (Torr)	$< 6 \times 10^{-1}$ ($< 4.5 \times 10^{-1}$)	$< 6 \times 10^{-1}$ ($< 4.5 \times 10^{-1}$)
Ultimate total pressure with gas ballast ¹⁾	mbar (Torr)	$< 9 \times 10^{-1}$ ($< 6.75 \times 10^{-1}$)	$< 9 \times 10^{-1}$ ($< 6.75 \times 10^{-1}$)
Water vapor tolerance ¹⁾	mbar (Torr)	40 (30)	40 (30)
Water vapor capacity	g/h (lbs/h)	1185 (2.612)	1420 (3.130)
Brake fluid filling, min. / max.	l (qt)	1.7 / 2.6 (1.8 / 2.7)	1.7 / 2.6 (1.8 / 2.7)
Noise level ²⁾ to DIN 45 635, without / with gas ballast	dB(A)	57 / 59	57 / 59
Admissible ambient temperature	°C (°F)	+12 to +40 (+54 to +104)	+12 to +40 (+54 to +104)
Motor rating	W (HP)	2200 (3.0)	2200 (3.0)
Nominal speed	rpm	1500	1800
Type of protection	IP	²⁾	²⁾
Weight ²⁾	kg (lbs)	75.8 (167)	75.8 (167)
Connections, Intake and Exhaust	DN	40 KF	40 KF

¹⁾ To DIN 28 400 and following numbers²⁾ See paragraph "Motor Dependent Data for the TRIVAC B, BCS and BCS-PFPE"

Ordering Information

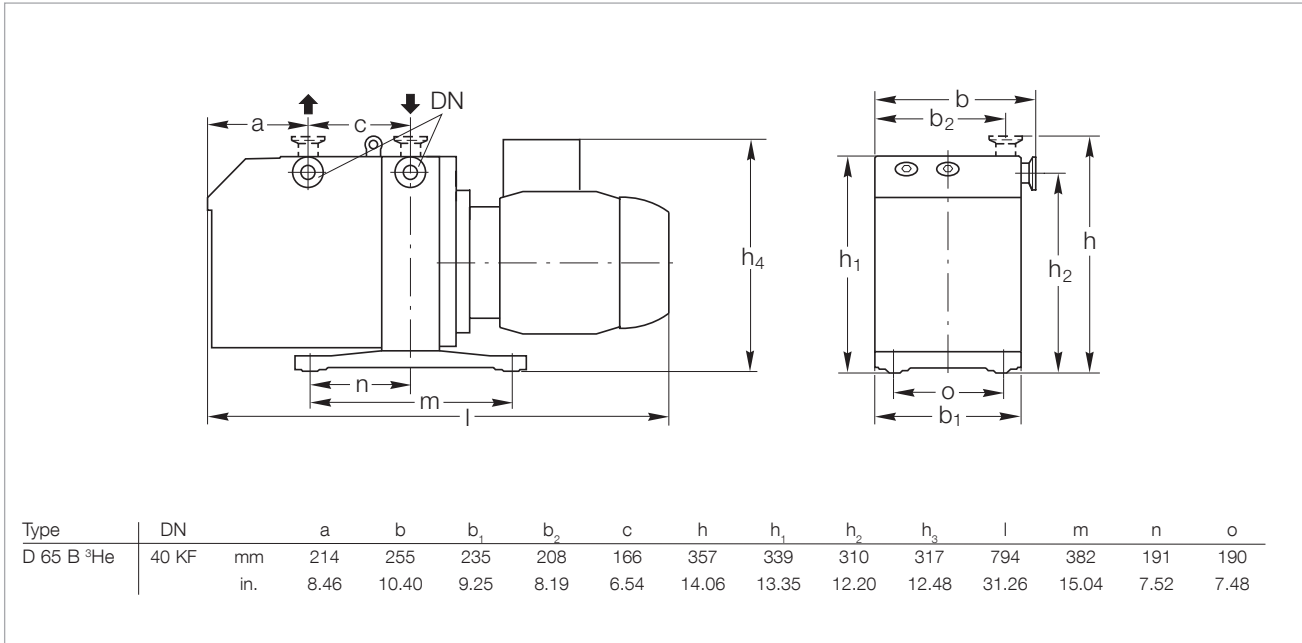
TRIVAC D 40 B-DOT
two-stage

	Part No.
TRIVAC B-DOT with 3-phase motor 200 – 240 V (200 V IE3) / 380 – 400 V (380 – 400 V IE3), 50 Hz / 200 – 240 (208 – 240 V IE3) / 380 – 480 V (416 – 480 V IE3), 60 Hz	112 86 12
AF 40-65 DOT exhaust filter	101 15
AK DOT condensate trap	upon request
Seal kit DOT	200 39 707

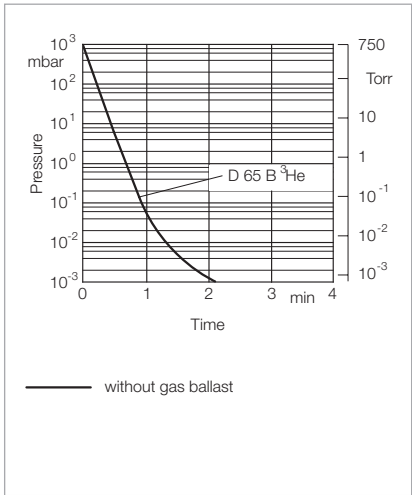
TRIVAC D 65 B ³He



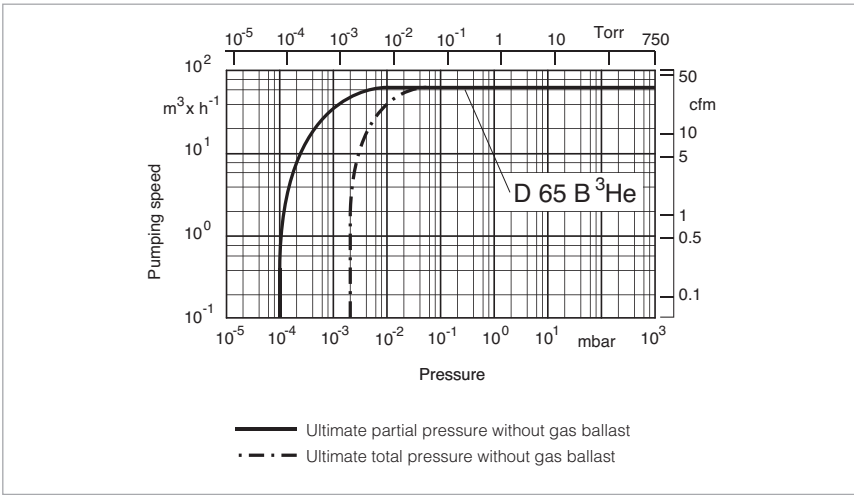
TRIVAC D 65 B ³He



Dimensional drawing for the TRIVAC D 65 B ³He



Pump-down characteristics of a 100 l vessel at 50 Hz



Pumping speed characteristics at 50 Hz (60 Hz curves at the end of the chapter)

Technical Data**TRIVAC D 65 B ³He**

		50 Hz	60 Hz
Nominal pumping speed ¹⁾	m ³ /h (cfm)	75 (44)	90 (53)
Pumping speed ¹⁾	m ³ /h (cfm)	65 (38)	78 (46)
Ultimate partial pressure without gas ballast ¹⁾	mbar (Torr)	10 ⁻⁴ (0.75 x 10 ⁻⁴)	10 ⁻⁴ (0.75 x 10 ⁻⁴)
Ultimate total pressure without gas ballast ¹⁾	mbar (Torr)	< 2 x 10 ⁻³ (< 1.5 x 10 ⁻³)	< 2 x 10 ⁻³ (< 1.5 x 10 ⁻³)
Oil filling with LEYBONOL LVO 100, min. / max.	l (qt)	2.0 / 3.3 (2.1 / 3.5)	2.0 / 3.3 (2.1 / 3.5)
Leak rate	mbar x l x sec ⁻¹	< 1.0 x 10 ⁻⁷	< 1.0 x 10 ⁻⁷
Noise level ²⁾ to DIN 45 635, without / with gas ballast	dB(A)	57 / 59	57 / 59
Admissible ambient temperature	°C (°F)	+12 to +40 (+54 to +104)	+12 to +40 (+54 to +104)
Motor rating ²⁾	W (HP)	2200 (3.0)	2200 (3.0)
Nominal speed	rpm	1500	1800
Type of protection	IP	³⁾	³⁾
Weight ²⁾	kg (lbs)	84.5 (186.3)	84.5 (186.3)
Connections, Intake and Exhaust	DN	40 KF	40 KF

Ordering Information**TRIVAC D 65 B ³He**

	Part No.
TRIVAC B ³ He with 3-phase motor 200 – 240 V (200 V IE3) / 380 – 400 V (380 – 400 V IE3), 50 Hz / 200 – 240 (208 – 240 V IE3) / 380 – 480 V (416 – 480 V IE3), 60 Hz	112 96 46

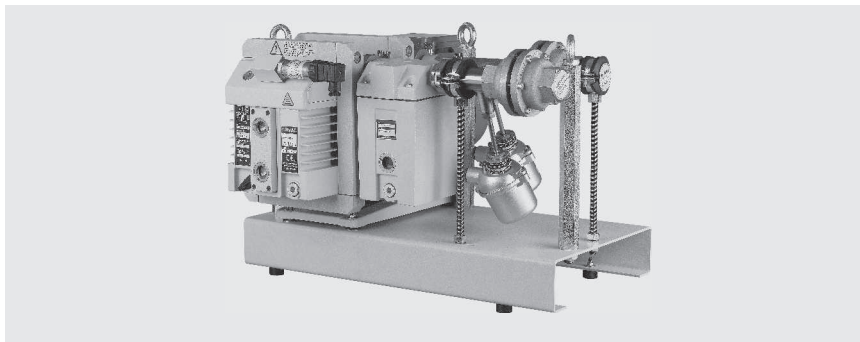
¹⁾ To DIN 28 400 and following numbers

²⁾ Motor rating and noise levels for the pumps with AC motor 50 Hz.

Any data that deviate from the above for pumps with other motors, and other motor-dependent data are given in chapter "Products", paragraph "Motor Dependent Data for the TRIVAC B, BCS and BCS-PFPE"

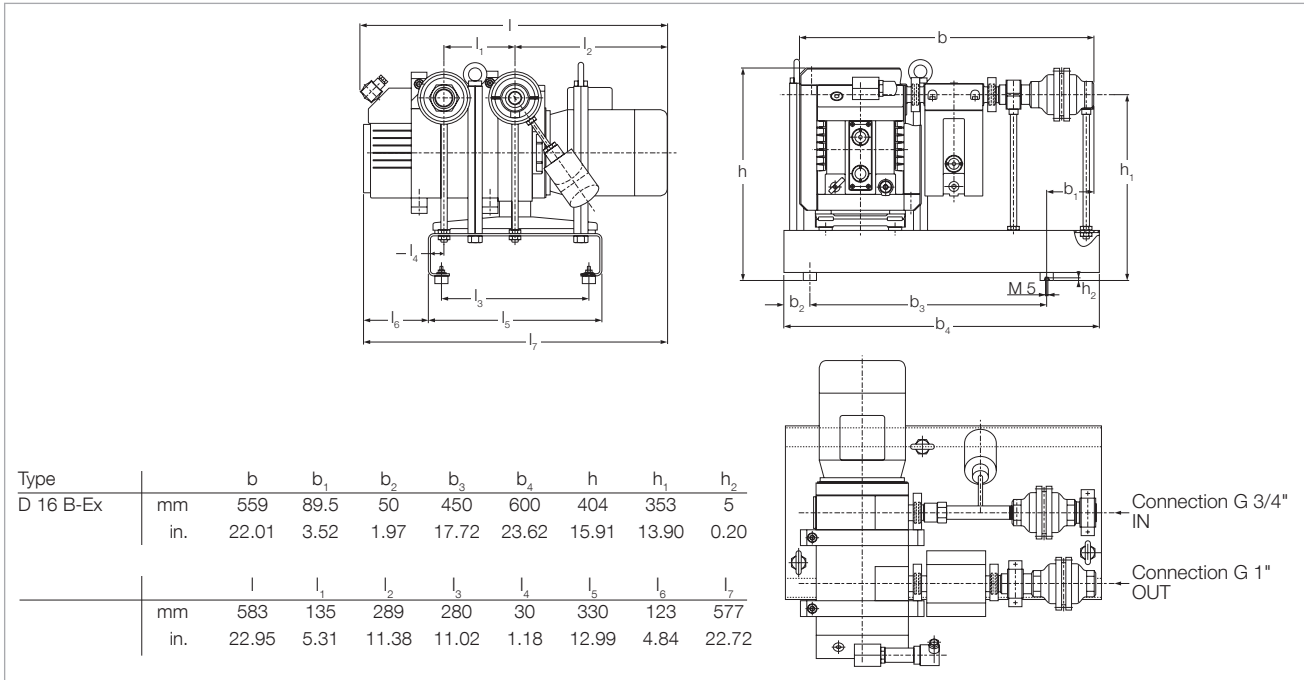
³⁾ See paragraph "Motor Dependent Data for the TRIVAC B, BCS and BCS-PFPE"

TRIVAC D 16 B-Ex (Explosion Protected and Pressure Burst Resistant)

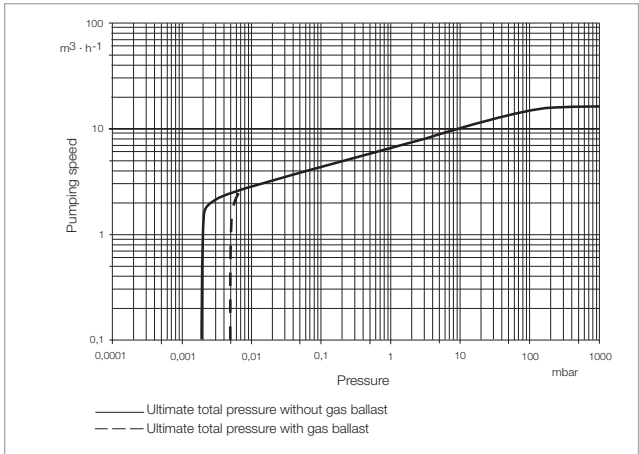


ATEX
Category 1 inside and 2 outside

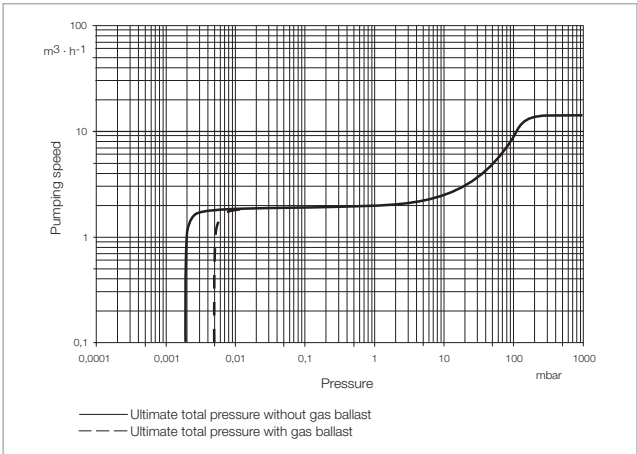
TRIVAC D 16 B-Ex



Dimensional drawing for the TRIVAC D 16 B-Ex (explosion protected and pressure burst resistant)



Pumping speed characteristics of TRIVAC D 16 B-Ex [IIB3 T4]
(Part No. 140 091)



Pumping speed characteristics of TRIVAC D 16 B-Ex [IIC T4]
(Part No. 140 092)


TRIVAC D 16 B-Ex

(Explosion Protected and Pressure Burst Resistant) Two-Stage

Nominal pumping speed ¹⁾	m ³ /h (cfm)	18.9 (11.1)
Pumping speed ¹⁾ (for Part No. 140 091 / 140 092) ¹⁾	m ³ /h (cfm)	16 / 15 (9.4/8.8)
Ultimate partial pressure without gas ballast ¹⁾	mbar (Torr)	1 x 10 ⁻⁴ (< 0.75 x 10 ⁻³)
Ultimate total pressure with gas ballast ¹⁾	mbar (Torr)	< 5 x 10 ⁻³ (< 3.8 x 10 ⁻³)
Water vapor tolerance ¹⁾	mbar (Torr)	25 (18.8)
Water vapor capacity	g/h (lbs/h)	305 (0.672)
Oil filling, min. / max.	l (qt)	0.55 / 1.3 (0.58 / 1.4)
Motor		3~, 230 V / 400 V, 50 Hz, Ex e II T4
Type of protection	IP	54
Maximum gas inlet temperature	°C (°F)	60 (140)
Highest permissible pressure in the oil box	mbar (Torr)	1500 (1125)
Ambient temperature (t _a)	°C (°F)	+12 to +40 (+46 to +104)
Maximum surface temperature	°C (°F)	135 (275)
Max. Inlet pressure	mbar (Torr)	Atmospheric pressure
Weight (complete system)	kg (lbs)	72 (159)
Materials (materials in contact with the gas)		Steel, hardened steel, spring steel, stainless steel, zinc, aluminium and aluminium alloys, grey cast iron 25, FKM, felt, glass, silicone, polyamide
Connections		
Intake side	Inside thread	G 3/4"
Pressure side	Inside thread	G 1"

TRIVAC D 16 B-Ex

(Explosion Protected and Pressure Burst Resistant) Two-Stage

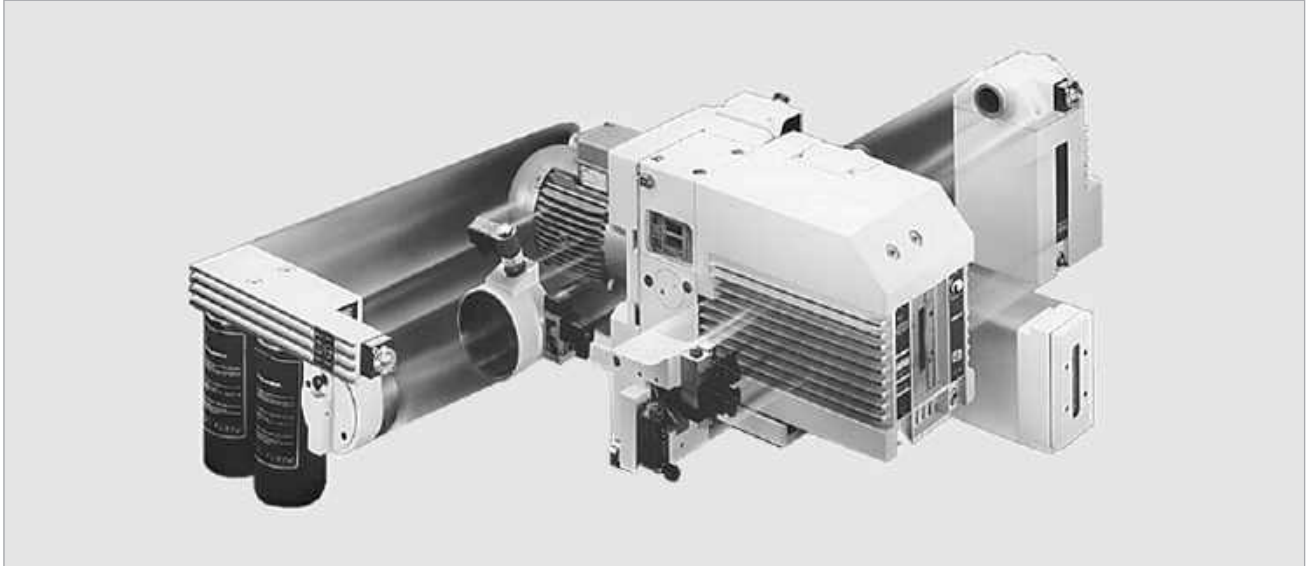
	Part No.
<p>TRIVAC D 16 B-Ex IIB3 T4</p> <p>in accordance with 94/9/EC</p> <p>[ II inside: 1G IIB3 T4 outside: 2G IIB T4 (12 °C < t_a < 40 °C) X</p> <p>EC Type Examination Certificate: IBExU03ATEX1017 X]</p>	<p>140 091</p>
<p>TRIVAC D 16 B-Ex IIC T4 ²⁾</p> <p>in accordance with 94/9/EC</p> <p>[ II inside: 1G IIC (no C₂H₂, CS₂) T4 outside: 2G IIC T4 (12 °C < t_a < 40 °C) X</p> <p>EC Type Examination Certificate: IBExU03ATEX1016 X]</p>	<p>140 092 ²⁾</p>

1) To DIN 28 400 and following numbers

²⁾ with the exception of acetylene and carbon bisulphide

For all enquiries and orders relating to category 1 and 2 ATEX products please exclusively use our ATEX questionnaire. You can find this questionnaire at the end of the full-line catalog together with the fax forms or on the Internet under "www.levbold.com" under Download Documents in the area Documentation.

TRIVAC BCS, Two-Stage Rotary Vane Vacuum Pumps



TRIVAC System

The TRIVAC BCS pumps are oil sealed vacuum pumps operating according to the rotary vane principle. Oil which is injected into the pump chamber is used for sealing, lubrication and cooling purposes.

The pump body is assembled from individual parts without sealing components. The parts are pinned in order to ensure easy disassembly and reassembly of the parts.

The motor is connected to the pumping section via an elastic coupling.

In addition, the TRIVAC BCS is ready for system integration (adaptable to different applications).

Advantages to the User

- Compact design
- Low noise operation with hardly any vibrations
- Built-in oil pump
- Continuous operation even at 1000 mbar (750 Torr)
- Pressure-lubricated sliding bearings
- Anti-suckback valve controlled via the oil pressure, no backstreaming of oil, independent of the operating mode, with or without gas ballast
- Low backstreaming of oil within the pump
- High pumping speed down to ultimate pressure
- Either vertical or horizontal intake and exhaust ports
- All controls as well as the oil sight glass are located on the face side
- Low power consumption
- Produces very little heat
- Exchangeable inner section
- Main flow oil filters may be fitted
- Very long service life
- Modular system
- Service-friendly
- Built-in temperature switch for temperature monitoring
- Corrosion protected – the use of yellow metals has been avoided; only grey cast iron, surface treated aluminium, steel and stainless steel is used
- Double shaft seal

Typical Applications

- In all areas of vacuum engineering
- Pumping of corrosive or aggressive media
- Production of semiconductors and in the area of chemistry
- Research and production
- Generation of rough and medium vacuum
- Backing pump in pump sets, i.e. in connection with Roots, diffusion, turbo or cryopumps

Supplied Equipment

- Small flanges
- Centering, sealing and clamping rings
- The intake port includes a dirt trap

BCS pumps are supplied with a filling of standard oil LEYBONOL LVO 100.

All pumps are subjected to a vacuum test before delivery!

TRIVAC SYSTEM

The TRIVAC BCS and its accessories

- CFS, chemical filter with safety isolation valve
- ARS, exhaust filter with lubricant return
- IGS, inert gas system
- LSS, limit switch system

make up the TRIVAC SYSTEM.

TRIVAC BCS-PFPE

In many applications the use of synthetic lubricants like perfluoropolyether (PFPE) offers superior characteristics compared to mineral oils.

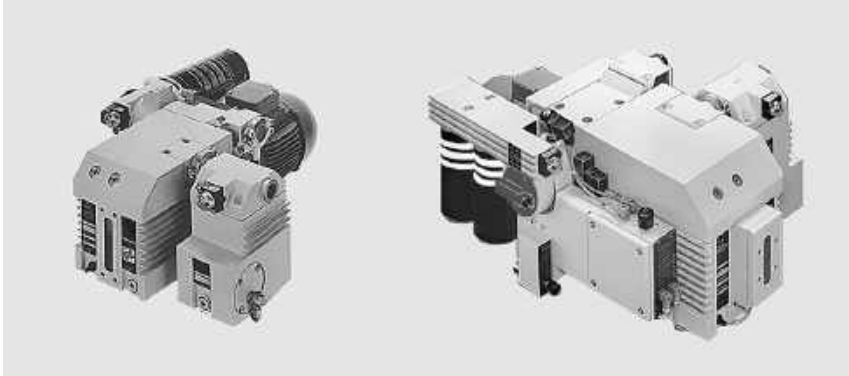
Advantages of perfluoropolyether (PFPE) LEYBONOL LVO 400:

- Practically inert against all chemical and oxidizing influences
- No polymerization under the influence of high energy radiation
- In part significantly increased oil change intervals
- Thermally highly stable. Thermal decomposition will only occur at temperatures over 290 °C (554 °F)

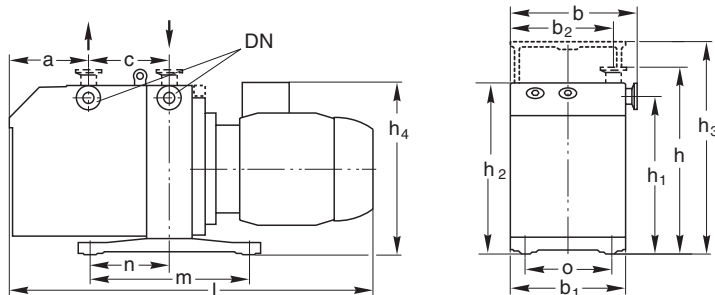
BCS-PFPE pumps have been especially prepared for operation with LEYBONOL LVO 400 and are supplied **without** the oil filling.

We recommend using our operating fluid LEYBONOL LVO 400 and always to install a chemical oil filter CF or CFS.

TRIVAC D 16 BCS to D 65 BCS



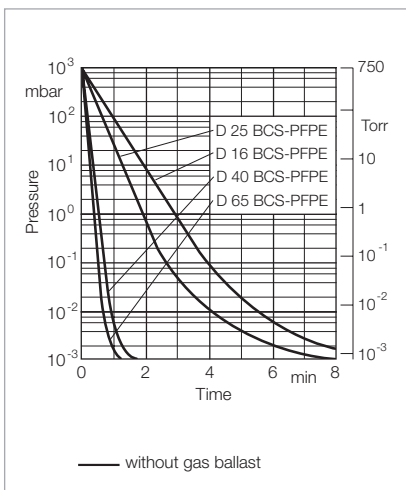
TRIVAC D 25 BCS with ARS and CFS (left)
and TRIVAC D 65 BCS with CFS, ARS, IGS, LSS, EIS – TRIVAC SYSTEM (right)



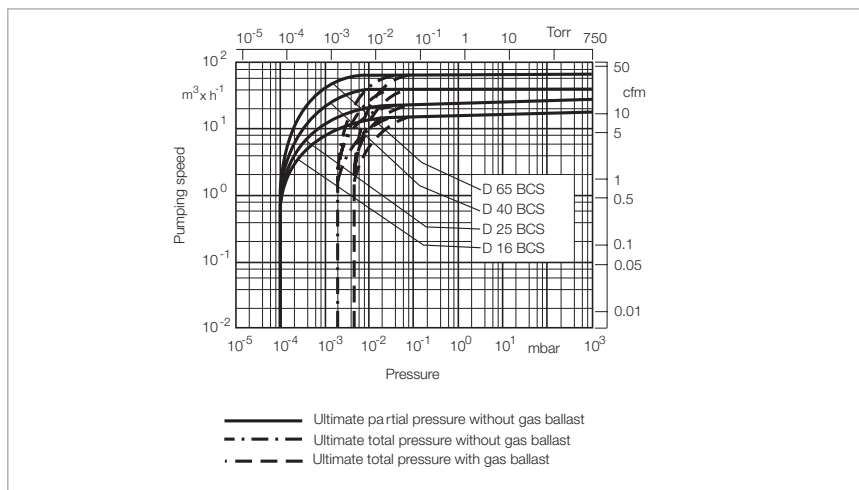
Type			DN	a	b	b ₁	b ₂	c	h	h ₁	h ₂	h ₃	h ₄ ¹⁾	l ¹⁾	m	n	o
D 16 BCS (Part No. 113 68)	25 KF	mm	82	186	172	151	135	262	227	248	298	260	508	280	140	132	
		in.	3.23	7.32	6.77	5.94	5.32	10.31	8.94	9.76	11.73	10.24	20.00	11.02	5.51	5.20	
D 25 BCS (Part No. 113 78)	25 KF	mm	144	186	172	151	135	262	227	248	298	260	570	280	140	132	
		in.	5.67	7.32	6.77	5.94	5.32	10.31	8.94	9.76	11.73	10.24	22.44	11.02	5.51	5.20	
D 40 BCS (Part No. 113 88)	40 KF	mm	135	264	234	206	166	355	308	336	–	317	719	382	191	190	
		in.	5.32	10.39	9.21	8.11	6.54	13.98	12.13	13.23	–	12.48	28.31	15.04	7.52	7.48	
D 65 BCS (Part No. 113 98)	40 KF	mm	213	264	234	206	166	355	308	336	–	317	794	382	191	190	
		in.	8.39	10.39	9.21	8.11	6.54	13.98	12.13	13.23	–	12.48	31.26	15.04	7.52	7.48	

¹⁾ For dimensions h₄ and l for further part numbers, see paragraph "Motor Dependent Data for the TRIVAC B, BCS and BCS-PFPE"

Dimensional drawing for the TRIVAC D 16 to D 65 BCS



Pump-down characteristics of a 100 l vessel at 50 Hz



Pumping speed characteristics at 50 Hz (60 Hz curves at the end of the chapter)

Technical Data

TRIVAC D 16 BCS

two-stage

TRIVAC D 25 BCS

two-stage

		50 Hz	60 Hz	50 Hz	60 Hz
Nominal pumping speed ¹⁾	m ³ /h (cfm)	18.9 (11.1)	22.7 (13.4)	29.5 (17.4)	35.4 (20.9)
Pumping speed ¹⁾	m ³ /h (cfm)	16.5 (9.7)	19.8 (11.7)	25.7 (15.1)	30.8 (18.2)
Ultimate partial pressure without gas ballast ¹⁾	mbar (Torr)	10 ⁻⁴ (0.75 x 10 ⁻⁴)	10 ⁻⁴ (0.75 x 10 ⁻⁴)	10 ⁻⁴ (0.75 x 10 ⁻⁴)	10 ⁻⁴ (0.75 x 10 ⁻⁴)
Ultimate total pressure without gas ballast ¹⁾	mbar (Torr)	< 2.5 x 10 ⁻³ (< 1.9 x 10 ⁻³)	< 2.5 x 10 ⁻³ (< 1.9 x 10 ⁻³)	< 2.5 x 10 ⁻³ (< 1.9 x 10 ⁻³)	< 2.5 x 10 ⁻³ (< 1.9 x 10 ⁻³)
Ultimate total pressure with gas ballast ¹⁾	mbar (Torr)	< 5 x 10 ⁻³ (< 3.8 x 10 ⁻³)	< 5 x 10 ⁻³ (< 3.8 x 10 ⁻³)	< 5 x 10 ⁻³ (< 3.8 x 10 ⁻³)	< 5 x 10 ⁻³ (< 3.8 x 10 ⁻³)
Water vapor tolerance ¹⁾	mbar (Torr)	25.0 (18.8)	25.0 (18.8)	25.0 (18.8)	25.0 (18.8)
Water vapor capacity	g/h (lbs/h)	305 (0.672)	370 (0.816)	480 (1.058)	570 (1.257)
Oil filling, min. / max.	l (qt)	0.45 / 1.0 (0.5 / 1.1)	0.45 / 1.0 (0.5 / 1.1)	0.6 / 1.4 (0.6 / 1.5)	0.6 / 1.4 (0.6 / 1.5)
Noise level ²⁾ to DIN 45 635, without / with gas ballast	dB(A)	54 / 56	54 / 56	54 / 56	54 / 56
Admissible ambient temperature	°C (°F)	+12 to +40 (+54 to +104)	+12 to +40 (+54 to +104)	+12 to +40 (+54 to +104)	+12 to +40 (+54 to +104)
Motor rating ²⁾	W (HP)	750 (1.0)	750 (1.0)	750 (1.0)	750 (1.0)
Nominal speed	rpm	1500	1800	1500	1800
Type of protection	IP	3)	3)	3)	3)
Weight ²⁾	kg (lbs)	28 (61.7)	28 (61.7)	32.3 (71.2)	32.3 (71.2)
Connections, Intake and Exhaust	DN	25 KF	25 KF	25 KF	25 KF

¹⁾ To DIN 28 400 and following numbers

²⁾ Motor rating and noise levels for the pumps with AC motor 50 Hz.

Any data that deviate from the above for pumps with other motors, and other motor-dependent data are given in chapter "Products", paragraph "Motor Dependent Data for the TRIVAC B, BCS and BCS-PFPE"

³⁾ See paragraph "Motor Dependent Data for the TRIVAC B, BCS and BCS-PFPE"

Technical Data

TRIVAC D 40 BCS

two-stage

TRIVAC D 65 BCS

two-stage

		50 Hz	60 Hz	50 Hz	60 Hz
Nominal pumping speed ¹⁾	m ³ /h (cfm)	46 (27)	55 (32.5)	75 (44)	90 (53)
Pumping speed ¹⁾	m ³ /h (cfm)	40 (24)	48 (28)	65 (38)	78 (46)
Ultimate partial pressure without gas ballast ¹⁾	mbar (Torr)	10 ⁻⁴ (0.75 x 10 ⁻⁴)	10 ⁻⁴ (0.75 x 10 ⁻⁴)	10 ⁻⁴ (0.75 x 10 ⁻⁴)	10 ⁻⁴ (0.75 x 10 ⁻⁴)
Ultimate total pressure without gas ballast ¹⁾	mbar (Torr)	< 2 x 10 ⁻³ (< 1.5 x 10 ⁻³)	< 2 x 10 ⁻³ (< 1.5 x 10 ⁻³)	< 2 x 10 ⁻³ (< 1.5 x 10 ⁻³)	< 2 x 10 ⁻³ (< 1.5 x 10 ⁻³)
Ultimate total pressure with gas ballast ¹⁾	mbar (Torr)	< 5 x 10 ⁻³ (< 3.8 x 10 ⁻³)	< 5 x 10 ⁻³ (< 3.8 x 10 ⁻³)	< 5 x 10 ⁻³ (< 3.8 x 10 ⁻³)	< 5 x 10 ⁻³ (< 3.8 x 10 ⁻³)
Water vapor tolerance ¹⁾	mbar (Torr)	40 (30)	40 (30)	40 (30)	40 (30)
Water vapor capacity	g/h (lbs/h)	1185 (2.612)	1420 (3.131)	1925 (4.244)	2310 (5.093)
Oil filling, min. / max.	l (qt)	1.7 / 2.6 (1.8 / 2.7)	1.7 / 2.6 (1.8 / 2.7)	2.0 / 3.3 (2.1 / 3.5)	2.0 / 3.3 (2.1 / 3.5)
Noise level ²⁾ to DIN 45 635, without / with gas ballast	dB(A)	57 / 59	57 / 59	57 / 59	57 / 59
Admissible ambient temperature	°C (°F)	+12 to +40 (+54 to +104)	+12 to +40 (+54 to +104)	+12 to +40 (+54 to +104)	+12 to +40 (+54 to +104)
Motor rating ²⁾	W (HP)	2200 (3.0)	2200 (3.0)	2200 (3.0)	2200 (3.0)
Nominal speed	rpm	1500	1800	1500	1800
Type of protection	IP	³⁾	³⁾	³⁾	³⁾
Weight ²⁾	kg (lbs)	75.3 (166)	75.3 (166)	84.5 (186.3)	84.5 (186.3)
Connections, Intake and Exhaust	DN	40 KF	40 KF	40 KF	40 KF

¹⁾ To DIN 28 400 and following numbers

²⁾ Motor rating and noise levels for the pumps with AC motor 50 Hz.

Any data that deviate from the above for pumps with other motors, and other motor-dependent data are given in chapter "Products", paragraph "Motor Dependent Data for the TRIVAC B, BCS and BCS-PFPE"

³⁾ See paragraph "Motor Dependent Data for the TRIVAC B, BCS and BCS-PFPE"

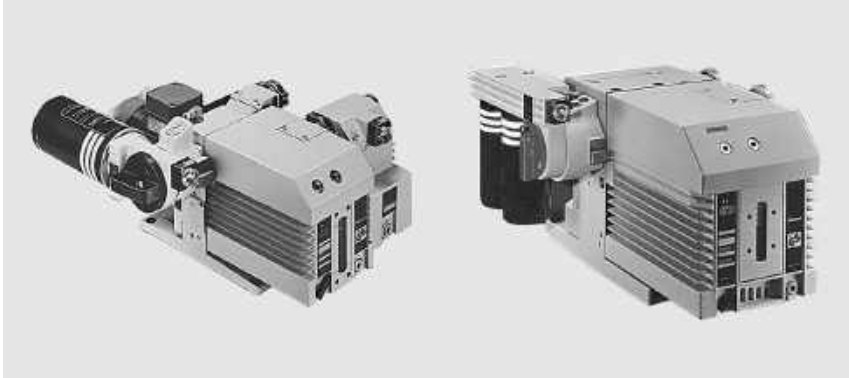
Ordering Information

TRIVAC
D 16 BCS
two-stageTRIVAC
D 25 BCS
two-stageTRIVAC
D 40 BCS
two-stageTRIVAC
D 65 BCS
two-stage

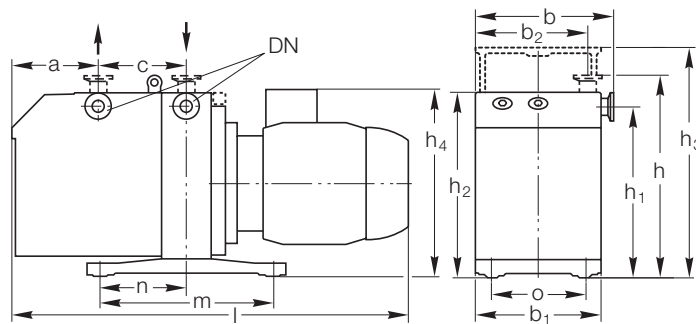
	Part No.	Part No.	Part No.	Part No.
TRIVAC B with 3-phase motor 200 – 240 V (200 V IE3) / 380 – 400 V (380 – 400 V IE 3), 50 Hz / 200 – 240 (208 – 240 V IE3) / 380 – 480 V (416 – 480 V IE3), 60 Hz	113 68	113 78	113 88	113 98
200 – 346 V (IE3 Japan), 50 Hz / 220 – 380 V (IE3 Japan), 60 Hz	-	-	-	113 98J
Accessories				
Roots pump adaptor	-	-	168 30	168 30
Exhaust filter with lubricant return ARS 16-25	189 56	189 56	-	-
ARS 40-65	-	-	189 57	189 57
Condensate separator AK 16-25	188 11	188 11	-	-
AK 40-65	-	-	188 16	188 16
Chemical filter with safety blocking valve CFS 16-25	101 76	101 76	-	-
CFS 40-65	-	-	101 77	101 77
Inert gas system IGS 16-25	161 76	161 76	-	-
IGS 40-65	-	-	161 68V	161 68V
Limit switch system LSS 16-25	161 06	161 06	-	-
LSS 40-65	-	-	161 07	161 07
Spare Parts				
Inner body	200 39 762	200 39 764	200 39 758	200 39 760
Major maintenance kit for LVO 100 (without oil)	EK110002646	EK110002647	EK110002641	EK110002642
Minor maintenance kit for LVO 100 (without oil)	EK110002649	EK110002648	EK110002624	EK110002624
Shaft sealing replacement kit	EK110002650	EK110002650	EK110002643	EK110002643
Small parts kit	-	-	EK110002651	EK110002651
Seal kit	197 31	197 31	197 32	197 32

For further accessories see section “Accessories for TRIVAC E, B and BCS”

TRIVAC D 16 BCS-PFPE to D 65 BCS-PFPE



TRIVAC D 25 BCS-PFPE with CFS 16-25 and ARS 16-25 (left) and
TRIVAC D 65 BCS-PFPE with CFS 40-65 (right)



Type	DN	a	b	b ₁	b ₂	c	h	h ₁	h ₂	h ₃	h ₄	l	m	n	o	
D 16 BCS-PFPE (Part No. 113 69)	25 KF	mm	82	190	175	150	135	263	226	250	298	260	508	280	140	132
		in.	3.23	7.48	6.89	5.91	5.32	10.35	8.90	9.84	11.73	10.24	20.00	11.02	5.51	5.20
D 25 BCS-PFPE (Part No. 113 79)	25 KF	mm	142	190	175	150	135	263	226	250	298	260	570	280	140	132
		in.	5.59	7.48	6.89	5.91	5.32	10.35	8.90	9.84	11.73	10.24	22.44	11.02	5.51	5.20
D 40 BCS-PFPE (Part No. 113 89)	40 KF	mm	135	264	234	206	166	355	308	336	–	317	719	382	191	190
		in.	5.32	10.39	9.21	8.11	6.54	13.98	12.13	13.23	–	12.48	28.31	15.04	7.52	7.48
D 65 BCS-PFPE (Part No. 113 99)	40 KF	mm	213	264	234	206	166	355	308	336	–	317	794	382	191	190
		in.	8.39	10.39	9.21	8.11	6.54	13.98	12.13	13.23	–	12.28	31.26	15.04	7.52	7.48

¹⁾ For dimensions h₄ and l for further part numbers, see paragraph "Motor Dependent Data for the TRIVAC B, BCS and BCS-PFPE"

Dimensional drawing for the TRIVAC D 16 to D 65 BCS-PFPE

Technical Data

TRIVAC D 16 BCS-PFPE

two-stage

TRIVAC D 25 BCS-PFPE

two-stage

		50 Hz	60 Hz	50 Hz	60 Hz
Nominal pumping speed ¹⁾	m ³ /h (cfm)	18.9 (11.1)	22.7 (13.4)	29.5 (17.4)	35.4 (20.9)
Pumping speed ¹⁾	m ³ /h (cfm)	16.5 (9.7)	19.8 (11.7)	25.7 (15.1)	30.8 (18.2)
Ultimate partial pressure without gas ballast ¹⁾	mbar (Torr)	$< 8 \times 10^{-4}$ ($< 6 \times 10^{-4}$)	$< 8 \times 10^{-4}$ ($< 6 \times 10^{-4}$)	$< 8 \times 10^{-4}$ ($< 6 \times 10^{-4}$)	$< 8 \times 10^{-4}$ ($< 6 \times 10^{-4}$)
Ultimate total pressure with gas ballast ¹⁾	mbar (Torr)	$< 5 \times 10^{-3}$ ($< 3.8 \times 10^{-3}$)	$< 5 \times 10^{-3}$ ($< 3.8 \times 10^{-3}$)	$< 5 \times 10^{-3}$ ($< 3.8 \times 10^{-3}$)	$< 5 \times 10^{-3}$ ($< 3.8 \times 10^{-3}$)
Ultimate total pressure with reduced gas ballast, 200 l/h ¹⁾	mbar (Torr)	$< 2 \times 10^{-3}$ ($< 1.5 \times 10^{-3}$)	$< 2 \times 10^{-3}$ ($< 1.5 \times 10^{-3}$)	$< 2 \times 10^{-3}$ ($< 1.5 \times 10^{-3}$)	$< 2 \times 10^{-3}$ ($< 1.5 \times 10^{-3}$)
Lubricant filling min. / max. upon delivery	l (qt)	0.45 / 1.0 (0.5 / 1.1)	0.45 / 1.0 (0.5 / 1.1)	0.6 / 1.4 (0.6 / 1.5)	0.6 / 1.4 (0.6 / 1.5)
Noise level ²⁾ to DIN 45 635, without / with gas ballast	dB(A)	54 / 56	54 / 56	54 / 56	54 / 56
Admissible ambient temperature	°C (°F)	+12 to +40 (+54 to +104)	+12 to +40 (+54 to +104)	+12 to +40 (+54 to +104)	+12 to +40 (+54 to +104)
Motor rating ²⁾	W (HP)	750 (1.0)	750 (1.0)	750 (1.0)	750 (1.0)
Nominal speed	rpm	1500	1800	1500	1800
Type of protection	IP	3)	3)	3)	3)
Weight ²⁾	kg (lbs)	29.3 (64.5) ⁴⁾	29.3 (64.5) ⁴⁾	33.8 (74.4) ⁴⁾	33.8 (74.4) ⁴⁾
Connections, Intake and Exhaust	DN	25 KF	25 KF	25 KF	25 KF

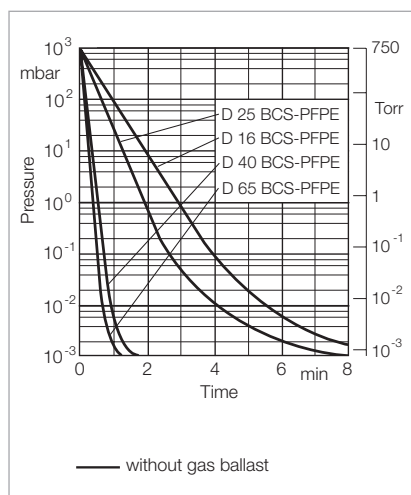
¹⁾ To DIN 28 400 and following numbers

²⁾ Motor rating and noise levels for the pumps with AC motor 50 Hz.

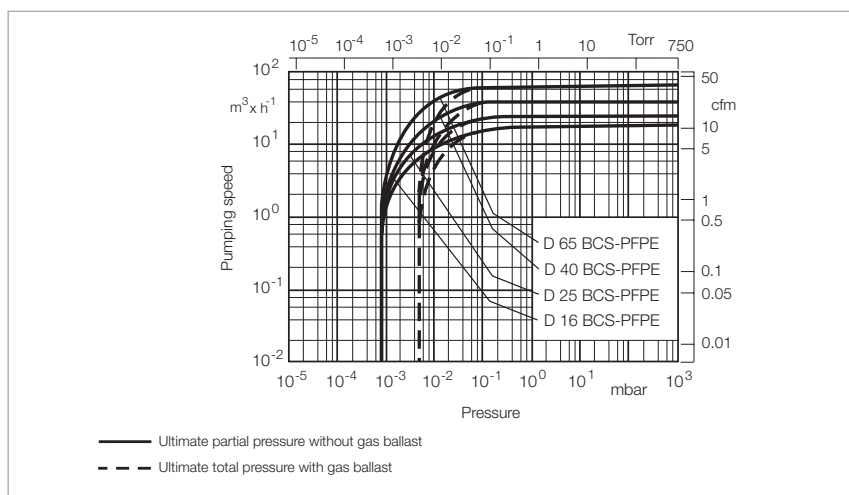
Any data that deviate from the above for pumps with other motors, and other motor-dependent data are given in chapter "Products", paragraph "Motor Dependent Data for the TRIVAC B, BCS and BCS-PFPE"

³⁾ See paragraph "Motor Dependent Data for the TRIVAC B, BCS and BCS-PFPE"

⁴⁾ Upon delivery



Pump-down characteristics of a 100 l vessel at 50 Hz



Pumping speed characteristics at 50 Hz (60 Hz curves at the end of the chapter)

Technical Data**TRIVAC D 40 BCS-PFPE****TRIVAC D 65 BCS-PFPE****two-stage****two-stage**

		50 Hz	60 Hz	50 Hz	60 Hz
Nominal pumping speed ¹⁾	m ³ /h (cfm)	46 (27)	55 (32.5)	75 (44)	90 (53)
Pumping speed ¹⁾	m ³ /h (cfm)	40 (24)	48 (28)	65 (38)	78 (46)
Ultimate partial pressure without gas ballast ¹⁾	mbar (Torr)	< 8 x 10 ⁻⁴ (< 6 x 10 ⁻⁴)	< 8 x 10 ⁻⁴ (< 6 x 10 ⁻⁴)	< 8 x 10 ⁻⁴ (< 6 x 10 ⁻⁴)	< 8 x 10 ⁻⁴ (< 6 x 10 ⁻⁴)
Ultimate total pressure with gas ballast ¹⁾	mbar (Torr)	< 5 x 10 ⁻³ (< 3.8 x 10 ⁻³)	< 5 x 10 ⁻³ (< 3.8 x 10 ⁻³)	< 5 x 10 ⁻³ (< 3.8 x 10 ⁻³)	< 5 x 10 ⁻³ (< 3.8 x 10 ⁻³)
Lubricant filling min. / max. upon delivery	l (qt) l (qt)	1.7 / 2.6 (1.8 / 2.7) 0.6 (0.6)	1.7 / 2.6 (1.8 / 2.7) 0.6 (0.6)	2.0 / 3.3 (2.1 / 3.5) 0.75 (0.8)	2.0 / 3.3 (2.1 / 3.5) 0.75 (0.8)
Noise level ²⁾ to DIN 45 635, without / with gas ballast	dB(A)	57 / 59	57 / 59	57 / 59	57 / 59
Admissible ambient temperature	°C (°F)	+12 to +40 (+54 to +104)	+12 to +40 (+54 to +104)	+12 to +40 (+54 to +104)	+12 to +40 (+54 to +104)
Motor rating ²⁾	W (HP)	2200 (3.0)	2200 (3.0)	2200 (3.0)	2200 (3.0)
Nominal speed	rpm	1500	1800	1500	1800
Type of protection	IP	3)	3)	3)	3)
Weight ²⁾	kg (lbs)	77.9 (171.8) ⁴⁾	77.9 (171.8) ⁴⁾	87.9 (193.7) ⁴⁾	87.9 (193.7) ⁴⁾
Connections, Intake and Exhaust	DN	40 KF	40 KF	40 KF	40 KF

¹⁾ To DIN 28 400 and following numbers

²⁾ Motor rating and noise levels for the pumps with AC motor 50 Hz.

Any data that deviate from the above for pumps with other motors, and other motor-dependent data are given in chapter "Products", paragraph "Motor Dependent Data for the TRIVAC B, BCS and BCS-PFPE"

³⁾ See paragraph "Motor Dependent Data for the TRIVAC B, BCS and BCS-PFPE"

⁴⁾ Upon delivery

Ordering Information

TRIVAC
D 16 BCS-PFPE
two-stageTRIVAC
D 25 BCS-PFPE
two-stageTRIVAC
D 40 BCS-PFPE
two-stageTRIVAC
D 65 BCS-PFPE
two-stage

	Part No.	Part No.	Part No.	Part No.
TRIVAC BCS-PFPE with 3-phase motor 200 – 240 V (200 V IE3) / 380 – 400 V (380 – 400 V IE3), 50 Hz / 200 – 240 (208 – 240 V IE3) / 380 – 480 V (416 – 480 V IE3), 60 Hz	113 69	113 79	113 89	113 99
Accessories				
Roots pump adaptor	–	–	168 30	168 30
Exhaust filter with lubricant return ARS 16-25	189 56	189 56	–	–
ARS 40-65	–	–	189 57	189 57
Condensate trap AK 16-25	188 11	188 11	–	–
AK 40-65	–	–	188 16	188 16
Chemical filter with safety isolation valve CFS 16-25	101 76	101 76	–	–
CFS 40-65	–	–	101 77	101 77
Inert gas system IGS 16-25	161 76	161 76	–	–
IGS 40-65	–	–	161 68V	161 68V
Limit switch system LSS 16-25	161 06	161 06	–	–
LSS 40-65	–	–	161 07	161 07
Spare Parts				
Major maintenance kit, LVO 400 (without oil)	EK110002644	EK110002645	EK110002637	EK110002638
Shaft sealing replacement kit	EK110002650	EK110002650	EK110002643	EK110002643
Small parts kit	–	–	EK110002651	EK110002651
Seal kit	197 41	197 41	197 42	197 42

For further accessories see section “Accessories for TRIVAC E, B and BCS”






Only available for purchase in North and South America

Ordering Information




TRIVAC D 16 BCS-PFPE
two-stageTRIVAC D 25 BCS-PFPE
two-stage






	Part No.	Part No.
TRIVAC BCS-PFPE with 1-phase motor 220 – 230 V, 50/60 Hz, NEMA plug	–	913 79-2






Motor Dependent Data for the TRIVAC B, BCS and BCS-PFPE

Pump type	D 4 / 8 B		D 4 / 8 B	
Part No. of the pump	140 081, 140 082		112 45, 112 55	
Motor part number	100002292		6507733	
Size	80		71	
Protection class	IP 54		IP 55	
Operating mode in acc. w. IEC 34 / NEMA			S1	
Insulation class			F	
Phases	1~		3~	
Efficiency class			-	
Number of poles			4	
Nominal output power at 50 Hz at 60 Hz	570 W 660 W		370 W -	
Nominal input frequency	50 Hz / 60 Hz		50 Hz / 60 Hz	
Nominal voltage range and nominal current (Mains voltage tolerance $\pm 10\%$) at 50 Hz	100 – 115 V / 7.7 A -		230 V / 3.0 A -	
	210 – 230 V / 4.0 A -		380 – 400 V / 1.07 A -	
at 60 Hz	100 – 115 V / 5.6 A -		200 – 240 V / 2.15 A -	
	210 – 230 V / 2.8 A -		380 – 480 V / 1.07 A -	
Nominal speed 50 Hz 60 Hz	rpm 1420 rpm 1690		1410 -	
Maximum operating altitude above sea level			1000 m	
Max. ambient temperature during operation	°C (°F)		40 (104)	
Terminal board / plug	Multi-pin plug at junction box, mains cord 20081091 (1.8 m) with Schuko plug CEE 7/7 (Included in delivery), mains cord 20081097 (1.8 m) with UK plug BS 1363 (optional), mains cord 20081099 (1.8 m) with CH plug SEV 1011 (optional), mains cord 20081141 (1.8 m) with US plug NEMA 6-15P (optional), mains cord 20081090 (1.8 m) with US plug NEMA 5-15P (100 – 120 V) (optional)		mains cord (2 m) with Schuko plug CEE	
Certifications	 		  	
Shaft dimension $\varnothing d / I$	mm (in.)		14 / 30 (0.55 / 1.18)	
Size of flange A/B	mm (in.)		140 / 95 (5.51 / 3.74)	
Length of the pump	mm (in.)		480 (18.90) (D 4 B) 504 (19.84) (D 8 B)	
Height up to top edge of junction box h_4	mm (in.)		254 (10.0)	



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Pump type	D 4 B		D 8 B	
Part No. of the pump	898 973		898 974	
Motor part number	72260195		72260196	
Size	56C			
Protection class	TEFC			
Operating mode in acc. w. IEC 34 / NEMA	continuous			
Insulation class	B			
Phases	1~			
Efficiency class	-			
Number of poles	4			
Nominal output power at 50 Hz at 60 Hz	180 W 240 W		240 W 370 W	
Nominal input frequency	50 Hz / 60 Hz			
Nominal voltage range and nominal current (Mains voltage tolerance ±10 %) at 50 Hz at 60 Hz	110 V / 6.8 A - 220 V / 3.4 A - 115 V / 6.0 A - 208-230 V / 3.1 A -		110 V / 9.6 A - 220 V / 4.8 A - 115 V / 8.8 A - 208-230 V / 4.5 A -	
Nominal speed 50 Hz 60 Hz	rpm rpm	1425 1725		
Maximum operating altitude above sea level	1000 m			
Max. ambient temperature during operation	°C (°F)	40 (104)		
Terminal board / plug	40 (104) 12 pin plug at the motor, mains cord (1.8 m) 721 27 874 with US plug NEMA 5-15P (115 V) (optional)			
Certifications			  RoHS 	
Shaft dimension ∅ d / l	mm (in.)	15.87 / 52.32 (0.625 / 2.06)		
Size of flange A/B	mm (in.)	114.3 (4.5)		
Length of the pump	mm (in.)	464 (18.27) (D 4 B)		488 (19.21) (D 8 B)
Height up to top edge of junction box h ₄	mm (in.)	252 (9.92)		287 (11.30)


Pump type	D 16 / 25 B D 16 / 25 BCS D 16 / 25 BCS-PFPE D 16 / 25 B-DOT		D 16 / 25 B	D 16 / 25 B (3i/3o)	D 16 B-Ex
Part No. of the pump	112 66, 112 76, 113 33 914 63-1 112 68, 112 78 112 69, 112 79 114 06, 114 10, 112 76 18	112 66J, 112 76J, 113 33J	140 160, 140 170	140 091, 140 092	
Motor part number	E6506939	6520730	20010409	2100002330	
Size	80	80Z	80L	80L	
Protection class	IP 55				
Operating mode in acc. w. IEC 34 / NEMA	S1				
Insulation class	F				
Phases	3~				
Efficiency class	IE3	IE3 Japan	–	–	
Number of poles	4				
Nominal output power at 50 Hz at 60 Hz	750 W 750 W	750 W 750 W	750 W –	750 W –	
Nominal input frequency	50 Hz / 60 Hz	50 Hz / 60 Hz	–	–	
Nominal voltage range and nominal current (Mains voltage tolerance $\pm 10\%$) at 50 Hz bei 60 Hz	200 – 240 V / 3.6 A 200 V / 3.6 A (IE3) 380 – 400 V / 1.8 A 380 – 400 V / 1.8 A (IE3) 200 – 240 V / 3.4 A 208 – 240 V / 3.2 A (IE3) 380 – 480 V / 1.7 A 416 – 480 V / 1.6 A (IE3)	200 – 346 V (IE3 Japan) – – – 200 – 350 V 220 – 380 V (IE3 Japan) –	230 V / 3.35 A – 400 V / 1.94 A – – – –	230 V / 3.4 A – 400 V / 1.95 A – – – –	
Nominal speed 50 Hz 60 Hz	rpm rpm	1430 1740	1440 1745	1380 –	1405 –
Maximum operating altitude above sea level	1000 m				
Max. ambient temperature during operation	°C (°F)	40 (104)			
Terminal board / plug	9 pins	9 pins	6 pins	6 pins	
Certifications	 RoHS 		 II 2 G Ex e II T3	 II 2 G Ex e II T3	
Shaft dimension $\varnothing d / l$	mm (in.)	19 / 40 (0.75 / 1.58)			
Size of flange A/B	mm (in.)	160 / 110 (6.30 / 4.33)			
Length of the pump	mm (in.)	508 (20.0) (D 16 B) 570 (22.44) (D 25 B)	508 (20.0) (D 16 B) 570 (22.44) (D 25 B)	510 (20.08) (D 16 B) 572 (22.52) (D 25 B)	510 (20.08) (D 16 B) –
Height up to top edge of junction box h_4	mm (in.)	260 (10.24)	260 (10.24)	268 (10.55)	268 (10.55)




Pump type	D 16 / 25 B		D 16 / 25 B	D 16 B
Part No. of the pump	112 65, 112 75		113 25, 113 35	898 698
Motor part number	E38066003		E110001212	72260187
Size	90		90	56C
Protection class	IP 44		IP 54	IP44
Operating mode in acc. w. IEC 34 / NEMA	S1		H	continuous
Insulation class			F	
Phases			1~	
Efficiency class			–	
Number of poles			4	
Nominal output power at 50 Hz at 60 Hz			750 W 750 W	
Nominal input frequency			50 Hz / 60 Hz	
Nominal voltage range and nominal current (Mains voltage tolerance $\pm 10\%$) at 50 Hz	230 V / 5.6 A – – –		230 V / 5.7 A – – –	110 V / 15.0 A – 220 V / 7.5 A –
at 60 Hz	230 V / 5.7 A – – –		230 V / 4.9 A – – –	115 V / 12.4 A – 208 – 230 V / 6.3 – 6.2 A–
Nominal speed 50 Hz 60 Hz	rpm rpm	1460 1750	1420 1680	1500 1800
Maximum operating altitude above sea level			1000 m	
Max. ambient temperature during operation	°C (°F)		40 (104)	
Terminal board / plug	mains cord (2 m) with Schuko plug CEE		Multi-pin plug at junction box, mains cord 20081091 (1.8 m) with Schuko plug CEE 7/7 (Included in delivery), mains cord 20081097 (1.8 m) with UK plug BS 1363 (optional), mains cord 20081099 (1.8 m) with CH plug SEV 1011 (optional), mains cord 20081141 (1.8 m) with US plug NEMA 6-15P (230 V) (optional)	Multi-pin plug at junction box, mains cord (1.8 m) E72127877 with US plug NEMA 5-15P (115 V), mains cord (1.8 m) E72127878 with US plug NEMA 6-15P (230 V)
Certifications				  
Shaft dimension $\varnothing d / l$	mm (in.)	19 / 40 (0.75 / 1.58)	19 / 40 (0.75 / 1.58)	15.87 / 53.32 (0.625 / 2.06)
Size of flange A/B	mm (in.)	160 / 110 (6.30 / 4.33)	160 / 110 (6.30 / 4.33)	114.3 (4.5)
Length of the pump	mm (in.)	521 (20.51) (D 16 B) 583 (22.95) (D 25 B)	505 (19.88) (D 16 B) 567 (22.32) (D 25 B)	582 (22.91) (D 16 B) –
Height up to top edge of junction box h_4	mm (in.)	278 (10.95)	279 (10.98)	263 (10.35)

Only available for purchase in North and South America

Pump type	D 16 B		D 16 B	
Part No. of the pump	898 208, 912 65-1		912 65-2	
Motor part number	72260117		72260005	
Size	56C			
Protection class	IP 43		TEFC	
Operating mode in acc. w. IEC 34 / NEMA	continuous			
Insulation class	F		B3	
Phases	1~			
Efficiency class	–			
Number of poles	4			
Nominal output power at 50 Hz at 60 Hz	560 W 560 W		550 W 550 W	
Nominal input frequency	50 Hz / 60 Hz			
Nominal voltage range and nominal current (Mains voltage tolerance ±10 %) at 50 Hz at 60 Hz	115 V / 13.0 A – 208 – 230 V / 5.5 – 6.5 A – 115 V / 9.4 A – 208 – 230 V / 4.8 – 7.4 A –		208 – 230 V / 5.5 – 6.5 A – – – 208 – 230 V / 4.8 – 4.7 A – – –	
Nominal speed 50 Hz 60 Hz	rpm rpm	1425 1725	1500 1800	
Maximum operating altitude above sea level	1000 m			
Max. ambient temperature during operation	°C (°F)		40 (104)	
Terminal board / plug	mains cord (1.8 m) with with US plug NEMA 5-15P (115 V)		mains cord (1.8 m) with with plug NEMA 6-15P (230 V)	
Certifications				
Shaft dimension ∅ d / l	mm (in.)	15.87 / 53.32 (0.625 / 2.06)		
Size of flange A/B	mm (in.)	114.3 (4.50)		
Length of the pump	mm (in.)	624 (24.57) (D 16 B)		538 (21.18) (D 16 B)
Height up to top edge of junction box h ₄	mm (in.)	265 (10.43)		247 (9.72)

Only available for purchase in North and South America

Pump type	D 16 B		D 25 B - PFPE	
Part No. of the pump	912 75-2, 913 79-2		170 119	
Motor part number	72260022		190260213	
Size	–		56C	
Protection class	IP 434		TEFC	
Operating mode in acc. w. IEC 34 / NEMA	continuous			
Insulation class	F			
Phases	1~			
Efficiency class	–			
Number of poles	4			
Nominal output power at 50 Hz at 60 Hz	1100 W 1100 W		– 1100 W	
Nominal input frequency	50 Hz / 60 Hz		60 Hz	
Nominal voltage range and nominal current (Mains voltage tolerance ±10 %) at 50 Hz	220 – 230 V / 9.6 – 9.2 A – – –		– – – –	
at 60 Hz	220 – 230 V / 9.6 – 8.0 A – – –		115 V / 18.0 A – 220 – 230 V / 8.4 – 8.0 A –	
Nominal speed 50 Hz 60 Hz	rpm rpm	1425 1725	– 1725	
Maximum operating altitude above sea level	1000 m			
Max. ambient temperature during operation	°C (°F)	40 (104)		
Terminal board / plug	mains cord (1.8 m) with with plug NEMA 6-15P (230 V)		9 wires	
Certifications				
Shaft dimension ∅ d / l	mm (in.)	15.87 / 53.32 (0.625 / 2.06)		
Size of flange A/B	mm (in.)	114.3 (4.50)		
Length of the pump	mm (in.)	639 (25.16) (D 25 B)		644 (25.35) (D 25 B)
Height up to top edge of junction box h ₄	mm (in.)	265 (10.43)		263 (10.35)

Pump type	D 40 / 65 B D 40 / 65 BCS D 40 / 65 BCS-PFPE D 40 B-DOT + D 65 B ³He			D 40 / 65 B	D 40 / 65 B-Ex
Part No. of the pump	112 86, 112 96 113 88, 113 98 113 89, 113 99 112 86 12 / 112 96 46			112 86J, 112 96J, 112 98J	140 180, 140 190
Motor part number	E6506961			6520731	20010411
Size	100L				
Protection class	IP 55				
Operating mode in acc. w. IEC 34 / NEMA	S1				
Insulation class	F				
Phases	3~				
Efficiency class	IE3			IE3 Japan	–
Number of poles	4				
Nominal output power at 50 Hz at 60 Hz	2200 W 2200 W			2200 W 2200 W	2600 W –
Nominal input frequency	50 Hz / 60 Hz			50 Hz / 60 Hz	–
Nominal voltage range and nominal current (Mains voltage tolerance ±10 %) at 50 Hz bei 60 Hz	200 – 240 V / 15.0 A 200 V / 10.4 A (IE3) 380 – 400 V / 5.2A 380 – 400 V / 5.2A (IE3) 200 – 240 V / 12.0 A 208 – 240 V / 9.2 A (IE3) 380 – 480 V / 5.2 A 416 – 480 V / 4.6 A (IE3)			200 – 346 V (IE3 Japan) – – – – 220 – 380 V (IE3 Japan) – –	230 V / 3.35 A – 400 V / 1.94 A – – – – –
Nominal speed 50 Hz 60 Hz	rpm rpm			1430 1735	1420 –
Maximum operating altitude above sea level	1000 m				
Max. ambient temperature during operation	°C (°F)			40 (104)	
Terminal board / plug	9 pins			9 pins	6 pins
Certifications					
Shaft dimension $\varnothing d / l$	mm (in.)	28 / 60 (1.10 / 2.36)			
Size of flange A/B	mm (in.)	160 / 110 (6.30 / 4.33)			
Length of the pump	mm (in.)	719 (28.31) (D 40 B) 794 (31.26) (D 65 B)			
Height up to top edge of junction box h_4	mm (in.)	317 (12.48)	317 (12.48)	328 (12.91)	

Accessories

For TRIVAC E, B and BCS

Exhaust Filters AF 8 to AF 25 Condensate Traps AK 8 to AK 25



Exhaust filter (left) and condensate trap (right)

Exhaust-Filter

Oil mists and aerosols are retained in the exhaust filter.

Advantages to the User

- Filtering of the exhaust gas by removal of entrained lubricant particles
- Emptying via drain screw or exhaust filter drain tap
- Separation efficiency > 99%
- Filter elements (made of glass fiber) are exchangeable

Condensate Trap

Condensate traps prevent the formation of condensate in the pump as well as the backstreaming of fluids.

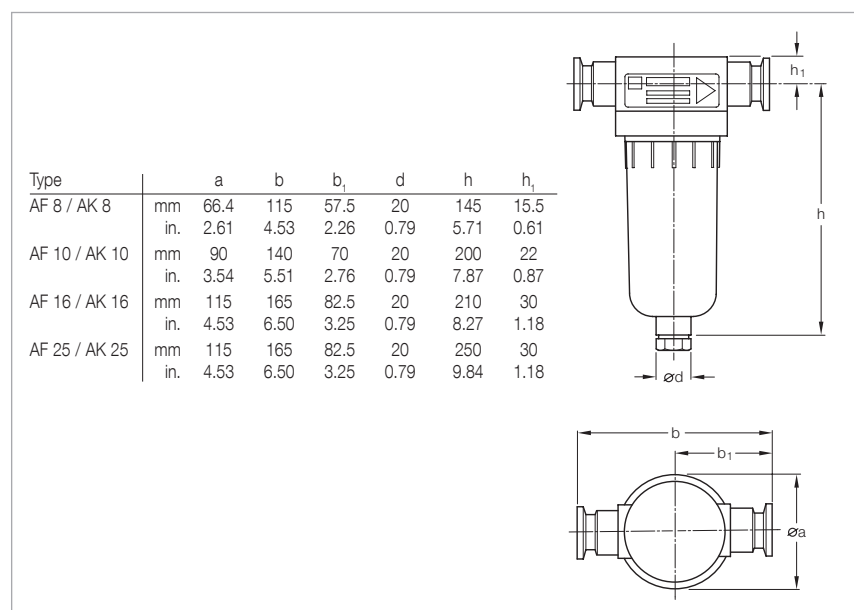
Advantages to the User

- Can be connected to either the intake or the exhaust side
- Protects against condensate forming from sucked in vapors or gases (intake line)
- Protects against backstreaming liquids (exhaust line)
- Emptying via drain screw/drain tap

Technical Information

The exhaust filter is not capable of retaining toxic and/or aggressive gases. For such applications we recommend the use of an exhaust gas line (e.g. a gas washer).

Since the material is not resistant to all gases and solvents, a materials compatibility chart is available upon request.



Dimensional drawing for the AF exhaust filter and AK condensate trap

Technical Data**AF 8 AK 8 AF 10 AK 10 AF 16 AK 16 AF 25 AK 25**

Connection to pump (required accessories for TRIVAC E: elbow)	TRIVAC	D 2,5 E D 4 B D 8 B	D 2,5 E D 4 B D 8 B	D 16 B	D 16 B	D 16 B	D 16 B	D 16 B D 25 B	D 16 B D 25 B
Connection flanges	DN	16 KF	16 KF	25 KF	25 KF	25 KF	25 KF	25 ISO-KF	25 KF
Max. filling level (for vertical installation)	ml	60	60	145	145	285	285	285	285
Permissible leak rate	mbar x l/s	$\leq 1 \times 10^{-5}$							
Max. continuous temperature	°C (°F)	90 (194)							
Material		Polyamide 6							

Ordering Information**AF 8 AK 8 AF 10 AK 10 AF 16 AK 16 AF 25 AK 25**

	Part No.	Part No.	Part No.	Part No.	Part No.	Part No.	Part No.	Part No.
Exhaust filter	190 50	-	190 51	-	190 52	-	190 53	-
Exhaust filter drain tap	190 95	190 95	190 95	190 95	190 95	190 95	190 95	190 95
Condensate trap	-	190 60	-	190 61	-	190 62	-	190 63
Replacement filter element (pack of 5)								
FE 8	ES 190 80	-	-	-	-	-	-	-
FE 10	-	-	ES 190 81	-	-	-	-	-
FE 16	-	-	-	-	ES 190 82	-	-	-
FE 25	-	-	-	-	-	-	ES 190 83	-
Reducer DN 25/16 KF ¹⁾								
Aluminium (if necessary)	183 86	183 86	183 86	183 86	183 86	183 86	183 86	183 86
Elbow (1x)								
Aluminium	184 36	184 36	184 37	184 37	184 37	184 37	184 37	184 37
Centering ring with O-ring (2x)								
Aluminium / NBR	183 26	183 26	183 27	183 27	183 27	183 27	183 27	183 27
Stainless steel / FPM (FKM)	183 46	183 46	183 47	183 47	183 47	183 47	183 47	183 47
Clamping ring (2x)	183 41	183 41	183 42	183 42	183 42	183 42	183 42	183 42

¹⁾ When using the reducer, an elbow is required

Exhaust Filters

AF 4-8 to AF 40-65

AF 16-25 DOT and AF 40-65 DOT

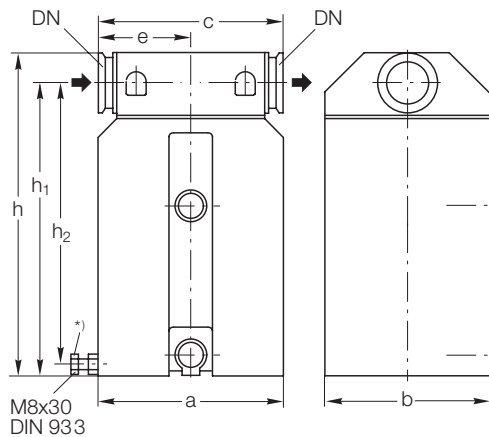


AF 4-8 exhaust filter

Exhaust filters retain oil mists and aerosols.

Advantages to the User

- Can be fitted without additional accessories
- Separation efficiency over 99 %
- Exchangeable filter inserts
- Built-in over-pressure relief valve (threshold at about 1.5 bar (7.2 psi, differential))
- Sight glass for checking of the quantity of collected oil
- Resistant against solvents
- Seals for
 - AF made of FPM (FKM)
 - AF-DOT made of EPDM
- Easy to clean and use
- Retains dirt and cracked products



Type	DN		a	b	c	e	h	h ₁	h ₂
AF 4-8	16 KF	mm	90	90	120	60	194	178	—
		in.	3.54	3.54	4.72	2.36	7.64	7.01	—
AF 16-25 (DOT)	25 KF	mm	110	125	142	71	214	193	—
		in.	4.33	4.92	5.59	2.80	8.43	7.60	—
AF 40-65 (DOT)	40 KF	mm	170	157	170	85	300	272	261
		in.	6.69	6.18	6.69	3.35	11.81	10.71	10.28

*) Supporting screw only for AF 40-65

Dimensional drawing for the AF exhaust filters

Typical Application

- Improvement of oil separating capacity

Technical Information

An exhaust line must be connected in case of hazardous exhaust gases.

Technical Data**AF 4-8****AF 16-25****AF 40-65****AF 16-25
DOT****AF 40-65
DOT**

Connection to pump	TRIVAC	D 4/8 B	D 16/25 B/BCS	D 40/65 B/BCS	D 16/25 B-DOT	D 40 B-DOT
Max. capacity for condensate, approx. l (qt)		0.4	0.5	1.0	-	-
Weight	kg (lbs)	1.9	3.2	6.5	-	-

Ordering Information**AF 4-8****AF 16-25****AF 40-65****AF 16-25
DOT****AF 40-65
DOT**

	Part No.	Part No.	Part No.	Part No.	Part No.
Exhaust filter	189 06	189 11	189 16	124 16	101 15
Replacement filter element					
FE 4-8	189 71	-	-	-	-
FE 16-25	-	189 72	-	-	-
FE 40-65	-	-	189 73	-	-
FE 16-25 DOT	-	-	-	200 10 304	-
FE 40-65 DOT	-	-	-	-	200 39 840 ¹⁾
Oil drain tap M 16 x 1.5 (vacuum-tight)	190 90	190 90	190 90	-	-

¹⁾ 2 pieces are required

Exhaust Filters with Lubricant Return

ARP 4-8 and AR 4-8 to AR 40-65



AR 4-8 exhaust filter with lubricant return



ARP 4-8 exhaust filter with lubricant return

This combination of an exhaust filter with a float-controlled valve considerably extends the maintenance intervals for the TRIVAC pumps.

Advantages to the User

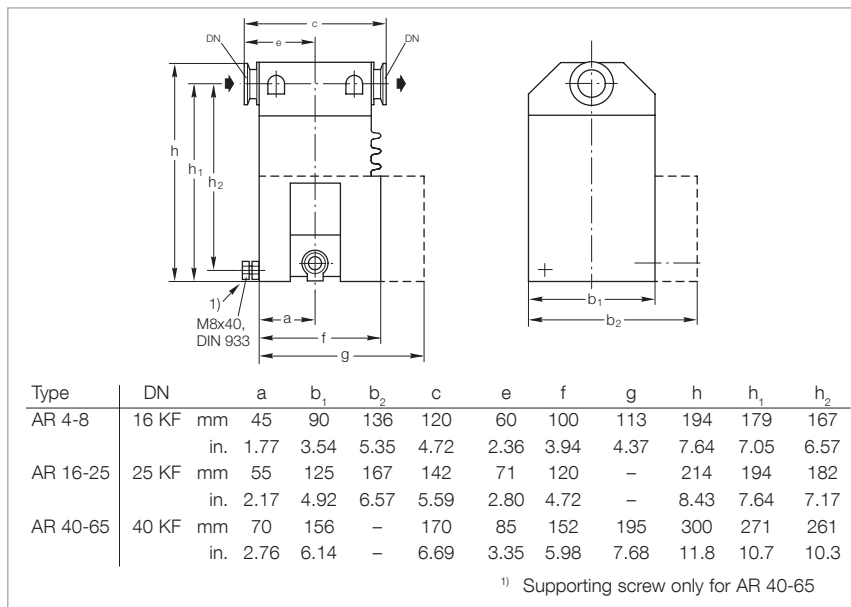
- Filtering the exhaust air of entrained lubricant particles
- Lubricant return with the aid of a float-controlled valve back into the intake port
- No operating costs caused by lost lubricant
- Hardly any oil consumption
- Standard filter element
- Built-in over-pressure relief valve
- Resists solvents
- All seals made of FPM (FKM)
- Easy change of the return port for horizontal or vertical connection

Typical Application

- Extending the maintenance intervals

Supplied Equipment

Intermediate flange, connecting lines with hollow screws, required gaskets as well as mounting screws for the intake flange.



Dimensional drawing for the AR exhaust filters with lubricant return
(dimensions for the ARP exhaust filter with lubricant return upon request)

Technical Data

ARP 4-8 AR 4-8 AR 16-25 AR 40-65

Connection to pump	TRIVAC	D 4/8 B	D 4/8 B	D 16/25 B/BCS	D 40/65 B/BCS
For opening the float-controlled valve					
required amount of oil					
LEYBONOL LVO 100	cm ³	–	430 (0.45)	510 (0.54)	760 (0.80)
LEYBONOL LVO 400	cm ³	–	350 (0.37)	430 (0.45)	700 (0.74)
Verbleibende Schmiermittel-Menge					
LEYBONOL LVO 100	cm ³ (qt)	–	290 (0.31)	340 (0.36)	420 (0.44)
LEYBONOL LVO 400	cm ³ (qt)	–	250 (0.26)	300 (0.32)	390 (0.41)
Weight	kg (lbs)	1.7 (3.8)	3.1 (6.89)	4.7 (10.4)	8.5 (18.7)

Ordering Information

ARP 4-8 AR 4-8 AR 16-25 AR 40-65

	Part No.	Part No.	Part No.	Part No.
Exhaust filter with lubricant return	140 065	189 20	189 21	189 22
Replacement filter element				
FE 8	190 80	–	–	–
FE 4-8	–	189 71	–	–
FE 16-25	–	–	189 72	–
FE 40-65	–	–	–	189 73

Technical Information

The AR is connected to the exhaust port of the TRIVAC B, the return line is connected at the intermediate flange under the intake port.
An exhaust line must be connected in case of hazardous exhaust gases.

The ARP and AR filters are factory cleaned to such an extent, that they may be operated either with mineral oil (e.g. LEYBONOL LVO 100) or perfluoropolyether (PFPE) (e.g. LEYBONOL LVO 400).

Exhaust Filters with Lubricant Return ARS 16-25 and ARS 40-65



ARS 40-65

This combination of an exhaust filter with a float-controlled valve considerably extends the maintenance intervals of the TRIVAC BCS.

The ARS is part of the TRIVAC SYSTEM.

Advantages to the User

- Lubricant return with the aid of a float-controlled valve back into the intake port
- The intake port may be easily exchanged (either vertical or horizontal orientation)
- No operating costs caused by lost lubricant
- Hardly any oil consumption
- Visual indication of the differential pressure
- Standard filter element
- All aluminium parts are surface protected
- Built-in over-pressure relief valve
- Resists solvents
- All seals made of FPM (FKM)

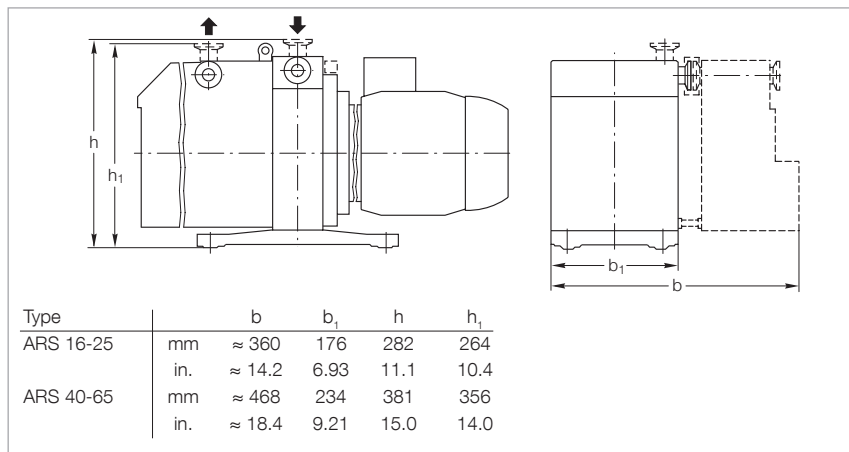
Typical Application

- Filtering the exhaust air of entrained lubricant particles

Supplied Equipment

Intermediate flange, connecting lines with hollow screws, required gaskets as well as mounting screws for the intake flange.

Wrapped in foil for shipping.



Dimensional drawing for the ARS mounted on a TRIVAC BCS

Technical Information

An exhaust line must be connected in case of hazardous exhaust gases. The ARS is connected to the exhaust port of the TRIVAC BCS, the return line is connected at the intermediate flange under the intake port.

The ARS is factory cleaned to such an extent, that it may be operated either with mineral oil (e.g. LEYBONOL LVO 100) or perfluoropolyether (PFPE) (e.g. LEYBONOL LVO 400).

Technical Data

ARS 16-25

ARS 40-65

Connection to pump	TRIVAC	D 16/25 B D 16/25 BCS (-PFPE)	D 40/65 B D 40/65 BCS (-PFPE)
Connection flanges	DN	25 KF	40 KF
Amount of oil required for opening the float-controlled valve			
LEYBONOL LVO 100	cm ³ (qt)	510 (0.54)	760 (0.80)
LEYBONOL LVO 400	cm ³ (qt)	340 (0.36)	420 (0.44)
Remaining amount of oil			
LEYBONOL LVO 100	cm ³ (qt)	430 (0.45)	700 (0.74)
LEYBONOL LVO 400	cm ³ (qt)	300 (0.31)	390 (0.41)
Weight with intermediate flange, tubing and filter, without lubricant	kg (lbs)	4.7 (10.4)	8.5 (16.7)

Ordering Information

ARS 16-25

ARS 40-65

	Part No.	Part No.
Exhaust filter with lubricant return	189 56	189 57
Replacement filter element		
FE 16-25	189 72	-
FE 40-65	-	189 73

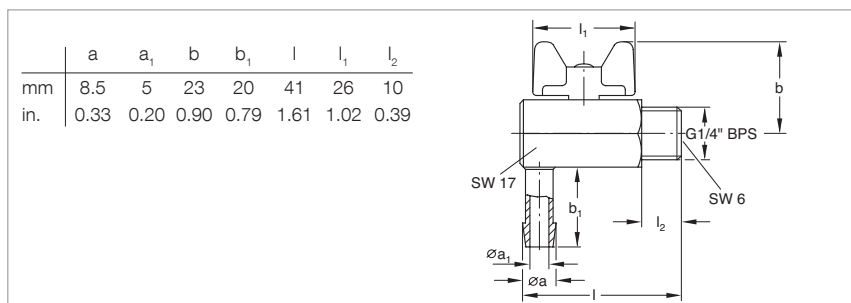
Exhaust Filter Drain Tap



The exhaust filter drain tap simplifies draining of the oil from the exhaust filter.

Technical Note

May also be used in connection with the condensate separator AK.



Dimensional drawing for the exhaust filter drain tap

Technical Data

Leak rate	mbar x l/s	$\leq 10^{-5}$
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Exhaust Filter Drain Tap

Ordering Information

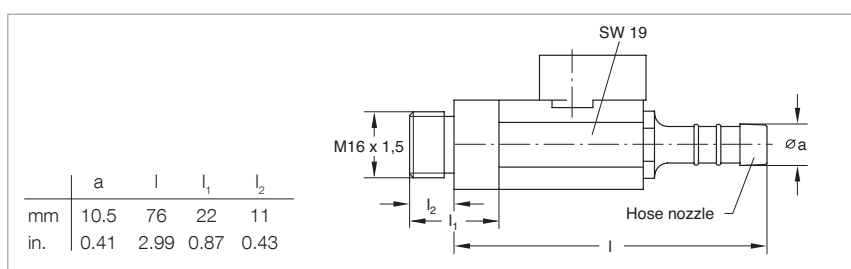
Exhaust Filter Drain Tap

	Part No.
Exhaust filter drain tap	190 95

Oil Drain Tap



This oil drain tap may be screwed into the oil drain when wanting to change the oil in the rotary vane pumps. It is also suited for the condensate separators and exhaust filters of the TRIVAC B series.



Dimensional drawing for the oil drain tap

Technical Data

Leak rate	mbar x l/s	$\leq 10^{-5}$
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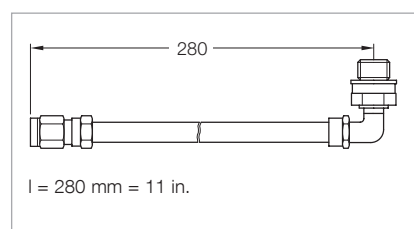
Oil Drain Tap

Ordering Information

Oil Drain Tap

	Part No.
Oil drain tap	190 90

Oil Drain Kit



Dimensional drawing for the oil drain kit

Technical Data

Length	mm (in)	280 (11)
Leak rate	mbar x l/s	$\leq 10^{-5}$

Oil Drain Kit

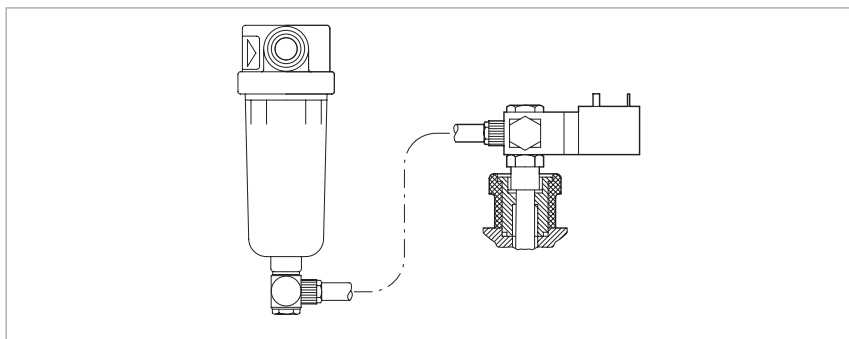
Ordering Information

Oil Drain Kit

	Part No.
Oil drain kit	190 94

Oil Suction Facility AR-V Controlled by Solenoid Valve

Suited for the AF 8 or AK 8 when connected to the D 2.5 E the oil suction facility AR-V with its solenoid valve allows the removal of oil via the gas ballast which has collected in the exhaust filter. When the valve is closed the gas ballast remains fully operational. For this, a hose link is provided between the exhaust filter and the gas ballast.



AR-V oil suction facility controlled by solenoid valve (kit without exhaust filter)

Technical Note

If oil which has collected in the exhaust filter is to be removed, the solenoid valve is opened briefly.

Technical Data

Leak rate	mbar x l/s	$\leq 10^{-5}$
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AR-V Oil Suction Facility Controlled by Solenoid Valve

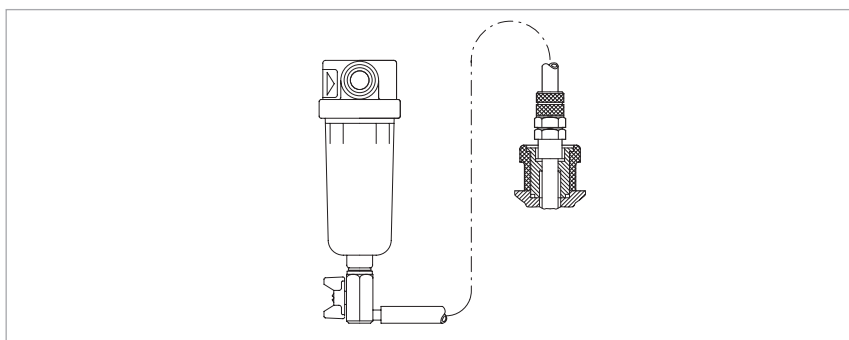
Ordering Information

	Part No.
AR-V oil suction facility controlled by solenoid valve 24 V DC, 4 W, normally closed	190 92

AR-V Oil Suction Facility Controlled by Solenoid Valve

Manually Operated Oil Suction Facility AR-M

Suited for the AF 8 or AK 8 when connected to the D 2,5 E the oil suction facility AR-M allows the removal of oil via the gas ballast which has collected in the exhaust filter, whereby the gas ballast remains fully operational as long as the angled ball valve remains closed. For this, a hose link is provided between the exhaust filter and the gas ballast.



AR-M manually operated oil suction facility (kit without exhaust filter)

Technical Note

If oil which has collected in the exhaust filter is to be removed, the angled ball valve is manually opened briefly.

Technical Data

Leak rate	mbar x l/s	$\leq 10^{-5}$
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AR-M Manually Operated Oil Suction Facility

Ordering Information

	Part No.
AR-M manually operated oil suction facility	190 93

AR-M Manually Operated Oil Suction Facility

Condensate Separators

AK 4-8 to AK 40-65

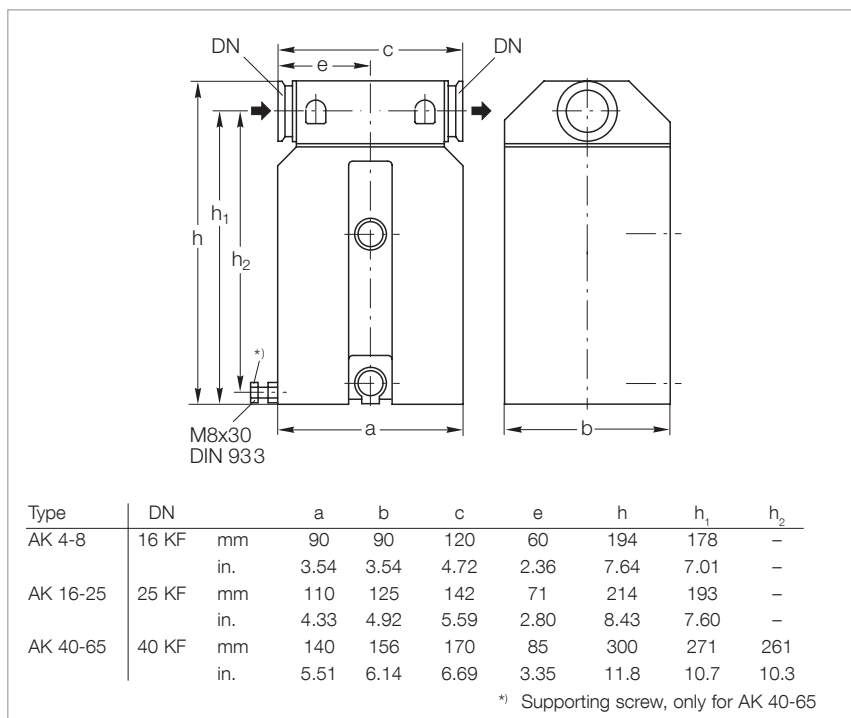


AK 4-8 condensate separator

Separators protect the pump against condensate.

Advantages to the User

- May be installed without accessories
- May be used either on the intake or the exhaust side
- Independent of the direction of flow
- Condensate level check via inspection glass
- Resists solvents
- All seals made of FPM (FKM)
- Simple to clean
- Easy to use
- Drained via drain screw or drain tap



Dimensional drawing for the AK condensate separators

Typical Application

- Prevention of the collection of liquids in the intake line

Technical Information

Depending upon the layout and pipe run of an exhaust line, it may be necessary to install a separator to prevent condensate draining back to the pump.

Technical Data

AK 4-8

AK 16-25

AK 40-65

Connection to pump	TRIVAC	D 4/8 B	D 16/25 B D 16/25 BCS (-PFPE)	D 40/65 B D 40/65 BCS (-PFPE)
Capacity for condensate	l (qt)	0.66 (0.7)	1.2 (1.3)	3.0 (3.2)
Weight	kg (lbs)	1.7 (3.7)	2.4 (5.3)	5.5 (12.1)

Ordering Information

AK 4-8

AK 16-25

AK 40-65

	Part No.	Part No.	Part No.
Condensate separator	188 06	188 11	188 16
Oil drain tap M 16 x 1.5 (vacuum-tight)	190 90	190 90	190 90
Adaptor DN 16 KF – hose nozzle DN 7	182 90	—	—

Dust Filters DN 16 KF to DN 40 KF



Filter housing FH 16 to FH 40 for dust filter insert DF

Dust filters protect the pump against sucked in dust. They are suited for oil sealed and also for dry compressing pumps.

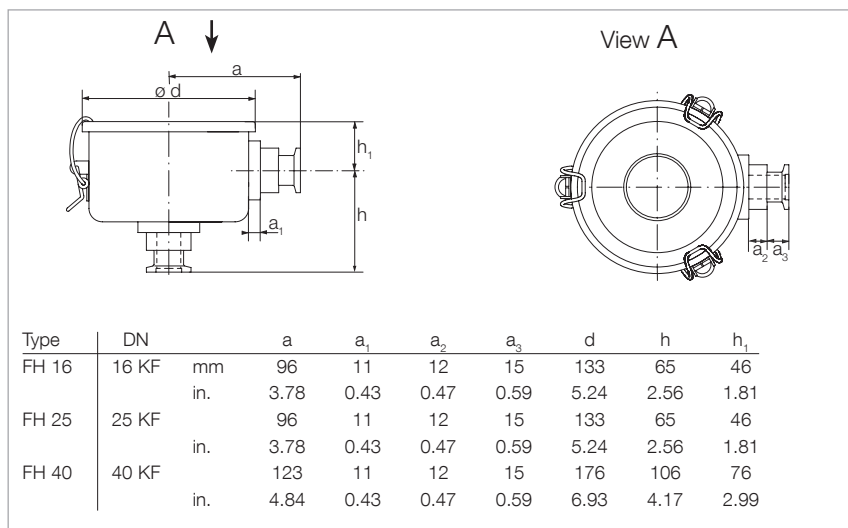
Advantages to the User

- Easy to disassemble
- Vacuum-tight steel housing
- Easily exchangeable replacement filter
- High filter capacity

Technical Information

Installing a dust filter in the intake line of the pump throttles its pumping speed at lower intake pressures much more than at higher intake pressures. Throttling reference values are stated in the Technical Data. These must be taken into account when dimensioning the vacuum system.

Since the collection capacity of dust filters is limited, we recommend the two-stage dust filters AS when larger quantities of dust are involved.



Dimensional drawing for the filter housings FH 16 to FH 40 for dust filter inserts DF

Technical Data

		Dust Filter		
		DN 16 KF	DN 25 KF	DN 40 KF
Use for	TRIVAC	D 4/8 B	D 16/25 B	D 40/65 B
Share of filtered out particles > 5 µm	%	98	98	98
Throttling of pumping speed at 10 mbar (7.5 Torr)	%	3	3	3
at 1 mbar (0.75 Torr)	%	6	6	6
Weight with dust filter insert	kg (lbs)	1.3 (2.9)	1.3 (2.9)	2.3 (5.1)

Ordering Information

		Dust Filter		
		DN 16 KF	DN 25 KF	DN 40 KF
	Part No.	Part No.	Part No.	
Dust filter				
filter housing FH ¹⁾	140 116T	140 125T	140 140T	
dust filter insert				
DF 16-25	140 117S	140 117S	-	
DF 40-65	-	-	-	140 141S

¹⁾ The filter housing is supplied without filter cartridge (dust filter insert) since it may also be used in connection with the adsorption trap or dust filter insert

Adsorption Traps DN 16 KF to DN 40 KF



Filter housing FH 16 to FH 40
for adsorption trap filter inserts RF

Adsorption traps are containers with a stainless steel insert which can be filled with a number of different adsorbents thereby offering a high adsorbing capacity for vapors, water vapor in particular.

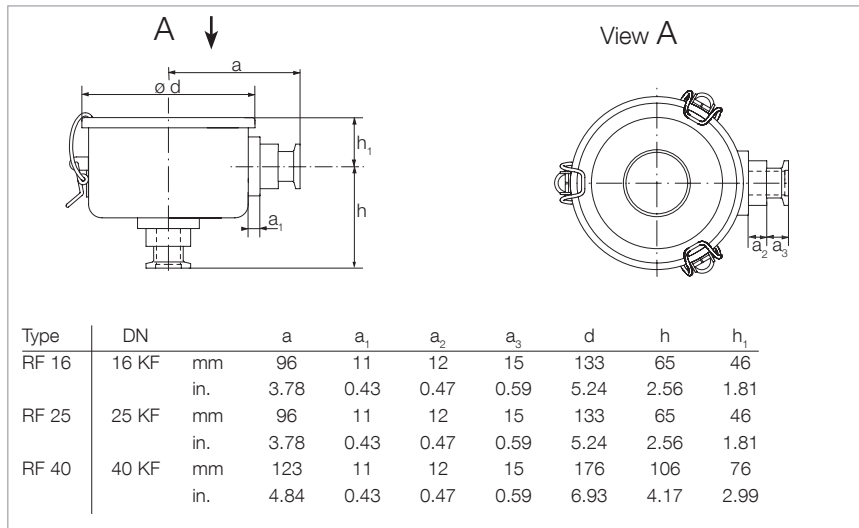
Advantages to the User

- Vacuum-tight steel housing
- Stainless steel, degassable up to 300 °C (572 °F)
- Different adsorbents and separating elements can be used
- Quick to replace
- Easy to disassemble

Technical Information

The adsorption traps have been developed specially for use in connection with oil sealed pumps. They are capable of retaining oil vapors discharged from forevacuum pumps and are at the same time in the position to separate vapors (water vapor) coming from the side of the process. Through the use of adsorption traps and a suitable adsorbent, a vacuum free of hydrocarbons can be produced. The stainless steel inserts with the corresponding adsorbent can be heated in a drying cabinet at 300 °C (572 °F) for regeneration. Depending on the type of adsorbent and operating pressure, the pumping speed of the pumps is reduced.

As to any questions relating to the selection of a suitable adsorbent, please consult us.



Dimensional drawing for the filter housings FH 16 to FH 40 for adsorption trap filter inserts RF

Technical Data

Technical Data		Adsorption Trap		
		DN 16 KF	DN 25 KF	DN 40 KF
Use for	TRIVAC	D 4/8 B	D 16/25 B	D 40/65 B
Conductance				
at 10 mbar (7.5 Torr) for				
aluminium oxide	l/s	2	6	14
zeolite	l/s	2	6	12
active charcoal filling	l/s	2	6	16
baffle ring filling	l/s	2	7	18
at 1 mbar (0.75 Torr) for				
aluminium oxide	l/s	1	4	5
zeolite	l/s	1	6	5
active charcoal filling	l/s	2	6	6
baffle ring filling	l/s	2	6	16
Filling quantity				
aluminium oxide	kg (lbs)	0.3 (0.7)	0.3 (0.7)	1.0 (2.2)
zeolite	kg (lbs)	0.2 (0.4)	0.2 (0.4)	0.7 (1.5)
active charcoal filling	kg (lbs)	0.1 (0.2)	0.1 (0.2)	0.5 (1.1)
baffle ring filling	kg (lbs)	0.1 (0.2)	0.1 (0.2)	0.3 (0.7)
Filling volume	l (qt)	0.3 (0.3)	0.3 (0.3)	1.2 (1.3)
Weight with adsorption trap insert	kg (lbs)	1.3 (2.9)	1.3 (2.9)	2.3 (5.1)

Ordering Information

Adsorption Trap			
	DN 16 KF	DN 25 KF	DN 40 KF
	Part No.	Part No.	Part No.
Adsorption trap			
filter housing FH ¹⁾	140 116T	140 125T	140 140T
adsorption trap filter insert			
RF 16-25	140 118A	140 118A	—
RF 40-65	—	—	140 142A
Active charcoal, un-dried, 5 kg	178 10	178 10	178 10
Zeolite, 1 kg	854 20	854 20	854 20
Aluminium oxide, 1.2 kg	854 10	854 10	854 10
Baffle ring 15 x 15 x 0.3, 1 liter			
Stainless steel 1.4301	390 26 126	390 26 126	390 26 126

¹⁾ The filter housing is supplied without filter cartridge (dust filter insert) since it may also be used in connection with the adsorption trap or dust filter insert

Cold Trap TK 4-8



TK 4-8 cold trap

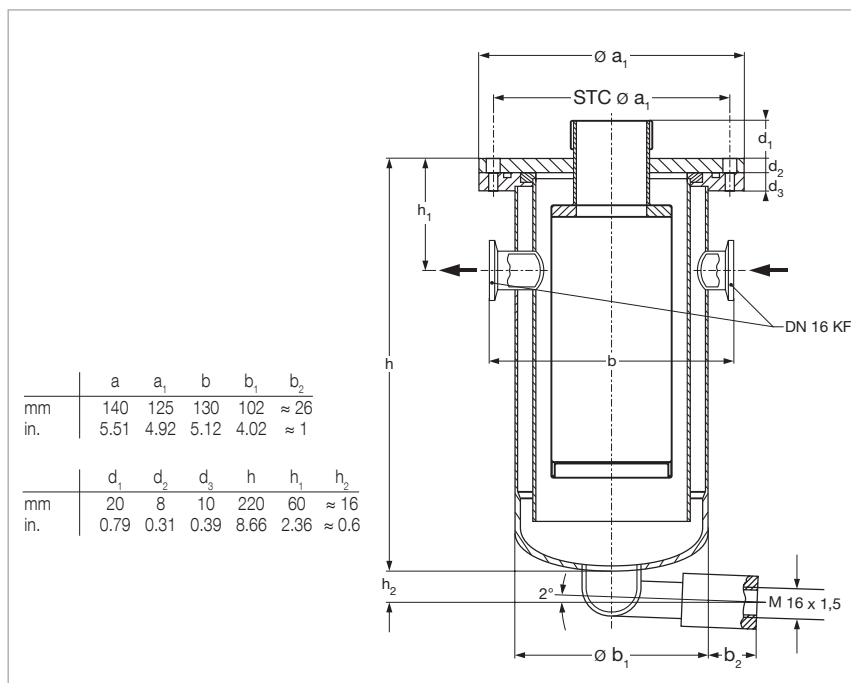
The cold trap protects the pump against damaging vapors.

Advantages to the User

- Rugged and implosion resistant
- May be fitted directly on the flange of the pump
- Safe draining of the condensate without problems
- Casing made of corrosion resistant stainless steel
- Simple filling with refrigerant (liquid nitrogen (LN_2) or a mixture of acetone and carbon di-oxide ice)

Typical Applications

- Prevention of oil from backstreaming into the vacuum system when operating at ultimate pressure
- Freezing of gases and vapors in the laboratory



Dimensional drawing for the TK 4-8 cold trap

Technical Data

TK 4-8

Connection to pump	TRIVAC	D 2,5 E, D 4/8 B
Capacity for refrigerant, approx.	l (qt)	0.4 (0.42)
Connections	DN	16 KF
Weight	kg (lbs)	4 (8.8)

Ordering Information

TK 4-8

	Part No.
Cold trap	188 20
Drain tap for the intake side, vacuum-tight	190 90
Elbow (1x)	184 36
Centering ring	
aluminium/NBR (2x)	183 26
stainless steel/FPM (FKM) (2x)	883 46
Clamping ring (2x)	183 41

Dust Separators AS 8-16 and AS 30-60 / Molecular Filters MF 8-16 and MF 30-60



AS 30-60 dust separator
(MF 30-60 molecular filter is similar)

Dust separators protect pumps against contamination and damage by sucked-in dust.

Advantages to the User

- Dust separators for large quantities of dust
- Two-stage, thus hardly any throttling
- Cyclone (for coarse dust) and wet filter (for fine dust)
- Dust separator and molecular filter have the same housing (for easy conversion)

Typical Application

- Separation of coarse and medium size dust starting at a grain size of 2 µm

Technical Information

Installing a dust filter in the intake line of the pump will throttle its pumping speed at low intake pressures more than at higher intake pressures. This must be taken into account when designing a vacuum system.

Even when large quantities of dust are deposited, the throttling effect will hardly increase.

Supplied Equipment

Blanked off drain port.

Molecular filters are used to separate vapors of a high molecular weight (i.e. monomers, vapors from resins).

Advantages to the User

- Molecular filter and dust separator have the same housing (for easy conversion)
- Separation of high-molecular weight vapors
- Protection of the pump's oil against damaging vapors

Technical Information

Installing a molecular filter in the intake line of the pump will throttle its pumping speed at low intake pressures more than at higher intake pressures. This must be taken into account when designing a vacuum system.

Supplied Equipment

Blanked off drain port.

Technical Data

AS 8-16

AS 30-60

MF 8-16

MF 30-60

Connection to pump	TRIVAC	D 16 B	D 25 B	D 40 B	D 65 B	D 16 B/BCS	D 25 B/BCS	D 40 B/BCS	D 65 B/BCS
Throttling of the pumping speed at 1 mbar (0.75 Torr) intake pressure, approx.	%	10	15	8	16	10	15	8	16
at 10 mbar (7.5 Torr) intake pressure, approx.	%	5	7	4	9	5	7	4	9
Capacity for dust	l (qt)	0.6 (0.63)	0.6 (0.63)	2.0 (2.11)	2.0 (2.11)	–	–	–	–
Capacity for resin vapors or similar	kg (lbs)	–	–	–	–	0.15 (0.3)	0.15 (0.3)	0.35 (0.8)	0.35 (0.8)
Impact ring filling	l (qt)	0.5 (0.53)	0.5 (0.53)	3.5 (3.7)	3.5 (3.7)	–	–	–	–
Active charcoal filling	kg (lbs)	–	–	–	–	0.6 (1.3)	0.6 (1.3)	1.4 (3.1)	1.4 (3.1)
Weight	kg (lbs)	4.5 (9.9)	4.5 (9.9)	18.4 (40.6)	18.4 (40.6)	4.5 (9.9)	4.5 (9.9)	18.4 (40.6)	18.4 (40.6)

Ordering Information

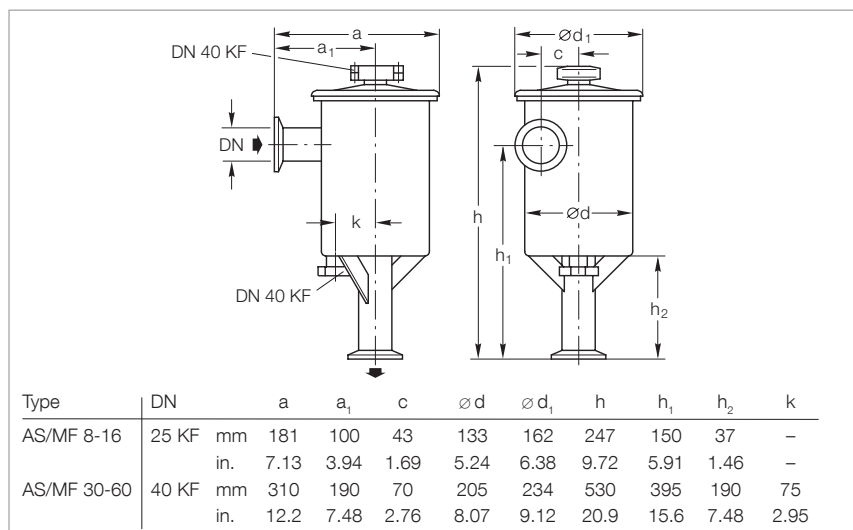
AS 8-16

AS 30-60

MF 8-16

MF 30-60

	Part No.	Part No.	Part No.	Part No.
Dust separator	186 11	186 16	–	–
Molecular filter	–	–	186 12	186 17
Replacement filter insert	–	178 43	–	–
Replacement active charcoal insert	–	–	178 07	178 08
Active charcoal, undried, 5 kg (11 lbs)	–	–	178 10	178 10



Dimensional drawing for the AS dust separators and MF molecular filters

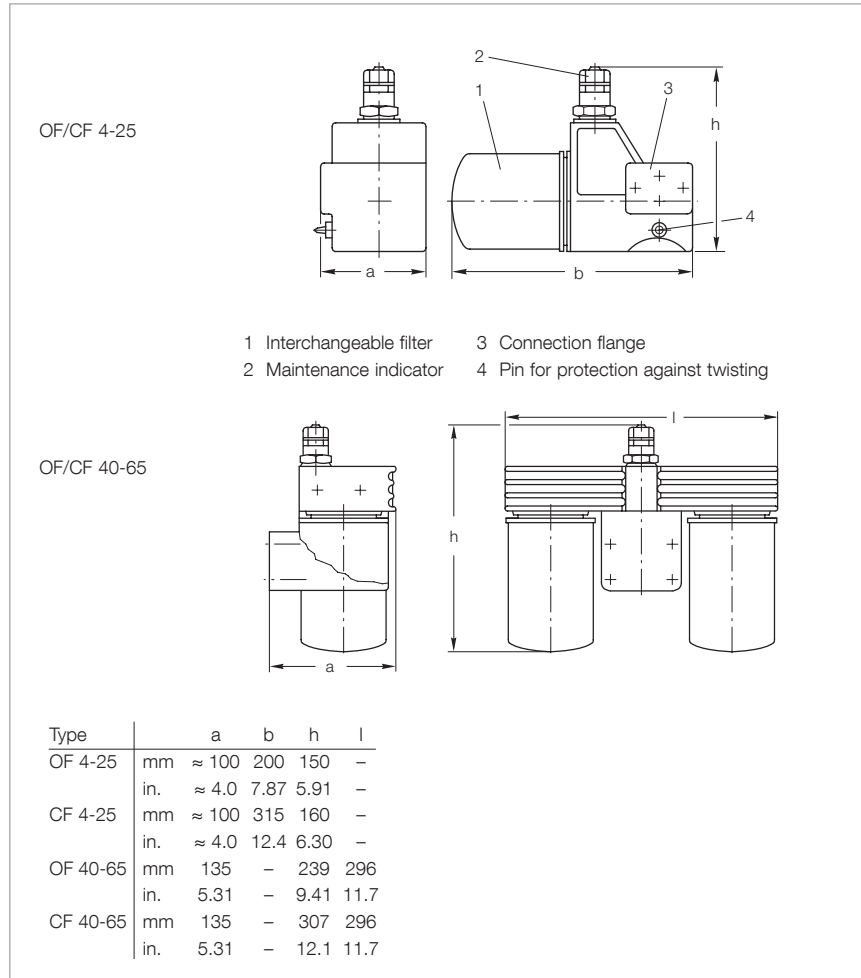
Mechanical Oil Filters OF 4-25 and OF 40-65 / Chemical Oil Filters CF 4-25 and CF 40-65



OF 4-25 mechanical oil filter

Since there is a pressure-lubrication system with an oil pump in every TRIVAC B, it is possible to connect main flow oil filters.

These filters are available either for mechanical filtering (OF types) or combined chemical/mechanical filtering (CF types).



Dimensional drawings for the OF mechanical oil filters and CF chemical oil filters

Advantages to the User

- Main flow oil filter
- Longer service life for the oil depending on the type of application
- Can be installed without problems to the TRIVAC B
- Hose connections are not required
- Easily interchangeable filters
- Only a small amount of oil needs to be added when changing the filters
- Expansion of the range of applications in case of special requirements

- Same casing for OF and CF types
- Greater reliability by standard maintenance indicator
- Built-in bypass valve
- Owing to the highly effective adsorbent for polar substances, an up to ten-fold adsorption effect is attained over normal bleaching earth (CF)
- Prevents mechanical damage to the pump

Typical Application

- Separation of fine particles from the pump's oil (sizes between 5 and 10 µm (OF))

Technical Data**OF 4-25****CF 4-25****OF 40-65****CF 40-65**

Connection to pump	TRIVAC	D 4/8 B, D 16/25 B	D 4/8 B, D 16/25 B	D 40/65 B	D 40/65 B
Nominal throughput	l/h	900	900	2000	2000
Separation					
mechanical oil filter	µm	5 to 10			
chemical oil filter	µm	to 3			
Permissible operating pressure	bar (psig)	2.5 (21.7)			
Opening pressure					
non-return valve	bar (psid)	0.12 (1.7)			
bypass valve	bar (psid)	2.5 ±0.3 (21.7 ±4.3)			
Topping up amount during					
first time installation	l (qt)	1.0 (1.1)	1.0 (1.1)	2.5 (2.6)	2.5 (2.6)
filter exchange	l (qt)	1.0 (1.1)	1.0 (1.1)	2.0 (2.1)	2.0 (2.1)
Weight, ready for operation, dry	kg (lbs)	4 (8.8)	4 (8.8)	10 (22.1)	10 (22.1)

Ordering Information**OF 4-25****CF 4-25****OF 40-65****CF 40-65**

	Part No.	Part No.	Part No.	Part No.
Mechanical oil filter	101 91	–	101 92	–
Chemical oil filter	–	101 96	–	101 97
WF 4-25 interchangeable filter, paper, 0.5 l (0.5 qt)	189 91	–	–	–
WF 40-65 interchangeable filter, paper 0.75 l (0.8 qt)	–	–	189 92 ¹⁾	189 92 ¹⁾
WF Alu 4-65 interchangeable filter, paper and Al ₂ O ₃ , 1 l (1.1 qt)	–	189 96	–	189 96 ¹⁾

¹⁾ 2 pieces are required

Chemical Filters with Safety Isolation Valve

CFS 16-25 and CFS 40-65



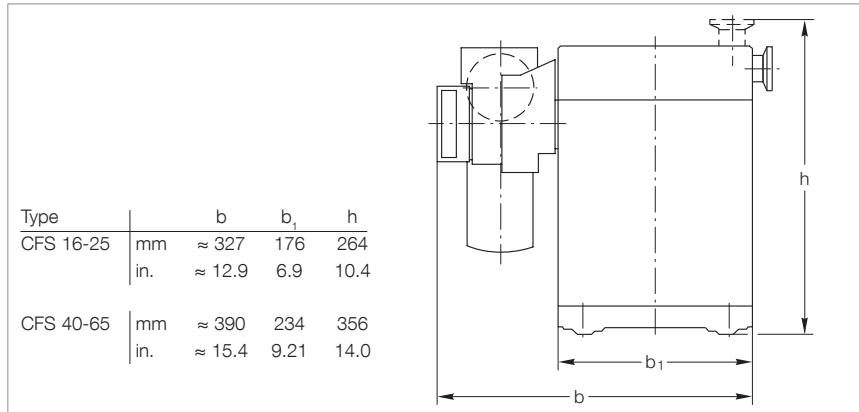
CFS 40-65

The CFS chemical filters with safety isolation valve are main flow oil filters for the TRIVAC B and BCS pumps.

The CFS is part of the TRIVAC SYSTEM.

Advantages to the User

- The CFS is included in the main lubricant flow
- Rapid filter exchange
 - the pump may continue to operate while changing the filters
- Visual indication of the filter's condition through a maintenance indicator
- Aluminium component with isolation valve for one or two interchangeable filters
- All aluminium parts are surface protected
- May be operated with different interchangeable filters
- Over-pressure relief valve in the interchangeable filters
- Prepared for connection of a differential pressure switch and an oil pressure switch
- May also be used on the TRIVAC B pumps



Dimensional drawing for the CFS (mounted on a TRIVAC BCS)

Technical Information

The CFS is cleaned in the factory to such an extent, that it may be operated either with mineral oil (e.g. LEYBONOL LVO 100) or perfluoropolyether (PFPE, e.g. LEYBONOL LVO 400).

Supplied Equipment

All gaskets and mounting parts required for installation.

Aluminium particle filters (WF Alu-Part) sealed for shipping are included separately.

Technical Data

		CFS 16-25	CFS 40-65
Connection to pump	TRIVAC	D 16/25 B	D 40/65 B
		D 16/25 BCS (-PFPE)	D 40/65 BCS (-PFPE)
Nominal throughput	l/h	900	2000
Permissible operating pressure	bar (psig)	2.5 (21.7)	
Opening pressure	Non-return valve	2.5 (21.7)	
	Bypass valve	2.5 ±0.3 (21.7 ±4.3)	
Filter medium		Al ₂ O ₃	
Lubricant filling when using WF Alu-Part	l (qt)	1.4 (1.5)	3.3 (3.5)
Weight, ready for operation, dry	kg (lbs)	7.0 (15.4)	15.5 (34.1)

Ordering Information

	CFS 16-25	CFS 40-65
Part No.	Part No.	Part No.
Chemical filter with safety isolation valve	101 76	101 77
WF Alu-Part combination filter, paper and Al ₂ O ₃ , 1.6 l (1.7 qt)	189 99	189 99 ¹⁾
WFG particle filter, paper with support mesh, 1 l (1.1 qt)	189 90	189 90 ¹⁾

¹⁾ 2 pieces are required

Inert Gas System

IGS 16-25 and IGS 40-65



IGS

This accessory, which is controlled via solenoid valves, permits the controlled admission of special gases into the TRIVAC BCS.

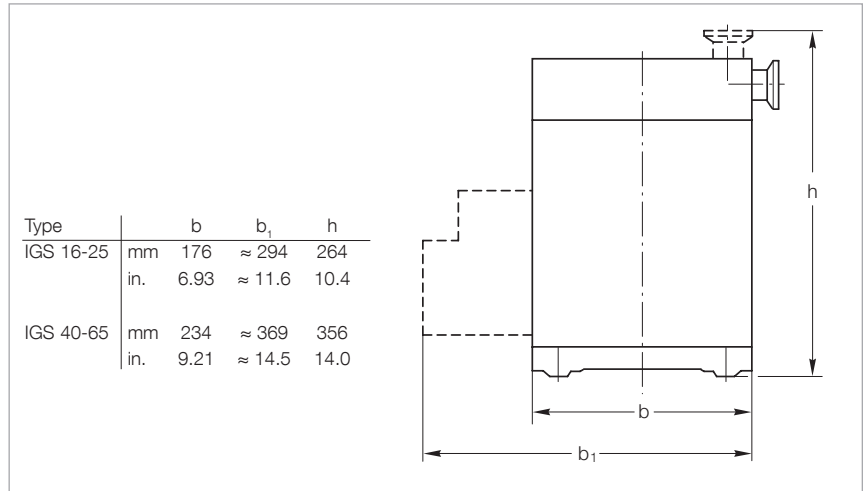
The IGS is part of the TRIVAC SYSTEM.

Advantages to the User

- Ready for connection to an inert gas supply
- Solenoid valve for reduced gas ballast
- Solenoid valve for purging the oil box
- Float throughput gauge with throttling valve adjustable from 200 to 700 l/h
- The flowing quantity can be read directly
- System protection by a non-return valve (requires a reservoir pressure of at least 3 bar (29 psi, gauge)) – this reliably prevents the reservoir vessel from being evacuated
- Connects directly on to the TRIVAC BCS

Typical Applications

- Reduction of the contamination levels in the lubricant
- Reduction in the dwell time of volatile substances within the pump



Dimensional drawing for the IGS (mounted on a TRIVAC BCS)

Technical Information

The amount of inert gas ballast is restricted by a nozzle to 200 l/h. Larger quantities are used for purging.

Supplied Equipment

Solenoid valves with connection cables and plugs, the required connecting pieces, mounting screws and cover panel.

Technical Data

	TRIVAC	IGS 16-25	IGS 40-65
Connection to pump	D 16/25 BCS (-PFPE)	D 40/65 BCS (-PFPE)	
Min. amount of admitted gas at a reservoir pressure of 3.0 bar (29 psig)	I/h	200	
Max. amount of admitted gas at a reservoir pressure of 6.0 bar (72.5 psig)	I/h	1450	
Supply voltage for the solenoid valves	V DC	24	
Power consumption	W	10	
Weight	kg (lbs)	1.0 (2.2)	1.4 (3.1)
Connection thread	G (BPS)	1/8"	

Ordering Information

	IGS 16-25	IGS 40-65
Inert gas system	Part No. 161 76	Part No. -
Inert gas system, UL conform	-	161 68V

Limit Switch System

LSS 16-25 and LSS 40-65



LSS

This accessory consists of a package of limit switches. It is used to monitor system functions.

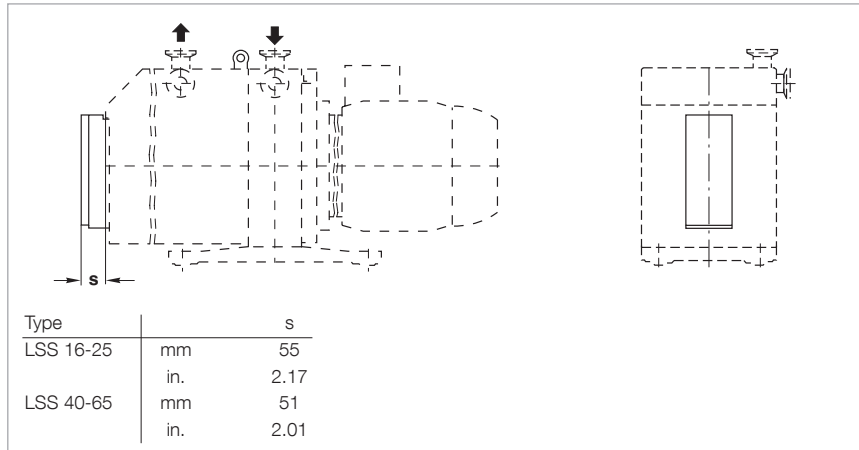
The LSS is part of the TRIVAC SYSTEM.

The package of limit switches includes:

- Differential pressure switch to monitor the CFS
- Oil pressure switch to monitor the operating pressure
- Flow switch to monitor the inert gas flow
- Pressure switch to monitor the pressure in the oil box of the pump
- Connection cable and plug for the temperature switch used for temperature monitoring
- Float switch with housing to monitor the oil level

Advantages to the User

- Errors are indicated well in advance so that it will in most cases be possible to complete the process for the running batch
- The switching action is independent of the optical displays (for optimum reliability)
- The temperature switch is already present in the TRIVAC BCS



Dimensional drawing for the LSS (mounted on a TRIVAC BCS)

Typical Application

- Changing the status in case operating conditions arise which are not permissible

Supplied Equipment

Fully wired-up switches with plugs as well as all required gaskets and mounting parts.

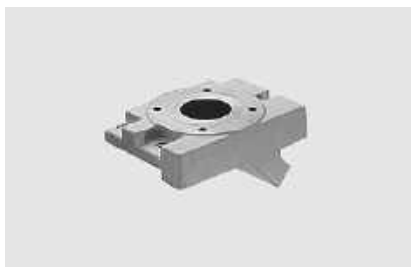
Technical Data

		LSS 16-25	LSS 40-65
Connection to pump	TRIVAC	D 16/25 BCS (-PFPE)	D 40/65 BCS (-PFPE)
Operating voltage	V DC	24	
Switching capacity	W / A	10.0 / 0.4	
Type of protection	IP	54	
Weight, approx.	kg (lbs)	2.5 (5.5)	

Ordering Information

	LSS 16-25	LSS 40-65
	Part No.	Part No.
Limit switch system	161 06	161 07

Roots Pump Adaptor



Roots pump adaptor

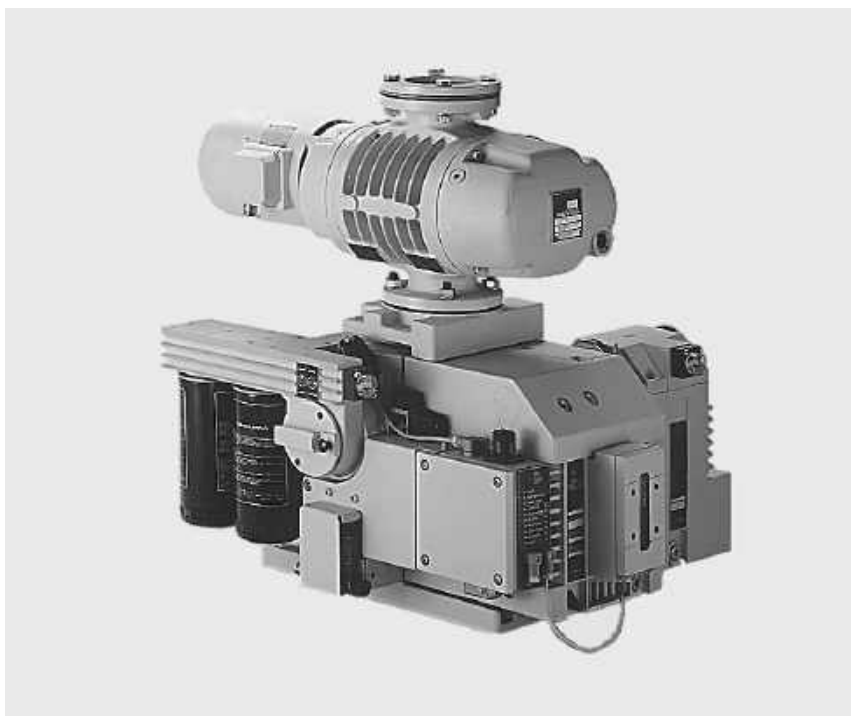
The Roots pump adaptor allows the direct installation of a Roots pump on a TRIVAC D 40/65 B/BCS.

Advantages to the User

- Compact and space-saving
- Short and direct connection between the pumps
- Minimal conductance loss
- Easy installation

Typical Application

- Simple assembly of a small pump system



Pump system consisting of a TRIVAC D 65 BCS and a RUVAC WS 251

Technical Data

Connection to pump	TRIVAC	D 40/65 B/BCS (-PFPE) and RUVAC WA/WAU/WS/WSU 251
Weight, approx.	kg (lbs)	11.5 (25.4)

Roots Pump Adaptor

Ordering Information

	Part No.
Roots pump adaptor	168 30

Roots Pump Adaptor

Only available for purchase in North and South America

SE Smoke Eliminator



SE smoke eliminator

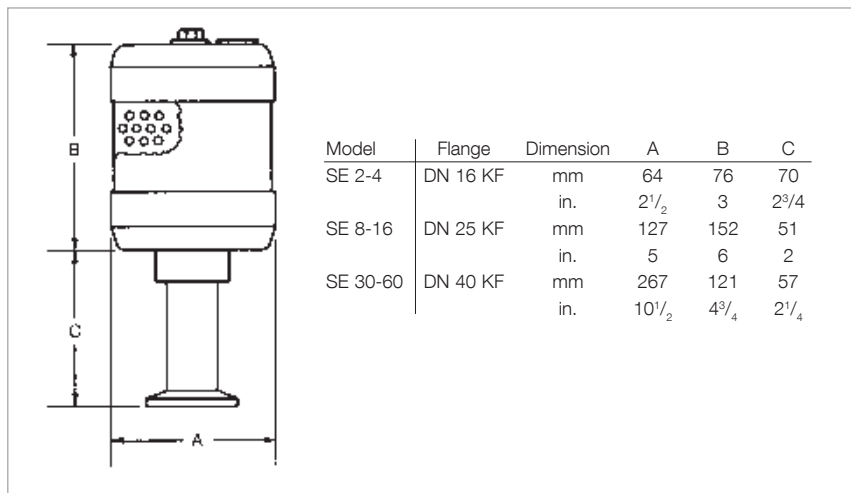
The Leybold SE smoke eliminator can be utilized on all TRIVAC B rotary vane vacuum pumps where pump fluid loss at the exhaust port must be eliminated. These filters consist of a replaceable two-stage coalescing element mounted in a steel housing. For maintenance purposes, the top of the housing can be removed by loosening a single bolt. The filter assembly attaches to the exhaust port of the TRIVAC pump by means of a KF flange. Since three models are available, an SE smoke eliminator is available for each TRIVAC pump model.

Advantages to the User

- Two stage design
- Three sizes for all TRIVAC models
- KF flanges

Applications

When any oil sealed mechanical vacuum pump is used to pump a fixed volume from atmospheric pressure to some lower pressure or when a dynamic gas flow from a process stream is pumped, some mechanical pump fluid loss will occur at the exhaust of the pump. The more often a fixed volume is cycled from atmospheric pressure to a lower pressure or the longer a pump operates at a relatively high inlet pressure in a dynamic flow condition, the greater will be the fluid loss at the exhaust port of the pump.



Dimensional drawing for the SE

Technical Data

SE 2-4

SE 8-16

SE 30-60

Connection to pump	TRIVAC	SE 2-4	SE 8-16	SE 30-60
		D 4/8 B	D 16/25 B	D 40/65 B

Ordering Information

SE 2-4

SE 8-16

SE 30-60

	Part No.	Part No.	Part No.
Smoke eliminator	99 171 125	99 171 126	99 171 127
Replacement element			
RE 2-4	99 171 128	-	-
RE 8-16	-	99 171 129	-
RE 30-60	-	-	99 171 130

By utilizing a coalescing exhaust filter for these applications, the fluid and exhaust gases are separated, and in the case of the SE smoke eliminator, the coalesced fluid is allowed to drain back into the pump fluid reservoir. Annoying oil fog to the atmosphere is thus eliminated.

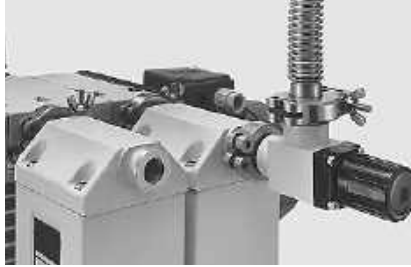
Eventually, after about a year's normal operation, the coalescing element will become totally saturated and oil fog will be apparent when high inlet pressures

are prevailing. The low cost coalescing element can be easily replaced.

Note: For applications where toxic, corrosive, radioactive or precious gases are pumped, we highly recommend the use of our AF coalescing exhaust filters in-stead of the SE smoke eliminator. The AF is an in-line type coalescing filter and much more suitable for these applications.

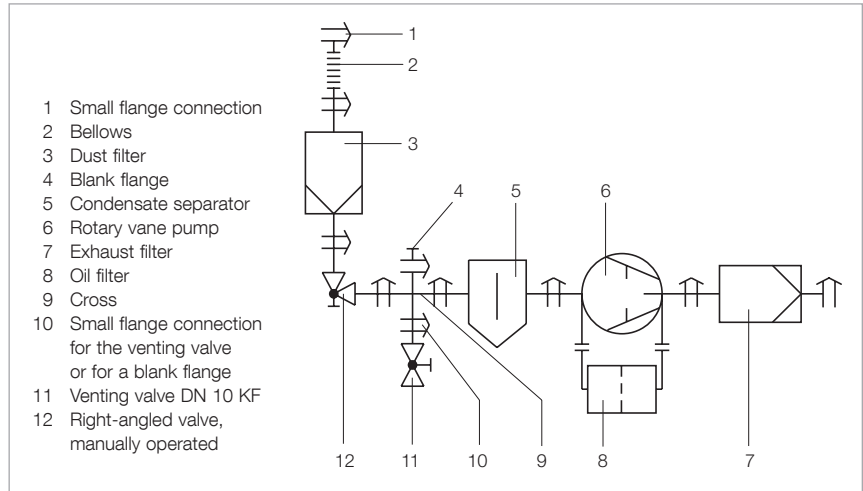
General Accessories

Flange Components, Valves



Our range of flange components and valves is described in detail in the Catalog Parts “Flanges and Fittings” and “Valves”.

Given in the following are only some components which you might find particularly useful when planning your system.



Example of connecting a pump with accessories

Isolation Valve

- The pump is allowed to warm up with the intake line isolated
- The pump may continue to operate in the energy-saving and environmentally compatible ultimate pressure mode when the vacuum chamber is vented briefly
- The pump may be left on after completion of the process so as to regenerate the oil

Branch (Cross)

- Installing a cross in the intake line permits the connection of a vacuum gauge and a venting valve

Flange Connections

Each flange connection requires one each centering and clamping ring.

Ordering Information

DN 16 KF DN 25 KF DN 40 KF

	Part No.	Part No.	Part No.
Small flange connection			
Clamping ring	183 41	183 42	183 43
Centering ring, aluminium/CR	183 26	183 27	183 28
Centering ring, stainless steel/FPM (FKM)	883 46	883 47	883 48
Bellows	872 41	872 43	872 45
Right-angled valve, manually operated			
Aluminium casing	215 375	215 376	215 377
Stainless steel casing	215 383	215 385	215 386
Blank flange for (reducing) cross			
Aluminium	184 46	184 41	184 41
Stainless steel	884 36	884 41	884 41
Reducing cross (to DN 10 KF)			
Aluminium	-	184 17	184 19
Stainless steel	-	884 92	884 94
Cross DN 16 KF			
Aluminium	184 71	-	-
Stainless steel	884 85	-	-
Small flange connection for venting valve or blank flange			
Clamping ring	183 41	183 41	183 41
(Adaptor) centering ring, aluminium/NBR	183 56	183 21	183 21
(Adaptor) centering ring, stainless steel/FPM (FKM)	883 56	183 21	183 21
Venting valve DN 10 KF			
Aluminium	173 24	173 24	173 24
Stainless steel	173 37	173 37	173 37

Services

On-site Replacement of the Dynamic Seals (with LEYBONOL LVO 100)

The on-site replacement of the dynamic seals includes the following:

Partial disassembly of the pump, replacement of the complete shaft seal, mounting of the pump including new gaskets and standard oil LEYBONOL LVO 100, electrical safety test, test run including check of the attained ultimate pressure levels.

Ordering Information

On-site Replacement of the Dynamic Seals (with LEYBONOL LVO 100)

	Part No.
For Pumpo	
TRIVAC D 4 B	AS 1130 F
TRIVAC D 8 B	AS 1130 F
TRIVAC D 16/25 B	AS 1129 F
TRIVAC D 40/65 B	AS 1128 F
TRIVAC D 40/65 BCS	AS 1137 F

Small On-site Maintenance (with LEYBONOL LVO 100)

The small on-site maintenance includes the following:

Oil change (standard LEYBONOL LVO 100), filter replacement, visual inspection of the subassemblies, cleaning of the pump module and the oil box, electrical safety test, test run including check of the attained ultimate pressure levels.

Ordering Information

On-site Maintenance (with LEYBONOL LVO 100)

	Part No.
For pump	
TRIVAC D 4 B	AS 1160 F
TRIVAC D 8 B	AS 1159 F
TRIVAC D 16 B + BCS with standard gaskets	AS 1158 F
TRIVAC D 25 B + BCS with standard gaskets	AS 1157 F
TRIVAC D 40/65 B + BCS with standard gaskets	AS 1156 F

Comprehensive On-site Maintenance (with LEYBONOL LVO 100) ¹⁾

Comprehensive on-site maintenance includes the following:

Disassembly of the pump, cleaning of all individual components, replacement of all wearing parts, mounting of the pump including new gaskets and standard oil LEYBONOL LVO 100, electrical safety test, test run including check of the attained ultimate pressure levels.

Ordering Information

Comprehensive On-site Maintenance (with LEYBONOL LVO 100) ¹⁾

	Part No.
For pump	
TRIVAC D 4 B	AS 1125 F
TRIVAC D 8 B	AS 1124 F
TRIVAC D 16 B	AS 1121 F
TRIVAC D 25 B	AS 1120 F
TRIVAC D 40 B	AS 1117 F
TRIVAC D 65 B	AS 1116 F
TRIVAC D 40 BCS with Viton gaskets	AS 1136 F
TRIVAC D 65 BCS with Viton gaskets	AS 1135 F
TRIVAC D 40 BCS with standard gaskets	AS 1132 F
TRIVAC D 65 BCS with standard gaskets	AS 1131 F

¹⁾ Notes on our on-site after sales service

The listed services include the costs for material and working hours on-site for standard TRIVAC pumps. Services for pump variants upon request.

Transportation and travelling expenses are invoiced at cost. All services refer to the repair of freely accessible and not contaminated vacuum components.

As to services for TRIVAC B-DOT, TRIVAC B-Ex and TRIVAC B ³He please ask us for a quotation.

Complete Refurbishing at the Service Center (with LEYBONOL LVO 100)

Complete refurbishing at the service center includes the following:

Disassembly of the pump, visual inspection of the subassemblies, replacement of all wearing parts, machined reworking of the pump module, mounting of the pump including new gaskets and standard oil LEYBONOL LVO 100, electrical safety test, test run including check of the attained ultimate pressure levels.

Ordering Information

Complete Refurbishing at the Service Center (with LEYBONOL LVO 100)

	Part No.
For pump	
TRIVAC D 4 B	AS 1125
TRIVAC D 8 B	AS 1124
TRIVAC D 16 B	AS 1121
TRIVAC D 25 B	AS 1120
TRIVAC D 40 B	AS 1117
TRIVAC D 65 B	AS 1116
TRIVAC D 40 BCS with Viton gaskets	AS 1136
TRIVAC D 65 BCS with Viton gaskets	AS 1135
TRIVAC D 40 BCS with standard gaskets	AS 1132
TRIVAC D 65 BCS with standard gaskets	AS 1131

Complete Refurbishing with Decontamination at the Service Center (with LEYBONOL LVO 100)

Complete refurbishing with decontamination at the service center includes the following:

Disassembly of the pump, decontamination of the individual components, visual inspection of the individual subassemblies, replacement of all wearing parts, machined reworking of the pump module, mounting of the pump including new gaskets and standard oil LEYBONOL LVO 100, electrical safety test, test run including check of the attained ultimate pressure levels.

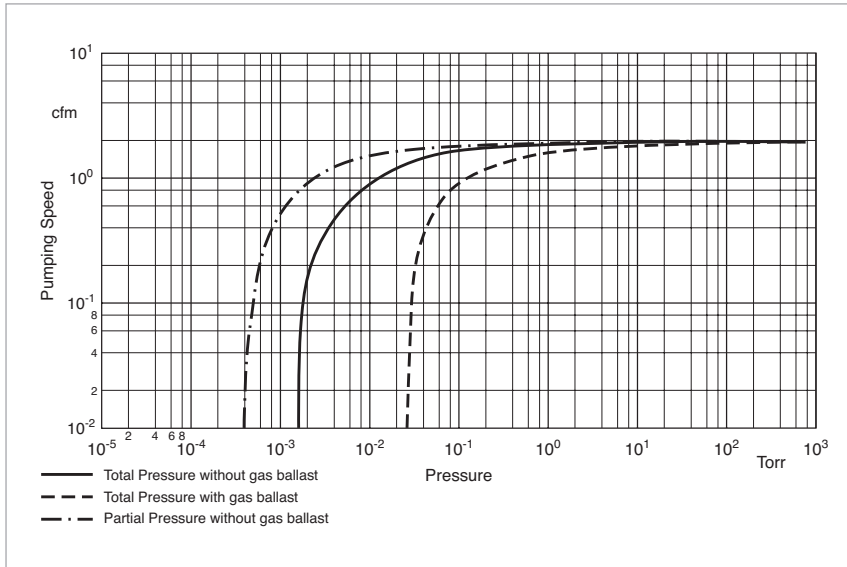
Ordering Information

Complete Refurbishing with Decontamination at the Service Center (with LEYBONOL LVO 100)

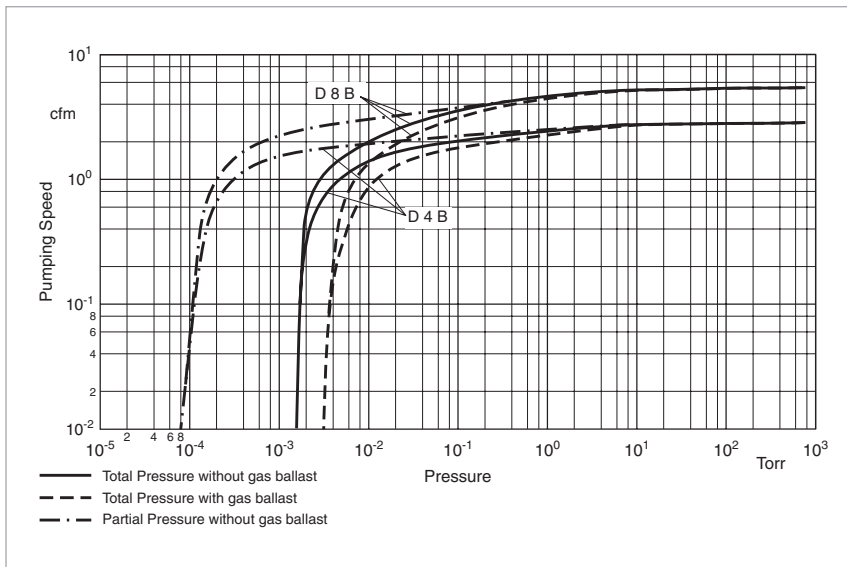
	Part No.
For pump	
TRIVAC D 4 B	AS 1125 D
TRIVAC D 8 B	AS 1124 D
TRIVAC D 16 B	AS 1121 D
TRIVAC D 25 B	AS 1120 D
TRIVAC D 40 B	AS 1117 D
TRIVAC D 65 B	AS 1116 D
TRIVAC D 40 BCS with Viton gaskets	AS 1155 D
TRIVAC D 65 BCS with Viton gaskets	AS 1154 D
TRIVAC D 40 BCS with standard gaskets	AS 1132 D
TRIVAC D 65 BCS with standard gaskets	AS 1131 D

Only available for purchase in North and South America

60 Hz Curves

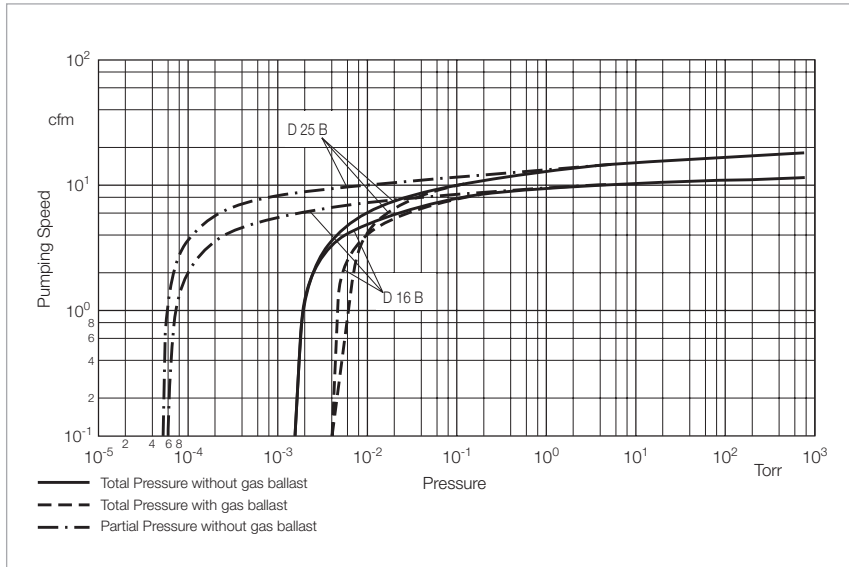


Pumping speed characteristics for the TRIVAC D 2,5 E at 60 Hz

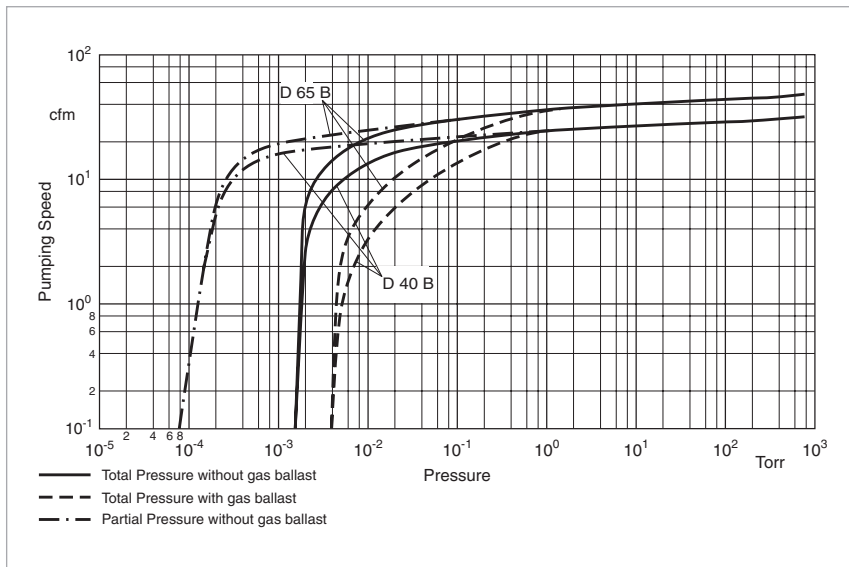


Pumping speed characteristics for the TRIVAC D 4 B and D 8 B at 60 Hz

Only available for purchase in North and South America



Pumping speed characteristics for the TRIVAC D 16 B/BCS and D 25 B/BCS at 60 Hz



Pumping speed characteristics for the TRIVAC D 40 B/BCS and D 65 B/BCS at 60 Hz

Applications for SOGEVAC NEO D pumps

Pumps				
Applications	SOGEVAC NEO D 16	SOGEVAC NEO D 25	SOGEVAC NEO D 40	SOGEVAC NEO D 65
Vacuum coating	■	■	■	■
Research and development	■	■	■	■
Chemistry / Pharmaceuticals	■	■	■	■
Metallurgy / Furnaces	■	■	■	■
Automotive industry	■	■	■	■
Analytical engineering	■	■	■	■
Cooling and air-conditioning	■	■	■	■
Electrical engineering	■	■	■	■
Medicine technology	■	■	■	■
Glove Boxes	■	■	■	■
Sterilisation	■	■	■	■
Freeze drying systems	■	■	■	■
Backing pump for high vacuum pump systems	■	■	■	■
Leak testing	■	■	■	■
Resin degassing / Composites	■	■	■	■

The table only lists general applications. Your specific requirements might be subject to deeper analysis. For further questions, please contact our technical Sales support.

Oil for SOGEVAC NEO D pumps for different fields of application

Applications	Vacuum coating	Research and development	Chemistry / Pharmaceutical	Metallurgy / Furnaces	Automotive industry	Analytical engineering	Cooling and air-conditioning	Electrical engineering	Medicine technology	Glove boxes	Sterilisation	Freeze drying systems	Backing pump for HV pump systems	Leak testing	Resin degassing / Composites
LEYBONOL Oils															
LVO 120 Mineral		■		■	■		■		■			■	■		
LVO 140 Food grade											■				
LVO 200 Synthetic	■	■	■			■		■	■	■					■
LVO 420 PFPE	■	■	■			■						■			
LVO 700 Long life	■	■	■			■	■		■	■	■	■			■

These oils can be used in all SOGEVAC NEO D sizes.

Other oils from the LEYBONOL Catalogue can be used as well, please contact our technical Sales support.

Depending of the chosen oil type different technical data may be applicable.

Technical information is valid for LVO 120, LVO 140, LVO 700 when the pump is in warm condition.

Pumps in LVO 200 or 420 may have different ultimate pressures. Precisions are given in the Sales text.

The table only lists general applications. Your specific requirements might be subject to deeper analysis.

For further questions, please contact our technical Sales support.

**For information on oil specifications please refer to Catalog Part
"Oils / Greases / Lubricants LEYBONOL®".**

Product Range, Features and Design

Oil sealed rotary vane vacuum pumps are being used in all areas of vacuum engineering. They are equally suited for both industrial production and research applications. They are best used to generate medium vacuum or as backing pumps in pump combinations with Roots vacuum pumps or high vacuum pumps.

The double stage SOGEVAC NEO D rotary vane pumps excel also to their low noise levels and smooth operation. Many years of experience in vacuum engineering and the latest developments in pump technology combine in the SOGEVAC NEO D range the capability to adapt to the requirements of both the industry and the environment.

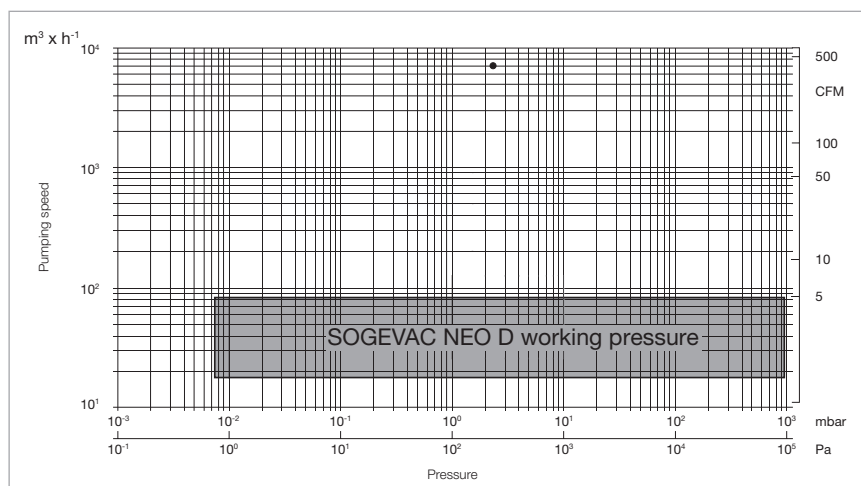
Main Application Examples

- Research and development
- Chemistry / Pharmaceuticals
- Metallurgy / Furnaces
- Analytical engineering
- Cooling and air-conditioning
- Medicine technology
- Glove Boxes

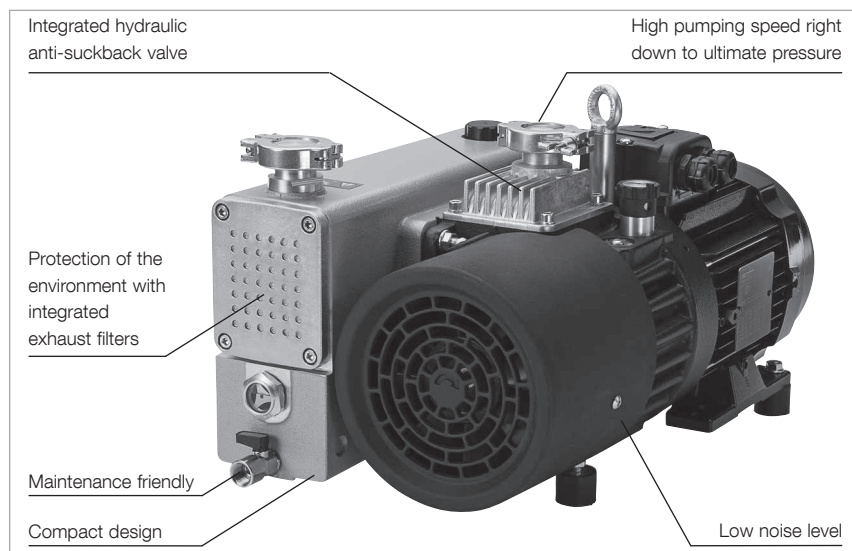
- Sterilisation
- Freeze drying systems
- Backing pump for high vacuum pump systems
- Leak testing
- Resin degassing / Composites

Advantages to the User

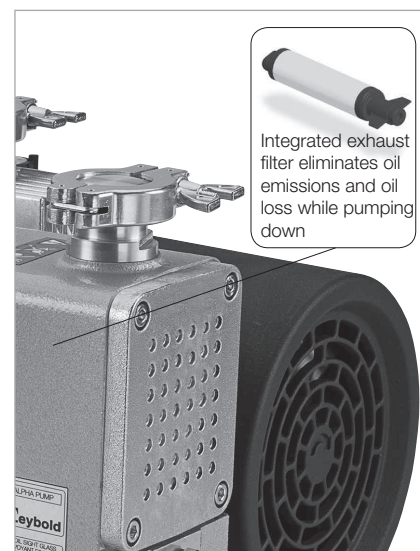
- Integrated exhaust filter ! No external accessory required ! Exhaust gas free of oil mists. Oil loss < 1 ppm!
- Continuous operation from atmospheric pressure to ultimate pressure
- Lowest noise and vibration levels on the market!
- Efficient air cooling (standard)
- Low space requirement, easy to install thanks to integrated exhaust filter
- Very Maintenance-friendly due to oil drain valve and easy to change exhaust filter
- Wide range of accessories available
- Wide pump variant range on every size to cover ATEX or oxygen pumping needs!



Working pressure of SOGEVAC NEO D pumps



Outstanding features of the SOGEVAC NEO pumps



Design Principle

SOGEVAC NEO D pumps are double stage oil sealed rotary vane pumps. Oil injected into the pump chamber for sealing, lubrication and cooling of the pump is recycled from the pump's oil reservoir and filtered. The lubrication system is rated for continuous operation at high intake pressures (max. 1000 mbar abs.) so that the pumps may be used in a versatile manner from atmospheric down to ultimate pressure.

The oil carried with the process gas is roughly separated in the oil box before the discharged gas enters the integrated exhaust filters where the fine oil mist is trapped. The thus filtered oil is collected in the oil box and then supplied back to the pump.

The separating system optimized in consideration of all operating conditions for the vacuum pump guarantees – also at high intake pressures and when pumping out of vapors – an exhaust gas which is free of oil mist (separation efficiency over 99.9%).

Materials used in the pump:

Steel, Cast iron, Aluminium, FPM (FKM), Glass, Polyamid 6 6, Filter material (Polymers, Paper), Epoxy resin & Glass fibre.

Pumps are yellow metal free.

Compact Design

The pumps have been so designed that efficiency of the pumps will be highest. The motor and vacuum generator section use the same shaft. All vacuum components like anti-suck back, exhaust filter with oil return line needed for a complete vacuum unit as well as the optimized placement of all controls and monitoring components allow for an extremely compact unit.

Quiet Operation

SOGEVAC NEO D pumps are designed throughout to keep the noise level as low as possible. This is ensured by optimized running and sliding speeds and the selection of low-noise drive motors and fans, as well as perfected manufacturing techniques using CNC automatic machines for optimized tolerances and reproducibility of the individual components.

Anti-Suckback Valve

A valve is built into the intake of the SOGEVAC NEO D pumps. This "anti-suck back valve" (called ASBV) is protected by a metal wiremesh filter. During standstill of the pump (for example due to shutting down or a power failure) the ASBV closes the intake hydraulically & very fast. This prevents the pressure from rising in the connected chamber while the pump is vented at the same time. Any suck-back of pump oil into the vacuum system is thus also effectively prevented. This closing process operates under all operating conditions and even when the gas ballast valve is open.

Protection of the Environment

The built-in exhaust filter ensures an oil-mist free exhaust gases over the entire range of operating pressures – from atmospheric pressure to ultimate pressure.

Supplied Equipment

All pumps are delivered with the required quantity of oil, already filled in and are thus ready for operation.

PFPE variants are typically delivered without fluid LVO 420.

Frequency converter drive (optional)

- FC drive enables:
Speed control
- Monitoring (RS485 interface)
- Constant pumping speed independent of mains frequency
- Soft start w/o inrush current
- Even lower noise and vibration levels than a 1-phase motor
- 1-phase power supply 180 ... 264 V at 50 & 60 Hz, for all pump sizes!

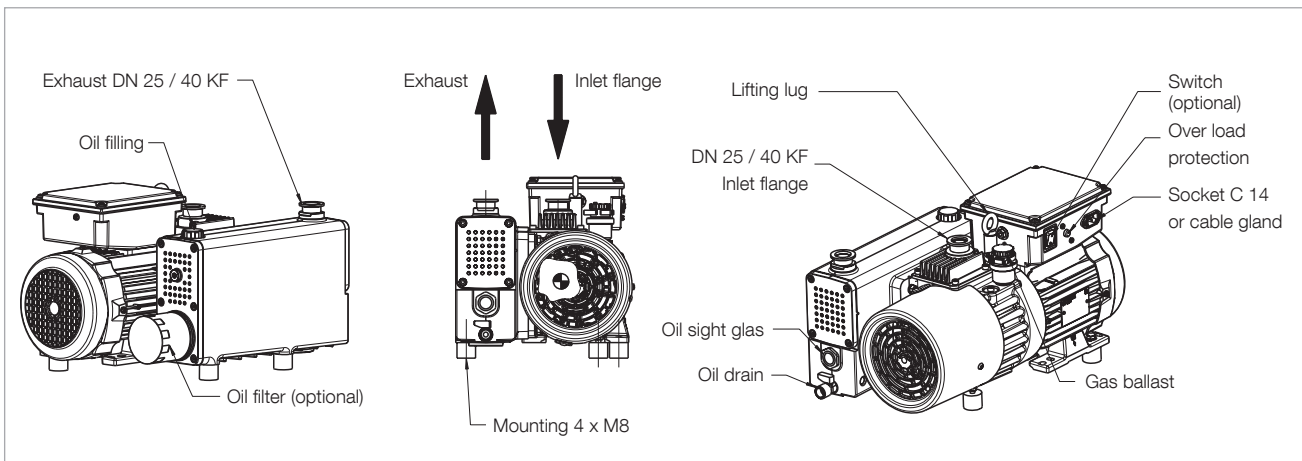
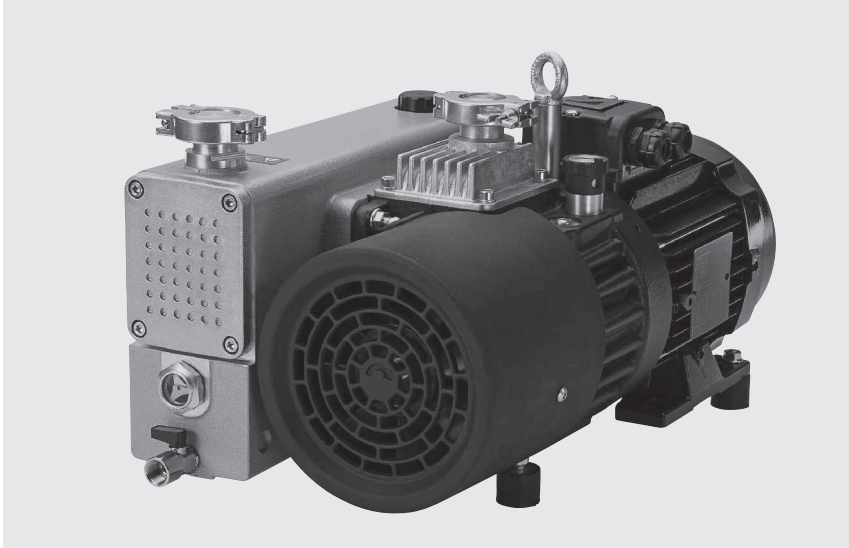
Pump failure indicator (optional)

Do you need to keep an eye on the status of your pump, even when you are not on site? Our pump failure indicator enables remote monitoring:

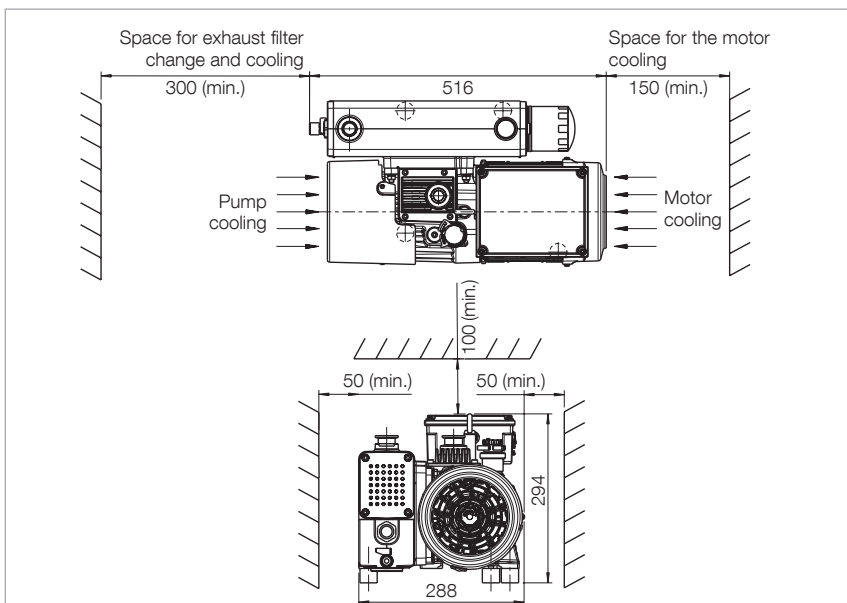
1. **Oil level**
Indicates a too low oil level
2. **Oil temp**
Indicates overheating
3. **Exhaust filter condition (back-pressure)**
Indicates that the exhaust filter needs to be changed

Products

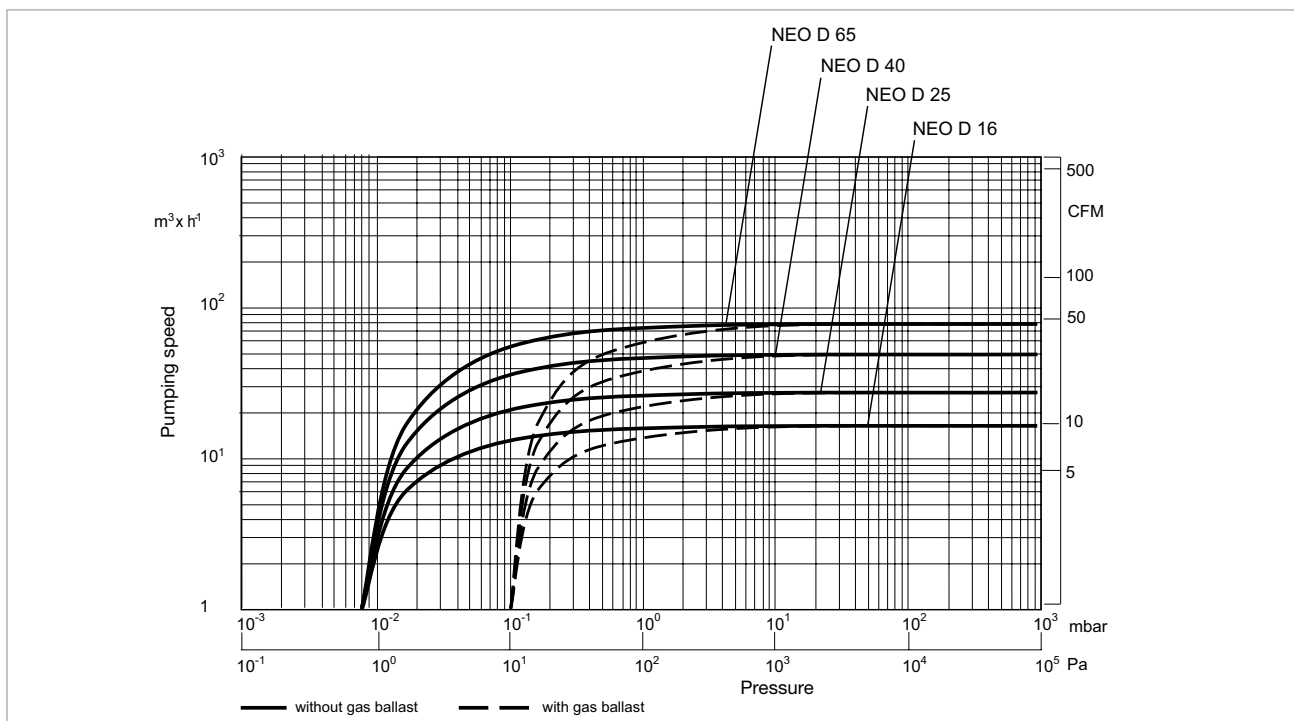
SOGEVAC NEO D 16 / D 25 / D 40 / D 65



Typical location of main pump components



Main installation clearance (in mm)



Pumping speed characteristics of the SOGEVAC NEO D 16, D 25, D 40 and D 65 at 50 Hz

Technical Data

SOGEVAC NEO

		D 16		D 25		D 40		D 65	
		50 Hz	60 Hz	50 Hz	60 Hz	50 Hz	60 Hz	50 Hz	60 Hz
Nominal speed ¹⁾	m³/h (cfm)	19 (11.18)	23 (13.54)	24 (14.13)	29 (17.07)	40 (23.54)	48 (28.25)	63 (37.08)	76 (44.73)
Pumping speed ¹⁾	m³/h (cfm)	16 (9.42)	19 (11.18)	28 (16.48)	34 (20.01)	47 (27.66)	56 (32.96)	74 (43.55)	89 (52.38)
Ultimate total pressure without gas ballast ¹⁾	mbar (Torr)	< 8 x 10 ⁻³ (< 6 x 10 ⁻³)							
Ultimate total pressure with gas ballast ¹⁾	mbar (Torr)	< 1 x 10 ⁻¹ (< 0.75 x 10 ⁻¹)							
Water vapor tolerance ¹⁾	mbar (Torr)	10 (7.5)							
Oil capacity	l (qt)	1.5 (1.59)				3 (3.17)			
Noise level ²⁾	dB(A)	54	55	54	55	57	58	57	58
Motor power									
three-phase motor	kW (hp)	0.55 (0.75)	0.70 (0.95)	0.9 (1.22)	1.1 (1.5)	1.15 (1.54)	1.5 (2.04)	2.0 (2.72)	2.6 (3.54)
single-phase motor	kW (hp)	0.75 (1.02)	0.9 (1.22)	0.9 (1.22)	1.1 (1.5)	1.3 (1.77)	1.6 (2.18)	–	–
Frequency converter	kW (hp)	0.75 (1.02)	0.9 (1.22)	0.9 (1.22)	1.1 (1.5)	1.5 (2.04)	1.5 (2.04)	2.0 (2.72)	2.2 (2.99)
Weight	kg (lbs)	49 (108)		50 (110)		80 (176)		96 (212)	
Flanges	DN	25 ISO-KF				40 ISO-KF			
Dimensions (L x W x H) ³⁾									
three-phase motor	mm	516 x 288 x 294		518 x 288 x 294		632 x 356 x 320		669 x 359 x 320	
	(in.)	(20.32 x 11.34 x 11.57)		(20.39 x 11.34 x 11.57)		(24.88 x 14.02 x 12.60)		(26.34 x 14.13 x 12.60)	
single-phase motor	mm	516 x 288 x 294		518 x 288 x 294		632 x 356 x 320		–	
	(in.)	(20.32 x 11.34 x 11.57)		(20.39 x 11.34 x 11.57)		(24.88 x 14.02 x 12.60)		–	
Frequency converter	mm	557 x 297 x 390		557 x 297 x 390		632 x 366 x 420		669 x 369 x 420	
	(in.)	(21.93 x 11.69 x 15.35)		(21.93 x 11.69 x 15.35)		(24.88 x 14.41 x 16.54)		(26.34 x 14.53 x 16.54)	

¹⁾ To DIN 28 400 and following numbers²⁾ Operated at the ultimate pressure without gas ballast, free-field measurement at a distance of 1 m (3.5 ft), with LVO 120, LVO 140 or LVO 700 oil³⁾ Dimensions may vary in function of mounted accessories or specific motors (e.g. ATEX).

Ordering Information

SOGEVAC NEO

	D 16	D 25	D 40	D 65
	Part No.	Part No.	Part No.	Part No.
3-phase world motor ¹⁾ 180...264 / 342...457 V, 50 Hz & 180...264 / 342...506 V, 60 Hz	970102V	970202V	970302V	970402V
3-phase ATEX Cat 2 ¹⁾ 230/400 V, 50 Hz, 460 V, 60 Hz Ex II 2G h IIB 180°C Gb 50Hz / T3 Gb 60Hz (10°C<Ta<40°C) x	970102A22	970202A22	970302A22	970402A22
3-phase ATEX Cat 3 ¹⁾ 230/400 V, 50 Hz, 460 V, 60 Hz Ex II (i) 3G h IIC 160°C Gb / (o) 3 GD h IIC T4 (10°C<Ta<40°C) x	970102A33	970202A33	970302A33	970402A33
1-phase ¹⁾ 180 - 264V, 50 & 60 Hz with overload protection	970100V	970200V	970300V	-
1-phase ¹⁾ 115 V ± 10%, 60 Hz with overload protection	970103V	-	-	-
1-phase driven F/C ¹⁾ 180 - 264V, 50 & 60 Hz with overload protection	970101V	970201V	970301V	970401V
Accessories ²⁾				
Oil level switch	9700LS			
Exhaust filter pressure switch	971471210			
Exhaust filter pressure manometer	95193			
Temperature switch	9700TS			
PT100 sensor	-	971444320		
EM 24 V DC gas ballast	9700GBDC			
Spare Parts				
Exhaust filter	EK6702228	EK6702158	EK6702490	EK6702425
I filter	EK96004			
aintenance kit ³⁾	EK9701M	EK9702M	EK9703M	EK9704M
epair kit ³⁾	EK9701RES	EK9702RES	EK9703RES	EK9704RES
Seal kit ³⁾	EK9701SK	EK9702SK	EK9703SK	EK9704SK
Consumables				
Oil				
Long life LVO 700	2 x L70001		3 x L70001	
Mineral LVO 120	1 x L12002		2 x L12002	
PFPE LVO 420	2 x L42001		3 x L42001	
Synthetic LVO 200	1 x L20002		2 x L20002	

¹⁾ Pumps delivered filled in with LVO700 oil

²⁾ All accessories can be retrofitted.

For the pump inlet accessories (e.g. inlet filters, inlet absorption traps etc.) kindly consult Trivac B Catalogue Section

For the connection fittings, kindly consult the Flanges & Fittings Catalogue Section

³⁾ Except PFPE

Applications for SOGEVAC pumps

Pumps																			
	SOGEVAC SV 10 B	SOGEVAC SV 16 B	SOGEVAC SV 25 B	SOGEVAC SV 16 D(I)	SOGEVAC SV 25 D	SOGEVAC SV 40 B	SOGEVAC SV 65 B	SOGEVAC SV 100 B	SOGEVAC SV 120 B	SOGEVAC SV 200	SOGEVAC SV 300 B / 320 B	SOGEVAC SV 470/570 B	SOGEVAC SV 470/570 BF	SOGEVAC SV 630 B	SOGEVAC SV 630 BF	SOGEVAC SV 750 B/BF	SOGEVAC SV 1200	SOGEVAC SV 28 - 120 BI	SOGEVAC SV 40 ATEX
Applications																			
Vacuum coating																			
Research and development																			
Chemistry / Pharmaceuticals																			
Metallurgy / Furnaces																			
Lamps and tubes manufacture																			
Automotive industry																			
Laser engineering																			
Space simulation																			
Analytical engineering																			
Environment engineering																			
Cooling and air-conditioning																			
Electrical engineering																			
Mechanical engineering																			
Medicine technology																			
Freeze drying systems																			
Backing pump for high vacuum pump systems																			
Food industry																			
Plant engineering																			
Power engineering / District heating																			
Cleaning																			
Packaging																			

Oil for SOGEVAC pumps for different fields of application

Applications																				
	Vacuum coating	Research and development	Chemistry / Pharmaceutical	Metallurgy / Furnaces	Lamps and tubes manufactures	Automotive industry	Laser technology	Space simulation	Analytical engineering	Environmental technologies	Electrical engineering	Mechanical engineering	Medicine technology	Vacuum drying cabinets	Food industry	Plant engineering	Power engineering	Packaging	Cleaning	
LEYBONOL Oils																				
LVO 120	■	■	■	■	■		■	■	■	■	■	■	■	■	■	■	■	■	■	
LVO 130	■	■	■	■	■		■	■		■	■	■	■	■	■	■	■	■	■	
LVO 140											■	■			■				■	
LVO 150											■	■			■				■	
LVO 200	■	■	■	■	■		■		■	■		■					■	■		
LVO 210	■	■	■	■	■		■					■					■	■		
LVO 300				■					■	■	■	■	■	■	■	■		■	■	
LVO 400	■	■	■								■			●	■				■	
LVO 420								■												
LVO 700/710	■	■	■	■	■		■	■	■	■	■	■	■	■	■	■	■	■	■	
DOT 4						■														

■

 = Standard

●

 = Possible

■ = Standard
● = Possible

The table only lists general applications. Your specific requirements might be subject to deeper analysis.
For further questions, please contact our technical Sales support.

**For information on oil specifications please refer to Catalog Part
"Oils / Greases / Lubricants LEYBONOL®".**

Oil for SOGEVAC pumps for different pump types

Pumps	Pump line			D			A			B / BF			BI			ATEX		
	SV 16 D, SV 25 D	SV 40, SV 65	SV 100	SV 200, SV 200 FP	SV 500, SV 630, SV 750	SV 1200	SV 10 B, SV 16 B/FP	SV 25 B/FP	SV 40 B, SV 45 FP	SV 65 B, SV 100 B, SV 120 B/FP	SV 16 DI to SV 750 B (F)	SV 40 B category 1(I)/2(I) IIA	SV 40 B category 1(I)/2(I) IIB + H2	SV 40 B to 630 B category 3(I)/3(I)				
LEYBONOL Oils																		
LVO 120	■	■					■	■	▲ ¹⁾		■							
LVO 130	▲	▲	■	■	■	■			▲ ²⁾	■	■							
LVO 140	●	●	●				●	●	▲	▲								
LVO 150			●	●	●	●		▲	●	●	●							
LVO 200	●	●	●				●	●	▲	▲		●	■				▲	
LVO 210	▲ ²⁾	▲ ²⁾	●	●	●	●	▲	▲	●	●	●			■		■		
LVO 300	●	●	●	●	▲	▲			●	●	▲						▲	
LVO 400	●	●	●	●	●	●				●	●					● ³⁾		
LVO 420												■						
LVO 700	●						●	●				●						
LVO 710		●	●	●	●	●			●	●	●		●	●	●			
DOT 4		●							●									

■ = Standard

● = Possible

▲ = Please contact Leybold Valence

¹⁾ = with single-phase motor

²⁾ = with three-phase motor

³⁾ = ATEX outside only

The table only lists general applications. Your specific requirements might be subject to deeper analysis.
For further questions, please contact our technical Sales support.

**For information on oil specifications please refer to Catalog Part
“Oils / Greases / Lubricants LEYBONOL®”.**

Product Range, Features and Design

Oil sealed rotary vane vacuum pumps are being used in all areas of vacuum engineering. They are equally suited for both industrial production and research applications. They may be used to generate a rough and medium vacuum or as backing pumps in pump combinations with Roots vacuum pumps or high vacuum pumps. The SOGEVAC pumps excel also to their low noise levels and smooth operation.

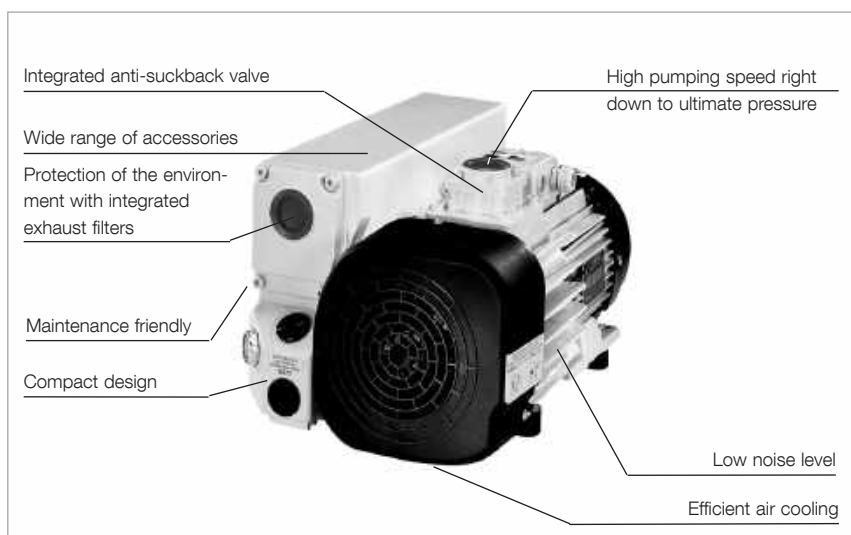
Many years of experience in vacuum engineering and the latest developments in pump technology combine in the SOGEVAC range the capability to adapt to the requirements of both the industry and the environment. The comprehensive range (pumping speeds ranging from 10 to 1200 m³ x h⁻¹ (5.9 to 707 cfm)) allows every customer to select the right pump for his particular needs.

Application Examples

- Automotive industry
- Food industry
- Furnaces and plants
- Vacuum coating
- Metallurgy
- Power engineering, long-distance energy
- Space simulation
- Laser technology
- Medicinal technology

Advantages to the User

- Continuous operation from atmospheric pressure to ultimate pressure
- High pumping speed also at low pressures
- Low noise level
- Low vibrations
- Integrated exhaust filter, better than 99.9% efficient
- No oil loss owing to the integrated oil return line
- Exhaust gas free of oil mists
- Efficient air cooling (standard)
- Water cooling (optional)
- Low space requirement, easy to install
- Rugged
- Maintenance-friendly
- Compact design
- For direct fitting to Roots pumps from SV 100 B up
- Optimum size-to-performance ratio
- High water vapor tolerance
- For use in various applications
- Wide range of accessories available for adaptation to differing problems



Outstanding features of the SOGEVAC pumps

Design Principle

SOGEVAC pumps are oil sealed rotary vane pumps. Oil injected into the pump chamber for sealing, lubrication and cooling of the pump is recycled from the pump's oil reservoir and filtered, if required, before it is injected. The lubricant system is rated for continuous operation at high intake pressures (max. 1000 mbar abs.) so that the pumps may be used in a versatile manner in most rough vacuum applications (accessories are required for some pumps).

The oil carried with the process gas is roughly separated in the oil box before the discharged gas enters the integrated exhaust filters where the fine oil mist is trapped. The thus filtered oil is collected in the oil box and then supplied back to the pump.

The separating system optimized in consideration of all operating conditions for the vacuum pump guarantees – also at high intake pressures and when pumping out of vapors – an exhaust gas which is free of oil mist (separation efficiency over 99.9%).

Materials used:

Steel, Cast iron, Aluminium, Bronze, FPM (FKM), Glass, Polyamid 6.6, Filter material (Polymers, Paper), Epoxy resin & Glass fibre.

Leybold rotary vane vacuum pumps from the SOGEVAC series excel through numerous special features:

Compact Design

The pumps have been so designed that efficiency of the pumps will be high.

For the SV 10 B through SV 65 B, the motor and pumping section use the same shaft. For the SV 100 B to SV 1200 the motor is linked depending on requirements to the pumping section directly via a coupling or via V-belts as a pedestal motor. All vacuum components like anti-suckback, exhaust filter with oil return line needed for a complete vacuum unit as well as the optimized placement of all controls and monitoring components allow for an extremely compact unit.

Quiet Operation

SOGEVAC pumps are designed throughout to keep the noise level as low as possible. This is ensured by optimized running and sliding speeds and the selection of low-noise drive motors, as well as perfected manufacturing techniques using CNC automatic machines for optimized tolerances and reproducibility of the individual components.

Anti-Suckback Valve

A valve is built into the intake of the SOGEVAC pumps. This “anti-suckback valve” is protected by a metal wire-mesh filter. During standstill of the pump (for example due to shutting down or a power failure) the valve closes the intake. This prevents the pressure from rising in the connected chamber while the pump is vented at the same time. Any suck-back of pump oil into the vacuum system is thus also effectively prevented. This blocking process operates under all operating conditions (below 800 mbar (600 Torr)) and even when the gas ballast valve is open.

Protection of the Environment

The built-in exhaust filter ensures an oil-mist free exhaust gases over the entire range of operating pressures – from atmospheric pressure to ultimate pressure.

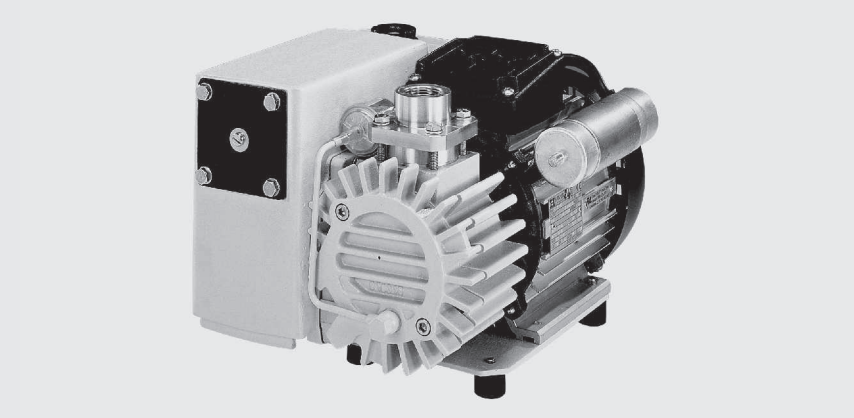
Supplied Equipment

All pumps are delivered with the required quantity of oil: SV 10 B to SV 65 B in a separate canister, whereas the SV 100 B and larger pumps already contain the oil and are thus ready for operation.

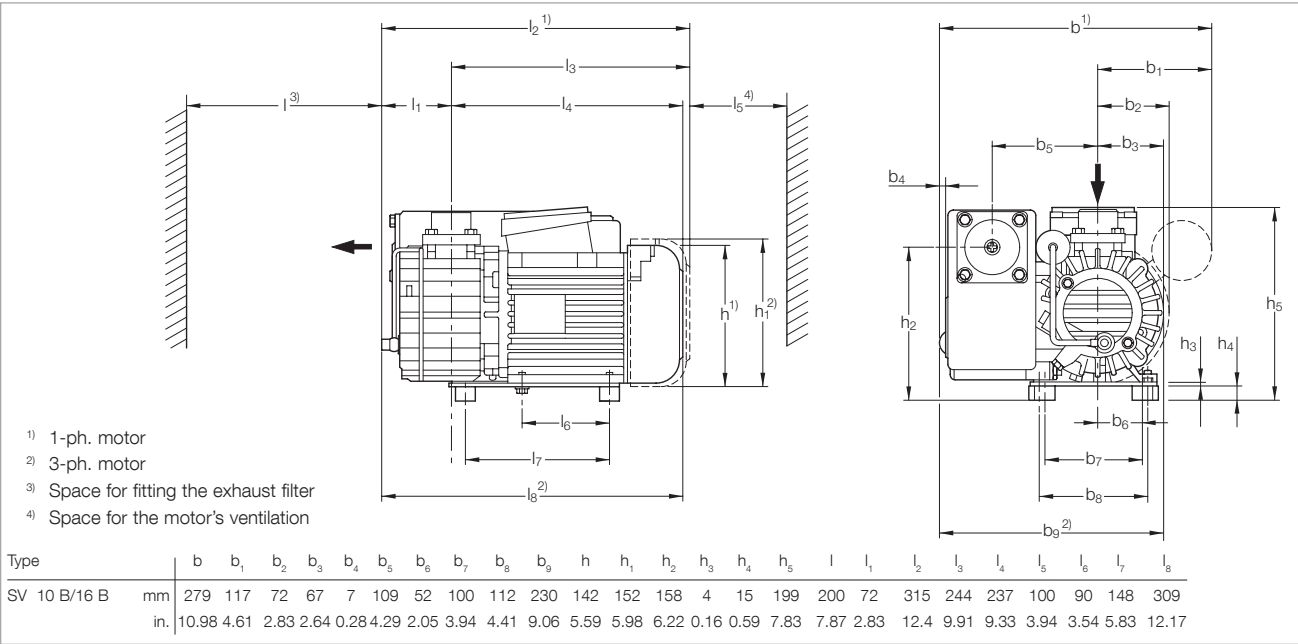
PFPE variants are typically delivered without fluid LVO 400.

Products

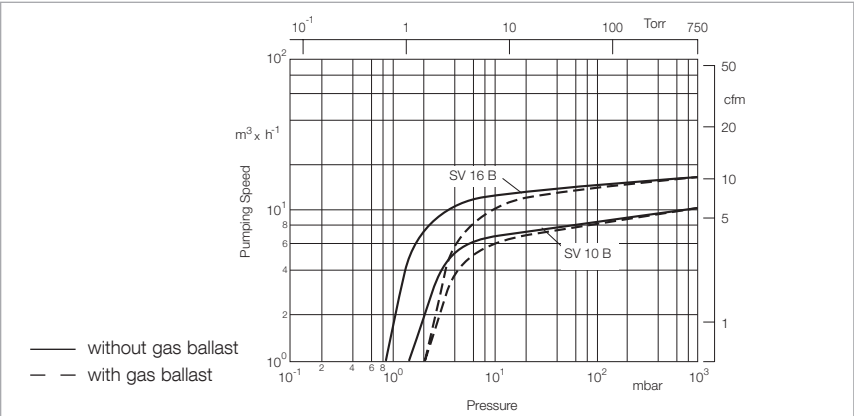
SOGEVAC SV 10 B / SV 16 B



SOGEVAC SV 16 B



Dimensional drawing for the SOGEVAC SV 10 B and SV 16 B



Pumping speed characteristics of the SOGEVAC SV 10 B and SV 16 B at 50 Hz
(60 Hz curves at the end of the chapter)

Technical Data

		SOGEVAC SV 10 B		SOGEVAC SV 16 B	
		50 Hz	60 Hz	50 Hz	60 Hz
Nominal speed ¹⁾	m ³ /h (cfm)	11.0 (6.5)	13.0 (7.7)	16.0 (9.4)	19.0 (11.2)
Pumping speed ¹⁾	m ³ /h (cfm)	9.5 (5.6)	11.5 (6.8)	15.0 (8.8)	17.0 (10.0)
Ultimate total pressure without gas ballast ¹⁾	mbar (Torr)	≤ 1.5 (≤ 1.1)	≤ 1.5 (≤ 1.1)	≤ 1.0 (≤ 0.8)	≤ 1.0 (≤ 0.8)
Ultimate total pressure with gas ballast ¹⁾	mbar (Torr)	≤ 2.5 (≤ 1.9)	≤ 2.5 (≤ 1.9)	≤ 2.0 (≤ 1.5)	≤ 2.0 (≤ 1.5)
Water vapor tolerance ¹⁾	mbar (Torr)	10.0 (7.5)	15.0 (11.3)	10.0 (7.5)	15.0 (11.3)
Water vapor capacity	g/h (qt/hr)	20 (0.02)	30 (0.03)	30 (0.03)	50 (0.05)
Oil capacity	l (qt)	0.5 (0.53)			
Noise level ²⁾	dB(A)	62 (1-ph.) – 60 (3-ph.)	66 (1-ph.) – 64 (3-ph.)	62 (1-ph.) – 60 (3-ph.)	66 (1-ph.) – 64 (3-ph.)
Admissible ambient temperature	°C (°F)	12 to 40 (54 to 104)			
Motor power	kW (hp)	0.55 (0.75)	0.75 (1.02)	0.55 (0.75)	0.75 (1.02)
Nominal speed	min ⁻¹ (rpm)	3000 (3000)	3600 (3600)	3000 (3000)	3600 (3600)
Type of protection	IP	55-F			
Weight (with oil filling)	kg (lbs)	20.0 (41.55)	20.0 (41.55)	20.5 (45.25)	20.5 (45.25)
Dimensions (L x W x H)	mm (in.)	315 x 281 x 199 (12.4 x 11.06 x 7.83)			
Connections intake (Inside thread) ³⁾	G	3/4" + 1/2"			

Ordering Information

		SOGEVAC SV 10 B		SOGEVAC SV 16 B	
		50 Hz	60 Hz	50 Hz	60 Hz
		Part No.		Part No.	
SOGEVAC SV 10 B/SV 16 B					
with three-phase motor, with permanent gas ballast					
220–240/380–415 V, 50 Hz and					
220–266/380–460 V, 60 Hz (CEI)		960 100		960 160	
200 V, 50/60 Hz		960 115		960 175	
with single-phase motor ⁴⁾ , with permanent gas ballast					
230 V, 50/60 Hz (CEI)		960 105		960 165	
110–120 V, 60 Hz		960 110		960 170	
100 V, 50/60 Hz		960 114		960 174	
Other voltages/frequencies ⁵⁾		upon request		upon request	
Filling with special oil		upon request		upon request	

Accessories

Exhaust filter cartridge AFE SV10B/16B	714 13 280	714 13 280
Exhaust connection G 3/4"	971 433 140	971 433 140

Spare Parts

Repair kit	714 22 230	714 22 230
Maintenance kit	971 444 430	971 444 430
Seal kit FPM (FKM)	714 22 220	714 22 220

¹⁾ To DIN 28 400 and following numbers²⁾ Operated at the ultimate pressure without gas ballast, free-field measurement at a distance of 1 m (3.5 ft)³⁾ 1/2" adapter supplied. Basic port is 3/4"⁴⁾ Single-phase motors do not have plugs, cords or ON/OFF switches⁵⁾ Please indicate when ordering a pump

Materials (materials in contact with the gas) Steel cast iron, Aluminium, Bronze, FPM (FKM), Glass, Polyamid 6.6, Filter material, (Polymers, Paper) Epoxy resin & Glass fibre

Remark: The SV 10 B and SV 16 B cannot work continuously above 150 mbar. Please consult Leybold for this application

SOGEVAC SV 16 D(I) and SV 25 D



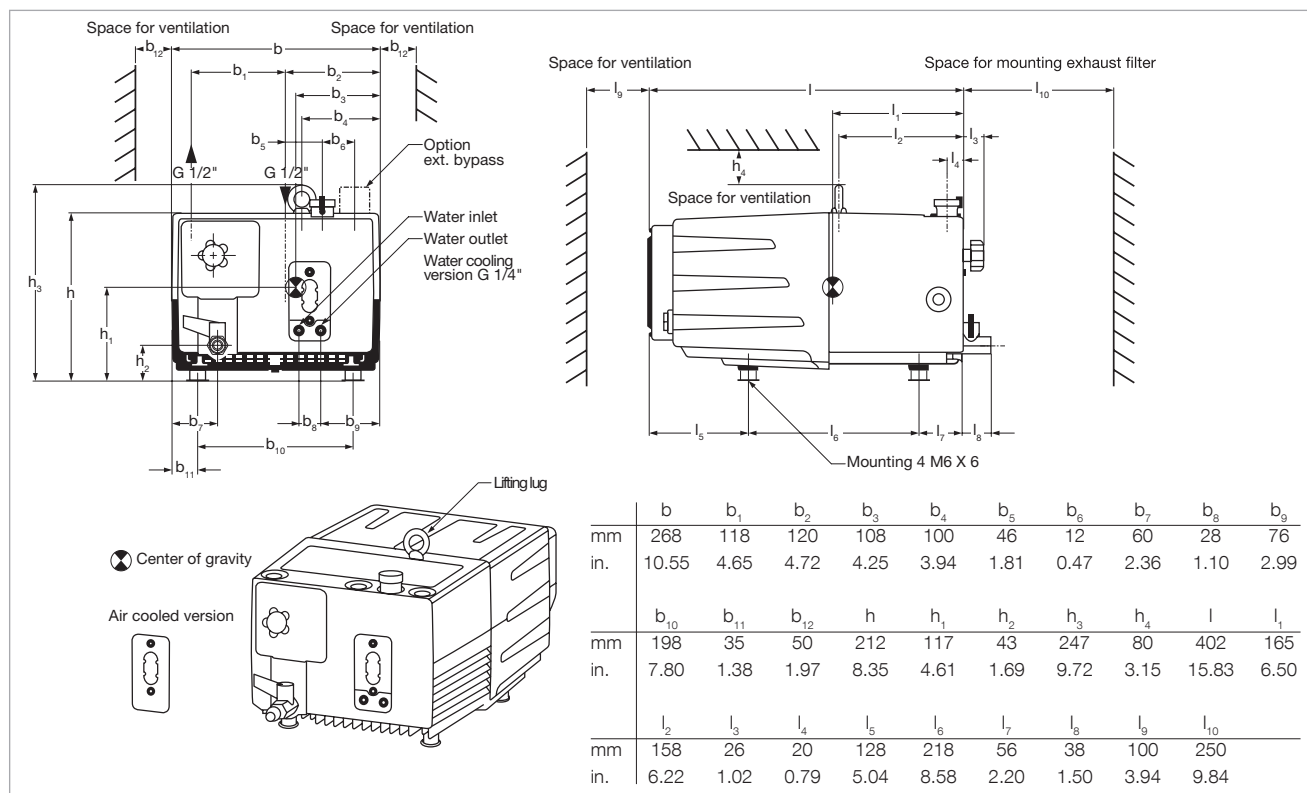
SOGEVAC SV 16 D / 25 D

Advantages to the User

- Good pump temperature due to optimized air cooling. Add water cooling possible, ideal for harsh applications and optimal oil life time thus reached
- 4 times more oil than on comparable pumps allow long oil life times
- Optimized integrated lubrication without external pipes
- Integrated oil recovery system and anti suckback valve
- Low noise level due to low pump speed
- Variant concept
- 3 phase wide range motors
- Different single phase motors with overload protection in accordance to EN 61010-1
- Compact and nice design

Typical Applications

- Oil purification, drying and de-gassing
- Plastic and rubber injection presses
- CO₂ lasers
- O₂ applications
- Analytical Instruments
- and more ...

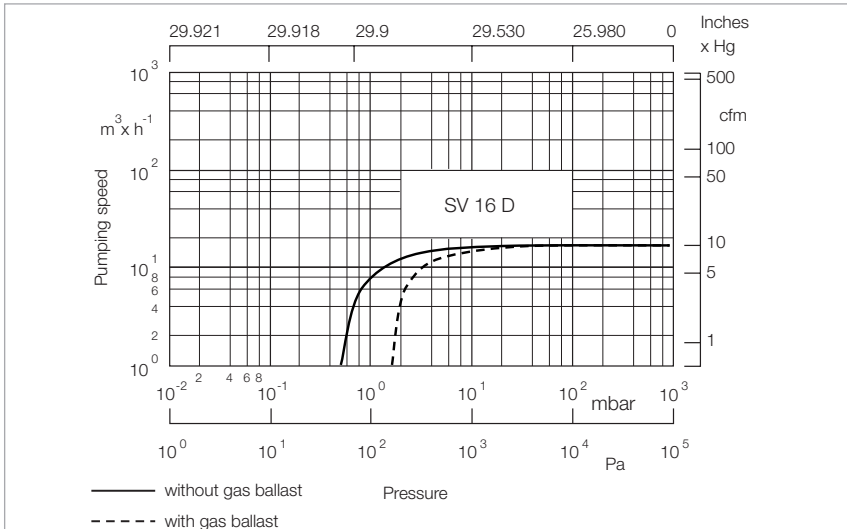


Dimensional drawing for the SOGEVAC SV 16 D and SV 25 D

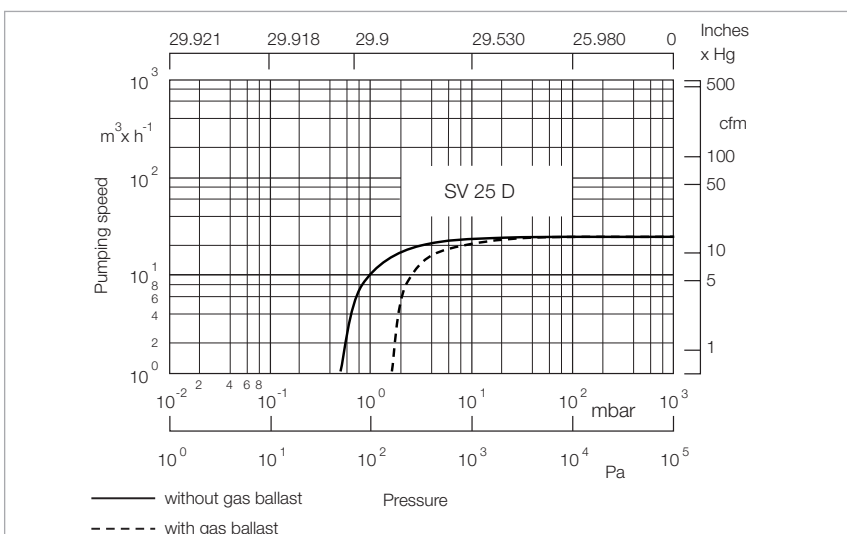
Technical Data

		SOGEVAC SV 16 D(I)		SOGEVAC SV 25 D	
		50 Hz	60 Hz	50 Hz	60 Hz
Nominal speed ¹⁾	m ³ /h (cfm)	16.0 (9.4)	18.7 (11.0)	25.0 (14.7)	29.0 (17.0)
Saugvermögen ¹⁾	m ³ /h (cfm)	14.5 (8.5)	17.0 (10.0)	22.5 (13.3)	25.5 (15.0)
Ultimate total pressure SV 16 D / 25 D without gas ballast ¹⁾	mbar (Torr)	≤ 0.5 (≤ 0.4)			
Ultimate total pressure SV 16 DI without gas ballast ¹⁾	mbar (Torr)	≤ 0.1 (≤ 0.08)			
Ultimate total pressure with gas ballast ¹⁾	mbar (Torr)	≤ 1.5 (≤ 1.1)			
Water vapor tolerance ¹⁾	mbar (Torr)	15.0 (11.3)			
Water vapor capacity	kg/h (qt/hr)	0.05 (0.05)	0.15 (0.16)	0.05 (0.05)	0.15 (0.16)
Oil capacity	l (qt)	2.0 (2.1)			
Noise level ²⁾	dB(A)	59			
Admissible ambient temperatur 1~ (oil: 32 cSt, approx.)	°C (°F)	+18 bis +40 (+64 to 104)			
3~	°C (°F)	+12 bis +40 (+54 to 104)			
Motor power (1~ and 3~), approx.	kW (hp)	0.75 (1.01)	0.90 (1.21)	0.75 (1.01)	0.90 (1.21)
Nominal speed	min ⁻¹ (rpm)	1440 (1440)	1750 (1750)	1440 (1440)	1750 (1750)
Weight (with oil filling)	kg (lbs)	25 (55.1)			
Connections, Intake and Exhaust SV 16 D / 25 D ³⁾ (Inside thread)	NPT/G	1/2"			
Connections, Intake and Exhaust SV 16 DI ³⁾	ISO-KF	25			

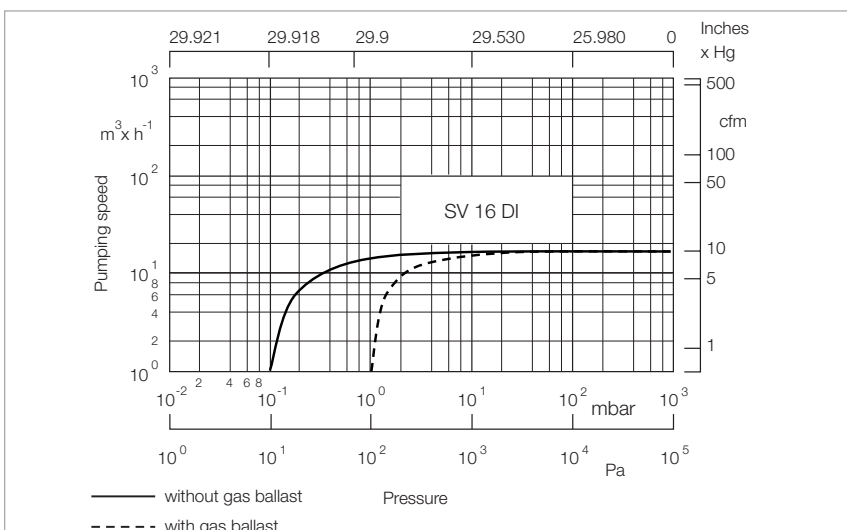
¹⁾ To DIN 28 400 ff²⁾ Operated at the ultimate pressure without gas ballast, free-field measurement at a distance of 1 m (3.5 ft)³⁾ Please indicate when ordering a pump



Pumping speed characteristics of the SOGEVAC SV 16 D at 50 Hz
(60 Hz curves at the end of the chapter)



Pumping speed characteristics of the SOGEVAC SV 25 D at 50 Hz
(60 Hz curves at the end of the chapter)



Pumping speed characteristics of the SOGEVAC SV 16 DI at 50 Hz
(60 Hz curves at the end of the chapter)

Ordering Information

SOGEVAC SV 16 D(I)

SOGEVAC SV 25 D

	Part No.	Part No.
SOGEVAC SV 16 D / SV 25 D		
with UL/CSA world three-phase motor and integrated gas ballast valve		
200 – 240 V $\pm 10\%$ and 380 – 415 V $\pm 10\%$, 50 Hz /		
200 – 240 V $\pm 10\%$ and 380 – 460 V $\pm 10\%$, 60 Hz ¹⁾	960 181V	960 211V
200 V $+10\%/-15\%$, 50/60 Hz	960 180V	960 210V
with single phase motor and integrated gas ballast valve		
200 – 240 V $\pm 10\%$, 50/60 Hz	960 185V	—
230 V $\pm 10\%$, 50/60 Hz	—	960 215V
100 V -15% and 100 V $+10\%$, 50/60 Hz	960 184V	—
110 – 115 V $\pm 10\%$ and 220 – 230 V $\pm 10\%$, 50/60 Hz (switchable manually)	960 186V	—
Other voltages/frequencies	upon request	upon request
Filling with special oil	upon request	upon request
SOGEVAC SV 16 DI		
with UL/CSA world three-phase motor and integrated gas ballast valve		
200 – 240 V $\pm 10\%$ and 380 – 415 V $\pm 10\%$, 50 Hz /		
200 – 240 V $\pm 10\%$ and 380 – 460 V $\pm 10\%$, 60 Hz ¹⁾	960 191V3001	—
with single phase motor and integrated gas ballast valve		
200 – 240 V $\pm 10\%$, 50/60 Hz	960 195V3001	—
100 V -15% and 100 V $+10\%$, 50/60 Hz	960 194V3001	—
110 – 115 V $\pm 10\%$ and 220 – 230 V $\pm 10\%$, 50/60 Hz (switchable manually)	960 196V3001	—
Accessories		
Exhaust filter monitoring gauge, mechanical G 3/4" ^{2), 3)}	951 93	951 93
Temperature switch conversion kit with plug, for three-phase version only ^{2), 3)}	upon request	upon request
Spare Parts		
Exhaust filter cartridge AFE	712 32 023	712 32 023
Maintenance kit (filter, O-Ring, filling plug)	EK 971 473 420	EK 971 473 420
Seal kit FPM (FKM) SV 16 D / SV 25 D	EK 971 473 430	EK 971 473 430
Repair kit complete SV 16 D / SV 25 D	EK 971 473 440	EK 971 473 440

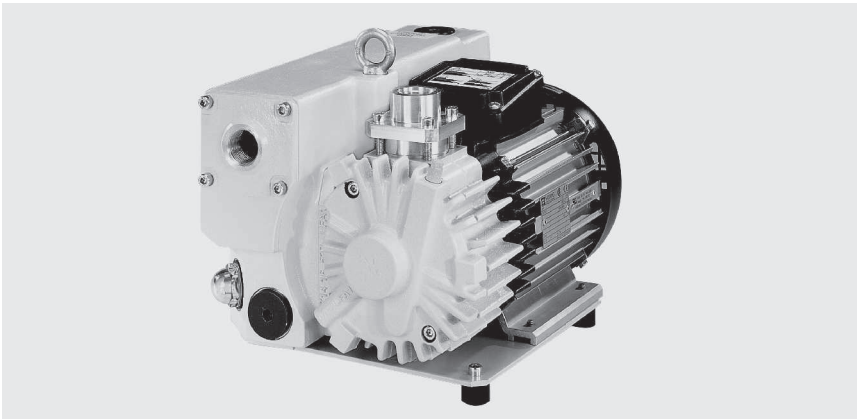
¹⁾ Pumps are delivered in high voltage connection.

For an operation at low voltage, the connections at motor terminal board must be changed

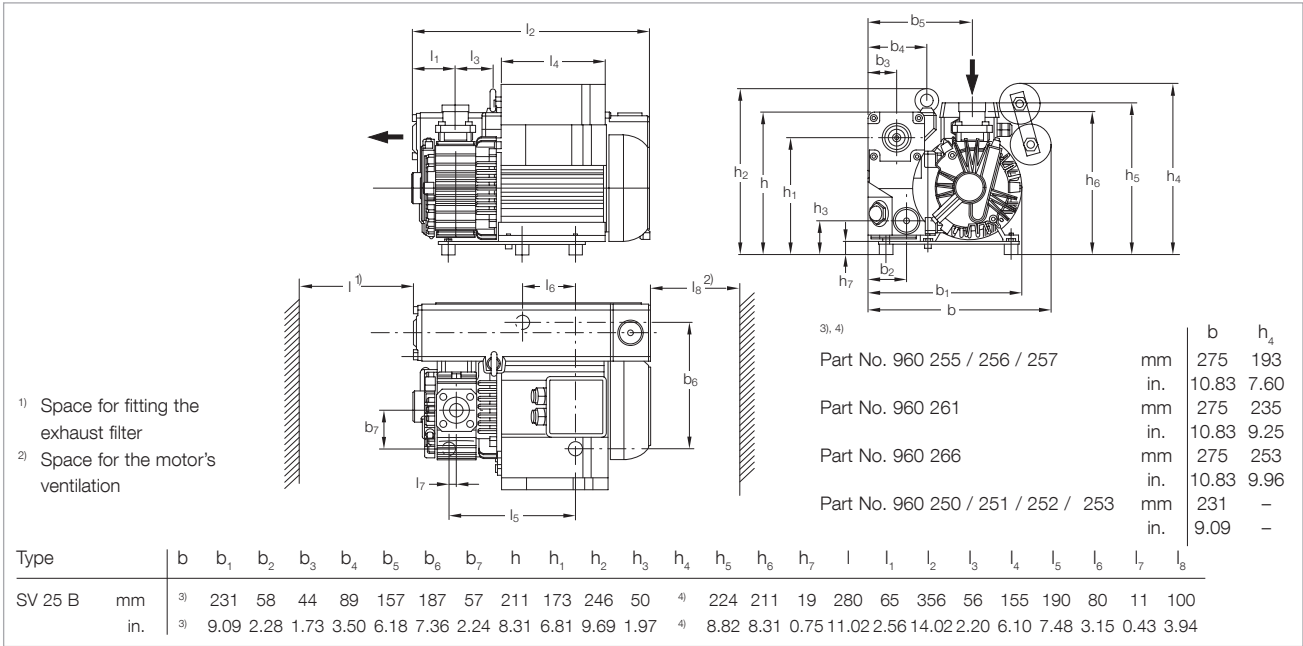
²⁾ Please indicate when ordering a pump

³⁾ Can be retrofitted

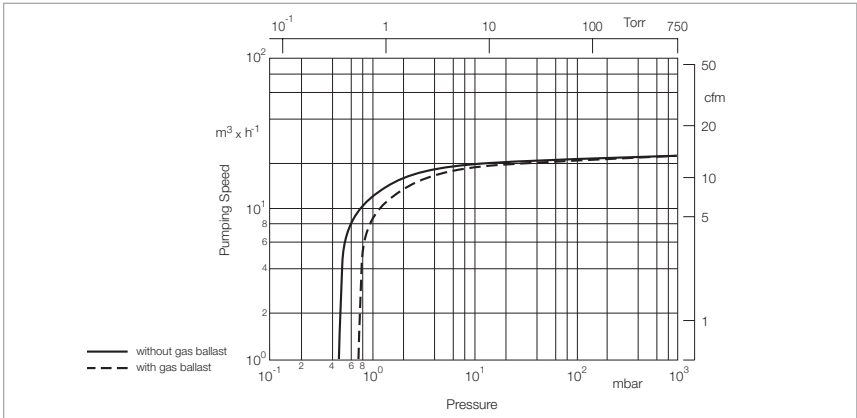
SOGEVAC SV 25 B



SOGEVAC SV 25 B



Dimensional drawing for the SOGEVAC SV 25 B



Pumping speed characteristics of the SOGEVAC SV 25 B at 50 Hz
(60 Hz curves at the end of the chapter)

Technical Data**SOGEVAC SV 25 B**

		50 Hz	60 Hz
Nominal speed ¹⁾	m ³ /h (cfm)	26.0 (15.3)	31.0 (18.3)
Pumping speed ¹⁾	m ³ /h (cfm)	22.5 (13.3)	25.0 (14.7)
Ultimate total pressure without gas ballast ¹⁾	mbar (Torr)	≤ 0.5 (≤ 0.4)	
Ultimate total pressure with gas ballast ¹⁾	mbar (Torr)	≤ 0.8 (≤ 0.6)	
Water vapor tolerance ¹⁾	mbar (Torr)	10.0 (7.5)	
Water vapor capacity	g/h (qt/hr)	85 (0.09)	100 (0.11)
Oil capacity	l (qt)	0.5 (0.53)	
Noise level ²⁾	dB(A)	64	67
Admissible ambient temperature	°C (°F)	12 to 40 (54 to 104)	
Motor power	kW (hp)	0.9 (1.2)	1.1 (1.5)
Nominal speed	min ⁻¹ (rpm)	3000 (3000)	3600 (3600)
Type of protection	IP	55-F	
Weight (with oil filling)	kg (lbs)	26 (57.4) [three-phase] 27 (60.0) [single-phase]	
Dimensions (L x W x H)	mm (in.)	356 x 275 x 246 (14.02 x 10.83 x 9.69)	
Connections ³⁾			
Intake ⁴⁾	G or NPT	3/4" + 1/2"	
Exhaust	G or NPT	3/4"	

Ordering Information**SOGEVAC SV 25 B**

	50 Hz	60 Hz
	Part No.	
SOGEVAC SV 25 B		
with three-phase motor, without gas ballast		
200–240/346–415 V, 50 Hz and 200–277/346–480 V, 60 Hz (CEI)	960 250	
200–240/346–415 V, 50 Hz and 200–277/346–480 V, 60 Hz (CEI), NPT flanges	960 252	
with three-phase motor, with permanent gas ballast		
200–240/346–415 V, 50 Hz and 200–277/346–480 V, 60 Hz (CEI)	960 251	
200–240/346–415 V, 50 Hz and 200–277/346–480 V, 60 Hz (CEI), NPT flanges	960 253	
with single-phase motor, without gas ballast		
230 V, 50/60 Hz (CEI)	960 255	
with single-phase motor, with permanent gas ballast		
230 V, 50/60 Hz (CEI)	960 256	
230 V, 50/60 Hz, NPT flanges (CEI)	960 257	
110–120 V, 60 Hz	upon request	
100 V, 50/60 Hz	upon request	
Other voltages/frequencies ⁵⁾	upon request	
Filling with special oil	upon request	
Accessories		
Exhaust filter cartridge AFE SV25B	714 13 280	
Spare Parts		
Maintenance kit	971 423 100	
Repair kit	971 423 450	
Seal kit FPM (FKM)	714 19 490	

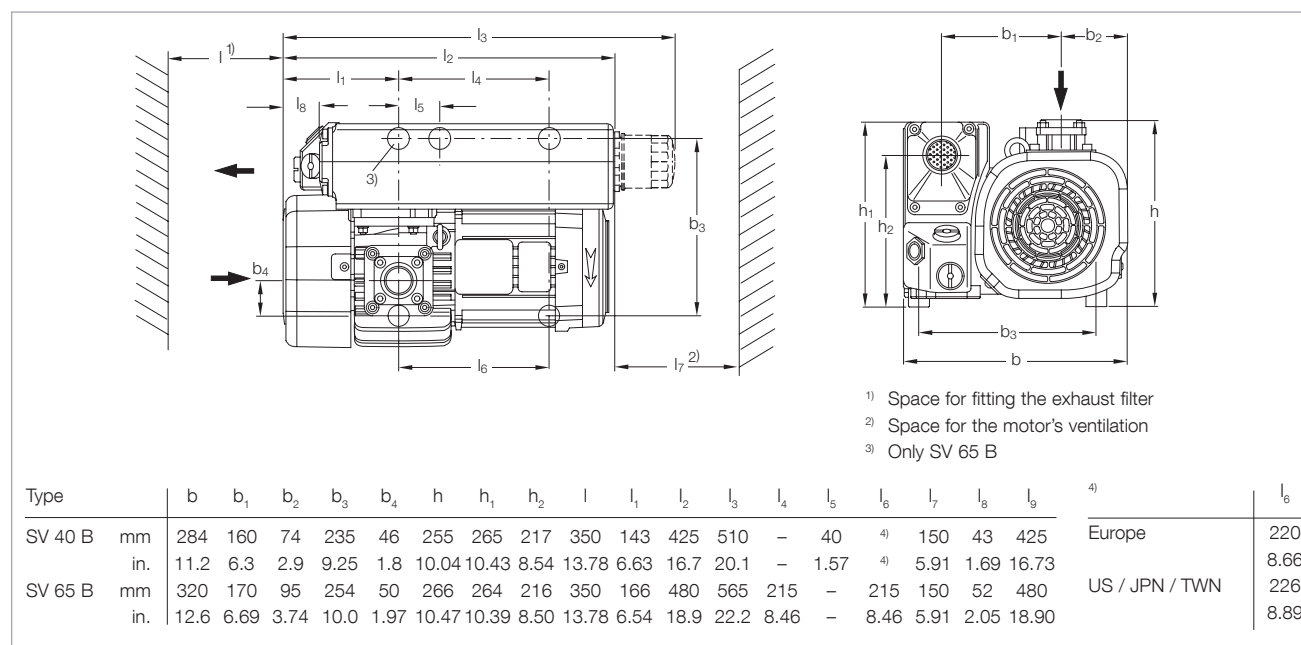
¹⁾ To DIN 28 400 and following numbers²⁾ Operated at the ultimate pressure without gas ballast, free-field measurement at a distance of 1 m (3.5 ft)³⁾ Pumps with European and Japanese motors have G,
pumps with NEMA motors have NPT⁴⁾ 1/2" adapter supplied. Basic port is 3/4"⁵⁾ Please indicate when ordering a pump

Materials (materials in contact with the gas) Steel cast iron, Aluminium, Bronze, FPM (FKM), Glass, Polyamid 6.6, Filter material, (Polymers, Paper) Epoxy resin & Glass fibre

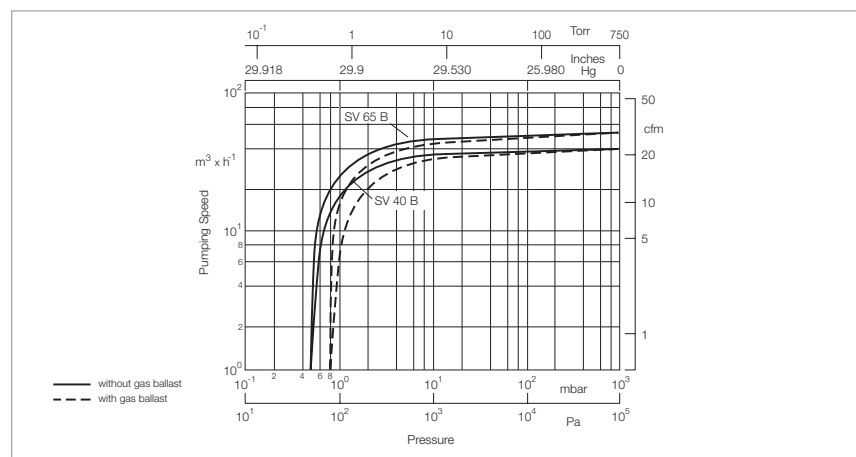
SOGEVAC SV 40 B / SV 65 B



SOGEVAC SV 65 B



Dimensional drawing for the SOGEVAC SV 40 B and SV 65 B with standard motor, European version



Pumping speed characteristics of the SOGEVAC SV 40 B and SV 65 B at 50 Hz (60 Hz curves at the end of the chapter)

Technical Data

SOGEVAC SV 40 B

SOGEVAC SV 65 B

		50 Hz	60 Hz	50 Hz	60 Hz
Nominal speed ¹⁾	m ³ /h (cfm)	44.0 (25.9)	53.0 (31.2)	59.0 (34.8)	71.0 (41.8)
Pumping speed ¹⁾	m ³ /h (cfm)	38.5 (22.7)	47.0 (27.7)	54.0 (31.8)	64.0 (37.7)
Ultimate total pressure without gas ballast ¹⁾	mbar (Torr)	≤ 0.5 (≤ 0.4)			
Ultimate total pressure ¹⁾ with standard gas ballast ²⁾	mbar (Torr)	≤ 1.5 (≤ 1.1)			
with small gas ballast ²⁾	mbar (Torr)	≤ 0.8 (≤ 0.6)			
Water vapor tolerance ¹⁾ with standard gas ballast ²⁾	mbar (Torr)	30.0 (22.5)			
with small gas ballast ²⁾	mbar (Torr)	10.0 (7.5)			
Water vapor capacity with standard gas ballast ²⁾	kg/h (qt/hr)	0.76 (0.80)	0.90 (0.95)	1.0 (1.1)0,36	1.25 (1.32)
with small gas ballast ²⁾	kg/h (qt/hr)	0.28 (0.30)	0.34 (0.36)	0.36 (0.38)	0.42 (0.44)
Oil capacity	l l (qt)	1.0 (1.05)	1.0 (1.05)	2.0 (2.1)	2.0 (2.1)
Mean noise level ³⁾	dB(A)	58	60	60	64
Admissible ambient temperature	°C (°F)	12 to 40 (54 to 104)			
Motor power	kW (hp)	1.1 (2.0)	1.5 (2.0)	1.5 (3.0)	1.8 (3.0)
Nominal speed	min ⁻¹ (rpm)	1500 (1500)	1800 (1800)	1500 (1500)	1800 (1800)
Type of protection	IP	55-F			
Weight (with oil filling)	kg (lbs)	43 (94.9)	45 (99.3)	49 (108.2)	52 (114.8)
Dimensions (L x W x H)	mm (in.)	425 x 284 x 265 (16.7 x 11.2 x 10.4)	425 x 284 x 265 (16.7 x 11.2 x 10.4)	480 x 320 x 264 (18.9 x 12.6 x 10.4)	480 x 320 x 264 (18.9 x 12.6 x 10.4)
Connection (inside thread) ⁴⁾ Intake	G or NPT	1 1/4"			
Exhaust	G or NPT	1 1/4"			

¹⁾ To DIN 28 400 and following numbers²⁾ Ordering Information, see next page³⁾ Operated at the ultimate pressure without gas ballast, free-field measurement at a distance of 1 m (3.5 ft)⁴⁾ Pumps with European and Japanese motors have G,
pumps with US motors have NPT

Materials (materials in contact with the gas) Steel cast iron, Aluminium, Bronze, FPM (FKM), Glass, Polyamid 6.6, Filter material, (Polymers, Paper) Epoxy resin & Glass fibre

Ordering Information

SOGEVAC SV 40 B

50 Hz

60 Hz

SOGEVAC SV 65 B

50 Hz

60 Hz

	Part No.	Part No.
SOGEVAC SV 40 B, SV 65 B ¹⁾ with three-phase motor, without gas ballast, without oil filter 230/400 V, 50 Hz and 460 V, 60 Hz (CEI) wide range motor (CEI) ²⁾	960 300 960 320 ²⁾	960 400 960 420 ²⁾
with three-phase motor, without gas ballast, with oil filter 230/400 V, 50 Hz und 460 V, 60 Hz (CEI)	960 302	960 402
with three-phase motor, with small gas ballast, without oil filter 230/400 V, 50 Hz and 460 V, 60 Hz (CEI)	960 301	960 401
230/460 V, 60 Hz and 400 V, 50 Hz, NPT flanges (UL/CSA motor) ³⁾	960 311	960 411
wide range motor (CEI) ²⁾	960 321 ²⁾	960 421 ²⁾
200 V, 50/60 Hz	960 316	960 416
with three-phase motor, with small gas ballast, with oil filter 230/400 V, 50 Hz and 460 V, 60 Hz (CEI)	960 303	960 403
230/460 V, 60 Hz and 400 V, 50 Hz (CEI), NPT flanges (UL/CSA motor) ³⁾	960 313	960 413
wide range motor (CEI) ²⁾	960 323 ²⁾	960 423 ²⁾
200 V, 50/60 Hz	960 318	960 418
with three-phase motor,, with standard gas ballast, without oil filter 230/400 V, 50 Hz and 460 V, 60 Hz (CEI)	960 305	960 405
230/460 V, 60 Hz and 400 V, 50 Hz (CEI), NPT flanges (UL/CSA motor) ³⁾	960 312	960 412
wide range motor (CEI) ²⁾	960 322 ²⁾	960 422 ²⁾
200 V, 50/60 Hz	960 317	960 417
with three-phase motor, with standard gas ballast, with oil filter 230/400 V, 50 Hz and 460 V, 60 Hz (CEI)	960 307	960 407
230/460 V, 60 Hz and 400 V, 50 Hz (CEI), NPT flanges (UL/CSA motor) ³⁾	960 314	960 414
wide range motor (CEI) ²⁾	960 324 ²⁾	960 424 ²⁾
200 V, 50/60 Hz	960 319	960 419
Other voltages/frequencies ⁴⁾	upon request	upon request
Filling with special oil ⁴⁾	upon request	upon request
Accessories		
Exhaust filter cartridge AFE SV40B	714 21 180	-
AFE SV65/100B	-	714 17 300
Spare Parts		
Maintenance kit	971 427 660	971 423 440
Repair kit	971 427 650	714 20 420
Seal kit FPM (FKM)	971 427 640	714 20 410
Oil filter ⁵⁾	EK 960 04	EK 960 04
Oil filter bypass	712 30 570	712 30 570

¹⁾ Pumpen mit Europa- und Japan-Motoren in G, Pumpen mit USA-Spannung in NPT

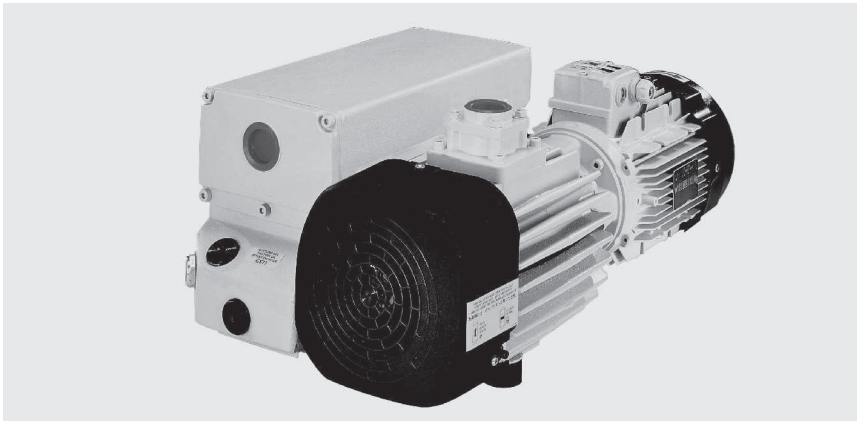
²⁾ Weitbereichsmotor: 210–240 & 360–420 V ± 5 %, 50 Hz und 210–260 & 360–460 V ± 5 %, 60 Hz

³⁾ Mit NEMA-elektrischen Anschlüssen ohne Klemmbrett

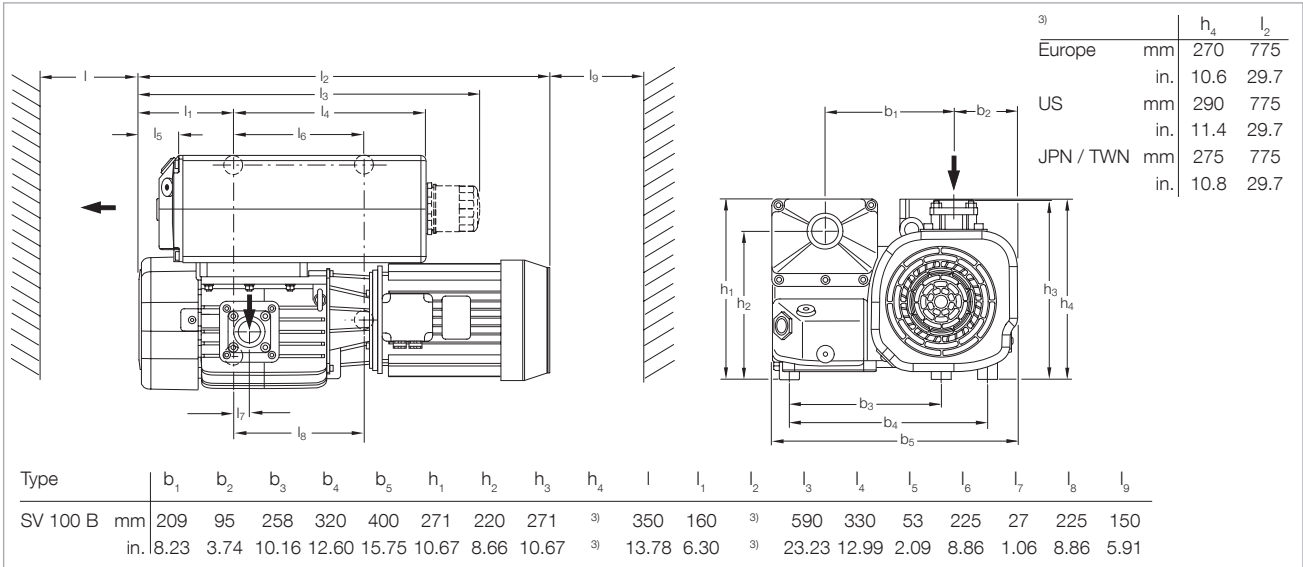
⁴⁾ Bei Bestellung der Pumpe bitte angeben

⁵⁾ Nicht im Wartungssatz enthalten

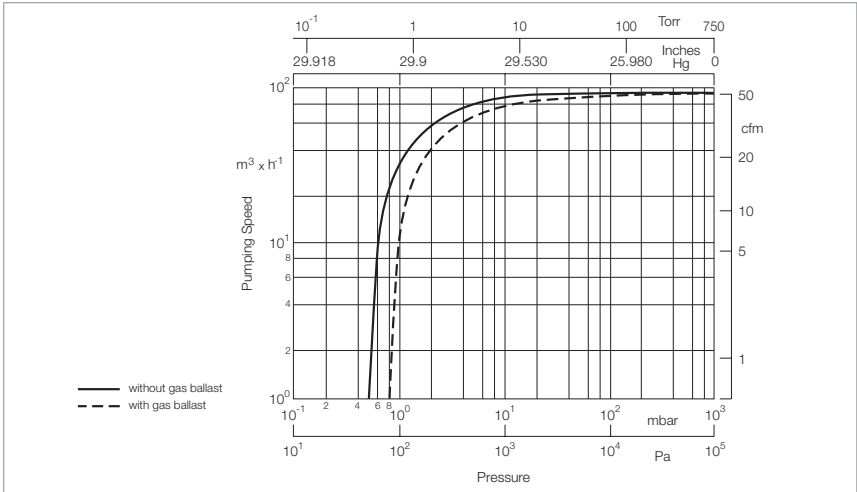
SOGEVAC SV 100 B



SOGEVAC SV 100 B



Dimensional drawing for the SOGEVAC SV 100 B



Pumping speed characteristics of the SOGEVAC SV 100 B at 50 Hz
(60 Hz curves at the end of the chapter)

Technical Data

SOGEVAC SV 100 B

		50 Hz	60 Hz
Nominal speed ¹⁾	m ³ /h (cfm)	97.5 (57.4)	117.0 (68.9)
Pumping speed ¹⁾	m ³ /h (cfm)	87.5 (51.5)	105.0 (61.8)
Ultimate total pressure without gas ballast ¹⁾	mbar (Torr)	≤ 0.5 (≤ 0.4)	
Ultimate total pressure ¹⁾ with standard gas ballast ²⁾	mbar (Torr)	≤ 1.5 (≤ 1.1)	
Ultimate total pressure ¹⁾ with small gas ballast ²⁾	mbar (Torr)	≤ 0.8 (≤ 0.6)	
Water vapor tolerance ¹⁾ with standard gas ballast ²⁾	mbar (Torr)	30.0 (22.5)	
Water vapor tolerance ¹⁾ with small gas ballast ²⁾	mbar (Torr)	10.0 (7.5)	
Water vapor capacity with standard gas ballast ²⁾	kg/h (qt/hr)	1.60 (1.69)	1.70 (1.80)
Water vapor capacity with small gas ballast ²⁾	kg/h (qt/hr)	0.45 (0.48)	0.60 (0.63)
Oil capacity	l (qt)	2.0 (2.1)	
Mean noise level ³⁾	dB(A)	61	64
Admissible ambient temperature	°C (°F)	12 to 40 (54 to 104)	
Motor power	kW (hp)	2.2 (3.5)	3.5 (5.0)
Nominal speed	min ⁻¹ (rpm)	1500 (1500)	1800 (1800)
Type of protection	IP	55-F	
Materials (materials in contact with the gas)		Steel, cast iron, Aluminium, Bronze, FPM (FKM), Glass, Polyamid 6.6, Filter material (Polymers, Paper), Epoxy resin & Glass fibre	
Weight (with oil filling)	(lbs)	92 (203)	93 (205)
Dimensions (L x W x H)			
Europe	mm (in.)	755 x 400 x 270 (29.7 x 15.7 x 10.6)	
US	mm (in.)	755 x 400 x 290 (29.7 x 15.7 x 11.4)	
JPN / TWN	mm (in.)	755 x 400 x 275 (29.7 x 15.7 x 10.8)	
Connection (inside thread) ⁴⁾			
Intake	G or NPT	1 1/4"	
Exhaust	G or NPT	1 1/4"	

¹⁾ To DIN 28 400 and following numbers²⁾ Ordering Information, see next page³⁾ Operated at the ultimate pressure without gas ballast, free-field measurement at a distance of 1 m (3.5 ft)⁴⁾ Pumps with European and Japanese motors have G, pumps with US (NEMA) motors have NPT

Ordering Information

SOGEVAC SV 100 B

50 Hz

60 Hz

	Part No.
SOGEVAC SV 100 B ¹⁾ with three-phase motor, without gas ballast, without oil filter 230/400 V, 50 Hz and 460 V, 60 Hz (CEI)	960 500
with three-phase motor, without gas ballast, with oil filter 230/400 V, 50 Hz and 460 V, 60 Hz (CEI)	960 502
with three-phase motor, with small gas ballast, without oil filter 230/400 V, 50 Hz and 460 V, 60 Hz (CEI)	960 501
230/460 V, 60 Hz and 400 V, 50 Hz (NEMA)	960 511
230/400 V, 50/60 Hz and 460 V, 60 Hz (CEI)	960 521 ²⁾
200 V, 50/60 Hz (JIS)	960 516
with three-phase motor, with small gas ballast, with oil filter 230/400 V, 50 Hz and 460 V, 60 Hz (CEI)	960 503
230/460 V, 60 Hz and 400 V, 50 Hz (NEMA)	960 513
230/400 V, 50/60 Hz and 460 V, 60 Hz (CEI)	960 523 ²⁾
200 V, 50/60 Hz (JIS)	960 518
with three-phase motor, with standard gas ballast, without oil filter 230/400 V, 50 Hz and 460 V, 60 Hz (CEI)	960 505
230/460 V, 60 Hz and 400 V, 50 Hz (NEMA)	960 512
230/400 V, 50/60 Hz and 460 V, 60 Hz (CEI)	960 522 ²⁾
200 V, 50/60 Hz (JIS)	960 517
with three-phase motor, with standard gas ballast, with oil filter 230/400 V, 50 Hz and 460 V, 60 Hz (CEI)	960 507
230/460 V, 60 Hz and 400 V, 50 Hz (NEMA)	960 514
230/400 V, 50/60 Hz and 460 V, 60 Hz (CEI)	960 524 ²⁾
200 V, 50/60 Hz (JIS)	960 519
Other voltages/frequencies ²⁾	upon request
Filling with special oil ²⁾	upon request
Accessories	
RUVAC adapter (WA/WS 251/501)	971 448 740
Exhaust filter cartridge AFE SV65/100B ³⁾	714 17 300
Spare Parts	
Maintenance kit	971 427 690
Repair kit	971 427 680
Seal kit FPM (FKM)	971 427 670
Oil filter ⁴⁾	EK 960 05
Oil filter bypass	712 30 570

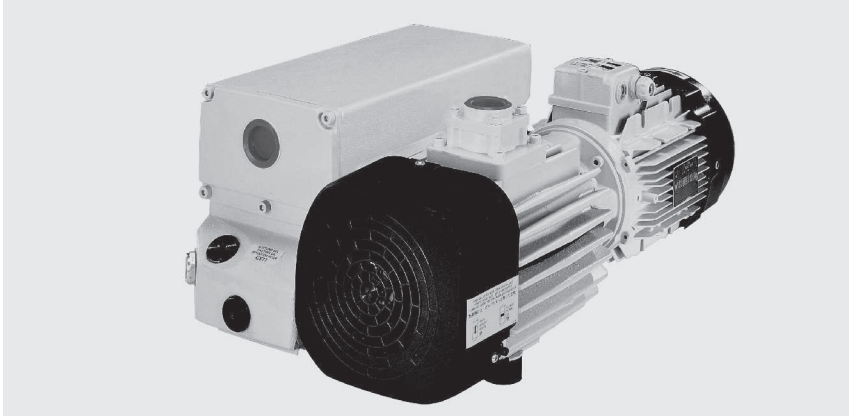
¹⁾ Pumps with European and Japanese motors have G, pumps with US voltages motors have NPT without terminal board

²⁾ Please indicate when ordering a pump

³⁾ 2 cartridges needed per pump

⁴⁾ Not included in maintenance kit

SOGEVAC SV 120 B



SOGEVAC SV 120 B

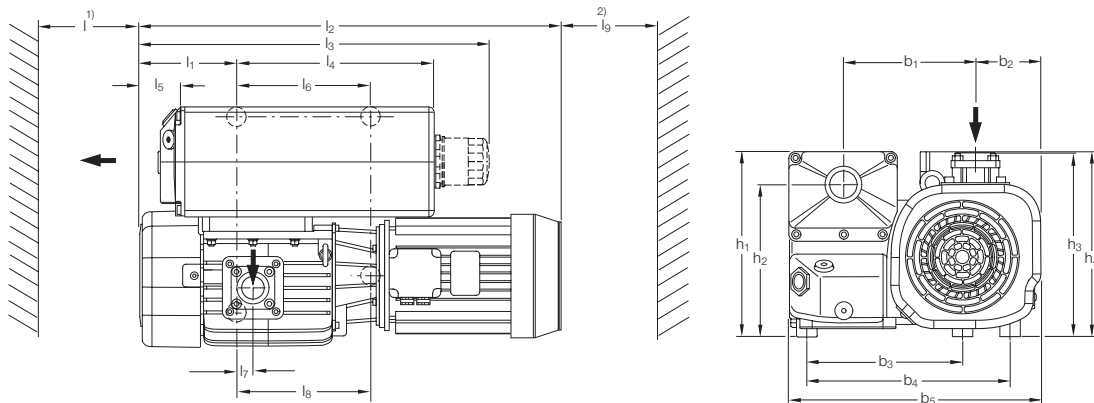
Advantages to the User

- Best effective pumping speed in this class
- Good pump temperature due to the cooling coil, ideal for harsh applications. Optimal oil life time thus reached
- Wide range motor as standard
- Optimized integrated lubrication without external pipes
- Integrated oil recovery system and anti suckback valve
- Low noise level

Typical Applications

- Oil purification
- Plastic & rubber injection presses
- Lamination
- ATEX and O₂ applications
- and more ...

- ¹⁾ Space for fitting the exhaust filter and cooling
²⁾ Space for the motor's ventilation



Type		b ₁	b ₂	b ₃	b ₄	b ₅	h ₁	h ₂	h ₃	h ₄	l	l ₁	l ₂	l ₃	l ₄	l ₅	l ₆	l ₇	l ₈	l ₉
SV 120 B	mm	209	95	258	320	460	275	220	271	274	350	160	760	630	330	53	225	27	225	150
	in.	8.23	3.74	10.16	12.60	18.1	10.8	8.66	10.67	10.79	13.78	6.3	30.0	24.8	12.99	2.09	8.86	1.06	8.86	5.91

Dimensional drawing for the SOGEVAC SV 120 B

Technical Data**SOGEVAC SV 120 B**

		50 Hz	60 Hz
Nominal speed ¹⁾	m ³ /h (cfm)	130 (77)	147 (86)
Pumping speed ¹⁾	m ³ /h (cfm)	110 (65)	122 (72)
Ultimate total pressure without gas ballast ¹⁾	mbar (Torr)	≤ 0.5 (≤ 0.4)	
Ultimate total pressure ¹⁾ with gas ballast ²⁾	mbar (Torr)	≤ 1.5 (≤ 1.1)	
Water vapor tolerance ¹⁾ with standard gas ballast ²⁾	mbar (Torr)	30.0 (22.5)	
Water vapor capacity with standard gas ballast ²⁾	kg/h (qt/hr)	1.60 (1.69)	1.70 (1.80)
Mean noise level ³⁾	dB(A)	61	64
Admissible ambient temperature	°C (°F)	12 to 40 (54 to 104)	
Motor power (with IEC Euro (NEMA) motor)	kW (hp)	2.4 (3.3)	3.2 (4.4)
Mains voltage and frequency 3 ~ motor		220–230 and 380–400 V ±10 %, 50 Hz 230 and 400–460 V ±10 %, 60 Hz	
Nominal speed	min ⁻¹ (rpm)	1500 (1500)	1800 (1800)
Type of protection	IP	55-F	
Leak rate	mbar x l/s	≤ 1 x 10 ⁻³	
Materials (materials in contact with the gas)		Steel, cast iron, Aluminium, Bronze, FPM (FKM), Glass, Polyamid 6.6, Filter material (Polymers, Paper), Epoxy resin & Glass fibre	
Oil capacity	l (qt)	2.0 (2.1)	
Weight (with oil filling)	(lbs)	94 (207)	
Dimensions (L x W x H)	mm (in.)	755 x 400 x 290 (29.7 x 15.7 x 11.4)	
Connection (inside thread) ⁴⁾			
Intake	G or NPT	1 1/4"	
Exhaust	G or NPT	1 1/4"	

¹⁾ To DIN 28 400 and following numbers²⁾ Ordering Information, see next page³⁾ Operated at the ultimate pressure without gas ballast, free-field measurement at a distance of 1 m (3.5 ft)⁴⁾ Pumps with European and Japanese motors have G, pumps with US (NEMA) motors have NPT

Ordering Information

SOGEVAC SV 120 B

50 Hz

60 Hz

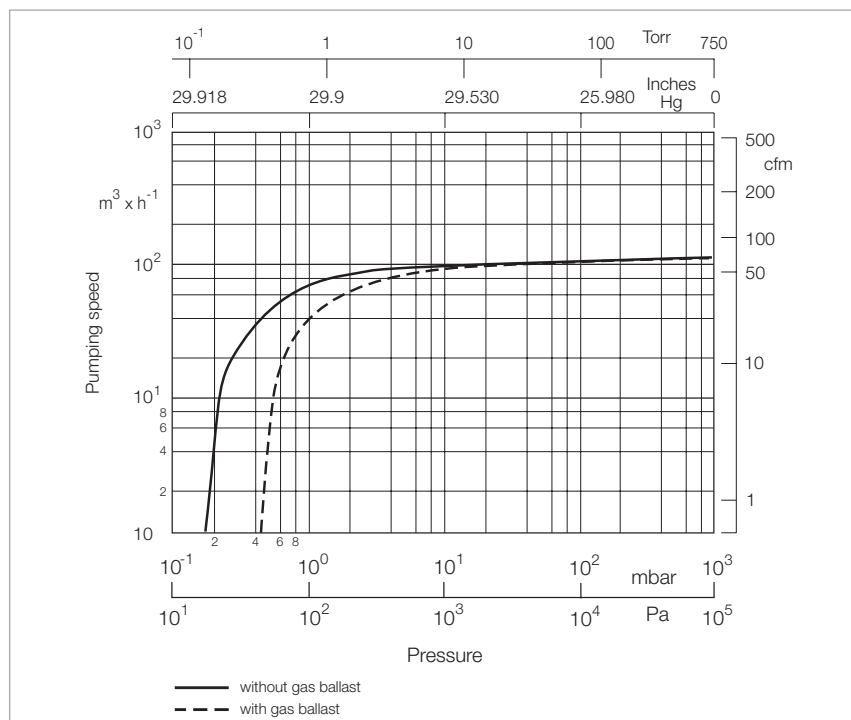
	Part No.
SOGEVAC SV 120 B ¹⁾ with three-phase motor 230/400 V $\pm 10\%$, 50 Hz and 230/400/460 V $\pm 10\%$, 60 Hz	
without gas ballast, without oil filter	960 550 V (upon request)
with small gas ballast, without oil filter	960 551
without gas ballast, with oil filter	960 552 V (upon request)
with small gas ballast, with oil filter	960 553
with standard gas ballast, without oil filter	960 572
with standard gas ballast, with oil filter	960 557
Other voltages/frequencies ²⁾	upon request
Filling with special oil ²⁾	upon request
Accessories	
RUVAC adapter (WA/WS 251/501)	971 448 740
Exhaust filter cartridge AFE SV65/100B ³⁾	714 17 300
Spare Parts	
Maintenance kit	971 427 690
Repair kit	EK 971 445 151
Oil filter ⁴⁾	EK 960 05
Oil filter bypass	712 30 570

¹⁾ Pumps with European and Japanese motors have G, pumps with US voltages motors have NPT without terminal board

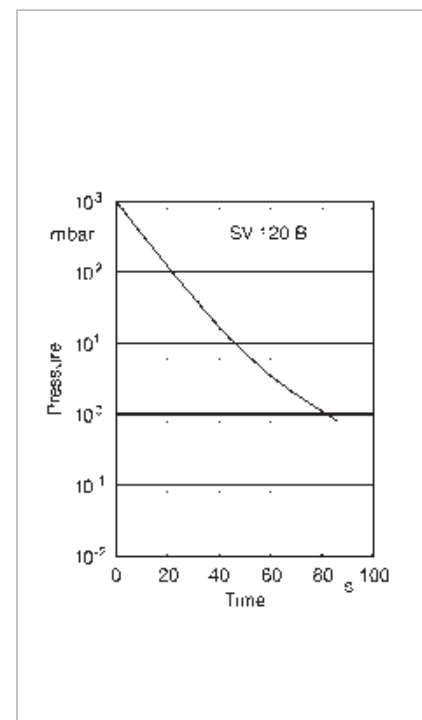
²⁾ Please indicate when ordering a pump

³⁾ 2 cartridges needed per pump

⁴⁾ Not included in maintenance kit

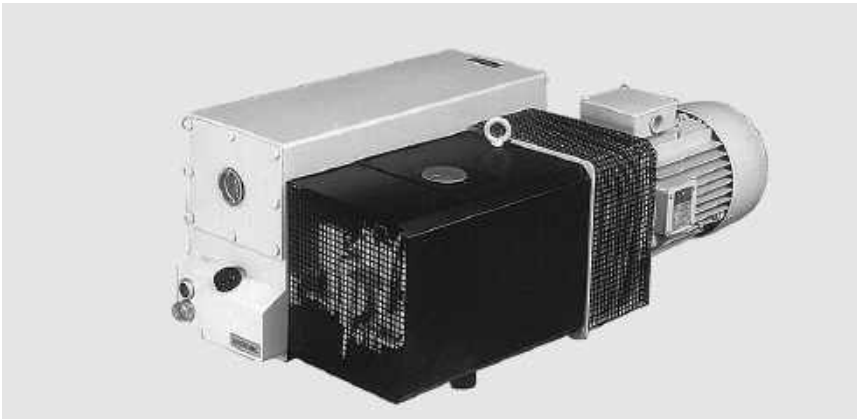


Pumping speed characteristics of the SOGEVAC SV 120 B at 50 Hz
(60 Hz curves at the end of the chapter)

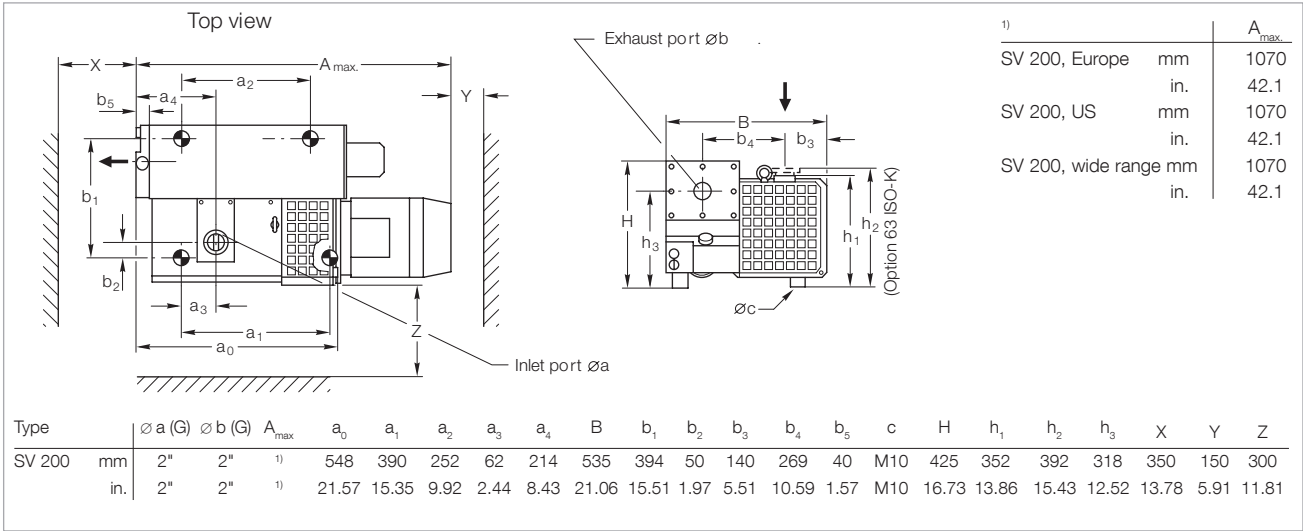


Pump-down characteristics of a 300 l vessel
at 50 Hz

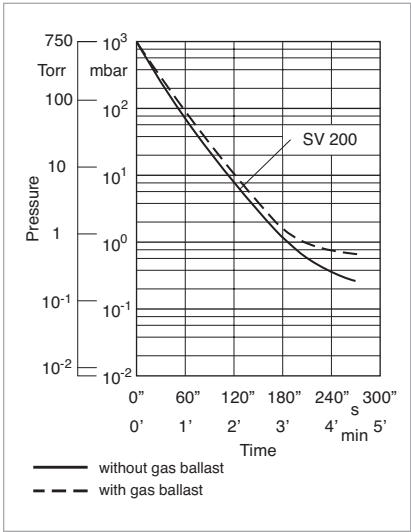
SOGEVAC SV 200



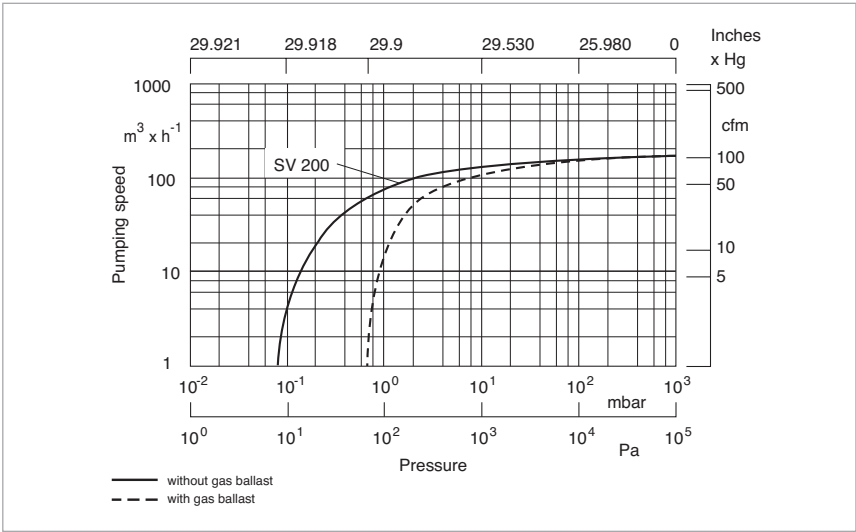
SOGEVAC SV 200



Dimensional drawing for the SOGEVAC SV 200, European version



Pump-down characteristics of a 1000 l vessel at 50 Hz



Pumping speed characteristics of the SOGEVAC SV 200 at 50 Hz (60 Hz curves at the end of the chapter)

Technical Data**SOGEVAC SV 200**

		50 Hz	60 Hz
Nominal speed ¹⁾	m ³ /h (cfm)	180 (106.0)	220 (129.5)
Pumping speed ¹⁾	m ³ /h (cfm)	170 (100.1)	200 (117.8)
Ultimate total pressure without gas ballast ¹⁾	mbar (Torr)	$\leq 8 \times 10^{-2}$ ($\leq 6 \times 10^{-2}$)	
Ultimate total pressure with gas ballast ¹⁾	mbar (Torr)	≤ 0.7 (≤ 0.5)	
Water vapor tolerance with standard gas ballast ¹⁾	mbar (Torr)	30.0 (22.5)	40.0 (30.0)
with big gas ballast ²⁾	mbar (Torr)	10.0 (7.5)	50.0 (37.5)
Water vapor capacity with standard gas ballast	kg/h (qt/hr)	3.4 (3.6)	5.4 (5.7)
Oil capacity, min. / max.	l (qt)	5.0 (5.3) / 9.0 (9.5)	
Noise level ³⁾	dB(A)	69	73
Admissible ambient temperature	°C (°F)	12 to 40 (54 to 104)	
Motor power	kW (hp)	4.0 (7.5)	4.6 (7.5)
Nominal speed	min ⁻¹ (rpm)	1450 (1450)	1750 (1750)
Type of protection	IP	55-F	TEFC/55 ⁴⁾
Materials (materials in contact with the gas)		Steel, cast iron, Aluminium, FPM (FKM), Glass, Polyamid 6.6, Filter material (Polymers, Paper), Epoxy resin & Glass fibre	
Weight (with oil filling)	(lbs)	150 (331)	160 (353)
Connection (inside thread) ⁴⁾			
Intake	G or NPT	2"	
Exhaust	G or NPT	2"	

¹⁾ To DIN 28 400 and following numbers²⁾ Ordering Information see Chapter "Accessories"³⁾ Operated at the ultimate pressure without gas ballast, free-field measurement at a distance of 1 m (3.5 ft)⁴⁾ CEI motor (Europe) 50/60 Hz has IP 55, NEMA motor (North and South America) has TEFC⁵⁾ Pumps with European and Japanese motors have G, pumps with US (NEMA) motors have NPT

Ordering Information

SOGEVAC SV 200

50 Hz

60 Hz

	Part No.
SOGEVAC SV 200 ¹⁾ with three-phase motor, without gas ballast 230/400 V, 50 Hz and 460 V, 60 Hz (CEI) 2) 200 V, 50/60 Hz (JIS)	109 26 955 26
with three-phase motor and integrated gas ballast valve 230/400 V, 50 Hz and 460 V, 60 Hz (CEI) 2) 208–230/460 V, 60 Hz (NEMA) and [400 V, 50 Hz] 2) 200 V, 50/60 Hz (JIS)	109 27 950 27 955 27
Other voltages/frequencies ²⁾	upon request
Filling with special oil ²⁾	upon request
Accessories	
Adaptor for Roots pump ^{3), 4)} RUVAC 501 (BR 2) RUVAC 1001 (BR 2)	953 90 953 91
Mounting pedestal for fitting to a Roots pump	711 19 209
Oil level monitor ^{3), 4)}	953 96
Thermal switch ^{3), 4)}	951 36
Exhaust filter gauge, mechanical ^{3), 4)}	951 94
Exhaust filter monitoring switch, electric ³⁾	upon request
Manual gas ballast ^{3), 4)}	951 30
Gas ballast valve, electromagnetic 24 V DC ^{3), 4)}	951 31
Two gas ballast valves ³⁾	upon request
Water cooling with thermostatic valve ³⁾	upon request
Ersatzteile	
Oil filter	EK 960 06
Oil filter bypass	712 30 570
Exhaust filter cartridge (4x required) AFE SV40-SV100 / SV 180/200	710 64 763
Set of gaskets NBR (standard)	971 97 552
Set of gaskets FPM (FKM)	714 36 730
Repair kit complete	714 36 190
Pump module complete	714 36 770

¹⁾ Pumps with European and Japanese motors have G,
pumps with US (NEMA) have NPT

²⁾ IEC motor (Europe) 50/60 Hz have IP 55, NEMA motor have TEFC

³⁾ Please indicate when ordering a pump

⁴⁾ Can be retrofitted

Note: Further pump options upon request (for example, water cooled pumps)

SOGEVAC SV 300 B and 320 B



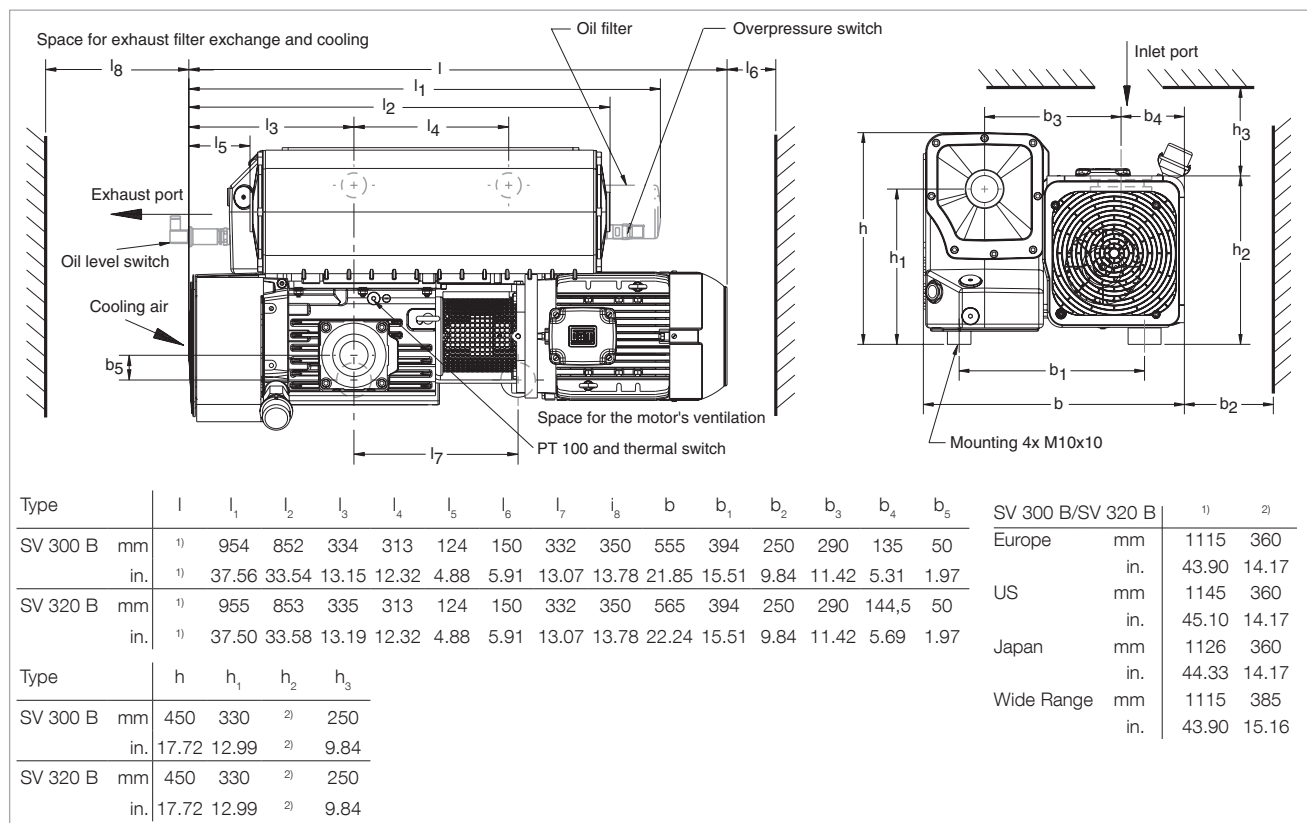
SOGEVAC SV 300 B / SV 320 B

Advantages to the User

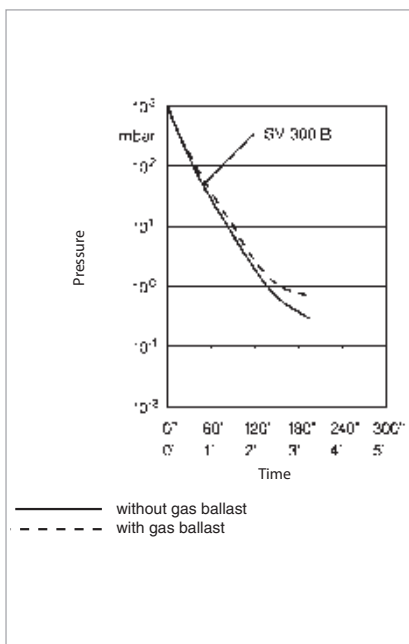
- SV 320 B provides highest pumping speed on the market
- Lowest pump temperature on the market: ideal for harsh applications. Optimal oil life time thus reached
- Integrated exhaust filters with low oil mist flow: long filter life time
- Optimized integrated lubrication without external pipes: yellow metal free as standard
- Integrated oil recovery system and anti-suckback valve
- Low noise level
- High reliability due to separate greased ball bearings (30.000 h life)
- Variant concept
- Best ultimate pressure
- Big oil volume for long oil life time

Typical Applications

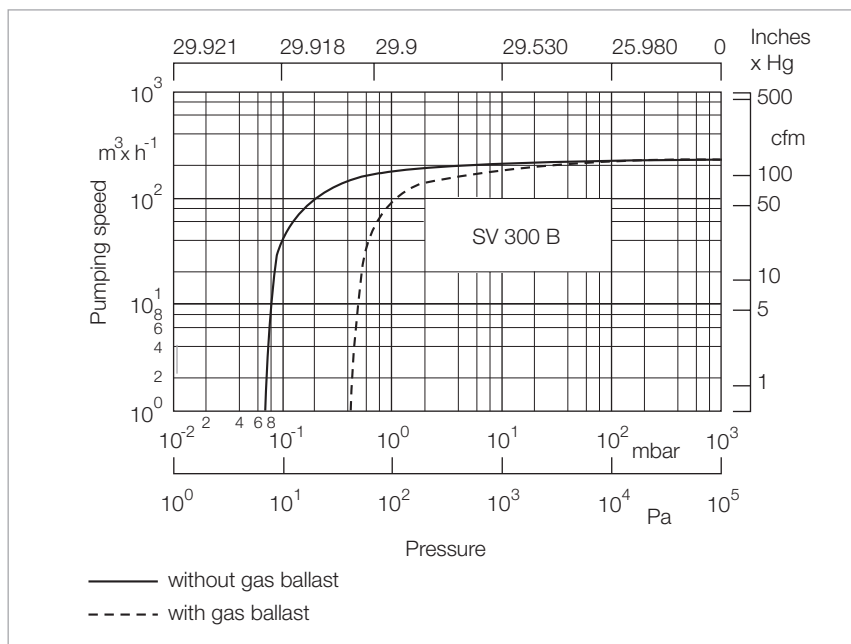
- Coating systems and load locks
- Oil purification
- Plastic & rubber injection presses
- Heat treatment / Metallurgy
- Lamination
- ATEX and O₂ applications
- and more ...



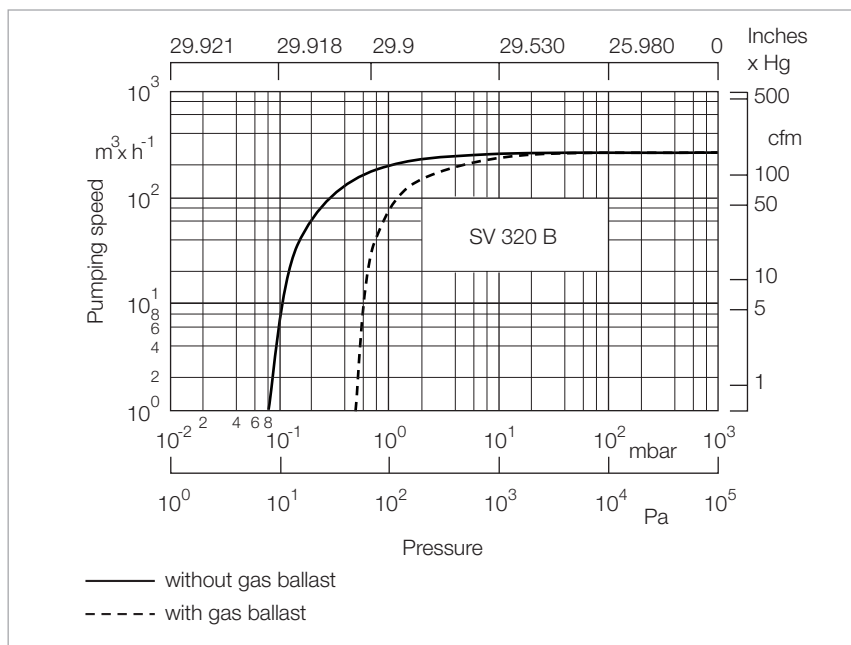
Dimensional drawing for the SOGEVAC SV 300 B/SV 320 B, European version



Pump-down characteristics of a 1000 l vessel at 50 Hz



Pumping speed characteristics of the SOGEVAC SV 300 B at 50 Hz
(60 Hz curves at the end of the chapter)



Pumping speed characteristics of the SOGEVAC SV 320 B at 50 Hz
(60 Hz curves at the end of the chapter)

Technical Data

SOGEVAC SV 300 B

		50 Hz	60 Hz
Nominal speed ¹⁾	m³/h (cfm)	280 (165)	340 (200)
Pumping speed ¹⁾	m³/h (cfm)	240 (141)	290 (171)
Ultimate total pressure without gas ballast ¹⁾	mbar (Torr)	≤ 0.08 (≤ 0.06)	
Ultimate total pressure with small gas ballast 4 Nm³/h ¹⁾	mbar (Torr)	≤ 0.5 (≤ 0.4)	
Ultimate total pressure with standard gas ballast 7.5 Nm³/h also for electromagnetic gas ballast 10 Nm³/h ¹⁾	mbar (Torr)	≤ 0.7 (≤ 0.5)	
Ultimate total pressure with big gas ballast 15 Nm³/h ¹⁾	mbar (Torr)	≤ 2.0 (≤ 1.5)	
Ultimate total pressure with 2 big gas ballasts 28 Nm³/h ¹⁾	mbar (Torr)	≤ 3.0 (≤ 2.3)	
Water vapor tolerance with small ballast 4 Nm³/h	mbar (Torr)	4 (3) with turbine 220 mm	5 (4) with turbine 220 mm
Water vapor capacity with small ballast 4 Nm³/h	kg/h (qt/hr)	0.4 (0.4) with turbine 220 mm	0.6 (0.6) with turbine 220 mm
Water vapor tolerance with standard gas ballast 7.5 Nm³/h also for electromagnetic gas ballast 10 Nm³/h ²⁾	mbar (Torr)	10.0 (7.5) with turbine 220 mm 40.0 (30.0) with turbine 150 mm ⁶⁾	12.0 (9.0) with turbine 220 mm 50.0 (37.5) with turbine 150 mm ⁶⁾
Water vapor capacity with standard gas ballast 7.5 Nm³/h also for electromagnetic gas ballast 10 Nm³/h	kg/h (qt/hr)	1.3 (1.4) with turbine 220 mm 6.0 (6.4) with turbine 150 mm ⁶⁾	1.8 (1.9) with turbine 220 mm 8.0 (8.5) with turbine 150 mm ⁶⁾
Water vapor tolerance with big gas ballast 15 Nm³/h ²⁾	mbar (Torr)	70.0 (52.5) with turbine 150 mm ⁶⁾	
Water vapor capacity with big gas ballast 15 Nm³/h ²⁾	kg/h (qt/hr)	11 (12) with turbine 150 mm ⁶⁾	14 (15) with turbine 150 mm ⁶⁾
Water vapor tolerance with 2 big gas ballasts 28 Nm³/h ²⁾	mbar (Torr)	95 (72) with turbine 150 mm ⁶⁾	
Water vapor capacity with 2 big gas ballasts 28 Nm³/h ²⁾	kg/h (qt/hr)	15 (16) with turbine 150 mm ⁶⁾	17 (18) with turbine 150 mm ⁶⁾
Noise level (according to DIN 466535) ³⁾	dB(A)	72	76
Admissible ambient temperature	°C (°F)	12 to 40 (54 to 104)	
Motor power ⁴⁾	kW (hp)	5.5 (7.5)	6.3 (8.6)
Mains voltage and frequency 3 ~ motor	V	see Ordering Information	
Nominal speed	min ⁻¹ (rpm)	1500 (1500)	1800 (1800)
Type of protection	IP	55	
Isolation class 3 ~ motor		F	
Leak rate	mbar x l/s	≤ 1 x 10 ⁻³	
Oil capacity, min. / max.	l (qt)	8.5 (9.0) / 11.5 (12.2)	
Weight (with oil filling)	kg (lbs)	223 (493)	225 (497)
Connections ⁵⁾			
Intake, Thread	G or NPT	2"	2"
Exhaust, Thread	G or NPT	2"	2"

¹⁾ To DIN 28 400 and following numbers

²⁾ Ordering Information see Chapter "Accessories"

³⁾ Operated at the ultimate pressure without gas ballast, free-field measurement at a distance of 1 m (3.5 ft)

⁴⁾ Versions with NEMA motor have 10 hp motors

⁵⁾ Pumps with European and Japanese motors have G, pumps with US (NEMA) motors have NPT

⁶⁾ Standard turbine 220 mm. Special turbine 150 mm can be retrofitted

Technical Data**SOGEVAC SV 320 B**

		50 Hz	60 Hz
Nominal speed ¹⁾	m³/h (cfm)	330 (194)	385 (227)
Pumping speed ¹⁾	m³/h (cfm)	284 (167)	330 (194)
Ultimate total pressure without gas ballast ¹⁾	mbar (Torr)	≤ 0.08 (≤ 0.06)	≤ 0.08 (≤ 0.06)
Ultimate total pressure with standard gas ballast ¹⁾	mbar (Torr)	≤ 0.7 (≤ 0.05)	≤ 0.7 (≤ 0.05)
Water vapor tolerance with standard gas ballast	mbar (Torr)	10 (7.5)	10 (7.5)
Water vapor capacity with standard gas ballast ¹⁾	kg/h (qt/hr)	1.3 (1.3)	1.8 (1.8)
Noise level (according to DIN 466535) ²⁾	dB(A)	70	73
Admissible ambient temperature	°C (°F)	+10 to +50 (+50 to +122)	+10 to +50 (+50 to +122)
Motor power	kW (hp)	6.0 (8.0)	7.5 (10.2)
Mains voltage and frequency 3 ~ motor	V	see Ordering Information	see Ordering Information
Weight (with oil filling)	kg (lbs)	211 (465.18)	211 (465.18)
Connections			
Intake, Thread	G	2"	2"
Exhaust, Thread	G	2"	2"

¹⁾ To DIN 28 400 and following numbers

²⁾ Operated at the ultimate pressure without gas ballast, free-field measurement at a distance of 1 m (3.5 ft)

Ordering Information

SOGEVAC SV 300 B

50 Hz

60 Hz

	Part No.
SOGEVAC SV 300 B ¹⁾ with oil filter with three-phase motor, without gas ballast, 230/400 V $\pm 10\%$, 50 Hz and 460 V $\pm 10\%$, 60 Hz (CEI) ²⁾	960 700
with small gas ballast, 230/400 V $\pm 10\%$, 50 Hz and 460 V $\pm 10\%$, 60 Hz (CEI) ²⁾	960 701
208 V $\pm 10\%$, 230/460 V $\pm 10\%$, 60 Hz and 400 V $\pm 10\%$, 50 Hz (NEMA) ²⁾	960 706
200 V $+10\%/-15\%$, 50/60 Hz (JIS) ¹⁾	960 711 V
with standard gas ballast, 230/400 V $\pm 10\%$, 50 Hz and 460 V $\pm 10\%$, 60 Hz (CEI) ²⁾	960 702
208 V $\pm 10\%$, 230/460 V $\pm 10\%$, 60 Hz and 400 V $\pm 10\%$, 50 Hz (NEMA) ²⁾	960 707
200 V $+10\%/-15\%$, 50/60 Hz (JIS) ¹⁾	960 712
with big gas ballast, 230/400 V $\pm 10\%$, 50 Hz and 460 V $\pm 10\%$, 60 Hz (CEI) ²⁾	960 703 ³⁾
208 V $\pm 10\%$, 230/460 V $\pm 10\%$, 60 Hz and 400 V $\pm 10\%$, 50 Hz (NEMA) ²⁾	960 708 ³⁾
200 V $+10\%/-15\%$, 50/60 Hz (JIS) ¹⁾	960 713 V ³⁾
with Wide range motor, 200 V -15% bis 230 V $+10\%$ / 380 bis 400 V $\pm 10\%$, 50 Hz, CTP; 5,5 kW & 200 V -15% bis 230 V $+10\%$ / 380 bis 400 V $\pm 10\%$ and 460 V $\pm 10\%$, 60 Hz, CTP; 6,6 kW	
with small gas ballast	960 716 V ⁴⁾
with standard gas ballast	960 717 ⁴⁾
with big gas ballast	960 718 ^{3, 4)}

¹⁾ Pumps with European and Japanese motors have G, pumps with US (NEMA) have NPT

²⁾ IEC motor (Europe) 50/60 Hz have IP 55, NEMA motor have TEFC without terminal board

³⁾ With small 150 mm turbine

⁴⁾ F and P inlet

Full option oil box with connections (bores and plugs) for

- G 3/8" for external oil filtration

- oil level sensor (vibration)

- thermostatic valve

- temperature sensor Pt100 and switch

Note: Further pump options upon request (for example, water cooled pumps)

Ordering Information

SOGEVAC SV 300 B

50 Hz

60 Hz

	Part No.
Accessories	
Adaptor for Roots pump ^{1), 2)} RUVAC 501 (BR 2) RUVAC 1001 (BR 2)	971 463 880 971 463 890
Mounting pedestal for fitting to a Roots pump	971 456 590
Oil level monitor ^{1), 3)} (several types are available)	712 21 992V or 971 458 110 (yellow metal free)
Thermal switch (105 °C) ^{2), 3)}	971 463 930
Pt100 sensor ²⁾	971 464 020
Exhaust filter gauge, mechanical ^{1), 2)}	951 94
Exhaust filter monitoring switch, electric ^{1), 3)}	712 22 360
Manual gas ballast kit ²⁾ (incl. small, standard and big)	971 464 130
Gas ballast valve, electromagnetic 24 V DC ^{1), 2)} with end plate without end plate	971 465 380 971 465 680
Two gas ballast valves ¹⁾	upon request
Water cooling with thermostatic valve only with all option oil casing ³⁾	EK 971 449 111
Oil filter bypass ^{1), 2)}	712 30 570
Spare Parts	
Oil filter	EK 960 06
Exhaust filter cartridge (3x required) AFE SV 300 B – SV 750 B	971 431 120
Set of gaskets FPM (FKM) (standard)	971 464 950
Repair kit	971 464 960
Maintenance kit	971 464 970
Generator kit G 2" NPT 2"	971 447 390 971 458 970
Turbine 150 mm kit ^{2), 3)}	EK 650 3 195

¹⁾ Please indicate when ordering a pump²⁾ Can be retrofitted³⁾ Can be retrofitted by Leybold Service

Ordering Information

SOGEVAC SV 320 B

50 Hz

60 Hz

	Part No.
SOGEVAC SV 320 B with three-phase motor IEC, with integrated gas ballast valve, air cooled, mineral oil 230/400 V $\pm 10\%$, 50 Hz and 460 V $\pm 10\%$, 60 Hz	960 722V
with integrated gas ballast valve, water cooled, mineral oil 230/400 V $\pm 10\%$, 50 Hz and 460 V $\pm 10\%$, 60 Hz	960 722V2002
with wide range motor, with integrated gas ballast valve, air cooled, mineral oil 200V -15% ... 230V +10% / 380 ... 400 V $\pm 10\%$, 50Hz und 200V -15% ... 230V +10% / 380 ... 400 V $\pm 10\%$ & 460 $\pm 10\%$, 60Hz	960 732V
with integrated gas ballast valve, water cooled, mineral oil 200V -15% ... 230V +10% / 380 ... 400 V $\pm 10\%$, 50Hz und 200V -15% ... 230V +10% / 380 ... 400 V $\pm 10\%$ & 460 $\pm 10\%$, 60Hz	960 732V2002
with three-phase motor IEC, with integrated gas ballast valve, air cooled, food grade oil 230/400 V $\pm 10\%$, 50 Hz and 460 V $\pm 10\%$, 60 Hz	960 722FP
with integrated gas ballast valve, water cooled, food grade oil 230/400 V $\pm 10\%$, 50 Hz and 460 V $\pm 10\%$, 60 Hz	960 722FP2002
Accessories	
Adaptor for Roots pump ^{1), 2)} RUVAC 501 (BR 2) RUVAC 1001 (BR 2)	971 463 880 971 463 890
Mounting pedestal for fitting to a Roots pump	971 456 590
Oil level monitor ^{1), 3)} (several types are available)	712 21 992V or 971 458 110 (yellow metal free)
Thermal switch (105 °C) ^{2), 3)}	971 463 930
Pt100 sensor ²⁾	971 464 020
Exhaust filter monitoring switch, mechanical ^{1), 2)}	951 94
Exhaust filter monitoring switch, electric ^{1), 3)}	712 22 360
Manual gas ballast kit ²⁾ (incl. small, standard and big)	971 464 130
Gas ballast valve, electromagnetic 24 V DC ^{1), 2)} without end plate	971 465 680
Oil filter bypass ^{1), 2)}	712 30 570
Spare Parts	
Oil filter	EK 960 06
Exhaust filter cartridge (3x required) AFE SV 300 B – SV 750 B	971 431 120
Set of gaskets FPM (FKM) (standard)	EK96022SK
Repair kit	EK96072RES
Maintenance kit	971 464 970

¹⁾ Please indicate when ordering a pump

²⁾ Can be retrofitted

³⁾ Can be retrofitted by Leybold Service

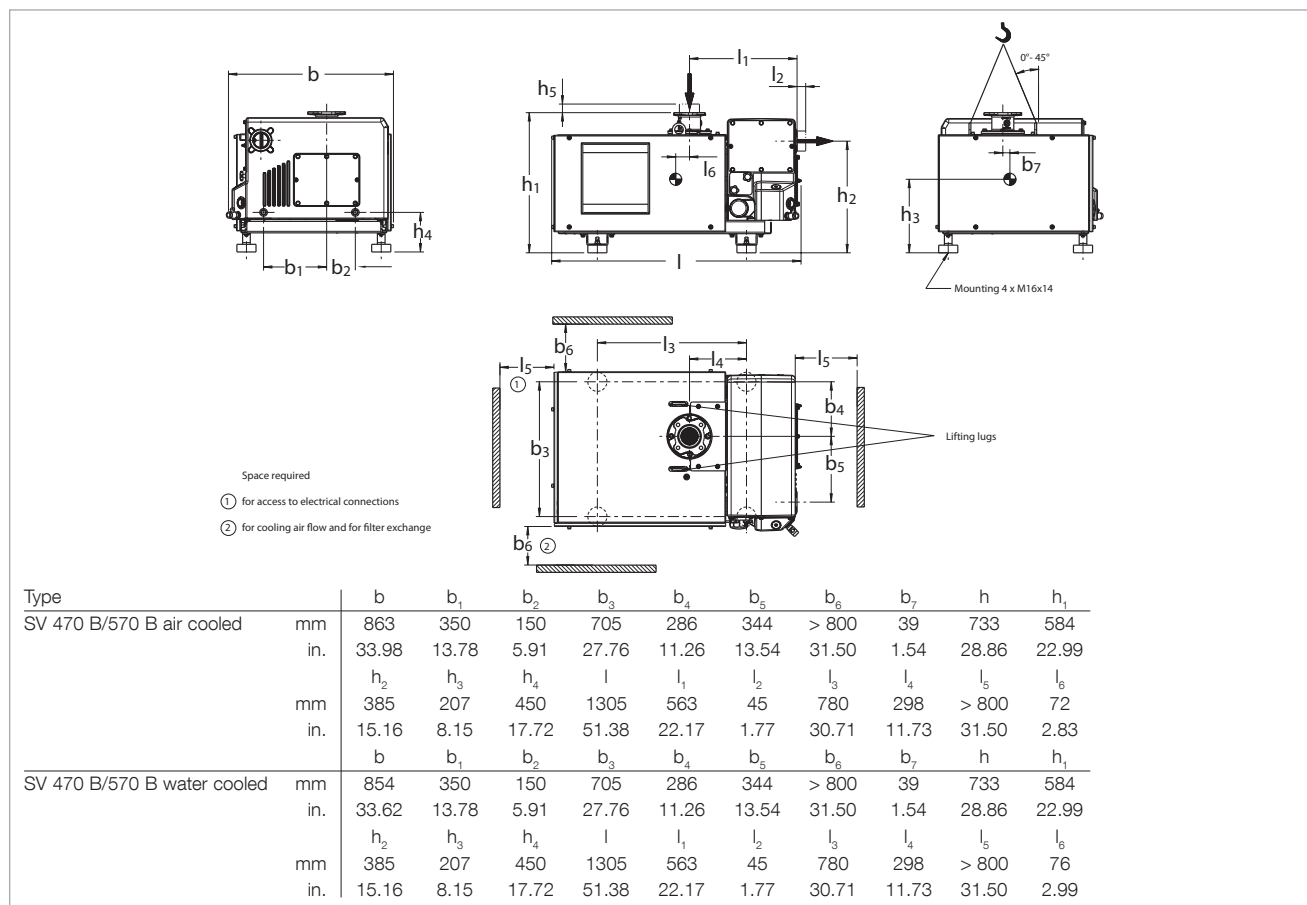
SOGEVAC SV 470 B(F) and SV 570 B(F)



SOGEVAC SV 470 B and 570 B

Advantages to the User

- Very low rotational speed increases the lifetime of the pump and leads to noise level reduction
- Extremely low noise level in any working conditions
- Reduced number of oil pipes
- Reduced operational costs
- Long lifetime of oil and exhaust filters
- Simplified maintenance thanks to an easy access to all key components
- Small size
- Air or water-cooling and many motors and options available
- Competitive price-to-performance ratio
- Adaptors for direct mounting of Roots pumps (RUVAC WH 700 to 2500)
- ATTEX IIC T3 Cat. 3 version internal/external possible
- PFPE versions available



Dimensional drawing for the SOGEVAC SV 470 B and 570 B

Technical Data

SOGEVAC SV 470 B(F)

SOGEVAC SV 570 B(F)

			50 Hz	60 Hz	50 Hz
Nominal speed ¹⁾	m ³ /h (cfm)		470 (277)	570 (366)	570 (366)
Pumping speed ¹⁾	m ³ /h (cfm)		400 (236)	470 (277)	470 (277)
Ultimate total pressure without gas ballast ¹⁾	mbar (Torr)		0,08 (0.06)		
Ultimate total pressure with 1 gas ballast ¹⁾	mbar (Torr)		(0.5)		
2 gas ballast valves ¹⁾	mbar (Torr)		2.0 (1.5)		
Water vapor tolerance ¹⁾					
1 gas ballast ^{1), 2)}	mbar (Torr)		15.0 (11.0)	20.0 (15.0)	20.0 (15.0)
2 gas ballast valves ^{1), 2)}	mbar (Torr)		40.0 (30.0)	50.0 (38.0)	50.0 (38.0)
Max. zulässige Wasserdampfkapazität					
1 gas ballast ^{1), 2)}	kg/h (qt/hr)		5.0 (5.3)	7.5 (8.0)	7,5
2 gas ballast valves ^{1), 2)}	kg/h (qt/hr)		13.0 (14.0)	17.0 (18.0)	17.0 (18.0)
Oil filling, min. / max.	l (qt)		20 / 21		
Noise level (averaged) ³⁾	dB(A)		72	75 (72 for BF pumps)	75 (72 for BF pumps)
Admissible ambient temperature	°C (°F)		12 to 40 (54 to 104)		
Nominal motor speed	min ⁻¹ (rpm)		820 (820)	1000 (1000)	1000 (1000)
Type of protection	IP		55-F		
Cooling			Air (Water at BF variants)		
Temperature protection					
Pump			yes		
Motor PTC			yes		
Water quality	TH		(4 to 8 at BF variants)		
Water pressure, min. / max.	bar (psig)		(2 to 8 at BF variants)		
Materials (materials in contact with the gas)			Steel, cast iron, Aluminium, FPM (FKM), Glass, Polyamid 6.6, Filter material (Polymers, Paper), Epoxy resin & Glass fibre		
Dimensions (L x W x H)	mm (in.)		1305 x 863 x 733 ⁴⁾ (51.38 x 33.98 x 28.86)		
Connection ⁴⁾					
Intake side	Europe / US	G or NPT	3"		
Pressure side	Europe / US	G or NPT	3"		

¹⁾ To DIN 28 400 and following numbers, with standard gas ballast

²⁾ Please ask Leybold for more information about water cooled pumps

³⁾ Operated at the ultimate pressure without gas ballast, free-field measurement at a distance of 1 m (3.5 ft)

⁴⁾ With G 3" flanges. NPT 3" flanges add. 45 mm (1.8 in.) on pump length and height

Additional Technical Data

Air Cooling

		SOGEVAC SV 470 B(F)	SOGEVAC SV 570 B(F)
		50 Hz	60 Hz
		50 Hz / 60 Hz?	
Water vapor tolerance with ¹⁾			
1 gas ballast ^{1), 2)}	mbar (Torr)	15 (11)	20 (15)
2 gas ballast valves ^{1), 2)}	mbar (Torr)	40 (30)	50 (37.5)
Max. perm. water vapor capacity with			
1 gas ballast ^{1), 2)}	kg/h (qt/hr)	5.0 (5.3)	7.5 (8.0)
2 gas ballast valves ^{1), 2)}	kg/h (qt/hr)	13.0 (13.8)	17.0 (18.0)
Gemittelter Schalldruckpegel ³⁾	dB(A)	72	75

¹⁾ To DIN 28 400 and following numbers, with standard gas ballast

²⁾ Please ask Leybold for more information

³⁾ Operated at the ultimate pressure without gas ballast, free-field measurement at a distance of 1 m (3.5 ft)

Additional Technical Data

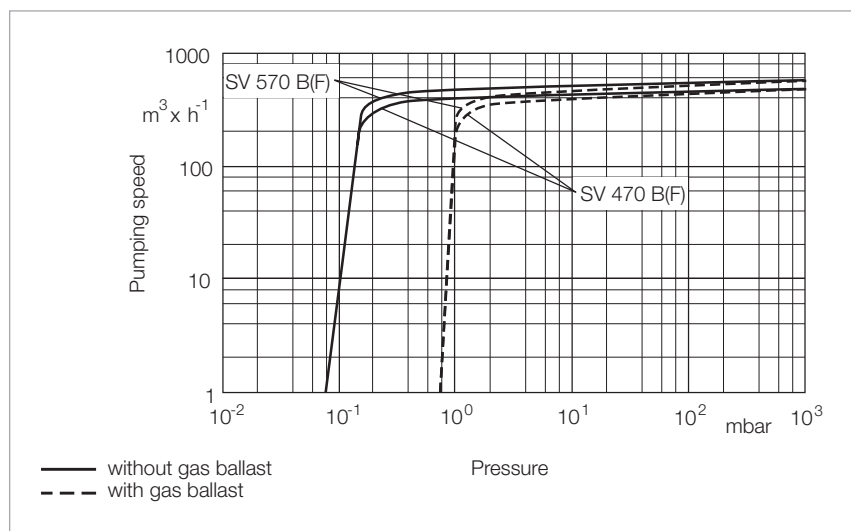
Water Cooling

		SOGEVAC SV 470 B(F)	SOGEVAC SV 570 B(F)
		50 Hz	60 Hz
		50 Hz / 60 Hz?	
Water vapor tolerance with ¹⁾			
1 gas ballast ^{1), 2)}	mbar (Torr)	15 (11)	20 (15)
mit 2 Gasballastventilen ^{1), 2)}	mbar (Torr)	35 (26)	40 (30)
Max. perm. water vapor capacity with			
1 gas ballast ^{1), 2)}	kg/h (qt/hr)	5.0 (5.3)	7.5 (8.0)
2 gas ballast valves ^{1), 2)}	kg/h (qt/hr)	11.0 (11.7)	13.0 (13.8)
Mean noise level ³⁾	dB(A)	72	
Thermostatic valve		Pos 3	
Water quality	TH (°F)	4-8	
Water pressure, min. / max.	bar (psi)	2 / 8 (29 / 114)	
Min. water flow			
for 10 °C (50 °F) water warming	l/h	700	800

¹⁾ To DIN 28 400 and following numbers, with standard gas ballast

²⁾ Please ask Leybold for more information

³⁾ Operated at the ultimate pressure without gas ballast, free-field measurement at a distance of 1 m (3.5 ft)



Pumping speed characteristics of the SOGEVAC SV 470 B(F) and 570 B(F) at 50 Hz operation
(60 Hz curves at the end of the chapter)

Ordering Information

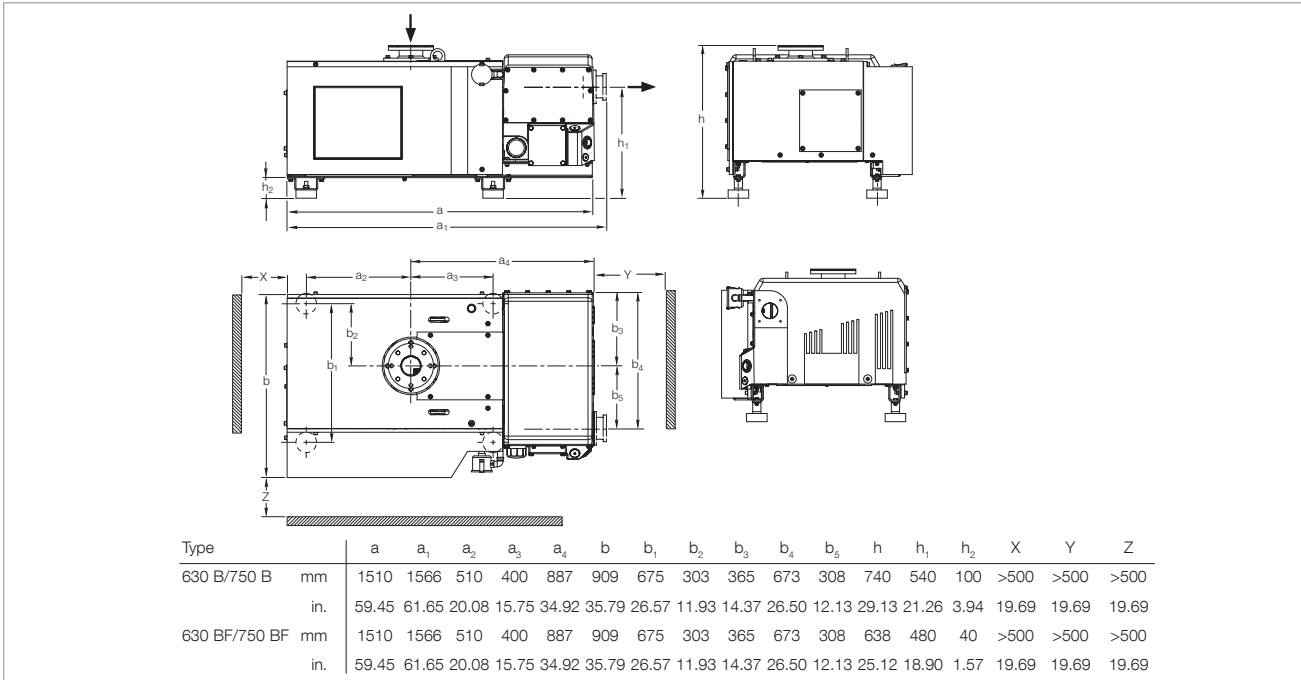
SOGEVAC

	SV 470 B	SV 470 BF	SV 570 B	SV 570 BF
	Part No.	Part No.	Part No.	Part No.
SOGEVAC SV ... B				
Three-phase Europe motor 230 V / 400 V, 50 Hz and 460 V, 60 Hz	960 753V	960 757V	-	-
Three-phase Europe motor 230 V / 400 V, 50 Hz	-	-	960 765V	960 767V
Three-phase world motor 230 V / 400 V, 50 + 60 Hz / 460 V, 60 Hz 230 V / 400 V, 50 Hz	960 754V -	960 758V -	- 960 766V	- 960 768V
NEMA Premium-Version 400 V ±10%, 50 Hz, 15 hp / 200-230 V ±10%, 60 Hz; 460 V ±10%, 60 Hz, 15 hp with terminal board	-	-	960 755V	960 759V
Accessories				
Adapter for Roots pump				
RUVAC 700	9516 241V	9516 241V	9516 241V	9516 241V
RUVAC 1001	9516 242V	9516 242V	9516 242V	9516 242V
RUVAC 2001	9516 243V	9516 243V	9516 243V	9516 243V
RUVAC WHU 2500	9516 244V	9516 244V	9516 244V	9516 244V
Oil drain valve	Standard	Standard	Standard	Standard
EM gas ballast kit, 24 V DC	971 438 170	971 438 170	971 438 170	971 438 170
Gas ballast standard				
manuell	9516 232V	9516 232V	9516 232V	9516 232V
permanent	9516 233V	9516 233V	9516 233V	9516 233V
2nd gas ballast valve				
EM, 24 V DC	9516 234V	9516 234V	9516 234V	9516 234V
manual	9516 235V	9516 235V	9516 235V	9516 235V
Exhaust filter monitoring gauge	951 94	951 94	951 94	951 94
Oil level check	9516 252V	9516 252V	9516 252V	9516 252V
Temperature switch	Standard	Standard	Standard	Standard
Water cooling with thermostatic valve	Upon request	Upon request	Upon request	Upon request
Exhaust filter overpressure switch	712 22 360	712 22 360	712 22 360	712 22 360
Oil filter bypass	712 36 390	712 36 390	712 36 390	712 36 390
Spare Parts				
Oil filter, standard	EK 960 08	EK 960 08	EK 960 08	EK 960 08
Exhaust filter AFE SV630/SV750B/SV300B (5 pieces are required)	971 431 120	971 431 120	971 431 120	971 431 120
Intake filter element				
Paper	710 35 242	710 35 242	710 35 242	710 35 242
Metal	E 710 37 734	E 710 37 734	E 710 37 734	E 710 37 734
Activated charcoal	710 37 724	710 37 724	710 37 724	710 37 724
Polyester	712 61 508	712 61 508	712 61 508	712 61 508
Seal kit FPM (FKM)	EK971474010	EK971474010	EK971474010	EK971474010
Repair kit, complete	EK971474020	EK971474020	EK971474020	EK971474020
Generator kit	EK6700666	EK6700666	EK6700666	EK6700666
Maintenance kit	EK971474000	EK971474000	EK971474000	EK971474000

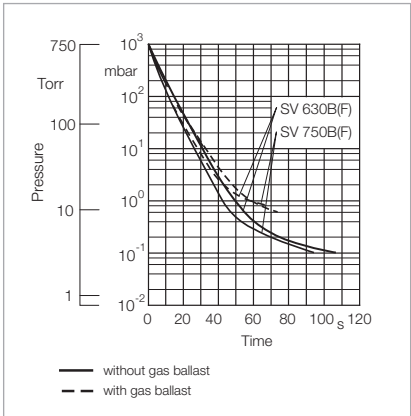
SOGEVAC SV 630 B/630 BF/750 B/750 BF



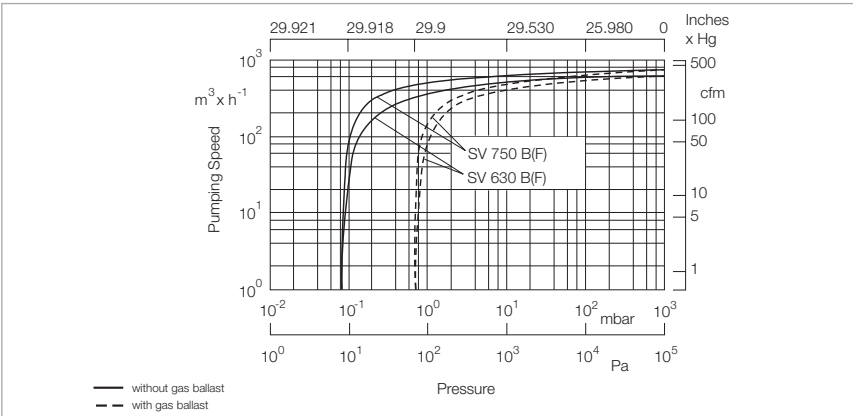
SOGEVAC SV 630 B



Dimensional drawing for the SOGEVAC SV 630 B, SV 630 BF, 750 B and 750 BF



Pumpdown curve for a 1000 l vessel for 50 Hz pump operation



Pumping speed characteristics of the SOGEVAC SV 630 B(F) and 750 B(F) (60 Hz curves at the end of the chapter)

Technical Data

			SOGEVAC SV 630 B		SOGEVAC SV 630 BF		SOGEVAC SV 750 B/BF
			50 Hz	60 Hz	50 Hz	60 Hz	50 Hz
Nominal speed ¹⁾	m ³ /h (cfm)		700 (412.0)	840 (494.4)	700 (412.0)	840 (494.4)	840 (494.4)
Pumping speed ¹⁾	m ³ /h (cfm)		640 (376.7)	755 (444.4)	640 (376.7)	755 (444.4)	755 (444.4)
Ultimate total pressure without gas ballast ¹⁾	mbar (Torr)		< 8 x 10 ⁻² (< 6 x 10 ⁻²)				
Ultimate total pressure with 1 gas ballast ¹⁾	mbar (Torr)		≤ 0,7 (≤ 0.5)				
with 2 gas ballast valves ¹⁾	mbar (Torr)		≤ 2 (≤ 1.5)				
Water vapor tolerance ¹⁾							
with 1 gas ballast ^{1), 2)}	mbar (Torr)		40.0 (30.0)	50.0 (37.5)	25.0 (18.8)	30.0 (22.5)	50.0 (37.5)
with 2 gas ballast valves ^{1), 2)}	mbar (Torr)		60.0 (45.0)	70.0 (52.5)	35.0 (26.3)	40.0 (30.0)	70.0 (52.5)
Max. zulässige Wasserdampfkapazität							
with 1 gas ballast ^{1), 2)}	kg/h (qt/hr)		17.0 (18.0)	24.0 (25.4)	11.0 (11.6)	14.0 (14.8)	24.0 (25.4)
with 2 gas ballast valves ^{1), 2)}	kg/h (qt/hr)		26.0 (27.5)	34.0 (35.9)	15.0 (15.9)	19.0 (20.1)	34.0 (35.9)
Gesteuertes Saugstutzenventil 24 V DC			–	–	yes	yes	–
Oil filling min. / max.	l		20 / 23				
Noise level (averaged) ³⁾	dB(A)		72	75	72	75	75
Admissible ambient temperature	°C (°F)		12 to 40 (54 to 104)				
Motor power	kW (hp)		15.0 (20.2)	18.5 (25.0)	15.0 (20.2)	18.5 (25.0)	18.5 (25.0)
Nominal speed pump	min ⁻¹ (rpm)		820 (820)	1000 (1000)	820 (820)	1000 (1000)	1000 (1000)
Type of protection	IP		55-F				
Cooling			air	air	water	water	air / water
Thermostatic valve			no	no	yes	yes	no / yes
Temperature protection							
Pump			no	no	yes	yes	no / yes
Motor PTC			no	no	yes	yes	no / yes
Water quality	TH		–	–	4 to 8	4 to 8	–
Water pressure, min. / max.	bar (psig)		–	–	2/8 (29/114)	2/8 (29/114)	–
Materials (materials in contact with the gas)			Steel, cast iron, Aluminium, FPM (FKM), Glass, Polyamid 6.6, Filter material (Polymers, Paper), Epoxy resin & Glass fibre				
Net weight (with oil filling)	kg (lbs)		730 (1611)	760 (1678)	730 (1611)	760 (1678)	750 (1656)
Dimensions (L x W x H)	mm (in.)		1510 x 909 x 740 (59.45 x 35.79 x 29.13)	1510 x 909 x 740 (59.45 x 35.79 x 29.13)	1566 x 638 x 909 (61.65 x 25.12 x 35.79)	1566 x 638 x 909 (61.65 x 25.12 x 35.79)	1510 x 909 x 740 (59.45 x 35.79 x 29.13)
Connection							
Intake	EUROPE / US	DN	100 PN 10 / 100 ISO-K	100 PN 10 / 100 ISO-K	DIN 160 Roots adapter 100 ISO-K	DIN 160 Roots adapter 100 ISO-K	100 PN 10 / 100 ISO-K
Exhaust	EUROPE / US	DN	Option ⁴⁾	Option ⁴⁾			Option

¹⁾ To DIN 28 400 and following numbers, with standard gas ballast

²⁾ Please ask Leybold for more information

³⁾ Operated at the ultimate pressure without gas ballast, free-field measurement at a distance of 1 m (3.5 ft)

⁴⁾ 77 mm exhaust with 4 x M10 holes on 145 mm circle.

Ordering Information

	SV 630 B 50/60 Hz	SOGEVAC SV 630 BF 50/60 Hz	SV 750 B/BF 50 Hz
	Part No.	Part No.	Part No.
SOGEVAC SV 630 B with three-phase motor NEMA) 400 V, 50 Hz and 230/460 V, 60 Hz w/o terminal board	960 865	-	-
380/400/415/690 V, 50 Hz and 440/460 V, 60 Hz	960 863	-	-
200 V, 50 Hz (JIS) and 200 V, 60 Hz	960 862	-	-
SOGEVAC SV 630 BF with three-phase motor (NEMA) 400 V, 50 Hz and 230/460 V, 60 Hz w/o terminal board	-	960 869	-
380/400/415/690 V, 50 Hz and 440/460 V, 60 Hz	-	960 867	-
200 V, 50 Hz (JIS) and 200 V, 60 Hz	-	960 866	-
SOGEVAC SV 750 B with three-phase motor 380/400/415/690 V, 50 Hz	-	-	960 875
SOGEVAC SV 750 BF with three-phase motor 380/400/415/690 V, 50 Hz	-	-	960 877
Other voltages/frequencies	upon request	upon request	upon request
Filling with special oil	upon request	upon request	upon request

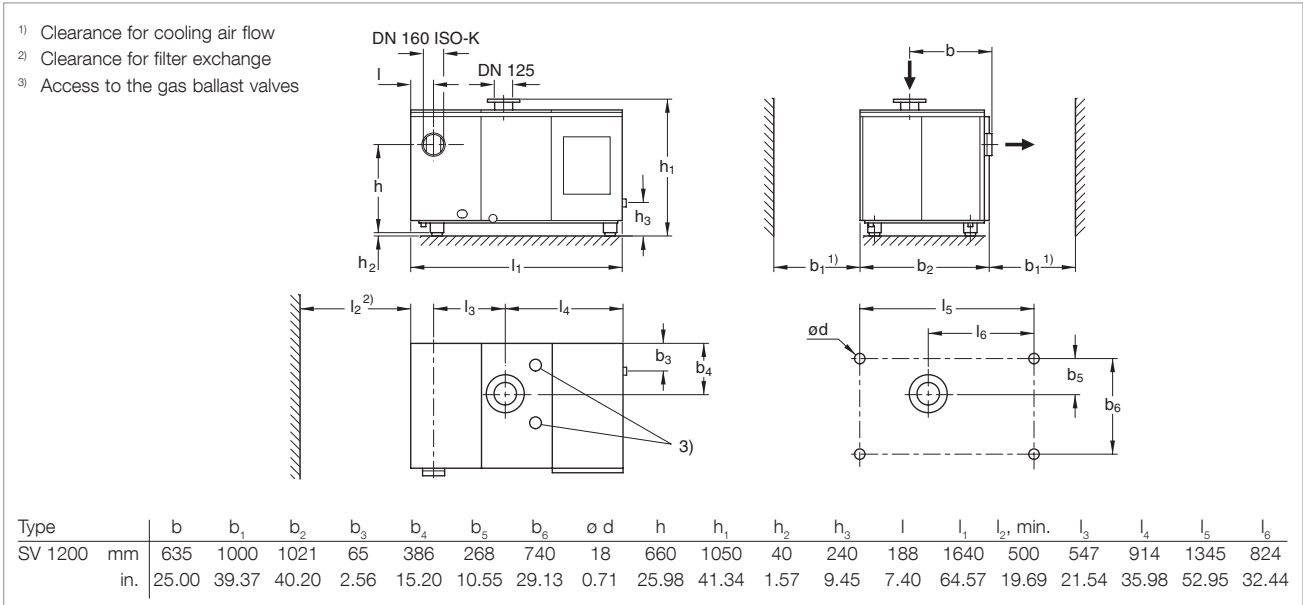
Ordering Information

	SV 630 B 50/60 Hz	SOGEVAC SV 630 BF 50/60 Hz	SV 750 B/BF 50 Hz
	Part No.	Part No.	Part No.
Accessories			
Adapter for Roots pump			
RUVAC 1000	971 432 340	971 432 340	971 432 340
RUVAC 2000	971 432 350	Standard	971 432 350
RUVAC 2000	971 43 WH4400	971 43 WH4400	971 43 WH4400
Oil drain valve	711 30 114	Standard	711 30 114
Gas ballast kit			
electromagnetic, 24 V DC	971 438 170	Standard	971 438 170
Gas ballast, standard			
manual	Standard	971 446 490	971 446 490
2nd gas ballast valve			
electromagnetic, 24 V DC	-	971 438 160	-
manual	971 438 340	-	971 438 340
Exhaust filter monitoring gauge	951 94	951 94	951 94
Oil level check	971 425 760	971 425 760	971 425 760
Temperature switch	Standard	Standard	Standard
Water cooling with thermostatic valve	upon request	Standard	upon request
Intake kit DN 100 ISO-K	Standard	971 430 550	Standard
Exhaust filter overpressure switch	712 22 360	712 22 360	712 22 360
Oil filter bypass	712 36 390	712 36 390	712 36 390
Exhaust kit DN 100 PN 10 – 100 ISO-K	971 438 540	Standard	971 438 540 for B version, standard on SV 750 BF
Spare Parts			
Oil filter, standard	EK 960 08	EK 960 08	EK 960 08
Exhaust filter AFE SV630/SV750B/SV300B (8 are required)	971 431 120	971 431 120	971 431 120
Intake filter element			
Paper	710 35 242	710 35 242	710 35 242
Metal	E 710 37 734	E 710 37 734	E 710 37 734
Activated charcoal	710 37 724	710 37 724	710 37 724
Polyester	712 61 508	712 61 508	712 61 508
Seal kit FPM	971 437 310	971 437 310	971 437 310
Repair kit, complete	971 437 320	971 437 320	971 437 320
Generator kit	971 437 330	971 437 330	971 437 330
Maintenance kit	971 437 340	971 437 340	971 437 340

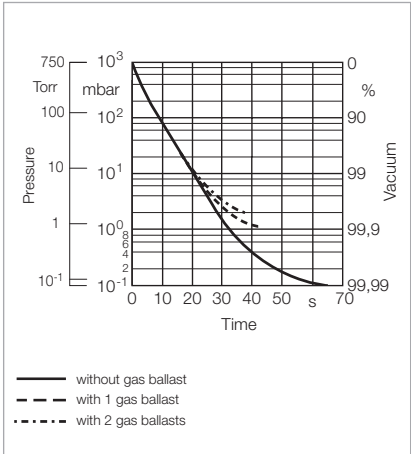
SOGEVAC SV 1200



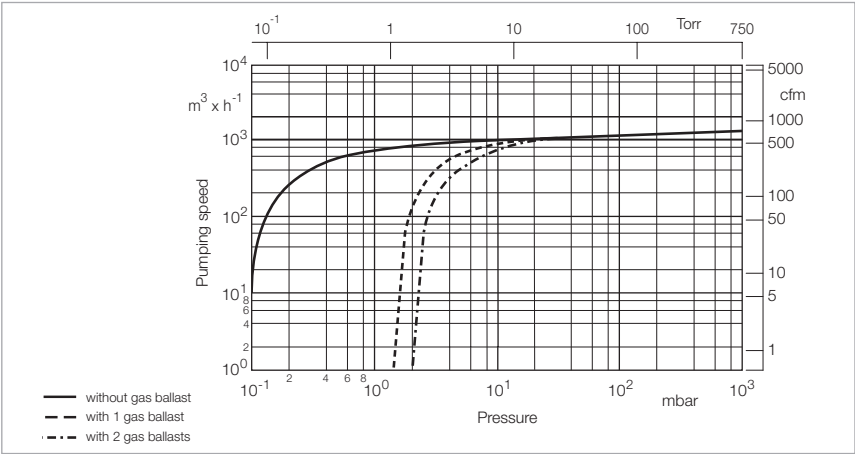
SOGEVAC SV 1200



Dimensional drawing for the SOGEVAC SV 1200



Pump-down characteristics of a 1000 l vessel at 50 Hz



Pumping speed characteristics of the SOGEVAC SV 1200 at 50 and 60 Hz

Technical Data

SOGEVAC SV 1200

50 Hz

60 Hz

Nominal speed ¹⁾	m ³ /h (cfm)	1150 (677)	
Pumping speed ¹⁾	m ³ /h (cfm)	1070 (630)	
Ultimate total pressure without gas ballast ¹⁾	mbar (Torr)	≤ 0.1 (≤ 0.08)	
Ultimate total pressure with 1 gas ballast ¹⁾	mbar (Torr)	≤ 1.5 (≤ 1.1)	
with 2 gas ballasts ²⁾	mbar (Torr)	≤ 2.0 (≤ 1.5)	
Water vapor tolerance with 1 gas ballast ¹⁾	mbar (Torr)	20.0 (15.0)	
with 2 gas ballasts ²⁾	mbar (Torr)	40.0 (30.0)	
Water vapor capacity with 1 gas ballast ¹⁾	kg/h (qt/hr)	12.5 (13.0)	
with 2 gas ballasts ²⁾	kg/h (qt/hr)	25.0 (26.0)	
Oil capacity, min. / max.	l (qt)	60 (63) / 70 (74)	
Noise level ³⁾	dB(A)	75	
Admissible ambient temperature	°C (°F)	12 to 40 (54 to 104)	
Motor power	kW (hp)	22 (30)	
Nominal motor speed / Pump rated rotational speed	min ⁻¹ (rpm)	1460 (1460) / 700 (700)	1750 (1750) / 700 (700)
Type of protection	IP	55-F	55-F/TEFC ⁴⁾
Weight (with oil filling)	kg (lbs)	1450 (3200)	1500 (3311)
Dimensions (L x W x H)	mm (in.)	1640 x 1021 x 1050 (64.57x 40.20 x 41.34)	
Connection			
Intake	DN	125 PN 10	ASA 150 - 6" ⁵⁾
Exhaust	DN	160 ISO-K	ASA 150 - 6" ⁵⁾
Option ⁶⁾	DN	125 PN 10	—

¹⁾ To DIN 28 400 and following numbers

²⁾ With 2 gas ballasts

³⁾ Operated at the ultimate pressure without gas ballast, free-field measurement at a distance of 1 m (3.5 ft)

⁴⁾ CEI motor (Europe) 50/60 Hz has IP 54, NEMA motor (North and South America) has TEFC

⁵⁾ For NEMA pumps

⁶⁾ Please indicate when ordering a pump

Note: Further pump options upon request (for example, water cooled pumps)

Ordering Information

SOGEVAC SV 1200

50 Hz

60 Hz

	Part No.
SOGEVAC SV 1200 with three-phase motor, integrated gas ballast valves, air-cooled and over-temperature switch 400 V, 50 Hz (CEI) ¹⁾	109 70
208–230/460 V, 60 Hz (NEMA)	950 70
Other voltages/frequencies ²⁾	upon request
Filling with special oil ²⁾	upon request
Accessories	
Adaptor for Roots pump ^{2), 3)} RUVAC 2001	953 37
RUVAC 3001	953 38
RUVAC WH 4400/7000	953 3WH
Water cooling with thermostatic valve ²⁾	upon request
Oil level monitor ^{2), 3)}	953 99
Exhaust filter monitoring switch electric ²⁾	712 22 360
Spare Parts	
Oil filter	EK 960 09
Oil filter bypass	712 36 390
Exhaust filter cartridge (14x required) AFE SV280/SV 300-SV1200	710 64 773
Set of gaskets NBR (standard)	971 96 681
Set of gaskets FPM (FKM)	712 36 060
Repair kit complete (50 Hz)	712 34 800
Pump module complete (50 Hz)	712 34 820

¹⁾ Junction box with six terminals for star/delta circuit

²⁾ Please indicate when ordering a pump

³⁾ Can be retrofitted

Note: Further pump options upon request

SOGEVAC SV 28 BI



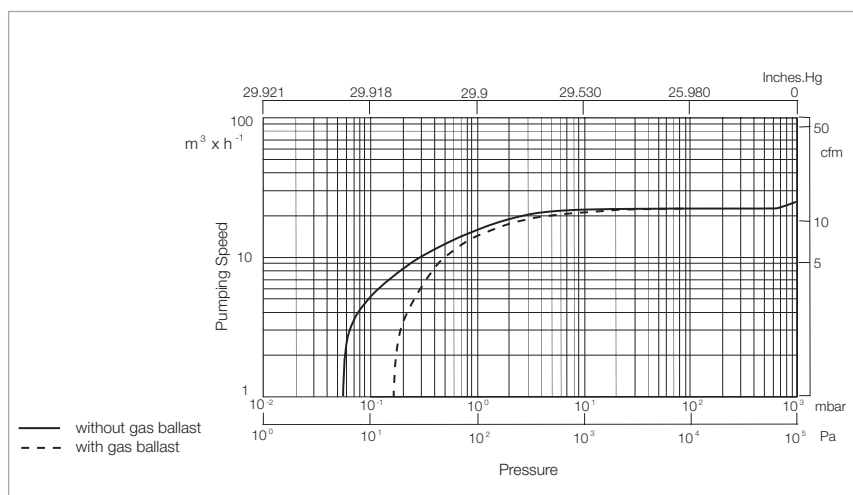
SOGEVAC SV 28 BI

Advantages to the User

- 1 decade better ultimate pressure compared to SOGEVAC SV 25 B
- Integrated exhaust filter
- Integrated oil recovery system and anti suckback valve
- Extremely low noise level
- High reliability
- Variant concept
- Customer specific configurations
- High pumping speed stability at low pressure
- 2 oil casings (0.5 and 1.5 l) are available. The bigger oil volume allows longer oil life times

Typical Applications

- Mass spectrometry
- Lyophilisation
- Laboratory
- Refrigeration and air-conditioning
- Lamps and bulbs
- and more ...



Pumping speed characteristics of the SOGEVAC SV 28 BI at 50 Hz
(60 Hz curves at the end of the chapter)

Technical Data**SOGEVAC SV 28 BI**

		50 Hz	60 Hz
Nominal pumping speed	m³/h (cfm)	25 (14.8)	30 (17.8)
Pumping speed (according to PNEUROP)	m³/h (cfm)	23 (13.6)	27 (15.9)
Ultimate total pressure without gas ballast	mbar (Torr)	≤ 0.05 (≤ 0.04)	
Ultimate total pressure with gas ballast	mbar (Torr)	≤ 0.5 (≤ 0.4)	
Water vapor tolerable load with gas ballast	mbar (Torr)	10.0 (7.5)	
Noise level (according to DIN 466535)			
3~ motor	dB(A)	54	57
1~ motor	dB(A)	57	60
Motor power			
3~ motor	kW (hp)	0.90 (1.2)	1.1 (1.5)
1~ motor	kW (hp)	0.75 (1.0)	0.9 (1.2)
Mains voltage and frequency		see Ordering Information	
3~ motor	V	see Ordering Information	
1~ mmotor	V	see Ordering Information	
Rated rotational speed	min⁻¹ (rpm)	1500 (1500)	1800 (1800)
Type of protection	IP	55-F	
Leak rate	mbar x l/s	≤ 1 x 10⁻³	
Oil capacity (depending on Part No.)	l (qt)	1.5 (1.59)	
Net weight (with oil filling) dependent of oil casing and motor	kg (lbs)	34 (75) to 37 (82)	
Connections			
intake	DN	25 ISO-KF	
exhaust	DN	25 ISO-KF	

Ordering Information

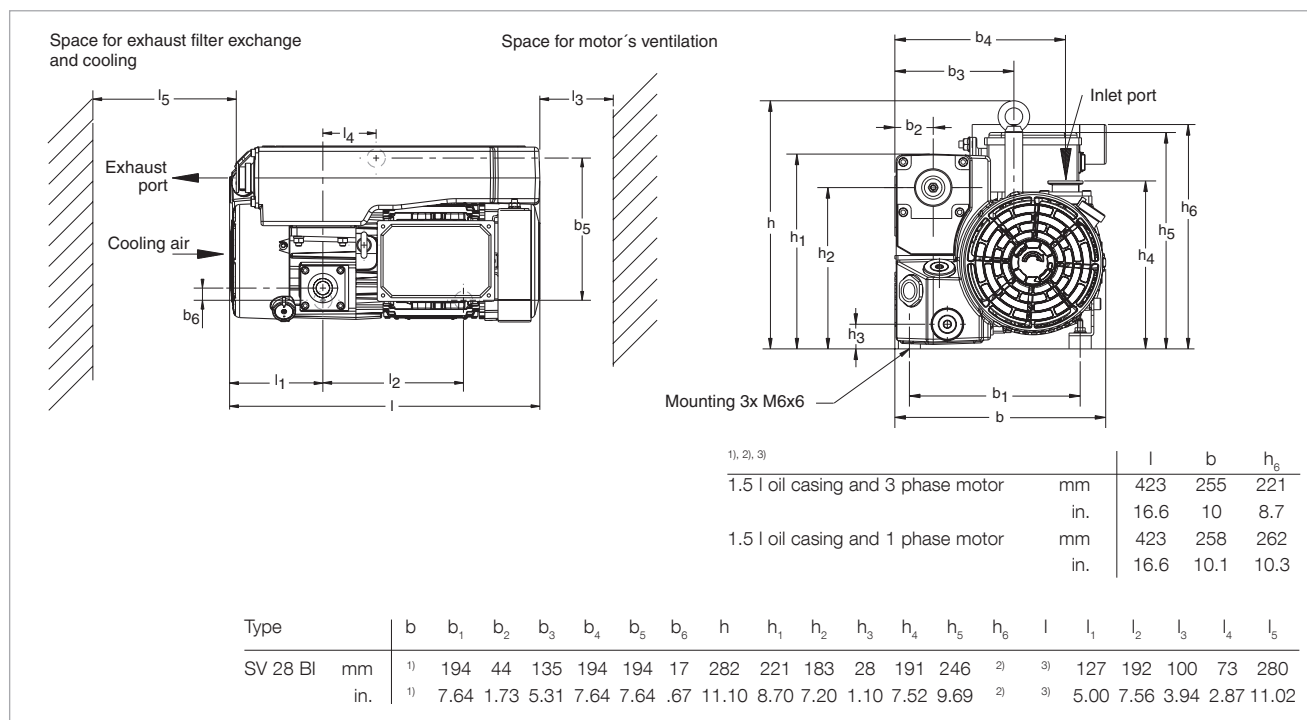
SOGEVAC SV 28 BI

50 Hz

60 Hz

	Part No.
SOGEVAC SV 28 BI with wide range three-phase motor 170–253 / 294–440 V, 50 Hz and 170–292 / 294–506 V, 60 Hz with gas ballast, with 1.5 l oil casing	960 273
with wide range single-phase motor 180–264 V, 50/60 Hz with gas ballast, with 1.5 l oil casing	960 277
with single-phase motor (US and Japan) 100 V +10%/-15%, 50/60 Hz and 115 V +10%/-15%, 60 Hz with gas ballast, with 1.5 l oil casing	upon request
Other voltages/frequencies	upon request
Filling with special oil	upon request
Accessories	
Exhaust filter cartridge	714 16 340
Spare Parts	
Repair kit	971 462 690
Set of seals FPM (FKM)	971 462 670
Generator kit	
three-phase	971 462 620
single-phase	971 462 630
Maintenance kit	971 462 810

For further accessories see Chapter “Accessories TRIVAC” in the Catalog Part “Oil Sealed Vacuum Pumps TRIVAC”



Dimensional drawing for the SOGEVAC SV 28 BI with standard single-phase motor, European version (dimensions for three-phase motor smaller)

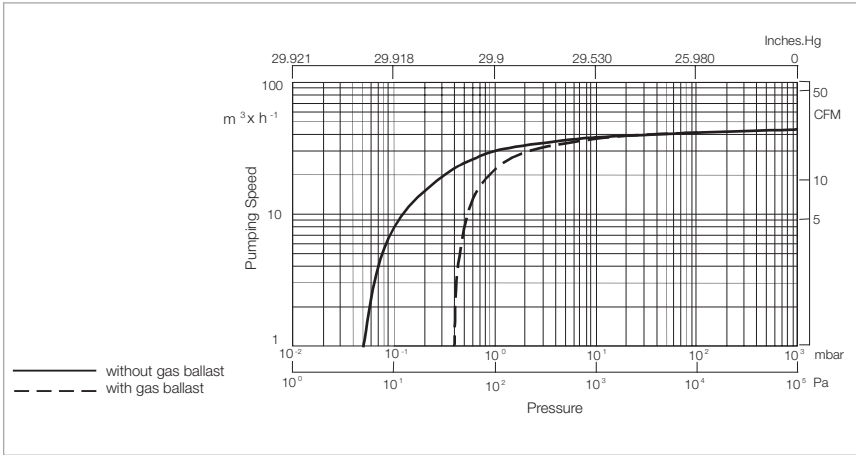
SOGEVAC SV 40 BI



SOGEVAC SV 40 BI

Advantages to the User

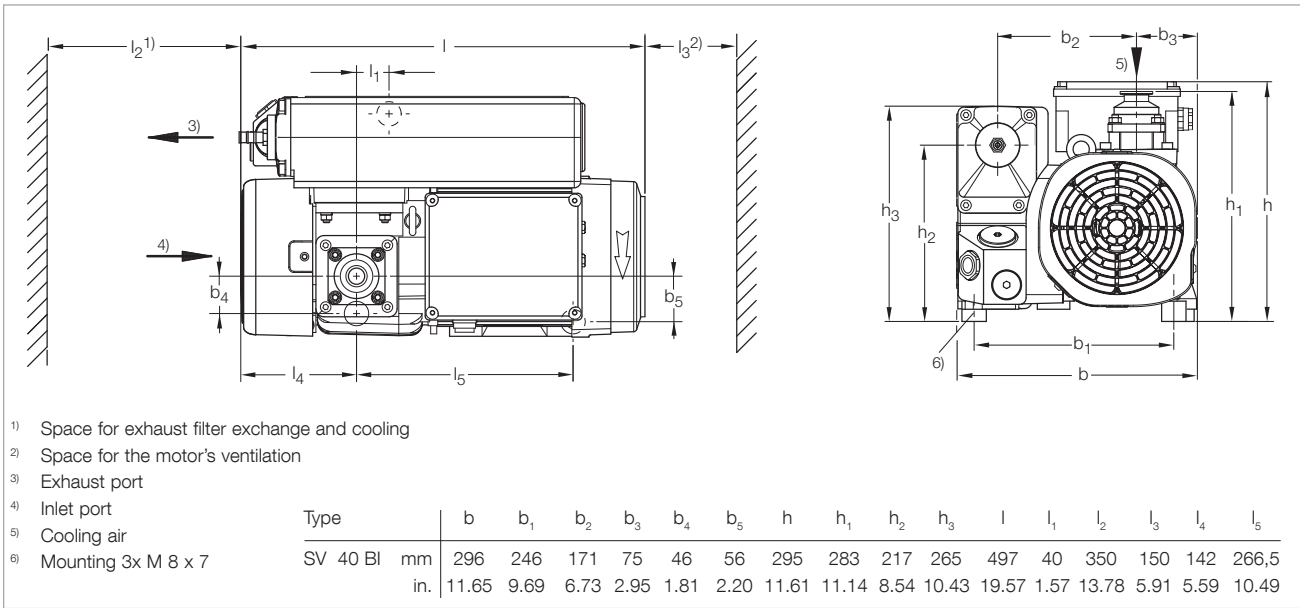
- 1 decade better ultimate pressure compared to SOGEVAC SV 40 B
- Integrated exhaust filter
- Integrated oil recovery system and anti suckback valve
- Extremely low noise level
- High reliability
- Variant concept
- Customer specific configurations
- High pumping speed stability at low pressure



Pumping speed characteristics of the SOGEVAC SV 40 BI at 50 Hz
(60 Hz curves at the end of the chapter)

Typical Applications

- Mass spectrometry
- Lyophilisation
- Refrigeration and air-conditioning
- Laboratory
- Lamps and bulbs
- and more ...



Dimensional drawing for the SOGEVAC SV 40 BI with standard single-phase motor, European version (dimensions for three-phase motor smaller)

Technical Data**SOGEVAC SV 40 BI**

		50 Hz	60 Hz
Nominal pumping speed	m ³ /h (cfm)	42 (24.8)	50 (29.5)
Pumping speed (according to PNEUROP)	m ³ /h (cfm)	40 (23.6)	48 (28.3)
Ultimate total pressure without gas ballast	mbar (Torr)	$\leq 5 \times 10^{-2}$ ($\leq 3.75 \times 10^{-2}$)	
Ultimate total pressure with gas ballast	mbar (Torr)	≤ 0.5 (≤ 0.4)	
Water vapor tolerable load with gas ballast	mbar (Torr)	10.0 (7.5)	
Motor power	kW (hp)	1.1 (1.5)	1.3 (1.8)
Mains voltage and frequency	V	see Ordering Information	
Rated rotational speed	min ⁻¹ (rpm)	1500 (1500)	1800 (1800)
Type of protection	IP	55-F	
Leak rate	mbar x l/s	$\leq 1 \times 10^{-3}$	
Oil capacity	l (qt)	1.0 (1.1)	
Net weight (with oil filling)		43 (94.9)	45 (99.3)
Connections			
intake	DN	40 ISO-KF	
exhaust	DN	40 ISO-KF	

Ordering Information**SOGEVAC SV 40 BI**

	50 Hz	60 Hz
	Part No.	
SOGEVAC SV 40 BI		
with three-phase motor		
without gas ballast		
230/400 V, 50 Hz and 460 V, 60 Hz	960 330	
with small gas ballast		
230/400 V, 50 Hz and 460 V, 60 Hz	960 331	
Other voltages/frequencies or		
single-phase motors	upon request	
Filling with special oil	upon request	
Accessories		
Exhaust filter cartridge AFE SV40B I	971 471 470	
Spare Parts		
Repair kit	971 443 150	
Set of seal	971 427 640	
Vacuum generator		
with gas ballast	971 443 160	
without gas ballast	971 443 170	
Maintenance kit	971 427 660	

For further accessories see Chapter "Accessories TRIVAC" in the Catalog Part "Oil Sealed Vacuum Pumps TRIVAC"

Pumps Prepared with PFPE for Use with Oxygen

Application

As soon as oxygen is being pumped at concentrations exceeding 20% (atmospheric air) the SOGEVAC pump needs to be prepared especially for such operation.

Safety Precautions

As standard, the pumps are equipped with FPM (FKM) seals and an oil filter bypass. Before assembly, all parts are degreased and the pumps are tested with PFPE lubricant (LVO 400). Thereafter the pumps are emptied and delivered without PFPE lubricant (LVO 400).

The pumps are supplied with special Operating Instructions (GA), Spare Parts List (ET) blue colored covers. This special information must be observed.

Due to the use of PFPE lubricant (LVO 400) and grease, also the maintenance schedule has been changed accordingly.

Only degreased accessories (filters and valves) and original spare parts from Leybold Vacuum must be used.

Product Selection

SOGEVAC pumps of the following sizes are available:

SV 16, SV 25, SV 65 B, SV 100 B, SV 200, SV 300 B, SV 630 B (F) and SV 750 B.

The use of PFPE lubricant (LVO 400) will also impair the attainable ultimate pressure depending on the size of the pump.

Local safety regulations (handling of O₂ and PFPE (LVO 400)) must be observed!

Advantages to the User

- High pumping speed down to ultimate pressure
- Operation of the pump at all pressures between 1000 mbar (750 Torr) and ultimate pressure is possible
- Integrated and effective separation of oil mist
- Compact design
- Air or water cooled
- Environment friendly (low noise and low heat radiation, low vibrations)
- Available in many different variants, motor voltages, ports etc.

Pump	Part No.	Ultimate pressure (mbar (Torr))	
		without gas ballast	with gas ballast
SV 16 D	960184V2016, 960185V2016, 960186V2016	1.0 (0.75)	3.0 (2.25)
SV 25 D	960211V2016, 960215V2016	1.0 (0.75)	3.0 (2.25)
SV 65 B	960400V2016, 960401V2016, 960412V2016	1.0 (0.75)	2.5 (1.88)
SV 100 B	960500V2016, 960505V2016, 960512V2016	1.0 (0.75)	2.5 (1.88)
SV 200	1092616, 1092716, 9502716	0.5 (0.375)	1.5 (1.13)
SV 300 B	960702V2016, 960707V2016, 960717V2016	0.5 (0.375)	1.5 (1.13)
SV 630 B(F)	960863V3011	1.0 (0.75)	1.5 (1.13)
SV 750 B(F)	960877V3001	1.0 (0.75)	1.5 (1.13)

SOGEVAC SV 40 ATEX (Explosion Protected and Pressure Burst Resistant)



IIA version with MR 40 pressure regulator on the suction side and horizontal suction flanges

The SOGEVAC SV 40 ATEX Cat. 1 rotary vane vacuum pumps comply with the European Directive 2014/34/EU regarding "Equipment and protective systems for use in potentially explosive atmospheres".

Classification

- Equipment group: II
- Categories: 1G inside
2G outside
- Zone: 0 inside
1 outside
- Material group: IIB + H₂ or IIA
- Temperature classes:

IIB + H ₂	at 50 Hz, T4
	at 60 Hz, 160 °C
IIA	at 50 and 60 Hz, T3

Applications

These pumps are suited for pumping solvents, for drying, filling applications including IIB + H₂ or IIA material groups.

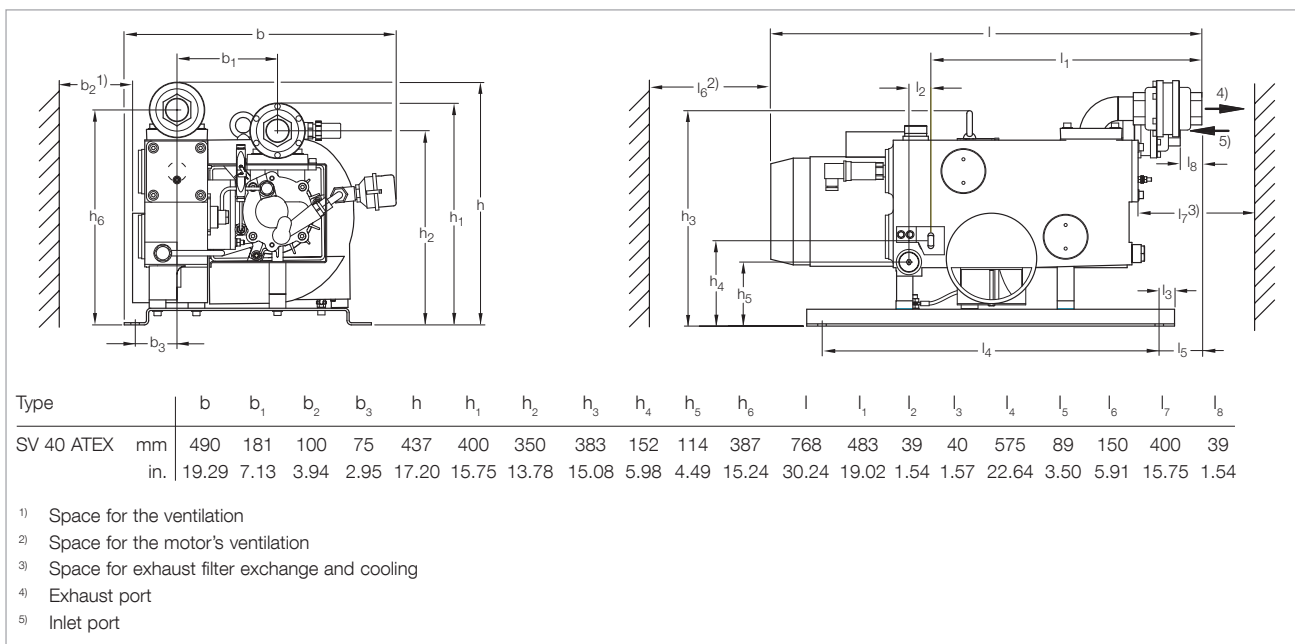
Safety Characteristics

- In order to fulfill the requirements of the safety regulations, the SOGEVAC SV 40 ATEX Cat. 1 pumps are equipped with:
- 1 flame arrester on their suction and exhaust sides
 - 1 pressure transmitter controlling the pressure in the oil casing
 - 1 temperature sensor controlling the pump temperature
 - 1 inlet gas temperature monitoring on the inlet side of the pump (for IIB + H₂ versions only).

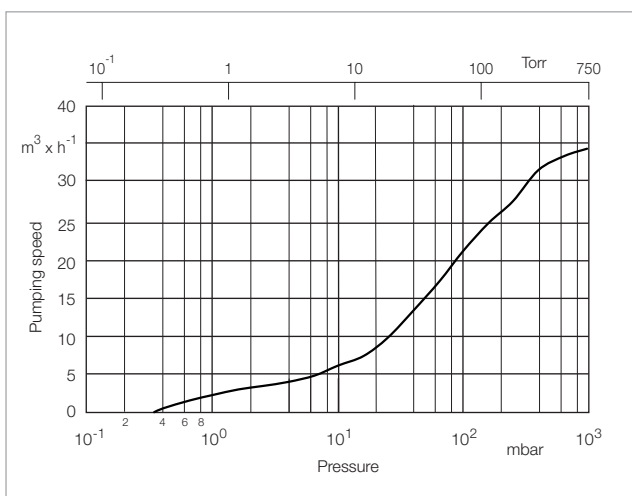
Furthermore, these pumps have an explosion-proof design.

Advantages to the User

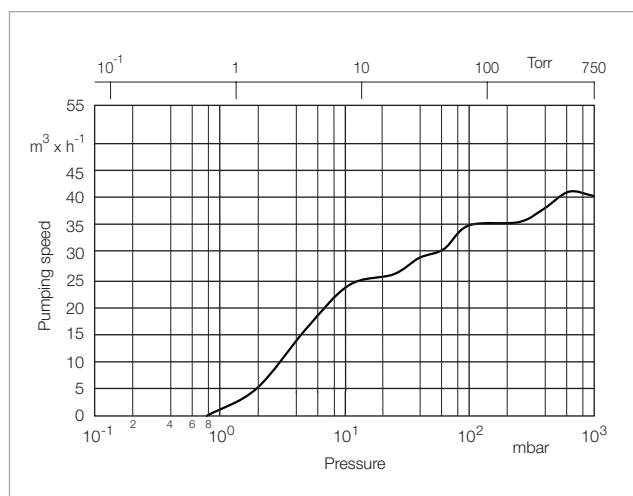
- High pumping speed down to ultimate pressure
- High vapor pumping capability
- Running possible at any pressure, from 1000 mbar (750 Torr) to ultimate pressure
- Integrated and efficient oil mist separation
- Compact design
- Air cooled
- Environment-friendliness (low noise level, no cooling water, low vibration operation)
- Many different designs available



Dimensional drawing for the SOGEVAC SV 40 ATEX with standard motor, European version



Pumping speed characteristics of the SOGEVAC SV 40 ATEX at 50 Hz for gases of the material group IIB + H₂ (60 Hz curves at the end of the chapter)



Pumping speed characteristics of the SOGEVAC SV 40 ATEX at 50 Hz for gases of the material group IIA (60 Hz curves at the end of the chapter)








Technical Data

SOGEVAC SV 40 ATEX

		50 Hz	60 Hz
Nominal pumping speed	m³/h (cfm)	46.0 (27.1)	55.2 (32.5)
Pumping speed (according to PNEUROP)			
IIB + H ₂	m³/h (cfm)	26 (15.3)	29 (17.1)
IIA	m³/h (cfm)	35 (20.6)	42 (24.7)
Ultimate total pressure without gas ballast			
IIA / IIB + H ₂	mbar (Torr)	0.8 (0.6)	
Ultimate total pressure with gas ballast			
II A / IIB + H ₂	mbar (Torr)	1.5 (1.1)	
Noise level (according to DIN 45635)	dB(A)	63	68
Water vapor tolerable load with gas ballast	mbar (Torr)	0.30 (0.23)	
Motor power	kW (hp)	1.5 (2.0)	1.8 (2.4)
Rated rotational speed	min ⁻¹ (rpm)	1500 (1500)	1800 (1800)
Standard voltage	V	230/400 (± 10%)	460 (± 10%)
Type of protection	IP	55-F	55-F
Leak rate	mbar x l/s	≤ 1 x 10 ⁻³	
Type of oil		LVO 210 (IIB + H ₂) or LVO 200 (IIA)	
Oil capacity, approx.	l (qt)	2 (2.1)	
Materials (materials in contact with the gas)		Steel, cast iron, Aluminium, Bronze, FPM (FKM), Glass, Polyamid 6.6, Filter material (Polymers, Paper), epoxy resin & glass fibre	
Weight (with oil filling)	kg (lbs)	110 (243)	
Connections			
intake			
IIB + H ₂	G	1 1/4"	
IIA	G	3/4"	
exhaust	G	1 1/4"	
Maximum gas inlet temperature	°C (°F)	40 (104)	

Ordering Information

SOGEVAC SV 40 ATEX

	50 Hz	60 Hz
	Part No.	Part No.
SOGEVAC SV 40 ATEX LA IIB + H ₂ in accordance with 2014/34/EU [ II 1/2 Gh IIB + H ₂ T4 Gb (+5 °C < t _a < 40 °C) EC Type Examination Certificate: PTB04ATEX4013X] with permanent gas ballast	960 345	–
SOGEVAC SV 40 ATEX LA IIB + H ₂ in accordance with 2014/34/EU [ II 1/2 Gh IIB + H ₂ 160 °C Gb (+5 °C < t _a < 40 °C) EC Type Examination Certificate: PTB04ATEX4013X] without gas ballast	–	960 349 V 3060
SOGEVAC SV 40 ATEX IIB + H ₂ in accordance with 2014/34/EU [ II 1/2 Gh IIB + H ₂ T4 Gb (+5 °C < t _a < 40 °C) EC Type Examination Certificate: PTB04ATEX4013X] without gas ballast	960 346	–
SOGEVAC SV 40 ATEX IIB + H ₂ in accordance with 2014/34/EU [ II 1/2 Gh IIB + H ₂ 160 °C Gb (+5 °C < t _a < 40 °C) EC Type Examination Certificate: PTB04ATEX4013X] without gas ballast	–	960 346 V 3060
SOGEVAC SV 40 ATEX IIB + H ₂ in accordance with 2014/34/EU [ II 1/2 Gh IIB + H ₂ T4 Gb (+5 °C < t _a < 40 °C) EC Type Examination Certificate: PTB04ATEX4013X] with gas ballast and MR 40 pressure regulator	960 343	–
SOGEVAC SV 40 ATEX IIA in accordance with 2014/34/EU [ II 1(i)/2(o) Gh IIA T3 (+5 °C < t _a < 40 °C) EC Type Examination Certificate: PTB04ATEX4011X] without gas ballast	960 344	960 349 V 3060
SOGEVAC SV 40 ATEX IIA in accordance with 2014/34/EU [ II 1(i)/2(o) Gh IIA T3 (+5 °C < t _a < 40 °C) EC Type Examination Certificate: PTB04ATEX4011X] with gas ballast and MR 40 pressure regulator	960 342	–
Accessories	upon request	upon request
Spare Parts	upon request	upon request

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ATEX Category 2 Pumps

Application

As soon as gases capable of exploding are being pumped or if such gases are present in the vicinity, then the customer must perform a hazard analysis. In Europe, the ATEX Directives 2014/34/EU need to be observed in this regard. For equipment in Zone 1, ATEX Category 3 SOGEVAC pumps are available.

Classification

As in the table below.

Safety Precautions

As standard, the pumps are equipped with FPM (FKM) seals, oil filter bypass and oil LEYBONOL LVO 210. Special ATEX exhaust filters, coupling components, motors, floats and final inspections are used, respectively performed. A DN 16 ISO-KF connection for the gas ballast is supplied.

All pumps are equipped with Pt100 temperature, oil level and oil casing pressure sensors. The motors are equipped with PTC thermistors.

SOGEVAC pumps of the following sizes are available:

SV 40 B, SV 65 B, SV 100 B, SV 200, SV 300 B, SV 630 B and SV 750 B

The pumps are supplied with special Operating Instructions (GA), Spare Parts List (ET) and include a CE declaration. This special information must be observed.

LV Restrictions apply for Service and Repairs: please consult us.

Only special accessories (filters, valves, taps) and original spare parts from Leybold must be used.

Advantages to be User

- High pumping speed down to ultimate pressure
- Operation of the pump at all pressures between 1000 mbar (750 Torr) and ultimate pressure is possible
- Integrated and effective separation of oil mist
- Compact design
- Air or water cooled
- Different gas ballast variants: without, manual and permanent upon request
- Available in many different variants, motor voltages, ports etc.

The pumping speed curves for ATEX Category 2 pumps are the same as for non ATEX standard SOGEVAC pumps.

Pump**Ultimate pressure, mbar (Torr)**
without gas ballast with gas ballast

	Part No.		
SV 40 B air cooled Ex II (i) 2G h IIB + H ₂ T3 Gb / (o) 2G IIC T4 Gb (10 °C < T _a > 40 °C) X	960305A22	0.5 (0.38)	1.5 (1.13)
SV 65 B air cooled Ex II (i) 2G h IIB + H ₂ T3 Gb / (o) 2G IIC T4 Gb (10 °C < T _a > 40 °C) X	960405A22	0.5 (0.38)	1.5 (1.13)
SV 100 B air cooled Ex II (i) 2G h IIB + H ₂ T3 Gb / (o) 2G IIC T4 Gb (10 °C < T _a > 40 °C) X	960505A22	0.5 (0.38)	1.5 (1.13)
SV 120 B air cooled Ex II (i) 2G h IIB + H ₂ T3 Gb / (o) 2G IIC T4 Gb (10 °C < T _a > 40 °C) X	upon request	0.5 (0.38)	1.5 (1.13)
SV 200 air cooled Ex II (i) 2G h IIB + H ₂ T3 Gb / (o) 2G IIC T3 Gb (10 °C < T _a > 40 °C) X	10927A22	0.15 (1.13)	0.7 (0.53)
SV 300 B air cooled Ex II (i) 2G h IIB + H ₂ T3 Gb / (o) 2G IIC T3 Gb (10 °C < T _a > 40 °C) X	960702A22	0.15 (1.13)	0.7 (0.53)
SV 630 B air cooled Ex II (i) 2G h IIB + H ₂ T3 Gb / (o) 3GD IIC T3 Gb (150 °C) (10 < T _a > 40 °C) X	upon request	0.15 (1.13)	0.7 (0.53)
SV 630 BF water cooled Ex II (i) 2G h IIB + H ₂ T3 Gb / (o) 3GD IIC T3 Gb (150 °C) (10 < T _a > 40 °C) X	upon request	0.15 (1.13)	0.7 (0.53)
SV 750 B air cooled Ex II (i) 2G h IIB + H ₂ T3 Gb / (o) 3GD IIC T3 Gb (150 °C) (10 < T _a > 40 °C) X	upon request	0.15 (1.13)	0.7 (0.53)
SV 750 BF water cooled Ex II (i) 2G h IIB + H ₂ T3 Gb / (o) 3GD IIC T3 Gb (150 °C) (10 < T _a > 40 °C) X	upon request	0.15 (1.13)	0.7 (0.53)

ATEX outside Dust: upon request. For SV 630 B(F): as on existing Cat 3 pumps.

SV 630 B(F) and SV 750 B(F) are ATEX Cat 3 only outside.

Gas ballast connection: with DN 16 ISO-KF as on Cat 3 pumps. Manual gas ballast is standard.

SV 40 B to SV 120 B with manual gas ballast are T3 inside. Pumps with permanent gas ballast are T4 inside.

Big gas ballast or no gas ballast available upon request.

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ATEX Category 3 Pumps

Application

As soon as gases capable of exploding are being pumped or if such gases are present in the vicinity, then the customer must perform a hazard analysis. In Europe, the ATEX Directives 2014/34/EU need to be observed in this regard. For equipment in Zone 2, ATEX Category 3 SOGEVAC pumps are available.

Classification

As in the table below.

Safety Precautions

As standard, the pumps are equipped with FPM (FKM) seals, oil filter bypass and oil LEYBONOL LVO 210. Special ATEX exhaust filters, coupling components, motors, floats and final inspections are used, respectively performed. A DN 16 ISO-KF connection for the gas ballast is supplied.

All pumps are equipped with Pt100 temperature, oil level and oil casing pressure sensors. The motors are equipped with PTC thermistors.

SOGEVAC pumps of the following sizes are available:

SV 40 B, SV 65 B, SV 100 B, SV 200, SV 300 B, SV 630 B and SV 750 B.

The pumps are supplied with special Operating Instructions (GA), Spare Parts List (ET) and include a CE declaration. This special information must be observed.

Only special accessories (filters, valves, taps) and original spare parts from Leybold must be used.

Advantages to be User

- High pumping speed down to ultimate pressure
- Continuous operation of the pump at all pressures between 1000 mbar (750 Torr) and ultimate pressure is possible
- Integrated and effective separation of oil mist
- Compact design
- Air or water cooled
- Environment friendly (low noise and low heat radiation, low vibrations)
- Available in many different variants, motor voltages, ports etc

The pumping speed curves for ATEX Category 3 pumps are the same as for non ATEX standard SOGEVAC pumps.

Pump**Ultimate pressure, mbar (Torr)**
without gas ballast with gas ballast

	Part No.		
SV 40 B air cooled Ex II (i) 3 G IIC T3 Gb / (o) 3 GDh IIC T3 Gb (150 °C)(10 < T _a < 40 °C) X	960305A33	0.5 (0.38)	1.5 (1.13)
SV 65 B air cooled Ex II (i) 3 G IIC T3 Gb / (o) 3 GDh IIC T3 Gb (150 °C)(10 < T _a < 40 °C) X	960405A33	0.5 (0.38)	1.5 (1.13)
SV 100 B air cooled Ex II (i) 3 G IIC T3 Gb / (o) 3 GDh IIC T3 Gb (150 °C)(10 < T _a < 40 °C) X	960505A33	0.5 (0.38)	1.5 (1.13)
SV 200 air cooled Ex II (i) 3 G IIC T3 Gb / (o) 3 GDh IIC T3 Gb (150 °C)(10 < T _a < 40 °C) X	10927A33	0.15 (1.13)	0.7 (0.53)
SV 300 B air cooled Ex II (i) 3 G IIC T3 Gb / (o) 3 GDh IIC T3 Gb (150 °C)(10 < T _a < 40 °C) X	960702A33	0.15 (1.13)	0.7 (0.53)
SV 630 air cooled Ex II (i) 3 G IIC T3 / (o) 3 GDh IIC T3 (150 °C)(10 < T _a < 40 °C) X	960863A33	0.15 (1.13)	0.7 (0.53)
SV 630 BF water cooled Ex II (i) 3 G IIC T3 Gb / (o) 3 GDh IIC T3 Gb (150 °C)(10 < T _a < 40 °C) X	960867A33	0.15 (1.13)	0.7 (0.53)
SV 750 B air cooled Ex II (i) 3 G IIC T3 Gb / (o) 3 GDh IIC T3 Gb (150 °C)(10 < T _a < 40 °C) X	upon request	0.15 (1.13)	0.7 (0.53)
SV 750 BF water cooled Ex II (i) 3 G IIC T3 Gb / (o) 3 GDh IIC T3 Gb (150 °C)(10 < T _a < 40 °C) X	upon request	0.15 (1.13)	0.7 (0.53)

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Accessories

Double Inlet Filter and Roots Adapter TwinFilter 500 for SOGEVAC SV 470 B(F) and SV 570 B(F)



Double inlet filter and Roots adapter TwinFilter 500

To avoid dust particles in your process use the new double inlet filter and Roots adapter TwinFilter 500.

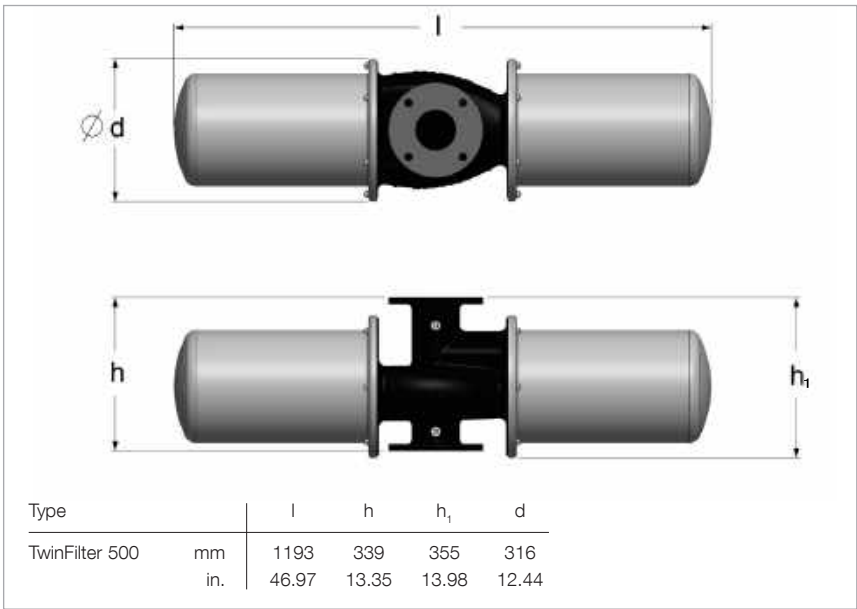
The TwinFilter replaces the otherwise needed Roots pump adapter to adapt a Roots vacuum pump. The Roots pump can be fitted directly on to the TwinFilter.

Typical Applications

- Protects the pump against dust and particles
- Compact forevacuum pump combination

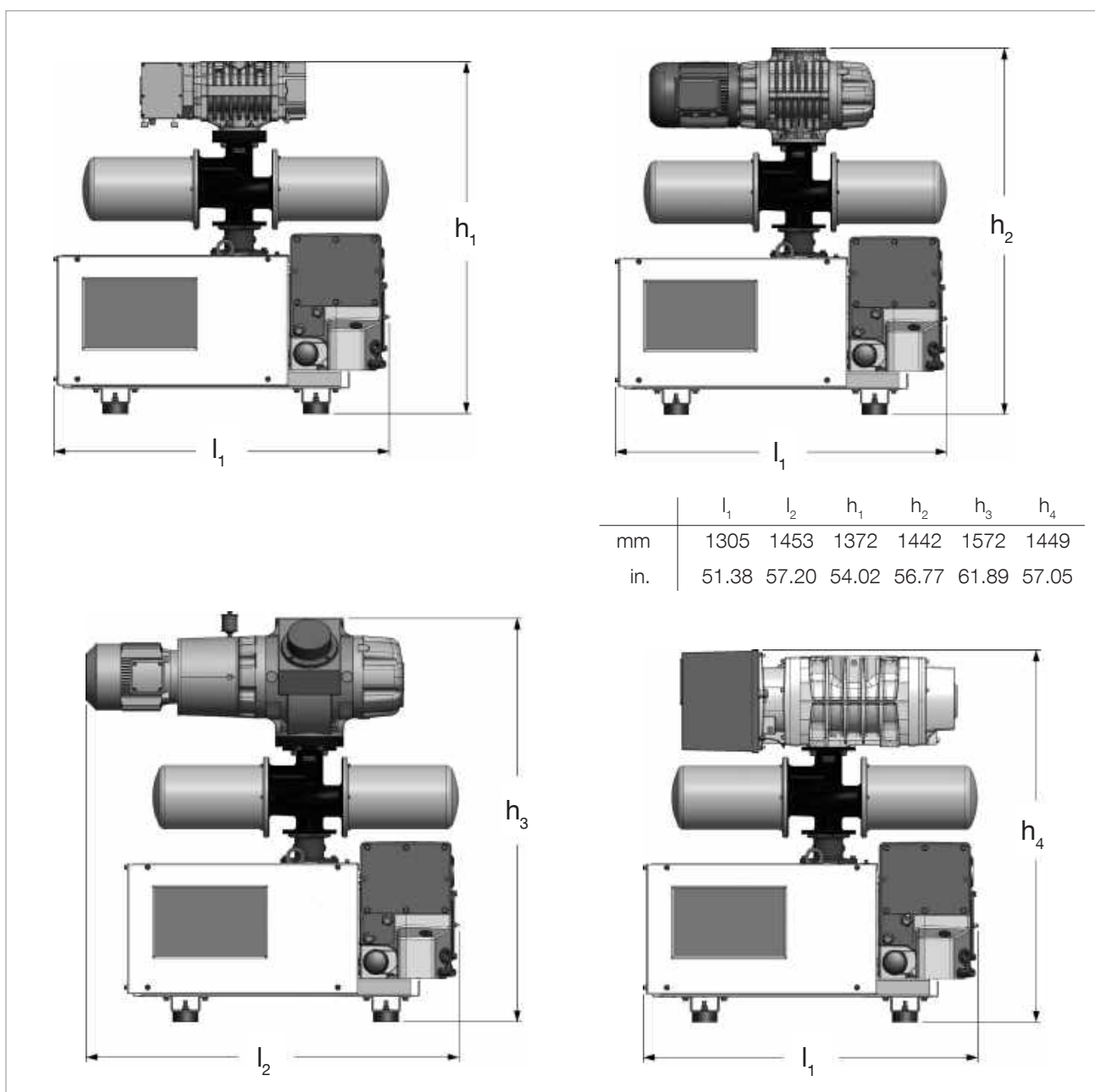
Advantages to the User

- No external frame required: costs and space savings
- Very compact combinations: space savings yet roughing pump protection
- Allows to have 2 different protection filters in series: more efficient filtration and longer filter life time
- No elbows, bellows, adapters required for filter mounting: cost savings



Dimensional drawing for the double inlet filter and Roots adapter TwinFilter 500

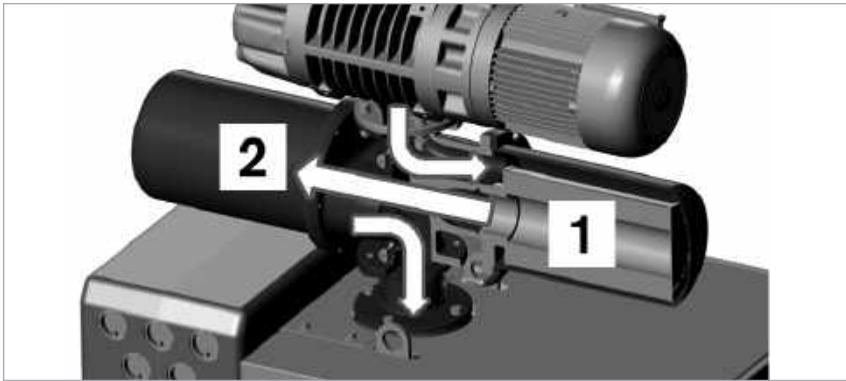
Adapter connection options



Ways in which to mount the Roots vacuum pump on the SOGEVAC SV 470 B(F) or SV 570 B(F)

Top left with RUVAC WH 700/702, top right with RUVAC WA(U)/WS(U) 1001,
bottom left with RUVAC WA(U) 2001, bottom right with RUVAC WH(U) 2500

Gas flow



Gas flow

The gas passes through the filter (1), then through the filter (2) and then enters the roughing pump.

Selection of the filter cartridges

Filter type	Paper 2 µm	Polyester 2 µm	Polyester 25 µm	Metal 0.09 mm (0.004 in.)	Activated charcoal
Applications					
Dry processes with dust, powders, chips etc.	2	1			
Wet (vapor) processes with dust, powders, chips etc.		2	1		
Heavy particles, plastics, glass, packaging materials, food stuff, etc.		2		1	
Vapors of high molecular weight (solvent, resin and acid vapors, alkaline solutions etc.)		2			1

1= Filter No. 1 in the diagram "Gas flow"

2= Filter No. 2 in the diagram "Gas flow"

Technical Data

Double Inlet Filter TwinFilter 500

Double Inlet Filter and Roots Adapter TwinFilter 500	Paper Cartridge	Polyester Filter Cartridge	Polyester Filter Cartridge	Metal Cartridge	Active Charcoal Cartridge
Particle size / mesh	2 µm	2 µm	25 µm	0.09 mm (0.004 in.)	
Pumping speed ¹⁾ loss by new filters (approx.)					
100 mbar (75.0 Torr)	< 1%	< 1%	< 1%	< 1%	< 1%
10 mbar (7.5 Torr)	< 1%	< 1%	< 1%	< 1%	< 7%
1 mbar (0.75 Torr)	< 13%	< 6%	< 4%	< 3%	< 33%
Efficiency for					
2 µm particle	98%	98%	–	–	–
5 µm particle	99%	99%	–	–	–
Weight					
Net max.	kg (lbs)		82 (181)		
Cover	kg (lbs)		< 10 (< 22)		
Filter	kg (lbs)		< 10 (< 22)		
Material			Cast iron, steel, filter material		

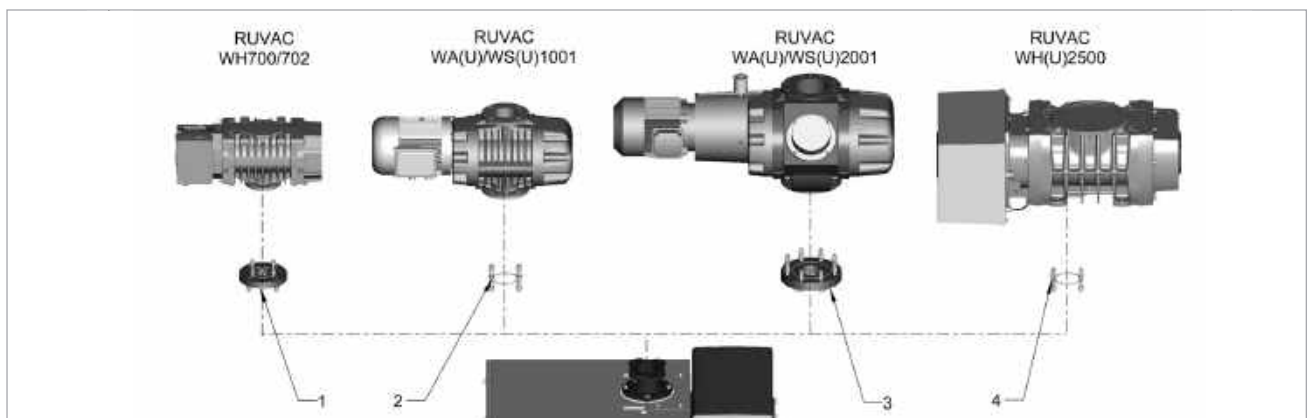
¹⁾ Pumping speed loss of each filter adds up for the total loss

Ordering Information

Double Inlet Filter TwinFilter 500

Double Inlet Filter and Roots Adapter TwinFilter 500	Paper Cartridge 2 µm	Polyester Filter Cartridge 2 µm	Polyester Filter Cartridge 25 µm	Metal Cartridge 0.09 mm (0.004 in.)	Active Charcoal Cartridge
For fitting to SOGEVAC	SV 470 B(F) / SV 570 B(F)	SV 470 B(F) / SV 570 B(F)	SV 470 B(F) / SV 570 B(F)	SV 470 B(F) / SV 570 B(F)	SV 470 B(F) / SV 570 B(F)
Part No. 9516248PAPO with paper cartridge and polyester filter cartridge 2 µm	X	-	X	-	-
Part No. 9516248PP with polyester filter cartridge 2 µm and 25 µm	-	X	X	-	-
Part No. 9516248MAPO with polyester filter cartridge 2 µm and metal cartridge	-	X	-	X	-
Part No. 9516248CAPO with polyester filter cartridge 2 µm and active charcoal cartridge	-	X	-	-	X
Part No. 9516248V without filter	X	X	X	X	X
Spare inlet filter Part No. EK95162PA	X	-	-	-	-
Spare inlet filter Part No. EK95162PO2	-	X	-	-	-
Spare inlet filter Part No. EK95162PO25	-	-	X	-	-
Spare inlet filter Part No. EK95162MA	-	-	-	X	-
Spare inlet filter Part No. EK95162CA	-	-	-	-	X

Roots adapter



Roots adapter connections

Ordering Information

Roots adapter

	Part No.
Adapter for Roots vacuum pump	
RUVAC WH 700/702	9516241V
RUVAC WA(U)/WS(U) 1001	9516242V
RUVAC WA(U)/WS(U) 2001	9516243V
RUVAC WH(U) 2500	9516244V

Dust Filters (Suction Side)



SOGEVAC SV 40 with connected F 40 dust filter and different types of filter cartridges

The filters consist of a steel housing and a lid with three quick locking clips

Advantages to the User

- Same housing for different cartridges
- High separation capacity
- Quickly exchangeable cartridge

Paper Filter Cartridge (Standard)

- Separates particles down to 5 µm (Dry process: dust, powders, chips etc.)

Polyester Filter Cartridge

- Separation of particles down to 5 µm (Moist process: dust, powders, chips etc.)

Type		ø A	ø B	C	D	ø E	F	Weight (kg (lbs))
F 16-25	mm	G 1/2"	G 1/2"	54	104	100	70	1
	in.	G 1/2"	G 1/2"	2.13	4.09	3.94	2.76	2.2
F 40	mm	G 1 1/4"	G 1 1/4"	74	115	135	75	1.5
	in.	G 1 1/4"	G 1 1/4"	2.91	4.53	5.31	2.95	3.31
F 65-100	mm	G 1 1/4"	G 1 1/4"	98	172	172	130	2
	in.	G 1 1/4"	G 1 1/4"	3.86	6.77	6.77	5.12	4.4
F 200-300	mm	G 2"	G 2"	118	287	200	230	4.5
	in.	G 2"	G 2"	4.65	11.3	7.87	9.06	9.9
F 200-300	mm	63 ISO-K	63 ISO-K	160	357	258	250	15
	in.	63 ISO-K	63 ISO-K	6.3	14.06	10.16	9.84	33.1
F 630	mm	DN 100 PN 10	DN 100 PN 10	220	358	340	250	33
	in.	DN 100 PN 10	DN 100 PN 10	8.66	14.09	13.39	9.84	72.8
F 630	mm	100 ISO-K	100 ISO-K	220	358	340	250	32
	in.	100 ISO-K	100 ISO-K	8.66	14.09	13.39	9.84	70.6

Dimensional drawing for the dust filters F 16-25 to F 630

Metal Filter Cartridge

- 0.08 mm (0.003 in.) mesh
- Collects solid particles down to 0.08 mm (0.003 in.) (plastics, paper, packaging materials, foodstuffs)

Activated Charcoal Cartridge

- Absorbs vapors of high molecular weight (solvent and acid vapors, alkaline solutions etc.)

Technical Notes

We recommend installing the filters horizontally on a 90° bend. This will prevent separated particles from falling into the intake line when disassembling the filter.

When using an activated charcoal filter it is recommended to also install a paper cartridge filter between the pump and the activated charcoal.

Technical Data**Dust Filter**

Dust Filter	Paper Cartridge	Polyester Filter Cartridge	Metal Cartridge	Active Charcoal Cartridge
Pumping speed reduction through a clean filter	2%	2%	1%	2%
Efficiency for 5 µm particles	98%	98%	–	–

Ordering Information**Dust Filter**

	Part No.	Part No.	Part No.	Part No.
Dust Filter	Paper Cartridge	Polyester Filter Cartridge	Metal Cartridge	Active Charcoal Cartridge
F 16-25 for pumps from 10 to 25 m³/h (G 1/2")	951 50	711 27 094	711 27 093	711 27 092
Spare cartridge for F 16-25	710 40 760	712 61 288	E 710 65 813	E 710 65 713
F 40 for SV 40 B (G 1 1/4")	951 55	711 27 104	711 27 103	711 27 102
Spare cartridge for F 40	710 46 118	712 61 298	710 49 083	710 49 103
F 65-100 for SV 65 B, SV 100 B (G 1 1/4")	951 60	711 27 114	711 27 113	711 27 112
Spare cartridge for F 65-100	712 13 283	712 61 308	E 712 13 324	E 712 13 304
F 200-300 for SV 200, SV 300 B (G 2")	951 65	711 27 124	711 27 123	711 27 122
F 200-300 for SV 200, SV 300 B (DN 63 ISO-K)	951 68	711 27 127	711 27 126	711 27 125
Spare cartridge for F 200-300 (G 2" or DN 63 ISO-K)	712 13 293	712 61 318	712 13 334	E 712 13 314
F 630 for SV 630 (B/F), SV 750 (B/F) (DN 100 PN 10)	951 71	711 27 164	711 27 163	711 27 162
F 630 for SV 630 (B/F), SV 750 (B/F) (DN 100 ISO-K)	951 72	711 27 168	711 27 167	711 27 166
Spare cartridge for F 630 (DN 100 PN 10 or DN 100 ISO-K)	710 35 242	712 61 508	E 710 37 734	710 37 724
Spare Parts				
Set of gaskets for F 16-25	NBR (Buna N)	714 10 820	714 10 820	714 10 820
Set of gaskets for F 40	NBR (Buna N)	714 10 830	714 10 830	714 10 830
Set of gaskets for F 65-100	NBR (Buna N)	714 10 840	714 10 840	714 10 840
Set of gaskets for F 200-300	NBR (Buna N)	714 10 850	714 10 850	714 10 850
O-ring gasket for F 630	NBR (Buna N)	712 41 032	712 41 032	712 41 032

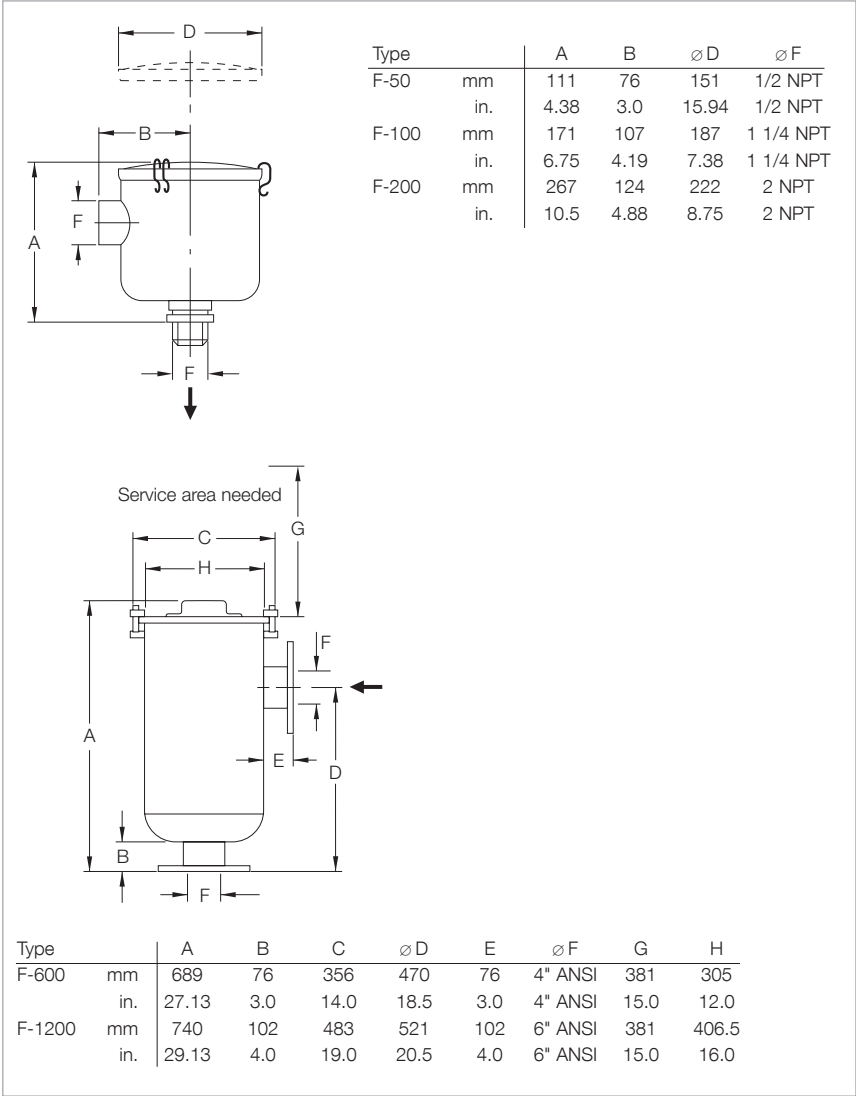
Only available for purchase
in North and South America

Dust Filters F (Suction Side)



SOGEVAC SV 40 with connected F-100 dust filter and different types of filter cartridges

High efficiency F filters are recommended for use at the inlet of SOGEVAC rotary vane vacuum pumps for protection against process contaminants, e.g., fiberglass particles, plastic dusts, resins and food-processing by-products. The filters are available with easily replaceable cartridge elements for particle filtration of dusts and particulates down to one microns, or activated carbon elements for the adsorption of chemical vapor.



Dimensional drawings for the dust filters F 50 to F 200 (top) and F 600 to F 1200 (bottom)

Technical Data**Dust Filter**

Dust Filter	Polyester Filter Cartridge	Metal Cartridge	Paper Cartridge	Active Charcoal Cartridge
New cartridge pumping speed reduction	2%	1%	2%	2%
Efficiency for 1 µm particulates	98%	–	99%	–
Filter for SV 16 (B), SV 25 (B), UV 25	–	–	F-50	–
Filter for SV 40 (B), SV 65 (B), SV 100 (B)	–	F-100	F-100	F-100
Filter for SV 200, 300 B	–	F-200	F-200	F-200
Filter for SV 500 (B), 630 (B/F)	F-600	–	–	–
Filter for SV 1200	F-1200	–	–	–

Ordering Information**Dust Filter**

	Part No.	Part No.	Part No.	Part No.
Dust Filter	Polyester Filter Cartridge	Metal Cartridge	Paper Cartridge	Active Charcoal Cartridge
F-50	–	–	899 460	–
Replacement element for F-50	–	–	E 899 461	–
F-100	–	898 527	898 528	898 529
Replacement element for F-100	–	704 44 400	704 13 901	704 13 906
F-200	–	898 530	898 531	898 532
Replacement element for F-200	–	704 45 400	704 14 901	704 14 908
F-600	898 470	–	–	–
Replacement element for F-600	898 471	–	–	–
F-1200	898 475	–	–	–
Replacement element for F-1200	898 476	–	–	–

SL Liquid Traps



SOGEVAC SV 40 with SL 40 liquid trap

The SL 16-25 liquid trap consists of a collection vessel made of transparent plastic.

Liquid traps SL 40 to SL 1200 are welded steel collection vessels acting as liquid traps. These are equipped with connecting threads.

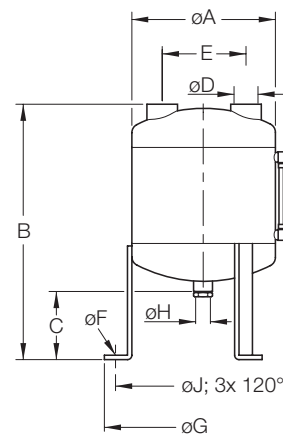
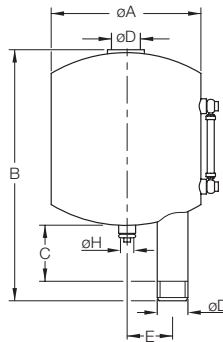
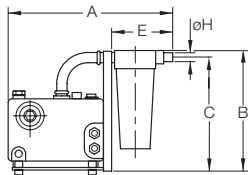
Liquid traps SL 630 and SL 1200 are equipped with a cleaning port DN 150 PN 10.

Advantages to the User

- Protection of the pumps against liquids which might condense in the intake or the exhaust line when pumping vapors

Technical Notes

The liquid traps are equipped with a sight glass tube, so that it is easy to determine when to empty the vessels. The liquid drain is sealed by a screw-in cap. This cap may be replaced by a drain valve.



Type		A	ø A	B	C	ø D	E	ø F	ø G	ø J	ø H
SL 16-25	mm	465	—	347	327	—	202	—	—	—	25
	in.	18.31	—	13.66	12.87	—	7.95	—	—	—	0.98
SL 40	mm	—	200	350	100	G 1 1/4"	60	—	—	—	G 1/2"
	in.	—	7.87	13.78	3.94	G 1 1/4"	2.36	—	—	—	G 1/2"
SL 65-100	mm	—	300	510	150	G 1 1/4"	170	12	400	360	G 1/2"
	in.	—	11.81	20.08	5.91	G 1 1/4"	6.69	0.47	15.75	14.17	G 1/2"
SL 200-300	mm	—	300	865	150	G 2"	170	12	400	360	G 1/2"
	in.	—	11.81	34.06	5.91	G 2"	6.69	0.47	15.75	14.17	G 1/2"
SL 630	mm	—	550	900	210	DN100 PN10	300	9	600	514	G 1 1/4"
	in.	—	21.65	35.43	8.27	DN100 PN10	11.81	0.35	23.62	20.24	G 1 1/4"
SL 1200	mm	—	550	900	133	DN125 PN10	300	9	600	514	G 1 1/4"
	in.	—	21.65	35.43	5.24	DN125 PN10	11.81	0.35	23.62	20.24	G 1 1/4"

Dimensional drawings for the liquid traps; SL 16-25 (left), SL 40 (middle) and SL 65-100 up to SL 1200 (right)

Technical Data

		SL 16-25	Liquid Traps SL 40	SL 65-100
For pump	SOGEVAC	for Pumps from 10 to 25 m ³ /h	SV 40 B	SV 40 B/65 B/100 B
Condensate capacity	l (qt)	2.0 (2.1)	4.0 (4.2)	16.0 (16.9)
Weight	kg (lbs)	3.5 (7.7)	5.0 (11.0)	11.0 (24.3)

Ordering Information

		SL 16-25	Liquid Traps SL 40	SL 65-100
		Part No.	Part No.	Part No.
Liquid trap		951 38	951 40	951 42
Liquid trap with electrical level switch		–	–	951 429 901
Drain valve		–	711 30 111	711 30 113

Technical Data

		SL 200-300	Liquid Traps SL 630	SL 1200
For pump	SOGEVAC	SV 200/300 B	SV 500/630/750 (B)(F)	SV 500/630/750 (B)(F)/1200
Condensate capacity	l (qt)	40.0 (42.3)	80.0 (84.6)	80.0 (84.6)
Weight	kg (lbs)	17.0 (37.5)	58.0 (127.9)	59.0 (130.1)

Ordering Information

		SL 200-300	Liquid Traps SL 630	SL 1200
		Part No.	Part No.	Part No.
Liquid trap		951 44	951 47	951 48
Liquid trap with electrical level switch		951 449 900 001	–	–
Drain valve			711 30 105	711 30 105
Double spigot for drain valve		–	711 18 033	711 18 033

Only available for purchase in North and South America

Ordering Information

		SL 16-25	Liquid Traps SL 40	SL 65-100
		Part No.	Part No.	Part No.
Liquid trap		951 38 (BSP)	951 40 (NPT)	951 43 (NPT)
Liquid trap with electrical level switch		–	–	951 429 901
Drain valve		–	711 30 111	711 30 113

Ordering Information

		SL 200-300	Liquid Traps SL 630	SL 1200
		Part No.	Part No.	Part No.
Liquid trap		951 45 (NPT)	951 47 (BSP)	951 48 (BSP)
Liquid trap with electrical level switch		951 449 900 001	–	–
Drain valve			711 30 105	711 30 105
Double spigot for drain valve		–	711 18 033	711 18 033

SEP Separators / SEPC Condensers



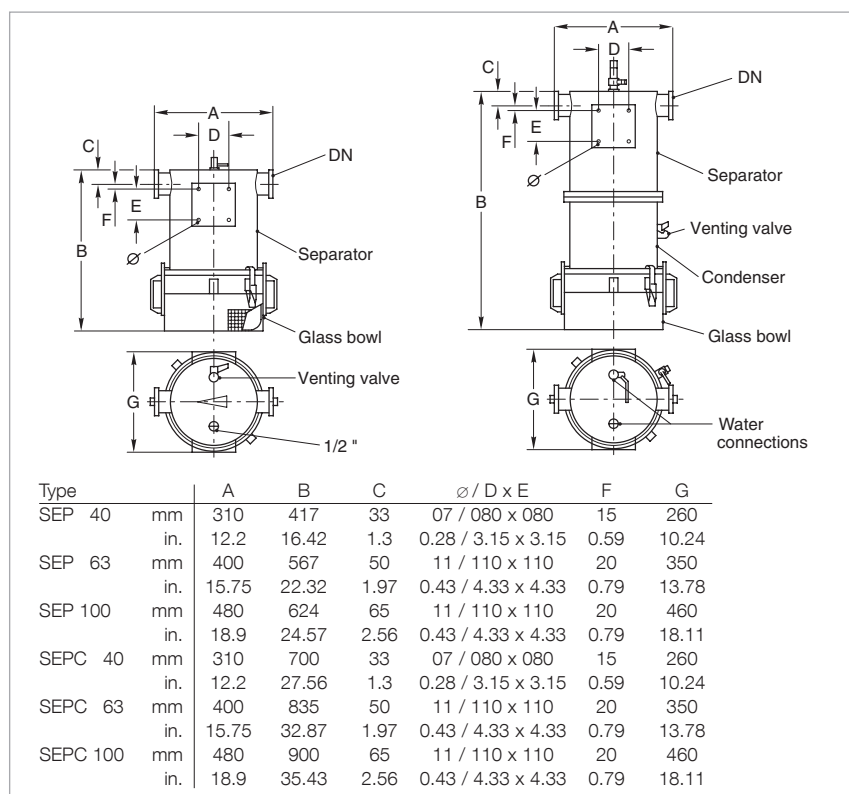
The separators from the SEP and the condensers from the SEPC range have been designed to be integrated in the vacuum circuit. They are employed in all those cases where the pumped gases may contain liquid drops (SEP), condensable vapors (SEPC) or solid particles which may impair proper operation of the pumps.

Advantages to the User

- Large capacity for solids
- Large condensation surface (SEPC)
- Visible level
- Easy to disassemble for cleaning
- Easy to drain, even in the presence of solids

Typical Applications

- Draining (SEP)
- Packaging (SEP)
- Conveying/filling under vacuum (SEP/SEPC)
- Drying (SEPC)
- Degassing (SEPC)
- and many more



Dimensional drawings for the separators (left) and condensers (right)

Technical Data

		Separator		
		SEP 40	SEP 63	SEP 100
For pump	SOGEVAC	SV 40 B/65 B/100 B	SV 200/300 B	SV 630 (F)/750
Connection flange	DN	40 ISO-KF	63 ISO-K	100 ISO-K
Capacity of the bowl	l (qt)	6.0 (6.3)	12.0 (12.7)	12.0 (12.7)
Weight	kg (lbs)	15.0 (33.1)	20.0 (44.1)	40.0 (88.2)

Ordering Information

		Separator		
		SEP 40	SEP 63	SEP 100
		Part No.	Part No.	Part No.
Steel design		953 54	953 56	953 60
Stainless steel design		953 55	953 57	953 61
Support		712 43 380	712 43 380	712 43 380

Technical Data

		Condenser		
		SEPC 40	SEPC 63	SEPC 100
For pump	SOGEVAC	SV 40 B/65 B/100 B	SV 200/300 B	SV 630 (F)/750
Connection flange	DN	40 ISO-KF	63 ISO-K	100 ISO-K
Capacity of the bowl	l (qt)	6.0 (6.3)	12.0 (12.7)	12.0 (12.7)
Condensation area	m²	2.5	5.0	5.0
Condensation capacity ¹⁾	l/h	10	20	20
Cooling water flow rate ²⁾	l/h	1500	3000	3000
Water connection dia.	mm (in.)	19.0 (0.75)		
Weight	kg (lbs)	30.0 (66.2)	40.0 (88.2)	65.0 (143.3)

Ordering Information

		Condenser		
		SEPC 40	SEPC 63	SEPC 100
		Part No.	Part No.	Part No.
Steel design		953 64	953 66	953 68
Stainless steel design		953 65	953 67	953 69
Support		712 43 380	712 43 380	712 43 380

¹⁾ For water vapor at a vapor pressure of 60 mbar (45 Torr)

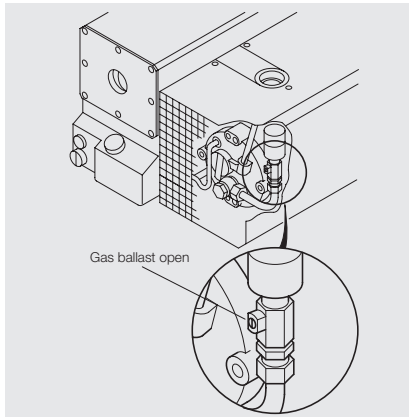
²⁾ Cooling water at a supply temperature of 10 °C (50 °F) and a discharge temperature < 15 °C (< 59 °F)

Remark: The stainless steel condensers have a copper heat exchanger coil

If required, the following products from the Catalog Part "Oil Sealed Vacuum Pumps TRIVAC" can be used for the small pumps SOGEVAC SV 10 to SV 25: condensate traps / separator AK, chapter "Accessories for TRIVAC".

Condensers for the large pump SOGEVAC SV 1200 upon request

Gas Ballast Valve



The pumps SOGEVAC SV 10 B, SV 16 B and SV 25 B are equipped depending of their Part No. without or with a permanent gas ballast.

The pumps SOGEVAC SV 16, SV 25, SV 40 B, SV 65 B, SV 100 B, SV 500 B(F), SV 630 B(F) and SV 750 B(F) are equipped depending of their Part No. without or with a manual, permanent or solenoid gas ballast.

The SV 1200 is equipped as standard with two manual gas ballast valves.

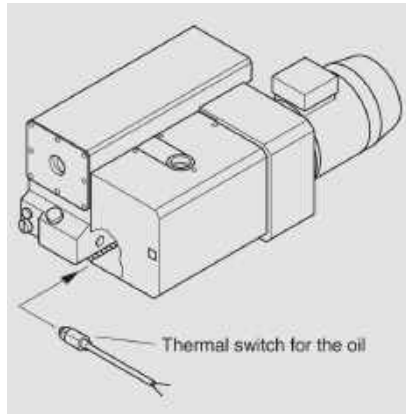
The gas ballast valve may also easily be retrofitted to the SV 40, SV 65, SV 100, SV 200 and SV 300 (either standard, large or solenoid).

Technical Notes

The gas ballast valve permits pumping of condensable vapors.

The permissible quantities of water are stated in the technical data section.

Thermal Switch



The thermal switch is installed at the hottest point of the pump module. It responds as soon as the temperature of the pump exceeds the maximum operating temperature. This accessory is recommended when operating the pump at high ambient temperatures.

Ratings for the normally closed contact:

25 V AC, 50 Hz – 5 A

60 V DC – 3 A

The SV 500, SV 630, SV 750 B(F) and SV 1200 include this switch as a standard.

Ordering Information

Accessories

	Part No.	Part No.	Part No.	Part No.
For pump SOGEVAC	SV 16 (B)/25	SV 25 B	SV 28 BI	SV 40 B
Gas ballast valve (standard)	integrated	integrated	971 462 640	²⁾
Thermal switch	–	²⁾	upon request	³⁾
Oil level monitor	711 19 108	²⁾	–	711 19 110
Gas ballast big	–	²⁾ ⁵⁾	–	⁴⁾
Gas ballast, electromagnetic with 24 V DC valve	–	–	upon request	upon request
Exhaust filter monitoring switch	–	–	–	971 425 890

Ordering Information

Accessories

	Part No.	Part No.	Part No.	Part No.
For pump SOGEVAC	SV 40 BI	SV 65 B	SV 100/120 B	SV 200 ^{3), 8)}
Gas ballast valve (standard)	¹⁾	¹⁾	¹⁾	951 29
Thermal switch	³⁾	³⁾	³⁾	951 36
Oil level monitor	711 19 110	711 19 110	711 19 110	953 96
Gas ballast, big	–	⁶⁾	⁷⁾	951 30
Gas ballast, electromagnetic with 24 V DC valve	upon request	upon request	upon request	951 31
Exhaust filter monitoring switch	971 425 890	971 425 890	971 425 890	712 22 360

Ordering Information

Accessories

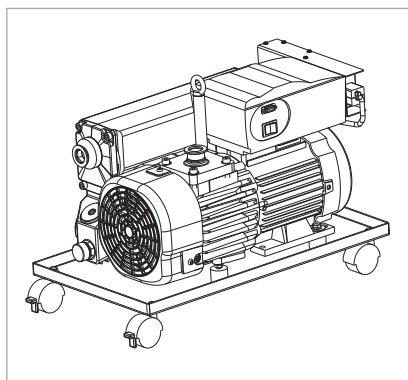
	Part No.	Part No.	Part No.
For pump SOGEVAC	SV 300 B	SV 630 B(F), SV 750 B(F) ^{3), 8)}	SV 1200
Gas ballast valve (standard)	971 464 130 ⁹⁾	integrated (24 V DC)	integrated (manual)
Thermal switch	971 463 930	integrated	integrated
Oil level monitor	upon request	971 425 760	953 99
Gas ballast kit	971 464 130 ⁹⁾	–	–
Gas ballast, electromagnetic with 24 V DC valve	upon request	971 438 170	upon request ³⁾
Exhaust filter monitoring switch	upon request	712 22 360	712 22 360

¹⁾ According to variant²⁾ Can not be retrofitted³⁾ Please state when ordering the pump⁴⁾ See pump with Part No. 960 305 V 2040⁵⁾ See pump with Part No. 960 251 V 2040⁶⁾ See pump with Part No. 960 405 V 0040⁷⁾ See pump with Part No. 960 505 V 2040⁸⁾ Second gas ballast possible. Contact Leybold⁹⁾ SV 300 B gas ballast kit (Part No. 971 464 130) includes all parts for small, standard and big gas flow

Mobile Base Frame



Mobile base frame

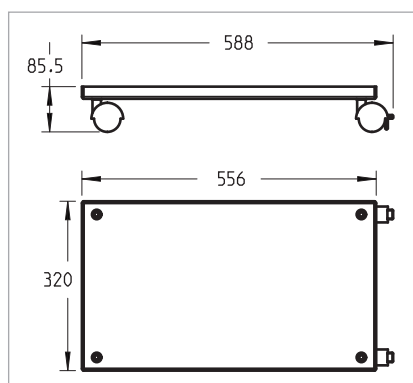


SOGEVAC pump upon mobile base frame

The mobile base frame allows moving easily single and double stage rotary vane pumps up to 65 m³/h and facilitates therefore their maintenance.

The oil tight base frame allows to hold up to 2 l (2,1 qt) oil and has swivable casters of which 2 have breaks.

The base frame doesn't alter the pump noise and facilitates oil draining and pump displacement.



Dimensional drawing for the mobile base frame

Technical Data

Mobile Base Frame

Net weight, approx..	kg (lbs)	3 (7)
Max. load	kg (lbs)	90 (200)
Oil recovery volume, max.	l (qt)	2 (2.1)
Caster diameter	mm (in)	50 (2)
Material oil pan		Stainless steel

Ordering Information

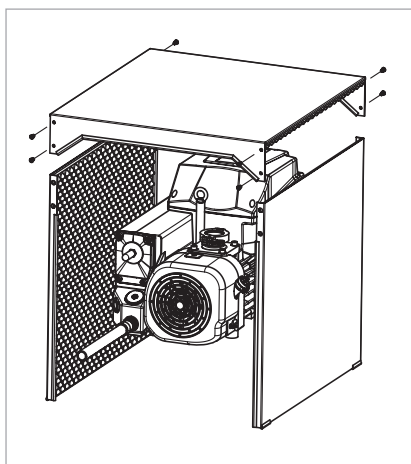
Mobile Base Frame

		Part No
For Pump	SOGEVAC	Single and double stage pumps up to 65 m³/h
Mobile base frame		960 331 BASE

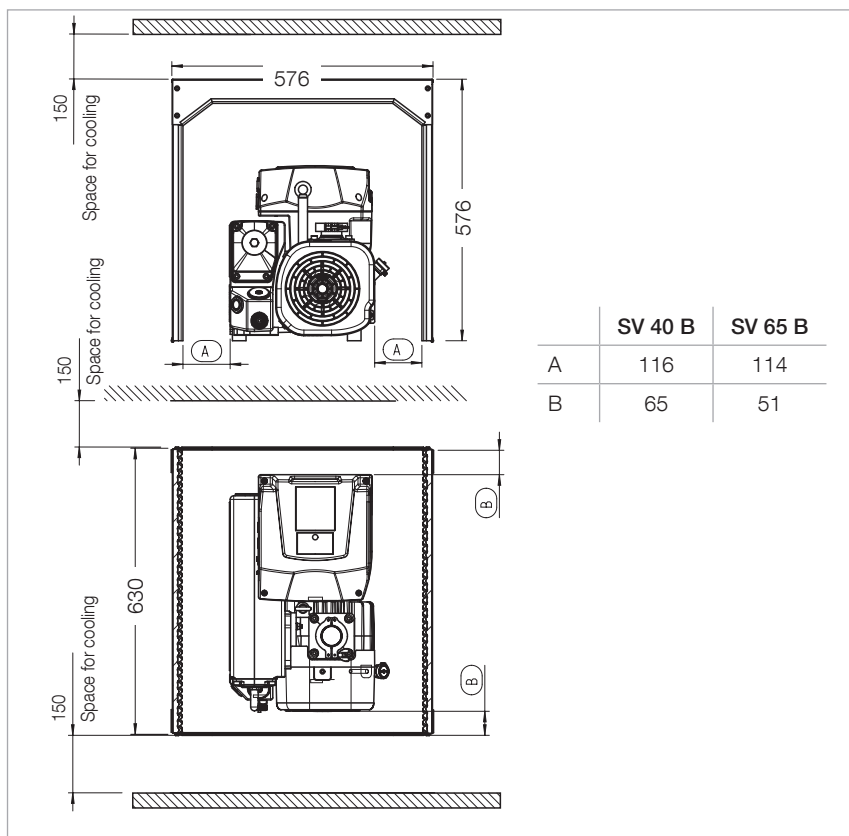
Noise Enclosure

Leybold has developed a specific noise enclosure for vacuum pumps, which reduce the noise level by approx. 5 dB(A) and which makes sure the pump doesn't overheat due to the open design on both sides.

A combination with the mobile base frame is possible.



Noise enclosure



Dimensional drawing for the noise enclosure, dimensions in mm

Technical Data

Net weight, approx.	kg (lbs)	12.2 (27)
Noise reduction, approx..	dB(A)	5
Temperature increase below top, max.	°C (°F)	7 (45)
Ambient temperature , max.	°C (°F)	34 (93)
Material frame absorption foam material	Galvanised steel acc. UL-94 HF1	

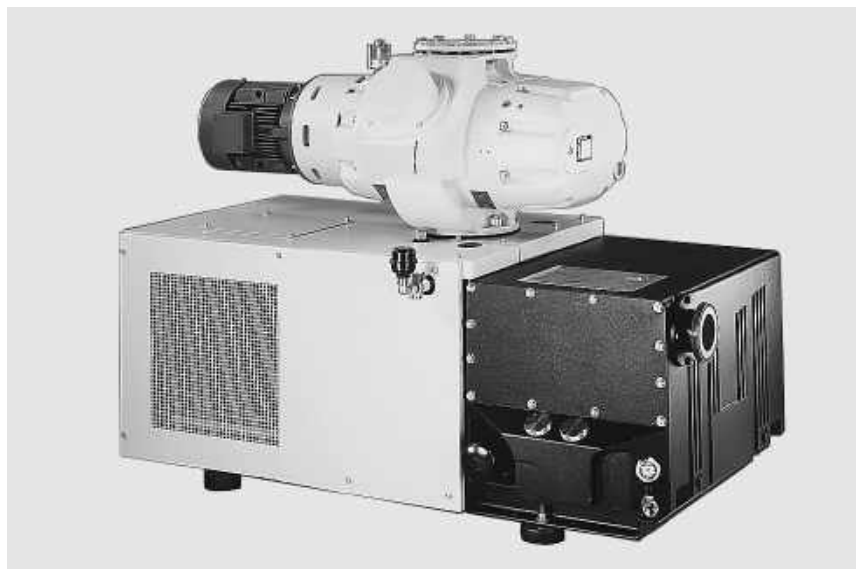
Noise Enclosure

Ordering Information

Noise Enclosure

	Part No.	Part No.
For pump	SOGEVAC	
	Single stage rotary vane pumps up to 65 m³/h and double stage rotary vane pumps up to 25 m³/h –	– Single stage rotary vane pumps up to 120 m³/h and double stage rotary vane pumps up to 65 m³/h
Noise enclosure	960 331 NENC	960 560 NENC

Mounting Accessories



SOGEVAC SV 630 F with RUVAC WAU 2001



SOGEVAC SV 200 with RUVAC WAU 501

Ordering Information

Mounting Accessories

		Part No.	Part No.	Part No.	Part No.	Part No.
For pump	SOGEVAC	SV 16 BI	SV 25 B	SV 28 BI	SV 40 B	SV 40 BI
Oil drain valve G 3/4"			711 30 114	711 30 114	711 30 114	711 30 114
Base frame for Roots installation		not possible				

Ordering Information

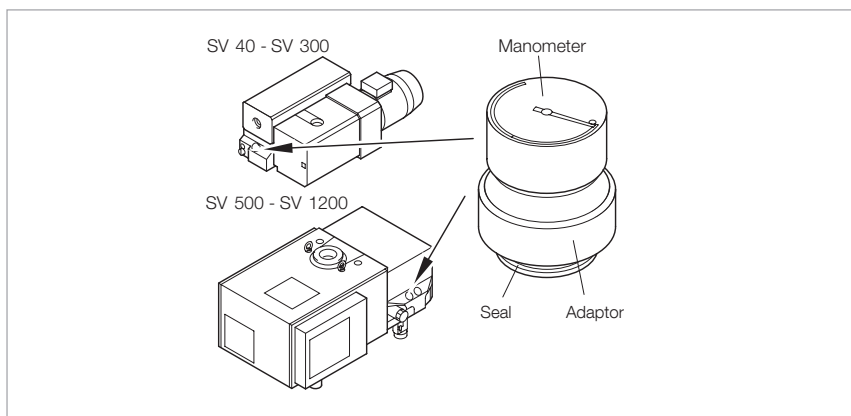
Mounting Accessories

		Part No.	Part No.	Part No.	Part No.
For pump	SOGEVAC	SV 40/65 B	SV 100 B	SV 200	SV 300 B
Base frame		971 453 840	971 434 000	711 19 208	711 19 208
Oil drain valve G 3/4"		711 30 114	711 30 114	711 30 114	711 30 114
Bracket for electric connections		–	–	711 19 226	upon request
Base frame for Roots installation		not possible	971 448 830 ¹⁾	711 19 209 ²⁾	971 456 590

¹⁾ Mandatory for direct Roots mounting

²⁾ Required for mounting the WAU 1001 on to the SV 200

Exhaust Filter Gauge



The manometer (40 mm (1.58 in.) dia.), glued in the adapter, is installed instead of the oil filling plug. Dial has 2 colors:

green: $1000 < p < 1450$ mbar abs.
($760 < p < 1090$ Torr abs.)
Exhaust filter OK

red: $p > 1450$ mbar abs.
(> 1090 Torr abs.)
Exhaust filter clogged

Technical Notes

The reliability of the manometer applies only provided the pump has attained

its operating temperature and when the intake pressure is high.

Ordering Information

Exhaust Filter Gauge

	Part No.	Part No.	Part No.
For pump SOGEVAC	SV 10 B to SV 25 B, SV 28 BI	SV 40 B(I) to SV 750 B(F)	SV 1200 ¹⁾
Manometer (with adaptor and seal)	951 93	951 94	951 95

¹⁾ Not visible from outside

Ball Valves and Valves



Ball valve 1 1/4"

Advantages to the User

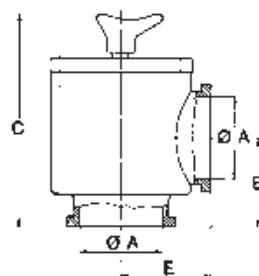
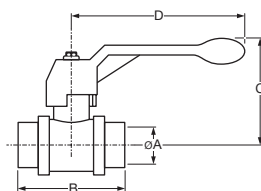
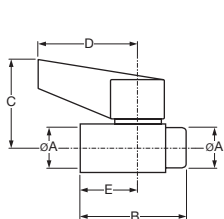
- Leak rate $< 1 \times 10^{-6}$ mbar x l/s ($\leq 0.75 \times 10^{-6}$ Torr x l x s⁻¹)
- Seals on both sides against the atmosphere
- Opens against atmospheric pressure
- Small size
- Simple and quick to operate
- Pressure range from 10^{-2} to 1000 mbar (0.75×10^{-2} to 750 Torr)
- Smaller models serve as venting valves

Information on the blocking components is provided in the Catalog Part "Vacuum Valves".

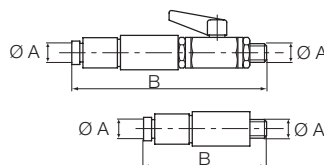
Material

The housing of the ball valves is made of brass, the ball of hard-chrome plated brass, the valve seat of PTFE.

The housing of the right angle valve is made of aluminium, the spindle and valve plate are sealed with an O-ring and are made of stainless steel.



Type		Ø A	B	C	D	E
Ball valve	mm	G 3/8"	45	38	43	25
	in.	G 3/8"	1.77	1.5	1.69	0.98
Ball valve	mm	G 1/2"	53	44	50	29
	in.	G 1/2"	2.09	1.73	1.97	1.14
Ball valve	mm	G 1 1/4"	103	96	140	—
	in.	G 1 1/4"	4.06	3.8	5.51	—
Ball valve	mm	G 2"	134	120	175	—
	in.	G 2"	5.28	4.72	6.89	—
Right-angle valve	mm	100 ISO-K	—	345	—	108
	in.	100 ISO-K	—	13.58	—	4.25
Control valve	mm	G 1/2"	128	—	—	—
	in.	G 1/2"	5.04	—	—	—
Control valve with	mm	G 1/2"	175	—	—	—
blocking valve	in.	G 1/2"	6.89	—	—	—



Dimensional drawings for the ball valves; G 3/8" and G 1/2" (left), G 1 1/4" and G 2" (middle), right-angle valves (right) and for the control valves (bottom)

Technical Data**Ball Valves and Valves ¹⁾**

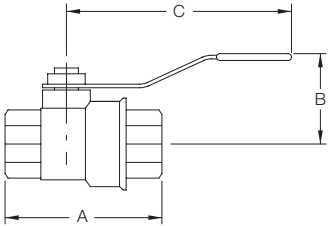
Type		Ball valve	Ball valve	Ball valve	Ball valve
Connection		F/M 3/8" BSP	F/M 1/2" BSP	F/F 1 1/4" BSP	F/F 2" BSP
Weight	kg (lbs)	0.12 (0.3)	0.15 (0.33)	1.24 (2.7)	3.22 (7.1)

Ordering Information**Ball Valves and Valves ¹⁾**

	Part No.	Part No.	Part No.	Part No.
Type	Ball valve	Ball valve	Ball valve	Ball valve
	971 471 220	711 30 113	711 30 100	711 30 107

¹⁾ Special versions for oxygen applications are available upon request

Only available for purchase in North and South America



Type		∅ A	B	C
BV50	mm	54	41	102
	in.	2.13	1.63	4.0
BV100	mm	102	67	140
	in.	4.0	2.63	5.5

Dimensional drawing for the ball valves BV

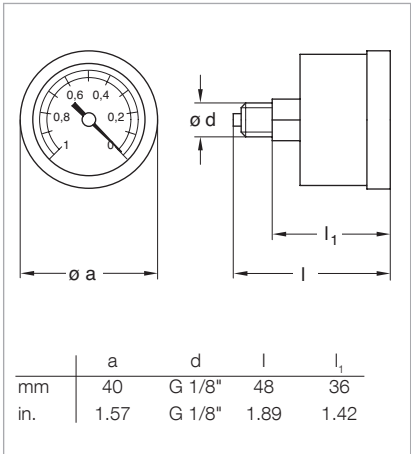
Technical Data**Ball Valves**

Type	Ball valve	Ball valve
Connection	1/2-inch NPT(F)	1 1/4-inch NPT(F)

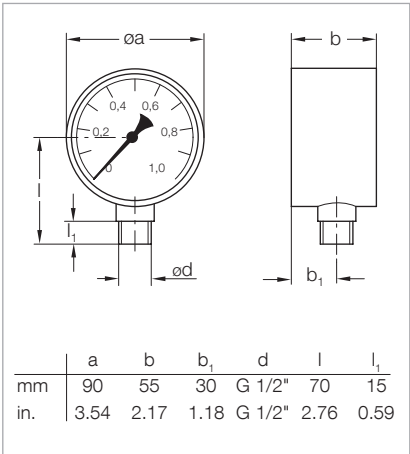
Ordering Information**Ball Valves**

	Part No.	Part No.
Type	BV50	BV100
	899 810	899 800

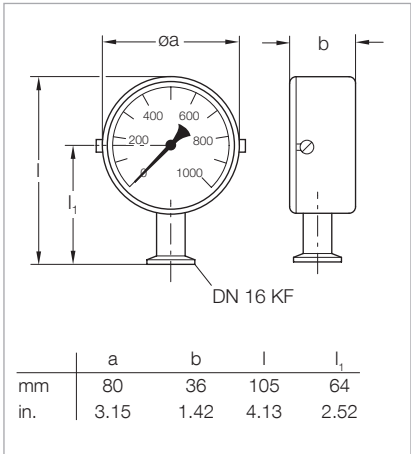
Bourdon Vacuum Gauges / DIAVAC DV 1000



Dimensional drawing for the Bourdon vacuum gauge Part No. 951 90



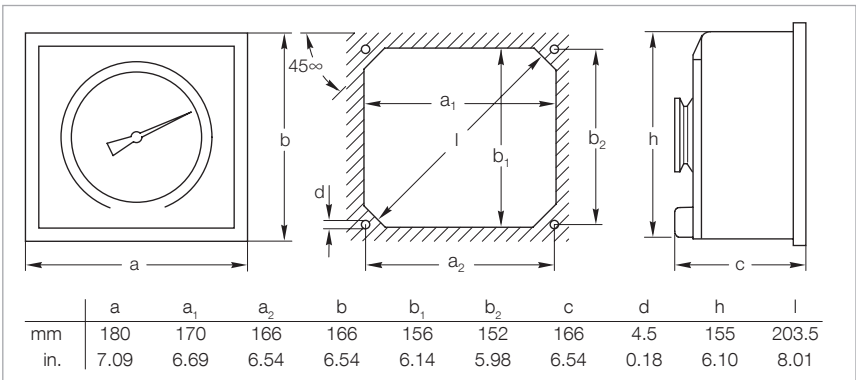
Dimensional drawing for the Bourdon vacuum gauge Part No. 951 92



Dimensional drawing for the Bourdon vacuum gauge Part No. 160 40



DIAVAC DV 1000



Dimensional drawing and panel cut-out for the DIAVAC DV 1000, Part No. 160 67

Advantages to the User

- Simple, rugged and vibration insensitive vacuum gauges for the rough vacuum range
- Linear response
- Clear dial which can also be read from a great distance
- Readings independent of atmospheric pressure

Technical Data

Bourdon Vacuum Gauges / DIAVAC DV 1000

Measuring range		0 to 100%	0 to 1 bar	0 to 1020 mbar	1 to 1000 mbar
Vacuum connection		M 1/8" BSP	M 1/2" BSP	DN 16 ISO-KF	DN 40 ISO-KF
Scale length	mm (in.)	55 (2.17)	140 (5.51)	140 (5.51)	270 (10.63)
Overall height	mm (in.)	48 (1.89)	115 (4.53)	105 (4.13)	166 (6.54)
Weight	g (lbs)	60 (0.13)	560 (1.24)	300 (0.66)	2700 (5.96)
Indication		low pressure in bar	absolute pressure in mbar	absolute pressure in mbar	absolute pressure in mbar

Ordering Information

Bourdon Vacuum Gauges / DIAVAC DV 1000

	Part No.	Part No.	Part No.	Part No.
Bourdon Vacuum Gauges	951 90	951 92	160 40	–
DIAVAC DV 1000	–	–		711 30 107

Standard vacuum gauge for all SOGEVAC pumps is Part No. 951 92.

Further information on other vacuum gauges is provided in Catalog Part "Vacuum Measuring, Controlling"

Only available for purchase in North and South America

Other Accessories

External Carbon Exhaust Filters

An external type spin-on filter made of activated carbon on a polyester cloth housed in wire mesh. Used for providing additional protection from oil odor or mist expelled from pump exhaust.

Requires NPT type nipple and street elbow for preferred vertical mounting. SV 16/25 requires nipple only.

Technical Data

Model	SVXCXF 50	SVXCXF 100	SVXCXF 200
Fits pump	SOGEVAC	SV 16 / 25 (B)	SV 40 B / 65 B / SV 100 B
Thread size	1/2" NPT-M	1 1/4" NPT-M	2" NPT-M

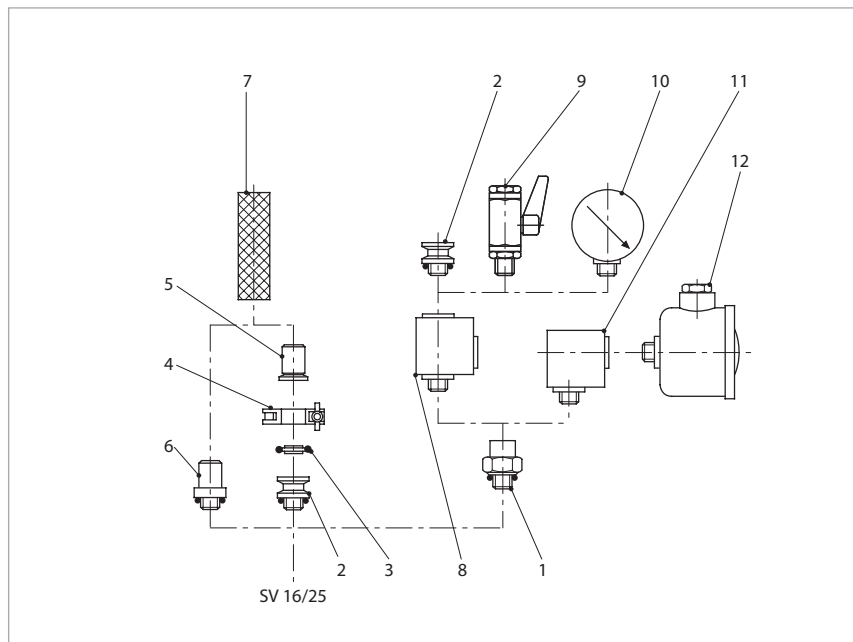
External Carbon Exhaust Filters

Ordering Information

External Carbon Exhaust Filters

	Part No.	Part No.	Part No.
Model	SVXCXF 50	SVXCXF 100	SVXCXF 200
External carbon exhaust filters	899 502	899 500	899 498
Replacement element	899 503	899 501	899 499

Connection Fittings for SOGEVAC SV 10 B, SV 16, SV 16 B, SV 16 D, SV 25, SV 25 B, SV 25 D



Connection fittings for SOGEVAC SV 10 B, SV 16 B, SV 25 B and SV 16, SV 25

The fittings presented have been specially matched to the SOGEVAC pumps. We recommend to use only these

or other components from Leybold for connecting SOGEVAC pumps, so as not to impair the pumping speed of the pumps or the leak tightness of the system.

More information on further fittings is provided in Catalog Part "Flanges and Fittings".

Technical Data

Connection Fittings

Item	Description	Connection	Material
1	Screw coupling	G 1/2" M/F	Aluminium
2	Threaded flange adaptor ¹⁾	G 1/2" M – DN 16 ISO-KF	Aluminium, anodized
3	Centering ring ¹⁾	DN 16 ISO-KF	Aluminium
4	Clamping ring	DN 10/16 ISO-KF	Aluminium
5	Hose connection	DN 16 ISO-KF – DN 25 mm (0.39 in.)	Aluminium, anodized
6	Hose connection ¹⁾	G 1/2" M – DN 25 mm (0.39 in.)	Aluminium, anodized
7	PVC tubing	5 mm (0.39 in.) dia., 1 m (3.5 ft) long	PVC
8	Tee piece	G 1/2" M/F/F	Aluminium, anodized
9	Ball valve	G 1/2" M/F	Brass, nickered
10	Bourdon vacuum gauge	G 1/2" M	
11	Elbow 90°	G 1/2" M/F	Aluminium, anodized
12	Dust filter	G 1/2" M/F	
13	Inlet reduction ¹⁾ (not shown)	G 1/2" M – G 3/4" F	galvanised steel

¹⁾ With NBR-O-Ring

M = Outside thread

F = Inside thread

Ordering Information**Connection Fittings****SV 10 B****SV 16, 16 B, 16 D****SV 25, 25 B, 25 D**

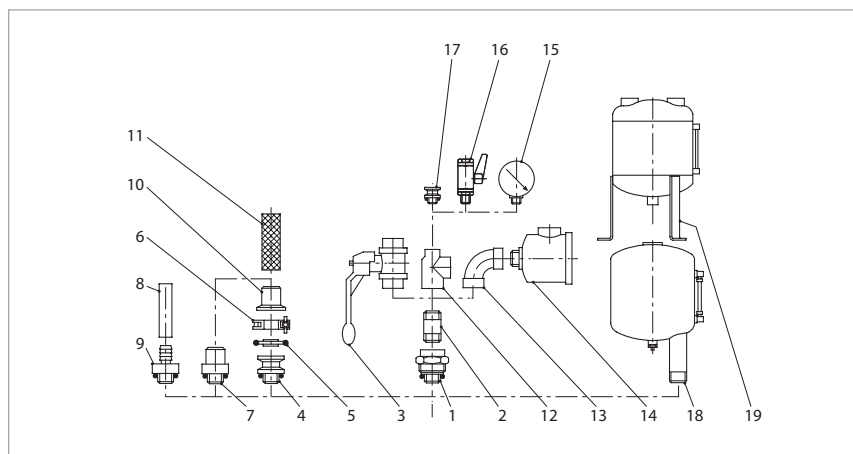
		Part No.	Part No.	Part No.
Item	Description			
1	Screw coupling	711 18 020	711 18 020	711 18 020
2	Threaded flange adaptor ¹⁾	711 18 120	711 18 120	711 18 120
3	Centering ring ¹⁾	183 26	183 26	183 26
4	Clamping ring	183 41	183 41	183 41
5	Hose connection	711 18 300	711 18 300	711 18 300
6	Hose connection ¹⁾	711 18 011	711 18 011	711 18 011
7	PVC tubing	711 18 323	711 18 323	711 18 323
8	Tee piece	711 18 250	711 18 250	711 18 250
9	Ball valve	711 30 113	711 30 113	711 30 113
10	Bourdon vacuum gauge	951 92	951 92	951 92
11	Elbow 90°	711 18 210	711 18 210	711 18 210
12	Dust filter ²⁾			
	with paper cartridge	951 50	951 50	951 50
	with activated charcoal cartridge	711 27 092	711 27 092	711 27 092
	with metal cartridge	711 27 093	711 27 093	711 27 093
	with polyester filter cartridge	711 27 094	711 27 094	711 27 094
13	Inlet reduction ¹⁾ (not shown)	951 24	951 24	951 24

Special versions for oxygen applications are available upon request

¹⁾ With NBR-O-Ring

²⁾ See "Dust Filters F (Suction Side)" for other options

Connection Fittings for SOGEVAC SV 40 B, SV 65 B, SV 100 B



Connection fittings for SOGEVAC SV 40 B, SV 65 B, SV 100 B

Technical Data

Connection Fittings

Item	Description	Connection	Material
1	Screw coupling	G 1 1/4" M/F	Aluminium, NBR
2	Double nipple	G 1 1/4" M/M	Steel
3	Ball valve	G 1 1/4" F/F	Brass, nickered
4	Threaded flange adaptor ¹⁾	G 1 1/4" M – DN 40 ISO-KF	Aluminium, anodized
5	Centering ring	DN 40 ISO-KF	Aluminium
6	Clamping ring	DN 32/40 ISO-KF	Aluminium
7	Hose connection ¹⁾	G 1 1/4" M / DN 40 mm (1.58 in.)	Aluminium, anodized
8	Rubber hose	dia 10 x 25 mm (0.39 x 0.98 in.), 1 m (3.5 ft) long	
9	Hose connection ¹⁾	G 1 1/4" M – DN 10	Aluminium, anodized
10	Hose connection	DN 40 ISO-KF/DN 40 mm	Aluminium, anodized
11	PVC tubing	DN 40 ISO-KF/DN 40 mm (1.58 in.)	
12	Tee reducer bush	G 1 1/4" – 1 1/4" – 1/2" F/F/F	Gray cast iron
13	Elbow 90°	G 1 1/4" F/F	Gray cast iron
14	Dust filter	G 1 1/4" M/F	
15	Bourdon vacuum gauge	G 1/2" M	
16	Ball valve	G 1/2" M/F	Brass, nickered
17	Threaded flange adaptor ¹⁾	G 1/2" M – DN 16 ISO-KF	Aluminium, anodized
18	Liquid trap	G 1 1/4" – 1 1/4" – 3/8" M/F	
19	Liquid trap	G 1 1/4" – 1 1/4" – 1/2" F/F/F	

¹⁾ inkl. O-Ring

M = Outside thread

F = Inside thread

Ordering Information**Connection Fittings**

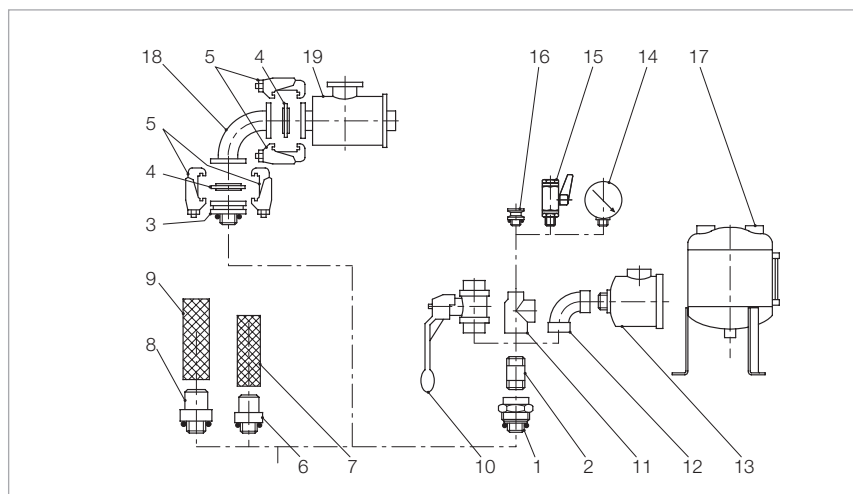
		SV 40 B	SV 65 B	SV 100 B
		Part No.	Part No.	Part No.
Item	Description			
1	Screw coupling	711 18 023	711 18 023	711 18 023
2	Double nipple	711 18 033	711 18 033	711 18 033
3	Ball valve	711 30 105	711 30 105	711 30 105
4	Threaded flange adaptor ¹⁾	711 18 123	711 18 123	711 18 123
5	Centering ring	183 28	183 28	183 28
6	Clamping ring	183 43	183 43	183 43
7	Hose connection ¹⁾	711 18 013	711 18 013	711 18 013
8	Rubber hose	172 03	172 03	172 03
9	Hose connection ¹⁾	711 18 153	711 18 153	711 18 153
10	Hose connection	711 18 303	711 18 303	711 18 303
11	PVC tubing	711 18 324	711 18 324	711 18 324
12	Tee reducer bush	711 18 263	711 18 263	711 18 263
13	Elbow 90°	711 18 213	711 18 213	711 18 213
14	Dust filter			
	with paper cartridge	951 55	951 55	951 55
	with activated charcoal cartridge	711 27 102	711 27 102	711 27 102
	with metal cartridge	711 27 103	711 27 103	711 27 103
	with polyester filter cartridge	711 27 104	711 27 104	711 27 104
15	Bourdon vacuum gauge	951 92	951 92	951 92
16	Ball valve	711 30 113	711 30 113	711 30 113
17	Threaded flange adaptor ¹⁾	711 18 120	711 18 120	711 18 120
18	Liquid trap	951 40	-	-
19	Liquid trap	951 42	951 42	951 42

Special versions for oxygen applications are available upon request

¹⁾ With NBR-O-Ring

²⁾ See "Dust Filters F (Suction Side)" for other options

Connection Fittings for SOGEVAC SV 200, SV 300 B



Connection fittings for SOGEVAC SV 200 and SV 300 B

Technical Data

Connection Fittings

Item	Description	Connection	Material
1	Screw coupling	G 2" M/F	Aluminium, anodized
2	Double nipple	G 2" M/M – 150 mm (5.9 in.)	Steel
3	Threaded flange adaptor ¹⁾	G 2" M – DN 63 ISO-K	Steel, zinc coated
4	Centering ring mit Außenring ¹⁾	DN 63 ISO-K	Aluminium, CR
5	Set of clamping screws DN ISO-K (4 pieces)	M10 x 24	Steel, zinc coated
6	Hose connection ¹⁾	G 2" M – DN 50 mm (1.97 in.)	Aluminium, anodized
7	PVC tubing ¹⁾	ø 50 mm (1.97 in.), 1 m (3.5 ft) long	PVC
8	Hose connection ¹⁾	G 2" M – DN 60 mm (2.36 in.)	Aluminium, anodized
9	PVC tubing	ø 60 mm (2.36 in.), 1 m (3.5 ft) long	PVC
10	Ball valve	G 2" F/F	Brass, nickerled
11	Tee reducer	G 2" – 2" – 1/2" F/F/F	Gray cast iron
12	Elbow 90°	G 2" F/F	Gray cast iron
13	Dust filter	G 2" M/F	
14	Bourdon vacuum gauge	G 1/2" M	
15	Ball valve	G 1/2" M/F	Brass, nickerled/Aluminium
16	Threaded ISO-KF small-flange adaptor ¹⁾	G 1/2" M – DN 16 ISO-KF	Aluminium, anodized
17	Liquid trap	G 2" – 2" – 1/2" F/F/F	
18	Elbow 90°	DN 63 ISO-K	Stainless steel
19	Dust filter with paper cartridge	DN 63 ISO-K	

¹⁾ inkl. O-Ring

M = Outside thread
F = Inside thread

Ordering Information**Connection Fittings****SV 200****SV 300 B****SV 320 B**

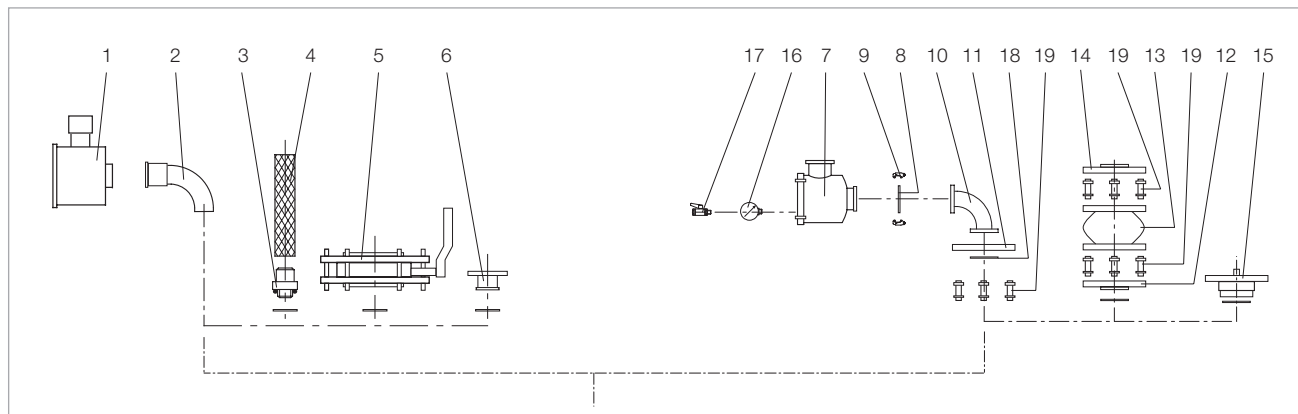
	Part No.	Part No.	Part No.
Item Description			
1 Screw coupling	711 18 025	711 18 025	711 18 025
2 Double nipple	11 18 035	711 18 035	711 18 035
3 Threaded flange adaptor ¹⁾	711 18 126	711 18 126	711 18 126
4 Centering ring mit Außenring ¹⁾	268 05	268 05	268 05
5 Set of clamping screws DN ISO-K (4 pieces)	267 01	267 01	267 01
6 Hose connection ¹⁾	711 18 015	711 18 015	711 18 015
7 PVC tubing ²⁾	711 18 325	711 18 325	711 18 325
8 Hose connection ¹⁾	711 18 016	711 18 016	711 18 016
9 PVC tubing	711 18 326	711 18 326	711 18 326
10 Ball valve	711 30 107	711 30 107	711 30 107
11 Tee reducer	711 18 265	711 18 265	711 18 265
12 Elbow 90°	711 18 215	711 18 215	711 18 215
13 Dust filter			
with paper cartridge	951 65	951 65	951 65
with activated charcoal cartridge	711 27 122	711 27 122	711 27 122
with metal cartridge	711 27 123	711 27 123	711 27 123
with polyester filter cartridge	711 27 124	711 27 124	711 27 124
14 Bourdon vacuum gauge	951 92	951 92	951 92
15 Ball valve	711 30 113	711 30 113	711 30 113
16 Threaded ISO-KF small-flange adapto ¹⁾	711 18 120	711 18 120	711 18 120
17 Liquid trap	951 44	951 44	951 44
18 Elbow 90°	887 25	887 25	887 25
19 Dust filter with paper cartridge	951 68	951 68	951 68

Special versions for oxygen applications are available upon request

¹⁾ With NBR-O-Ring

²⁾ See "Dust Filters F (Suction Side)" for other options

Connection Fittings for SOGEVAC SV 470 B(F), SV 570 B(F)



Connection fittings for SOGEVAC SV 470 B(F), SV 570 B(F)

Technical Data

Connection Fittings

Item	Description	Connection	Material
1	Dust filter with paper cartridge with metal cartridge with activated charcoal cartridge	G3" F/M	Steel, zinc coated
2	Elbow 90°	G3" M/F	Cast iron, painted
3	Adapter	G3" M – DN 90	Steel, painted
4	PVC tubing	Ø 90 mm, 1 m long	
5	Manual valve	G3" M/F	Cast iron, painted
6	Flange	G3" M – DN 100 ISO-K	Aluminium
7	Dust filter with paper cartridge with metal cartridge with activated charcoal cartridge with polyester filter cartridge	DN 100 ISO-K DN 100 ISO-K DN 100 ISO-K DN 100 ISO-K	Steel, painted Steel, painted Steel, painted Steel, painted
8	Centering ring mit O-Ring	DN 100 ISO-K	Stainless steel
9	Set of clamping screws (4 pieces are required)	M10 x 24	Steel, zinc coated
10	Elbow 90°	DN 100 ISO-K	Stainless steel
11	Adaptor flange	DN 100 ISO-K, DIN 2501	Steel, painted
12	Collar flange	DN 100 PN 10 – G3" M	Steel, painted
13	Compensator	DN 100 PN 10	Steel / Rubber
14	Flange	DN 100 PN 10 – G3" F	Steel, painted
15	Double nipple	DN 100 ISO-K / DN 100 PN 10 – G3" M	Steel
16	Filter manometer	G1/2" M	
17	Venting valve	G1/2" M/F	Steel
18	O-ring FPM (FKM)		FPM (FKM)
19	Set of bolts	M16	Steel, zinc coated

M = Outside thread

F = Inside thread

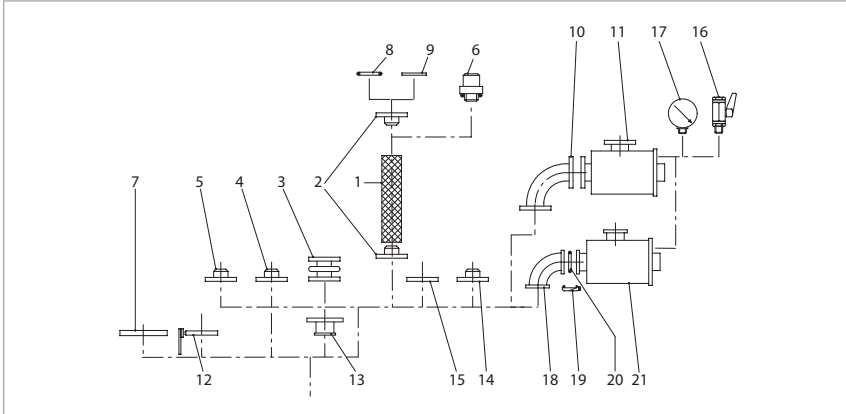
Ordering Information**Connection Fittings****SV 470 B(F)****SV 570 B(F)**

		Part No.	Part No.
Item	Description		
1	Dust filter with paper cartridge with metal cartridge with activated charcoal cartridge	Upon request Upon request Upon request	Upon request Upon request Upon request
2	Elbow 90°	9516 223V	9516 223V
3	Adapter	9516 221V	9516 221V
4	PVC tubing	711 18 329	711 18 329
5	Manual valve	9516 225V	9516 225V
6	Flange	711 18 127	711 18 127
7	Dust filter with paper cartridge with metal cartridge with activated charcoal cartridge with polyester filter cartridge	951 72 711 27 167 711 27 166 711 27 168	951 72 711 27 167 711 27 166 711 27 168
8	Centering ring mit O-Ring ¹⁾	268 06	268 06
9	Set of clamping screws (4 pieces are required)	267 01	267 01
10	Elbow 90°	887 26	887 26
11	Adaptor flange	267 50	267 50
12	Collar flange	9516 226V	9516 226V
13	Compensator	711 18 342	711 18 342
14	Flange	711 18 370	711 18 370
15	Double nipple	9516 222V	9516 222V
16	Filter manometer	951 92	951 92
17	Venting valve	711 30 113	711 30 113
18	O-ring FPM (FKM)	712 42 892	712 42 892
19	Set of bolts	714 12 440	714 12 440

Special versions for oxygen applications are available upon request

¹⁾ With NBR O-ring

Connection Fittings for SOGEVAC SV 630 B(F), SV 750 B(F)



Connection fittings for SOGEVAC SV 630 B(F), SV 750 B(F)

Technical Data

Connection Fittings

Item	Description	Connection	Material
1	PVC tubing	90 mm (3.54 in.) dia., 1 m (3.5 ft) long	
2	Hose connection	DN 100 PN 10 – DN 90 mm (3.54 in.)	Steel
3	Coupling	Ø 100 – PN 10	Stainless steel/Aluminium/Rubber
4	Adaptor flange	DN 100 PN 10 – G 4" F	Steel
5	Adaptor flange	DN 100 PN 10 – G 3" F	Steel
6	Adaptor flange	G 4" M – DN 90	Steel/NBR
7	Adaptor for Roots pump	RUVAC 1001 RUVAC 2001 RUVAC WH4400	Steel/NBR Steel/FPM Steel/FPM
8	O-Ring	dia. 110 x 5 (3.94 x 0.2 in.)	NBR
9	Centering ring with O-Ring	DN 100 PN 10 – DN 100 ISO-K	Aluminium/NBR
10	Elbow 90°	DN 100 PN 10	Steel
11	Dust filter F 630	DN 100 PN 10	
12	Manually operated blocking valve	DN 100 PN 10	Gray cast iron
13	Adapter	DN 100 PN 10 – 100 ISO-K	Aluminium
14	Adaptor flange with tubulation	DN 100 PN 10 (tube dia. 108 (4.25 in.))	Steel
15	Collar flange	DN 100 PN 10 – DN 100 ISO-K	Steel
16	Ball valve	G 1/2" M/F	Brass, nickered/Aluminium
17	Bourdon vacuum gauge	G 1/2" M	
18	Elbow 90°	DN 100 ISO-K	Stainless steel
19	Set of clamps for DN ISO-K Set = 4 pieces	M 10 x 24	Steel, zinc coated
20	Centering ring	DN 100 ISO-K	Aluminium/NBR
21	Dust filter	DN 100 ISO-K	
	Screw set (not drawn) Set = 8 screws and 8 nuts	DN 100 PN 10	Steel, zinc coated

M = Outside thread

F = Inside thread

Ordering Information

Connection Fittings

SV 630 B(F)

SV 750 B(F)

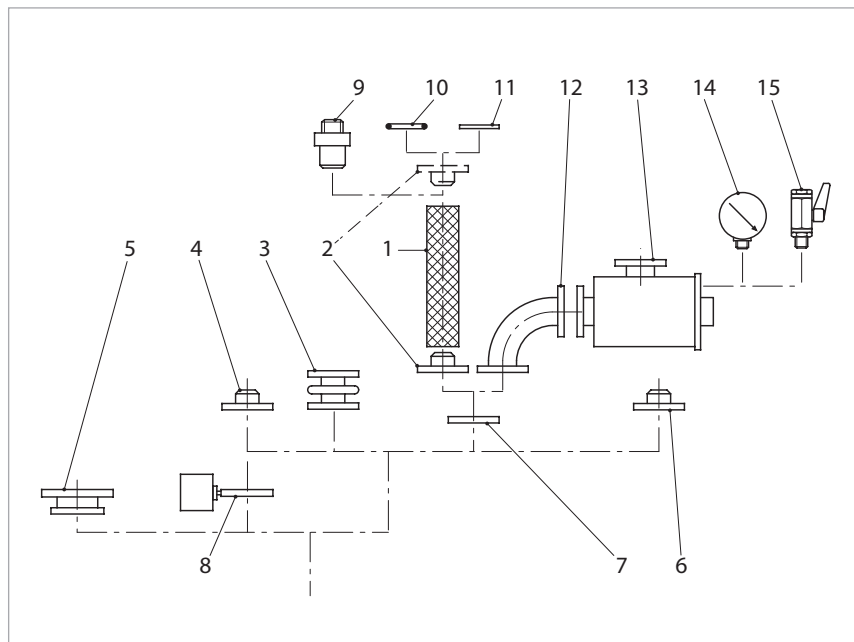
Item	Description	Part No.	Part No.
1	PVC tubing	711 18 329	711 18 329
2	Hose connection	711 18 362	711 18 362
3	Coupling	711 18 342	711 18 342
4	Adaptor flange	711 18 372	711 18 372
5	Adaptor flange	711 18 370	711 18 370
6	Hose connection	711 18 017	711 18 017
7	Adaptor for Roots pump RUVAC 1000 RUVAC 2000 RUVAC WH4400	971 432 340 971 432 350 971 43 WH4400	971 432 340 971 432 350 971 43 WH4400
8	O-ring	712 42 882	712 42 882
9	Centerring ring with O-ring	711 18 391	711 18 391
10	Elbow 90°	711 18 284	711 18 284
11	Dust filter F 630 ¹⁾ with paper cartridge with activated charcoal cartridge with metal cartridge with polyester filter cartridge	951 71 711 27 162 711 27 163 711 27 164	951 71 711 27 162 711 27 163 711 27 164
12	Manually operated blocking valve	711 30 116	711 30 116
13	Adaptor	711 18 336	711 18 336
14	Adaptor flange with tubulation	711 18 351	711 18 351
15	Collar flange	711 18 383	711 18 383
16	Ball valve	711 30 113	711 30 113
17	Bourdon vacuum gauge	951 92	951 92
18	Elbow 90°	887 26	887 26
19	Clamp screws for DN ISO-K Set = 4 pieces	267 01	267 01
20	Centering ring ²⁾	268 06	268 06
21	Dust filter ¹⁾ with paper cartridge with activated charcoal cartridge with metal cartridge with polyester cartridge	951 72 711 27 166 711 27 167 711 27 168	951 72 711 27 166 711 27 167 711 27 168
	Screw set (not drawn) Set = 8 screws and 8 nuts	714 12 440	714 12 440

Special versions for oxygen applications are available upon request

¹⁾ See "Dust Filters F (Suction Side)" for other options

²⁾ incl. O-ring

Connection Fittings for SOGEVAC SV 1200



Connection fittings for SOGEVAC SV 1200

Technical Data

Connection Fittings

Item	Description	Connection	Material
1	PVC tubing	90 mm (3.54 in.) dia., 1 m (3.5 ft) long	PVC
2	Hose connection	DN 125 PN 10 – DN 90 mm (3.54 in.)	Steel
3	Coupling	DN 125 PN 10	Stainless steel/Aluminium/Rubber
4	Flange with tubulation ¹⁾	DN 125 (tube 139.7 (5.5 in.))	Steel
5	Adaptor for Roots pump	RUVAC 2001 RUVAC 3001 RUVAC WH 4400/7000	Steel Steel/FPM Steel/FPM
6	Adaptor flange	DN 125 PN 10 – G 4" F	Steel
7	Collar flange	DN 125 PN 10 – DN 160 ISO-K	Steel
8	Electropneumatic valve	DN 125 PN 10	Gray cast iron
9	Hose connection	G 4" M – DN 90 mm (3.54 in.)	Steel /NBR
10	O-ring 165 x 5 165 x 5		NBR FPM
11	Centering ring ¹⁾	DN 125 PN 10 – DN 160 ISO-K	Aluminium
12	Elbow 90°	DN 125 PN 10	Steel
13	Dust filter ²⁾	DN 125 PN 10	
14	Bourdon vacuum gauge	G 1/2" M	
15	Ball valve	G 1/2" M/F	Brass, nicked/Aluminium

¹⁾ incl. O-ring

²⁾ See "Dust Filters F (Suction Side)" for other options

M = Outside thread

F = Inside thread

Ordering Information**Connection Fittings
SV 1200**

	Part No.
Item Description	
1 PVC tubing	711 18 329
2 Hose connection	711 18 363
3 Coupling	711 18 343
4 Flange with tubulation ¹⁾	711 18 355
5 Adaptor for Roots pump	
RUVAC 2001	953 37
RUVAC 3001	953 38
RUVAC WH 4400/7000	953 3WH
6 Adaptor flange	711 18 117
7 Collar flange	711 18 386
8 EP-Ventil	715 69 202
9 Hose connection	711 18 017
10 O-Ring	
165 x 5	712 42 902
165 x 5	712 42 912
11 Centering ring ¹⁾	711 18 396
12 Elbow 90°	711 18 287
13 Dust filter ²⁾	
with paper cartridge	951 75
with activated charcoal cartridge	711 27 142
with metal cartridge	711 27 143
with polyester filter cartridge	711 27 144
14 Bourdon vacuum gauge	951 92
15 Ball valve	711 30 113

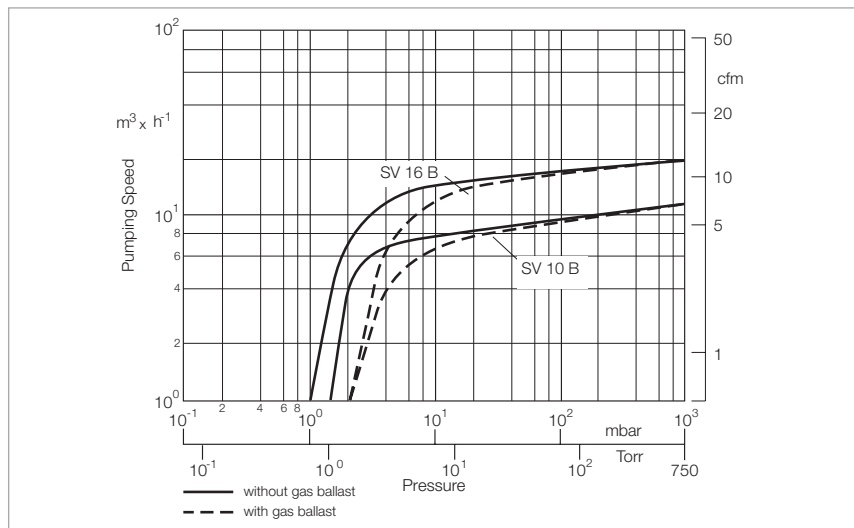
Special versions for oxygen applications are available upon request

¹⁾ incl. O-ring

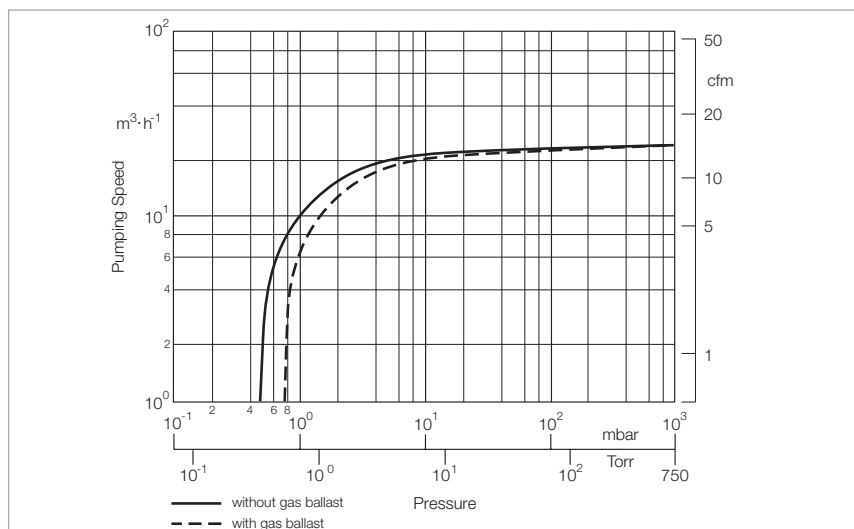
²⁾ See "Dust Filters F (Suction Side)" for other options

Only available for purchase in North and South America

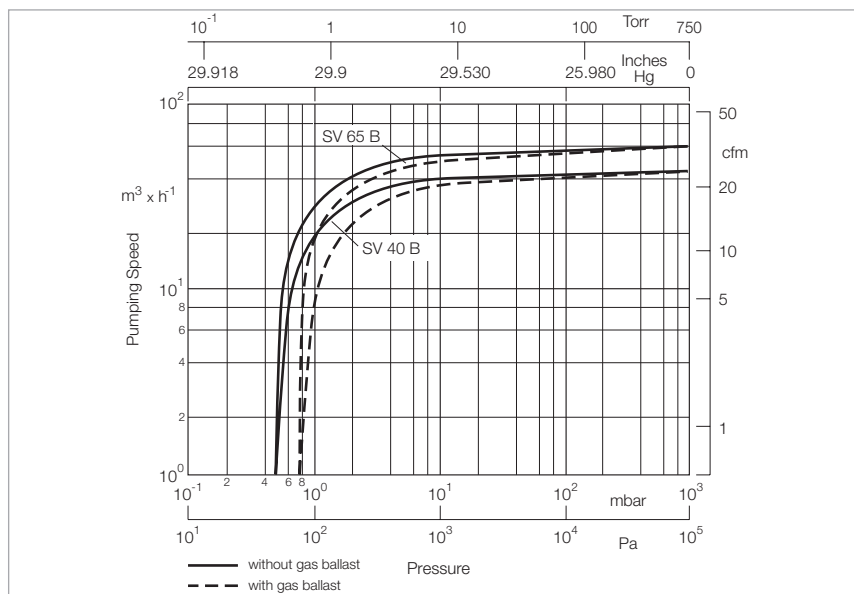
60 Hz Curves



Pumping speed characteristics for the SOGEVAC SV 10 B and SV 16 B at 60 Hz

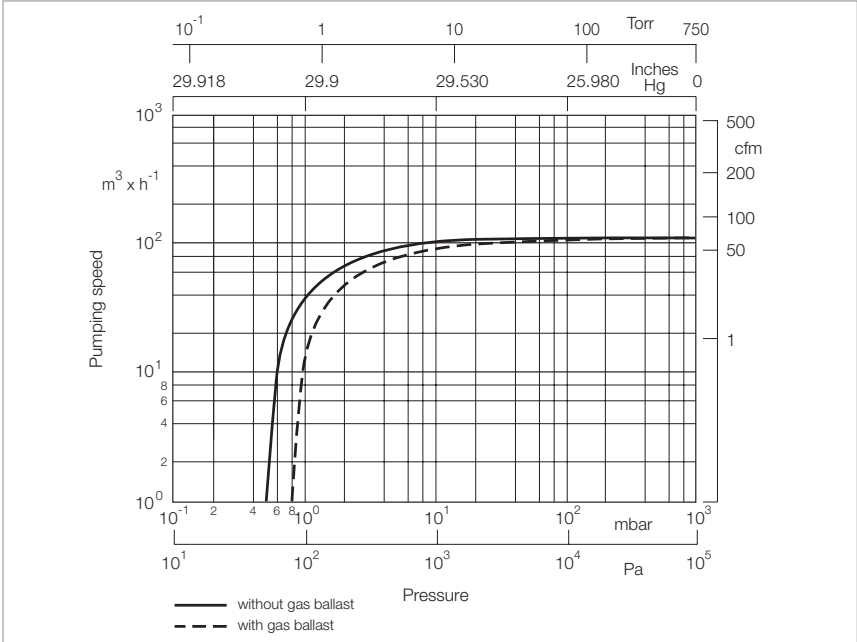


Pumping speed characteristics for the SOGEVAC SV 25 B at 60 Hz

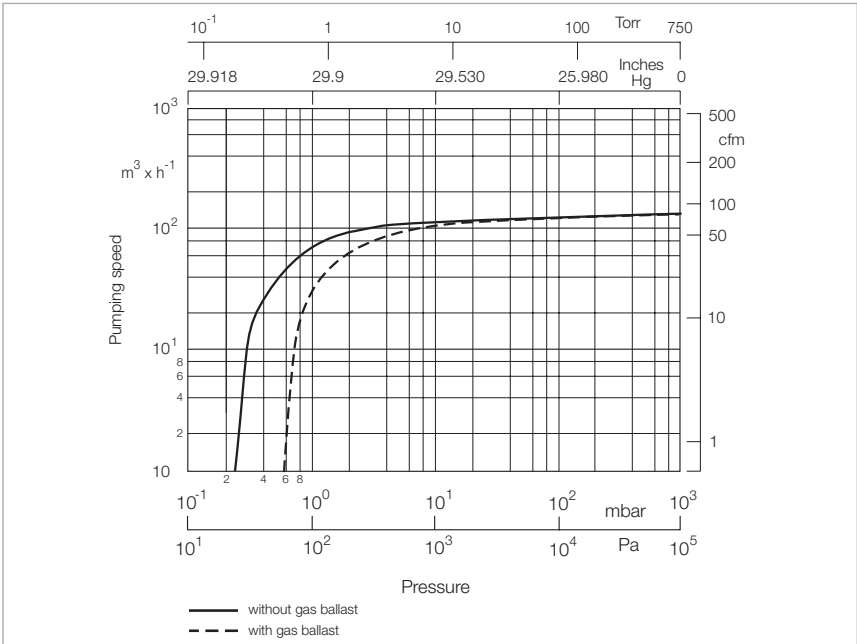


Pumping speed characteristics for the SOGEVAC SV 40 B and SV 65 B at 60 Hz

Only available for purchase in North and South America

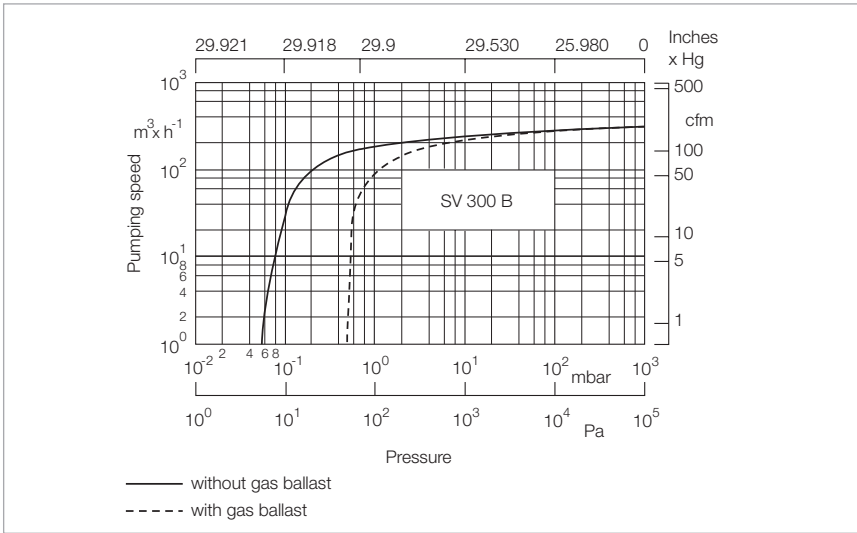


Pumping speed characteristics for the SOGEVAC SV 100 B at 60 Hz

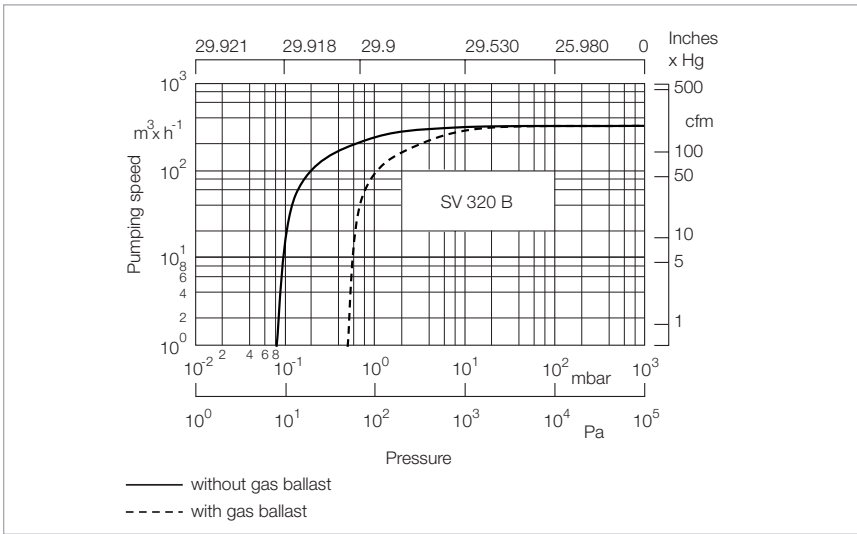


Pumping speed characteristics for the SOGEVAC SV 120 B at 60 Hz

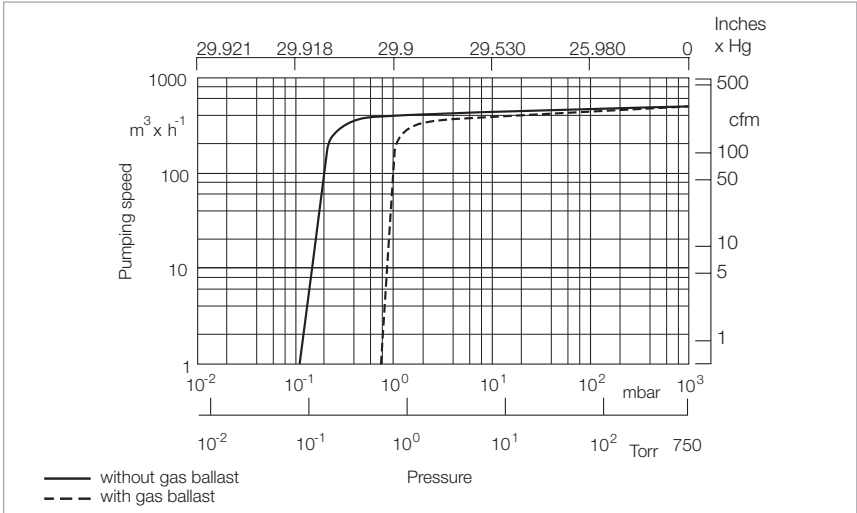
Only available for purchase in North and South America



Pumping speed characteristics for the SOGEVAC SV 300 B at 60 Hz

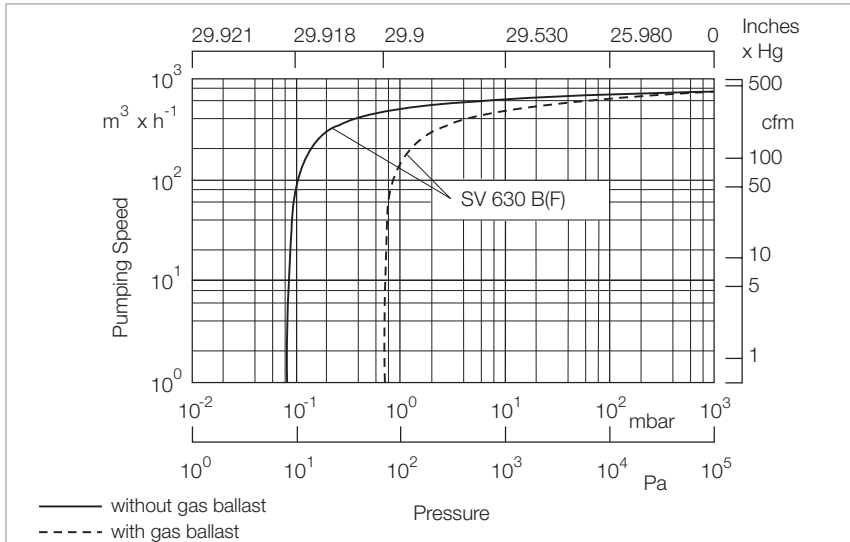


Pumping speed characteristics for the SOGEVAC SV 320 B at 60 Hz

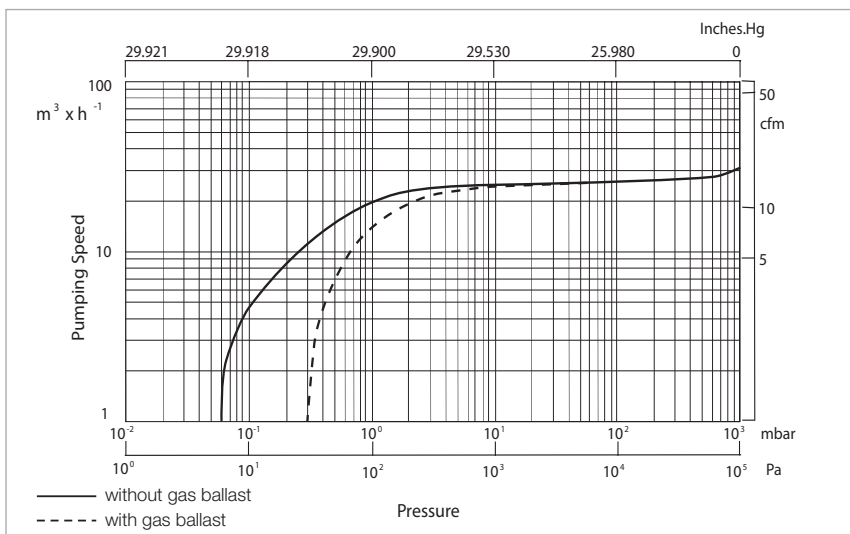


Pumping speed characteristics of the SOGEVAC SV 470 B(F) and 570 B(F) at 60 Hz operation

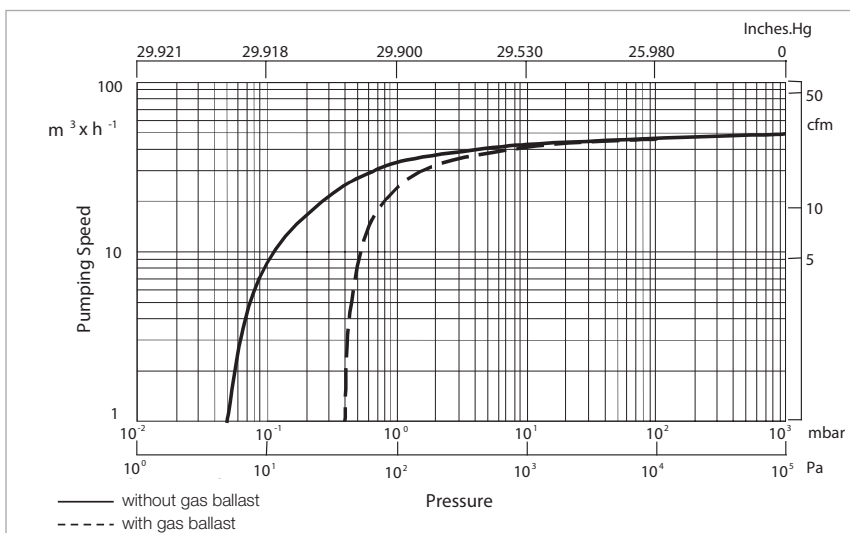
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Pumping speed characteristics for the SOGEVAC SV 630 B(F) at 60 Hz

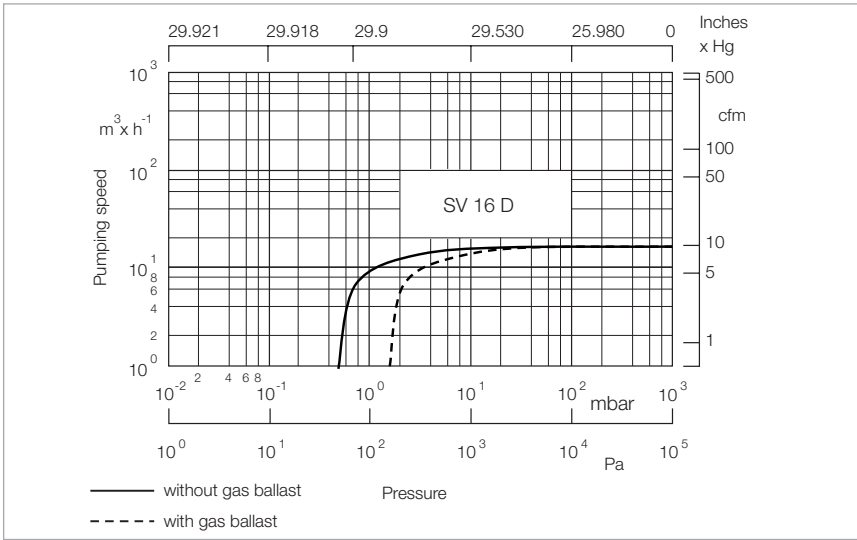


Pumping speed characteristics for the SOGEVAC SV 28 BI at 60 Hz

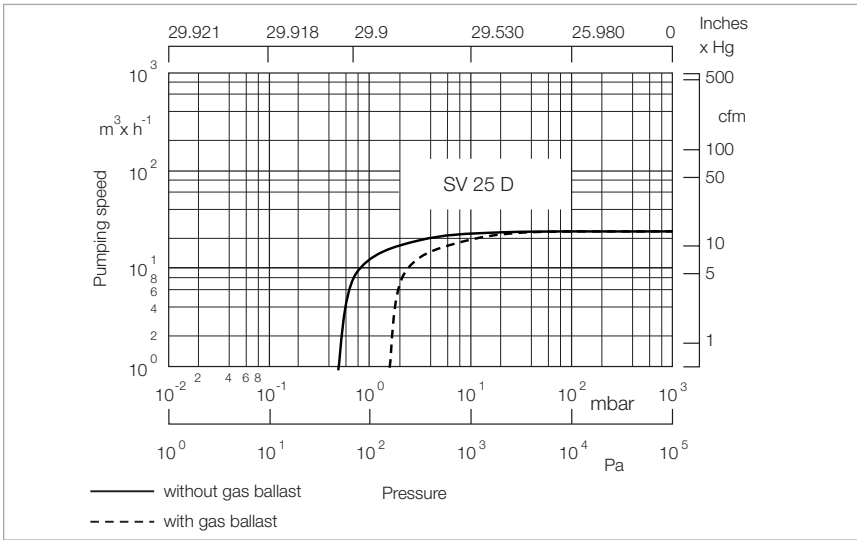


Pumping speed characteristics for the SOGEVAC SV 40 BI at 60 Hz

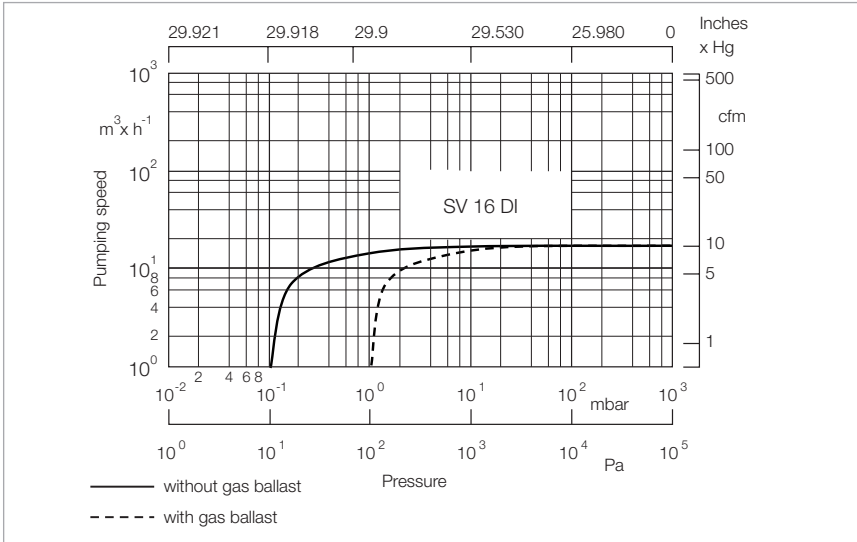
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Pumping speed characteristics of the SOGEVAC SV 16 D at 60 Hz

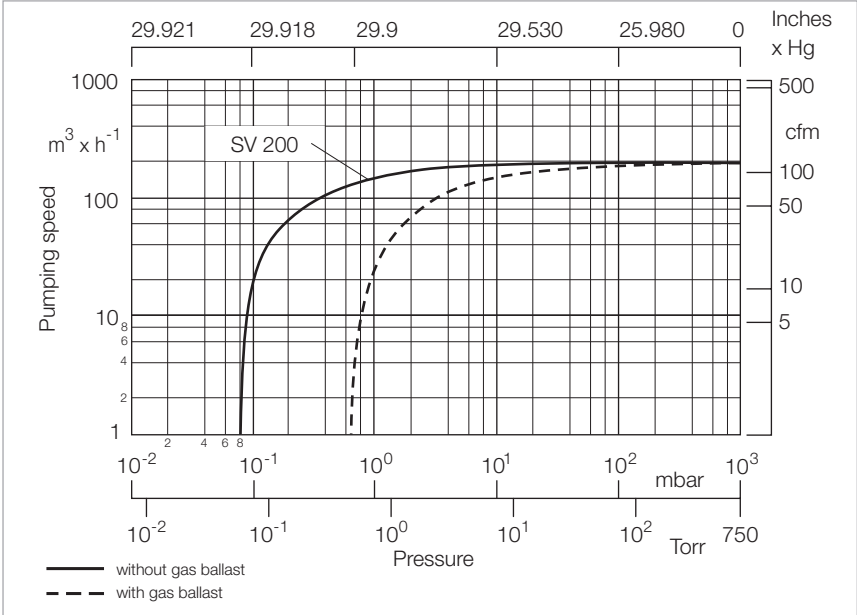


Pumping speed characteristics of the SOGEVAC SV 25 D at 60 Hz

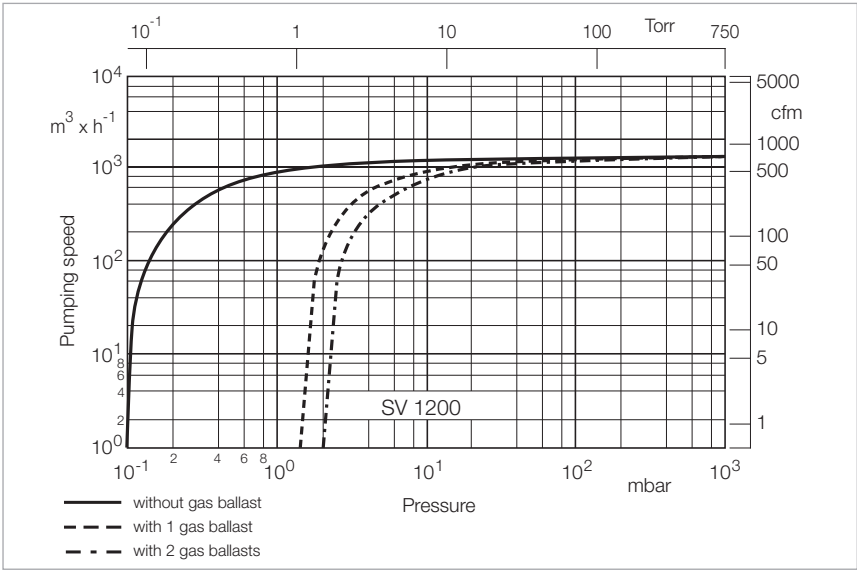


Pumping speed characteristics of the SOGEVAC SV 16 DI at 60 Hz

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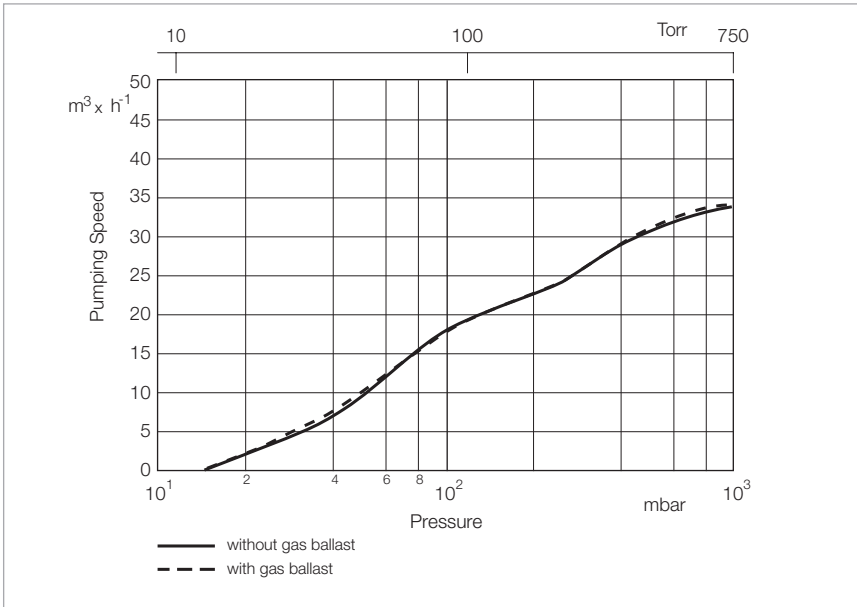


Pumping speed characteristics for the SOGEVAC SV 200 at 60 Hz

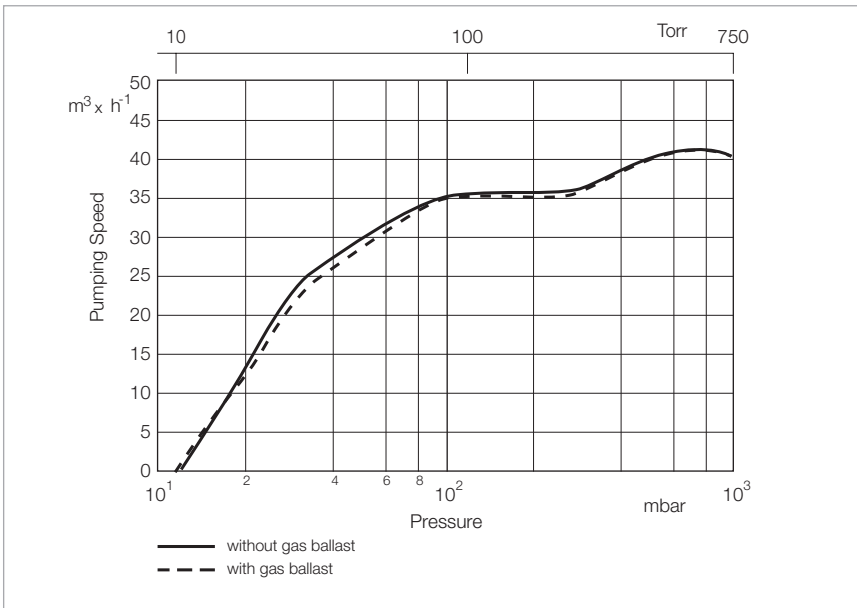


Pumping speed characteristics for the SOGEVAC SV 1200 at 60 Hz

Only available for purchase in North and South America



Pumping speed characteristics of the SOGEVAC SV 40 ATEX at 60 Hz
for gases of the material group IIB and H₂



Pumping speed characteristics of the SOGEVAC SV 40 ATEX at 60 Hz
for gases of the material group IIA

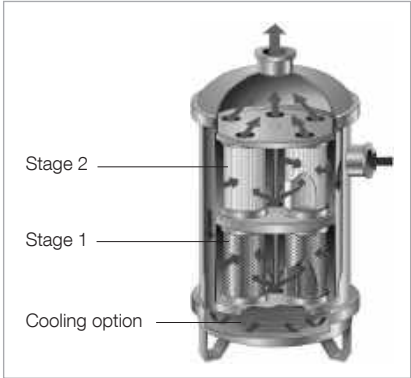
Only available for purchase in North and South America

Combination Filter

Vacuum Pump Inlet Filter



Combination filter

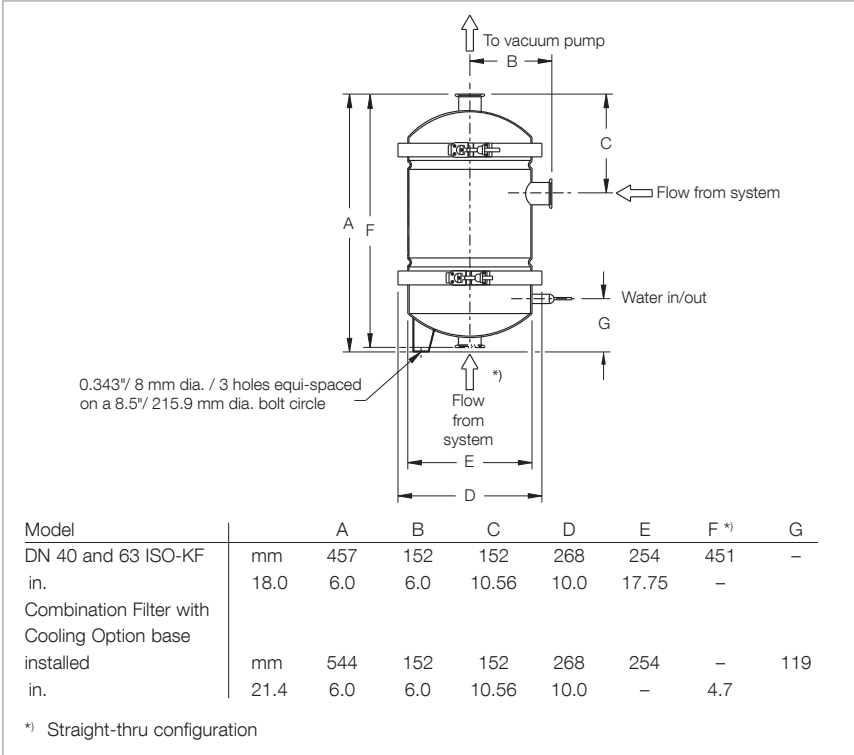


Combination filter: cutaway view

The combination filter is a high efficiency vacuum pump inlet filter designed specifically to condense, absorb, and neutralize process byproducts generated from vacuum applications in the chemical and pharmaceutical industries.



Cooling Option for combination filter



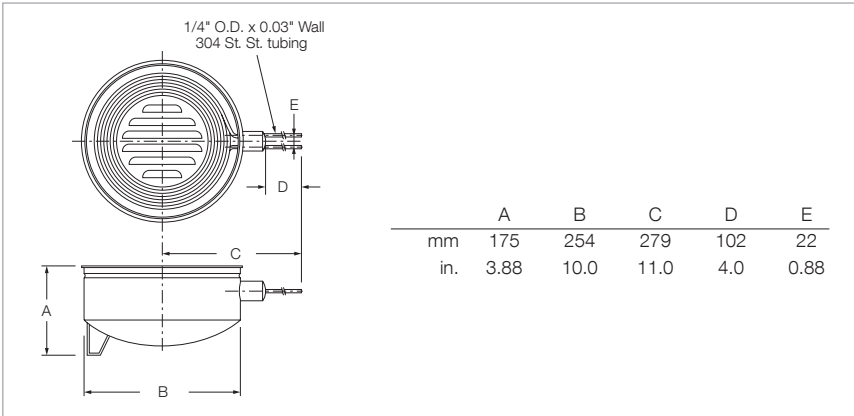
Dimensional drawing for the combination filter

Advantages to the User

- All stainless steel construction with-stands corrosive environments
 - Modular design allows for numerous configurations and easy servicing
 - Stacking modules available for increased capacity
 - Optional drain port for solvent draining and reclamation
 - Customizable absorption/neutraliza-tion stages for optimal efficiency
- Processes such as distillation, drying, degassing, central lab vacuum protection
 - Cooling option: Large cooled surface area for condensing of sol-vents, acids and water vapor

Specifications

- Construction in stainless steel 304
- Upper and lower seals in Buna N and Viton



Dimensional drawing for the combination filter Cooling Option

Ordering Information**Combination Filter****DN 40 ISO-KF****DN 63 ISO-K**

	Part No.	Part No.
Combination filter 5 filter elements in stage 1 and 5 elements in stage 2 (elements not included)	180497V	180499V
straight-thru configuration, same as above except inlet on bottom	180498V	–
Stacking modules includes 2 stages (5 elements ea.), 11.25" (286 mm) tall, all attachment hardware included (filter elements not included)	180500V	180500V
Cooling Option base, 0.5 – 1.0 GPM (2 – 4 LPM) water flow recommended	180501V	180501V

Ordering Information**Filter Elements**

	Part No.
Copper gauze	180502V
Stainless steel gauze	180503V
Molecular sieve	180504V
Porous mixture of sodium hydroxide and potassium hydroxide	180505V
Activated charcoal	180506V
Pleated polypropylene 2 micron (99% efficient)	180507V
Pleated polypropylene 5 micron (99% efficient)	180508V
Pleated polypropylene 20 micron (99% efficient)	180509V

Ordering Information**Adapters (Stainless Steel)**

	Part No.
DN 40 ISO-KF to 1 1/4" NPT (male)	899 627
DN 40 ISO-KF to 2" NPT (male)	899 629
DN 63 ISO-K to 2" NPT (male)	721 03 040

Products

Oil Sealed Screw Vacuum Pumps VACUBE VQ 400 i to VQ 1650 iCH



Screw vacuum pump VACUBE VQ 1250 iCH

VACUBE is a new generation of intelligent, single-stage, oil sealed screw vacuum pumps with Variable Speed Drive (VSD) technology.

VACUBE generates vacuum on demand. All pumps are controlled and maintained by an internal controller. The systems offer superior performance for a wide range of rough vacuum applications.

Models

i – model

Ideal for standard vapor free applications as needed in central vacuum systems for holding, lifting and moving of parts and components.

iH – model

This variant is best suited for applications with high water vapor ingress. The high water vapor tolerance level makes the iH – model best suited for the humid applications.

iC – model

The iC – VACUBE variant is specifically designed to support the special needs in short cycling applications, as for example common in vacuum packaging or assembly lines for electronic equipment.

iCH – model

The combination of „iH“ and „iC“ offers high water vapor tolerance and the short cycling ability.

Advantage to the User

- **Pump efficiency**
 - Variable speed drive (VSD)
 - Internal controller
- **Power demand**
 - Sustainable power saving due to on-demand vacuum generation
- **Work space environment**
 - Ultra-high oil retention system
 - Quiet operation, noise level bench mark
 - Small footprint – pallet size dimensions* (*up to 950 m³/h speed)
 - “Plug and play” system set up
- **Sustainable productivity**
 - Programable operation modes
 - Long maintenance intervals
- **Forming and shaping**
 - Plastics (e.g. bath tubs, shower trays, white goods internals)
 - Packaging materials (e.g. thermoformed parts)
 - Glass items such as bottles and windscreens
 - Wood lamination
- **Preserving**
 - Meat packaging (skin, modified atmosphere packaging MAP)
 - Poultry packaging
 - Canning
 - Food freeze drying
- **Dehumidification**
 - Vacuum cooling
 - Roof tile and brick manufacture
 - Pipeline drying
- **Special demands**
 - Altitude testing
 - Special evacuation duties
 - Coating
 - Clean environments

Typical Applications

- **Holding, lifting and moving**
 - Print & Paper
 - Packaging
 - Electronic manufacturing
- **Woodworking**
 - Li-Ion cell manufacturing
 - Glass manufacturing



Integrated Controller / Monitoring System

The VACUBE controller maintains the pressure within programmable limits by automatically adapting the motor speed. A number of programmable settings, e.g. the setpoint, the minimum stop time and the maximum number of

motor starts and several other parameters are hereby taken into account.

The controller stops the vacuum pump whenever possible to reduce the power consumption and restarts it automatically when the pressure increases.

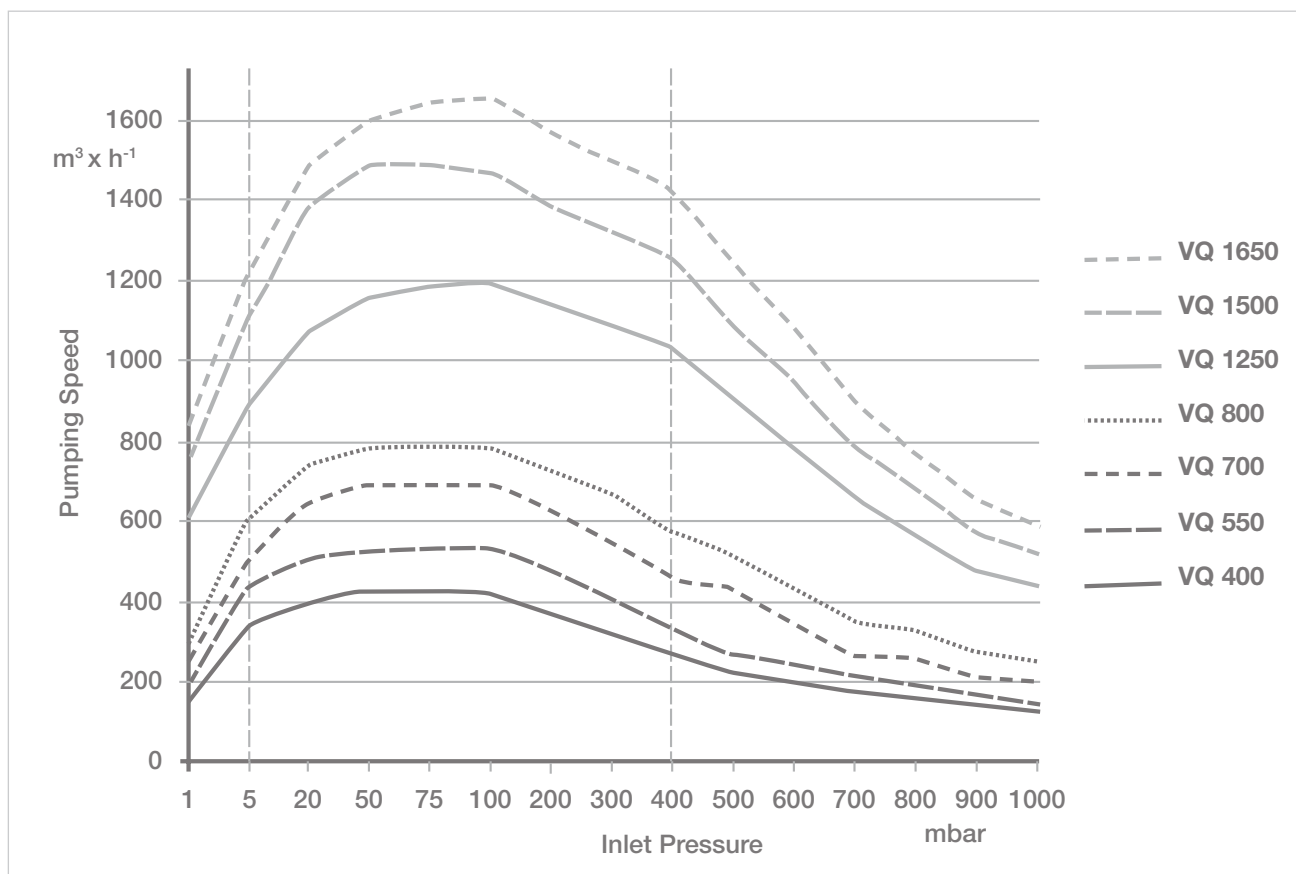
For H version pumps, the pump is equipped with a purge cycle which prevents and removes condensed water in the sealing oil.

The controller can be operated intuitively. A comfortable 3,5" – Color Display is used as graphic user interface to call up menus or to input customized settings easily. LED's inform about maintenance and service demands.

Multiple controllers can be linked with each other.

Further features:

- Set point pressure selection
- Gas ballast on/off
- Displays:
 - Pressures (inlet, discharge)
 - Temperatures
 - Alarms and warnings
 - Counters (e.g. running hours, pump starts, etc.)
- Week timer function
- Language and unit selection



Pumping speed characteristics

		w	h	d
VACUBE 400 - 800	mm (inch)	1266 (49.84)	1083 (42.64)	934 (36.77)
VACUBE 1250 - 1650	mm (inch)	1420 (55.91)	1470 (57.87)	1590 (62.60)

Dimensional drawing VACUBE

Technical Data

VACUBE

VQ 400 VQ 550 VQ 700 VQ 800 VQ 1250 VQ 1500 VQ 1650

Max. eff. pumping speed	m ³ /h / cfm	420 / 247	530 / 310	700 / 412	790 / 465	1250 / 736	1490 / 877	1620 / 955
Ultimate pressure	mbar / Torr	0.35 / 0.26						
Motorshaft power	kW / hp	5.5 / 7.5	7.5 / 10	11 / 15	15 / 20	22 / 29	30 / 40	37 / 50
Noise level	dB(A)	51 – 65	51 – 65	51 – 73	51 – 76	65 – 75	65 – 75	65 – 80
Ambient temperature	°C / °F	0 – 46 / 32 – 115						
Weight	kg / lbs	500 / 1102	500 / 1102	510 / 1125	520 / 1147	1058/ 2333	1058/ 2333	1073/ 2366
Motor protection class	IP	54						
Supply voltages*		380 – 460V, 3ph, 50/60Hz						

* other voltages available on request

Ordering Information

VACUBE

	Part No.
VACUBE VQ 400 i	177040V01
VACUBE VQ 400 iH	177040V10
VACUBE VQ 550 i	177055V01
VACUBE VQ 550 iC	177055V05
VACUBE VQ 550 iH	177055V10
VACUBE VQ 550 iCH	177055V15
VACUBE VQ 700 i	177070V01
VACUBE VQ 700 iC	177070V05
VACUBE VQ 700 iH	177070V10
VACUBE VQ 700 iCH	177070V15
VACUBE VQ 800 i	177080V01
VACUBE VQ 800 iC	177080V05
VACUBE VQ 800 iH	177080V10
VACUBE VQ 800 iCH	177080V15
VACUBE VQ 1250 i	177125V01
VACUBE VQ 1250 iH	177125V10
VACUBE VQ 1500 i	177150V01
VACUBE VQ 1500 iC	177150V05
VACUBE VQ 1500 iH	177150V10
VACUBE VQ 1500 iCH	177150V15
VACUBE VQ 1650 i	177165V01
VACUBE VQ 1650 iC	177165V05
VACUBE VQ 1650 iH	177165V10
VACUBE VQ 1650 iCH	177165V15

Dry Compressing Vacuum Pumps

DIVAC

Diaphragm Vacuum Pumps

SCROLLVAC

Scroll Vacuum Pumps

ECODRY plus

Multi-Stage Roots Vacuum Pumps

LEYVAC / DRYVAC / SCREWLINE / VARODRY

Screw Vacuum Pumps

CLAWVAC

Claw Vacuum and Overpressure Pumps

220.00.02

Excerpt from the Leybold Full Line Catalog (Edition 02/2019)

Catalog Part Dry Compressing Vacuum Pumps

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Vacuum Pumps CLAWVAC CP 65 to CP 300 62

Overpressure Pumps CLAWVAC OP 150 to OP 300 62

DIVAC Program Overview

This range of vacuum pumps was developed especially for laboratory operations and as backing pumps for (wide range) turbomolecular pumps. It satisfies the highest expectations in terms of precision, reliability and ease of use.

The DIVAC line of vacuum pumps is the logical continuation of diaphragm pump technology which has proven its quality in decades of service.

Laboratory Pumps

Through the laboratory pumps and the three different pumping speeds available for the same base pressure and through the modular design, the optimum pump system can be implemented for every application.

DIVAC L diaphragm pumps are suited for almost all requirements in the chemistry lab. They are basically corrosion and solvent resistant since their parts in contact with the pumped medium are made of PTFE (Teflon), FFPM (Kalrez) and PVDF (Solef).

Backing Pumps

The DIVAC T range of diaphragm pumps comprises backing pumps which are used in all applications requiring an especially low base pressure while having to maintain an oil-free vacuum.

The DIVAC T pumps have been specially developed as backing pumps for wide range high vacuum turbomolecular pumps. They meet the requirements for a dry vacuum and a long service life.

DIVAC T pumps may be used both free-standing and integrated in applications or certain devices, and for this reason they are used in the areas of mass spectrometry, analytical and in general applications.

Application Examples

Laboratory Pumps

- Vacuum filtration
- Vacuum distillation
- Vacuum drying
- To extract and transfer gases
- On rotary evaporators
- Gel drying

Backing Pumps

- Backing pump for wide range turbomolecular pumps
- Mass spectrometry
- Medicine technology
- Analytical technology
- General rough and medium vacuum applications

The customized Diaphragm Pump and the Accessories recommended for your Applications

Modular diaphragm pump system	DIVAC 0.6 L	DIVAC 1.2 L	DIVAC 2.2 L	DIVAC 1.4 HV3C	DIVAC 0.8 T	DIVAC 0.8 TL	DIVAC 1.4 HV3	DIVAC 3.8 HV3	DIVAC 4.8 VT
Applications									
Evacuating small devices (e.g. desiccator)	■	■	■	■					
Sublimation	■	■	■	■					
Analysis preparation	■	■	■	■					
Filtration	■	■	■	■					
Distillation	■	■	■	■					
Drying in the drying cabinet			■	■					
Drying cabinets (2 cabinets with 1 pump)			■	■					
Rotary evaporator		■	■	■					
Backing pumps for wide range turbomolecular pumps				■	■	■	■	■	■
Mass spectrometry				■	■	■	■	■	■
Medical technology				■	■	■	■	■	■
Analytical technology				■	■	■	■	■	■
General applications in the rough and medium vacuum range	■	■	■	■	■	■	■	■	■

Modular Diaphragm Pump System for the Chemical Laboratory

Advantages to the User

- Low base vacuum of 8 mbar (6 Torr) for two-stage and 2 mbar (1.5 Torr) for three-stage DIVAC
- All parts of the pump head in contact with the gas are resistant against aggressive media through the use of PTFE (Teflon), FFPM (Kalrez) and PVDF (Solef)
- Dry compressing, oil-free
- Water vapor tolerance
- Low maintenance costs and long service intervals through the use of high-quality components which are well-proven
- Simple maintenance by staff of the customer
- Low noise operation
- Portable, compact, small footprint
- Can be operated in any orientation
- Overheat protection for the vacuum pump by means of a thermal fuse
- Available in four pumping speed categories

Products

Diaphragm Vacuum Pumps for the Chemical Laboratory

Dual-Stage Diaphragm Vacuum Pumps

DIVAC 0.6 L, 1.2 L, 2.2 L

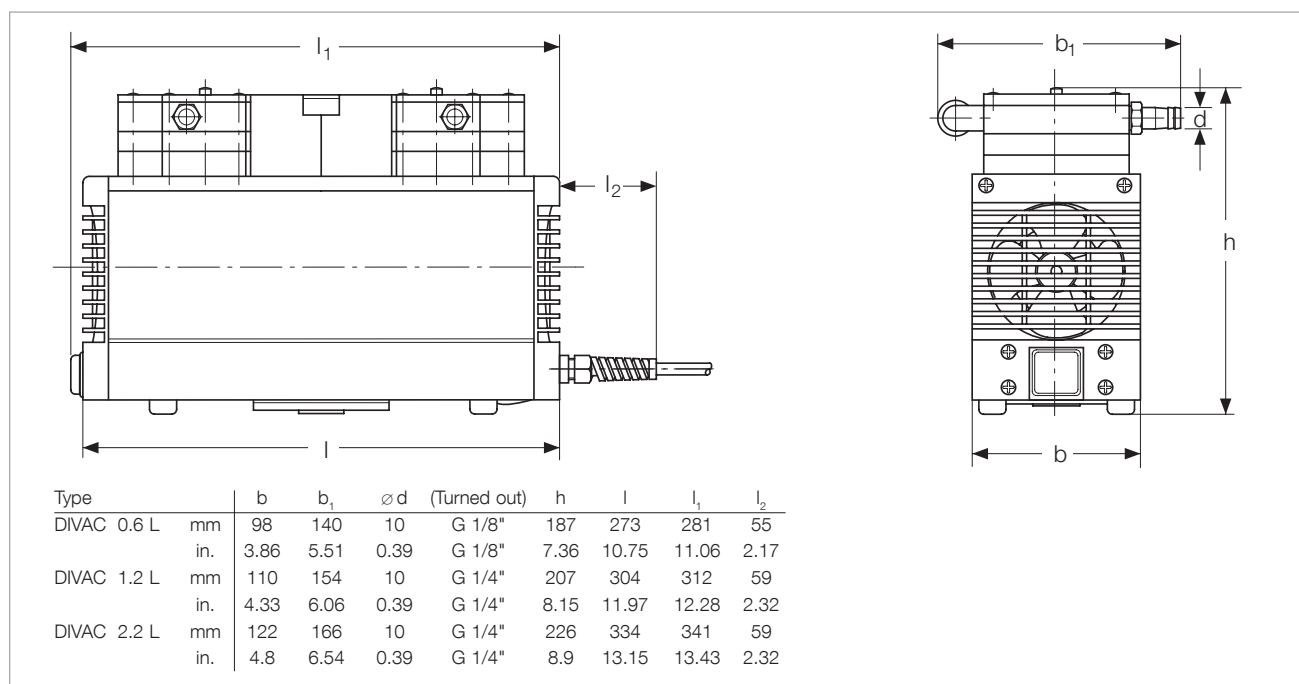


Typical Applications

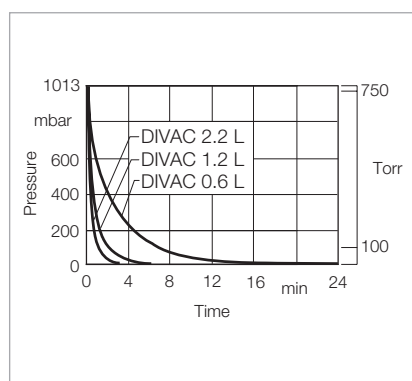
Vacuum generation for

- Rotary evaporators
- Drying chambers
- Filtration units
- Distillation configurations
- Gel dryers

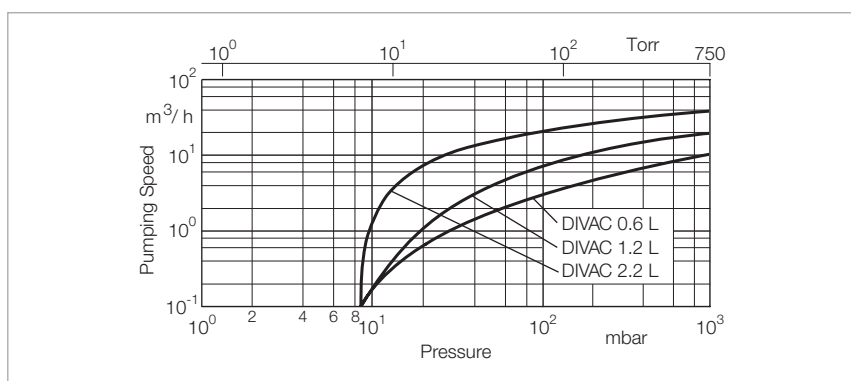
Dual-stage diaphragm vacuum pumps DIVAC 0.6 L, 1.2 L, 2.2 L



Dimensional drawing for the DIVAC 0.6 L, 1.2 L, 2.2 L



Curves of pump-down time of a 10 l vessel



Curves of pumping capacity

Technical Data

DIVAC

		0.6 L	1.2 L	2.2 L
Max. pumping speed (atm.)	m ³ /h ¹ (cfm)	0.6 (0.4)	1.2 (0.7)	2.0 (1.2)
Ultimate pressure	mbar (Torr)	≤ 8 (≤ 6)		
Max. exhaust back pressure (absolute)	mbar (Torr)	2000 (1500)		
Pump heads		2		
Connection				
Inlet (suction side)	DN	Hose nozzle ID 10	Hose nozzle ID 10	Hose nozzle ID 10
Exhaust (delivery side)	DN	Hose nozzle ID 10	Hose nozzle ID 10	Hose nozzle ID 10
Thread (suction and delivery side)	G	G 1/8"	G 1/4"	G 1/4"
Noise level acc. to DIN 45 635 Part 13, approx.	dB(A)	47	50	52
Permissible gas admission temperature, max.	°C (°F)	+5 to +40 (+41 to +104)		
Permissible ambient temperature, max.	°C (°F)	+5 to +40 (+41 to +104)		
Voltage / nominal frequency (1-ph. motor)				
Schuko plug	V / Hz	230 ± 10% / 50		
NEMA plug	V / Hz	115 ± 10% / 60		
NEMA plug	V / Hz	100 ± 10% / 50/60		
Protective class	IP	44		
Motor power ¹⁾	W	90	120	245
Current consumption ¹⁾	A	0,6	0,7	1,8
Motor speed				
50 Hz	min ⁻¹	1500		
60 Hz	min ⁻¹	1800		
Dimensions (W ¹⁾ x H ¹⁾ x D), approx	mm (in.)	281 x 140 x 187 (11.06 x 5.51 x 7.36)	312 x 154 x 207 (12.28 x 6.06 x 8.15)	341 x 166 x 226 (13.43 x 6.54 x 8.9)
Weight, approx.	kg (lbs)	6.9 (15.2)	9.3 (20.5)	12.6 (27.8)
Material				
Pump head		PTFE (Teflon)		
Structured diaphragm		PTFE coated		
Valves		FFPM (Kalrez)		
Nozzles		PVDF (Solef)		

Ordering Information

DIVAC

	0.6 L	1.2 L	2.2 L
	Part No.	Part No.	Part No.
Diaphragm vacuum pump 230 V, 50 Hz, with 2.3 m (8 ft) power cord and Schuko plug	135 00	135 06	135 12
Diaphragm vacuum pump 100 V, 50/60 Hz, with 2.3 m (8 ft) power cord and NEMA plug	135 02	135 08	135 14
Diaphragm vacuum pump 115 V, 60 Hz, with 2.3 m (8 ft) power cord and NEMA plug	-	-	135 15
Spare parts kit consisting of 2 diaphragms, 4 gasket rings, 4 valve plates	EK135 23	EK135 24	EK135 25
Hose nozzle kit consisting of 2 hose nipples, piping	-	200 650 06	200 650 07

¹⁾ For 230 V, 50 Hz version

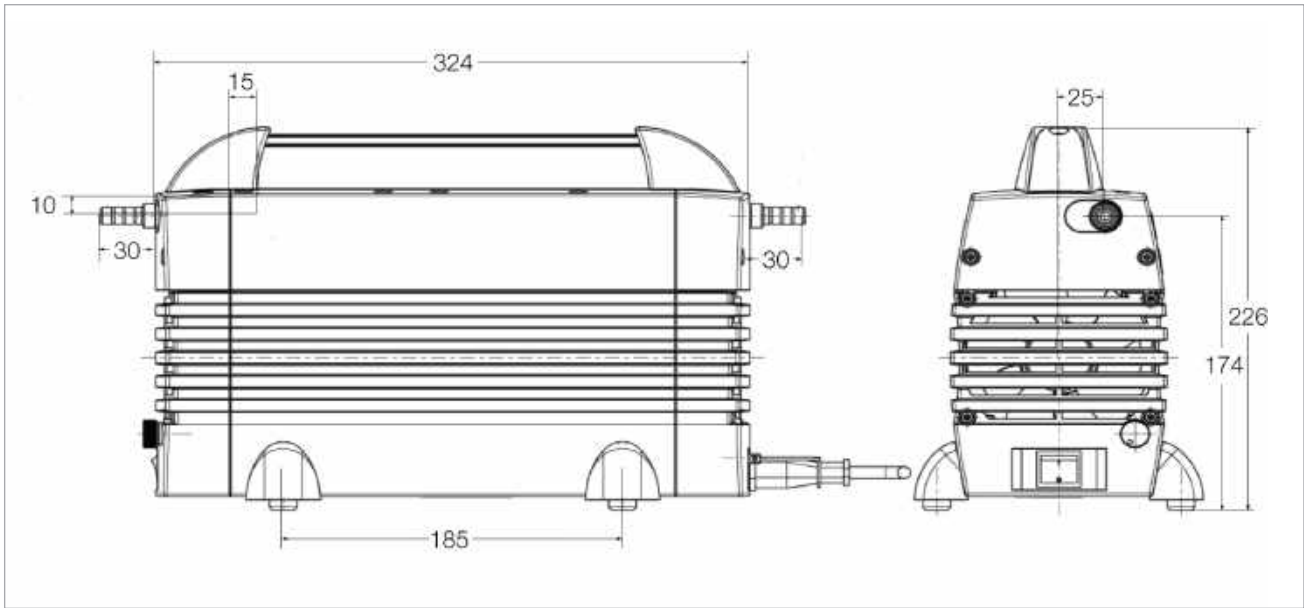
Three-Stage Diaphragm Vacuum Pumps

DIVAC 1.4 HV3C

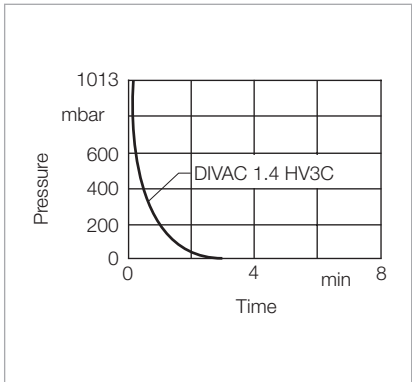


Three-stage diaphragm vacuum pump DIVAC 1.4 HV3C

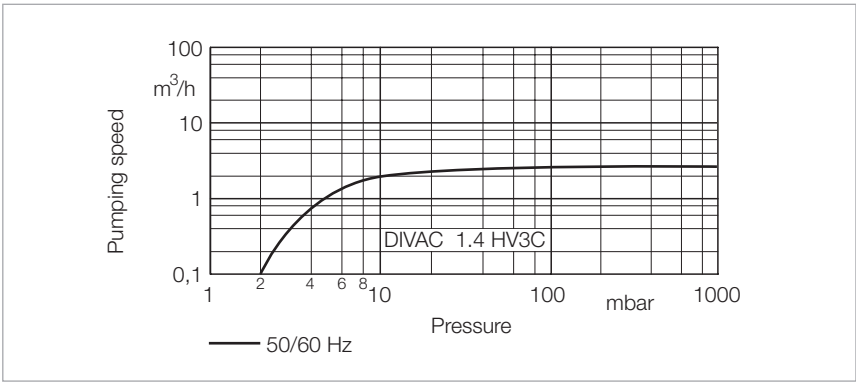
The DIVAC 1.4 HV3C is a three-stage diaphragm pump capable of resisting chemicals and offering an improved pumping performance. Its speed is infinitely variable from 700 to 1600 rpm so that the pumping speed of the pump can be easily adapted to differing requirements. The built-in textured diaphragm is made of EPDM and has been coated with PTFE. The valves are made of KALREZ® thereby ensuring excellent resistance also in connection with aggressive gases. Owing to the three-stage design, pressures of 2 mbar can be attained very easily.



Dimensional drawing for the DIVAC 1.4 HV3C



Curves of pump-down time of a 10 l vessel



Curves of pumping capacity

Technical Data

DIVAC 1.4 HV3C

Max. pumping speed	m ³ /h ¹ (cfm)	1.3 (0.77)
Ultimate pressure	mbar (Torr)	≤ 2.0 (≤ 1.5)
Max. exhaust back pressure (absolute)	mbar (Torr)	1500 (1125)
Pump heads		3
Connection		
Inlet (suction side)	DN	Hose nozzle ID 10
Exhaust (delivery side)	DN	Hose nozzle ID 10
Thread (suction and delivery side)	G	G 1/8"
Noise level acc. to DIN 45 635 Part 13, approx.	dB(A)	48
Permissible gas admission temperature, max.	°C (°F)	+5 to +40 (+41 to +104)
Permissible ambient temperature, max.	°C (°F)	+5 to +40 (+41 to +104)
Voltage / nominal frequency	V / Hz	90 – 230 / 50 – 60
Protective class	IP	20
Motor power ¹⁾	W	135
at ultimate pressure	W	35
Current consumption ¹⁾	A	1.3
Motor speed	min ⁻¹	700 to 1600
Dimensions (W ¹⁾ x H ¹⁾ x D), approx	mm (in.)	324 x 158 x 226 (12.76 x 6.22 x 8.90)
Weight, approx.	kg (lbs)	8.6 (18.99)
Material		
Pump head		Ryton
Structured diaphragm		EPDM coated with PTFE
Valves		FFPM (Kalrez)
Nozzles		PTFE

Ordering Information

DIVAC 1.4 HV3C

	Part No.
Diaphragm vacuum pump 90 – 230 V, 50 – 60 Hz, with 2.3 m (8 ft) power cord and Schuko plug	135 20 V
Accessories Exhaust silencer 1.4 with connection G 1/8"	127 90 A

¹⁾ For 230 V, 50 Hz version

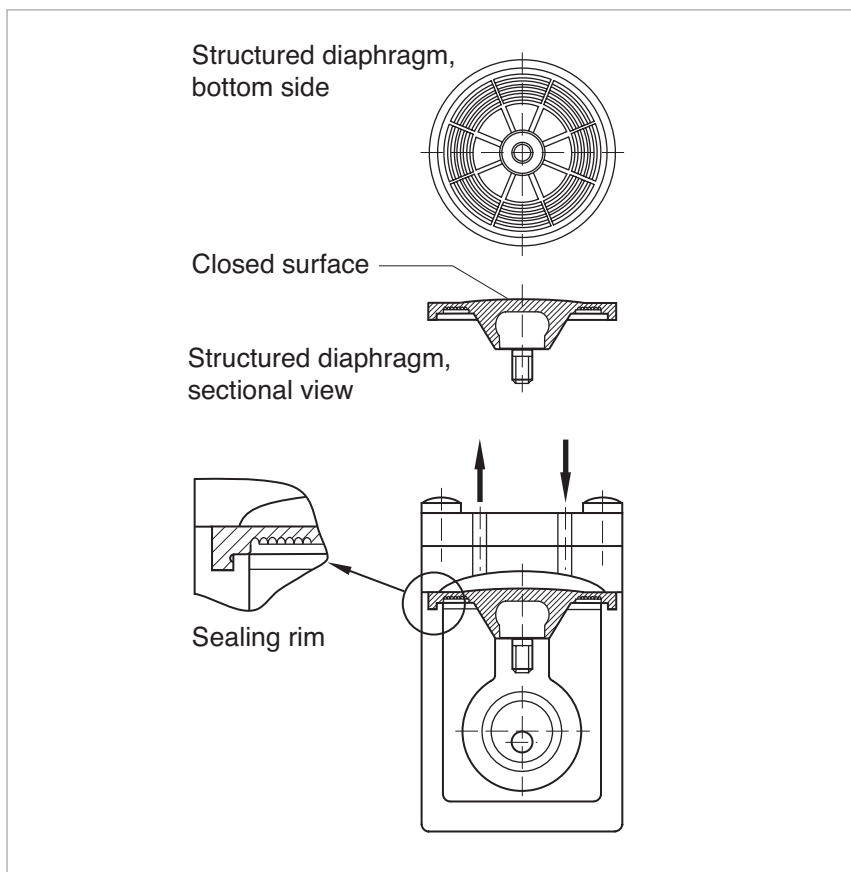
Dry Compressing Backing Pumps for Turbomolecular Pumps

DIVAC 0.8 T to 4.8 VT



Our dry compressing backing pumps from the DIVAC T series are now supplemented by the three-stage DIVAC 1.4 HV3 and the DIVAC 3.8 HV3.

Like the proven DIVAC T series, these new models also ensure a forevacuum free of hydrocarbons. Owing to their three-stage design, they provide especially within the lower pressure ranges a higher pumping speed and are therefore even better suited as backing pumps for turbomolecular pumps. But they are also used as backing pumps operating in the rough and medium vacuum range to pump clean media.



Diaphragm pump with structured diaphragm

The structured diaphragm with its sealed surface provides the basis for a long service life and a low base pressure.

Advantages to the User

- Dry compressing, free of oil and hydro-carbons
- Matched to the turbomolecular pumps from Leybold (SL 80 to TURBOVAC 450i)
- Low ultimate pressure
- ISO-KF flange at the intake port
- Fully equipped with cable, switch (ON/OFF) and plug
- Better performance and smaller size through the use of structured diaphragms
- Low vibration levels through dynamic mass balancing (in VT pumps)
- Lower maintenance costs and long maintenance intervals through the use of high-quality and well-proven components
- Simple maintenance
- Favourable price-to-performance ratio
- Can be operated in any position

Typical Applications

- Backing pump for wide pressure range turbomolecular pumps
- Mass spectrometers
- Medical equipment
- Analyzes
- For laboratory applications also with corrosive media
- General use for rough and fine vacuum applications

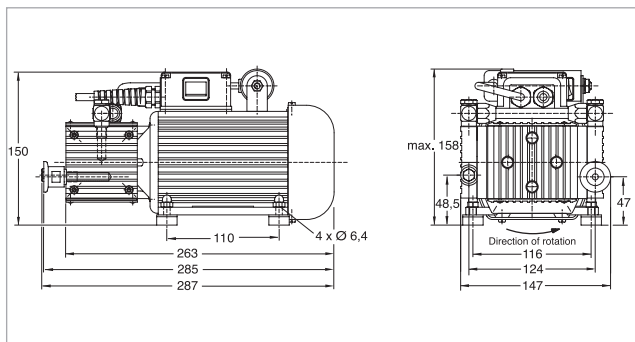
DIVAC 0.8 T and 0.8 LT



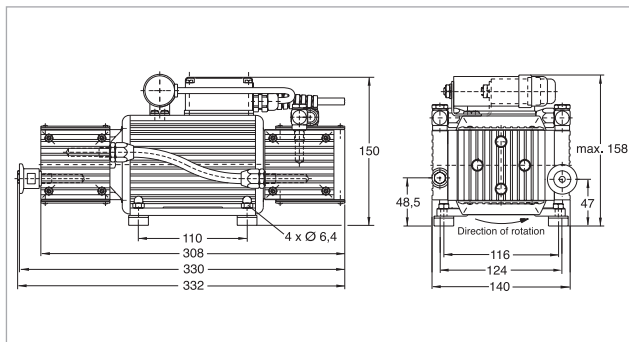
DIVAC 0.8 T



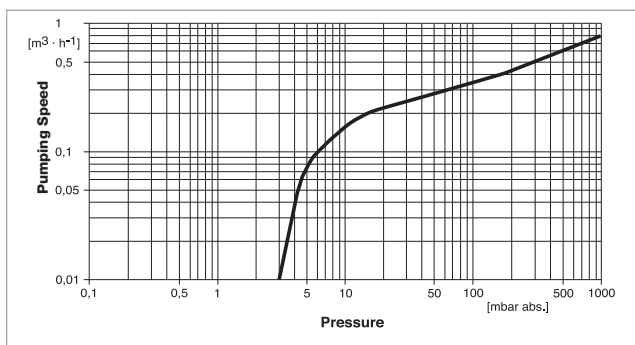
DIVAC 0.8 LT



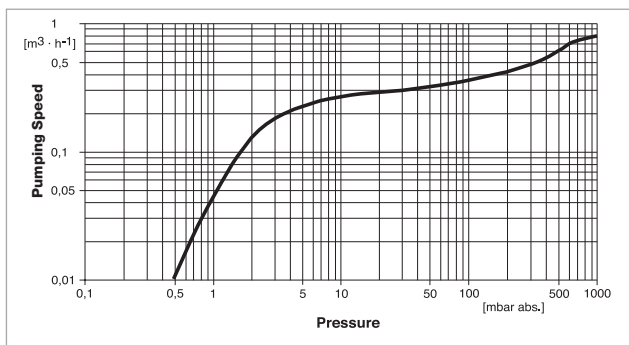
Dimensional drawing for the DIVAC 0.8 T



Dimensional drawing for the DIVAC 0.8 LT



Pumping speed curve of the DIVAC 0.8 T



Pumping speed curve of the DIVAC 0.8 LT

Technical Data

DIVAC

		0.8 T	0.8 LT
Max. pumping speed (atm.)	m ³ /h ¹ (cfm)	0.77 (0.45)	
Ultimate pressure	mbar (Torr)	≤ 3.0 (≤ 2.25)	≤ 0.5 (≤ 0.38)
Max. exhaust back pressure (absolute)	mbar (Torr)	2000 (1500)	
Pump heads		2	4
Connection		16 KF Silencer G 1/8"	
Inlet (suction side)	DN		
Exhaust (delivery side)	DN		
Thread (suction and delivery side)	G		
Noise level acc. to DIN 45 635 Part 13, approx.	dB(A)	49	53
Permissible gas admission temperature, max.	°C (°F)	+5 to +40 (+41 to +104)	
Permissible ambient temperature, max.	°C (°F)	+5 to +40 (+41 to +104)	
Voltage / nominal frequency (1-ph. motor)			
Schuko plug	V / Hz	198 – 264 / 50/60	230 / 50 ± 10%
NEMA plug	V / Hz	90 – 127 / 50/60	115 / 60 ± 10%
Protective class	IP	44	
Motor power ¹⁾	W	50	80
Current consumption ¹⁾	A	0.4	0.5
Nominal speed, approx. (50/60 Hz)	min ⁻¹	1500/1800	
Dimensions (W ¹⁾ x H ¹⁾ x D), approx	mm (in.)	285 x 150 x 150 (11.22 x 5.9 x 5.9)	332 x 150 x 150 (13.07 x 5.9 x 5.9)
Weight, approx.	kg (lbs)	5.9 (13.02)	7.5 (16.56)
Material		Aluminum Neoprene EPDM	
Pump head			
Diaphragm			
Valves			

Ordering Information

DIVAC

	0.8 T	0.8 LT
	Part No.	Part No.
Diaphragm vacuum backing pumps for turbomolecular pumps including 1 m (3.5 ft) long mains cord, country-specific plug, silencer, rubber feet, as well as ON/OFF switch 198 – 264 V / 50/60 Hz 230 V ± 10% / 50 Hz	127 80 –	– 127 83
Spare parts kit consisting of 2 diaphragms, 4 valves, 4 valve gaskets, 4 piping gaskets	EK 127 95	EK 127 95 (2x)
Exhaust silencer	127 98	127 98

T = For use in connection with Turbomolecular pumps

L = Very low ultimate pressure (Low pressure)

V = Low vibration levels (Low Vibration)

DIVAC 1.4 HV3 and 3.8 HV3

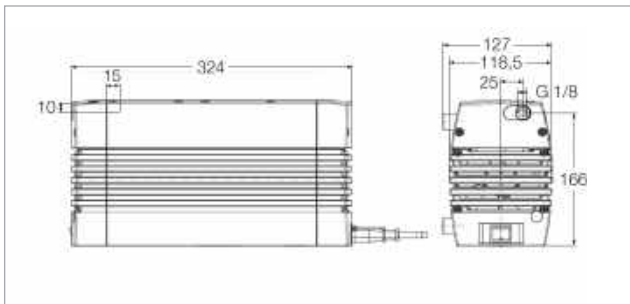


DIVAC 1.4 HV3

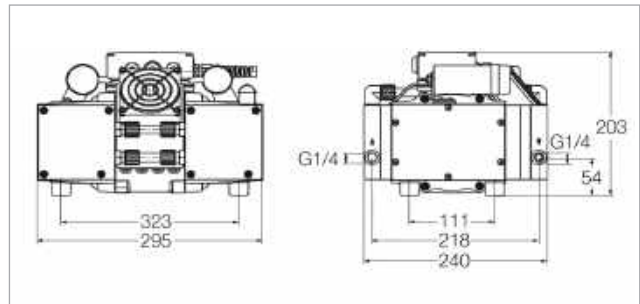


DIVAC 3.8 HV3

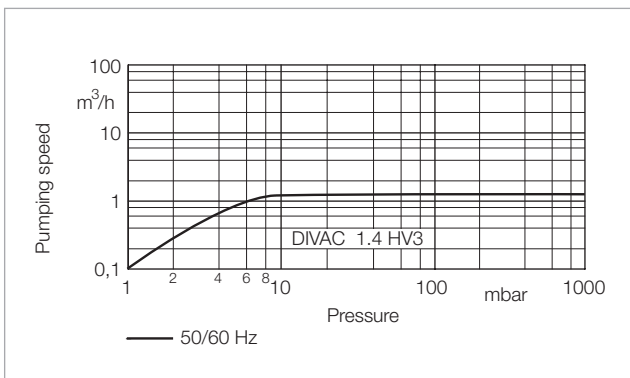
The three-stage DIVAC 1.4 HV3 and the DIVAC 3.8 HV3 provide especially in the lower pressure range a higher pumping speed compared to conventional diaphragm pumps. At the same time they are capable of attaining ultimate pressures below 2 mbar (1.5 Torr) and are thus very well suited as backing pumps for turbomolecular pumps. Owing to their compact design they are also suited for installation within pump systems.



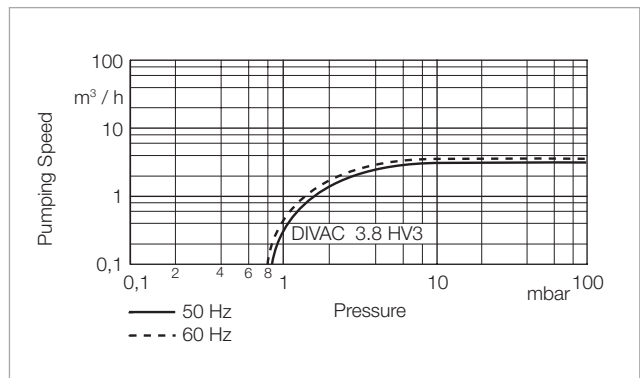
Dimensional drawing for the DIVAC 1.4 HV3



Dimensional drawing for the DIVAC 3.8 HV3



Pumping speed curve of the DIVAC 1.4 HV3



Pumping speed curve of the DIVAC 3.8 HV3

Technical Data

DIVAC

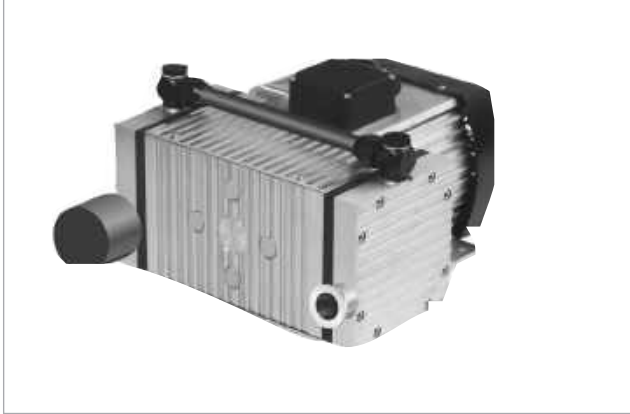
		1.4 HV3	3.8 HV3
Max. pumping speed			
50 Hz	m³/h¹ (cfm)	1.3 (0.77)	3.4 (2.00)
60 Hz	m³/h¹ (cfm)	–	3.8 (2.24)
Ultimate pressure	mbar (Torr)	≤ 1.5 (≤ 1.13)	≤ 1.0 (≤ 0.75)
Max. exhaust back pressure (absolute)	mbar (Torr)	1500 (1125)	
Pump heads		3	
Connection			
Inlet (suction side)	DN	Hose nozzle ID 9	Hose nozzle ID 9
Exhaust (delivery side)	DN	Hose nozzle ID 9	Hose nozzle ID 9
Thread (suction and delivery side)	G	G 1/8"	G 1/4"
Noise level acc. to DIN 45 635 Part 13, approx.	dB(A)	48	54
Permissible gas admission temperature, max.	°C (°F)	+5 to +40 (+41 to +104)	
Permissible ambient temperature, max.	°C (°F)	+5 to +40 (+41 to +104)	
Voltage / nominal frequency (1-ph. motor)			
Schuko plug	V / Hz	90 – 230 / 50-60	90 – 230 / 50-60
NEMA plug	V / Hz	–	115 / 50-60
Protective class	IP	20	
Motor power ¹⁾	W	120	250
at ultimate pressure	W	35	190
Current consumption ¹⁾	A	1.3	1.7
Nominal speed, approx. (50/60 Hz)	min ⁻¹	1500	1500/1800
Dimensions (W ¹⁾ x H ¹⁾ x D), approx	mm (in.)	324 x 158 x 226 (12.76 x 6.22 x 8.90)	295 x 240 x 203 (11.61 x 9.45 x 7.99)
Weight, approx.	kg (lbs)	10.5 (23.18)	18.9 (41.72)
Material			
Pump head		Aluminum	
Structured diaphragm		EPDM	
Valves		EPDM	
Nozzles		PA	

Ordering Information

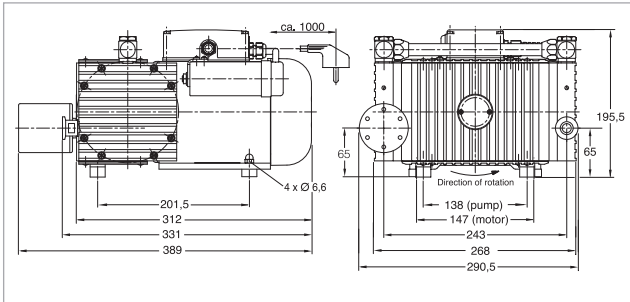
DIVAC

	1.4 HV3	3.8 HV3
	Part No.	Part No.
Diaphragm vacuum backing pumps for turbomolecular pumps including 1 m (3.5 ft) long mains cord, country-specific plug, silencer, rubber feet, as well as ON/OFF switch 90 – 230 V / 50 – 60 Hz 230 V / 50 – 60 Hz 115 V / 50 – 60 Hz	127 90 V – –	– 127 95 V 127 96 V
Exhaust silencer 1.4 with connection G 1/8" 3.8 with connection G 1/4"	127 90 A –	– 127 95 A
Spare parts kit	EK057456	EK12768

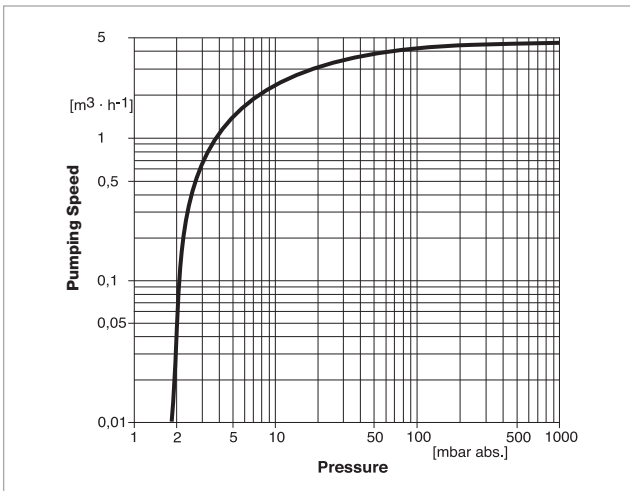
DIVAC 4.8 VT



DIVAC 4.8 VT



Dimensional drawing for the DIVAC 4.8 VT



Pumping speed curve of the DIVAC 4.8 VT

Technical Data

DIVAC 1.4 HV3C

Max. pumping speed (atm.)	m ³ /h ¹ (cfm)	4.8 (2.83)
Ultimate pressure	mbar (Torr)	≤ 2.0 (≤ 1.5)
Max. exhaust back pressure (absolute)	mbar (Torr)	2000 (1500)
Pump heads		2
Connection		
Inlet (suction side)	DN	16 KF
Exhaust (delivery side)	DN	Silencer
Thread (suction and delivery side)	G	G 3/8"
Noise level acc. to DIN 45 635 Part 13, approx.	dB(A)	55
Permissible gas admission temperature, max.	°C (°F)	+5 to +40 (+41 to +104)
Permissible ambient temperature, max.	°C (°F)	+5 to +40 (+41 to +104)
Voltage / nominal frequency (1-ph. motor)		
Schuko plug	V / Hz	230 / 50 ± 10%
NEMA plug	V / Hz	115 / 60 ± 10%
Protective class	IP	54
Motor power ¹⁾	W	350
Current consumption ¹⁾	A	2.6
Nominal speed, approx. (50 Hz)	min ⁻¹	1500
Dimensions (W ¹⁾ x H ¹⁾ x D), approx	mm (in.)	324 x 273 x 220 (12.76 x 10.75 x 8.66)
Weight, approx.	kg (lbs)	18.0 (39.74)
Material		
Pump head		Aluminum
Diaphragm		EPDM
Valves		Viton

Ordering Information

DIVAC 1.4 HV3C

	Part No.
Diaphragm vacuum backing pumps for turbomolecular pumps including 1 m (3.5 ft) long mains cord, country-specific plug, silencer, rubber feet, as well as ON/OFF switch 230 V ± 10% / 50 Hz	127 92
Spare parts kit consisting of 2 diaphragms, 4 valves, 4 valve gaskets, 4 piping gaskets	EK 127 97
Exhaust silencer	127 94

T = For use in connection with Turbomolecular pumps

L = Very low ultimate pressure (Low pressure)

V = Low vibration levels (Low Vibration)

Products

Oil-free Scroll Vacuum Pumps SCROLLVAC 7 plus to 18 plus



Scroll vacuum pump SCROLLVAC 15 plus

Advantage for the User

- Flexibility for customer requirements
- Four different pumping speeds available as required for the application
- Single- and Three-phase configurations available
- High robustness for each application
- ATEX certification (**Ex II 3 G c IIB T4**)
- Variants for aggressive applications available (SCROLLVAC C plus)
- High water vapour capacity
- Electronic-free three-phase variant for reduced radiation sensitivity
- Better work environment and low environmental impact
- quiet operation
- Simple operation
- intelligent and easy to use controls
- No contamination and no oil to dispose of
- hermetically sealed for a lubricant-free vacuum environment
- Low cost of ownership
- long service interval and low power consumption from a single sided scroll arrangement
- Maximised up-time
- long service intervals

Typical Applications

- General clean pumping applications
- Scanning Electron Microscopes - SEM
- Beam lines and high energy physics
- Research and development
- Backing turbomolecular pumps
- Centrifuges, ultra-high speed
- Chamber evacuation
- Chemical applications including gel dryers and solvent recovery

In 1905 the principle of the scroll compressor was developed by the Frenchman Leon Creux.

SCROLLVAC plus is the next generation in completely oil free, dry scroll pumps by offering increased pumping speeds, combined with lower ultimate pressures, lower power consumption and lower noise. Gas ballast allows for pumping of condensable vapours including, water, solvents, dilute acids and bases. SCROLLVAC plus pumps also feature the latest in tip seal technology giving significantly longer life between tip seal changes. Integrated inverter drive with auto sensing voltage input delivers optimised pumping performance globally.

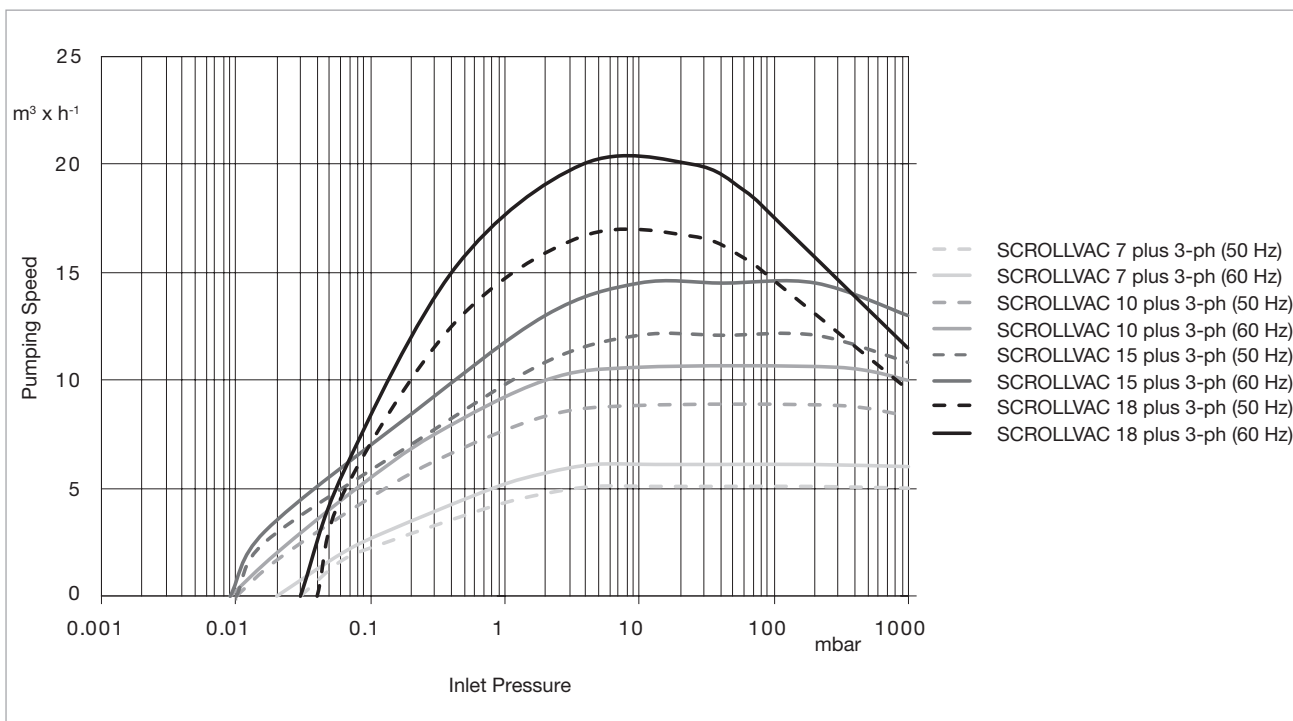
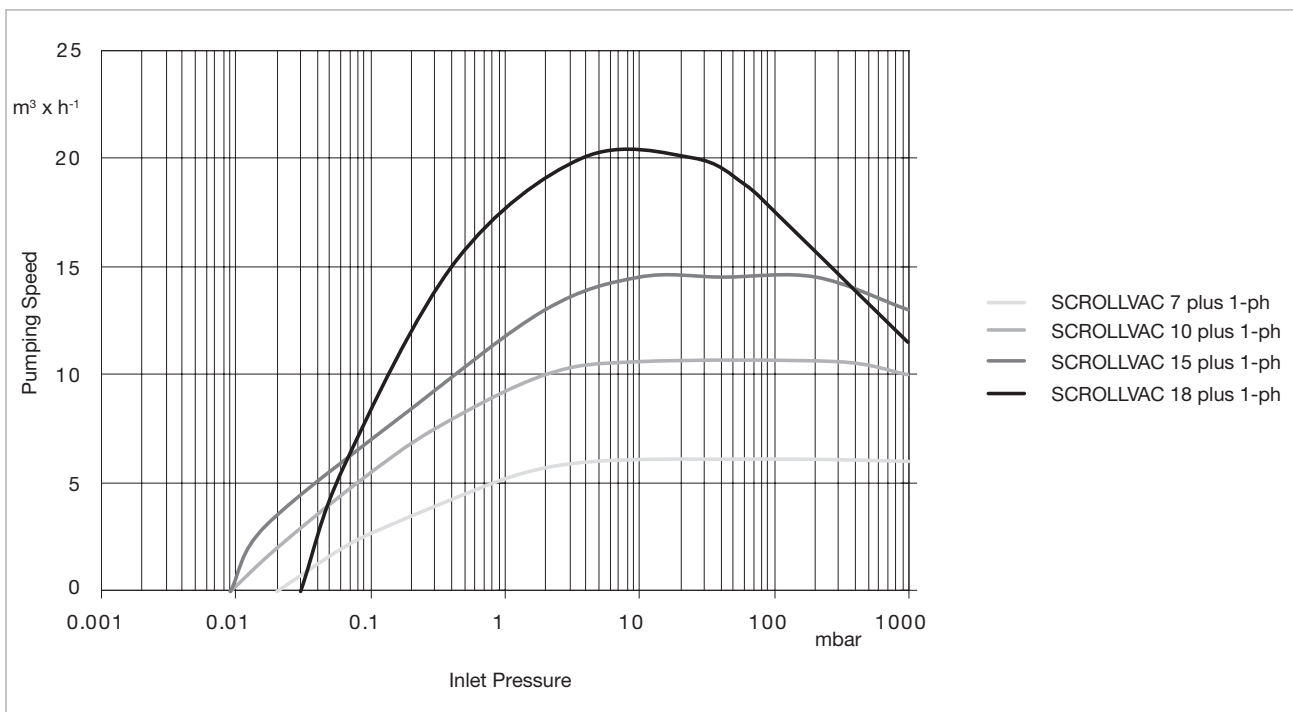
SCROLLVAC plus pumps are designed to be completely field serviceable.

Service

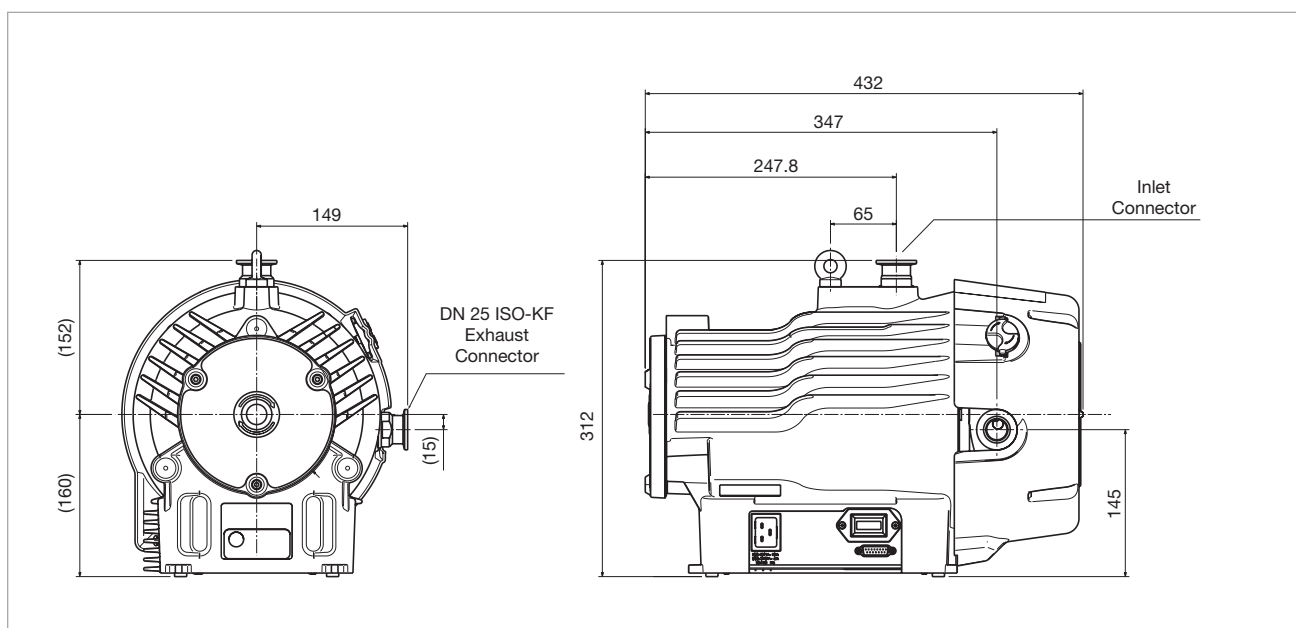
Our wide portfolio of services is designed with you in mind: to help keep your process and equipment running in the most economical and environmentally efficient manner.

Service include:

- Overhaul and repair using genuine Leybold OEM parts
- OEM spares and kits available for cost-effective expansion and backups
- Remanufactured products available for cost-effective expansions and backups
- Global network of expert field service engineers available to respond quickly to unexpected equipment failures



Pumping speed curves for the SCROLLVAC plus – pumps



Dimensional drawing for the scroll vacuum pumps SCROLLVAC 7 plus to SCROLLVAC 18 plus (dimensions in mm)

Technical Data

SCROLLVAC plus

7 10 15 18

Rotation speed	rpm	1740			
Max. pumping speed	m ³ /h	6.1	10.6	14.5	20.0
Ultimate vacuum (total pressure)	mbar (Torr)	2×10^{-2} (1.5×10^{-2})	9×10^{-3} (6.5×10^{-3})	9×10^{-3} (6.5×10^{-3})	3×10^{-2} (2.25×10^{-3})
Maximum water vapour pumping rate (with gas ballast)	g/h	100	140	280	220
Maximum continuous inlet pressure	mbar	200			
Mains voltage 1-ph	V	100 – 127, 200 – 240 ($\pm 10\%$)			
Mains voltage 3-ph	V	200 / 380 – 415, 200 – 230 / 460			
Frequency	Hz	50/60			
Motor power (at ultimate pressure)	W	260	280	300	260
Power connector 1-ph		IEC EN60320 C19			
Weight	kg (lb)	26 (58)	25 (56)	26 (58)	25 (56)
Inlet flange		DN 25 ISO-KF			
Exhaust flange		DN 25 ISO-KF			
Noise level	dB(A)	55			
Leak tightness (Static)	mbar x l/s	1×10^{-6}			
Operating temperature range	°C (°F)	10 to 40 / 41 to 104			

Ordering Information

SCROLLVAC plus

	7	10	15	18
	Part No.	Part No.	Part No.	Part No.
Oil-free scroll vacuum pump, Single-phase motor *				
Standard (with manual gas ballast)	141007V10	141010V10	141015V10	141018V10
C-Version (for aggressive applications)	-	-	141015V12	141018V12
Oil-free scroll vacuum pump, Three-phase motor *				
Standard (with manual gas ballast)	-	141010V30	141015V30	141018V30
C-Version (for aggressive applications)	-	141010V32	141015V32	141018V32
Accessories Mains cable (required for pump operation)				
Mains cable Europe				
CEE 7/7 (Schuko) – IEC-60320 C19				
Length 2.0 m	161810EU			
Mains cable Great Britain				
BS 1363 – IEC-60320 C19				
Length 2.0 m	161810UK			
Mains cable US				
115 V: NEMA 5-15P – IEC-60320 C19				
Length 3.0 m	141103US			
208/230 V: NEMA 6-15P – IEC-60320 C19				
Length 2.5 m	161810US			
Optional accessories				
Gas ballast adaptor blank (H-conversion KIT)	141100A01			
Gas ballast adaptor for external gas line – no restriction (Quick connect 1/4 inch)	141100A02			
Gas ballast adaptor for external gas line – with fine restriction (Quick connect 1/4 inch)	141100A03			
Chemical resistance conversion kit (C-conversion KIT)	141101A01	141101A01	141101A01	141101A02
Vibration isolators	141102A01			
Silencer	141102A02			
Minor Service Kit				
Standard (with manual gas ballast)	EK117141000	EK117141000	EK117141000	EK117141001
C-Version (for aggressive applications)	EK117141002	EK117141002	EK117141002	EK117141003

* Other pump variants on request

Applications for ECODRY plus Pumps

Pumps	ECODRY 40 plus	ECODRY 65 plus
Application		
Mass spectrometry	■	■
Electron microscopy	■	■
Vacuum drying	■	■
Particle accelerators / Synchrotron	■	■
Spectroscopy	■	■
Regeneration of cryo pumps	■	■
Backing pumps for turbomolecular pumps	■	■
Surface analysis	■	■

Products

ECODRY plus multi-stage Roots vacuum pumps

ECODRY 40 plus, ECODRY 65 plus



The ECODRY plus is a newly developed family of dry-compression multi-stage Roots vacuum pumps, which sets new standards in noise reduction. The pumps have been specially designed for use in quiet and clean environments, such as analysis and research laboratories.

Dry Compressing
Vacuum Pumps

Operating principle

The multi-stage Roots pump is a further development of the tried-and-tested Roots pump principle. Two contactless rotating rotors turn in contrary motion within a single pump housing. The rotors do not come into contact with one another, or with the pump housing. Through their rotation, they convey the gas from the intake flange on the upper side to the outlet aperture on the underside of the suction chamber. In the multi-stage Roots pump ECODRY plus, there are eight pump chambers in succession along the same axis. The outlet apertures are connected to the respective intake aperture of the ensuing chamber via channels in the pump housing. The pump's operating range extends from the medium vacuum range to ambient pressure.

Short channels between the compression stages, combined with a high rotational speed of 12,600 rpm, make a compact construction with simultaneously high suction capacity possible. Lubrication takes place only in the shaft bearing regions. These are separated from the suction chamber by means of a wear-free sealing system, such that no lubricant can find its way into the suction chamber or into the vacuum chamber.

Low-noise operation

During the design phase, particular emphasis was placed on reducing the pumps' noise levels. The rotors' high manufacturing quality guarantees that the pumps will run with a low level of vibration, and consequently with a low level of noise, even at high inlet pressures. Efficient noise insulation is integrated within the pump housing, to shield the user from residual noise. The silencer integrated within the exhaust region further serves to minimize noise, even at high gas flow rates. These measures combine to achieve a noise level of less than 52 dB(A) – quieter than a normal conversation

Clean environment

Thanks to the oil-free suction chamber, no lubricant can enter the vacuum chamber or the area surrounding the pump from the interior of the pump. Furthermore, because the rotors operate contact-free, no abrasion debris are created in the form of particles, which could contaminate the vacuum chamber. In the case of the pump itself, this guarantees long-term stable operation with no deterioration in final pressure or suction capacity.

Ease of commissioning

The ECODRY plus models have a compact housing and are simple to operate. With integrated castors and their low weight, they can be easily rolled out of their packaging and on to their installation location. There is no need for elaborate power cabling, as the pumps can be connected directly to a single-phase electricity supply. The pumps are air-cooled, and therefore require no connection to a water supply for the purposes of cooling.

Maintenance-free operation

ECODRY plus features a friction-free operating principle, so their components are not exposed to wear in any way. The ECODRY plus's shaft bearings are designed for up to five years' operation. Maintenance measures such as replacing seals or changing the oil are not required during that time.

High water vapour tolerance

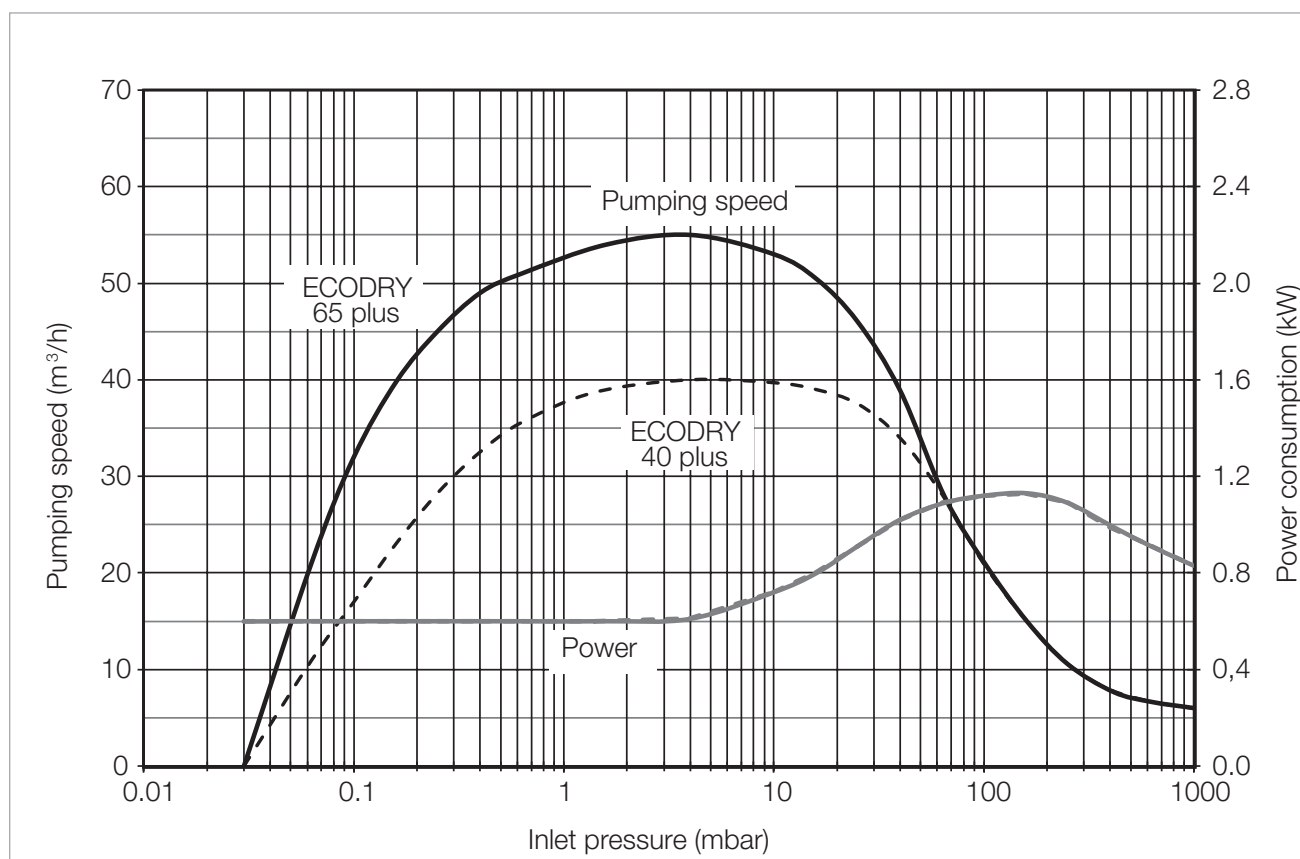
In drying applications, such as cryo-pump regeneration, or when pumping out vacuum chambers with large surface areas, high quantities of water vapour may accrue. Not every pump can handle this without difficulty, as condensation in the pump can lead to corrosion and pump failure. However, with its gas ballast valve open, the ECODRY plus can pump water vapour at rates of up to 500 g/h without internal condensation. Because the manually operated gas ballast inlet has an integrated silencer, the pump is quieter than any of its competitors in these applications also.

Benefits at a glance

- Quietest pump in its class – it won't disturb your work
- Clean vacuum generation with no contamination of workstation or vacuum chamber
- Many years of maintenance-free operation without deterioration of vacuum parameters

Typical applications

- Mass spectrometry
- Electron microscopy
- Backing pump for turbomolecular pumps
- Drying
- Accelerator/synchrotron
- Spectroscopy
- Regeneration of cryopumps
- Surface analysis



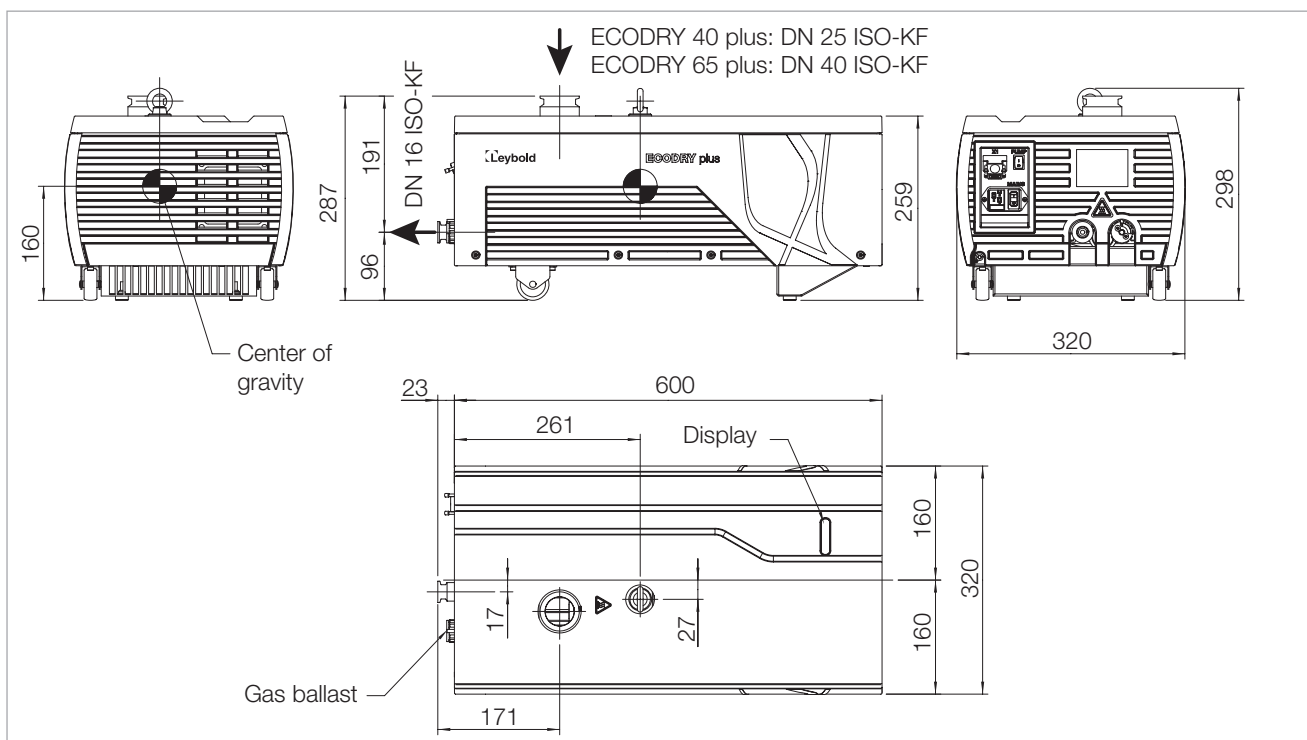
Pumping speed curves for the ECODRY plus - pumps

Technical Data

ECODRY 40 plus

ECODRY 65 plus

Maximum pumping speed without gas ballast	m ³ /h	40	55
Ultimate pressure without gas ballast	mbar	< 0.03	
Ultimate pressure with gas ballast	mbar	< 0.1	
Leak rate	mbar l/s	< 10 ⁻⁵	
Water vapour tolerance with gas ballast	mbar	20	
Water vapour capacity with gas ballast	g/h	300	500
Maximum permissible inlet pressure	mbar	1050	
Permissible ambient temperature	°C	+5 to +40	
Max. installation height (up to NHN)	m	2000	
Cooling		Air	
Mains voltage	V	200 – 240 ± 10%	
Frequency	Hz	50/60	
Phases		1-ph	
Max. power consumption	W	1200	
Power consumption at ultimate pressure	W	600	
Plug connector for power supply		C 20 acc. to IEC 60320	
Rotational speed	rpm	12600	
Protection class	IP	42	
Intake flange		DN 25 ISO-KF	DN 40 ISO-KF
Outlet flange		DN 16 ISO-KF	
Weight, approx.	kg	43	
Dimensions (L x W x H)	mm	623 x 320 x 298	



Dimensional drawing for the ECODRY plus – pumps, all dimensions in mm

Ordering Information

ECODRY 40 plus

ECODRY 65 plus

	Part No.	Part No.
Dry Compressing Vacuum Pump ECODRY plus High voltage: 200-240 V (± 10%), 50/60 Hz Low voltage: 120 V (± 10%), 50/60 Hz	161 040 V22 161 040 V21	161 065 V22 161 065 V21
Inlet screens		
DN 25 ISO-KF	E41170206	-
DN 40 ISO-KF	-	E41170121
Accessories		
Mains cables (mandatory accessories)		
EU (CEE 7/7 – C19, 2.0 m)	161 810 EU	
UK (BS 1363 – C19, 2.0 m)	161 810 UK	
US 120 V only (NEMA 5-15P – C19, 2.0 m)	141 103 US	
US 200-240 V only (NEMA 6-15P – C19, 2.5 m)	161 810 US	
other accessories		
Casing assembly mounting kit	161 831 A	
RS485/USB connecting cable for X104 interface, 1.8 m	161 820 USB	
Gas ballast blank plug	161 832 A	
Purge gas adapter (10 mm quick connect)	161 833 A	
LEYASSIST Software	230 439 V01	

Applications for LEYVAC Pumps

Dry compressing vacuum pumps						
	LEYVAC LV 80	LEYVAC LV 80 C	LEYVAC LV 80 CC	LEYVAC LV 140	LEYVAC LV 140 C	LEYVAC LV 140 CC
Applications						
Process industry						
Industrial furnaces	■	■	■	■	■	■
Degassing	■	■	■	■	■	■
Charging	■	■	■	■	■	■
Casting	■	■	■	■	■	■
Drying processes in general				■	■	■
Freeze drying	■	■	■	■	■	■
Packaging	■	■	■	■	■	■
Electron beam welding	■	■	■	■	■	■
Coating						
PVD / CVD coating	■	■	■	■	■	■
Wear protection	■	■	■	■	■	■
Optical coating	■	■	■	■	■	■
Web coating	■	■	■	■	■	■
Lock / Transfer chambers	■	■	■	■	■	■
Solar						
CVD / PECVD	■	■	■	■	■	■
Crystal pulling and casting	■	■	■	■	■	■
Support functions						
Regeneration of cryo pumps	■	■	■	■	■	■
Forevacuum pumps for Turbomolecular pumps	■	■	■	■	■	■

Products

LEYVAC

Excellent efficiency in every respect



LEYVAC LV 80 and 140

Our LEYVAC dry vacuum pumps provide power combined with high performance.

This product line covers the pumping speed ranges from 80 to 160 m³/h and is especially suited to meet the special requirements of industrial processes and coating applications.

LEYVAC pumps and system combinations are rugged, reliable and durable, ready to cope with harsh process requirements.

The LEYVAC product line comprises the models LEYVAC LV 80, LV 140, and their C or CC versions.

The CC versions include an overtemperature safety shutdown facility.

Advantages to the User

- Dry pump technology
- No contact of the process gases with oil
- Shortest pumpdown times through high pumping speed for air already starting at atmospheric pressure
- Hermetically tight
 - No shaft seals
 - No oil leakage
 - Safe pumping of toxic gases
- High reliability
 - Long service intervals (up to 5 years)
 - High uptime
 - Robust and durable design
- One motor solution
 - Multi-voltage, dual frequency motor operable at 200 V - 460 V and 50/60 Hz
- Easy and modular
 - Direct coupling of roots booster pumps without frames for models RUVAC WH 700 and WA(U)/WS(U) 251-1001

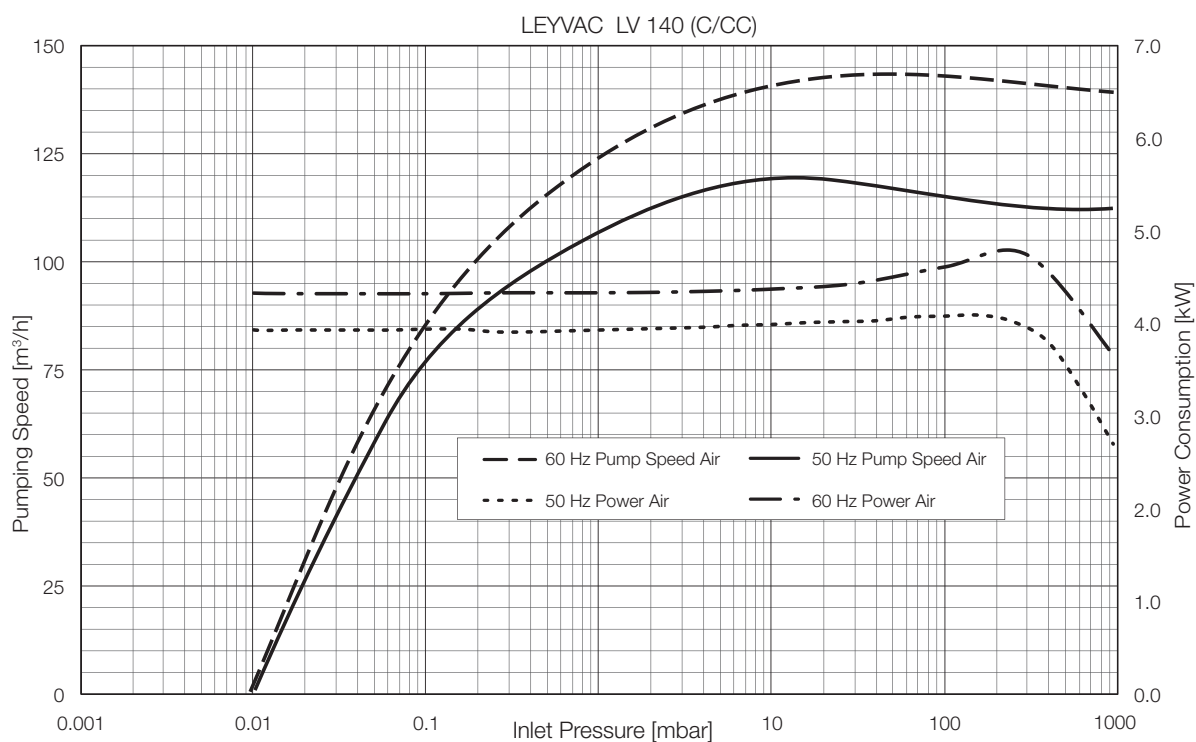
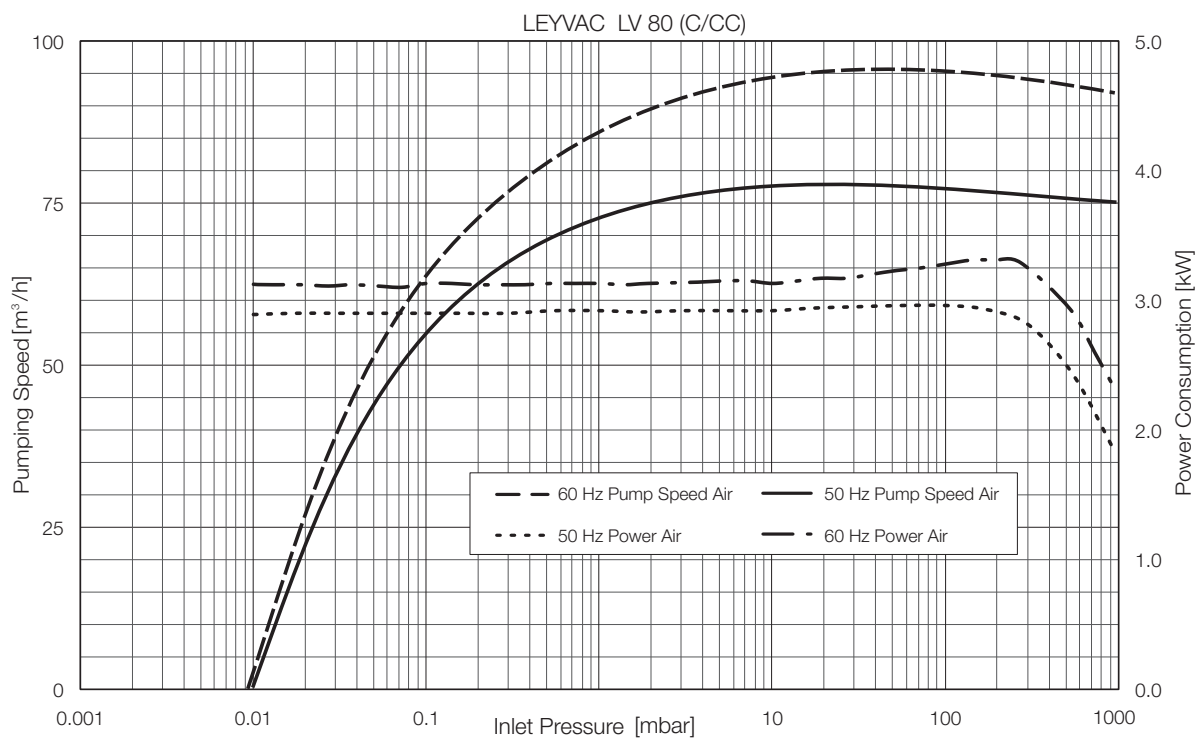
Typical Application

- Process industry
 - Industrial furnaces
 - Degassing
 - Charging
 - Casting
 - Drying processes
 - Freeze drying
 - Electron beam welding
 - Packaging
- Coating
 - PVD/CVD coating
 - Wear resistant coating
 - Optical coating
 - Web coating
 - Load locks/transfer chambers
- Solar
 - CVD/PECVD
 - Crystal pulling and casting
- Support functions
 - Regeneration of cryo pumps
 - Forevacuum pumps for turbomolecular pumps

Performance Details at a Glance

LEYVAC dry vacuum pumps provide **optimized**

- System uptime
 - Robust design based on the proven RUVAC and DRYVAC technology
 - Most effective cooling system
 - Thermal protection on board (for CC versions)
 - Tolerant to pressure shocks
 - Long intervals for bearing exchange
- Process safety
 - designed for harsh applications
- Performance data
 - High pumping speed already at high intake pressures
 - Good pumping speed also for lighter gases (with purge)
- Environmental properties
 - Low noise and low heat emission
- Price-to-performance ratio
 - Low investment costs
 - Small, price optimized pumping systems



Pumping speed curves of the LEYVAC LV 80 (C/CC) and LEYVAC LV 140 (C/CC)

Technical Data

LEYVAC

		LV 80 (C/CC)	LV 140 (C/CC)
Nominal pumping speed without gas ballast at 50/60 Hz	m³/h (cfm)	80/96 (47.1/56.5)	125/145 (73.6/85.3)
Ultimate pressure with seal and rotor purge	mbar (Torr)	1×10^{-2} (0.75 x 10 ⁻²)	
Power consumption at ultimate pressure and 50/60 Hz operation	kW (hp)	2.9/3.2 (3.9/4.3)	3.9/4.3 (5.2/5.8)
Weight, approx.			
LV ..	kg (lbs)	280 (617)	300 (661)
LV ... C/CC	kg (lbs)	300 (661)	320 (705)
Noise level ¹⁾	dB(A)	< 65	< 65
Connection flange			
Intake	DN	63 ISO-K	
Discharge	DN	40 ISO-KF	
Mains voltage (± 10%)			
LV ...	V	200 – 460	
LV ... C (with housing)	V	200 – 460	
LV ... CC (with housing and Temperature monitoring)	V	380 – 460	
Nominal power at 50/60 Hz	kW (hp)	4.1 (5.5)	5.5 (7.4)
Nominal current consumption 50/60 Hz bei 400 V	A	6	8
Cooling		water/glycol	
Cooling water temperature	°C (°F)	+15 to +30 (+59 to +86)	
Min. cooling water throughput	l/min	3	
Water vapor tolerance (with gas ballast)			
80 slm 50/60 Hz	mbar (Torr)	20/30	125/160
150 slm 50/60 Hz ²⁾	mbar (Torr)	-/-	-/-
Water vapor capacity (with gas ballast)			
80 slm 50/60 Hz	kg/h	1,24/2,3	11,5/18,0
150 slm 50/60 Hz ²⁾	kg/h	-/-	-/-
Permissible ambient temperature	°C (°F)	+5 to +45 (+41 to +113)	
Protection class EN 60529	IP	54	
Dimensions (W x H x D)			
LV ... and LV ... C	mm (in.)	814 x 375 x 550 (32.05 x 14.76 x 21.65)	895 x 400 x 567 (35.24 x 15.75 x 22.32)
LV ... CC	mm (in.)	984 x 375 x 550 (38.74 x 14.76 x 21.65)	1065 x 400 x 567 (41.93 x 15.75 x 22.32)

¹⁾ At ultimate pressure and with rigid exhaust line DIN EN ISO 2151

²⁾ 2nd case: with 24 V gas ballast kit 115005A13 fitted to port 2, standard purge also opened

Type		b	b ₁	b ₂	h	h ₁	h ₂	h ₃	h ₄	h ₅	l (CC version)	l ₁	l ₂	l ₃	l ₄	l ₅
LV 80 (C)	mm	375	320	266	550	576	266	266	341	191	814 (984)	335	265	402	485	410
	in.	14.76	12.60	10.47	21.65	22.68	10.47	10.47	13.43	7.52	32.05 (38.74)	13.19	10.43	15.83	19.09	16.14
LV 140 (C)	mm	400	350	285	567	597	257	257	332	182	895 (1065)	364	297	453	514	439
	in.	15.75	13.78	11.22	22.32	23.50	10.12	10.12	13.07	7.17	35.24 (41.93)	14.33	11.69	17.84	20.24	17.28

Dimensional drawing for the LEYVAC LV 80/C and LV 140/C; below for exhaust connection

Ordering Information

LEYVAC

LV 80 (C/CC)

LV 140 (C/CC)

	Part No.	Part No.
Dry compressing vacuum pump LEYVAC including LEYBONOL LVO 410 lubricant, base plate, castors, temperature switch, shaft seal and rotor purge	15080V15	115140V15
including LEYBONOL LVO 210 lubricant	115080V40	115140V40
additionally with casing (C version)	115080V30	115140V30
additionally with casing and temperature monitoring (CC version)	115080V35	115140V35
Accessories		
Non-return ball valve	115005A01	115005A01
Non-return valve, spring-loaded	115005A02	115005A02
Roots pump adapter for RUVAC WS/WSU 251/501 and WH 700	115005A03	115005A03
Adapter ring for RUVAC WA(U)/WS(U)1001	—	115005A04 and 115005A03
Exhaust pressure sensor LV 80 LV 140	115005A10 —	— 115005A11
Gas ballast kit manually operated 24 V	115005A12 115005A13	115005A12 115005A13
Silencer standard (with integrated non-return valve) serviceable emptyable	115005A20 115005A22 115005A23	115005A20 115005A22 115005A23
High-performance silencer	115005A21	115005A21
Elbow for silencer, emptyable	115005A26	115005A26
Inlet screen	115005A28	115005A28
External frequency converter (including mains filter) for LEYVAC LV 80 (400 V) LEYVAC LV 80 (200 V) LEYVAC LV 140 (400 V) LEYVAC LV 140 (200 V)	115005A30 115005V31 — —	— — 115005A35 115005V36
Profibus module ¹⁾	155212V	155212V
Relais module (digital output) ¹⁾	112005A01	112005A01
Ethernet interface module ¹⁾	112005A02	112005A02
ProfiNet module ¹⁾	112005A35	112005A35
EtherCAT module ¹⁾	112005A36	112005A36

¹⁾ For optional, external frequency converter

General

Applications for DRYVAC Pumps

Pumps	DRYVAC DV 200	DRYVAC DV 300	DRYVAC DV 450	DRYVAC DV 450 S	DRYVAC DV 450 C	DRYVAC DV 650	DRYVAC DV 650 S	DRYVAC DV 650 C	DRYVAC DV 1200	DRYVAC DV 1200 -i
Applications										
Automotive industry	■	■	■			■			■	■
Electrical engineering	■	■	■			■			■	■
Energy technology	■	■	■		■	■		■	■	■
Degassing	■	■	■		■			■	■	■
Research and development	■	■	■		■	■		■	■	■
Freeze drying	■	■	■		■	■		■	■	■
Industrial gases	■	■	■		■	■		■	■	■
Refrigeration and air conditioning	■	■	■		■			■	■	■
Crystal pulling/casting	■	■	■		■	■		■	■	■
Lamination	■	■	■		■			■	■	■
Leak testing machines	■	■	■	■		■	■		■	■
Loadlock chambers	■	■	■	■		■	■		■	■
Metallurgy/Furnaces	■	■	■			■			■	■
Plasma cleaning or activation	■	■	■		■	■		■	■	■
Welding technology	■	■	■	■		■	■		■	■
Sterilization	■	■	■		■	■		■	■	■
Vacuum coating	■	■	■		■	■		■	■	■
Vacuum drying	■	■	■	■		■	■		■	■
Packaging	■	■	■			■			■	■
Space simulation	■	■	■			■			■	■
Wind turbines	■	■	■			■			■	■
Backing pump for highvacuum systems	■	■	■			■			■	■

Oil for DRYVAC pumps for different pump types

Pumps	DRYVAC DV 200	DRYVAC DV 300	DRYVAC DV 450	DRYVAC DV 450 S	DRYVAC DV 450 C	DRYVAC DV 650	DRYVAC DV 650 S	DRYVAC DV 650 C	DRYVAC DV 1200	DRYVAC DV 1200 -i
LEYBONOL Oils										
LVO 210	■	■	■	■		■	■		■	■
LVO 410				■	■		■	■		■

■ = Standard

The table only lists general applications. Your specific requirements might be subject to deeper analysis.
For further questions, please contact our technical Sales support.

**For information on oil specifications please refer to Catalog Part
"Oils / Greases / Lubricants LEYBONOL®".**

Oil for DRYVAC pumps for different fields of application

LEYBONOL Oils

	LVO 210	LVO 410
Applications		
Automotive industry	■	
Electrical engineering	■	
Energy technology	■	
Degassing	■	
Research and development	■	
Freeze drying	■	
Industrial gases	■	
Refrigeration and air conditioning	■	
Crystal pulling/casting	■	
Lamination	■	
Leak testing machines	■	
Loadlock chambers	■	
Metallurgy/Furnaces	■	
Plasma cleaning or activation	●	■
Welding technology	■	
Sterilization	■	
Vacuum coating	■	
Vacuum drying	■	
Packaging	■	
Space simulation	■	
Wind turbines	■	
Backing pump for highvacuum systems	■	
Oxygen processes		■
PECVD		■

■ = Standard

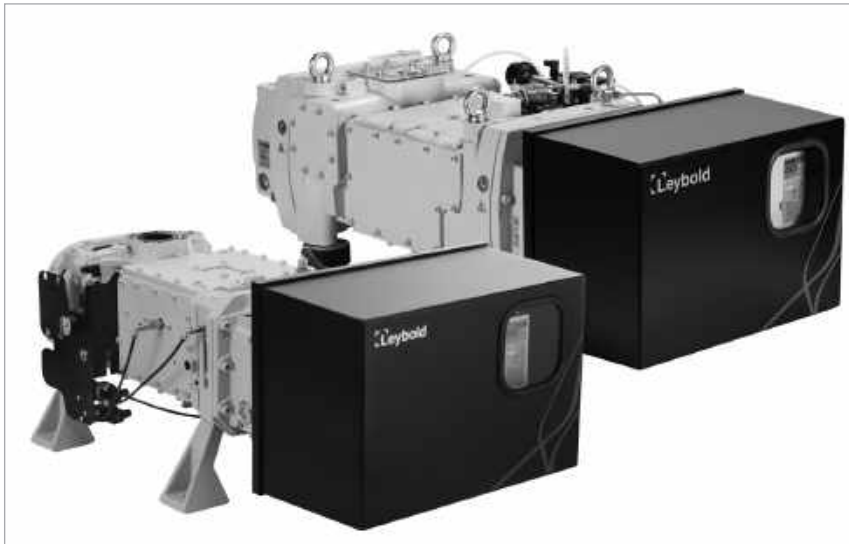
● = Possible

The table only lists general applications. Your specific requirements might be subject to deeper analysis.
For further questions, please contact our technical Sales support.

**For information on oil specifications please refer to Catalog Part
"Oils / Greases / Lubricants LEYBONOL®".**

Products

DRYVAC DV 200 to DV 1200 -i



DRYVAC DV 200/300 (left), DV 650 (right)



DRYVAC DV 1200 -i

DRYVAC – The benchmark in industrial vacuum processes

The DRYVAC dry screw pumps provide high pumping speeds down to the lowest vacuum pressure levels required in industrial processes. The pumps provide continuous production output in your stressful environment minimizing the risk of contamination thanks to modern oil-free technology.

If you already own a mechanical booster, consider that dry pumps have the same low level of requirement in terms of maintenance and service.

All DRYVAC variants are water cooled, very compact and easy to combine into systems, in particular with the well-proven Roots pumps of the RUVAC WH series.

Concerning basic and full blown plug & play system combination of DRYVAC and RUVAC please refer the chapter DRYVAC SYSTEMS DS.

DRYVAC Versions

The DRYVAC-i versions and DS-i-Systems (see chapter DRYVAC Systems DS) expand the DRYVAC by an on board controller with a touch screen display and a user interface allowing plug&play operation and configuration.

Different interfaces are available: 24 V I/O, Profibus, Ethernet IP.

DRYVAC DV200 and DV 300 are for 200-240 Volts and for 380-460 Volts equipped with an on-boarded intelligent variable speed drive. They offer an automatically controlled vacuum side shaft seal purge and on the outside an I/O (15 pin Sub D) and RS485 interface (9 pin Sub-D). All other interfaces like Ethernet IP are available as optional cards. The DRYVAC speaks proverbial every language.

DRYVAC 450/650 with external variable speed drive (FC) are available on request. These are named DV – r.

The DRYVAC DV 650 200 V comes with an external variable speed drive (FC) as standard.

All DRYVAC DV 1200 come on a base plate with casters, adjustable feet and enclosure.

All DRYVAC S and C and DV 1200 versions comprise a water cooling unit which includes water distributions, a pressure reducer and an overpressure safety valve.

Features and Benefits

Maintenance

- Minimal maintenance requirements lead to lowest cost of ownership
- Extended periods between user intervention
- Lower consumable costs

Performance

- Very stable pumping speed gives repeatability to processes
- Continuous pumping at atmosphere
- Ability to handle dust, vapors and process by-products
- Dry eliminates back-streaming, thus protecting reactive alloys from contamination

Design

- Superior and compact design
- Energy-efficient (benchmark in 300 and 650 class)
- Integrated variable speed drive cannot be harmed by industrial cooling water or dust
- Flexible to use (three inlet ports and low height)

Safety

- Low noise levels

The best DRYVAC for every application

For industrial processes of all kinds, where rapid pumping down and short cycling (e.g. load locks) is required, the DRYVAC Industrial is the best solution.

The DRYVAC DV industrial versions (with **lubricant LVO 210, synthetic oil**) deliver an excellent pumping speed also in processes with pressures exceeding 100 mbar. They are suited for short cycle operation or for evacuation of large vacuum chambers.

The DRYVAC DV pumps are furthermore equipped with all features necessary for process industry applications (Purge gas unit including rotor purge or gas ballast for example).

In application with high oxygen concentrations, corrosive gasses or harsh PECVD processes pumps with **lubricant LVO 410 (PFPE)** are required. In these applications the DRYVAC DV C models are the right choice

Typical Applications

- Metallurgy
- Coating
- Drying
- Solar
- Vacuum chamber evacuation
- Load lock

Certifications

DRYVAC vacuum pumps are certified to NRTL and CSA according to UL 61010-1



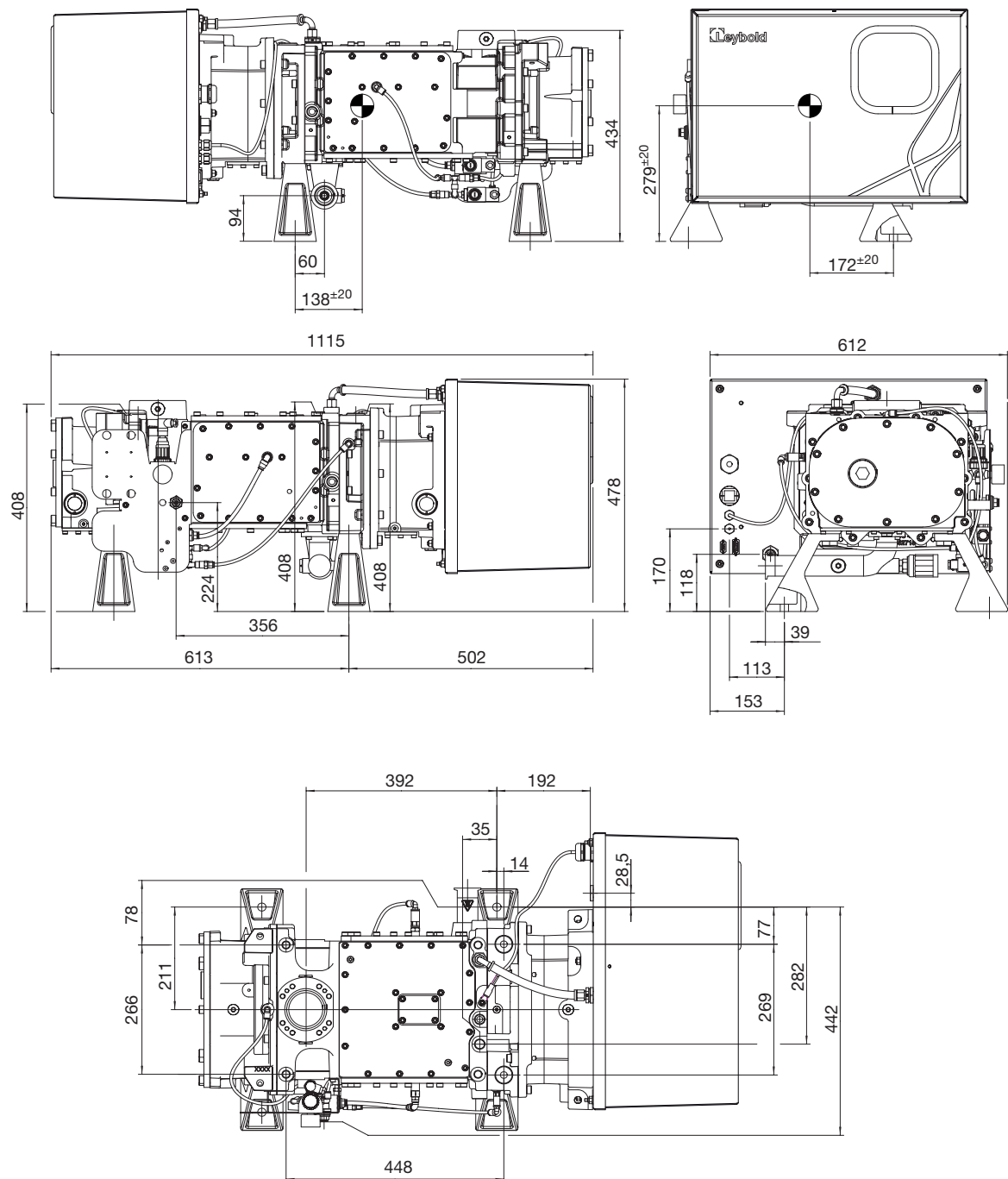
The DRYVAC series

comprises the models

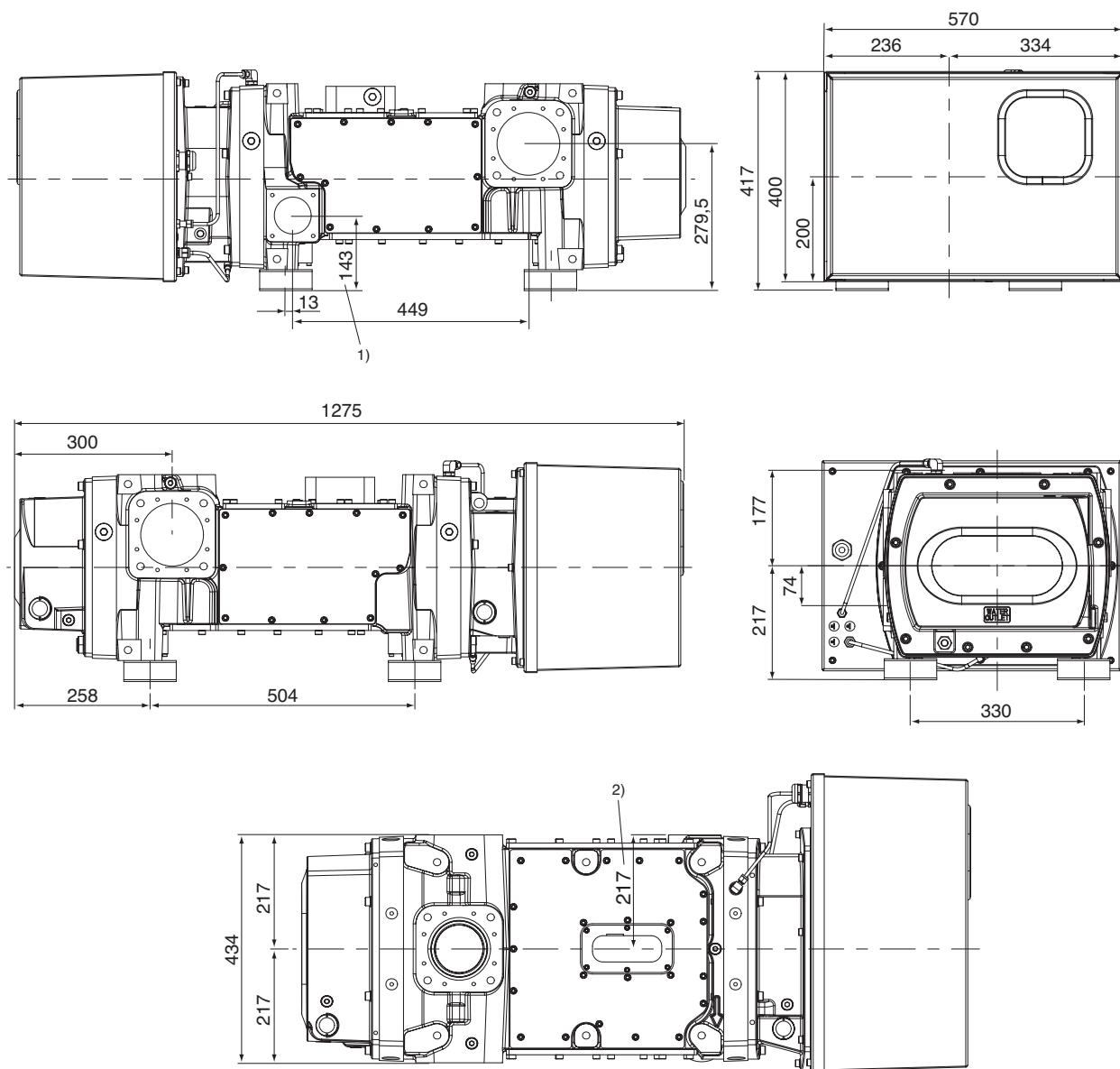
- DRYVAC DV 200
 - DRYVAC DV 300
 - DRYVAC DV 450
 - DRYVAC DV 650
 - DRYVAC DV 650 Atex Cat. 2 I T2
 - DRYVAC DV 1200
 - DRYVAC DV 1200 S-i
 - DRYVAC DV 1200 Atex Cat. 2 I T2
- and allows for numerous combinations with Roots pumps from the RUVAC series.



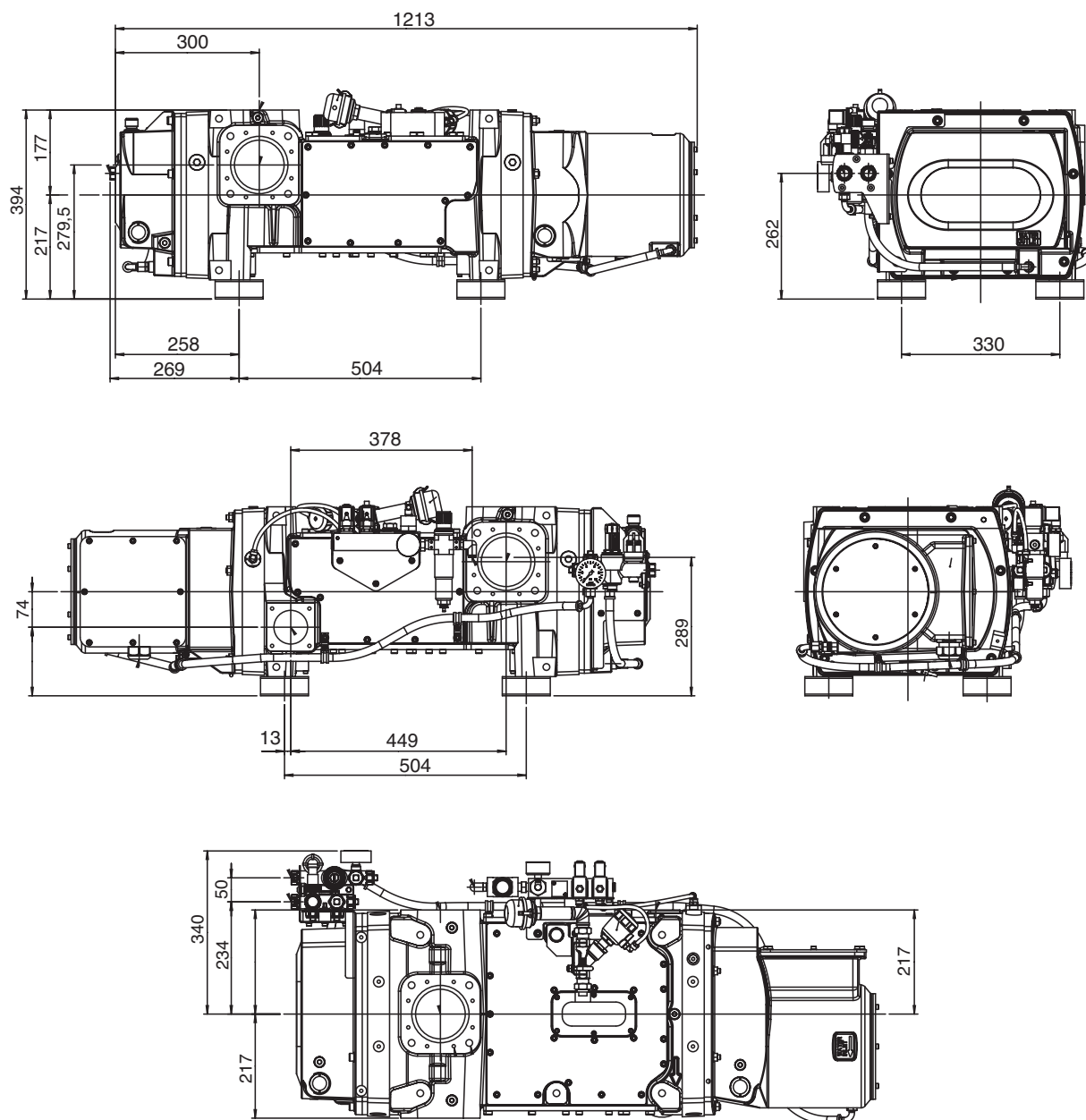
DRYVAC DS Systems with Roots Blowers RUVAC WAU 2001, WH 2500, WH 4400



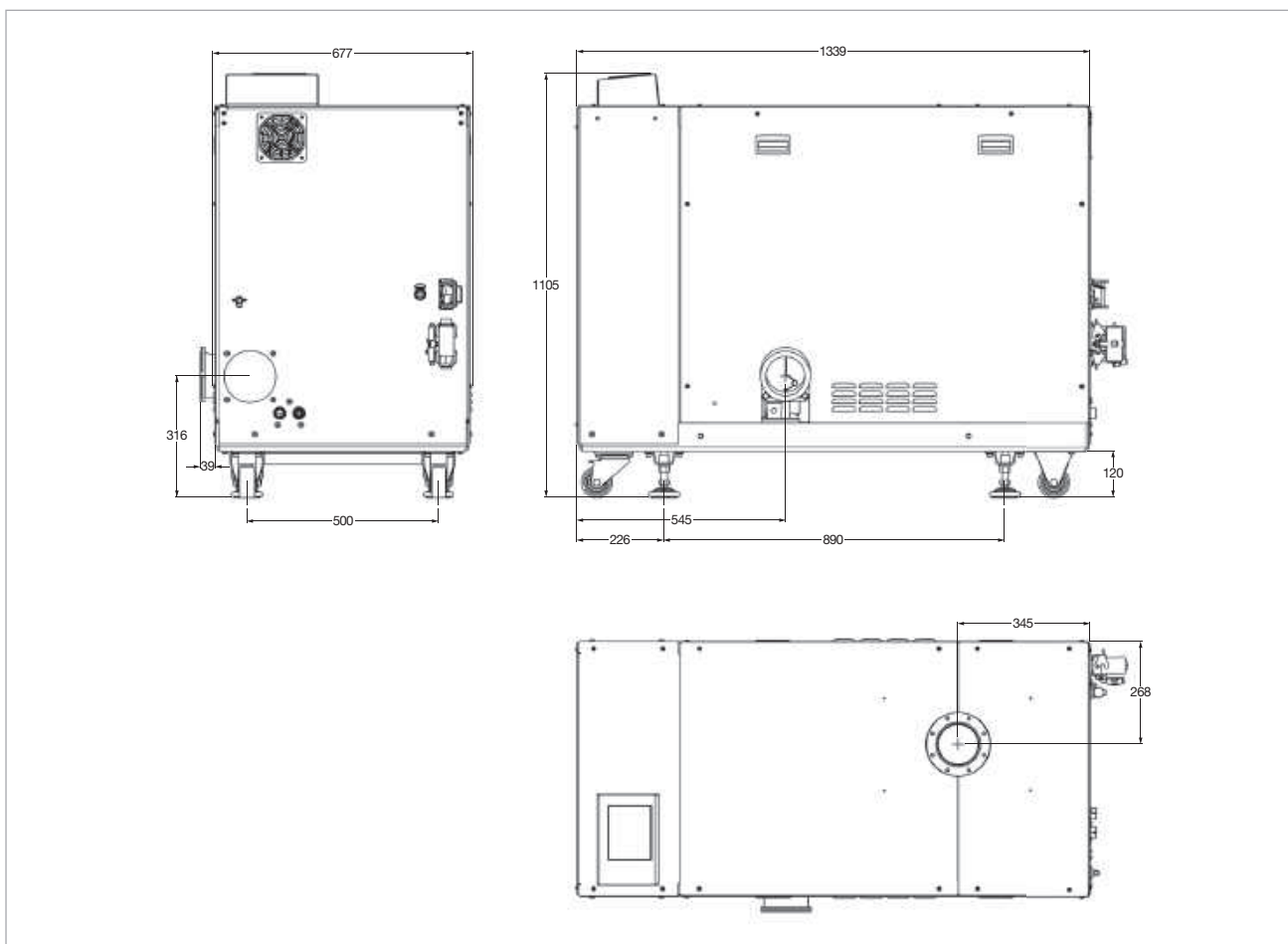
Dimensional drawing for the DRYVAC DV 200 and DV300, all dimensions in mm



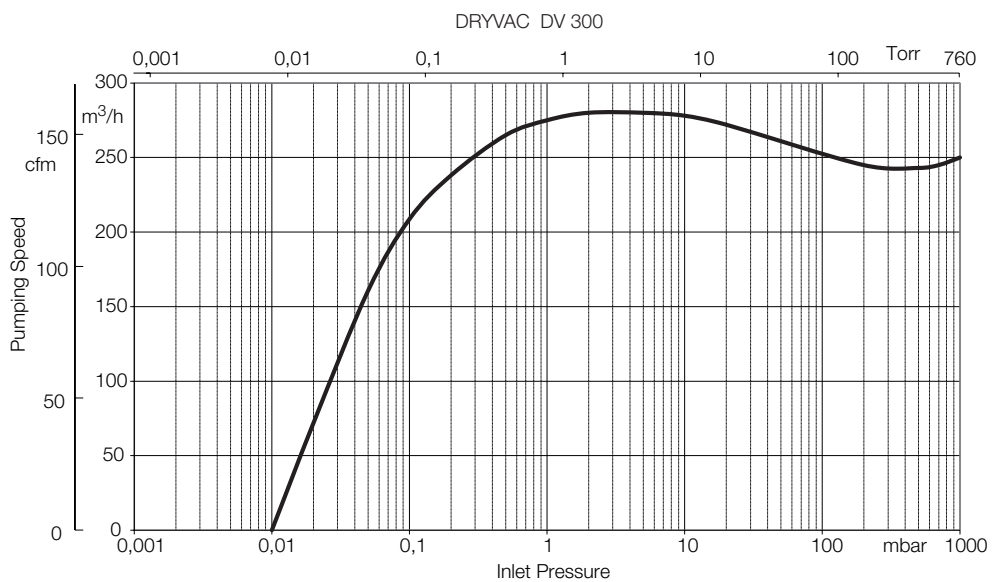
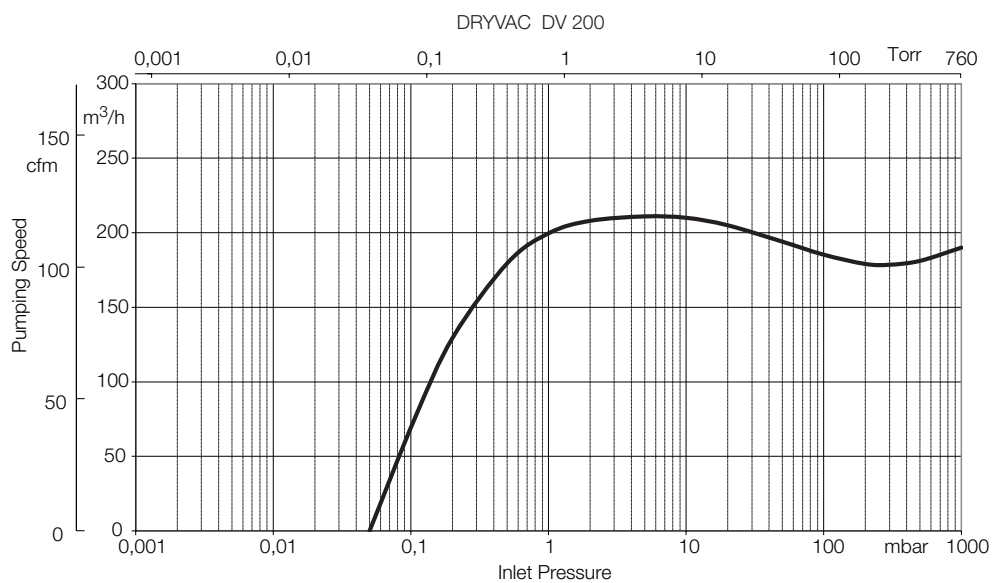
Dimensional drawing for the DRYVAC DV 450 and DV 650, all dimensions in mm



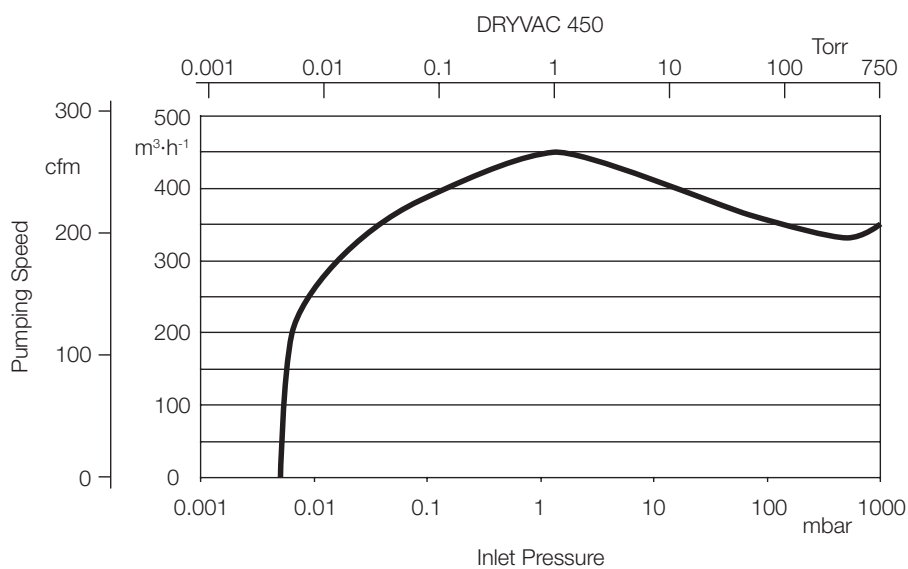
Dimensional drawing for the DRYVAC DV 450-r and DV 650-r, all dimensions in mm



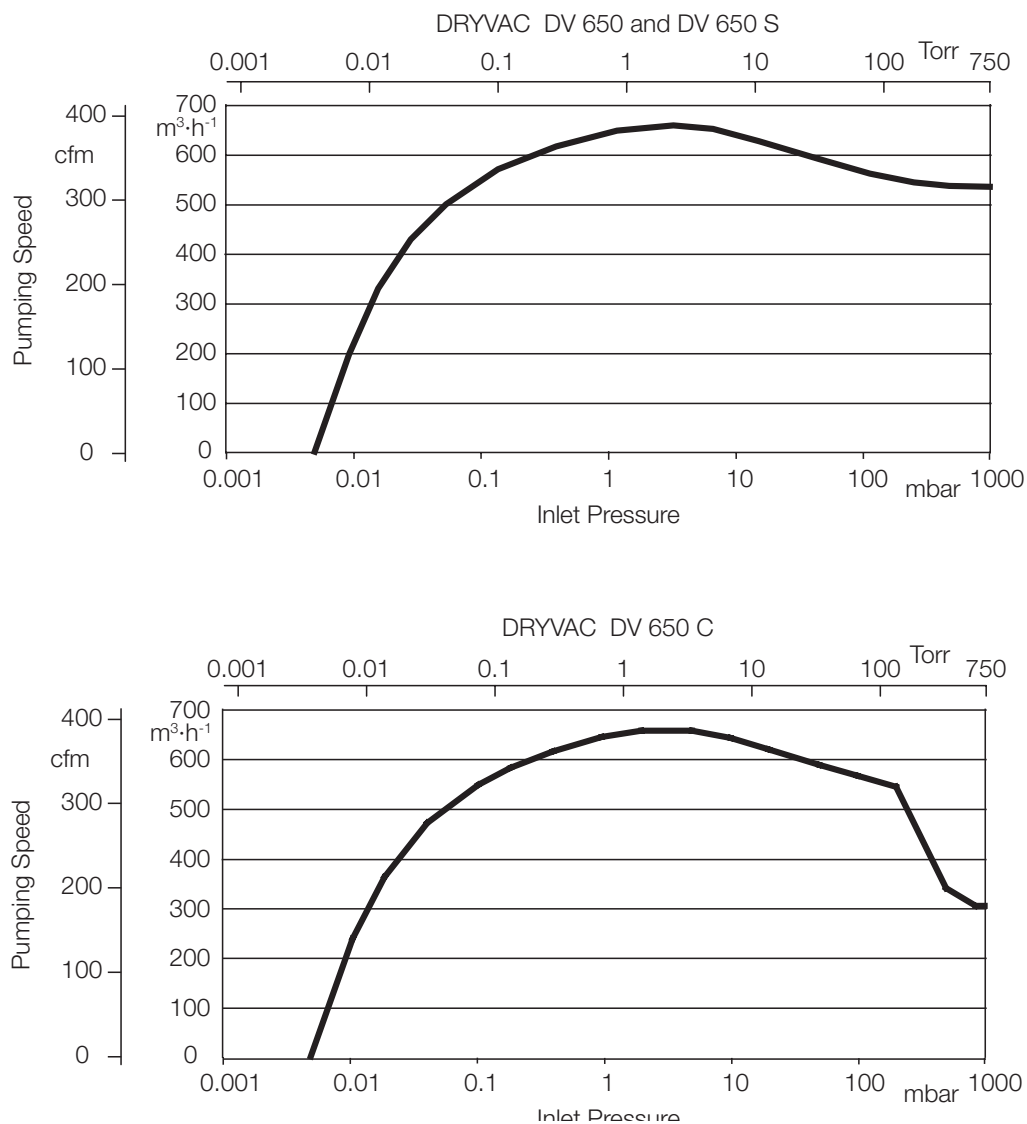
Dimensional drawing for the DRYVAC DV 1200 S-i, all dimensions in mm



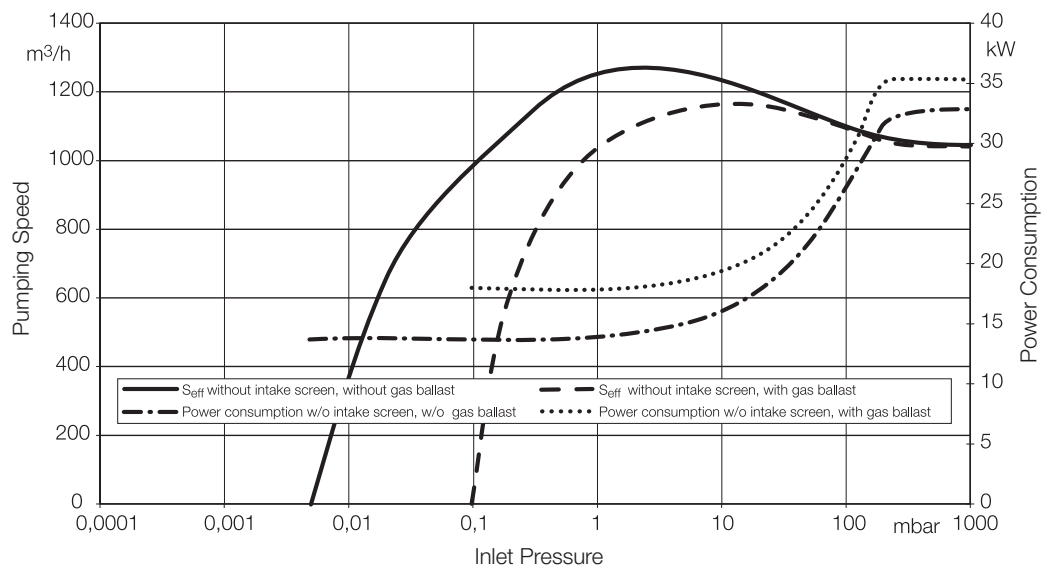
Pumping speed curves of the DRYVAC DV 200 and DV 300



Pumping speed curves of the DRYVAC DV 200 and DV 300



Pumping speed curves of the DRYVAC DV 650 (S) and DRYVAC DV 650 C



Pumping speed curves of the DRYVAC DV 1200 and DV 1200 S-i

Technical Data

DRYVAC DV

		200	300
Nominal pumping speed	m³/h (cfm)	210 (123.6)	280 (164,8)
Max. effective pumping speed without gas ballast	m³/h (cfm)	210 (123.6)	280 (164,8)
Ultimate pressure	mbar (Torr)	< 0.05 (< 0.038)	< 0.01 (< 0.0075)
Permissible ambient temperature	°C (°F)	+5 to +50 (+41 to +122)	
Water vapour tolerance with > 20 slm purge gas or gas ballast	mbar (Torr)	50 (37.5)	
Water vapour capacity	kg/h	5	
Noise level at ultimate pressure with silencer	dB(A)	65	
with rigid exhaust line	dB(A)	65	
Power consumption at ultimate pressure	kW	4.1	4.5
Lubricant filling		LV 210 synthetic Oil	
Cooling		water	
Electrical connection		380-460 V or 200-240 V ±10 %, 50/60 Hz	
Phases		3-ph.	
Nominal power	kW	7.5	
Nominal current at 400 V	A	13.8	
Intake connection	DN	63 ISO-K	
Exhaust side connection	DN	40 ISO-KF	
Protection class EN 60529	IP	54	
Weight	kg (lbs)	370 (815.7)	
Dimensions (W x D x H)	mm (in.)	1110 x 613 x 478 (43.7 x 24.1 x 18.8)	
Cooling water connection Threads, female	G	1/2	
Cooling water temperature	°C (°F)	5 to 35 (41 to 95)	
Cooling water throughput, nominal	l/min	8	
(US gallon/min)		(2.11)	
Purge gas connection (plugged connection)		D10	

Ordering Information

DRYVAC DV

200

300

	Part No.	Part No.
DRYVAC 200 V 400 V	112020V19 112020V15	112030V19 112030V15
DRYVAC ATEX, 400 V	-	112030V11
DRYVAC PFPE, 400 V	112020V25	112030V25
Accessories		
Profibus module for DRYVAC DV / DV-r	155212V	
ProfiNet module for DRYVAC DV / DV-r	112005A35	
EtherCAT module for DRYVAC DV / DV-r	112005A36	
Relay module (digital output) for DRYVAC DV / DV-r	112005A01	
Ethernet module (Dual port) for DRYVAC DV / DV-r	112005A02	
RS485/USB cable for interface X104, 1.8 m	161820USB	
Adapter DRYVAC DV 200/300 for		
RUVAC WH 501 / WH 700	112004A03	
RUVAC Wx(U) 1001	112004A04	
RUVAC Wx(U) 2001	112004A05	
RUVAC WH(U) 2500	112004A07	
Non-return valve DRYVAC, DN 40 KF ¹⁾	115005A01	
Elbow 90° DN 40 KF, stainless steel	88464	
Silencer DN 40 KF	115005A21	
Synthetic Oil, ester oil, LEYBONOL LVO 210, 5 litres	L21005	

¹⁾ must only be installed vertically

Technical Data

DRYVAC DV

		450	650	1200-i	1200
Nominal pumping speed	m³/h (cfm)	450 (265)	650 (383)	1250 (736)	1250 (736)
Max. effective pumping speed	m³/h (cfm)	450 (265)	650 (383)	1250 (736)	1250 (736)
Ultimate pressure	mbar (Torr)	5 x 10 ⁻³ (4 x 10 ⁻³)			
Permissible ambient temperature	°C (°F)	+5 to +50 (+41 to +122)			
Water vapour tolerance with > 20 slm purge gas or gas ballast	mbar (Torr)	60 (45)	60 (45)	- -	- -
with > 40 slm purge gas or gas ballast	mbar (Torr)	- -	- -	60 (45)	60 (45)
Water vapour capacity	kg/h	15	25	50	50
Noise level at ultimate pressure with silencer	dB(A)	67			
with rigid exhaust line	dB(A)	65			
Power consumption at ultimate pressure	kW	4.7	6.6	14	14
Cooling		water	water	water/air	water
Electrical connection		380 – 460 V, 50/60 Hz			
Phases		3-ph.			
Nominal power at 400 V	kW	11	15	30	30
Nominal current at 400 V	A	24	31	62	62
Intake connection	DN	100 ISO-K PN6 (1x at the top, 2x at the side)	100 ISO-K PN6 (1x at the top, 2x at the side)	100 ISO-K	100 ISO-K
Exhaust side connection	DN	63 ISO-K	63 ISO-K	100 ISO-K	100 ISO-K
Protection class EN 60529	IP	54	54	20	54
Weight	kg (lbs)	620 (1367)	589 (1280)	1400 (3091)	1400 (3091)
Dimensions (W x D x H)	mm (in.)	1280 x 570 x 420 (50.4 x 22.4 x 16.5)	1280 x 570 x 420 (50.4 x 22.4 x 16.5)	1339 x 677 x 1105 (53.9 x 26.7 x 43.5)	1339 x 677 x 1105 (53.9 x 26.7 x 43.5)
Cooling water connection Threads, female	G	1/2			
Cooling water temperature with gear oil LEYBONOL LVO 210 °C (°F) with gear oil LEYBONOL LVO 410 °C (°F)		5 to 35 (41 to 95) 5 to 25 (41 to 77)			
Cooling water throughput, nominal	l/min (US gallon/min)	6.0 (1.6)	7.5 (2.0)	15.0 (4.0)	15.0 (4.0)
Purge gas connection (plugged connection)		D10			

Ordering Information

DRYVAC DV

	450	650	1200-i	1200
	Part No.	Part No.	Part No.	Part No.
DRYVAC LVO 210 (Industrial) Double purge and air- gasballast				
200 V	112045V19-1	112065V19-1	-	-
400 V	112045V15-1	112065V15-1	-	112120V17-1
400 V, with Energy Saver	-	112065V16-1	-	-
DRYVAC LVO 210 (Industrial) Triple purge, 400 V				
400 V	-	112065V17-1	112120V50-1	-
400 V, with Energy Saver	-	112065V18-1	-	-
DRYVAC LVO 210 (Industrial) Load lock, 400 V	112045V09-1	112065V09-1	-	-
DRYVAC LVO 210 ATEX, 400 V	-	112065V11-1	-	112120V11-1
DRYVAC LVO 410 (PFPE) S Single purge				
200 V	112045V29-1	-	-	-
400 V	112045V20-1	112065V20-1	112120V40-1	-
DRYVAC LVO 410 (PFPE) C Triple purge, 400 V	112045V30-1	112065V30-1	-	-
Accessories				
DRYVAC Energy Safer (only for LVO 210)	112005A60	112005A60	-	-
Glycol Air-Cooling-System FLKS-4S	112005A45	112005A45	-	-
Kit Fitting Hoses for Glycol Air-Cooling-System	112005A47	112005A47	-	-
Outlet Flange DN 63 ISO-K x 80 mm	112005A62	112005A62	-	-
Frequenzcy Converter IP 66 for DRYVAC DV-r	112005A65	-	-	-
Profibus module for DRYVAC DV / DV-r	155212V			
ProfiNet module for DRYVAC DV / DV-r	112005A35			
EtherCAT module for DRYVAC DV / DV-r	112005A36			
Relay module (digital output) for DRYVAC DV	112005A01			
Ethernet module (Dual port) for DRYVAC DV	112005A02			
LEYASSIST Windows Software ²⁾	230439V01			
RS232 adapter for FC DRYVAC RUVAC WH	155224V			
Adapter USB – RS232	800110V0103			
Interface kit 24 Volt I/O for DRYVAC DV / DV-i	112005A22			
Adapter DRYVAC for DV 450/650				
RUVAC WH 700	112005A03			
RUVAC WS(U) 1001	112005A04			
RUVAC WS(U) 2001	112005A05			
RUVAC WH(U) 2500	112005A07			
RUVAC WH(U) 4400/7000	112005A10			
Cooling water unit				
DRYVAC 450/650	112005A12			
DRYVAC 450/650-r	112005A13			
Non-return valve DRYVAC, DN 63 ISO-K ¹⁾	112005A15			
Gas ballast kit DRYVAC, 24 V electro-pneumatic	112005A17			
Silencer				
DN 63 ISO-K for DV 450/650 and SP 250	119002			
DN 100 ISO-K for DV 1200 and SP 630	119001			
Serviceable silencer				
DN 63 ISO-K for DV 450/650 and SP 250	119003V			
DN 100 ISO-K for DV 1200 and SP 630	119004V			
External display (not for 1200-i)	155213V			
Harting plug DRYVAC S-i/C-i	112005A20			
Set of nozzles for DRYVAC purge gas	112005A30			
Permanent inlet purge kit	112005A32			

¹⁾ Already integrated in all -i versions

²⁾ Operating, configuration and analysis software for DRYVAC and other Leybold products

Applications for SCREWLINE Pumps

Dry Compressing Scroll Vacuum Pumps		SCREWLINE SP 250 (ATEX)	SCREWLINE SP 630 F (ATEX)
Applications			
Food processing		■	■
Vacuum coating		■	■
Lamination		■	■
Loadlock chambers		■	■
Mechanical engineering		■	■
Automotive industry		■	■
Metallurgy/Furnaces		■	■
Crystal pulling		■	■
Degassing		■	■
Electrical engineering		■	■
Energy technology		■	■
Welding technology		■	■
Lamps/Tubes manufacture		■	■
Cooling and air conditioning		■	■
Chemistry/Pharmaceuticals		■	■
Chemical research laboratories		■	■
Vacuum drying		■	■
Freeze drying systems		■	■
Environmental engineering		■	■
Packaging		■	■
Medical technology		■	■
Analytical engineering		■	■
Research and development		■	■
Space simulation		■	■
Backing pump for HV-Systems		■	■

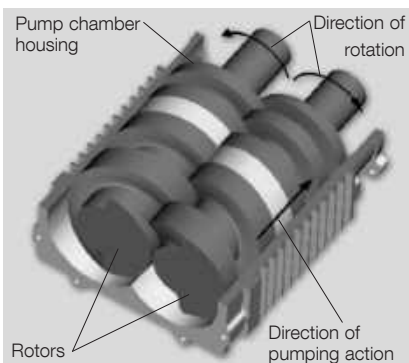
Products



Screw Vacuum Pump SCREWLINE SP 630

Principle of Operation

Screw Vacuum Pumps are dry compressing backing pumps, the operation of which is based on the screw principle. The pumping chamber of the pump is formed by two synchronised positive displacement rotors and the housing enclosing these. Since the rotors rotate in opposite directions, the chambers move steadily from the intake to the exhaust side of the pumps thereby resulting in a smooth pumping action (see figure below). Since with a single Screw Vacuum Pump rotor pair a multistage compression process is implemented, the component count in the pumping path is very low. In this way maintenance and servicing work is much simplified.



Principle of operation of the SCREWLINE Line

Properties

The direct pumping path without multiple deflections for the medium make the Screw Vacuum Pumps highly insensitive to foreign materials. This ensures a high uptime in industrial processes.

The two non-contacting shaft-seals are practically wear-free, which allows for very long maintenance intervals. Shaft seal purge is usually required in industrial applications. SCREWLINE pumps are equipped with a purge gas supply unit.

Because of the cantilevered bearing arrangement for the Screw Vacuum Pump rotors, a potential source of failure (i.e. a bearing on the intake side) is entirely eliminated. On the one hand, no lubricants from the bearings can enter into the vacuum process, and the other hand also an impairment of the bearing by aggressive process media can be excluded.

A further benefit of the cantilevered bearing arrangement is the easy

The Screw Vacuum Pumps SCREWLINE were developed in view of the special requirements of industrial applications. The innovative design allows these pumps to be used whenever reliable, compact and low maintenance vacuum solutions are required.

accessibility of the pump chamber. This innovative design feature allows the removal of the pump housing without time-consuming and costly disassembly of the bearings. Thus on-site cleaning of all surfaces in contact with the medium is possible. In particular, if the processes involved considerable amounts of contaminants this is a significant advantage which ensures a long uptime.

The low exhaust temperature is an important advantage of the Screw Vacuum Pumps. Owing to the design of the screw rotors, a temperature of maximum 100 °C (212 °F) is attained inside the pump. Thus deposits of many substances are avoided which react at high temperatures. This makes the pump unique and many customers, above all from the field of coating, value this highly.

Should deposits form in spite of this, then the easy to disassemble housing facilitates rapid cleaning.

Besides the integrated oil cooling arrangement for the rotors, the Screw Vacuum Pumps are air-cooled from the outside. Here rotor and housings are thermally linked via the oil cooler. Thus, Screw Vacuum Pumps adapt themselves ideally to the ambient conditions under changing operating situations.



Oil/water cooling unit SP 630 F

A water-cooled version is offered as Screw Vacuum Pumps SP 630 F. This product version is intended for operation in air-conditioned rooms.

The Screw Pumps portfolio is completed through ATEX-certified variants.

Moreover, the Screw Vacuum Pumps portfolio also includes pump versions suited for pumping pure oxygen (O_2).

Maintenance and Monitoring

During the development of the Screw Vacuum Pumps, special emphasis was placed on a particularly simple maintenance concept. This has been implemented through the cantilevered bearing arrangement, with all maintenance components and controls having been located on the so-called service side for easy accessibility. Thus, the space requirement which needs to be taken into account during planning has been optimized. The lower space requirement gives the user more flexibility during installation of the pump.

The monitoring system SP-GUARD was developed especially for constant real-time monitoring of the operational status of the Screw Vacuum Pumps. The operating parameters are con-

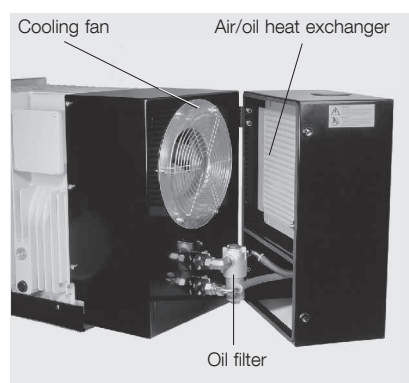
stantly acquired and processed. This enables the user to introduce preventive actions early enough so as to ensure trouble-free operation of his Screw Vacuum Pumps. The key current operating parameters can be read off from a local display. Moreover, connection to a PLC and remote monitoring is possible. Maintenance of the Screw Vacuum Pumps will generally be limited to a regular visual inspection of the pump and the annual change of gear oil and oil filter. The oil fill ports as well as the filters are readily accessible and can be easily exchanged.

With the aid of a flushing kit (optional) it is possible to clean the pump chamber, while the pump is operating without process. Deposits due to the process can thus be removed effectively and quickly without the need of having to disassemble the housing.

Also, cleaning of the air/oil heat exchanger can be done simply on-site by blowing out the heat exchanger with compressed air.

Accessories

Screw Vacuum Pumps offer to the user a high degree of flexibility. Inlet and exhaust connections are made through universal flanges, respectively clamped flanges, permit simple integration within the system. Through the accessories which are available, the pump can be optimally adapted to the individual requirements of differing applications.



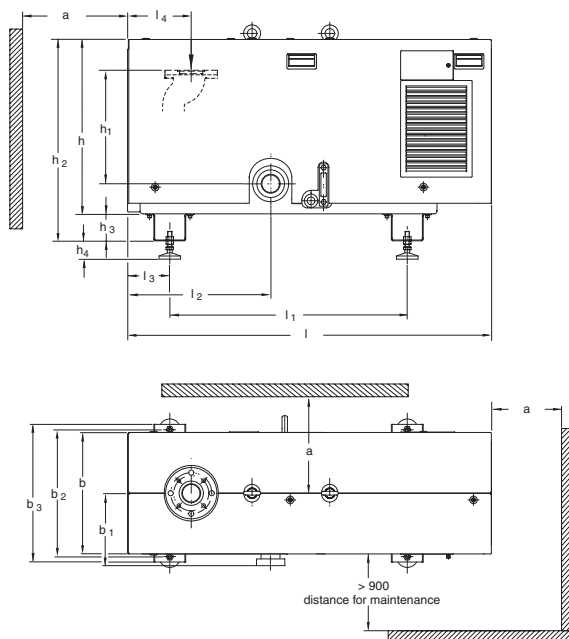
Oil/water cooling unit SP 630

Advantages to the User

- Utmost reliability
- Protection of the pump through monitoring vital parameters by means of the SP-GUARD
- Minimum downtimes owing to rapid cleaning of the pump chamber (in less than one hour)
- Avoidance of deposits through low internal temperatures
- Minimum operating costs
- The only directly air cooled screw vacuum pump on the market. No need for cooling water
- No seal gas needed for standard applications
- No oil in the pump chamber. Thus no need for disposing of contaminated oil
- Gear oil change only every two years
- Utmost flexibility
- Direct adaptation of RUVAC pumps for increased pumping speed up to approximately 7000 m³/h
- Multi-flange for all commonly used pipe connections
- Flushing kit for constant cleaning of the pump chamber
- Silencing hoods for a further reduction of noise emissions

Typical Applications

- Industrial furnaces
- Coating technology
- Load lock chambers
- Metallurgical systems
- Food processing
- Drying processes
- Degassing
- Research and development
- Lamps and tubes manufacture
- Automotive industry
- Packaging industry
- Space simulation
- Electrical engineering
- Energy research

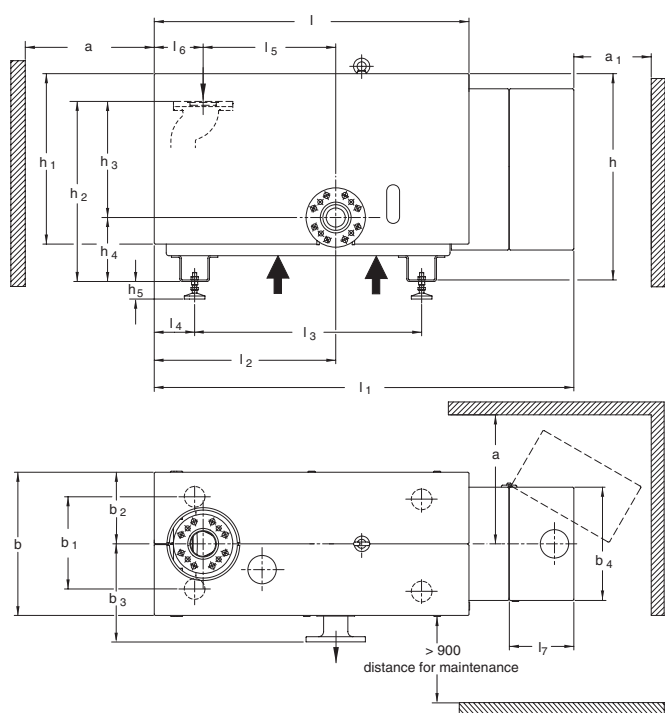


	a	b	b ₁	b ₂	b ₃
mm	> 500	450	268	470	510
in.	> 19.69	17.72	10.55	18.50	20.08

	h	h ₁	h ₂	h ₃	h ₄
mm	646	385	746	100	68 – 75
in.	25.43	15.16	29.37	3.94	2.68 – 2.95

	l	l ₁	l ₂	l ₃	l ₄
mm	1348	880	529	156	236
in.	53.08	34.65	20.83	6.14	9.29

Dimensional drawing for the SCREWLINE SP 250

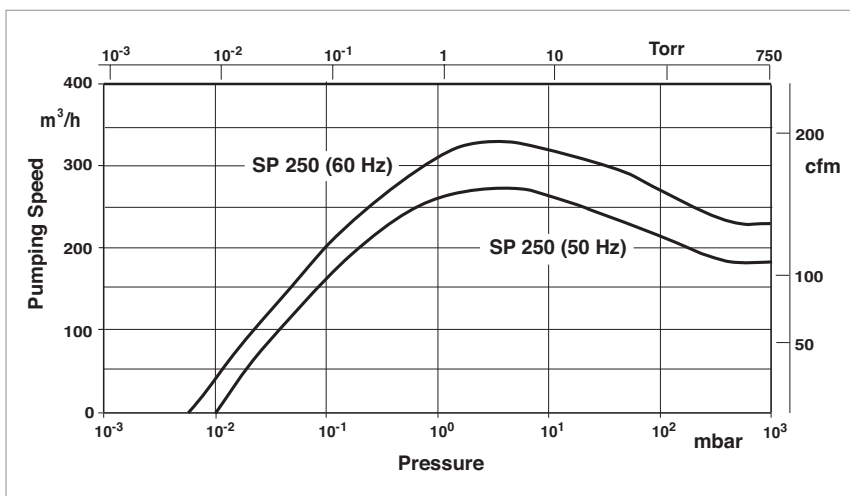


	a	a ₁	b	b ₁	b ₂	b ₃	b ₄
mm	> 500	> 300	555	470	276	380	439
in.	> 19.69	> 11.81	21.85	18.50	10.87	14.96	17.28

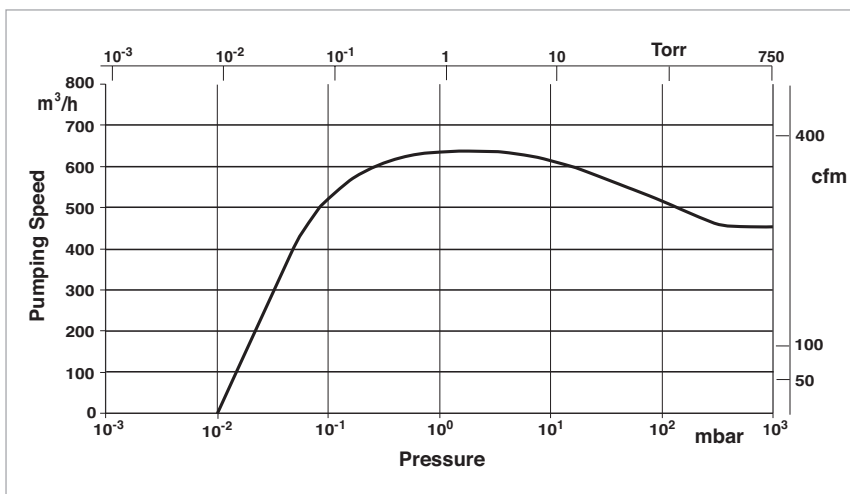
	h	h ₁	h ₂	h ₃	h ₄	h ₅	l
mm	806	636	698	450	248	68	1220
in.	31.73	25.04	27.48	17.72	9.76	2.68	48.03

	l ₁	l ₂	l ₃	l ₄	l ₅	l ₆	l ₇
mm	1626	703	880	157	514	189	250
in.	64.02	27.68	34.65	6.18	20.24	7.44	9.84

Dimensional drawing for the SCREWLINE SP 630



Effective pumping speed of the SCREWLINE SP 250 for air, without gas ballast (50/60 Hz)



Effective pumping speed of the SCREWLINE SP 630 for air, without gas ballast

Technical Data

SCREWLINE SP 250

		50 Hz	60 Hz
Effective pumping speed	m ³ /h (cfm)	270 (157)	330 (194)
Ultimate pressure, total	mbar (Torr)	≤ 0.01 (≤ 0.0075)	≤ 0.005 (≤ 0.0038)
Permissible intake pressure, max.	mbar (Torr)	1030 (773)	
Maximum exhaust pressure with reference to the ambient pressure		$p_{ex} = p_{amb}$ + 200 mbar (150 Torr) - 50 mbar (37 Torr)	
Permissible ambient temperature	°C (°F)	+10 to +40 (+50 to +104)	
Water vapour tolerance (with gas ballast)	mbar (Torr)	60 (45)	75 (56)
Water vapour capacity (with gas ballast)	g/h (gal/h)	10 (2.7)	18 (4.9)
Installation location		up to 3000 metres (9.800 feet) (above sea level)	
Cooling		Air	
Power supply at operating voltage	ΔΔ Δ	32.0 A / 200 V (cos phi 0.88) 16.0 A / 400 V (cos phi 0.88)	31.5 A / 210 V (cos phi 0.88) 15.5 A / 460 V (cos phi 0.88)
Nominal power	kW (HP)	7.5 (10.0)	
Power consumption at ultimate pressure	kW (HP) kW (HP)	5.9 (8.0) at 3-ph. 200 V / 400 V 6.5 (8.8) at 3-ph. 500 V	7.2 (9.8) at 3-ph. 200 V / 400 V –
Energy efficiency class		IE 2	
Motor rotational speed	rpm	2920	3505
Type of protection	IP	55	
Thermal protection class		F	
Lubricant filling (LVO 210)	I	7	
Intake flange, standard Clamping flange Bolt flange Bolt flange		ISO 1609-1986 (E)-63 (DN 63 ISO-K) ¹⁾ ASME B 16.5 NPS 3 class 150 EN 1092-2-PN 6 - DN 65	
Exhaust flange, standard Clamping flange		ISO 1609-1986 (E)-63 (DN 63 ISO-K)	
Exhaust flange, optional Clamping flange Bolt flange Bolt flange Bolt flange		ISO 1609-1986 (E)-63 (DN 63 ISO-K) ¹⁾ ASME B 16.5 NPS 3 class 150 EN 1092-2-PN 16 - DN 65 EN 1092-2-PN 6 - DN 65	
Materials (components in contact with the gas)		Aluminum, aluminum anodic oxidised, C steel, CrNi steel, grey cast-iron, FPM (FKM) (Viton))	
Weight, approx.	kg (lbs)	450 (992)	
Dimensions (W x D x H)	mm (in.)	1350 x 530 x 880 (53.1 x 20.9 x 34.6)	
Noise level ²⁾	dB(A)	67	72

¹⁾ This flange is required when ISO-K flanges are to be connected (Part No. 267 47)

²⁾ With connected exhaust gas line at ultimate pressure

Ordering Information

SCREWLINE SP 250

	Standard	ATEX	O ₂
	Part No.	Part No.	Part No.
Screw Vacuum Pump SP 250 (50/60 Hz) with manual gas ballast and purge gas unit	115 001 ¹⁾	–	–
with purge gas unit, castors and manual gas ballast valve	115 006 ¹⁾	–	–
with electromagnetic gas ballast and purge gas unit Category 3GD IIC 160 °C (320 °F) inside	–	115 003 ^{1, 2)}	–
with electromagnetic gas ballast Purge vent kit, FFPM gaskets and purge gas unit Category 2G3D b IIC 160 °C (320 °F) inside/ Category 3GD Ex nA IIC 160 °C (320 °F) outside	–	115 012V11 ¹⁾	–
with electromagnetic gas ballast and purge gas unit SP-GUARD	–	–	115 019 ^{1), 3)}
Accessories			
Exhaust silencer	119 002	119 002	119 002
Serviceable silencer	119 003V	119 003V	119 003V
Exhaust non-return valve (DN 65 PN 6)	119 011	–	–
Solenoid gas ballast kit, 24 V ⁴⁾	119 054V	–	–
Adaptor for RUVAC 501/1001	119 022	119 022	119 022
Purge gas retrofit kit	119 031	–	–
Inlet filter adapter DN 63 ISO-K	119 019	119 019	–
Dust filter	951 68	–	–
Purge vent kit	119 061V	119 061V	119 061V
Flushing kit	119 015V02	119 015V02	119 015V02
Oil change kit	EK 110 000 820	EK 110 000 820	EK 110 000 820
Screw inspection kit	EK 110 000 821	EK 110 000 821 ⁵⁾	EK 110 000 821
Purge gas connection servicing kit	EK 110 000 834	EK 110 000 834	EK 110 000 834
Filter for gas ballast	E 110 000 980	E 110 000 980	E 110 000 980
Filter for purge gas valve unit	E 110 000 850	E 110 000 850	E 110 000 850
Absorbing felt	E 110 002 435	E 110 002 435	E 110 002 435
Silencer service kit	EK 500 003 476	EK 500 003 476	EK 500 003 476
Seal kit non-return valve SP 250	EK 110 000 828	EK 110 000 828	EK 110 000 828
Seal kit RUVAC adaptor SP 250	EK 110 000 835	EK 110 000 835	EK 110 000 835
Vibration element RUVAC adaptor SP 250	ES 110 000 2677	ES 110 000 2677	ES 110 000 2677

¹⁾ All pumps are equipped as standard with an SP-GUARD

²⁾ Only ATEX Category 3i (Directive 94/9/EG)

³⁾ T4 with max. $p_{ex} = p_{amb} + 200 \text{ mbar}$
– 50 mbar

⁴⁾ This accessory item can only be used beginning with SN (serial number) 31000530865

⁵⁾ Only for Part No.

For all enquiries and orders relating to category 1 and 2 ATEX products please exclusively use our ATEX questionnaire. You can find this questionnaire at the end of the full-line catalog together with the fax forms or on the Internet under "www.leybold.com" under Download Documents in the area Documentation.

Technical Data

SCREWLINE SP 630

50 Hz

60 Hz

Effective pumping speed	m³/h (cfm)	630 (371)	
Ultimate pressure, total	mbar (Torr)	≤ 0.01 (≤ 0.0075)	
Permissible intake pressure, max.	mbar (Torr)	1030 (773)	
Maximum exhaust pressure with reference to the ambient pressure		$p_{ex} = p_{amb}$ <div> + 200 mbar (150 Torr) - 50 mbar (37 Torr) </div>	
Permissible ambient temperature	°C (°F)	+10 to +40 (+50 to +104)	
Water vapour tolerance (with gas ballast)	mbar (Torr)	40 (30)	
Water vapour capacity (with gas ballast)	g/h (gal/h)	14 (3.7)	
Installation location		up to 3000 metres (9.800 feet) (above sea level)	
Cooling		Air	
Power supply	$\Delta\Delta$ Δ Y ¹⁾	56 A / 200 V 28 A / 400 V 16 A / 690 V	52 A / 210 V 24 A / 460 V –
cos φ		0.89	0.90
Nominal power	kW (HP)	15 (20)	
Power consumption at ultimate pressure	kW (HP)	< 11 (< 15)	
Energy efficiency class		IE 2	
Motor rotational speed	rpm	2930	3530
Type of protection	IP	55	
Thermal protection class		F	
Lubricant filling (LVO 210)	I	13	
Intake flange and exhaust flange compatible with bolt flanges		EN 1092-2 - PN 6 – DN 100 EN 1092-2 - PN 16 – DN 100 ISO 1609-1986 (E)-100 (DN 100 ISO-K) ²⁾ ASME B 16.5 NPS4 class 150	
Materials (components in contact with the gas)		Aluminum, aluminum anodic oxidised, C steel, CrNi steel, grey cast-iron, FPM (FKM) (Viton))	
Weight, approx.	kg (lbs)	530 (1166)	
Dimensions (W x D x H)	mm (in.)	1630 x 660 x 880 (64 x 26 x 35)	
Noise level ²⁾	dB(A)	73	75

¹⁾ 690 V upon request

²⁾ This flange is required when ISO-K flanges are to be connected (Part No. 267 50)

³⁾ With connected exhaust gas line at ultimate pressure

Additional Technical Data

SCREWLINE SP 630 F

50 Hz

60 Hz

Cooling	m³/h	Water	
Water connection	G	1/2" ISO 228-1	
Water temperature	°C (°F)	+5 to +35 (+41 to +95)	
Minimum water feed pressure	bar (psi, gauge)	2 (15)	
Nominal flow at a water feed temperature of 25° C (77 °F)	l/min (gal/min)	12 (3)	
Noise level ¹⁾	dB(A)	71	

¹⁾ With connected exhaust gas line at ultimate pressure

Ordering Information

SCREWLINE SP 630 Standard / SP 630 F Standard

	50 Hz	60 Hz
	Part No.	Part No.
Screw Vacuum Pump SP 630 air cooled, with manual gas ballast and purge gas unit	117 007	117 008
Screw Vacuum Pump SP 630 F water cooled, with adapter for RUVAC 2001 and electromagnetic gas ballast and purge gas unit	117 105	117 106
with purge gas unit and manual gas ballast	117 113	117 114
Screw Vacuum Pump SP 630 water cooled, with castors, purge gas unit and electromagnetic gas ballast	117 117	117 118

All pumps are equipped as standard with an SP-GUARD

Ordering Information

SCREWLINE SP 630 ATEX / SP 630 F ATEX

	50 Hz	60 Hz
	Part No.	Part No.
Screw Vacuum Pump SP 630 with purge gas unit manual gas ballast and air cooled, Category 3G IIC (160 °C (320 °F)) inside	117 017	117 018
with purge gas unit 24 V gas ballast and water cooled, Category 3G IIC (160 °C (320 °F)) inside	117 115	117 116
Screw Vacuum Pump SP 630 F water cooled Category 2G3D IIC (160 °C (320 °F)) Category 3G IIC T3 (160 °C (320 °F)) with purge gas unit adapter for RUVAC 2001 and electromagnetic gas ballast	117 111V11	117 112V11

All pumps are equipped as standard with an SP-GUARD

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Ordering Information

SP 630 O₂

	50 Hz	60 Hz
	Part No.	Part No.
Screw Vacuum Pump SP 630 purge gas unit and electromagnetic gas ballast	117 039	117 040

All pumps are equipped as standard with an SP-GUARD

Ordering Information

Accessories

SCREWLINE SP 630 Standard / SP 630 F Standard

50 Hz / 60 Hz

	Part No.
Exhaust silencer	119 001
Serviceable silencer	119 004V
Roots pump adapter for RUVAC 1001 ¹⁾ for RUVAC 2001 for RUVAC WH(U) 2500 ¹⁾ for RUVAC WH 4400 ¹⁾	500 003 173 119 021 155222V 119 024V
Dust filter ²⁾ Elbow 90° (DN 100 ISO-K) Clamping screws for DN 63-250 ISO-K Centering ring for DN 100 ISO-K	951 72 887 26 267 01 268 06
Purge vent Kit	119 060V
Flushing Kit	119 015V02
Inlet filter adapter DN 100 ISO-K	119 020
Solenoid gas ballast kit, 24 V from serial number 31000530865	119 054V
Non-return valve (DN 100 PN 6)	119 010
Purge gas retrofit kit ³⁾	119 030
Maintenance kit, level 1 (oil change kit) up to serial number 31000197911 from serial number 31000197911	EK 110 000 792 EK 110 000 832
Maintenance kit, level 2 (rotor inspection kit)	EK 110 000 793
Purge gas connection servicing kit	EK 110 000 827
Filter for gas ballast	E 110 000 980
Filter for purge gas valve unit	E 110 000 850
Water filter maintenance kit for SP 630 F	EK 110 000 813
Silencer service kit	EK 500 003 475
Seal kit for SP 630 check valve	EK 110 000 815

¹⁾ Must mount to adapter Part No. 119 021

²⁾ For information on the dust filter please refer to the Catalog Part "Oil sealed Vacuum Pumps", Section "SOGEVAC", Chapter "Accessories"

³⁾ Not for ATEX pumps and pumps which comprise this already

Products

Dry Screw Vacuum Pumps VARODRY



The new VARODRY vacuum pump series is designed and produced by Leybold, in Germany specifically for industrial processes.

Being 100% air-cooled and dry, the VARODRY only consumes electricity, with no extra costs for cooling water supply or oil / oil-filter exchange and disposal. Its low power consumption will save significant operation costs.

With VARODRY vacuum can be easy, efficient, reliable and dry.

Advantages to the User

- Effortless installation - just connect to power
- Fully air-cooled, no need for cooling water
- Compact design, seamless integration or retrofit
- Minimized total cost of ownership
 - Low upfront investment and operating costs
 - Best-in-class power consumption
 - Limited maintenance expenses
 - No costs for cooling water and compressed air
- Quiet, low pitch sound level
- Excellent condensable vapor pumping capacity
- Optimized system uptime
 - Robust pump design, made for industrial applications
 - Uses only proven and simple machine parts
 - Superior performance, even in humid and dusty applications
 - Tested under extreme conditions
 - Extended maintenance intervals
 - Long-term operation without system downtimes

- 100 % clean vacuum
 - True oil-free vacuum pump
 - Absolutely no oil needed, not even for gear-box lubrication
 - Free of any oil emissions or oil leakages
 - No oil migration into vacuum chamber or product

Typical Applications

The VARODRY is optimized for the challenges found in many industrial applications:

- Repeated and fast cycling:
 - The VARODRY offers very quick pump down. The pump tolerates atmospheric pressure shocks and repeated evacuation cycles.
- Dust / particle handling:
 - The pumps screw principle offers best performance to handle fine, dry dust particles without wear. A wide portfolio of dust filters are available if big dust amounts need to be handled.

- Vapor handling:
 - Due to its optimized temperature profile and the built-in gas-ballast, the VARODRY offers a high vapor tolerance, avoiding internal condensation and corrosion.
- Reactive gas handling:
 - Often vapors (e.g. hydrocarbons) tend to react inside hot dry pumps and build-up internal coatings which can cause pump seizing. The moderate temperatures inside the VARODRY virtually eliminate this risk.
- Liquid handling:
 - The VARODRY can handle droplets or even liquid slugs as the liquids can flow freely out of the pump.

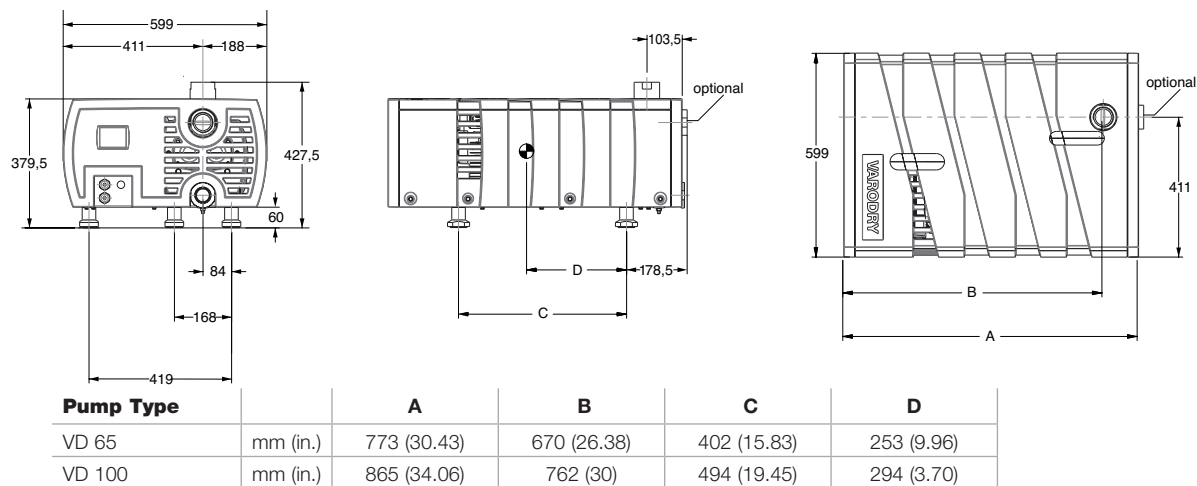
Technical details at a glance

- Intake connection
 - Horizontal or vertical orientation
 - G-thread as standard
 - ISO-KF, ISO-K or NPT thread as accessory
- Exhaust connection
 - G-thread as standard
 - ISO-KF or NPT thread as accessory
 - At lowest position, enabling condensate drainage
- Built-in exhaust silencer
 - No extra installation space for silencer
 - Lowest noise emission
 - Drainable design
- Variable pitch rotor
 - Benchmark efficiency
 - Lowest power demand in its class
- Shaft seal / bearing protection
 - "Self-cleaning" seal design
 - Optional purge-gas system available
 - No need for seal purge in most industrial applications
- Gas-ballast
 - High vapor tolerance
 - Supports dust handling
- Air-cooled design
 - Low operation cost
 - Simple integration into mobile system

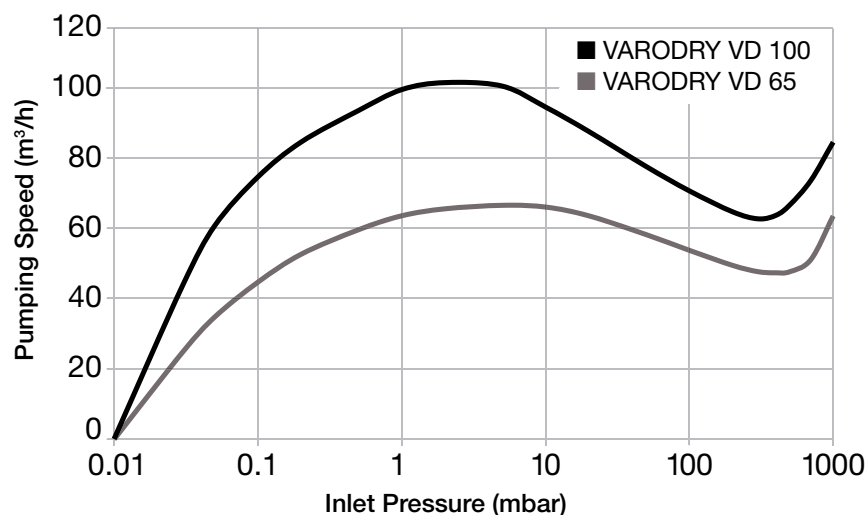
- High-tech belt-drive
 - Provides synchronization and transmission
 - Proven, long-life technology
 - Easy to maintain
 - No need for gear lubrication
- Innovative bearing technology
 - Most robust hybrid bearing design
 - Life-time grease lubricated
 - No need for oil exchange
- Enclosure
 - Integrated noise dampening
 - Enhances pump integrity
 - Clean and sleek design.

Maintenance and Service

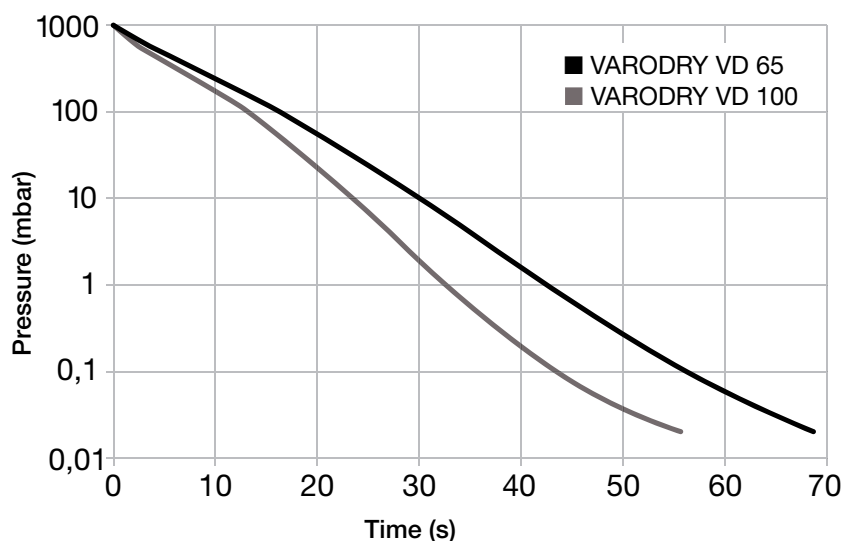
- Minimum maintenance and service requirements:
 - With only two wearing parts (belt and bearings), only minimal efforts are required to keep your pump running at peak performance – and improve the uptime at your facility.
- User maintenance:
 - The belt can easily be exchanged in less than 30 minutes. The exchange interval depends on the individual application but is typically >1 year. Belt-exchange kits and maintenance tool sets are available.
- Leybold Service:
 - The bearings can be exchanged on site by trained service technicians. Typical bearing lifetime is >3 years. Complete pump-overhauls can be done in one of the many Leybold Global Service hubs. To ensure highest factory uptime, Leybold offers fastest "pump exchange". Our back-up pools also offer flat rates for exchanging pumps, thus your production keeps running at all times.



Dimensional drawing for the VARODRY Pumps



Pumping speed curves of the VARODRY VD 65 and VARODRY VD 100



Pump-down time of a 100 l chamber

Technical Data

VARODRY

		VD 65	VD 100
Max. pumping speed	m³/h	65	100
Ultimate pressure			
without gas ballast	mbar	< 0.01	
with standard gas ballast	mbar	< 0.1	
Max. permissible inlet pressure	mbar	1050	
Max. permissible outlet pressure (rel. to ambient)	mbar	200	
Water vapor tolerance			
with standard gas ballast	mbar	20	
with big gas ballast	mbar	60	
Water vapor capacity			
with standard gas ballast	kg/h	0.6	1
with big gas ballast	kg/h	1.8	3
Noise level (with built-in silencer) at ultimate pressure (50 / 60 Hz)*	dB(A)	61/64	62/65
Permissible ambient temperature	°C	0 to +40	
Mains voltage		50 Hz, 200/400 V ±10%, 3 ph or 60 Hz, 230/460 V ±10%, 3 ph 3	
Rated motor power	kW	1.5	2.2
Protection class	IP	55	
Intake connection		G 2"	
Outlet connection		G 1 1/2"	
Weight, approx.	kg	90	100

All listed data is preliminary.

*According to DIN EN ISO 2151

Ordering Information

VARODRY

	VD 65	VD 100
	Part No.	Part No.
Dry Screw Vacuum Pumps VARODRY		
50/Hz	110 065 V10	110 100 V10
50/Hz, with purge gas module	111 065 V15	111 100 V15
60/Hz	111 065 V11	111 100 V11
60/Hz, with purge gas module	111 065 V16	111 100 V16
Accessories		
Inlet adapter DN40 ISO-KF, 20 mm	111005A20	
Inlet adapter G 1 1/4", 10 mm	111005A21	
Inlet adapter NPT 1 1/4 -11.5, 10 mm	111005A22	
Inlet adapter NPT 2-11.5, 35 mm	111005A23	
Inlet adapter DN63 ISO-K, 27 mm	111005A24	
Exhaust adapter DN40 ISO-KF, 20 mm	111005A30	
Exhaust adapter NPT 1 1/2-11.5, 30 mm	111005A31	
Inlet non return valve (for inlet pressures > 5 mbar) G 2"	111005A15	

Products

Dry Vacuum Claw Pumps CLAWVAC CP 65 to CP 300 Over-Pressure Claw Pumps CLAWVAC OP 150 to OP 300



Claw vacuum pumps CLAWVAC CP 150 and CP 300

In the CLAWVAC, a claw rotor pair rotates completely contactless and wearfree in the cylinder. The CLAWVAC differentiates itself from conventional claw pumps mainly through its material selection. Stainless steel rotors as well as the corrosion-resistant coated vacuum chamber also prove themselves under very harsh process conditions and contribute to a reliable operation.

The systems offer great advantages for a wide range of rough vacuum and over-pressure applications.

The pumps design enables extreme robustness, especially for challenging applications which include handling of particle or vapor contaminated gases.

Advantage to the User

- **Oil free compression room**
 - No oil migration into process
 - No oil contamination
- **Air cooled**
 - Extremely efficient air cooling for lowest operation temperature
 - No demand for expensive cooling water
 - Performance independent from water temperature
- **Flexible**
 - Variable speed drive (VSD) compatible
 - Compact design with small footprint
 - Cool running
- **Environment friendly**
 - Market leading low noise level
 - Lowest power consumption
 - Up to 50% energy saving by operation with VSD
- **Safe operation**
 - Continuous operation at any inlet pressure without overheating
 - Most robust bearing and seal design

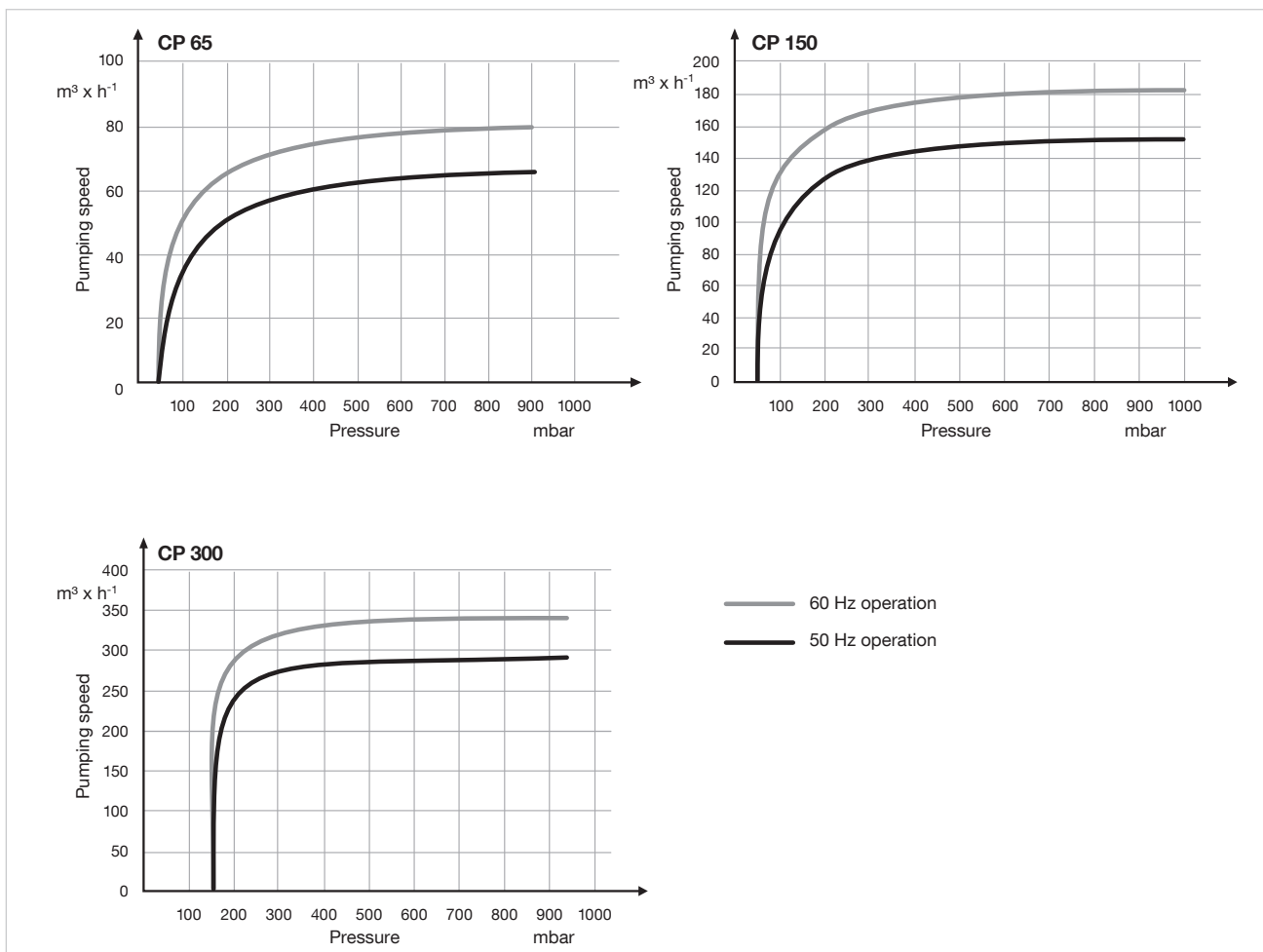
Typical Applications

- **Food Processing**
 - Bottling
 - Dairy products (e.g. milking)
 - Vacuum conveying (e.g. in slaughterhouse)
 - Beverage production
- **Food Packaging**
 - Thermoforming of foil container
 - Tray sealing
 - Modified Atmosphere Packaging (MAP)
- **Woodworking**
 - Holding & lifting
 - CNC router
 - Drying & impregnation
- **Material Transport & Holding**
 - Print & paper (press & post-press)
 - Vacuum conveying
 - Vacuum clamping
- **Degassing**
 - Li-battery slurry
 - Ceramics & bricks
- **Thermoforming**
 - Deep drawing of bath tubs

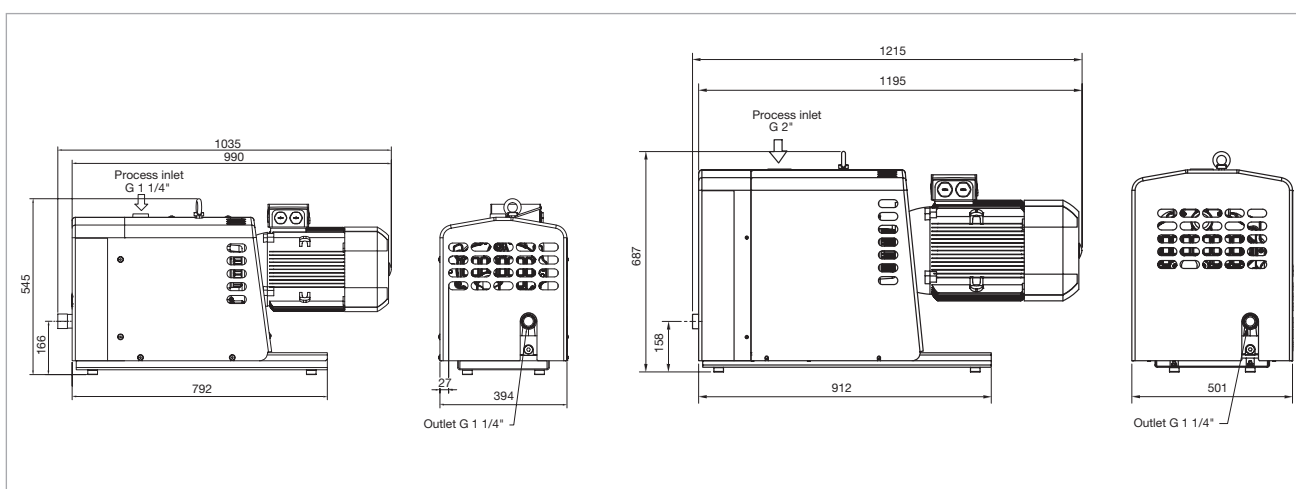
- **Plastic Industry**
 - Composite manufacturing
 - Granulate conveying
 - Extruder degassing (e.g. PP, PE, PS)
 - Gluing
- **Environmental Engineering**
 - Sewage degassing
 - Biogas production
 - Soil remediation



Corrosion resistant stainless steel claws and coated pumping chamber



Pumping speed characteristics CP 65, CP 150 and CP 300 right



Dimensional drawing – CP 65 and CP / OP 150 left, CP / OP 300 right (dimensions in mm)

Technical Data

CLAWVAC

			CP 65	CP 150	CP 300
Pumping speed	50 Hz	m³/h	65	150	300
	60 Hz	m³/h	79	184	347
Ultimate vacuum		mbar / Torr	50 / 37.5	50 / 37.5	140 / 105
Continuous operation range		mbar / Torr	50 – 1000 / 37.5 – 750	50 – 1000 / 37.5 – 750	140 – 1000 / 105 – 750
Permissible ambient temperature range		°C / °F	0 – 40 / 32 – 104		
Connections			Inlet: G 1 1/4" or NPT Outlet: G 1 1/4" or NPT	Inlet: G 1 1/4" or NPT Outlet: G 1 1/4" or NPT	Inlet: G 2" or NPT Outlet: G 1 1/4" or NPT
Motor size	50 Hz	kW	1.8	4.0	6.2
	60 Hz	kW	2.2	3.7	7.5
Operation range		Hz	20 – 60		
Noise level (50 Hz / 60 Hz)		dB(A)	66 / 77	75 / 80	77 / 84
Weight		kg	120	160	252
Motor protection class		IP	55		

Ordering Information

CLAWVAC

	CP 65	CP 150	CP 300
	Part. No.	Part. No.	Part. No.
230 V 50 Hz 3Ph	178065V01	178150V01	178300V01
380 V 60 Hz 3Ph	178065V02	178150V02	178300V02
400 V 50 Hz 3Ph	178065V03	178150V03	178300V03
575 V 60 Hz 3Ph	178065V04	178150V04	178300V04
200 V 60 Hz 3Ph	178065V05	178150V05	178300V05
460 V 60 Hz 3Ph	178065V06	178150V06	178300V06
230/460 V 60 Hz 3Ph	178065V07	178150V07	178300V07
200 V 50 Hz 3Ph	178065V08	178150V08	178300V08
230 V 60 Hz 3Ph	178065V09	178150V09	178300V09
500 V 50 Hz 3Ph	178065V10	178150V10	178300V10

Technical Data

CLAWVAC

			OP 150	OP 300
Max. volume flow	50 Hz	l/s	30.2	66
	60 Hz	l/s	40	82
Max. over-pressure	bar(g) / psi		2.5 / 36	
Permissible ambient temperature range	°C / °F		0 – 40 / 32 – 104	
Connections			Inlet: G 1 1/4" or NPT Outlet: G 1 1/4" or NPT	Inlet: G 2" or NPT Outlet: G 1 1/4" or NPT
Motor size	50 Hz / 60 Hz	kW	14	6.2
Operation range	Hz		20 – 60	
Noise level (50 Hz / 60 Hz)	dB(A)		75 / 80	77 / 82
Weight	kg		160	252
Motor protection class	IP		55	

Ordering Information

CLAWVAC

	OP 150	OP 300
	Part. No.	Part. No.
230 V 50 Hz 3Ph	178150P01	178300P01
380 V 60 Hz 3Ph	178150P02	178300P02
400 V 50 Hz 3Ph	178150P03	178300P03
575 V 60 Hz 3Ph	178150P04	178300P04
200 V 60 Hz 3Ph	178150P05	178300P05
460 V 60 Hz 3Ph	178150P06	178300P06
230/460 V 60 Hz 3Ph	178150P07	178300P07
200 V 50 Hz 3Ph	178150P08	178300P08
230 V 60 Hz 3Ph	178150P09	178300P09
500 V 50 Hz 3Ph	178150P10	178300P10

Roots Vacuum Pumps

RUVAC Roots Vacuum Pumps

230.00.02

Excerpt from the Leybold Full Line Catalog (Edition 02/2019)
Catalog Part Roots Vacuum Pumps

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Roots Vacuum Pumps

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Applications and Accessories for RUVAC Pumps

Roots Vacuum Pumps	WA/WAU 251	WA/WAU(H) 501-2001	WS/WSU 251	WS/WSU(H) 501-2001	WH 700	WH/WHU 2500/4400/7000
Applications						
Semiconductor production			■			
Vacuum coating	■		■	■	■	
Large scale research		■			■	
Chemistry/Pharmaceutica	■					
Metallurgy/Furnaces	■	■	■	■	■	
Lamps and tubes manufacturing		■				
Packaging	■					
Central vacuum supply systems	■	■	■	■	■	
Freeze drying	■	■	■	■		
Leak testing systems		■	■	■	■	
Electrical engineering	■	■	■	■	■	
High purity gases/closed refrigerant cycles		■	■	■	■	
Mechanical engineering	■	■	■	■	■	
Automotive industry	■	■	■	■	■	

Accessories

Frequency converters	■	■	■	■
Pressure switches	■	■	■	■
Temperature sensor Pt100	■ ¹⁾			

¹⁾ For ATEX pumps only

Oil for RUVAC Pumps for different fields of application

LEYBONOL Oils			
	LVO 100	LVO 210	LVO 400
Applications			
Semiconductor production	▲	●	■
Vacuum coating	■	●	●
Research and development	■	●	●
Chemistry/Pharmaceutical	■	●	●
Metallurgy/Furnaces	■	●	▲
Lamps and tubes manufacturing	■	●	
Packaging	■	●	
Central vacuum supply systems	■	●	
Freeze drying	■	●	▲
Leak testing systems	■		
Electrical engineering	■		
High purity gases/closed refrigerant cycles	■		
Mechanical engineering	■		
Automotive industry	■	●	●

■ = Standard
 ● = Possible
 ▲ = Please contact Leybold

The table only lists general applications. Your specific requirements might be subject to deeper analysis. For further questions, please contact our technical Sales support.

Oil for RUVAC pumps for different pump types

LEYBONOL Oils			
	LVO 100	LVO 210	LVO 400
Pumps			
WA/WAU 251	■	●	●
WA/WAU(H) 501-2001	■	●	●
WS/WSU 251	■	●	●
WS/WSU(H) 501-2001	■	●	●
WS 501 W	■	●	●
WS/WSU 1001 and 2001 W	■	●	●
WH 700		■	●
WH/WHU 2500		■	●
WH/WHU 4400/7000	●	■	●

■ = Standard
 ● = Possible

For information on oil specifications please refer to Catalog Part "Oils / Greases / Lubricants LEYBONOL®".

General Information on Roots Vacuum Pumps

Applications

For many years now Roots vacuum pumps have been well established in the area of vacuum technology. In combination with backing pumps, which compress against the atmosphere, these pumps offer the following advantages:

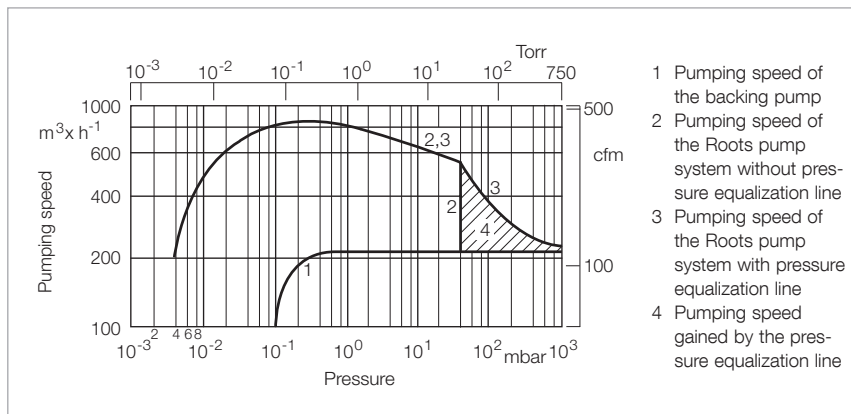
Shifting the Operating Pressure into the High Vacuum Range

As a rule of the thumb one may say that Roots vacuum pumps are capable of improving the attainable ultimate pressure of a pump system by a factor of 10. With two Roots vacuum pump stages and a corresponding backing pump it is possible to attain pressures in the range down to 10^{-5} mbar (0.75×10^{-5} Torr). Under certain circumstances this will make the use of additional high vacuum pumps (turbo-molecular pumps or diffusion pumps) unnecessary.

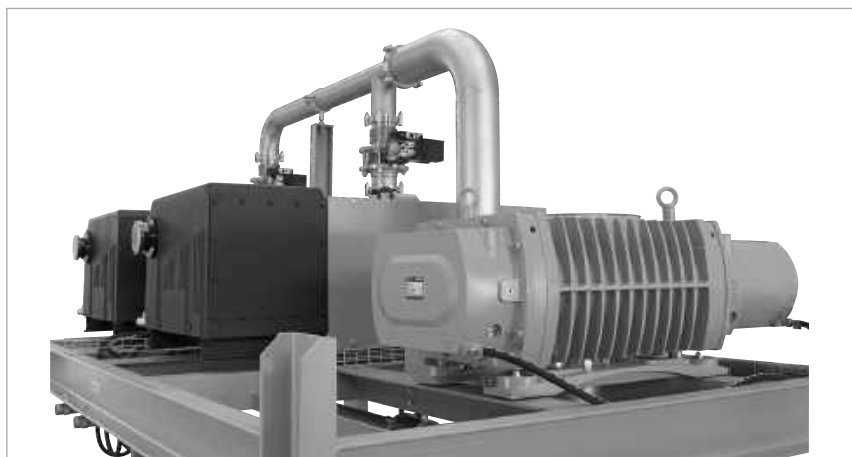
Multiplied Pumping Speed

Due to the non-contact rotation of the impellers, Roots vacuum pumps are able to run at higher speeds. Thus a high pumping speed is obtained with a relatively small size pump. Pumping speeds in excess of $1500 \text{ m}^3/\text{h}$ (589 cfm) can only be attained with Roots vacuum pumps.

When selecting the right kind of backing pump (sizing) it will be possible to pump large quantities of gas in connection with smaller backing pumps. Energy consumption of such a pump system is much less compared to a single backing pump offering the same pumping speed.



Comparison of pumping speed characteristics with and without pressure equalization line



Pump system with WH 7000 Roots vacuum pump and SOGEVAC SV 630 B rotary vane vacuum pump

The use of Roots vacuum pumps in the area of vacuum technology has resulted in further specializations and improvements:

- Through an integrated bypass (pressure equalization line) it is also possible to utilize the pumping speed of the Roots vacuum pump at high pressures and large quantities of gas at an early stage. This reduces the pumpdown time especially for cyclic operation (see figure "Comparison of pumping speed characteristics with and without pressure equalization line").
- High-purity gases or hazardous gases impose strict requirements on the leak-tightness of the system. Canned motors from the WS line or canned motors from the WH line are hermetically sealed. There are no

seals in contact with the atmosphere which might be subject to wear. This prevents leaks and failures due to oil leaks. A service life of over 20,000 hours without maintenance is quite common.

- Tolerances and the quality of the balancing combined with forced lubricated bearings and toothed gears permit high speeds and the use of frequency converters. Thus it is possible to attain a high pumping speed while the process is in progress and to reduce the speed when the process has been stopped or while changing the batch. This results in a lower consumption of energy and a longer service life with uncompromised reliability.

- Conversion from vertical to horizontal flow is easily implemented and can be performed at the place where the pump has been installed. Thus the pump can be adapted more closely to the operating conditions of your system.

Lately, a further characteristic is gaining prominence: Roots vacuum pumps are capable of compressing the media in the pump chamber without the presence of any further media. This mostly avoids interaction between different media in the pump itself and also in the connected vacuum chamber. Therefore

- the medium which is pumped is not contaminated with lubricants or sealants; complex accessories (exhaust filters, separators, etc.) are not needed;
- the lubricant in the side chambers is hardly affected, so that service life is not reduced;
- backstreaming of oil from the backing pump into the connected vacuum chamber is prevented.

These characteristics make the Roots vacuum pump attractive for almost all rough and medium vacuum applications.



Pump system consisting of RUVAC WH 4400 and SOGEVAC SV 630 B



Pump system with WH 7000 Roots vacuum pump and SOGEVAC SV 630 B rotary vane vacuum pump

Semiconductor Technology (RUVAC WH and WS)

In the area of semiconductor technology, Roots vacuum pumps are found in etching processes among others, and in use with dry compressing backing pumps.

The pumping speed of the combination of backing pumps amounts to 200 to 500 m³/h (118 to 295 cfm) and it ensures a cut-in pressure of 10^{-1} mbar (0.75×10^{-1} Torr) for the turbomolecular pump. In the process, corrosive gases need to be pumped together with a high particle count.

Owing to the usage of media which present a health hazard, hermetically sealed pump versions are used. Due to the LVO 400 lubricant filling in the gear, a high degree of media resistance, long service intervals a high reliability and thus very low costs of ownership are attained.

For use in clean rooms, Roots vacuum pumps with a water cooled motor without a motor fan are used.

This type of motor reduces the quantity of heat dissipated to the surroundings to a minimum.

Central Vacuum Supply Systems

Large Roots vacuum pumps, usually in connection with single-stage rotary vane vacuum pumps serve several consumers of vacuum (packaging machines, for example) at the same time.

The pressure can be controlled in a highly flexible manner through the speed controller of the Roots pump, which allows for a flexible adaptation of the pumping speed. In the case of the RUVAC WH and WS types a significantly higher pumping speed can also be attained by means of a frequency converter compared to operation off the normal mains power.

Solar and Display

In the solar and display industry, Roots vacuum pumps can be found in almost all production steps. In connection with the Czochralski process or at DSS furnaces for the manufacture of silicon crystals, Roots vacuum pumps are deployed to rapidly attain the demanded conditioning pressure. In connection with the various coating processes they ensure the necessary pumping speed at process pressure and very fast cycles at the load lock chambers. In connection with lamination processes for the modules they assist in pumping down the laminators quickly and ensure a high pumping speed at lamination pressure.

Owing to the high production pressure, very much is demanded as to the reliability of the pumps during all process steps and this despite of reduced maintenance and service complexity.

Process Industry

Typical process industry applications are highly demanding regarding the ruggedness of Roots pumps. These need not only to pump clean media but must also be suited for pumping dusty or vapor containing media within an industrial environment.

Here a high level of ruggedness is demanded at a good price-to-performance ratio.

Whether during metallurgical processing or heat treatment of metals, in connection with drying processes, the plasma treatment of surfaces or in vacuum packaging processes – everywhere Roots pumps from the different RUVAC lines can excel. They permit a rapid pump down and offer a high pumping speed at process pressure. In combination with a frequency converter, extremely high pumping speeds are possible with a small footprint.

Operating Principle

Roots vacuum pumps, which are also called Roots blowers, are rotary plunger type pumps where two symmetrical-shaped impellers rotate in opposite directions inside the pump housing.

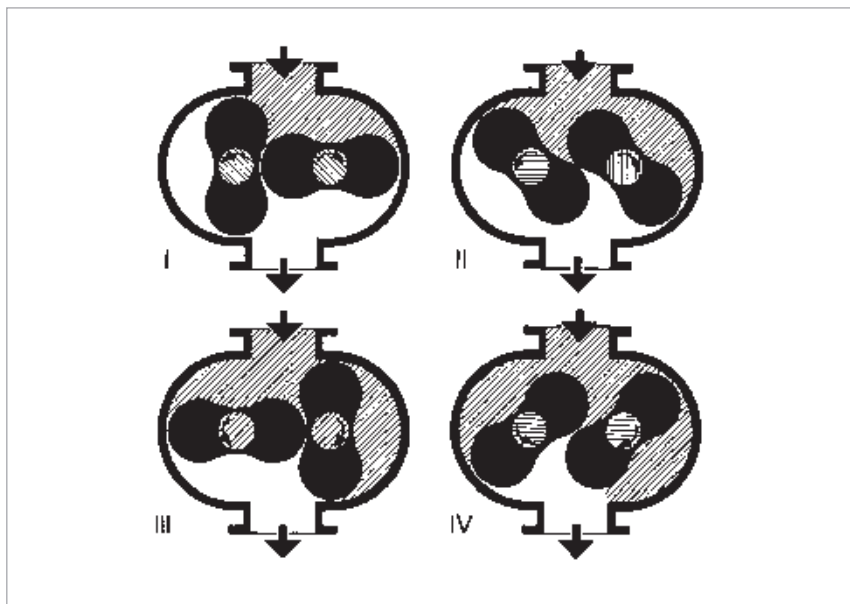
The figure-of-eight rotors are synchronized by a gear which ensures that the impellers are counter-rotating in such a way, that they are near to one another and to the housing without actual contacting.

In rotor positions I and II (see figure "Operational diagram of a single-stage Roots vacuum pump (with vertical pumping action)") the volume of the intake is increased. As the rotors turn further to position III a part of the volume is cut off from the intake side.

In position IV this volume is opened to the exhaust side and gas under fore-vacuum pressure (higher than the intake pressure) flows in. This gas compresses the gas coming from the intake. As the rotors turn further the compressed gas is ejected through the exhaust flange.

This process repeats itself twice for each rotor per full turn.

As the rotors do not come into contact with the pump's housing Roots vacuum pumps may be operated at high speeds. Thus a high pumping speed is obtained from comparably small pumps.



Operational diagram of a single-stage Roots vacuum pump (with vertical pumping action)

The pressure difference and the compression ratio between intake and exhaust is limited in Roots vacuum pumps.

In practice the maximum attainable pressure difference is of significance only in the rough vacuum range ($p > 10 \text{ mbar}$ ($p > 7.5 \text{ Torr}$)) whereas in the medium vacuum range ($p < 1 \text{ mbar}$ ($p < 0.75 \text{ Torr}$)) the attainable compression ratio is of importance.

Roots vacuum pumps from Leybold have been designed to specially meet the requirements of the fine vacuum range. They are normally used in connection with backing pumps or in closed gas cycles (WSLF series).

Design

The pump chamber of Roots vacuum pumps is free of any sealing agents or lubricants. Only the toothed wheels of the synchronous gear are lubricated with oil. Toothed gear wheels and bearings of the RUVAC are placed in two side chambers which also contain the oil reservoir. These two side chambers are separated from the pump chamber by piston ring seals.

Suitably designed oil supply systems in both chambers ensure that a sufficient quantity of oil is supplied to the gear wheels and bearings at all permissible speeds.

Almost all RUVAC Roots vacuum pumps are designed for a horizontal and vertical pumping action.

Types

Various types of Roots vacuum pumps have been developed to ensure optimum adaptation to the widely varying applications for this type of pump.

- **Flange mounted motor**
The drive shaft of the pump is directly connected to an electric motor via a flexible coupling. The required seal of the drive shaft against atmospheric pressure is obtained by oiled shaft seals.
- **Canned motor**
In the canned motor, rotor and stator pack are separated by a vacuum-tight can made of a non-magnetic material. The rotor operates on the drive shaft of the pump in the vacuum, so that a shaft seal which would be subject to wear is not required.
- **Hermetically sealed motor**
The hermetically sealed motor is the latest technology step for Roots vacuum pumps. It integrates the complete motor assembly into the vacuum reaching the same efficiency as a standard flange mounted motor without the need of a shaft seal. The hermetically sealed motor is the most compact, efficient and reliable motor technology available for roots pumps.
- **Pressure equalization line**
The integrated pressure equalization line connects the exhaust flange to the intake flange by means of a differential pressure valve. In the event of an excessively high pressure difference between the flanges, the valve will open. Then a part of the pumped gas will flow through this line back to the intake flange. Therefore the pump may be switched on together with the backing pump at atmospheric pressure. This increases the pumping speed of the pump combination also at high intake pressures.

- **Special ACE vibration absorber**
These pumps are best used in applications involving frequent pump-down cycles. The vibration absorber is of an oil sealed or filled design where minute amounts of oil may enter the vacuum system via the piston of the vibration attenuator.

RUVAC WA/WAU, WS/WSU

The series WA/WAU Roots vacuum pumps are provided with directly flange-mounted air-cooled standard three-phase motors. The oiled radial sealing rings of the RUVAC WA/WAU for sealing the shaft against the atmosphere are made of FPM (FKM) (fluoropolymer).

The WS/WSU series pumps have a air-cooled hermetically canned motor.

Roots vacuum pumps of the series WAU/WSU/WHU are provided with an additional integrated pressure equalization line and a differential pressure valve.

Pumps from these series are supplied with a vertical pumping action as standard.

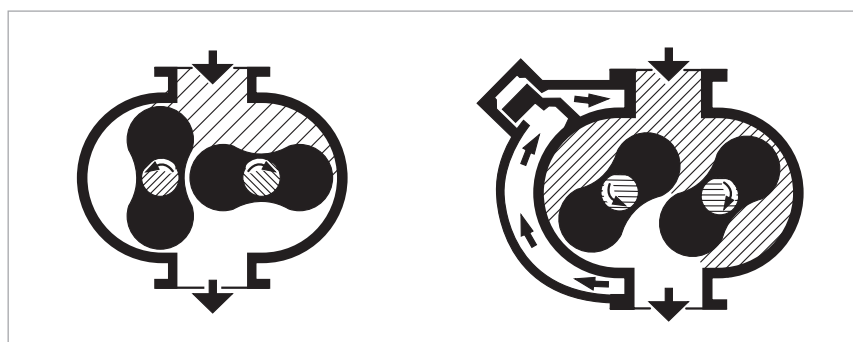
RUVAC WH/WHU

The series WH/WHU pumps are technological leaders in the area of Roots vacuum pumps.

Both motors and oil reservoirs are water cooled thereby perfectly balancing the internal temperature management of the pumps resulting in significantly lower oil temperatures and thus a longer oil service life. At ultimate pressure, emissions are reduced by approximately 50% and the motor coils can sustain higher loads while at the same time offering improved efficiency. The new drive concept with potted motors replaces the can for hermetically sealed drives. This improves efficiency even further whereby the motors are capable of complying with the IE2 requirements of the new efficiency standard without problems.

In order to increase pumping speed thereby cutting pumpdown times, optionally available specially parameterized frequency converters can be used. Moreover, the pump may be operated at its maximum power already at atmospheric pressure.

Especially for short cycles the new WHU pump is being equipped with improved valve technology. Due to the bypass line, this pump can be operated starting at atmospheric pressure. The bypass valve already closes at a very early stage, whereby the cycle times can be significantly reduced. Pumps from the WHU series should not be operated over longer periods of time at high pressures.



Schematic section through a RUVAC WA/WS (left) and a RUVAC WAU/WSU (right)

Using the RUVAC WS and RUVAC WH in combination with a frequency converter

Simulation of a pressure equalization line

The available frequency converters have been matched to the pump so that the possibility of mechanically overloading it is excluded. In the case of a pressure difference which is too high, the rotational speed of the pump is automatically reduced until its load drops in to the permissible range.

Operation at any rotational speeds

The frequency converter can be used to adjust the pumping speed of the Roots pump during operation. This allows maximum flexibility to find the right setup for any application.

Increasing the pumping speed

The pumps were developed to handle a maximum rotational speed between 4200 rpm and 7200 rpm depending on the respective pump size.

Therefore the use of a frequency converter permits an increase in the nominal pumping speed of up to 140%.

Note

Please enquire about possibly existing usage limits (process dependent).

Backing Pumps

The backing pumps from Leybold listed in the following are recommended for connection to the RUVAC Roots vacuum pumps:

- Rotary vane vacuum pumps
 - TRIVAC B with pumping speeds between 16 and 65 m³/h (9.4 and 38.3 cfm)
- Rotary vane vacuum pumps
 - SOGEVAC with pumping speeds between 16 and 1200 m³/h (9.4 and 707 cfm)
- Dry compressing screw vacuum pumps
 - SCREWLINE SP 250 and SP 630 with pumping speed of 250 and 630 m³/h (147.3 and 371 cfm)
- Dry compressing screw vacuum pumps
 - DRYVAC with pumping speed of 450 to 3800 m³/h (265 and 2238 cfm)
 - directly adaptable
 - smallest system
 - smart control



Pump system with Roots vacuum pumps and dry compressing vacuum pumps DRYVAC

Accessories

Frequency Converter V1000

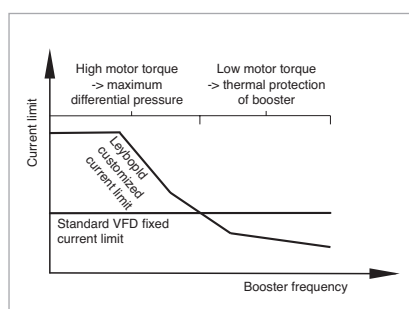
A frequency converter was specially developed for the WH series which perfectly matches the requirements of vacuum engineering applications.

Owing to the flexible current limiting, the maximum pumping speed is available within the high pressure range whereas in the lower pressure ranges the current limit is reduced correspondingly so as to best protect the pump against thermal overloads.

This combination of power and protection can only be attained through our specially developed frequency converter.

“Plug and play operation” allows for simple installation. The frequency converters are set up in the factory so that they only need to be connected for optimised pump operation. It is not necessary to set up any additional parameters, and no further expert know-how is required.

DRYVAC backing pumps work also with the V1000.



Flexible motor current limit V 1000

Frequency Converter RUVATRONIC RT 5

The electronic frequency converters RUVATRONIC RT 5/251 to 5/16000 have been designed specially for use in connection with Leybold Roots pumps of the RUVAC WA and WS series.

The main characteristics of the RUVATRONIC RT 5 are:

Simulation of a pressure equalization line

The software of the frequency converters is adapted to each pump and ensures that the risk of mechanically overloading the pump can be excluded. In the case of too high pressure differences, the rotational speed will be decreased automatically until the load is reduced to within the pump's limits. RUVAC Roots vacuum pumps of the types WA and WS (without pressure equalization line) can be switched on together with the forepump at atmospheric pressure. Through this, the pumpdown time can be reduced drastically. The minimum pumping speed of the backing pump needs to be considered in this case.

In connection with this kind of operation, the minimum pumping speed of the backing pump needs to be observed.

Pump	Required pumping speed for the backing pump
WA/WS 251	50 m ³ /h (29 cfm)
WA/WS 501	100 m ³ /h (59 cfm)
WA/WS 1001	200 m ³ /h (118 cfm)
WA/WS 2001	410 m ³ /h (241 cfm)
WH 700	140 m ³ /h (82 cfm)
WH/WHU 2500	430 m ³ /h (253 cfm)
WH/WHU 4400	880 m ³ /h (518 cfm)
WH/WHU 7000	1200 m ³ /h (707 cfm)

Operation at up to 3 predefined speeds

Via floating contacts, the pump can be operated at one of the 3 predefined speeds. Switching over to another predefined speed is possible during operation.

Operation at any rotational speed

With a 0 to 10 V signal, any speed can be predefined to operate the pump between the minimum and maximum rotational speed. The software reliably ensures that the rotational speed cannot drop below the minimum speed or exceed the maximum speed.

Increase in the pumping speed

By operating the Roots vacuum pumps at frequencies over 50 Hz, the nominal pumping speed of the pumps can be increased. Depending on the type of pump, an increase between 20 and 100% is possible.

Note

Please enquire about possible application limitations (process dependent).

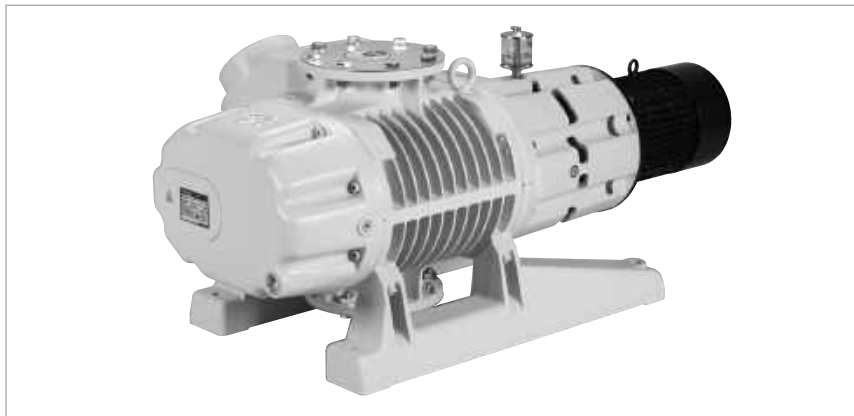
Dust Separators and Dust Filters

Vacuum processes with a high particle count or involving significant quantities of dust require special measures for protecting the vacuum pumps.

Dust separators and dust filters can be found in the Catalog Part “Vacuum Pump Systems”, Chapter “Accessories for oil sealed and dry compressing vacuum pumps”.

Products

RUVAC WA/WAU 251 to 2001 Roots Vacuum Pumps with Air-Cooled Flange-Mounted Motors



RUVAC WAU 2001 single-stage Roots vacuum pump

Advantages to the User

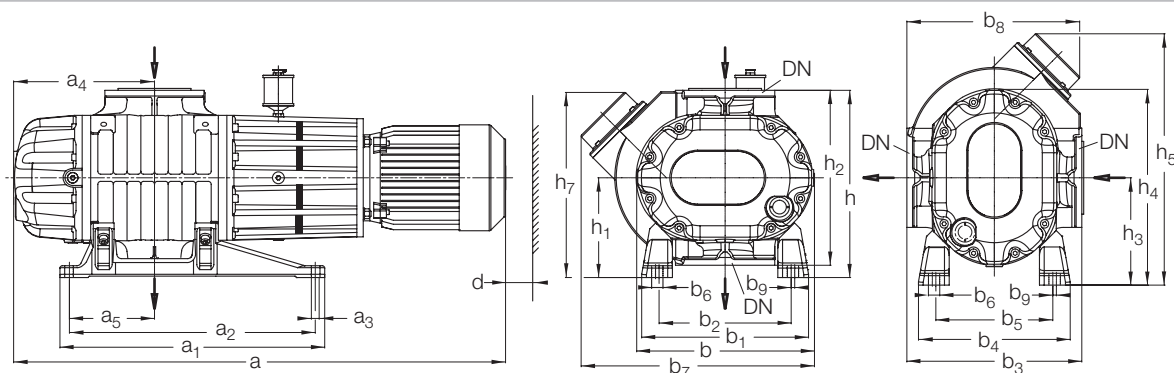
- Two air-cooled lines WA/WAU, each with four pump sizes
- Motors of efficiency class IE 3
- Reliable and trouble-free
- Sealing rings with their housing can be readily replaced
- Shaft seals and elastomer seals made of FPM (FKM)/Viton
- Easy to exchange with custom motors
- Integrated pressure equalization line for protection against overloading at high pressures on WAU models
- Conversion from vertical to horizontal pumping action can be done from the side of the customer
- All WA(U) pumps comply as standard with ATEX Cat. 3i (valid only for 50 Hz operation)
- Depending on requirements, motors from different ATEX categories can be fitted

Typical Applications

- For oil-free compression of gases and vapors in combination with a backing pump
- Short cycle pumping processes also in the presence of large quantities of gas and vapor

Supplied Equipment

- RUVAC WA/WAU are supplied as standard for a vertical pumping action, horizontal pumping action upon request
- Mineral oil LVO 100 is used as standard
- Gasket in the intake flange with dirt sieve
- The required lubricant filling is included in separate bottles



Type		DN	a ¹⁾	a ₁	a ₂	a ₃	a ₄	a ₅	a ₆	b
WA/WAU 251	mm	63	732	405	365	14	209	120	194	250
	in.		28.82	15.94	14.37	0.55	8.23	4.72	7.64	9.84
WA/WAU 501	mm	63	830	486	450	14	237	155	218	310
	in.		32.68	19.13	17.72	0.55	9.33	6.10	8.58	12.20
WA/WAU 501H	mm	63	830	486	450	14	237	155	218	310
	in.		32.88	19.13	17.72	0.55	9.33	6.10	8.58	12.20
WA/WAU 1001	mm	100	1054	560	520	16.5	298	180	262	376
	in.		41.50	22.05	20.47	0.65	11.73	6.10	10.31	14.80
WA/WAU 1001H	mm	100	1054	560	520	16.5	298	180	262	376
	in.		41.50	22.05	20.47	0.65	11.73	6.10	10.31	14.80
WA/WAU 2001	mm	160	1275	800	740	18	367	220	310	463
	in.		50.20	31.50	29.13	0.71	14.45	8.66	12.20	18.23
WA/WAU 2001H	mm	160	1275	800	740	18	367	220	310	463
	in.		50.20	31.50	29.13	0.71	14.45	8.66	12.20	18.23

		b ₁	b ₂	b ₃	b ₄	b ₅	b ₆	b ₇ ²⁾	b ₈	b ₉	d
WA/WAU 251	mm	270	210	280	230	170	24	305	285	7.5	50
	in.	10.63	8.27	11.02	9.06	6.69	0.94	12.01	11.22	0.30	2.00
WA/WAU 501	mm	299	229	320	271	201	24	390	313	7.5	50
	in.	11.77	9.02	12.60	10.67	7.91	0.94	15.35	12.32	0.30	2.00
WA/WAU 501H	mm	299	229	320	271	201	24	414	330	7.5	50
	in.	11.77	9.02	12.60	10.67	7.91	0.94	16.30	12.99	0.30	2.00
WA/WAU 1001	mm	352	278	370	320	246	24	494	366	7.5	50
	in.	13.86	10.94	14.57	12.60	7.91	0.94	19.45	14.41	0.30	2.00
WA/WAU 1001H	mm	352	278	370	320	246	24	524	398	7.5	50
	in.	13.86	10.94	14.57	12.60	7.91	0.94	20.63	15.67	0.30	2.00
WA/WAU 2001	mm	518	388	460	422	292	24	638	456	7.5	50
	in.	20.39	15.28	18.11	16.61	11.50	0.94	25.12	17.95	0.30	2.00
WA/WAU 2001H	mm	518	388	460	422	292	24	642	460	7.5	50
	in.	20.39	15.28	18.11	16.61	11.50	0.94	25.28	18.11	0.30	2.00

		h	h ₁	h ₂	h ₃	h ₄	h ₅ ²⁾	h ₆	h ₇
WA/WAU 251	mm	300	160	280	180	306	360	330	307
	in.	11.81	6.30	11.02	7.09	12.05	14.17	12.99	12.09
WA/WAU 501	mm	340	180	320	194	348	430	370	332
	in.	13.39	7.09	12.60	7.48	13.70	16.93	14.57	13.07
WA/WAU 501H	mm	340	180	320	194	348	450	370	350
	in.	13.39	7.09	12.60	7.48	13.70	17.72	14.57	13.78
WA/WAU 1001	mm	396	211	370	227	414	532	425	392
	in.	15.59	8.31	14.57	8.94	16.30	20.94	425	15.43
WA/WAU 1001H	mm	396	211	370	227	414	564	425	424
	in.	15.59	8.31	14.57	8.94	16.30	22.20	425	16.69
WA/WAU 2001	mm	530	300	460	351	578	753	541	523
	in.	20.87	11.81	18.11	13.82	22.76	29.65	21.3	20.59
WA/WAU 2001H	mm	530	300	460	351	578	760	541	530
	in.	20.87	11.81	18.11	13.82	22.76	29.92	21.3	20.87

¹⁾ This dimension "a" relates to pumps with the IEC motor used as standard by Leybold

²⁾ For RUVAC WAU only

DN = PN 6 pump flange in accordance with DIN 2501

Outside dimensions ± 3 mm (0.12 in.)

Dimensional drawing for the RUVAC WA/WAU(H) pumps

Technical Data

WA/WAU 251

WA/WAU(H) 501

		50 Hz	60 Hz	50 Hz	60 Hz
Nominal pumping speed ¹⁾	m ³ /h (cfm)	253.0 (149.0)	304.0 (179.0)	505.0 (297.4)	606.0 (357.0)
Max. effective pumping speed with backing pump	m ³ /h (cfm) TRIVAC SOGEVAC	210.0 (123.7) D 65 B –	251.0 (148.0) D 65 B –	410.0 (241.0) – SV 200	530.0 (312.0) – SV 200
Ultimate total pressure ²⁾	mbar (Torr)	< 8 x 10 ⁻⁴ (< 6 x 10 ⁻⁴)	< 8 x 10 ⁻⁴ (< 6 x 10 ⁻⁴)	< 4 x 10 ⁻² (< 3 x 10 ⁻²)	< 4 x 10 ⁻² (< 3 x 10 ⁻²)
Max. permissible pressure difference during continuous operation ³⁾	mbar (Torr)	80 (60.0)			
Leak rate, integral	mbar x l/s	< 5 x 10 ⁻⁴			
Mains supply	V V	200–240 380–400			
Thermal class		F			
Permissible ambient temperatures	°C (°F)	+5 to +40 (+ 41 to +104)			
Motor power	kW (hp)	1.1 (1.5)	1.1 (1.5)	2.2 (3.0)	2.2 (3.0)
Energy efficiency class		IE 3			
Nominal speed, approx.	rpm	3000	3600	3000	3600
Max. permissible speed	rpm	3600			
Type of protection	IP	55			
ATEX protection category ⁴⁾		Category 3i	–	Category 3i	–
Lubricant for the bearing chamber ⁵⁾					
vertical pumping action, approx.	l (qt)	0.6 (0.63)	0.6 (0.63)	0.8 (0.85)	0.8 (0.85)
horizontal pumping action, approx.	l (qt)	0.45 (0.48)	0.45 (0.48)	0.7 (0.74)	0.7 (0.74)
Lubricant of the shaft sealing ring housing	l (qt)	0.6 (0.63)	0.6 (0.63)	1.0 (1.06)	1.0 (1.06)
Connection flanges	DN	63 ISO-K			
Materials (materials in contact with the gas)		C steel, CrNi steel, grey cast iron, FPM (FKM)			
Weight WA / WAU	kg (lbs)	85.0 / 89.0 (187.4 / 196.2)	85.0 / 89.0 (187.4 / 196.2)	128.0 / 133.0 (187.4 / 196.2)	128.0 / 133.0 (187.4 / 196.2)
Noise level ⁶⁾	dB(A)	< 62	< 64	< 65	< 67

¹⁾ To DIN 28 400 and subsequent numbers

²⁾ With double-stage rotary vane vacuum pump TRIVAC, resp. single-stage rotary vane vacuum pump SOGEVAC (Type of backing pump look at max. pumping speed).

When using 2-stage backing pumps the ultimate pressures will be correspondingly lower

³⁾ Applicable for ratio up to 1 : 10 between backing pump and Roots vacuum pump at 3000 rpm

⁴⁾ For ATEX category 3o a appropriate motor has to be used.

Please contact Leybold (System)

⁵⁾ Authoritative, however, is the oil level at the oil-level glass

⁶⁾ Valid under ultimate pressure conditions. Pressures over 10 mbar (7.5 Torr) produce a higher operating noise

Technical Data

WA/WAU (H) 1001

WA/WAU(H) 2001

		50 Hz	60 Hz	50 Hz	60 Hz
Nominal pumping speed ¹⁾	m ³ /h (cfm)	1000 (589)	1200 (707)	2050 (1207.5)	2460 (1449)
Max. effective pumping speed with backing pump	m ³ /h (cfm) SOGEVAC	800 (470) SV 300 B	1000 (588) SV 300 B	1850 (1089) SV 630 BF	2100 (1236) SV 630 BF
Ultimate total pressure ²⁾	mbar (Torr)	< 4 x 10 ⁻² (< 3 x 10 ⁻²)			
Max. permissible pressure difference during continuous operation ³⁾	mbar (Torr)	80.0 (60.0)	80.0 (60.0)	50.0 (37.5)	50.0 (37.5)
Leakrate, integral	mbar x l/s	< 5 · 10 ⁻⁴			
Mains supply	V V	200–240 380–400			
Thermal class		F			
Permissible ambient temperatures	°C (°F)	+5 to +40 (+ 41 to +104)			
Motor power	kW (hp)	4.0 (5.4)	4.0 (5.4)	7.5 (10.0)	7.5 (10.0)
Energy efficiency class		IE 3			
Nominal speed, approx.	rpm	3000	3600	3000	3600
Max. zulässige Drehzahl	rpm	3600			
Type of protection	IP	55			
ATEX protection category ⁴⁾		Category 3i	–	Category 3i	–
Lubricant for the bearing chamber ⁵⁾					
vertical pumping action, approx.	l (qt)	1.8 (1.90)	1.8 (1.90)	3.6 (3.81)	3.6 (3.81)
horizontal pumping action, approx.	l (qt)	1.1 (1.16)	1.1 (1.16)	2.4 (2.54)	2.4 (2.54)
Lubricant of the shaft sealing ring housing	l (qt)	1.3 (1.37)	1.3 (1.37)	1.6 (1.69)	1.6 (1.69)
Connection flanges	DN	100 ISO-K	100 ISO-K	160 ISO-K	160 ISO-K
Materials (materials in contact with the gas)		C-Stahl, CrNi-Stahl, Grauguss, FPM			
Weight WA / WAU	kg (lbs)	220 / 225 (485.1 / 496.1)	220 / 225 (485.1 / 496.1)	400 / 406 (882.0 / 895.2)	400 / 406 (882.0 / 895.2)
Noise level ⁶⁾	dB(A)	< 70	< 73	< 72	< 77

¹⁾ To DIN 28 400 and subsequent numbers

²⁾ With single-stage rotary vane vacuum pump SOGEVAC (Type of backing pump look at max. pumping speed).
When using 2-stage backing pumps the ultimate pressures will be correspondingly lower

³⁾ Applicable for ratio up to 1 : 10 between backing pump and Roots vacuum pump at 3000 rpm

⁴⁾ For ATEX category 3o a appropriate motor has to be used.
Please contact Leybold (System)

⁵⁾ Authoritative, however, is the oil level at the oil-level glass

⁶⁾ Valid under ultimate pressure conditions. Pressures over 10 mbar (7.5 Torr) produce a higher operating noise

Ordering Information

	WA/WAU	WA/WAU(H)	WA/WAU(H)	WA/WAU(H)
	251	501	1001	2001
	Part No.	Part No.	Part No.	Part No.
Roots vacuum pump				
RUVAC WA	117 20	117 30	117 40	117 50
RUVAC WAU	117 21	117 31	117 41	117 51
RUVAC WA, without motor	117 24	117 34	117 44	112 54
RUVAC WAU, without motor	155 011V	155 008	112 17	113 22
RUVAC WAU(H), with special ACE vibration absorber	-	118 31	118 41	118 51

Mandatory Accessories

Collar flange with retaining ring, DIN 2501 ¹⁾				
DN 63 ISO-K	86747V01	86747V01	-	-
DN 100 ISO-K	-	-	86750V01	-
DN 160 ISO-K	-	-	-	86751V01

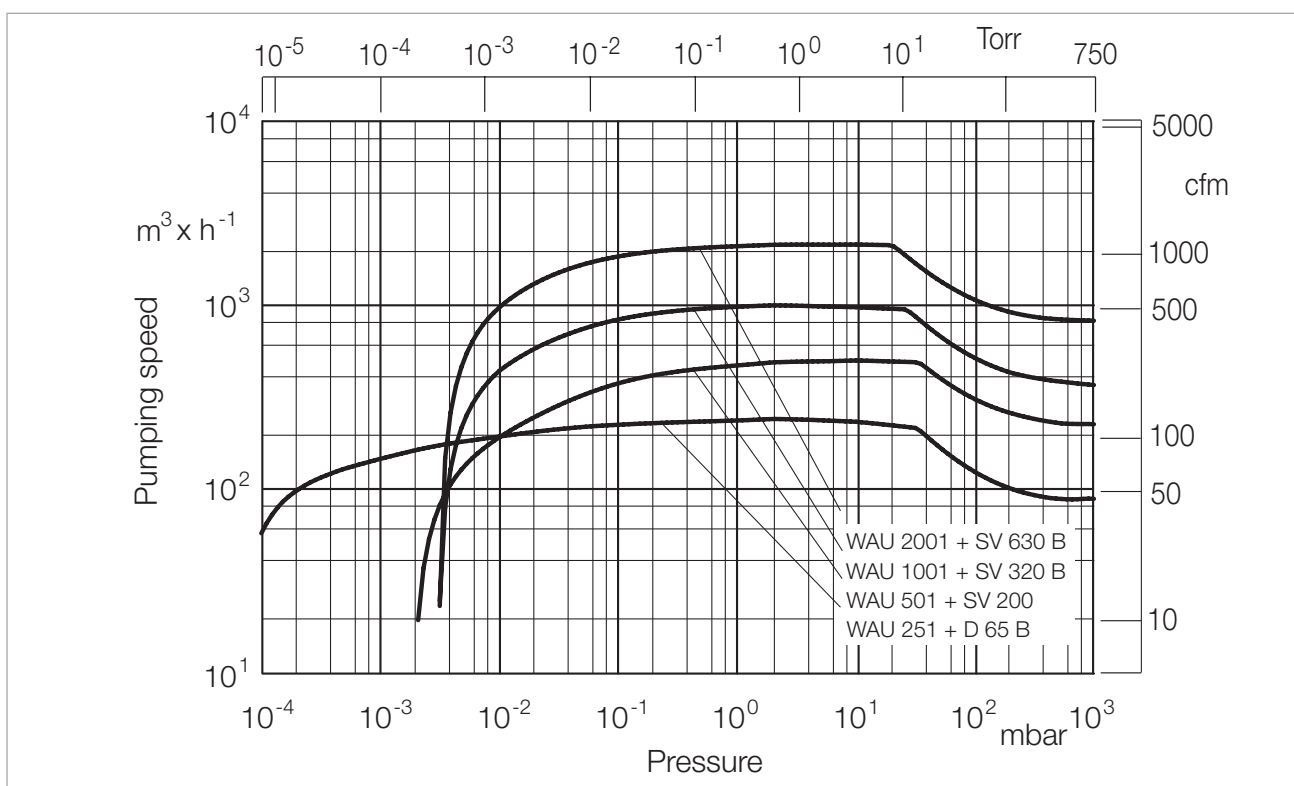
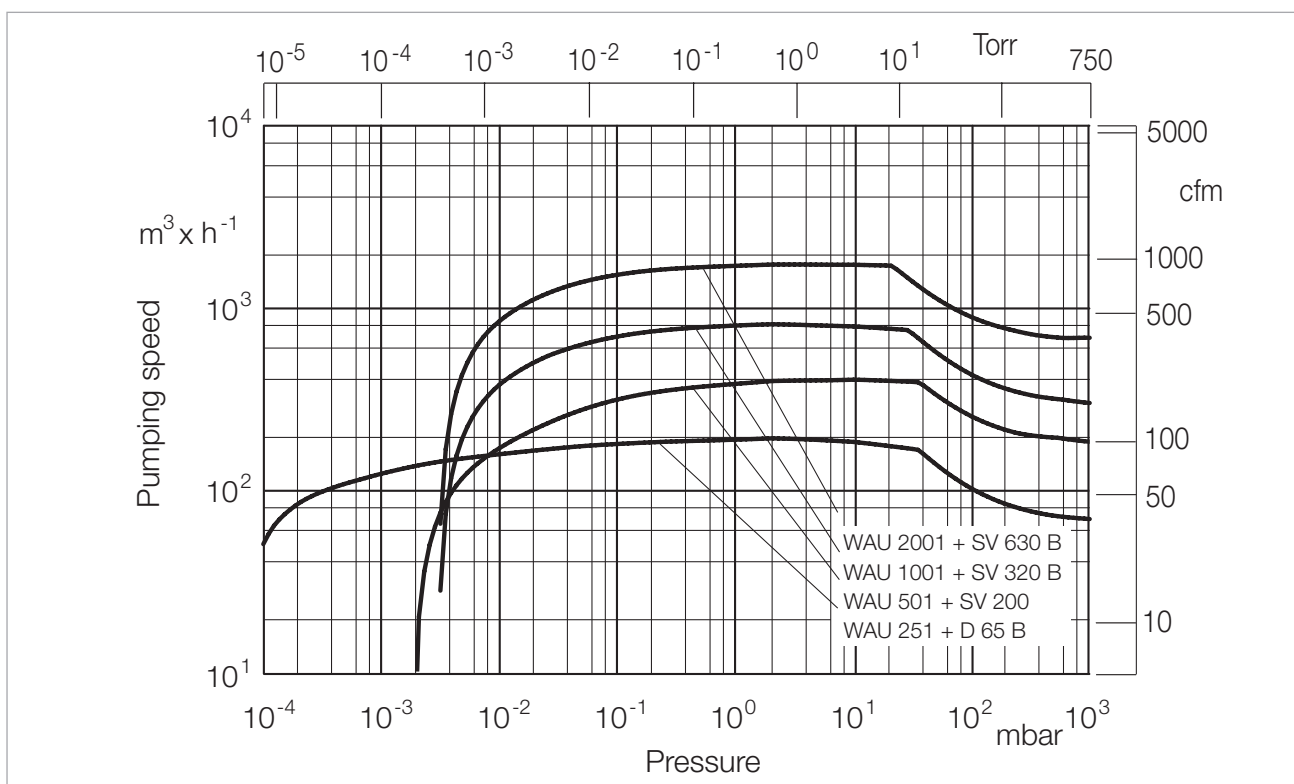
Accessories

RUVAC WS/WSU(H) seal kit	194 60	194 64	194 68	194 72
Flange adapter set, consisting of Flange adapter with screws, bolts, washers and nuts for ANSI flange	(3" ANSI)	(3" ANSI)	(4" ANSI)	(6" ANSI)
WA/WS pump	200 03 179V	200 03 179V	200 03 180V	200 03 181V
WAU/WSU pump	200 03 179V	200 03 179V	200 03 180V	200 03 182V
RUVAC WA US conversion kit, consisting of ANSI flanges 3 in., NEMA motor flange, coupling and installation components WA(U) pumps	155 013V	155 014V	155 015V	155 016V
Frequency converter RUVATRONIC (see description in chapter "General", paragraph "Accessories")	RT 5/251 500 001 381	RT 5/501 500 001 382	RT 5/1001 500 001 383	RT 5/2001 500 001 384

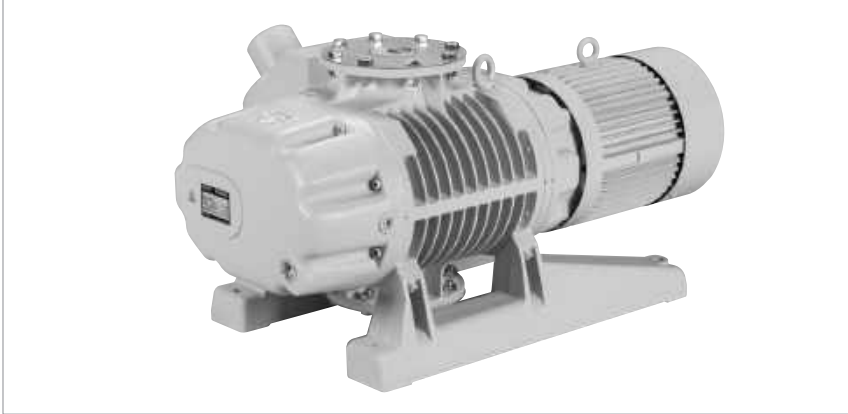
Accessories

Shaft sealing ring replacement kit WA/WAU	EK 110 002 661	EK 110 002 661	EK 110 002 662	EK 110 002 662
Major maintenance kit				
WA	EK 110 002 663	EK 110 002 664	EK 110 002 667	EK 110 002 669
WAU	EK 110 002 665	EK 110 002 666	EK 110 002 668	EK 110 002 670

¹⁾ For connection to flange system DN 63 ISO-K, resp. DN 100 ISO-K, resp. DN 160 ISO-K



RUVAC WS/WSU 251 to 2001 Roots Vacuum Pumps with Air-Cooled Canned Motors



Single-stage Roots vacuum pump RUVAC WSU 2001

Advantages to the User

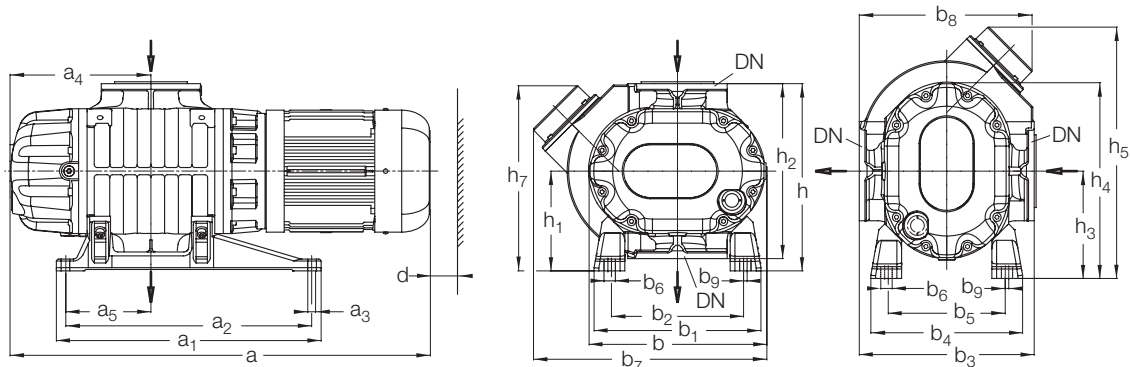
- Two air-cooled lines WS/WSU, each with four pump sizes
- Highly leak-tight air-cooled pumps driven by a air-cooled canned motor
- Lubricated with mineral oil (alternatively with LVO 400)
- Over-temperature switch in the stator coil of the motor
- All elastomer seals made of FPM (FKM)/Viton
- Integrated pressure equalization line with differential pressure valve prevents overloading on WSU model (optional)
- A frequency converter can be used to operate the RUVAC WS 251 to 2001 pumps between 20 and 100 Hz
- No shaft feedthrough to the atmosphere, thus particularly leak-tight
- Conversion from vertical to horizontal pumping action can be done from the side of the customer

Typical Applications

- For applications which require a high pumping speed at pressures between 10^{-2} and 10^{-4} mbar (0.75×10^{-2} and 0.75×10^{-4} Torr)
- Used where the possibility of contamination due air ingress or pumped media leakage must be avoided
- Suction or pumping of high-purity gases
- Is used in clean rooms where the air must not be recirculated by the motor's fan

Supplied Equipment

- The required quantity of oil is supplied separately with the pump (exceptions from this are indicated)
- If no other type of oil is stated, then mineral oil LVO 100 is used as standard
- Purged with nitrogen for corrosion protection
- Gasket in the intake flange with integrated dirt sieve



Type		DN	a	a ₁	a ₂	a ₃	a ₄	a ₅	
WS/WSU 251	mm	63	694	405	365	14	212	120	
	in.		27.32	15.94	14.37	0.55	8.35	4.72	
WS/WSU 501	mm	63	752	486	450	14	237	155	
	in.		29.61	19.13	17.72	0.55	9.33	6.10	
WS/WSU 501H	mm	63	752	486	450	14	237	155	
	in.		29.61	19.13	17.72	0.55	9.33	6.10	
WS/WSU 1001	mm	100	885	560	520	16,5	298	180	
	in.		34.84	22.05	20.47	0.65	11.73	7.09	
WS/WSU 1001H	mm	100	885	560	520	16,5	298	180	
	in.		34.84	22.05	20.47	0.65	11.73	7.09	
WS/WSU 2001	mm	160	1042	800	740	18	367	220	
	in.		41.02	31.50	29.13	0.71	14.45	8.66	
WS/WSU 2001H	mm	160	1042	800	740	18	367	220	
	in.		41.02	31.50	29.13	0.71	14.45	8.66	

		b	b ₁	b ₂	b ₃	b ₄	b ₅	b ₆	b ₇ ¹⁾	b ₈
WS/WSU 251	mm	250	270	210	280	230	170	24	305	285
	in.	9.84	10.63	8.27	11.02	9.06	6.69	0.94	12.01	11.22
WS/WSU 501	mm	310	299	229	320	271	201	24	390	313
	in.	12.20	11.77	9.02	12.60	10.67	7.91	0.94	15.35	12.32
WS/WSU 501H	mm	310	299	229	320	271	201	24	414	330
	in.	12.20	11.77	9.02	12.60	10.67	7.91	0.94	16.30	12.99
WS/WSU 1001	mm	376	352	278	370	320	246	24	494	366
	in.	14.80	13.86	10.94	14.57	12.60	9.69	0.94	19.45	14.41
WS/WSU 1001H	mm	376	352	278	370	320	246	24	524	398
	in.	14.80	13.86	10.94	14.57	12.60	9.69	0.94	20.63	15.67
WS/WSU 2001	mm	463	518	388	460	422	292	24	638	456
	in.	18.23	20.39	15.28	18.11	16.61	11.50	0.94	25.12	17.95
WS/WSU 2001H	mm	463	518	388	460	422	292	24	642	460
	in.	18.23	20.39	15.28	18.11	16.61	11.50	0.94	25.28	18.11

		b ₉	d	h	h ₁	h ₂	h ₃	h ₄	h ₅ ¹⁾	h ₆
WS/WSU 251	mm	7.5	50	300	160	280	180	306	360	307
	in.	0.30	2.00	11.81	6.3	11.02	7.09	12.05	14.17	12.09
WS/WSU 501	mm	7.5	50	340	180	320	194	348	430	332
	in.	0.30	2.00	13.39	7.09	12.60	7.48	13.70	16.93	13.07
WS/WSU 501H	mm	7.5	50	340	180	320	194	348	450	350
	in.	0.30	2.00	13.39	7.09	12.60	7.48	13.70	17.72	13.78
WS/WSU 1001	mm	7.5	50	396	211	370	227	414	532	392
	in.	0.30	2.00	15.59	8.31	14.57	8.94	16.30	20.94	15.43
WS/WSU 1001H	mm	7.5	50	396	211	370	227	414	564	424
	in.	0.30	2.00	15.59	8.31	14.57	8.94	16.30	22.20	16.69
WS/WSU 2001	mm	7.5	50	530	300	460	351	578	760	523
	in.	0.30	2.00	20.87	11.81	18.11	13.82	22.76	29.92	20.59
WS/WSU 2001H	mm	7.5	50	530	300	460	351	578	753	530
	in.	0.30	2.00	20.87	11.81	18.11	13.82	22.76	29.65	20.87

¹⁾ For RUVAC WSU only

Outside dimensions ± 3 mm (0.12 in.)

DN₁ = PN 6 pump flange in accordance with DIN 2501

Dimensional drawing for the RUVAC WS/WSU(H) pumps

Technical Data

WS/WSU 251

WS/WSU(H) 501

		50 Hz	60 Hz	50 Hz	60 Hz
Nominal pumping speed ¹⁾	m ³ /h (cfm)	253 (149)	304 (179)	505 (297.4)	606 (357)
Max. effective pumping speed with backing pump	m ³ /h (cfm) TRIVAC SOGEVAC	210.0 (123.7) D 65 B –	251.0 (148.0) D 65 B –	410.0 (241.0) – SV 200	530.0 (312.0) – SV 200
Ultimate total pressure ²⁾	mbar (Torr)	< 8 x 10 ⁻⁴ (< 6 x 10 ⁻⁴)	< 8 x 10 ⁻⁴ (< 6 x 10 ⁻⁴)	< 4 x 10 ⁻² (< 3 x 10 ⁻²)	< 4 x 10 ⁻² (< 3 x 10 ⁻²)
Max. permissible pressure difference during continuous operation ³⁾	mbar (Torr)	80.0 (60.0)			
Leak rate, integral	mbar x l/s	< 1 x 10 ⁻⁴			
Mains supply	V	200 / 230 / 400	200–208 / 265 / 460	200 / 230 / 400	200–208 / 265 / 460
Thermal class		F			
Permissible ambient temperatures	°C (°F)	+5 to +40 (+41 to +104)			
Motor power	kW (hp)	1.1 (1.5)	1.4 (1.9)	2.2 (3.0)	2.4 (3.3)
Nominal speed, approx.	rpm	3000	3600	3000	3600
Max. permissible speed	rpm	6000			
Type of protection	IP	20			
Lubricant for the bearing chamber ⁴⁾ LVO 400					
vertical pumping action, approx.	l (qt)	0.55 (0.58)	0.55 (0.58)	0.75 (0.79)	0.75 (0.79)
horizontal pumping action, approx.	l (qt)	0.45 (0.48)	0.45 (0.48)	0.7 (0.74)	0.7 (0.74)
other oils					
vertical pumping action, approx.	l (qt)	0.6 (0.63)	0.6 (0.63)	0.8 (0.85)	0.8 (0.85)
horizontal pumping action, approx.	l (qt)	0.45 (0.48)	0.45 (0.48)	0.7 (0.74)	0.7 (0.74)
Connection flanges	DN	63 ISO-K			
Weight WS / WSU	kg (lbs)	90 / 95 (198.5 / 209.5)	90 / 95 (198.5 / 209.5)	130 / 135 (286.7 / 297.7)	130 / 135 (286.7 / 297.7)
Noise level ⁵⁾	dB(A)	< 58	< 60	< 52	< 56

¹⁾ To DIN 28 400 and subsequent numbers

²⁾ With double-stage rotary vane vacuum pump TRIVAC or single-stage rotary vane vacuum pump SOGEVAC
(Type of backing pump look at max. pumping speed)

When using 2-stage backing pumps the ultimate pressures will be correspondingly lower

³⁾ Applicable for ratio up to 1 : 10 between backing pump and Roots vacuum pump at 3000 rpm

⁴⁾ Authoritative, however, is the oil level at the oil-level glass

⁵⁾ Valid under ultimate pressure conditions. Pressures over 10 mbar (7.5 Torr) produce a higher operating noise

Technical Data

WS/WSU(H) 1001

WS/WSU(H) 2001

		50 Hz	60 Hz	50 Hz	60 Hz
Nominal pumping speed ¹⁾	m ³ /h (cfm)	1000 (589)	1200 (707)	2050 (1207.5)	2460 (1449)
Max. effective pumping speed with backing pump	m ³ /h (cfm) SOGEVAC	800 (470) SV 300 B	1000 (588) SV 300 B	1850 (1089) SV 630 BF	2100 (1236) SV 630 BF
Ultimate total pressure ²⁾	mbar (Torr)	< 4 x 10 ⁻² (< 3 x 10 ⁻²)			
Max. permissible pressure difference during continuous operation ³⁾	mbar (Torr)	80.0 (60.0)	80.0 (60.0)	50.0 (37.5)	50.0 (37.5)
Leak rate, integral	mbar x l/s	< 1 x 10 ⁻⁴			
Mains supply	V	200 / 230 / 400	200-208 / 265 / 460	200 / 230 / 400	200-208 / 265 / 460
Thermal class		F			
Permissible ambient temperatures	°C (°F)	+5 to +40 (+41 to +104)			
Motor power	kW (hp)	4.0 (5.4)	4.4 (6.0)	7.5 (10.0)	8.5 (11.6)
Nominal speed, approx.	rpm	3000	3600	3000	3600
Max. permissible speed	rpm	6000	6000	4200 ⁴⁾	4200 ⁴⁾
Type of protection	IP	20			
Lubricant for the bearing chamber ⁵⁾ LVO 400					
vertical pumping action, approx.	l (qt)	1.75 (1.85)	1.75 (1.85)	2.7 (2.85)	2.7 (2.85)
horizontal pumping action, approx.	l (qt)	1.1 (1.16)	1.1 (1.16)	1.9 (2.00)	1.9 (2.00)
other oils					
vertical pumping action, approx.	l (qt)	1.8 (1.90)	1.8 (1.90)	3.6 (3.81)	3.6 (3.81)
horizontal pumping action, approx.	l (qt)	1.1 (1.16)	1.1 (1.16)	2.4 (2.54)	2.4 (2.54)
Connection flanges	DN	100 ISO-K	100 ISO-K	160 ISO-K	160 ISO-K
Weight WS / WSU	kg (lbs)	228 / 233 (502.7 / 513.8)	228 / 233 (502.7 / 513.8)	458 / 465 (1009.9 / 1025.3)	458 / 465 (1009.9 / 1025.3)
Noise level ⁶⁾	dB(A)	< 60	< 60	< 65	< 67

¹⁾ To DIN 28 400 and subsequent numbers

²⁾ With single-stage rotary vane vacuum pump SOGEVAC

(Type of backing pump look at max. pumping speed)

When using 2-stage backing pumps the ultimate pressures will be correspondingly lower

³⁾ Applicable for ratio up to 1 : 10 between backing pump and Roots vacuum pump at 3000 rpm

⁴⁾ Also 6000 rpm upon order

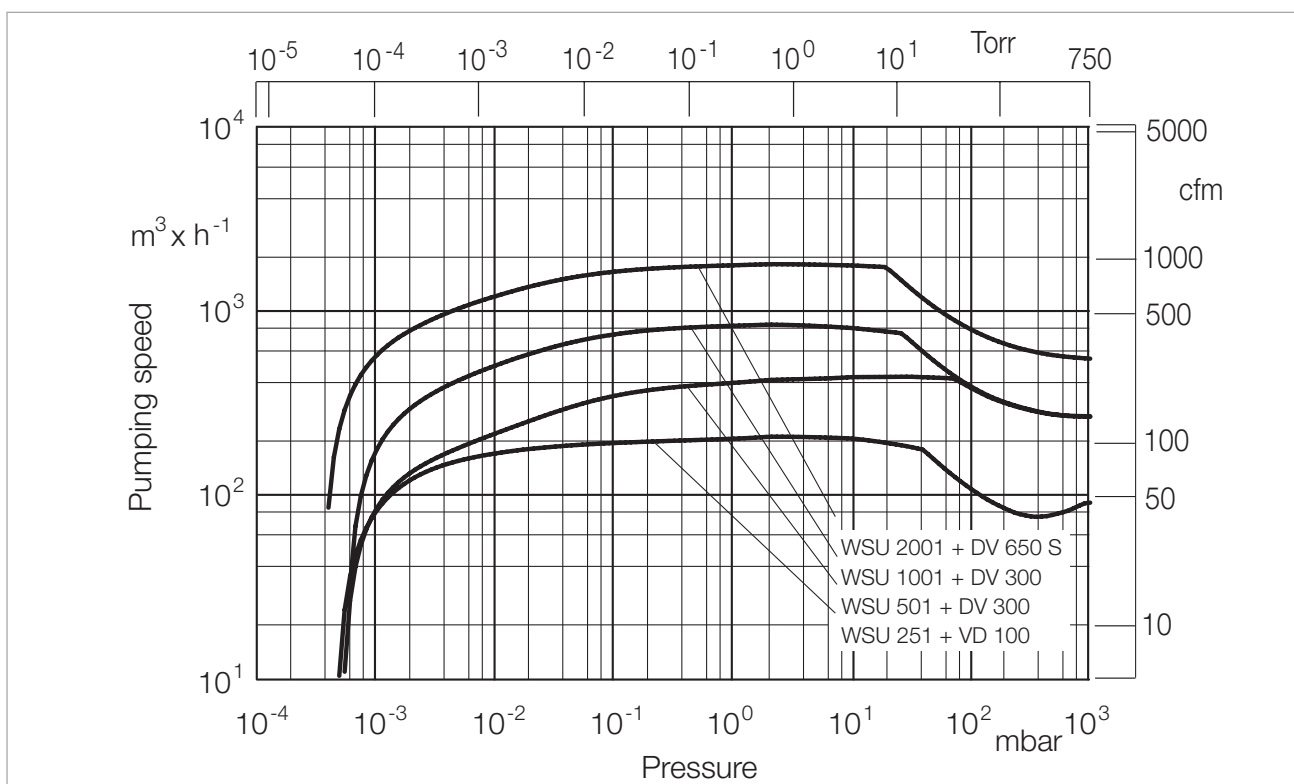
⁵⁾ Authoritative, however, is the oil level at the oil-level glass

⁶⁾ Valid under ultimate pressure conditions. Pressures over 10 mbar (7.5 Torr) produce a higher operating noise

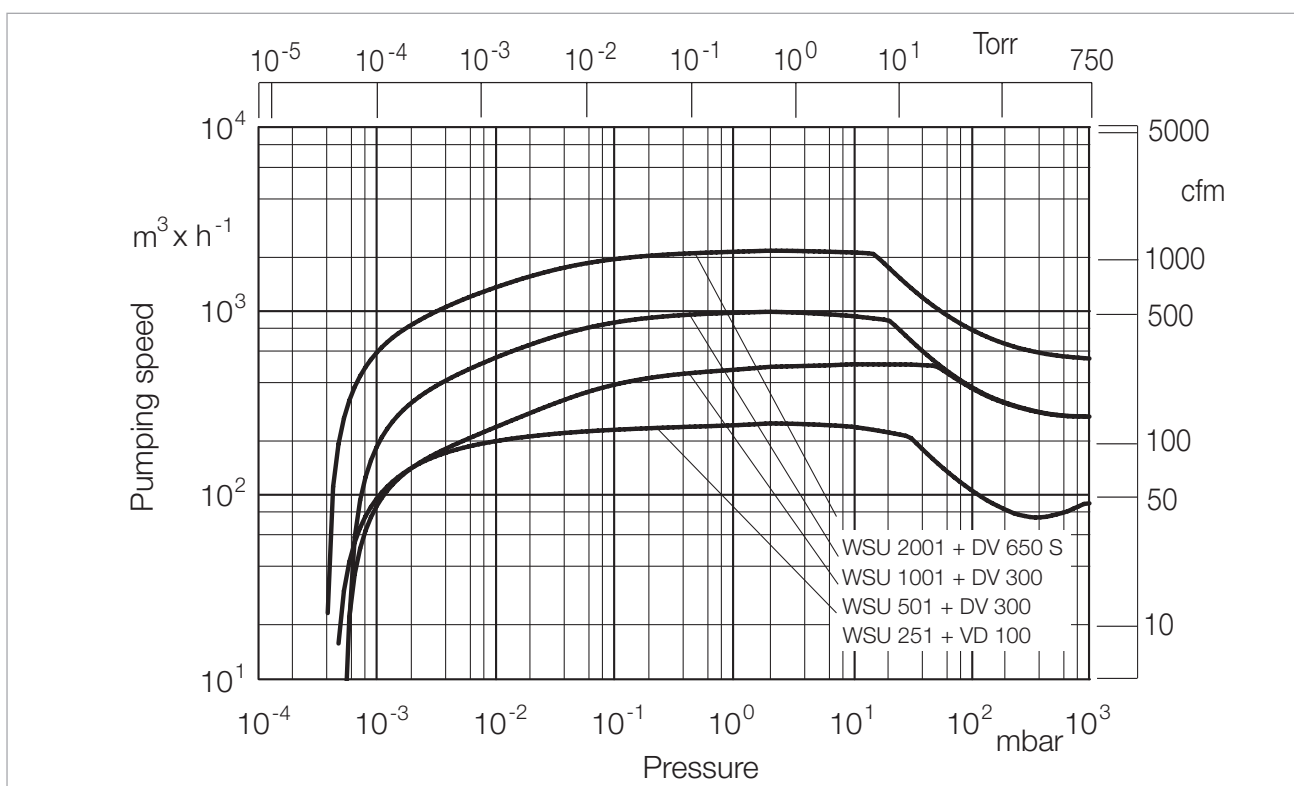
Ordering Information

	WS/WSU	WS/WSU(H)	WS/WSU(H)	WS/WSU(H)
	251	501	1001	2001
	Part No.	Part No.	Part No.	Part No.
Roots vacuum pump				
RUVAC WS, (LVO 100)	117 22	117 32	117 42	117 52
RUVAC WSU, (LVO 100)	117 23	117 33	117 43	117 53
RUVAC WS-PFPE oil, (LVO 400)	117 27	117 37	117 47	117 57
RUVAC WSU-PFPE oil, (LVO 400)	117 28	117 38	–	200 03 123
RUVAC WS 2001-Ester oil, (LVO 210) (max. 100 Hz)	–	–	–	167 007
RUVAC WS 2001-PFPE oil, (LVO 400) (max. 100 Hz)	–	–	–	150 95
RUVAC WSU 2001-Ester oil (LVO 210) (max. 100 Hz)	–	–	–	150 96
RUVAC WSU H, (LVO 100) with special ACE vibration absorber	–	118 33	118 43	118 53
RUVAC WSU H-PFPE oil, (LVO 400) with special ACE vibration absorber	–	–	150 47	167 129V
Mandatory Accessories				
Collar flange with retaining ring, DIN 2501 ¹⁾				
DN 63 ISO-K	86747V01	86747V01	–	–
DN 100 ISO-K	–	–	86750V01	–
DN 160 ISO-K	–	–	–	86751V01
Accessories				
Flange adapter set, consisting of flange adapter with screws, bolts, washers and nuts for ANSI flange	(3" ANSI)	(3" ANSI)	(4" ANSI)	(6" ANSI)
WA/WS pump	200 03 179V	200 03 179V	200 03 180V	200 03 181V
WAU/WSU pump	200 03 179V	200 03 179V	200 03 180V	200 03 182V
Frequency converter RUVATRONIC (see description in chapter "General", paragraph "Accessories")	RT 5/251	RT 5/501	RT 5/1001	RT 5/2001
	500 001 381	500 001 382	500 001 383	500 001 384
Spare Parts				
RUVAC WS/WSU(H) seal kit	194 62	194 66	194 70	194 74
Major maintenance kit				
WS	EK 110 002 671	EK 110 002 672	EK 110 002 673	EK 110 002 674
WSU	EK 110 002 675	EK 110 002 676	EK 110 002 677	EK 110 002 678

¹⁾ For connection to flange system DN 63 ISO-K, resp. DN 100 ISO-K, resp. DN 160 ISO-K



Pumping speed of the RUVAC WS/WSU, 50 Hz



Pumping speed of the RUVAC WS/WSU, 60 Hz

RUVAC WH/WHU Roots Vacuum Pumps with Water-Cooled Hermetically Sealed Motors with Synthetic Oil or PFPE filling



RUVAC WH 4400 and WH 7000 single-stage Roots vacuum pump with hermetically sealed motor

Advantages to the User

- Lower energy costs through innovative motor technology (relates to efficiency class IE 2)
 - Minimized space requirements due to an extremely compact design
 - Easy system integration
 - Optimum price-to-performance ratio; high pumping speed up to 9800 m³/h @ 70 Hz with optional frequency converter
 - Integrated water cooling system for installation within closed systems
 - Parts in contact with the cooling water are made of stainless steel (corrosion-free)
 - Trouble-free operation with toxic or corrosive media owing to the hermetically sealed motor
 - No shaft seals towards atmosphere, therefore high reliability, long service intervals and no oil leaks
- Conversion from vertical to horizontal pumping action can be done from the side of the customer (for WH 4400/7000)

- Secure operation and faster pump down in short cycle operation with optional bypass-line (does not apply to WH 700)
- Motor protection PTC and PTO

RUVAC WHU with Bypass Line

- Maximum efficiency in short cycle operation for the WHU types with bypass line and newly developed control flap
- Reduced pumpdown time
- Pump start-up at atmospheric pressure possible
- Maximum pumpdown time with bypass line active not over three minutes
- Optimized cycle time for the control flap (patent pending); delivers an even faster response compared to operation with frequency converter
- Extreme contamination resistance of the control flap

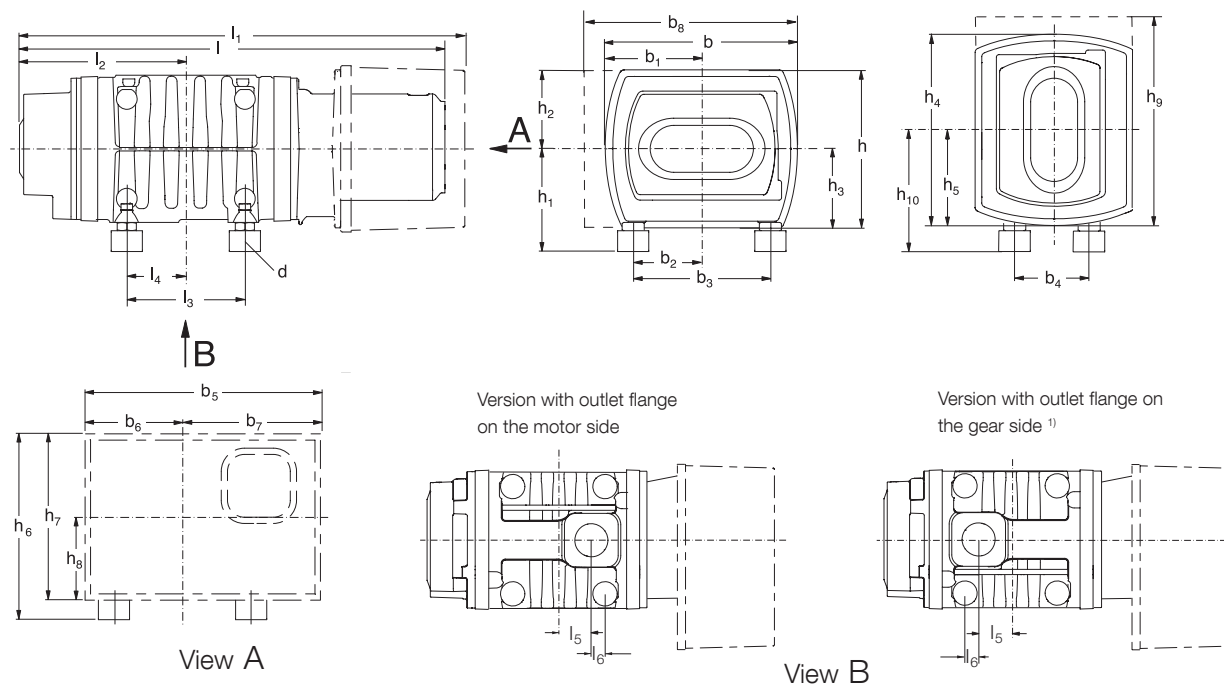
Typical Applications

The Roots pumps of the WH series were developed for deployment in all applications with high requirements regarding operating pressure, cycle times and system uptime.

- Display production processes
- Solar industry
- Furnace construction
- Industrial coating processes
- Research
- Space simulation

Supplied Equipment

- Pump will be delivered with standard shock absorbers
- Gasket in the intake flange with dirt sieve
- The required lubricant is included in separate bottles



Type		Inlet flange	Outlet flange	l	l ₁	l ₂	l ₃	l ₄	l ₅	l ₆	d
WH 700	mm	100 ISO-K	63 PN 6	705	—	259	276	138	—	—	M 8
	in.			27.76	—	10.20	10.87	5.43	—	—	M 8
WH 2500	mm	250 ISO-K	100 ISO-K	1015	1076	400	284	142	100	42	M 12
	in.			39.96	42.36	15.75	11.18	5.59	3.94	1.65	M 12
WHU 2500	mm	250 ISO-K	100 ISO-K	1015	—	400	284	142	100	42	M 12
	in.			39.96	—	15.75	11.18	5.59	3.94	1.65	M 12
WH 4400	mm	250 ISO-K	160 ISO-K	1183	—	457	310	155	—	—	M 12
	in.			46.58	—	17.99	12.21	6.10	—	—	M 12
WHU 4400	mm	250 ISO-K	160 ISO-K	1183	—	457	310	155	—	—	M 12
	in.			46.58	—	17.99	12.21	6.10	—	—	M 12
WH 7000	mm	320 ISO-K	160 ISO-K	1433	—	582	560	280	—	—	M 12
	in.			56.42	—	22.91	22.05	11.02	—	—	M 12
WHU 7000	mm	320 ISO-K	160 ISO-K	1433	—	582	560	280	—	—	M 12
	in.			56.42	—	22.91	22.05	11.02	—	—	M 12
Type		b	b ₁	b ₂	b ₃	b ₄	b ₅	b ₆	b ₇	b ₈	h
WH 700	mm	269	129	100	200	—	—	—	—	—	270
	in.	10.59	5.08	3.94	7.87	—	—	—	—	—	10.63
WH 2500	mm	428	214	165	330	—	570	236	334	—	—
	in.	16.85	8.43	6.50	12.99	—	22.44	9.29	13.15	—	—
WHU 2500	mm	—	214	165	330	—	—	—	—	508	354
	in.	—	8.43	6.50	12.99	—	—	—	—	20.00	13.94
WH 4400	mm	540	330	155	310	260	—	—	—	—	419
	in.	21.26	12.99	6.10	12.21	10.24	—	—	—	—	16.50
WHU 4400	mm	—	330	238	393	260	—	—	—	600	419
	in.	—	12.99	9.37	15.47	10.24	—	—	—	23.62	16.50
WH 7000	mm	540	330	155	310	260	—	—	—	—	419
	in.	21.26	12.99	6.10	12.21	10.24	—	—	—	—	16.50
WHU 7000	mm	—	330	238	393	260	—	—	—	600	419
	in.	—	12.99	9.37	15.47	10.24	—	—	—	23.62	16.50
Type		h ₁	h ₂	h ₃	h ₄	h ₅	h ₆	h ₇	h ₈	h ₉	h ₁₀
WH 700	mm	176	114	156	—	—	—	—	—	—	—
	in.	6.93	4.49	6.14	—	—	—	—	—	—	—
WH 2500	mm	247	177	177	—	—	447	400	200	—	—
	in.	9.72	6.97	6.97	—	—	17.60	15.75	7.87	—	—
WHU 2500	mm	247	177	177	—	—	447	400	200	—	—
	in.	9.72	6.97	6.97	—	—	17.60	15.75	7.87	—	—
WH 4400	mm	298	207	212	540	315	—	—	—	645	315
	in.	11.73	8.15	8.35	21.26	12.40	—	—	—	25.39	12.40
WHU 4400	mm	298	207	212	540	315	—	—	—	645	315
	in.	11.73	8.15	8.35	21.26	12.40	—	—	—	25.39	12.40
WH 7000	mm	298	207	212	540	315	—	—	—	645	315
	in.	11.73	8.15	8.35	21.26	12.40	—	—	—	25.39	12.40
WHU 7000	mm	298	207	212	540	315	—	—	—	645	315
	in.	11.73	8.15	8.35	21.26	12.40	—	—	—	25.39	12.40

¹⁾ The outlet flange for WH 700/4400/7000 is centric of the housing. For WH 2500 the outlet flange is peripheral arbitrary

Technical Data

WH 700

		50 Hz	60 Hz	50 Hz	60 Hz
Nominal pumping speed ²⁾	m ³ /h (cfm)	710 (418)	860 (507)	1150 (677)	1730 (1019)
Max. effective pumping speed with backing pump SOGEVAC SV 300 B	m ³ /h (cfm)	620 (365)	740 (436)	950 (560)	1310 (772)
Max. permissible pressure difference during continuous operation ^{3), 4), 5)}	mbar (Torr)	75.0 (56.3)	65.0 (48.8)	50.0 (37.5)	30.0 (22.5)
Leak rate, integral	mbar x l/s	< 1 x 10 ⁻⁵			
Mains voltage					
FC operation	V	340 to 530 180 to 260	340 to 530 180 to 260 ⁶⁾	340 to 530 180 to 260	340 to 530 180 to 260
Mains operation	V	360 to 440 180 to 260	410 to 500 210 to 260 ⁶⁾	– –	– –
Max. permissible pressure difference at mains voltage ⁵⁾					
200 V	mbar (Torr)	50.0 (37.5)	50.0 (37.5)	40.0 (30.4)	40.0 (30.4)
400 V	mbar (Torr)	60.0 (45.6)	60.0 (45.6)	45.0 (34.2)	45.0 (34.2)
Permissible ambient temperatures	°C (°F)	+5 to +45 (+41 to +113)			
Nominal power consumption					
FC operation	kW (hp)	3.5 (4.7)	3.5 (4.7)	3.5 (4.7)	3.5 (4.7)
Mains operation	kW (hp)	2.2 (2.9)	2.2 (2.9)	–	–
Idle mode power consumption	kW (hp)	0.5 (0.7)			
Energy efficiency class		IE 2			
Nominal speed	rpm	3000	3600	4800	7200
Max. permissible speed ⁷⁾	rpm ¹	7200			
Type of protection	IP	55			
Water connection (4 pcs.)	G	1/4", female			
Cooling water quantity ⁸⁾	l/min	1 to 3			
Cooling water admission temperature	°C (°F)	5 to 35 (+41 to +95)			
Permissible cooling water pressure	bar	2 to 6			
Lubricant ⁹⁾					
gear side	l (qt)	0.6 (0.63)			
motor side	l (qt)	0.3 (0.31)			
Connection flange					
Inlet	ISO-K	100			
Outlet	ISO-K	63			
Weight	kg (lbs)	125 (276)			
Dimension (W x B x H)	mm (in.)	709 x 265 x 270 (27.91 x 10.43 x 10.63)			
Noise level ¹⁰⁾	dB(A)	< 56	< 56	< 60	< 60

¹⁾ Only possible with frequency converter motor and external frequency converter

²⁾ To DIN 28 426 and subsequent numbers

³⁾ Higher pressure differences are possible. Please contact Leybold (LV)

⁴⁾ Gas temperatures over 40 °C (104 °F) can result in a reduction of the pressure difference values; please consult LV on this

⁵⁾ The optional frequency converter automatically reduces the rotational speed of the rotors so as to compensate for overloads. During operation do not expose the pump to sudden pressure increases like shock venting to atmospheric pressure, for example

⁶⁾ Requires 200 V FC variant and 200 V motor

⁷⁾ Min. permissible speed: 1200 rpm if run for more than 1 hour

⁸⁾ The cooling water quantity can be reduced provided the temperature of the discharged water does not exceed 45 °C (113 °F)

⁹⁾ Authoritative, however, is the oil level at the oil-level glass

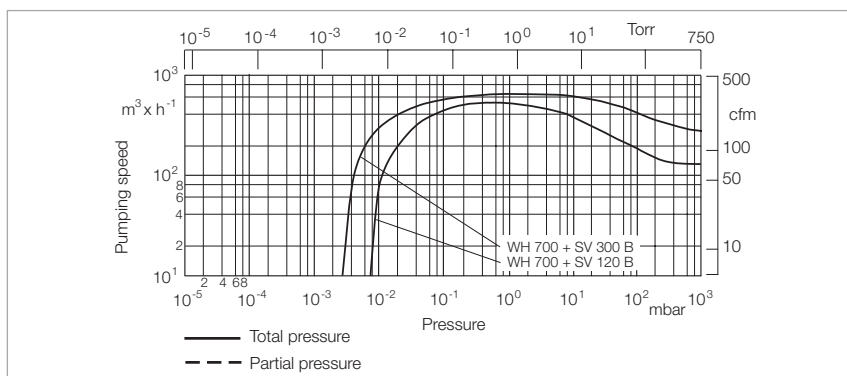
¹⁰⁾ Valid under ultimate pressure conditions. Pressures over 10 mbar (7.5 Torr) produce a higher operating noise

Ordering Information

WH 700

	Part No.
Roots vacuum pump RUVAC WH Roots vacuum pump 3.8 kW 400 V, Internal FC, IP 55, PFPE oil (LVO 400) Ester oil (LVO 210)	167 186V 167 189V
2.2 / 2.6 kW for direct inline operation 50/60 Hz 400 / 460 V, Ester oil (LVO 210) 400 V, PFPE oil (LVO 400)	155 203 155 208V
3.5 kW for FC operation (external FC) 200 V, Ester oil (LVO 210) 400 V, Ester oil (LVO 210) 400 V, PFPE oil (LVO 400) 200 V, PFPE oil (LVO 400)	155 204V 155 205V 155 207V 155 209V
Accessories	
Frequency converter with integrated mains filter 200 / 240 V, motor power 4 kW (for Part. No. 155 204V) 400 / 480 V, motor power 4 kW (for Part. No. 155 205V and 155 207V) 400 V, motor power 4 kW, IP 66 (for Part. No. 155 ??? and 155 ???)	155 218V 155 217V 155 219V
LCD Display (for Part No. 155 217V and 155 218V)	155 213V
USB Copy Unit (for Part No. 155 217V and 155 218V)	155 214V
Profibus DP module ¹⁾ (for Part No. 155 217V and 155 218V)	155 212V
ProfiNet module for (DRYVAC/LEYVAC/RUVAC)	112005A35
EtherCAT module for (DRYVAC/LEYVAC/RUVAC)	112005A36
Relay modul (digital output) for (DRYVAC/LEYVAC/RUVAC)	112005A01
Ethernet interface board for (DRYVAC/LEYVAC/RUVAC)	112005A02
Oil drain facility (M 16 x 1.5) with 90° drain coupling	200 14 271
Reducer DN 100/63 ISO-K	267 47
Spare Parts	
Major maintenance kit	EK 110 002 691

¹⁾ For further bus options please contact Leybold Sales



Pumping speed of the RUVAC WH 700

Technische Daten

WH/WHU 2500

		50 Hz	60 Hz	80 Hz ¹⁾	100 Hz ¹⁾
Nominal pumping speed ²⁾	m ³ /h (cfm)	2500 (1473)	3000 (1767)	4000 (2356)	5000 (2945)
Max. effective pumping speed with backing pump DRYVAC DV 650	m ³ /h (cfm)	2200 (1296)	2500 (1473)	3200 (1885)	3900 (2297)
Max. permissible pressure difference ^{3), 4), 5)}					
during continuous operation (WH)	mbar (Torr)	50 to 75 (37.5 to 56.3)	40 to 60 (30.0 to 45.0)	30 to 40 (22.5 to 30.0)	20 (15.0)
for short-cycle operation < 2 min. (WHU)	mbar (Torr)	160 (120)	160 (120)	–	–
Leak rate, integral	mbar x l/s	< 1 x 10 ⁻⁵			
Mains voltage					
FC operation	V	340 to 530	340 to 530	340 to 530	340 to 530
		180 to 260	180 to 260	180 to 260	180 to 260
Mains operation	V	360 to 440	410 to 500	–	–
Permissible ambient temperatures	°C (°F)	+5 to +50 (+41 to +122)			
Nominal power rating					
FC operation (WH)	kW (hp)	11.0 (14.8)	11.0 (14.8)	11.0 (14.8)	11.0 (14.8)
Mains operation					
WH	kW (hp)	6.2 (8.4)	7.4 (10.1)	–	–
WHU	kW (hp)	6.2 (8.4)	7.4 (10.1)	–	–
Idle mode power consumption	kW (hp)	1.1 (1.5)	1.2 (1.6)	1.5 (2.0)	1.7 (2.3)
Energy efficiency class		IE 2			
Nominal speed	rpm	3000	3600	4800	6000
Max. permissible speed with FC ⁶⁾	rpm	6000			
Type of protection (int. FC/ext. FC)	IP	54/55			
Cooling water connection (2 pcs.)	G	1/4", female			
Cooling water quantity ⁷⁾	l/min	1 to 3			
Cooling water admission temperature	°C (°F)	5 to 35 (+41 to +95)			
Permissible cooling water pressure	bar	2 to 6			
Lubricant ⁸⁾	l (qt)	1.2 (1.27)			
Connection flange					
Inlet	ISO-K	250			
Outlet	ISO-K	100			
Weight					
WH/ WHU	kg (lbs)	390/410 (861/905)			
WH with integrated FC	kg (lbs)	430 (946)			
Dimension (W x B x H)					
WH/ WHU	mm (in.)	1015 x 428 x 354 (39.96 x 16.85 x 13.94)			
WH with integrated FC	mm (in.)	(42.36 x 22.44 x 13.94)			
Noise level ⁹⁾	dB(A)	< 63			

¹⁾ Only possible with frequency converter motor or external frequency converter

²⁾ To DIN 28 426 and subsequent numbers

³⁾ Higher pressure differences are possible. Please contact Leybold (LV)

⁴⁾ Gas temperatures over 40 °C (104 °F) can result in a reduction of the pressure difference values; please consult LV on this

⁵⁾ The optional frequency converter automatically reduces the rotational speed of the rotors so as to compensate for overloads. During operation do not expose the pump to sudden pressure increases like shock venting to atmospheric pressure, for example

⁶⁾ Min. permissible speed: 1200 rpm if run for more than 1 hour

⁷⁾ The cooling water quantity can be reduced provided the temperature of the discharged water does not exceed 45 °C (113 °F)

⁸⁾ Authoritative, however, is the oil level at the oil-level glass

⁹⁾ Valid under ultimate pressure conditions. Pressures over 10 mbar (7.5 Torr) produce a higher operating noise

Technical Data

WH/WHU 4400

WH/WHU 7000

		50 Hz	60 Hz	80 Hz ¹⁾	50 Hz	60 Hz	70 Hz ¹⁾
Nominal pumping speed ²⁾	m³/h (cfm)	4400 (2592)	5280 (3100)	7040 (4147)	7000 (4123)	8400 (4948)	9800 (5772)
Max. effective pumping speed with backing pump							
DRYVAC DV 650	m³/h (cfm)	3300 (1944)	3900 (2297)	4800 (2827)	4700 (2768)	5300 (3122)	5800 (3416)
and RUVAC WH 2500	m³/h (cfm)	3700 (2179)	4400 (2592)	5800 (3416)	5700 (3357)	6800 (4005)	7800 (4594)
Max. permissible pressure difference ^{3), 4), 5)}							
during continuous operation (WH)	mbar (Torr)	30 to 45 (22.5 to 33.75)	20 to 30 (15.0 to 22.5)	8 to 12 (6.0 to 9.0)	0 to 30 (15.0 to 22.5)	14 to 21 (10.5 to 15.75)	11 to 14 (8.25 to 10.5)
for short-cycle operation < 2 min. (WHU)	mbar (Torr)	120 (90)	120 (90)	–	60 (45)	60 (45)	–
Leak rate, integral	mbar x l/s	< 1 x 10 ⁻⁵					
Mains voltage							
FC operation	V	340 to 530 180 to 260	340 to 530 180 to 260 ⁶⁾	340 to 530 180 to 260	340 to 530 180 to 260	340 to 530 180 to 260 ⁶⁾	340 to 530 180 to 260
Mains operation	V	360 to 440 180 to 220	410 to 500 210 to 260 ⁶⁾	– –	360 to 440 180 to 220	410 to 500 210 to 260 ⁶⁾	– –
Permissible ambient temperatures	°C (°F)	+5 to +40 (+41 to +104)					
Nominal power consumption (alternatively)							
FC operation	kW (hp)	11.0 / 15.0 (14.75 / 20.12)	11.0 / 15.0 (14.75 / 20.12)	11.0 / 15.0 (14.75 / 20.12)	11.0 / 15.0 (14.75 / 20.12)	11.0 / 15.0 (14.75 / 20.12)	11.0 / 15.0 (14.75 / 20.12)
Mains operation	kW (hp)	11.0 / 18.5 (14.75 / 24.81)	11.0 / 18.5 (14.75 / 24.81)	– –	11.0 / 18.5 (14.75 / 24.81)	11.0 / 18.5 (14.75 / 24.81)	– –
Idle mode power consumption	kW (hp)	0.7 (1.0)	0.8 (1.1)	1.0 (1.4)	0.9 (1.2)	1.0 (1.4)	1.2 (1.6)
Energy efficiency class		IE 2					
Nominal speed	rpm	3000	3600	4800	6000	3600	4200
Max. permissible speed ⁷⁾	rpm	4800	4800	4800	4200	4200	4200
Type of protection	IP	54					
Cooling water connection (2 pcs.)	G	1/4", female					
Cooling water quantity ⁸⁾	l/min	1 to 3					
Cooling water admission temperature	°C (°F)	5 to 35 (+41 to +95)					
Permissible cooling water pressure	bar	2 to 6					
Lubricant ⁹⁾	l (qt)	4.75 (5.0)					
Connection flange							
Inlet	ISO-K	250	250	250	320	320	320
Outlet	ISO-K	160	160	160	160	160	160
Weight							
WH	kg (lbs)	590 (1301)	590 (1301)	590 (1301)	650 (1433)	650 (1433)	650 (1433)
WHU	kg (lbs)	620 (1369)	620 (1369)	620 (1369)	715 (1578)	715 (1578)	715 (1578)
Dimension (W x B x H)	mm (in.)	1183 x 540 x 415 (46.57 x 21.26 x 16.34)	1183 x 540 x 415 (46.57 x 21.26 x 16.34)	1183 x 540 x 415 (46.57 x 21.26 x 16.34)	1433 x 540 x 415 (46.57 x 21.26 x 16.34)	1433 x 540 x 415 (46.57 x 21.26 x 16.34)	1433 x 540 x 415 (46.57 x 21.26 x 16.34)
Noise level ¹⁰⁾	dB(A)	< 63					

¹⁾ Only possible with external frequency converter

²⁾ To DIN 28 400 and subsequent numbers

³⁾ Higher pressure differences are possible. Please contact Leybold (LV)

⁴⁾ Gas temperatures over 40 °C (104 °F) can result in a reduction of the pressure difference values; please consult LV on this

⁵⁾ The optional frequency converter automatically reduces the rotational speed of the rotors so as to compensate for overloads. During operation do not expose the pump to sudden pressure increases like shock venting to atmospheric pressure, for example

⁶⁾ Requires 200 V FC variant and 200 V motor

⁷⁾ Min. permissible speed: 1200 rpm if run for more than 1 hour

⁸⁾ The cooling water quantity can be reduced provided the temperature of the discharged water does not exceed 45 °C (113 °F)

⁹⁾ Authoritative, however, is the oil level at the oil-level glass

¹⁰⁾ Valid under ultimate pressure conditions. Pressures over 10 mbar (7.5 Torr) produce a higher operating noise

Ordering Information

RUVAC WH/WHU 2500

	Part No.
Roots vacuum pump	
RUVAC WH	
400 V	
int. FC	
PFPE oil (LVO 410)	
gear side ¹⁾	155 250V
motor side	155 251V
Ester oil (LVO 210)	
gear side ¹⁾	155 252V
motor side	155 253V
ext. FC	
PFPE oil (LVO 410)	
gear side ¹⁾	155 260V
motor side	155 261V
Ester oil (LVO 210)	
gear side ¹⁾	155 262V
motor side	155 263V
without FC, DOL ²⁾	
PFPE oil (LVO 410)	
gear side ¹⁾	155 270V
motor side	155 271V
Ester oil (LVO 210)	
gear side ¹⁾	155 272V
motor side	155 273V
200 V, ext. FC	
PFPE oil (LVO 410)	
gear side ¹⁾	155 265V
motor side	155 264V
RUVAC WHU	
without FC, DOL ²⁾	
PFPE oil (LVO 410)	
400 V	
gear side ¹⁾	155 280V
motor side	155 281V
200 V	
gear side ¹⁾	155 284V
motor side	155 285V
Ester oil (LVO 210)	
400 V	155 288V

¹⁾ Discharge flange on the motor side (SOGEVAC and SCREWLINE) respectively gear side (DRYVAC)

²⁾ DOL is the mains power version for direct connection to 50 or 60 Hz mains power

Ordering Information

RUVAC WH/WHU

	4400 Part No.	7000 Part No.
Roots vacuum pump		
RUVAC WH-Ester oil (LVO 210)		
11.0 kW, 400 V	155 150	155 160
18.5 kW, 400 V	-	155 167
18.5 kW, heavy duty ¹⁾	155 154V	155 163V
18.5 kW, heavy duty, ATEX Cat. 2i ¹⁾	-	155 163V11
RUVAC WH-Ester oil (LVO 210)		
11.0 kW, 400 V, int. FC, IP 55	167 193V	167 194V
RUVAC WH-PFPE oil (LVO 400), 11.0 kW		
400 V	155 155	155 165
200 V	155 156	155 164V
RUVAC WH-Ester oil (LVO 210), 11.0 kW		
200 V	155 151V	155 161V
RUVAC WHU, 18.5 kW, bypass valve		
Ester oil (LVO 210)	155 158V	155 162
PFPE oil (LVO 400)	155 153	-

¹⁾ With large motor, gas-sealed impellers and purge gas

Ordering Information

RUVAC WH/WHU

	2500	4400	7000
	Part No.	Part No.	Part No.
Accessories			
Frequency converter, inclusive mains filter			
11 kW / 200 V	155 231V	155 193V	155 193V
11 kW / 400 V	155 230V	155 191V	155 191V
18 kW / 400 V	–	155 192V	155 192V
11 kW / 400 V, IP 66	–	155 187V	155 187V
18 kW / 400 V, IP 66	–	155 187V	155 187V
LCD display (for Part. No. 155 191V, 155 192V and 155 193V)	155 213V		
Profibus DP module (for Part. No. 155 191V, 155 192V and 155 193V)	155 212V		
ProfiNet module für (DRYVAC/LEYVAC/RUVAC)	112005A35		
EtherCAT module for (DRYVAC/LEYVAC/RUVAC)	112005A36		
Relay module (digital output) for (DRYVAC/LEYVAC/RUVAC)	112005A01		
Ethernet interface board for (DRYVAC/LEYVAC/RUVAC)	112005A02		
LEYASSIST Windows Software ¹⁾	230439V01		
RS232 adapter for DRYVAC RUVAC WH	155224V		
Adapter USB / RS232	800110V0103		
Pump feet set for horizontal operation	–	155 181V	155 181V
Gear chamber evacuation kit	–	155 183V	155 183V
Spare Parts			
Major maintenance kit	EK 110 003 000	EK 110 002 828	EK 110 002 828
Spare motor, 400 V			
11.0 kW	–	E 110 000 406	E 110 000 406
15.0 kW	upon request	–	–
18.5 kW	–	E 110 000 405	E 110 000 405

¹⁾ Operation, configuration and analysis software for RUVAC WH with frequency converter, DRYVAC and further Leybold products

Accessories

Pressure Switches

The RUVAC vacuum pumps may be switched on and off automatically through a pressure switch driven by a SV 110 switching amplifier and a contactor.

The pressure switch may be installed in the intake of the RUVAC using a screw-in adaptor, an elbow and two centering and two clamping rings.

Upon request the pressure switch may be set by Leybold to a fixed value. Please state this pressure value in your order.

Ordering Information

Pressure Switches

	Part No.
Pressure switch	
PS 115, adjustable setting	160 04
Pressure switch setting	160 05
Accessories for fitting the PS 115 pressure switch	
Screw-in adaptor DN 16 ISO-KF, M 16 x 1.5 mm (0.06 in.)	168 40
Elbow DN 16 KF	184 36
Centering ring DN 16 KF (2 are required)	183 26
Clamping ring DN 16 KF (2 are required)	183 41
SV 110 switching amplifier (for PS 114/115)	160 78
Oil pressure switch for RUVAC WSLF 1001 and WS-PFPE	194 82

Temperature Sensor Pt100

The temperature sensor measures the gas temperature at the centre of the RUVAC delivery flange.

Depending on the size of the RUVAC pump, respectively its flange size, the Pt100 sensor is fitted at different positions.

Ordering Information

Temperature sensor

	Part No.
Temperature sensor Pt100	155 010

Miscellaneous

Services

On-site Replacement of the Dynamic Seals (with oil LVO 100) *)

The on-site replacement of the dynamic seals includes the following:

Oil change (standard oil LVO 100), partial disassembly of the pump, replacement of the complete shaft seal, visual inspection of the subassemblies, electrical safety test, test run including check of the attained ultimate pressure levels (depending on the installation situation)

Ordering Information

On-site Replacement of the Dynamic Seals (with oil LVO 100) *)

	Part No.
For pump	
WA/WAU 151/251	AS 1181 F
WA/WAU 501	AS 1182 F
WA/WAU 1001	AS 1183 F
WA/WAU 2001	AS 1184 F

Small On-site Maintenance (with oil LVO 100) *)

The small on-site maintenance includes the following:

Oil change (standard oil LVO 100), visual inspection of the subassemblies, electrical safety test, test run including check of the attained ultimate pressure levels (depending on the installation situation)

Ordering Information

Small On-site Maintenance (with oil LVO 100) *)

	Part No.
For pump	
WA/WAU 151/251	AS 1185 F
WA/WAU 501	AS 1186 F
WA/WAU 1001	AS 1187 F
WA/WAU 2001	AS 1188 F

*) Notes on our on-site after sales service

The listed services include the costs for material and working hours on site for standard RUVAC pumps. Services for pump variants upon request.

Transportation and travelling expenses are invoiced at cost. All services refer to the repair of freely accessible and not contaminated vacuum components.

Complete Refurbishing at the Service Centre (with oil LVO 100)

Complete refurbishing at the service centre includes the following:

Disassembly of the pump, cleaning of all individual components including visual inspection, machined reworking of the housing sections; if required rebalancing of the pair of impellers, replacement of the wearing parts, assembly of the pump including new seals and standard oil LVO 100, electrical safety test, test run including check of the attained ultimate pressure levels.

Ordering Information

Complete Refurbishing at the Service Centre (with oil LVO 100)

	Part No.
For pump	
WA 151/251	AS 1189
WA 501	AS 1190
WA 1001	AS 1191
WA 2001	AS 1192
WS 151/251	AS 1193
WS 501	AS 1194
WS 1001	AS 1195
WS 2001	AS 1196
WAU 151/251	AS 1197
WAU 501	AS 1198
WAU 1001	AS 1199
WAU 2001	AS 1200
WSU 151/251	AS 1201
WSU 501	AS 1202
WSU 1001	AS 1203
WSU 2001	AS 1204

Complete Refurbishing with Decontamination at the Service Centre (with oil LVO 100)

Complete refurbishing with decontamination at the service centre includes the following:

Disassembly of the pump, cleaning and decontamination of all individual components, visual inspection of all components, machined reworking of the housing sections; if required rebalancing of the pair of impellers, replacement of the wearing parts, assembly of the pump including new seals and standard oil LVO 100, electrical safety test, test run including check of the attained ultimate pressure levels.

Ordering Information

Complete Refurbishing with Decontamination at the Service Centre (with oil LVO 100)

	Part No.
For pump	
WA 151/251	AS 1189 D
WA 501	AS 1190 D
WA 1001	AS 1191 D
WA 2001	AS 1192 D
WS 151/251	AS 1193 D
WS 501	AS 1194 D
WS 1001	AS 1195 D
WS 2001	AS 1196 D
WAU 151/251	AS 1197 D
WAU 501	AS 1198 D
WAU 1001	AS 1199 D
WAU 2001	AS 1200 D
WSU 151/251	AS 1201 D
WSU 501	AS 1202 D
WSU 1001	AS 1203 D
WSU 2001	AS 1204 D

High Vacuum Pumps

TURBOVAC / TURBOVAC MAG

Turbomolecular Pumps

DIP / DIJ / OB / LEYBOJET

Oil Diffusions Pumps

COOLVAC

Cryo Pumps

COOLPOWER

Cold Heads

COOLPAK

Compressor Units

240.00.02

Excerpt from the Leybold Full Line Catalog (Edition 05/2018)

Catalog Part High Vacuum Pumps

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for pneumatically driven cold heads and pumps

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with water cooling

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General to TURBOVAC Pumps

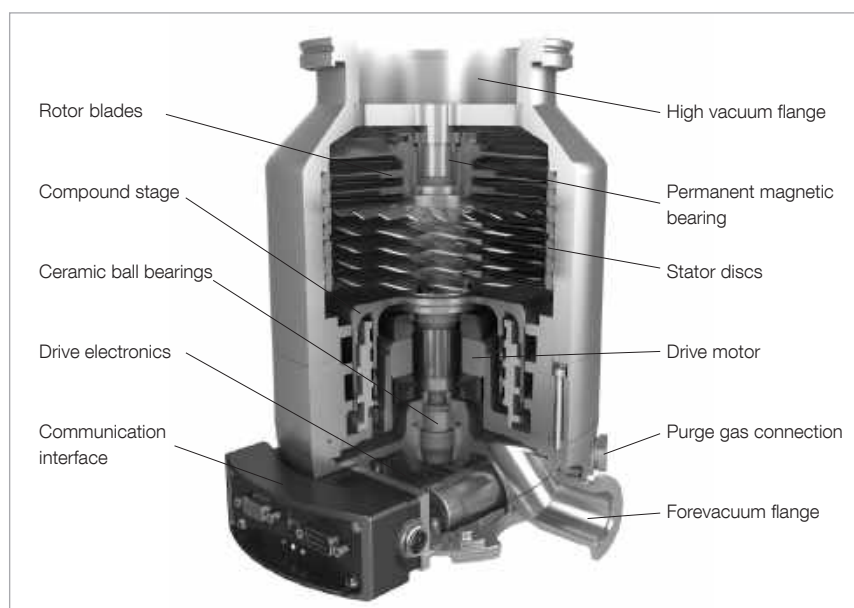
Turbomolecular vacuum pumps (TURBOVAC) are used in applications which require a clean high or ultrahigh vacuum like, for example, in research, development or in industrial fields like the semiconductor industry, analytical instrumentation or coating technology.

Principle of Operation

In principle, the turbomolecular pump is a turbine rapidly revolving in a housing where the rotor stages of the turbine

are equipped with a number of rotor blades. Located between the rotating rotor blades are stationary stator disks with blades arranged in the opposite direction. By means of a momentum transfer from the rotating rotor blades to the gas molecules their initially non-directional thermal motion is changed in to a directional motion from the inlet flange of the pump in the axial direction towards the forevacuum flange. In the molecular flow range (i.e. at pressures below 10^{-3} mbar (0.75×10^{-3} Torr)) the mean free path of the gas molecules is

larger than the spacing between the rotor and the stator blades (typically a few tenths of a millimetre). Correspondingly the molecules chiefly collide with the optically dense rotor blades, resulting in a highly efficient pumping action. In the laminar flow range (i.e. at pressures over 10^{-1} mbar (0.75×10^{-1} Torr)) the effect of the rotor is impaired by frequent collisions between molecules themselves. For this reason, a turbomolecular pump is not capable of pumping gases at atmospheric pressure.



Sectional drawing of a turbomolecular pump (TURBOVAC i)

Rotor Bearing

Leybold offers different rotor bearing systems. A purely classic mechanical type of rotor bearing (TURBOVAC) or a magnetic rotor bearing (TURBOVAC MAG) and also

a hybrid bearing (TURBOVAC i / iX) where the bearing on the forevacuum side is a ceramic ball bearing lubricated for life and where the bearing on the high vacuum side is implemented by way of a non-wearing magnetic bear

ing. Typical for all these types of bearing is that they do not require any lubricating oil which under circumstances like standstill of the pump might diffuse back into the vacuum chamber due to the lack of any pumping action.

Drive Electronics/Control Unit

Driving and monitoring the turbomolecular pump requires an electronic frequency converter (inverter). The frequency converter delivers the driving voltage and the output frequency for the motor and also automatically monitors the system. Optimum running up of the pump rotor is attained by a steadily increasing voltage and frequency feed. After attaining the nominal speed, the start-up current is reduced in a controlled manner to the level necessary for normal operation.

The frequency converter and the motor of the TURBOVAC have been designed for a minimal drop of speed even at high intake pressures. This ensures the highest possible gas throughput also in the transition range from molecular to viscous flow

Depending on the given system and installation conditions, the control unit may be supplemented by a comprehensive range of optional accessories facilitating easy integration within existing installations.

Forevacuum Pump

Since turbomolecular pumps are not capable of compressing directly against atmospheric pressure their operation will always require a sufficiently rated forevacuum pump. For the classic rotor arrangement with rotor blades, generally two-stage rotary vane pumps (TRIVAC) will be suitable. In some cases also single-stage rotary vane vacuum pumps (SOGEVAC BI) or scroll vacuum pumps (SCROLLVAC). In the case of the wide range variant where the rotor is equipped with an additional compression stage (compound stage) also diaphragm vacuum pumps (DIVAC) may be used.

Characteristic Quantities

Pumping speed (volume flow rate)

The pumping speed "S" is the conveyed volume flow through the intake opening of the pump. It is dependent on the type of gas so that for this reason the nominal pumping speed, i.e. the maximum attainable pumping speed of the pump is commonly stated for air, respectively nitrogen. In the field of high vacuum engineering it is common to state the pumping speed in the unit of measurement [l/s]. The pumping speed is a nonlinear function of the inlet pressure $S = S(p_i)$.

Gas throughput

Gas throughput "Q", unit of measurement [mbar x l/s] is linked to the pumping speed through the inlet pressure.
 $Q = Q(p_i) = p_i \times S(p_i)$.

Compression

Compression "K" is defined as the ratio between the pressure on the forevacuum side of the turbomolecular pump and the pressure on the high vacuum side.
 $K = K(p_{VV}) = p_{VV}/p_{HV}$
 Compression is dependent on the type of gas.

Ultimate pressure (base pressure)

The ultimate pressure " p_{ult} " of a turbomolecular pump which can be baked out is defined through the ratio between forevacuum pressure and compression ratio which is attained in a test chamber 48 hours after a 24-hour bake-out (degassing) of the measurement arrangement.

$$p_{ult} = p_{FV}/K_0$$

The maximum attainable ultimate pressure depends among other things on the cleanliness of the apparatus, the type of forevacuum pump used, the types of seals used for the high vacuum flange and the bake-out conditions.

TURBOVAC Product Line

The TURBOVAC pumps are turbomolecular pumps with mechanical rotor suspension which are used in the pressure range from 10^{-1} mbar (0.75×10^{-1} Torr) to 10^{-10} mbar (0.75×10^{-10} Torr). Pumping speeds for air vary from 35 l/s (inlet flange diameter = 40 mm (1.57 in.)) to 1,150 l/s (inlet flange diameter = 250 mm (9.84 in.)).

Besides a variant with extremely reliable ceramic ball bearings on the forevacuum and the high vacuum side, Leybold also offers a line of turbomolecular pumps equipped with hybrid bearings which on the forevacuum side are equipped with a ceramic ball bearing and on the high vacuum side with a permanent magnetic bearing (TURBOVAC i line).

Owing to their compact design and ease of operation, these pump lines are

used in all high vacuum and ultrahigh vacuum fields of application. In particular, the TURBOVAC pumps are running very successfully in mass spectrometers, in CD, DVD and hard disk production units, in the manufacture of large area optical coatings, in non-corrosive semiconductor production processes and in laboratories as well as research institutes

The most important advantages of the TURBOVAC product line are:

- Oil-free pumps for the generation of clean high and ultra-high vacuum conditions
- Highest performance in any orientation
- Highest degree of operating reliability
- Easy to operate
- Compact design



TURBOVAC (T) 350 iX

TURBOVAC MAG Product Line

The TURBOVAC MAG pumps are turbomolecular pumps with magnetic rotor suspension which are used in the pressure range from 10^{-1} mbar (0.75×10^{-1} Torr) to 10^{-10} mbar (0.75×10^{-10} Torr). Pumping speeds for air vary from 300 l/s (inlet flange diameter = 100 mm (3.94 in.)) to 2,200 l/s (inlet flange diameter = 250 mm (12.6 in.)).

The TURBOVAC MAG pumps are mostly installed in areas that require noise-free and vibration-free operation, have to be free of hydrocarbons and require long maintenance intervals. Electron beam microscopy, analytical technology and R & D are also important areas of application for these pumps.

The most important advantages of the TURBOVAC MAG product line are:

- Hydrocarbon-free pumps for the generation of clean high and ultra-high vacuum conditions
- High performance in any orientation
- High degree of operating reliability
- Extremely low vibration
- Almost maintenance-free



TURBOVAC MAG 2200 iPL

Use of Turbomolecular Pumps in Analytical Instruments

All modern analytical methods for gas, liquid and plasma analysis – like for example GC-MS, LC-MS and ICP-MS – rely on mass spectrometers and for this reason require adequate high vacuum conditions. Also in electron microscopes and many surface analysis instruments the production of a high vacuum is essential. In over 90% of all high vacuum applications, the turbomolecular pump has been found to be ideal. Thanks to the hydrocarbon-free vacuum, most simple operation, compact design and almost maintenance-free operation it has in most cases displaced above all the diffusion pump.

On the basis of decades of experience and in cooperation with research facilities and the manufacturers of analytical instruments, Leybold has continually optimized its products.



TURBOVAC MAG W 600 IP

Through the TURBOVAC wide range series, a further improvement has been attained, making available to users in the area of analytical engineering highly flexible and reliable products.

Owing to the modular concept the user may adapt the vacuum system precisely to his requirements. The components can be integrated perfectly and thus find the most cost-effective system configuration. Through the introduction of the TURBOVAC multi inlet series, Leybold has, based on special customer requirements, achieved a major step ahead for analytical instruments.

Two or more analysis chambers can be pumped down simultaneously by a single multi-inlet pump. These pumps have been tailored for pumping speed and gas throughput in order to attain a higher detection sensitivity of analytical systems, for a smaller footprint and an increased sample throughput, for example. The benefits for the customers are the extreme compactness of the vacuum systems without sacrificing performance density, simple installation, stable vacuum connections and, compared to the use of discrete individual pumps, significantly lower investment costs for the entire system. The cartridge solution, moreover, allows for an innovative and cost-effective design of the customer's system and during servicing a simple replacement of the active unit without involved assembly work and leak searching.

Cartridge benefits, which convince

- Higher effective pumping speed
- No losses in conductance
- Compact vacuum system
- Easy pump replacement without having to disassemble the highly sensitive mass spectrometer chambers

The benefits for the customers are reflected by the efficiency of the analytical instruments:

- Increase in detection sensitivity
- Smaller analytical systems
- Increase in sample throughput
- Reduction of system costs
- Lower maintenance costs

In combination with backing pumps like the SOGEVAC, TRIVAC or SCROLLVAC, Leybold is able to offer the best vacuum system optimized for all major applications in the area of analytical instrumentation.



TURBOVAC i Multi Inlet

Use of Turbomolecular Pumps in the Area of Coating Systems

Coating of optical and magnetic storage media, optical components as well as architectural glass requires high vacuum conditions. This is the only way to ensure that the formed layers will be uniform and adhere to the substrate.

The way in which the vacuum is generated has a significant impact on the quality of the coating. By pumping the vacuum chamber down to pressures in the range of 10^{-6} mbar (0.75×10^{-6} Torr), interfering gas and water molecules are removed from the processing chamber. In the case of sputtering the coating process is run in the pressure range between 10^{-3} and 10^{-2} mbar (0.75×10^{-3} and $0.75 \times$

10^{-2} Torr), and in the case of evaporation coating, pressures below 10^{-4} mbar (0.75×10^{-4} Torr) are utilized.

The turbomolecular pump meets all requirements of the customers as to a hydrocarbon-free vacuum, very simple operation, compact design and almost maintenance-free operation in an almost ideal manner. The range of pumps from Leybold includes pumps with flange diameters ranging from 40 mm to 250 mm (1.57 in. to 9.84 in.) nominal width.

Thus the right pump is available for each application, be it coating of data memories (CD, DVD, hard discs), coat-

ing of tools and coating of precision lenses in the area of optical components, displays or architectural glass.



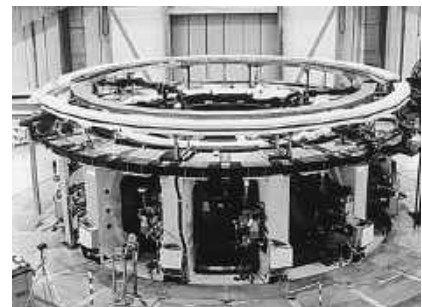
Coating of architectural glass

Use of turbomolecular pumps in research and development

In many applications in which new ideas shall be transformed into technical processes, vacuum technology is a basic requirement for being able to implement these processes at all.

In the field of research and development, all types of turbomolecular pumps from Leybold are being used. Since the application

requirements differ widely, for example are being used. Since the application requirements differ widely, for example between university basic research, industrial development, in research and in large laboratories, the right component or the matching system can be put together from the comprehensive range of equipment being offered.



Nuclear fusion technology

Applications for TURBOVAC Pumps

Pumps							
	TURBOVAC 90 i, (T) 250/350/450 i	TURBOVAC 90 IX, (T) 250/350/450 IX	TURBOVAC i Multi Inlet	MAG W 300/400/600/700 iP	MAG W 1300/1600/1700/2200 iP(L)	MAG W 300/400/600/700 P	
Applications							
Analytical Instruments							
Leak detectors	■			■	■		■
Mass spectrometers	■		■	■	■		■
Gas chromatography (GC-MS)	■		■	■	■		■
Liquid chromatography (LC-MS)	■		■	■	■		■
Quadrupol time of flight (Q-TOF)	■		■	■	■		■
Matrix assisted laser desorption time of flight (MALDI-TOF)	■		■	■	■		■
Inductively coupled plasma mass spectrometry (ICP-MS)	■		■	■	■		■
Electron beam microscopy	■	■		■	■		■
Coating							
Data storage / optical	■	■		■	■	■	■
Data storage / magnetic	■	■		■	■	■	■
Flat panel displays				■	■	■	■
Optical coating	■	■		■	■	■	■
Large area coating					■	■	
Decorative coating	■				■	■	
Metallization	■				■	■	
Wear protection					■	■	
Metallurgy					■	■	
R & D (Research and Development)							
Surface analysis	■			■	■		■
UHV / XHV systems	■	■		■	■		■
Particle accelerators				■	■		■
Fusion experiments				■	■		■
Space simulation				■	■		■
Semiconductor Processes							
Load locks and transfer chambers	■	■		■	■	■	■
PECVD				■	■	■	■
PVD	■			■	■	■	■
Ion implantation				■			■

Accessories for TURBOVAC Pumps

Pumps							
	TURBOVAC 90 i, (T) 250/350/450 i	TURBOVAC 90 iX, (T) 250/350/450 iX	TURBOVAC i Multi Inlet	MAG W 300/400/600/700 iP	MAG W 1300/1600/1700/2200 iPL	MAG W 300/400/600/700 P	
Accessories							
Integrated Frequency Converter	■	■	■	■	■	■	
External Frequency Converter and Power Supply							■
24VDC Display Unit TURBO.CONTROL i	■	■					
Pump control unit with Power Supply TURBO.CONTROL 300	■	■					
Power Supply	■	■	■	■			
Mounting Kit	■	■	■				
Inlet screen / Splinter guard	■	■	■	■	■	■	■
Vibration absorber	■	■	■	■			■
Air cooling unit	■	■	■	■			■
Water cooling kit	■	■	■	■			■
Flange heaters for CF flanges	■	■	■	■			■
Venting valve	■	■		■			■
Purge gas valve	■	■	■	■	■	■	■
Purge gas and venting valve					■	■	
Power failure venting valve	■	■	■	■	■	■	■
Electronic brake module				■			■
Relay box	■	■	■				
Accessories for serial interfaces	■	■	■	■	■	■	■
Control Software for TURBOVAC	■	■	■	■	■	■	■

General to TURBOVAC i / iX Pumps

Turbomolecular Pumps with Hybrid Rotor Suspension (mechanical/magnetic)

TURBOVAC i, iX / T i, T iX

The TURBOVAC i / iX series is a modular line of turbomolecular vacuum pumps. With the integrated drive electronics (frequency converter) it forms a single unit.

In the development of the TURBOVAC i / iX special emphasis was placed on the maximum attainable pump performance in consideration of its footprint. The specially developed rotor/stator design, upon request with an additional compression stage, guarantees excellent performance data as to pumping speed, gas throughput and compression especially also for light gases.

In all pumps of this line, the bearing consists of a non-wearing permanent magnetic bearing on the high vacuum side and an oil-free ceramic ball bearing which is lubricated for life on the forevacuum side. For this reason, the usually required standard maintenance involving an oil change is no longer necessary. The ceramic ball bearing is replaceable on-site, should this be required.

The pumps are equipped as standard with a venting and purge gas facility for directly connecting a venting valve, purge gas valve or purge gas throttle to the pump.

Owing to the many possible combinations (electronics, pump stage design, housing and the range of accessories) the TURBOVAC i / iX can be flexibly adapted to the specific application in each case.

For example, in comparison with the TURBOVAC i, the TURBOVAC iX is equipped with an integrated vacuum system control unit which drives accessory components like vacuum gauge, valves, fans and forevacuum pumps. Moreover, numerous optionally available communication interfaces facilitate easy integration within your installation.

The pump stage design (rotor, stator and Holweck stage) can be selected specifically in consideration of the respective process requirements and offers variants for highest possible gas throughput, pumping speed and/or compression in single or multi-chamber systems. Equally comprehensive is the range of housing and flange variants being offered where the vacuum connections can be adapted flexibly to the on-site installation conditions. The comprehensive range of accessories completes the TURBOVAC i / iX line thereby extending the fields of application for these pumps.

Advantages to the User

- High pumping performance from a compact size
- Cost-effective price-to-performance ratio
- Highly reliable, maintenance-free bearing concept without oil lubrication
- Owing to the overall modular concept, individually adaptable to the respective conditions and requirements
- Variety of housings and flange options
- Easy and easily adaptable installation, any mounting position
- Easy process integration due to the numerous interfacing options
- Flexible accessory options (power supply, cooling, heating, venting, installation etc.)

Overview of Variants

Electronics Variants

All pumps are equipped with integrated drive electronics with a 24 V/48 V power supply which controls the amount of drive power and which monitors all pump functions.

The individual requirements with regard to communication interfaces and the functional scope of the driving options for accessory components can be covered through a number of different electronics variants.



Left: TURBOVAC i with standard interface

Centre: **TURBOVAC i** with Anybus interface extension

Right: **TURBOVAC iX** with integrated vacuum system control unit and Anybus interface extension

Electronics Variants

TURBOVAC i (Standard)

Cost-effective solution equipped with basic functions and interfaces.

- Internal 24/48 V DC frequency converter
- Status LEDs
- Accessory connection for up to 2 controllable accessory components
- User-friendly interfaces (USB, RS 485, 15-pin digital I/O)

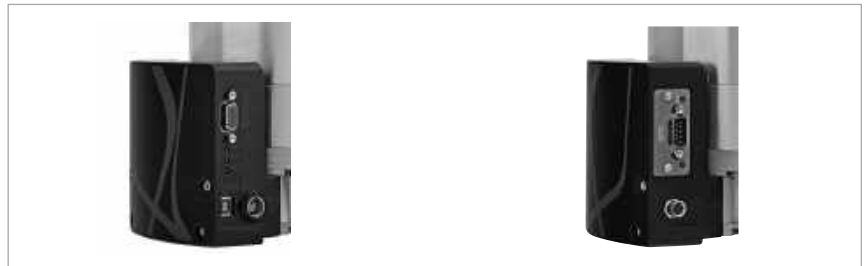


Standard interface USB, RS 485 and 15-pin digital I/O for TURBOVAC i

TURBOVAC i (Anybus interface extension)

Features like TURBOVAC i, additionally:

- User-friendly interfaces (USB, 15-pin digital I/O) and Anybus interface instead of the RS 485 for further interface options: RS 232, Profibus, Ethernet/IP (further interfaces upon request)



Anybus interface expansion for TURBOVAC i

TURBOVAC iX (Vacuum system control unit)

With integrated vacuum system control unit and Anybus interface extension.

Features like TURBOVAC i (Anybus interface extension), additionally:

- 3 outputs for controlling vacuum pump accessories
- 1 vacuum gauge head connection for powering and data recording of vacuum gauge heads and application of pressure data for pump system control
- Flexibly programmable software, for customising the configuration of the control connections



Integrated vacuum system control unit of the TURBOVAC iX

Performance Variants



TURBOVAC i, iX

The standard variant for UHV applications and compact pump system solutions. Owing to the additional Holweck compression stage it delivers a high pumping speed and a high compression especially for light gases, and due to its high forevacuum tolerance it is suited for operation in connection with diaphragm or scroll forevacuum pumps.



TURBOVAC T i, T iX

The "T" version with its classic rotor design without additional compression stage is suited for deployment under more stringent process conditions and high gas loads. Compared to the standard variant it stands for faster run-up times, increased gas throughput and an improved tolerance with regard to pumping of particle or dust containing media.



TURBOVAC i Multi-Inlet

The variant with a special rotor design and two or more inlets as an efficient and compact vacuum solution for multi-chamber systems. It allows for a high degree of system integration and convinces compared to systems with discrete turbomolecular pumps through its lower weight and smaller footprint as well as an increased reliability of the entire vacuum system through the reliance on fewer components compared to similar systems equipped with discrete turbomolecular pumps.

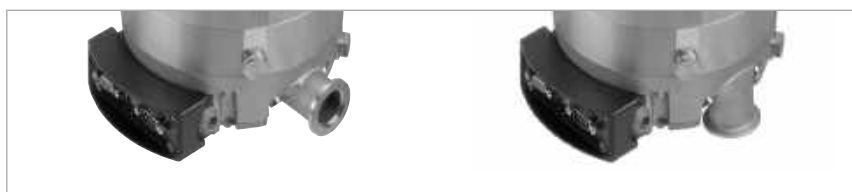
Housing and Flange Variants

The optimised rotor geometry has been specially adapted to the industrial standard sizes for maximum pump performance. Housings with ISO-K as well as CF flanges are available. Moreover, the standard housings with an additional inlet stage are available upon request.

Multiple inlet stages can be implemented through the **TURBOVAC Multi-Inlet**. Here in addition to the special cartridge solution which facilitates easy replacement in the field, also custom housing and chamber solutions are offered for utmost system integration.

Flexibility

The forevacuum connection on all pumps is rotatable thereby facilitating flexible installation within existing systems making optimum use of the available space. Moreover, the required amount of installation space may be reduced by a detachable cable connected interface module



Left: TURBOVAC i with radial forevacuum flange
Right: TURBOVAC i with axial forevacuum flange

Accessories for TURBOVAC i, iX / T i, T iX

Power Supply

TURBO.POWER integra

- Plug-and-play power supply for fitting underneath the pump, 100-240 V
- for TURBOVAC (T) 350 i(X) and TURBOVAC (T) 450 i(X) only
- Including short connecting cable to the pump
- Also for benchtop placement (TURBOVAC 90/250/350/450) with optional extension cable (1, 3, 5 m (3.5, 10.5, 17.5 ft))
- Requires a country-specific mains cord (EU, US, UK ...)



24VDC Display Unit

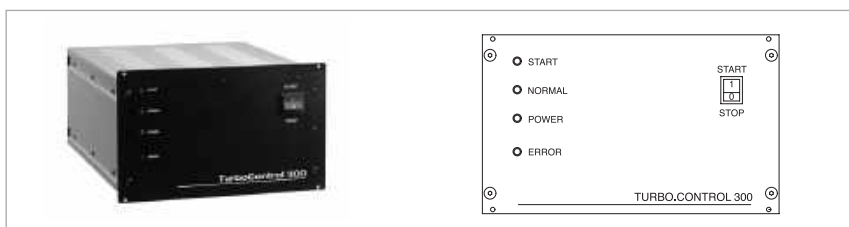
TURBO.CONTROL i

- Control and monitoring of a TURBOVAC i/iX pump
- The 24 V/DC operating voltage comes from a plug power supply with round plug (24 V/DC - 1.5A - 36W)
- Can be installed in a rack or mounted in a table housing
- Has two communication channels (RS485 & USB) to the pump control and two interfaces for gauges. An ethernet provides the possibility of running a web server for the pump control and monitoring on an external PC and to read logged data via the TURBOCONTROL i.
- Requires a plug-in power supply and standard cable for communication
- The following measuring gauges can be attached:
PTR 90, PTR 91 N, TTR 91,
TTR 91 N, TTR101, TTR 101 N



Pump control unit with Power Supply TURBO.CONTROL 300

- Control unit and power supply for rack installation
- With on/off switch for the turbo-molecular pump
- Status LEDs and status relays for monitoring the pump
- For remote control via interface
- Requires a connection cable to the pump (1, 3, 5 m (3.5, 10.5, 17.5 ft)) and country-specific mains cord (EU, US, UK ...)



Connecting cables to the pump with bare wire ends of for customer specific power supply units



Relay Box

The relay box allows you to control via the 24 V DC output on the TURBOVAC i a mains powered electric consumer, like a backing pump, for example. Mains power and consumer are connected using mains power cords, the control voltage is connected through an M 8 connector.

- incl. connection cable with a M 8 plug, 2 m (7.0 ft) long



DC Pump Plug

for adapting the supply voltage by the customer.

- 24/48 V DC-In plug TURBOVAC i



Radial air cooler

for lateral installation on the pump, including connection plug

- Flexible positioning



Axial air cooler

For installation underneath the pump, including connection plug



Water cooling

for flexible installation on the pump (required for degassing the turbomolecular pump)



Heating Collar

for degassing the pump

- Degassing temperature 100 °C (212 °F)
- Requires a country-specific mains cord (EU, US, UK ...)
- With optional relay box and accessory cable, automatic control via the electronics of the TURBOVAC i / iX is possible



Accessory Valves

- Power supply 24 V DC
- G 1/8" inlet (inside thread) and discharge (outside thread) connection
- Including O-ring and connecting cable with M 8 plug for connection to the accessory input on the TURBOVAC i / iX

Purge Gas Valve (for connection to the purge gas connection on the turbomolecular pump)

for controlling the admitted purge gas quantity

- The valve is closed when no power

Venting Valve (for connection the venting connection)

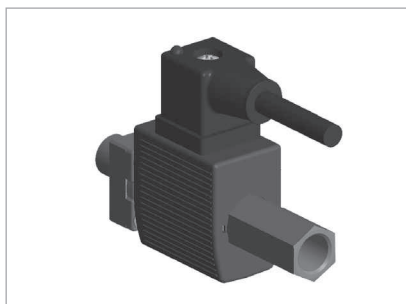
for venting the turbomolecular pump

- The valve is normally closed

Power Failure Venting Valve (for connection the venting connection)

for venting the turbomolecular pump

- The valve is normally open



Purge Gas Throttle

for passively controlling the admitted purge gas quantity

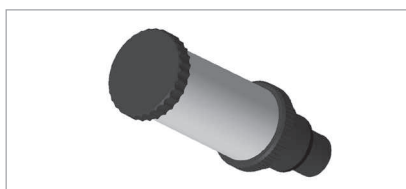
- G 1/8" inlet (inside thread) and discharge (outside thread) connection
- Purge gas throttle 24 sccm



Air Filter

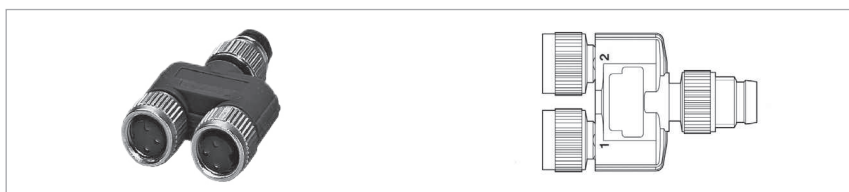
for connection to the valves or throttles

- Prevents contamination and clogging of valves and throttles
- G1/8"



Y-Splitter

- Extends the M 8 accessory connection on the TURBOVAC i by a further connection for parallel driving of two accessory components. Here both accessory components are switched synchronously



Installation and Mounting Accessories

Mounting kit for safe mounting of the pump

The mounting kits include:

ISO-K kit (100 und 160):

centering rings and clamps

ISO-F kit (100 und 160):

collar flange, outside ring, bolts and nuts

CF kit (100 und 160):

2 copper gaskets, bolts, nuts and washers



Mounting kits (left ISO-KF, centre ISO-F, right CF)

Centering Rings with Splinter Guard (DN 100 and 160 ISO-K/F)

Centering Rings with Inlet Screens (DN 100 and 160 ISO-K/F)

Splinter Guards (DN 100 und 160 CF)

Inlet Screens (DN 100 und 160 CF)

for protecting the pump against ingesting parts.

Inlet screen, 3.2 mm (0.01 ft) mesh

Splinter guard, 0.8 mm (0.003 ft) mesh

Note:

For ISO-K/F, both inlet screen and splinter guard have been integrated in the centering ring.



Vibration Absorber

(DN 100/160 ISO-K and 100/160 CF)

Prevents any possible vibration transfer from the pump to sensitive instrumentation or apparatus.



Software LEYASSIST *

Software for PC-based communication, control and monitoring of turbomolecular pumps via USB, RS 485 or RS 232 interface with automatic pump detection.

Functions

- Display of vacuum system status
- Trend configuration and report
- Configuring the accessory functions of the TURBOVAC i / iX
- Reading/writing of parameters
- Data logging
- Alarm/warning message logging
- Interface uses USB (with USB cable 2.0, Type A/B, 1.8 m (6.3 ft) long), RS 485 or RS 232 (with dongle)
 - Functions: reading/writing of parameters, control and data acquisition
- Automatic detection of connected Leybold pump type or instrument
- Different languages and with different user access levels are available

* included in delivery of TURBOVAC iX

Ordering Information

Software LEYASSIST for turbomolecular vacuum pumps

Part. No. 230439V01



Products

TURBOVAC
with Hybrid Rotor Suspension (mag/mech)

with integrated Frequency Converter
TURBOVAC 90 i, 250 i, (T) 350 i and (T) 450 i



TURBOVAC 90 i (left), 250 i (T), 350 i and (T) 450 i (right)

with integrated Frequency Converter and
integrated Vacuum System Controller
TURBOVAC 90 iX, 250 iX, (T) 350 iX and (T) 450 iX



TURBOVAC 90 iX (left), 250 iX, (T) 350 iX and (T) 450 iX (right)

Typical Applications

- Analytical technologies / Research & Development
 - Mass spectrometers
 - Electron microscopes
 - Surface analysis
 - X-ray-analysis
 - Particle accelerators and synchrotrons
 - Laboratory coating systems
 - MBE (Molecular Beam Epitaxy)
 - UHV systems
- Life Sciences
 - Proton therapy
 - Gamma sterilisation
 - Production of high quality implants
- Industrial and Coating applications
 - PVD- Physical Vapour deposition
 - Optical coatings
 - CD/DVD/Blu-Ray Disc production
 - Thin film technologies, photovoltaics
- Load locks, transfer chambers, handling systems
- Electron beam welders
- Insulation vacuum and leak detection

Technical Features

TURBOVAC i

- Integrated electronic drive unit with 24/48 V DC supply
- Best in class pumping speed and compression especially for light gases
- Vacuum port design flexibility
- Installation in any orientation
- Superior reliability due to innovative pump and bearing design
- The only maintenance free hybrid mechanical TMP
 - no need for oil changes
- On-site maintenance possibility (bearing exchange) to reduce service costs and time
- Widest range of interface options (USB, RS 485 and 15 pin digital I/O as standard)
- Optimized size/performance ratio on 100 and 160 flanges

TURBOVAC iX

- Integrated vacuum system controller with flexible interfaces and several accessory ports for control of cooling units, valves, gauges, fore-vacuum pumps etc.
- Flexible accessory program options for easy plug & play
- Flexibility to match different process and application requirements

TURBOVAC T i, T iX

- Variant without Compound Stage
- increased gas throughput
- Increased tolerance against dust and particles
- Improved run-up time

Advantages to the User

TURBOVAC i

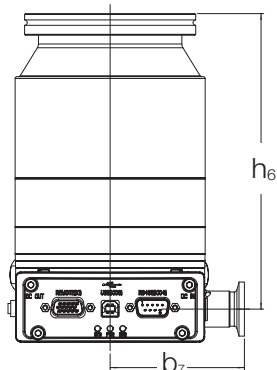
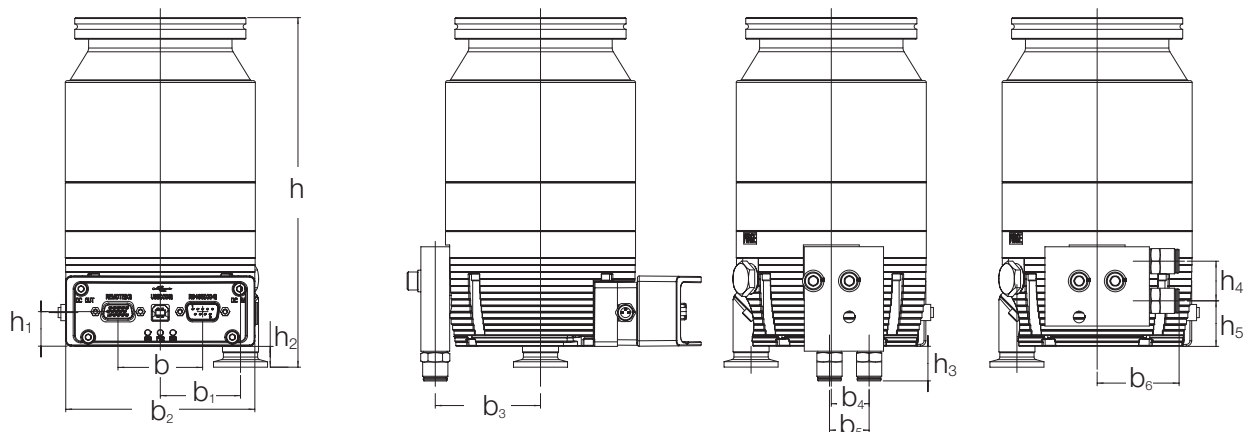
- Best performance and functionality for your money
- Maximum user flexibility for easy system integration, operation and control
- Highest productivity and system uptime at lowest CoO (Cost of Ownership)
- Improved pump-down time and target pressures
- Superior pumping performance for light gases
- Down-sizing of vacuum system in terms of costs and dimensions (use of small forevacuum pumps)

TURBOVAC iX

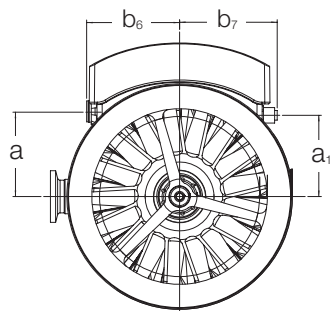
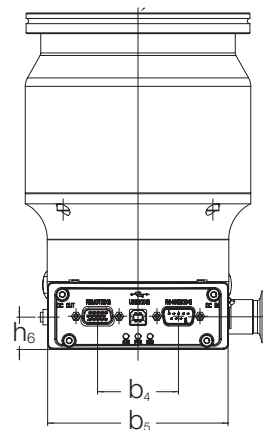
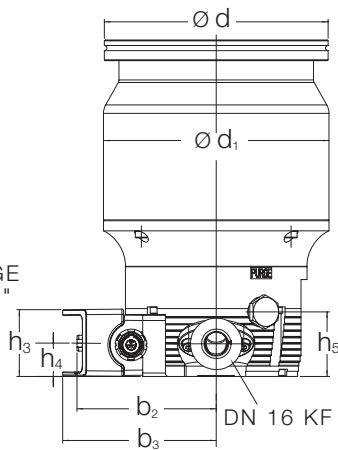
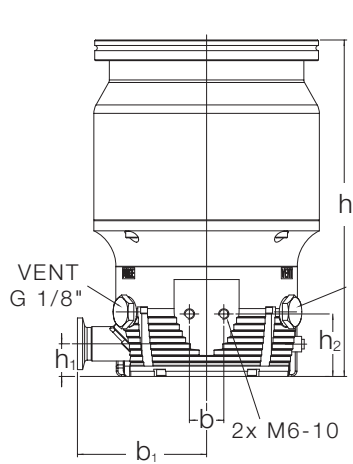
- Easy plug & play pump system control
- Avoid extra costs for separate pump system control units and cabling

TURBOVAC T i, T iX

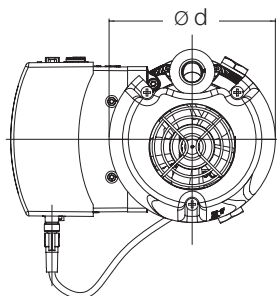
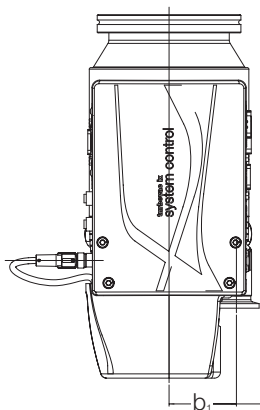
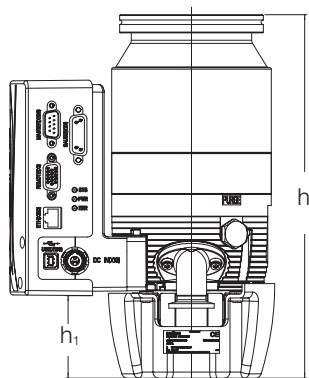
- Suitable for demanding process applications and high throughput operation
- Fast cycle operation and pump down possible



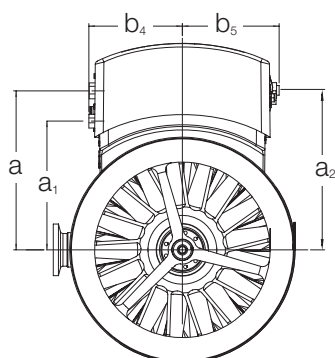
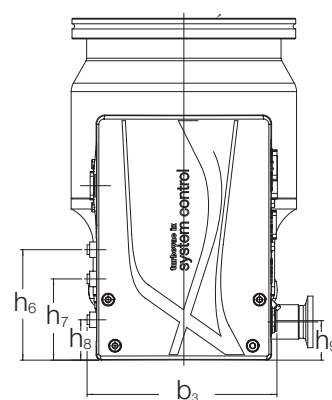
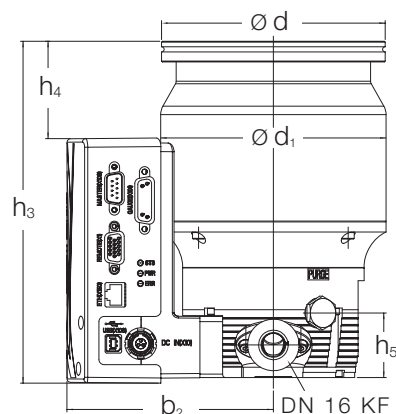
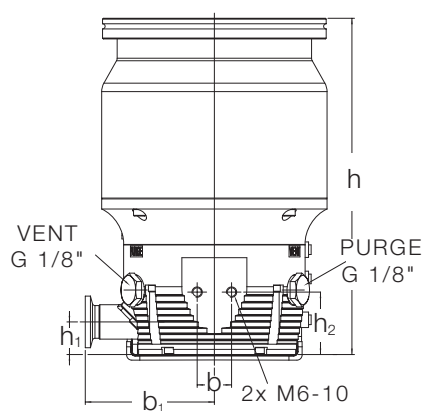
Typ	DN		a	a ₁	b	b ₁	b ₂	b ₃	b ₄
TURBOVAC 90 i	ISO-K	mm (in.)	-	-	47 (1.85)	45 (1.77)	105 (4.13)	58 (2.28)	21 (0.83)
	CF	mm (in.)	-	-	47 (1.85)	45 (1.77)	105 (4.13)	58 (2.28)	21 (0.83)
TURBOVAC 250 i	ISO-K	mm (in.)	49 (1.93)	47 (1.85)	20 (0.79)	75 (2.95)	81 (3.19)	89 (3.50)	47 (1.85)
	CF	mm (in.)	49 (1.93)	-	20 (0.79)	75 (2.95)	81 (3.19)	89 (3.50)	47 (1.85)
	DN		b ₅	b ₆	b ₇	d	d ₁	h	h ₁
TURBOVAC 90 i	ISO-K	mm (in.)	22 (0.87)	46 (1.81)	75 (2.95)	110 (4.33)	-	194 (7.64)	19 (0.75)
	CF	mm (in.)	22 (0.87)	46 (1.81)	75 (2.95)	110 (4.33)	-	194 (7.64)	19 (0.75)
TURBOVAC 250 i	ISO-K	mm (in.)	105 (4.13)	54 (2.13)	57 (2.24)	130 (5.12)	131 (5.16)	196 (7.32)	19 (0.75)
	CF	mm (in.)	105 (4.13)	54 (2.13)	52 (2.05)	151.5 (5.96)	131 (5.16)	205 (8.07)	19 (0.75)
	DN		h ₂	h ₃	h ₄	h ₅	h ₆		
TURBOVAC 90 i	ISO-K	mm (in.)	12 (0.47)	19 (0.75)	22 (0.87)	25 (0.98)	164 (6.46)		
	CF	mm (in.)	12 (0.47)	19 (0.75)	22 (0.87)	25 (0.98)	164 (6.46)		
TURBOVAC 250 i	ISO-K	mm (in.)	36 (1.41)	39 (1.54)	19 (0.75)	38 (1.50)	19 (0.75)		
	CF	mm (in.)	36 (1.41)	39 (1.54)	19 (0.75)	38 (1.50)	19 (0.75)		



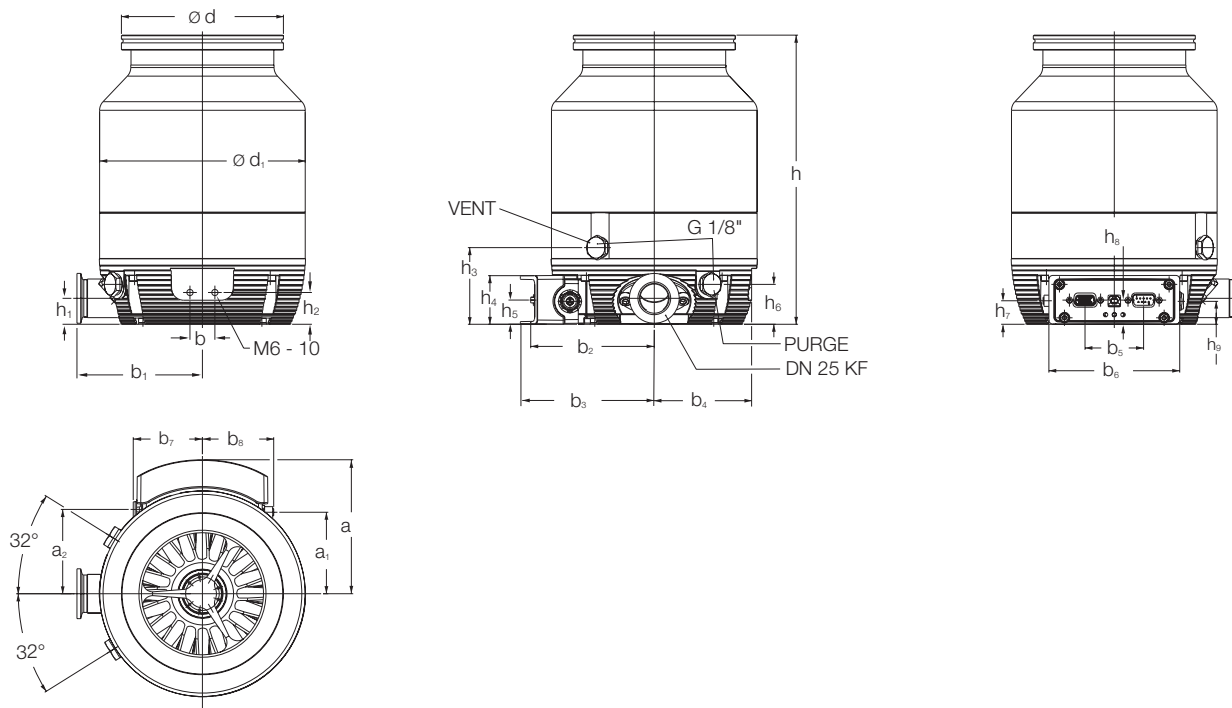
Dimensional drawing for the TURBOVAC pumps, 90 i top and 250 i bottom



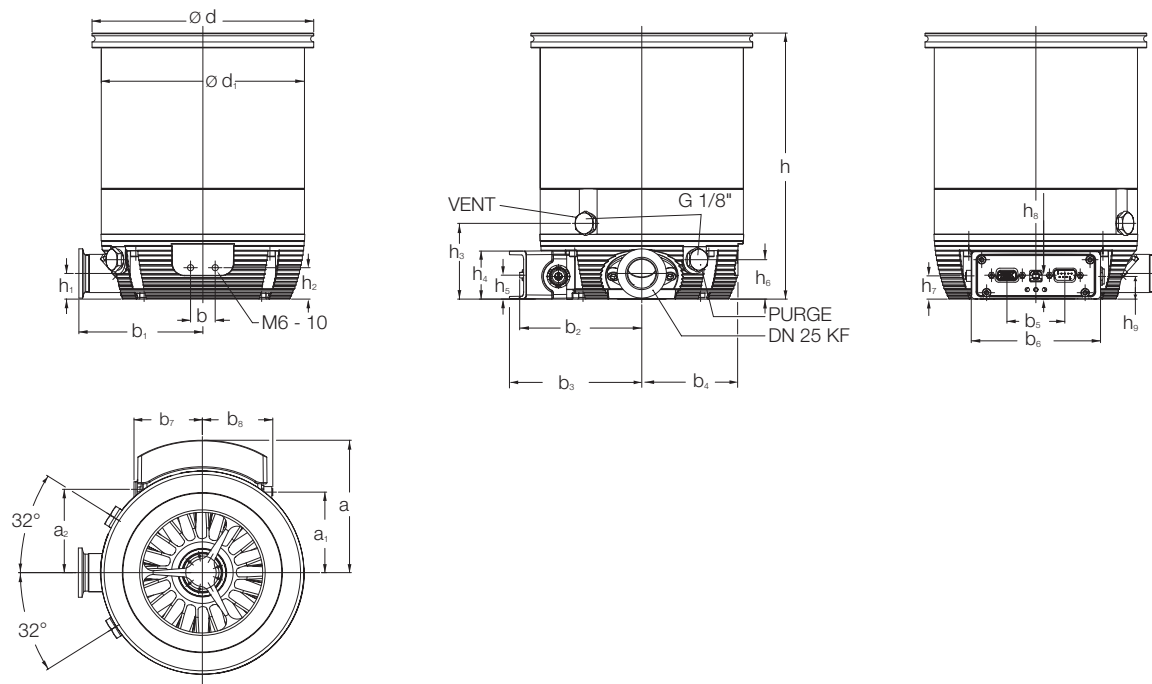
Typ	DN		a	a ₁	a ₂	b	b ₁	b ₂	b ₃
TURBOVAC 90 IX	ISO-K	mm (in.)	-	-	-	-	45 (1.77)	-	-
	CF	mm (in.)	-	-	-	-	45 (1.77)	-	-
TURBOVAC 250 IX	ISO-K	mm (in.)	92 (3.62)	75 (2.95)	93 (3.66)	20 (0.79)	75 (2.95)	120 (4.72)	110 (4.33)
	CF	mm (in.)	92 (3.62)	75 (2.95)	93 (3.66)	20 (0.79)	75 (2.95)	120 (4.72)	110 (4.33)
	DN		d	d ₁	h	h ₁	h ₂	h ₃	h ₄
TURBOVAC 90 IX	ISO-K	mm (in.)	110 (4.33)	-	240 (9.45)	55 (2.16)	-	-	-
	CF	mm (in.)	110 (4.33)	-	240 (9.45)	55 (2.16)	-	-	-
TURBOVAC 250 IX	ISO-K	mm (in.)	130 (5.12)	131 (5.16)	196 (7.72)	19 (0.75)	36 (1.42)	199 (7.83)	57 (2.24)
	CF	mm (in.)	151,5 (5.96)	131 (5.16)	205 (8.07)	19 (0.75)	36 (1.42)	208 (8.19)	66 (2.60)
	DN		h ₅	h ₆	h ₇	h ₈	h ₉		
TURBOVAC 90 IX	ISO-K	mm (in.)	-	-	-	-	-		
	CF	mm (in.)	-	-	-	-	-		
TURBOVAC 250 IX	ISO-K	mm (in.)	38 (1.50)	64 (2.52)	47 (1.85)	23 (0.91)	23 (0.91)		
	CF	mm (in.)	38 (1.50)	64 (2.52)	47 (1.85)	23 (0.91)	23 (0.91)		



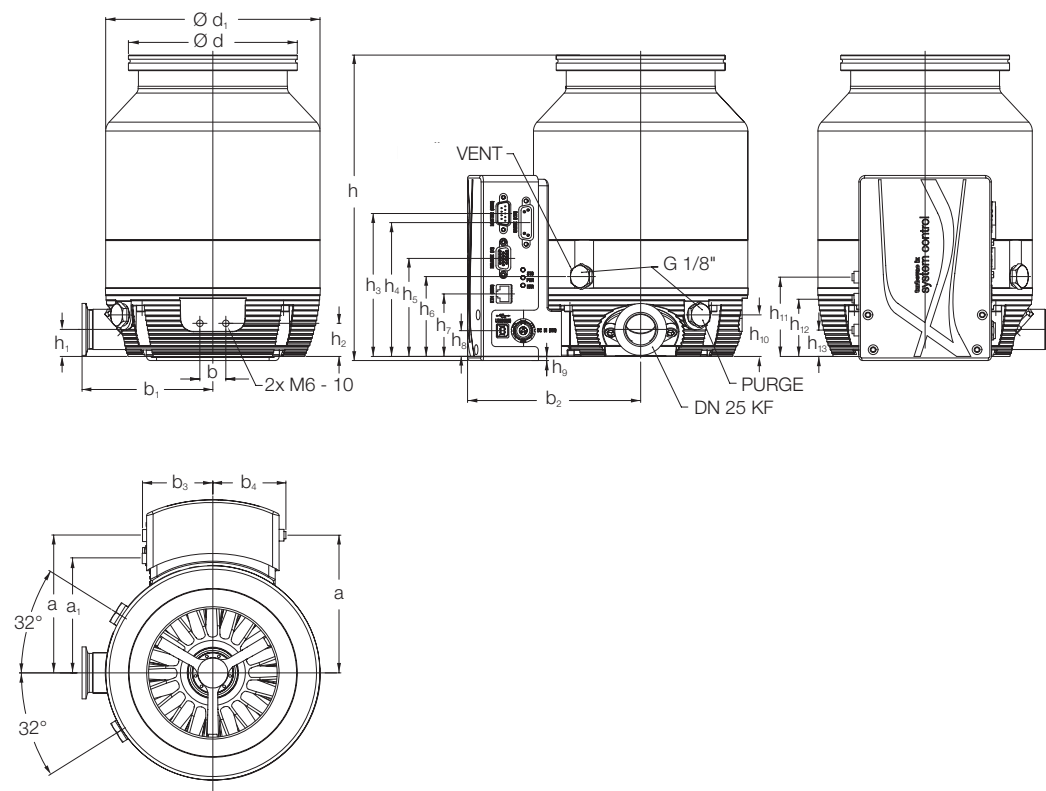
Dimensional drawing for the TURBOVAC pumps, 90 IX top and 250 IX bottom



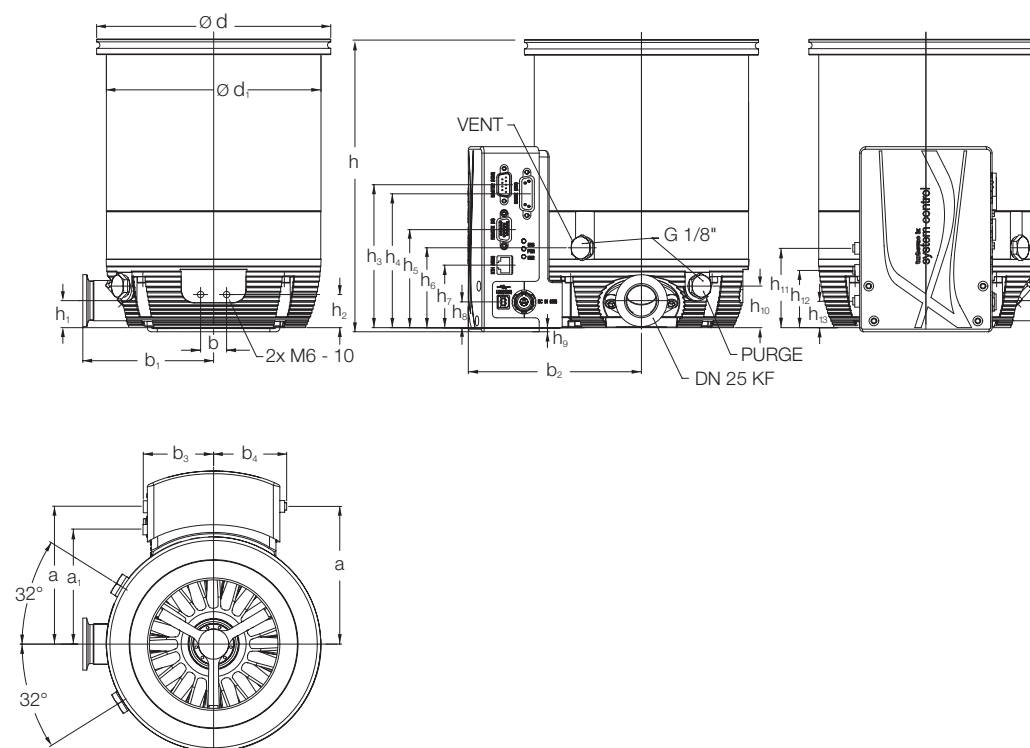
Type	DN		a	a ₁	a ₂	b	b ₁	b ₂	b ₃	b ₄
TURBOVAC (T) 350 i	ISO-K	mm (in.)	107.5 (4.23)	65.4 (2.57)	67.6 (2.66)	20 (0.79)	100.7 (3.96)	99.2 (3.91)	107.5 (4.23)	78.1 (3.07)
	CF	mm (in.)	107.5 (4.23)	65.4 (2.57)	67.6 (2.66)	20 (0.79)	100.7 (3.96)	99.2 (3.91)	107.5 (4.23)	78.1 (3.07)
TURBOVAC (T) 450 i	ISO-K	mm (in.)	107.5 (4.23)	65.4 (2.57)	67.6 (2.66)	20 (0.79)	100.7 (3.96)	99.2 (3.91)	107.5 (4.23)	78.1 (3.07)
	CF	mm (in.)	107.5 (4.23)	65.4 (2.57)	67.6 (2.66)	20 (0.79)	100.7 (3.96)	99.2 (3.91)	107.5 (4.23)	78.1 (3.07)
	DN		b ₅	b ₆	b ₇	b ₈	d	d ₁	h	h ₁
TURBOVAC (T) 350 i	ISO-K	mm (in.)	47 (1.85)	105 (4.13)	55.5 (2.19)	57.2 (2.25)	130 (5.12)	165 (6.5)	232 (9.13)	20.8 (0.82)
	CF	mm (in.)	47 (1.85)	105 (4.13)	55.5 (2.19)	57.2 (2.25)	180 (7.09)	165 (6.5)	245 (9.65)	20.8 (0.82)
TURBOVAC (T) 450 i	ISO-K	mm (in.)	47 (1.85)	105 (4.13)	55.5 (2.19)	57.2 (2.25)	130 (5.12)	165 (6.5)	216 (8.5)	20.8 (0.82)
	CF	mm (in.)	47 (1.85)	105 (4.13)	55.5 (2.19)	57.2 (2.25)	180 (7.09)	165 (6.5)	222 (8.74)	20.8 (0.82)
	DN		h ₂	h ₃	h ₄	h ₅	h ₆	h ₇	h ₈	h ₉
TURBOVAC (T) 350 i	ISO-K	mm (in.)	25.5 (1.0)	61.5 (2.42)	39 (1.54)	19.4 (0.76)	32 (1.26)	19 (0.75)	18.8 (0.74)	18.4 (0.72)
	CF	mm (in.)	25.5 (1.0)	61.5 (2.42)	39 (1.54)	19.4 (0.76)	32 (1.26)	19 (0.75)	18.8 (0.74)	18.4 (0.72)
TURBOVAC (T) 450 i	ISO-K	mm (in.)	25.5 (1.0)	61.5 (2.42)	39 (1.54)	19.4 (0.76)	32 (1.26)	19 (0.75)	18.8 (0.74)	18.4 (0.72)
	CF	mm (in.)	25.5 (1.0)	61.5 (2.42)	39 (1.54)	19.4 (0.76)	32 (1.26)	19 (0.75)	18.8 (0.74)	18.4 (0.72)



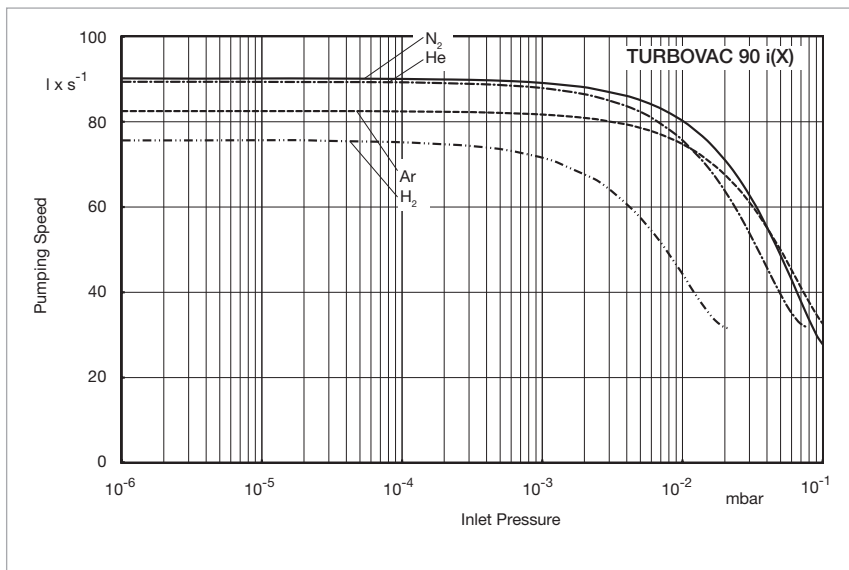
Dimensional drawing for the TURBOVAC (T) pumps, 350 i top and 450 i bottom



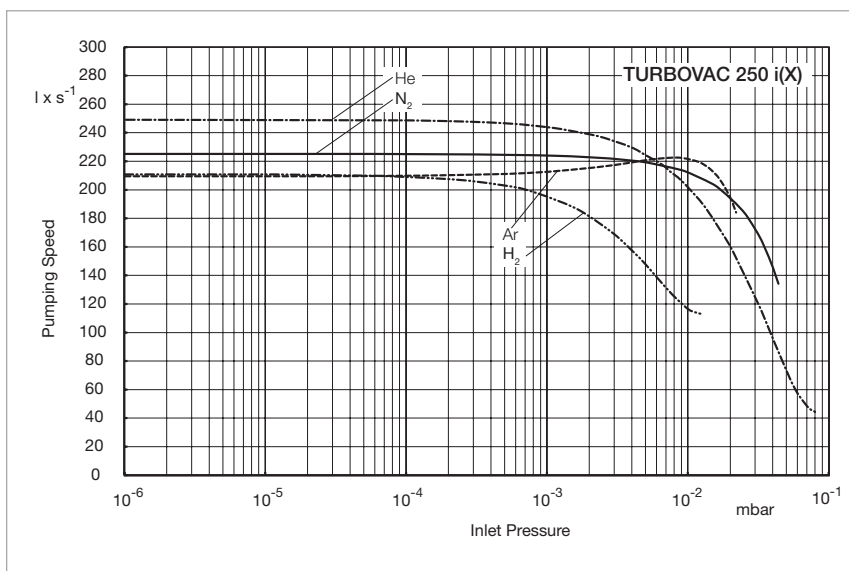
Type	DN			a	a ₃	b	b ₁	b ₂	b ₃	b ₄	
TURBOVAC (T) 350 iX	ISO-K	mm (in.)		111 (4.37)	78 (3.07)	20 (0.79)	101 (3.98)	138 (5.43)	54 (2.13)	56 (2.2)	
	CF	mm (in.)		111 (4.37)	78 (3.07)	20 (0.79)	101 (3.98)	138 (5.43)	54 (2.13)	56 (2.2)	
TURBOVAC (T) 450 iX	ISO-K	mm (in.)		111 (4.37)	78 (3.07)	20 (0.79)	101 (3.98)	138 (5.43)	54 (2.13)	56 (2.2)	
	CF	mm (in.)		111 (4.37)	78 (3.07)	20 (0.79)	101 (3.98)	138 (5.43)	54 (2.13)	56 (2.2)	
	DN			d	d ₁	h	h ₁	h ₂	h ₃	h ₄	
TURBOVAC (T) 350 iX	ISO-K	mm (in.)		130 (5.12)	165 (6.5)	235 (9.25)	21 (0.83)	26 (1.02)	110 (4.33)	103 (4.06)	76 (2.99)
	CF	mm (in.)		180 (7.09)	165 (6.5)	248 (9.76)	21 (0.83)	26 (1.02)	110 (4.33)	103 (4.06)	76 (2.99)
TURBOVAC (T) 450 iX	ISO-K	mm (in.)		130 (5.12)	165 (6.5)	219 (8.62)	21 (0.83)	26 (1.02)	110 (4.33)	103 (4.06)	76 (2.99)
	CF	mm (in.)		180 (7.09)	165 (6.5)	225 (8.86)	21 (0.83)	26 (1.02)	110 (4.33)	103 (4.06)	76 (2.99)
	DN			h ₆	h ₇	h ₈	h ₉	h ₁₀	h ₁₁	h ₁₂	h ₁₃
TURBOVAC (T) 350 iX	ISO-K	mm (in.)		62 (2.44)	48 (1.89)	20 (0.79)	3 (0.12)	32 (1.26)	64 (2.52)	47 (1.85)	23 (0.91)
	CF	mm (in.)		62 (2.44)	48 (1.89)	20 (0.79)	3 (0.12)	32 (1.26)	64 (2.52)	47 (1.85)	23 (0.91)
TURBOVAC (T) 450 iX	ISO-K	mm (in.)		62 (2.44)	48 (1.89)	20 (0.79)	3 (0.12)	32 (1.26)	64 (2.52)	47 (1.85)	23 (0.91)
	CF	mm (in.)		62 (2.44)	48 (1.89)	20 (0.79)	3 (0.12)	32 (1.26)	64 (2.52)	47 (1.85)	23 (0.91)



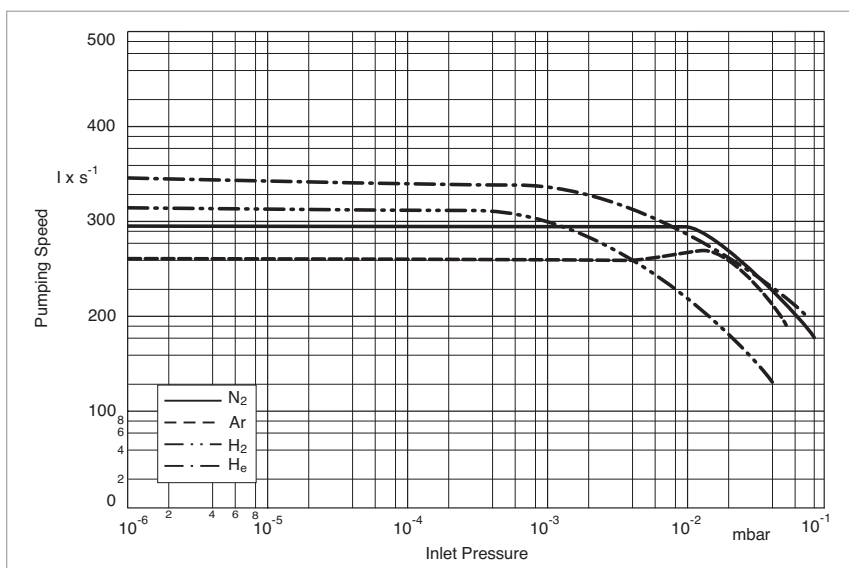
Dimensional drawing for the TURBOVAC (T) pumps, 350 iX top and 450 iX bottom



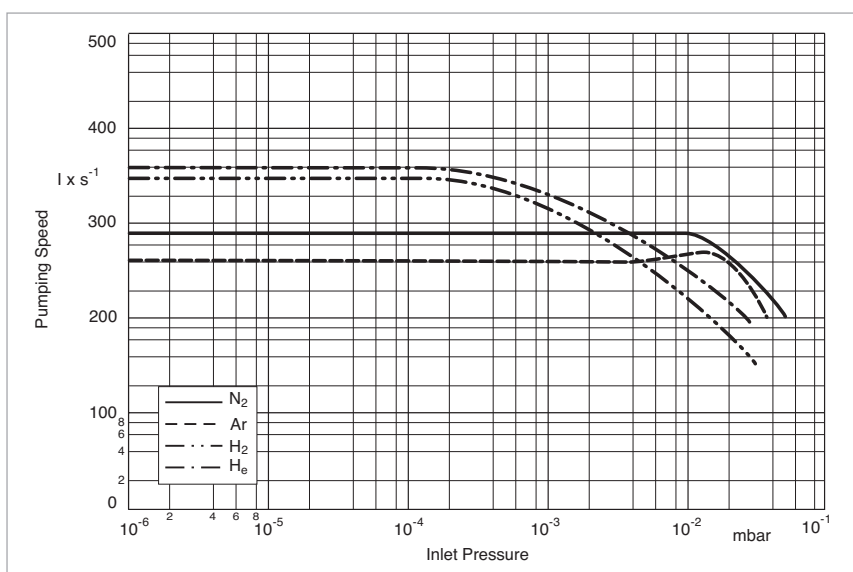
Pumping speed as a function of the inlet pressure for the TURBOVAC 90 i (DN 63 Flange)



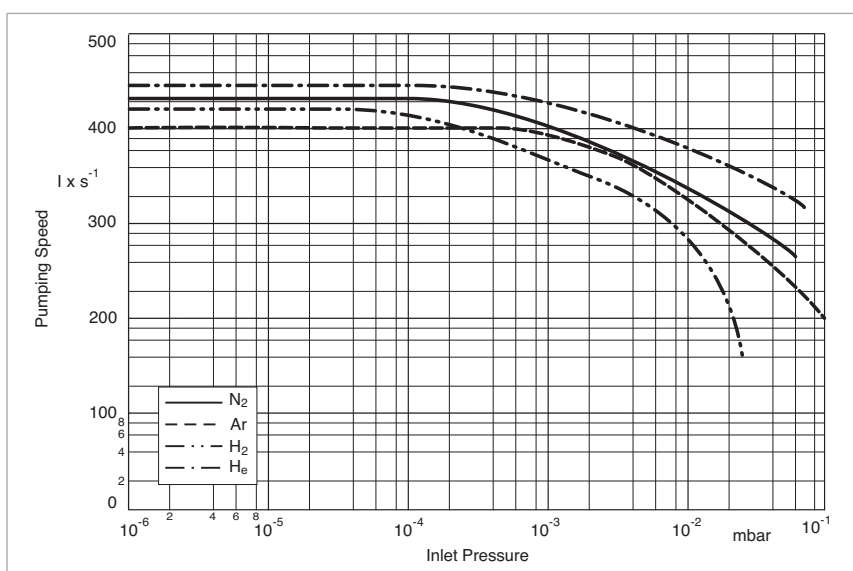
Pumping speed as a function of the inlet pressure for the TURBOVAC 250 i



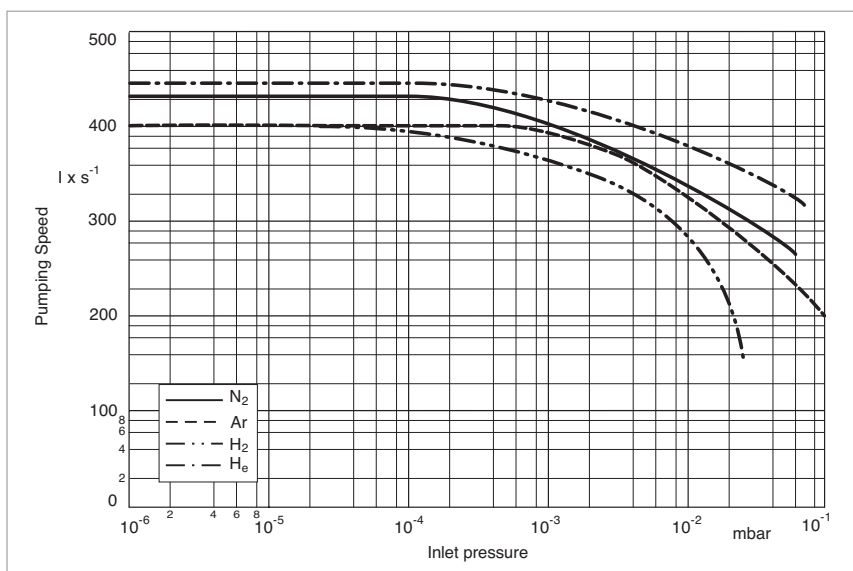
Pumping speed as a function of the inlet pressure for the TURBOVAC 350 i



Pumping speed as a function of the inlet pressure for the TURBOVAC T 350 i



Pumping speed as a function of the inlet pressure for the TURBOVAC 450 i



Pumping speed as a function of the inlet pressure for the TURBOVAC T 450 i

Technical Data

TURBOVAC

		90 i/iX	250 i/iX	350 i/iX	450 i/iX	T 350 i/iX	T 450 i/iX
High-vacuum connection	DN	63 ISO-K 63 CF	100 ISO-K 100 CF	100 ISO-K 100 CF	160 ISO-K 160 CF	100 ISO-K 100 CF	160 ISO-K 160 CF
Forevacuum connection	DN	16 ISO-KF	16 ISO-KF	25 ISO-KF	25 ISO-KF	25 ISO-KF	25 ISO-KF
Pumping speed							
N ₂	l/s	90	225	290	430	290	430
Ar	l/s	83	210	260	400	260	400
He	l/s	90	250	360	440	360	440
H ₂	l/s	78	210	350	420	320	400
Gas throughput							
N ₂	mbar x l/s	10	6	4.5	4.5	11.5	115
Ar	mbar x l/s	3	3	2	2	6	6
He	mbar x l/s	11	6	8	8	20	20
H ₂	mbar x l/s	11	>10	8	8	20	20
Compression ratio							
N ₂		1 x 10 ¹¹	1 x 10 ¹¹	1 x 10 ¹¹	1 x 10 ¹¹	1 x 10 ¹⁰	1 x 10 ¹⁰
Ar		1 x 10 ¹¹	1 x 10 ¹¹	1 x 10 ¹¹	1 x 10 ¹¹	1 x 10 ¹¹	1 x 10 ¹¹
He		-	-	1 x 10 ⁸	1 x 10 ⁸	1 x 10 ⁶	1 x 10 ⁶
H ₂		5 x 10 ⁷	2 x 10 ⁷	1 x 10 ⁶	1 x 10 ⁶	1 x 10 ⁴	1 x 10 ⁴
Ultimate pressure with 2-stage oil-sealed rotary vane vacuum pump ISO-K / CF flange		mbar (Torr)					
		< 8 x 10 ⁻⁸ / < 5 x 10 ⁻¹⁰ (< 6 x 10 ⁻⁸ / < 3.75 x 10 ⁻¹⁰)					
Max. forevacuum pressure							
N ₂	mbar (Torr)	14 (10.5)	14 (10.5)	10 (7.5)	10 (7.5)	0.5 (0.375)	0.5 (0.375)
Recommended forevacuum pumps							
TRIVAC		D 2,5 E / D 4 B	D 2,5 E / D 4 B	D 4 B	D 4 B	D 16 B	D 16 B
SCROLLVAC		SC 5 D	SC 5 D / 15 D	SC 5 D / 15 D	SC 5 D / 15 D	SC 15 D / 30 D	SC 15 D / 30 D
DIVAC		1.4 HV3	3.8 HV3	3.8 HV3	3.8 HV3	-	-
Operating speed	min ⁻¹ (rpm)	72 000	72 000	60 000	60 000	60 000	60 000
Speed adjustment range	%	62 to 100	62 to 100	50 to 100	50 to 100	50 to 100	50 to 100
Run-up time, approx.	min	1.5	2	5.5	5.5	3.5	3.5
Ambient temperature							
during operation	°C	+5 to +45					
	(°F)	(+41 to +113)					
during storage	°C	-15 to +70					
	(°F)	(+5 to +158)					
Cooling							
standard		Convection					
optional		Air or water					
Cooling water connection		Plug connection for 6 x 1 hose					
alternatively		G 1/8" Screw-in thread					
Cooling water consumption	l/h	30 to 60	30 to 60	50 to 100	50 to 100	50 to 100	50 to 100
Permissible cooling water pressure	bar(g)	3 to 6					
Permissible cooling water temperature	°C	+15 to +35					
	(°F)	(+59 to +95)					
Noise level							
with convection cooling	db(A)	< 41	< 41	< 44	< 44	< 44	< 44
with radial cooler	db(A)	< 44	< 44	< 47	< 47	< 47	< 47
with axial cooler	db(A)	< 49	< 49	< 49	< 49	< 49	< 49

Additional Technical Data for the Frequency Converter (i Version)

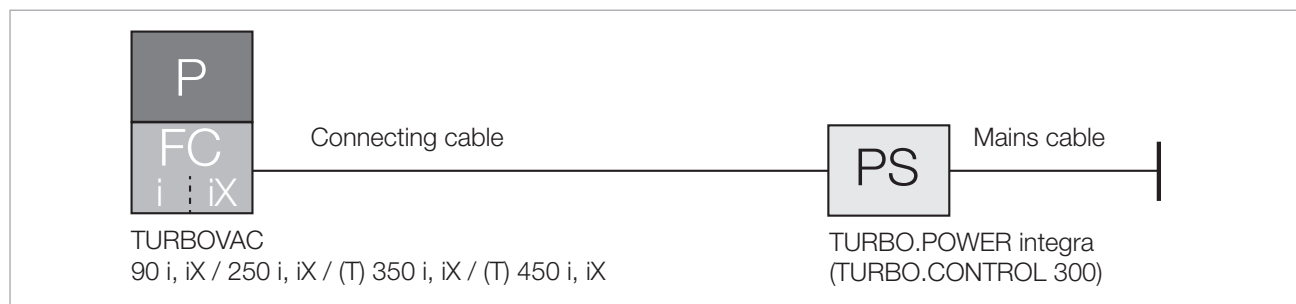
TURBOVAC

		90 i	250 i	350 i	450 i	T 350 i	T 450 i
Technical Data for the integrated Drive Electronics							
Supply voltage	V DC	24/48 ±10%					
Max. current consumption	A	10 at 24 V DC					
Max. power consumption	W	240					
Power consumption at ultimate pressure	W	20					
Type of protection	IP	40					
Interfaces		RS 485, USB, 15-pin digital I/O					
Other interfaces		Upon request					
Accessory connection		1 pcs. M 8 connector, 24 V DC					
Weight ISO-K / CF	kg (lbs)	3.1 / 4.8 (6.8 / 10.6)	4 / 6.6 (8.8 / 14.5)	7.5 / 11.5 (16.5 / 25.4)	7.7 / 12.5 (17.0 / 27.6)	7.0 / 11.0 (15.4 / 14.3)	7.2 / 12.0 (15.9 / 26.5)

Additional Technical Data for the Frequency Converter (iX-Version)

TURBOVAC

		90 iX	250 iX	350 iX	450 iX	T 350 iX	T 450 iX
Technical Data for the integrated Drive Electronics and Vacuum System Controller							
Supply voltage	V DC	24/48 ±10%					
Max. current consumption	A	10 at 24 V DC					
Max. power consumption	W	240					
Power consumption at ultimate pressure	W	20					
Type of protection	IP	40					
Interfaces		USB+, 15 pin Standard, Anybus (either RS 485, RS 232, Profibus, ...)					
Accessory connections		3 pcs. M 8 connector, 24 V DC					
Max. load for the 24 V DC output (cooler or valve supply)	V / W	24 / max. 12					
Gauge head connection		15-way Sub-D					
Weight ISO-K / CF	kg (lbs)	3.6 / 5.3 (7.9 / 11.7)	4.5 / 7.1 (9.9 / 15.6)	8.0 / 12.0 (17.6 / 26.5)	8.2 / 13.0 (18.1 / 28.7)	7.5 / 11.5 (16.5 / 25.4)	7.7 / 12.5 (17.0 / 27.6)



Ordering Information

TURBOVAC

	Wide Range			Classic		
	90 i	250 i	350 i	450 i	T 350 i	T 450 i
	Part No.	Part No.	Part No.	Part No.	Part No.	Part No.
TURBOVAC with integrated frequency converter, RS 485, USB+ and 15-Pin digital I/O interface						
DN 40 ISO-K	810011V1000	—	—	—	—	—
DN 63 ISO-K	810031V1000	—	—	—	—	—
DN 63 CF	810041V1000	—	—	—	—	—
DN 100 ISO-K	—	820051V1000	830051V1000	—	830050V1000	—
DN 100 CF	—	820061V1000	830061V1000	—	830060V1000	—
DN 160 ISO-K	—	—	—	830071V1000	—	830070V1000
DN 160 CF	—	—	—	830081V1000	—	830080V1000
other interfaces	Upon request					

	Wide Range			Classic		
	90 iX	250 iX	350 iX	450 iX	T 350 iX	T 450 iX
	Part No.	Part No.	Part No.	Part No.	Part No.	Part No.
TURBOVAC with integrated frequency converter, and vacuum system controller, RS 485, USB+ and 15-Pin digital I/O interface						
DN 63 ISO-K	810031V3300	—	—	—	—	—
DN 63 CF	810041V3300	—	—	—	—	—
DN 100 ISO-K	—	820051V3300	830051V3300	—	830050V3300	—
DN 100 CF	—	820061V3300	830061V3300	—	830060V3300	—
DN 160 ISO-K	—	—	—	830071V3300	—	830070V3300
DN 160 CF	—	—	—	830081V3300	—	830080V3300
other interfaces	Upon request					

Included in the Delivery of the Pump

High and forevacuum flanges are protective-capped

The flange mounting components and the inlet screen are not included in the delivery

Ordering Information

TURBOVAC (T)

90 i, iX / 250 i, iX / 350 i, iX / 450 i, iX

Mandatory Accessories	P P S	Part No.
Power supply TURBO.POWER integra, including 0.3 (1.1 ft) long cable		800100V0003
Mains cable, 3 m (10.5 ft)		
EU plug		800102V0002
UK plug		800102V0003
US plug 5-15P, 115 V		800102V1002
Cable pump – TURBO.POWER integra		
1 m (3.5 ft)		800096V0100
3 m (10.5 ft)		800096V0300
5 m (17.5 ft)		800096V0500
Mounting kit TURBOVAC		
DN 63 ISO-K		800134V0010
DN 100 ISO-K		800134V0020
DN 160 ISO-K		800134V0030
DN 100 ISO-K to ISO-F		800134V0025
DN 160 ISO-K to ISO-F		800134V0035
DN 63 CF		800134V0011
DN 100 CF		800134V0021
DN 160 CF		800134V0031

Forevacuum pumps TRIVAC D 4 B and TRIVAC D 16 B see Catalog Part “Oil Sealed Vacuum Pumps”

Forevacuum pumps SCROLLVAC 7 plus to SCROLLVAC 18 plus and DIVAC 3.8 HV3
see Catalog Part “Dry Compressing Vacuum Pumps”

Accessories, optional P	Part No.
Power supply, cable, other accessories	
24VDC display unit TURBO.CONTROL i	800100V0004
Plug-in power supply 24 V/DC – TURBO.CONTROL i	800110V0027
Standard cable for communication – TURBO.CONTROL i	
USB cable 2.0 Type A/B, 1.8 m (5.9 ft)	800110V0108
RS485 cable, 5 m (16.4 ft)	800103V0029
RS485 cable, 1 m (3.3 ft)	800103V0027
Power supply and control unit TURBO.CONTROL 300	800100V0001
Cable pump – TURBO.CONTROL 300	
1 m (3.3 ft)	800092V0100
3 m (10.5 ft)	800092V0300
5 m (16.4 ft)	800092V0500
Extension cable - only in combination with connecting cable 1m (3.5 ft)	
10 m (35 ft)	800092V1000
20 m (70 ft)	800092V2000
24/48 V DCIn plug TURBOVAC	800090V0000
USB-Kabel 2.0, Typ A/B, 1.8 m (5.9 ft) long	800110V0108
Y cable M 8	800110V0020
Relaybox for forevacuum pump, 1-phase, 10 A	800110V0030
Start stop switch	800110V0021
Cooling	
Air cooler	
TURBOVAC 90 i(X)	
radial	800136V0007
axial	800136V0008
TURBOVAC 250 i(X)	
radial	800136V0009
axial	800136V0008
TURBOVAC 350/450 i(X)	
radial	800136V0005
axial	800136V0006
Water cooling TURBOVAC i(X), connection thread G 1/8"	800135V0005
Water cooling TURBOVAC i(X), connection thread G 1/4"	800135V0006
Venting and purge gas	
Venting valve, 24 V DC, G 1/8"	800120V0012
Power failure venting valve, 24 V DC, G 1/8"	800120V0022
Purge gas valve, 24 V DC, G 1/8", 24 sccm	800120V0013
Purge gas throttle, 24 sccm	800120V0014
Air filter, G 1/8"	800110V0022
Heating	
Flange heater (needs mains cable, see above)	
DN 63 CF, 230 V	800137V0003
DN 63 CF, 115 V	800137V0004
DN 100 CF, 230 V	800137V0005
DN 100 CF, 115 V	800137V0006
DN 160 CF, 230 V	800137V0007
DN 160 CF, 115 V	800137V0008
Installation	
Vibration absorber	
DN 100 ISO-K	800131V1100
DN 160 ISO-K	500073
DN 100 CF	500071
DN 160 CF	500072
Centering ring	
with fine inlet screen, 0.8 mm (0.03") mesh	
DN 63 ISO-K/F	800133V0012
DN 100 ISO-K/F	800133V0022
DN 160 ISO-K/F	800133V0032
with coarse inlet screen, 3.2 mm (0.13") mesh	
DN 63 ISO-K/F	800133V0011
DN 100 ISO-K/F	800133V0021
DN 160 ISO-K/F	800133V0031
Fine Inlet screen, 0.8 mm (0.03") mesh	
DN 63 CF	800132V0012
DN 100 CF	800132V0022
DN 160 CF	800132V0032
Coarse inlet screen, 3.2 mm (0.13") mesh	
DN 63 CF	800132V0011
DN 100 CF	800132V0021
DN 160 CF	800132V0031

Special Turbomolecular Pumps



TURBOVAC i Multi Inlet Cartridge

Precision is key when it comes to analytical instruments.

Outfitted with two or more inlets, the innovative turbopumps with integrated drive electronics provide extraordinary pumping performance and are adaptable to the system requirements of each instrument.

In combination with our support for the whole vacuum system design, it will result in the best possible level of pump system integration you have ever experienced.



The TURBOVAC 350-400 i Multi Inlet line has been especially developed to meet the requirements of analytical instruments and features an extremely high level of flexibility, allowing you to choose the number, height and position of the multiple vacuum ports. The result: a pump that is perfectly fitted to your specific performance needs and installation requirements.

Additionally, we offer the support and experience in vacuum system design which opens a wide range of possibilities, from the adaptation of the pump housing to your vacuum chamber through to the design of a custom-built housing/chamber that meets your particular needs. Your benefit: optimum system integration of the pump(s) into your instrument and a reduced time to market.

Your Advantage

- Perfect integration of the pump(s) within your instrumentation
- Cutting of system costs
- Smaller size of the analytical system
- Reduction in the number of individual vacuum components
- Choice between cartridge and custom pump housing

In order to simplify installation, operation and control, all TURBOVAC i variants feature an integrated electronic drive with 24/48 V DC supply and a detachable operator interface with USB, RS 485 and digital I/O connections.

Performance

- Industry-leading pumping speed especially for light gases (up to 60 % higher than existing products)
- Optimized rotor diameter to provide maximum pumping performance
- > 40 l/s pumping speed at Inter-stage port 2

Flexibility

- Vacuum port design flexibility
 - Rotatable fore-vacuum port
 - Multiple interstage ports
 - High level of flexibility in terms of height and position of vacuum ports
- Unique cartridge solutions for optimized system integration with fast and simple field replacement
- Special pump housing solutions adapted to your instrument
- Complete vacuum system design including your vacuum chamber
- Variable rotor and Holweck design to adapt the performance to your application

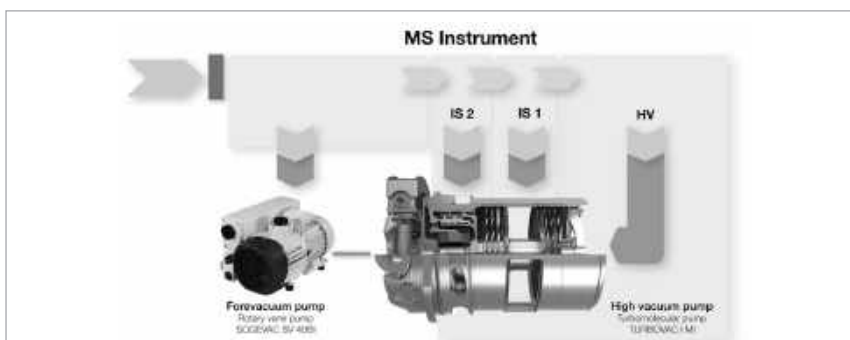
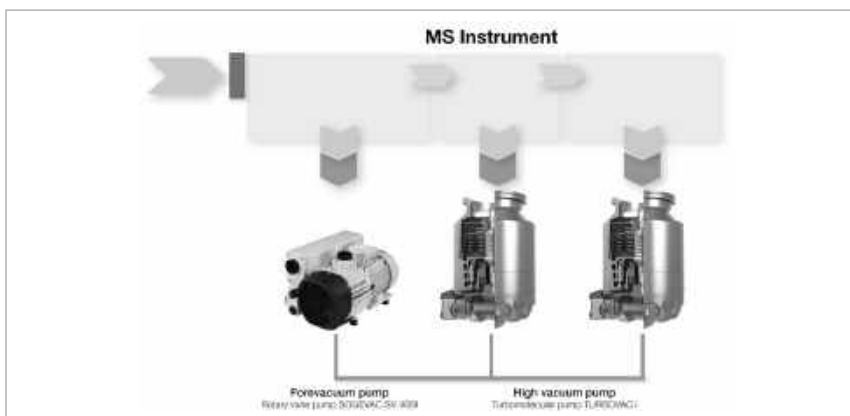
Installation, operation and control

- Integrated 24/48 V DC drive electronics to avoid expensive cabling
- Widest range of communication interfaces: USB, RS 485 and remote 15 pin digital I/O as standard options
- Highly efficient motor
- Thermal isolation by design for optimized cooling of bearing and improved pump lifetime
- Simply-supported shaft reduces vibration
- Maintenance free upper passive magnetic bearing
- Oil free, lifetime lubricated lower mechanical ceramic ball bearing, field-replaceable

Outstanding performance

Thanks to its variable rotor and drag stage design, our new Multi Inlet product line provides the highest performance for all mass spectrometer applications. With increased pumping speed levels especially for light gases which are up to 60% higher than those

offered by other products currently on the market, it provides significant advantages for your instruments: lower pressures, improved detection sensitivity levels and higher sample throughput rates.



Superior reliability

The unique maintenance and oil free hybrid bearing system is characterized by its extreme reliability and durability – that's because we equipped it with an innovative lifetime lubrication system that never needs an oil change. The simply-supported shaft system results in a low vibration pump design which reduces noise, mechanical stress and negative impact on vibration sensitive applications. Optimized cool-

ing of the bearings is ensured through thermal isolation and the highly efficient motor. To protect the bearings from critical gases or particles, all pumps are equipped with a purge port. As a consequence, not only pump lifetime is increased significantly, but also system uptime as well as productivity. In combination with low costs of ownership, the operation of your vacuum system will be more efficient than ever.

Advantages to the User

- High gas throughput
- High effective pumping speed
- High efficiency for analytical instruments
- High detection sensitivity
- High sample throughput
- Free of hydrocarbons
- Hybrid bearing suspension for low vibration levels
- Space and weight saving
- Low component count
- Favourable price-to-performance ratio
- Installation and user friendly
- Practically maintenance free

Typical Applications

For example

- LC-MS (linking of a liquid chromatograph to a mass spectrometer)
- GC/MS (linking of a gas chromatograph to a mass spectrometer)
- TOF-MS (time-of-flight mass spectrometer)
- ICP-MS (inductively coupled plasma mass spectrometry)
- Helium leak detectors

Technical Features

- Dual Inlet (pumping down of two analysis chambers)
- Triple inlet (pumping down of three analysis chambers)
- High effective pumping speed

HV stage	up to 400 l/s
Interstage IS 1	up to 300 l/s
Interstage IS 2	up to 50 l/s
- Cartridge solutions (without pump housing) are available
- Compact vacuum system

Customized versions are available upon request

MAG INTEGRA – Magnetic Rotor Suspension with integrated Frequency Converter, with Compound Stage

TURBOVAC MAG W 300/400 iP

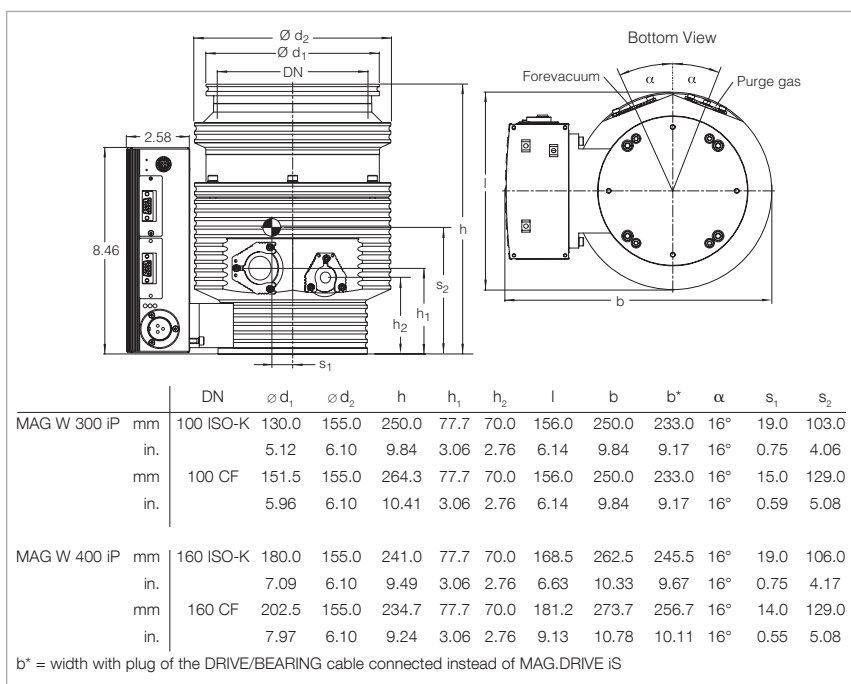


Typical Applications

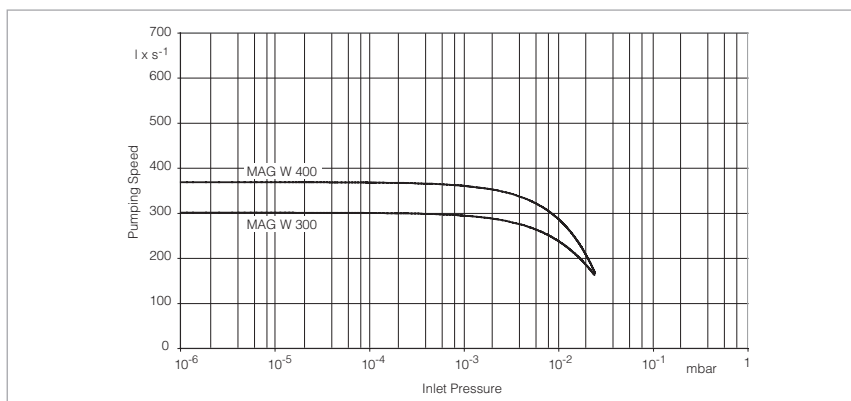
- Gas analysis systems
- Particle accelerators
- Electron microscopes
- Research
- Coating systems

Technical Features

- Installation in any orientation
- DN 100 or 160 ISO-K and/or CF high vacuum connection
- DN 16 ISO-KF with clamped fore vacuum connection
- Purge gas/venting connection DN 16 ISO-KF with clamped connection (purge/vent)
- Water or air cooling optional
- 2 slots for industrial communications modules
- Standard 9 pin 24 V SPS PLC-IO in Control Slot
- RS 232 C in Service Slot
- further interfaces can be fitted: Profibus, RS 485 C, DeviceNet, EtherNet IP, EtherCat



Dimensional drawing for the TURBOVAC MAG W 300/400 iP



Pumping speed for N_2 of the TURBOVAC MAG W 300/400 iP as a function of the inlet pressure

Advantages to the User

- Highest pumping speed from the smallest possible size
- New standard regarding maintenance-free systems
- Suitability for vibration sensitive applications in the area of analytical engineering, thin-film technology, electron microscopes, research, development among others
- Flexibility due to the modular concept; the converter is optionally also available by way of a bench top unit

Technical Data**TURBOVAC MAG****W 300 iP****W 400 iP**



Inlet flange	DN	100 ISO-K	100 CF	160 ISO-K	160 CF
Pumping speed					
N ₂	l/s	300	300	365	365
Ar	l/s	260	260	330	330
He	l/s	260	260	280	280
H ₂	l/s	190	190	200	200
Operating speed	min ⁻¹	58 800			
Compression ratio					
N ₂		1,0 x 10 ¹⁰			
H ₂		3,2 x 10 ³			
He		9,2 x 10 ⁴			
Ultimate pressure	mbar (Torr)	< 10 ⁻⁸ (< 0.75 x 10 ⁻⁸)	< 10 ⁻¹⁰ (< 0.75 x 10 ⁻¹⁰)	< 10 ⁻⁸ (< 0.75 x 10 ⁻⁸)	< 10 ⁻¹⁰ (< 0.75 x 10 ⁻¹⁰)
Max. degassing temperature	°C (°F)	–	80 (176)	–	80 (176)
Max. foreline pressure for N ₂	mbar (Torr)	8 (6)			
Recommended backing pump		TRIVAC D 2,5 E TRIVAC D 8 B			
Run-up time	min	< 5			
Foreline flange (clamped)	DN	16 ISO-KF			
Purge / vent port (clamped)	DN	16 ISO-KF			
Water cooling connection (optional)	G	1/8"			
Weight, approx.	kg (lbs)	12 (26)			

Technical Data**Integrated Frequency Converter****TURBO.DRIVE iS**

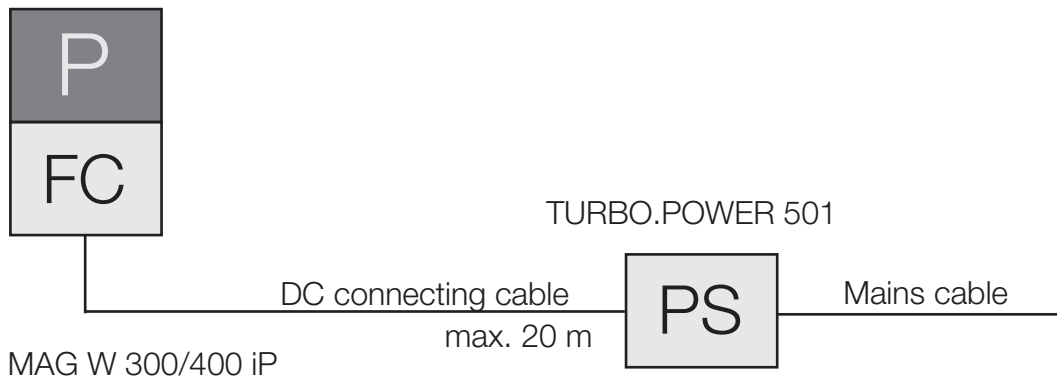
Power supply	V	48
Ripple	%	< 2
Power consumption		
maximum	W	400
at ultimate pressure	W	259
DC current consumption, max.	A	7.5 to 9.3
DC power supply voltage range	V	43 to 53
Length of the DC connection cable, max.		
at 3 x 1,5 mm ²	m (ft)	5 (17.5)
at 3 x 2,5 mm ²	m (ft)	20 (70.0)
Contact rating for the relays, max.		32 V; 0.5 A
Permissible ambient temperature		
during operation	°C (°F)	+10 to +40 (+50 to +104)
during storage	°C (°F)	0 to +60 (0 to +140)
Relative humidity of the air, non-condensing	%	5 to 85
Protection class	IP	30
Overvoltage category		II
Pollution category		2

Ordering Information

TURBOVAC MAG W 300/400 iP

TURBOVAC MAG W 300 iP with Integrated Frequency Converter and Seal Gas Connection	Part No.	
DN 100 ISO-K DN 100 CF	410300V0505 410300V0506	
TURBOVAC MAG W 400 iP with Integrated Frequency Converter and Seal Gas Connection	Part No.	
DN 160 ISO-K DN 160 CF	410400V0505 410400V0506	
Mandatory Accessories	Part No.	
Power supply TURBO.POWER 501	410300V5221	
DC cable frequency converter - power supply 1 m (3.5 ft) 3 m (10.5 ft) 5 m (17.5 ft) 10 m (35.0 ft) 20 m (70.0 ft)	410300V2001 410300V2003 410300V2005 410300V2010 410300V2020	
Mains cable, 3 m (10.5 ft) with EURO plug with US plug 5-15 P	800102V0002 800102V1002	
Forevacuum pump TRIVAC D 2,5 E 220 – 240 V, 50 Hz; 230 V, 60 Hz; Schuko plug, EURO version 110 – 120 V, 50/60 Hz; NEMA plug, US version	140 000 140 002	
TRIVAC D 8 B 1 phase motor; 230 V, 50/60 Hz 3 phase motor; 230/400 V, 50 Hz; 250/440 V, 60 Hz	112 55 112 56	

With integrated Frequency Converter



Ordering Information

TURBOVAC MAG W 300/400 iP

Optionales Zubehör	P	Part No.
Inlet screen		
DN 100 ISO-K		
coarse (3.2 x 3.2 mm (0.13 x 0.13 in.))		800132V0101
fine (1.6 x 1.6 mm (0.06 x 0.06 in.))		800132V0102
DN 100 CF		
coarse (3.2 x 3.2 mm (0.13 x 0.13 in.))		200 91 514
fine (1.6 x 1.6 mm (0.06 x 0.06 in.))		E 200 17 195
DN 160 ISO-K		E 200 00 307
DN 160 CF		E 200 17 247
Flange heater		
100 CF, 230 V, 50 Hz		854 27
100 CF, 115 V, 60 Hz		854 28
160 CF, 230 V, 50 Hz		854 37
160 CF, 115 V, 60 Hz		854 38
Water cooling unit		410300V0101
Air cooling unit		410300V0102
START/STOP switch for manual operation of the turbomolecular pump		152 48
DC plug		800 001 694
Solenoid venting valve, normally closed		
24 V DC, DN 16 ISO-KF		800120V0011
Power failure venting valve, normally open		800120V0021
Included in the Delivery of the Pump	P	
Flanges for forevacuum, venting and purge gas are blank-flanged		
Centering ring with FPM sealing ring and a clamping yoke		

MAG INTEGRA – Magnetic Rotor Suspension with integrated Frequency Converter, with Compound Stage

TURBOVAC MAG W 600/700 iP

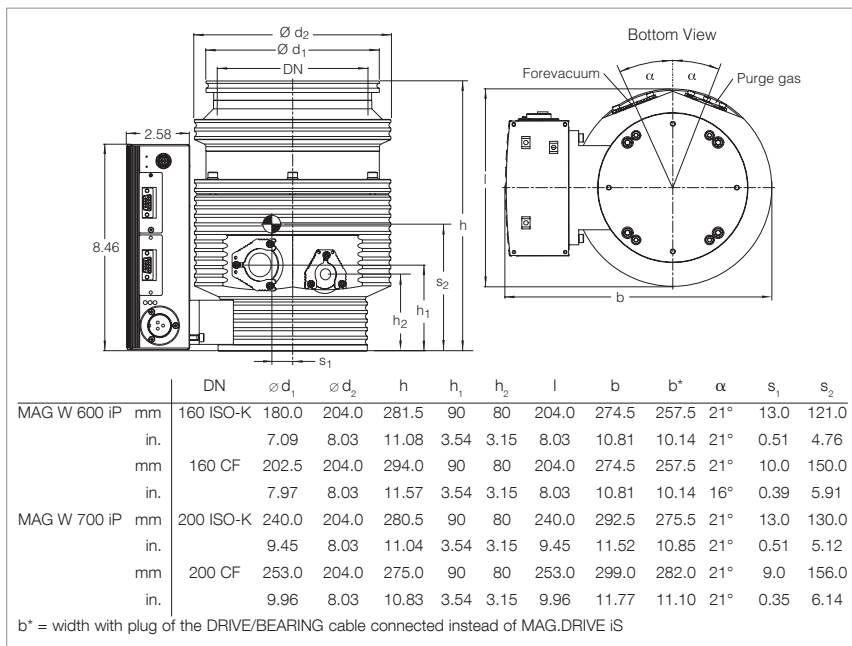


Typical Applications

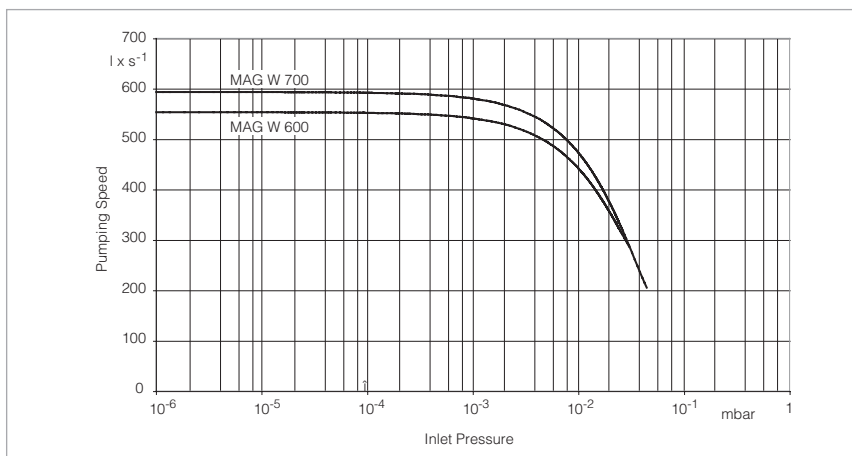
- Gas analysis systems
- Particle accelerators
- Electron microscopes
- Research
- Coating systems

Technical Features

- Installation in any orientation
- DN 160 or 200 ISO-K and/or CF high vacuum connection
- DN 25 ISO-KF with clamped fore-vacuum connection
- Purge gas/venting connection DN 16 ISO-KF with clamped connection (purge/vent)
- Water or air cooling optional
- 2 slots for industrial communications modules
- Standard 9 pin 24 V SPS PLC-IO in Control Slot
- RS 232 C in Service Slot
- further interfaces can be fitted: Profibus, RS 485 C, DeviceNet, EtherNet IP, EtherCat



Dimensional drawing for the TURBOVAC MAG W 600/700 iP



Pumping speed for N₂ of the TURBOVAC MAG W 600/700 iP as a function of the inlet pressure

Advantages to the User

- Highest pumping speed from the smallest possible size
- New standard regarding maintenance-free systems
- Suitability for vibration sensitive applications in the area of analytical engineering, thin-film technology, electron microscopes, research, development among others
- Flexibility due to the modular concept; the converter is optionally also available by way of a bench top unit

Technical Data

TURBOVAC MAG

W 600 iP

W 700 iP

Inlet flange	DN	160 ISO-K	160 CF	200 ISO-K	200 CF
Pumping speed					
N ₂	l/s	550	550	590	590
Ar	l/s	520	520	540	540
He	l/s	570	570	600	600
H ₂	l/s	410	410	430	430
Operating speed	min ⁻¹	48 000			
Compression ratio					
N ₂		1.6 x 10 ¹⁰			
H ₂		3.4 x 10 ⁴			
He		1.7 x 10 ⁶			
Ultimate pressure	mbar (Torr)	< 10 ⁻⁸ (< 0.75 x 10 ⁻⁸)	< 10 ⁻¹⁰ (< 0.75 x 10 ⁻¹⁰)	< 10 ⁻⁸ (< 0.75 x 10 ⁻⁸)	< 10 ⁻¹⁰ (< 0.75 x 10 ⁻¹⁰)
Max. degassing temperature	°C (°F)	–	80 (176)	–	80 (176)
Max. foreline pressure for N ₂	mbar (Torr)	6.0 (4.5)			
Recommended backing pump		TRIVAC D 2,5 E TRIVAC D 8 B			
Run-up time	min	< 6			
Foreline flange (clamped)	DN	25 ISO-KF			
Purge / vent port (clamped)	DN	16 ISO-KF			
Water cooling connection (optional)	G	1/8"			
Weight, approx.	kg (lbs)	17 (37.5)			

Technical Data



Integrated Frequency Converter

TURBO.DRIVE iS

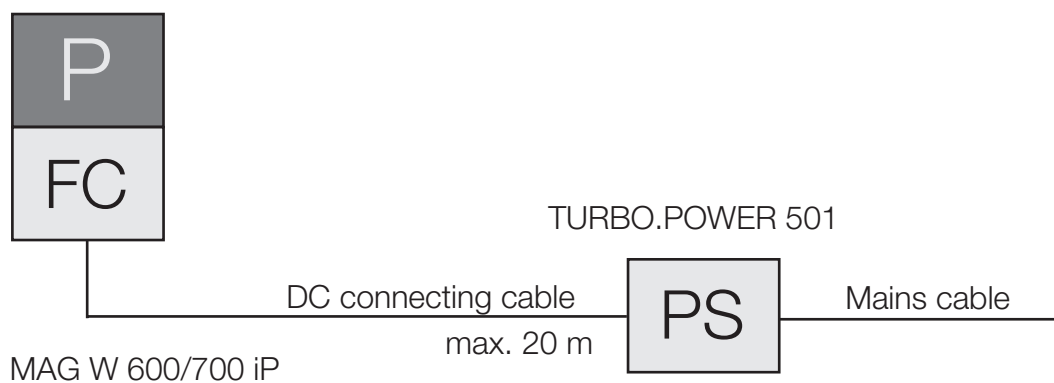
Power supply	V	48
Ripple	%	< 2
Power consumption		
maximum	W	400
at ultimate pressure	W	259
DC current consumption, max.	A	7.5 to 9.3
DC power supply voltage range	V	43 to 53
Length of the DC connection cable, max.		
at 3 x 1,5 mm ²	m (ft)	5 (17.5)
at 3 x 2,5 mm ²	m (ft)	20 (70.0)
Contact rating for the relays, max.		32 V; 0.5 A
Permissible ambient temperature		
during operation	°C (°F)	+10 to +40 (+50 to +104)
during storage	°C (°F)	0 to +60 (0 to +140)
Relative humidity of the air, non-condensing	%	5 to 85
Protection class	IP	30
Overvoltage category		II
Pollution category		2

Ordering Information

TURBOVAC MAG W 600/700 iP

TURBOVAC MAG W 600 iP with Integrated Frequency Converter and Seal Gas Connection	Part No.	
DN 160 ISO-K DN 160 CF	410600V0505 410600V0506	
TURBOVAC MAG W 700 iP with Integrated Frequency Converter and Seal Gas Connection	Part No.	
DN 200 ISO-K DN 200 CF	410700V0505 410700V0506	
Mandatory Accessories	Part No.	
Power supply TURBO.POWER 501	410300V5221	
DC cable frequency converter – power supply 1 m (3.5 ft) 3 m (10.5 ft) 5 m (17.5 ft) 10 m (35.0 ft) 20 m (70.0 ft)	410300V2001 410300V2003 410300V2005 410300V2010 410300V2020	
Mains cable, 3 m (10.5 ft) with EURO plug with US plug 5-15 P	800102V0002 800102V1002	
Forevacuum pump TRIVAC D 2,5 E 220 – 240 V, 50 Hz; 230 V, 60 Hz; Schuko plug, EURO version 110 – 120 V, 50/60 Hz; NEMA plug, US version	140 000 140 002	
TRIVAC D 8 B 1 phase motor; 230 V, 50/60 Hz 3 phase motor; 230/400 V, 50 Hz; 250/440 V, 60 Hz	112 55 112 56	

With integrated Frequency Converter



Ordering Information

TURBOVAC MAG W 600/700 iP

Accessories, optional P	Part No.
Inlet screen	
DN 160 ISO-K	E 200 00 307
DN 160 CF	E 200 17 247
DN 200 ISO-K	200 91 639
DN 200 CF	400 001 515
Flange heater	
160 CF, 230 V, 50 Hz	854 37
160 CF, 115 V, 60 Hz	854 38
Water cooling unit	410300V0101
Air cooling unit	410300V0102
START/STOP switch for manual operation of the turbomolecular pump	152 48
DC plug	800 001 694
Solenoid venting valve, normally closed 24 V DC, DN 16 ISO-KF	800120V0011
Power failure venting valve, normally open	800120V0021
Included in the Delivery of the Pump P	
Flanges for forevacuum, venting and purge gas are blank-flanged	
Centering ring with FPM sealing ring and a clamping yoke	

MAG INTEGRA – Magnetic Rotor Suspension with integrated Frequency Converter, with and without Compound Stage

TURBOVAC MAG W 1300 iP(L) to 2201 iP(L)

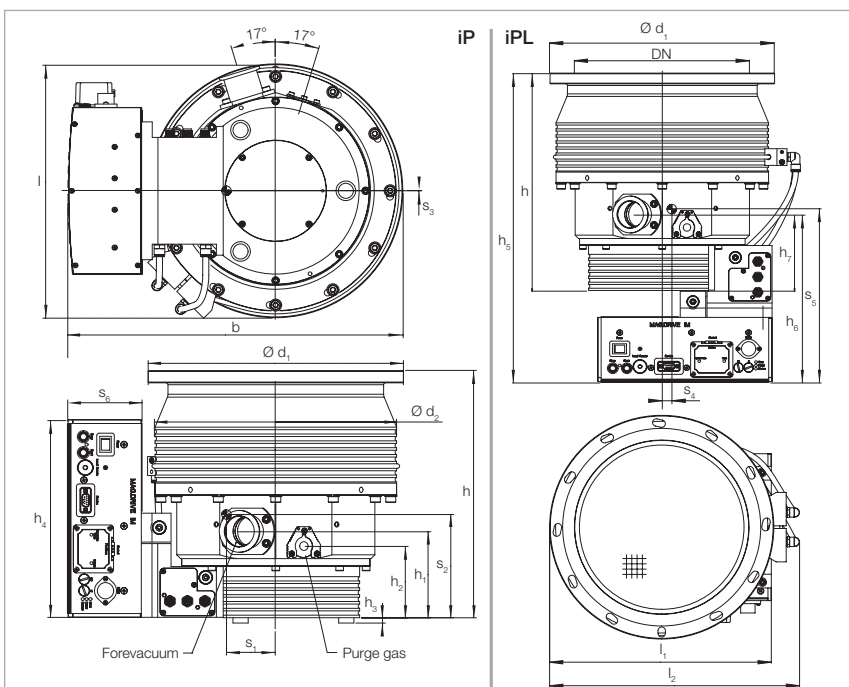


Typical Applications

- PVD coatings systems
- Coating of architectural glass
- Optical coatings
- LC displays
- Flat panels
- Research
- Analytical systems

Technical Features

- Installation in any orientation
- DN 200 and/or 250 in ISO-F and/or CF high vacuum connection
- DN 40 KF forevacuum connection
- Purge gas/venting connection
DN 16 KF with clamped connection (purge/vent)
- Water cooling
- Protection class IP 54
- RS 232 C in Service Slot
- 1 slot for industrial communications modules
- Standard ProfiBus
- further interfaces can be fitted:
RS 485 C, 9 pin 24 V PLC,
DeviceNet, EtherNet IP, EtherCat



Type	DN		b	d ₁	d ₂	h	h ₁	h ₂	h ₃	h ₄	h ₅	h ₆
MAG W 1300	200 ISO-F	mm	420 ¹⁾	285	285	305	114	94	7	260	442	251
		in.	16.54 ¹⁾	11.22	11.22	12.01	4.49	3.70	0.38	10.24	17.40	9.88
	200 CF	mm	416	254	285	335	114	94	7	260	472	251
		in.	16.38	10.00	11.22	13.19	4.49	3.70	0.38	10.24	18.58	9.88
MAG W 1600/1601/1700	250 ISO-F	mm	442	335	317	325	114	94	7	260	463	251
		in.	17.40	13.19	12.48	12.80	4.49	3.70	0.38	10.24	18.23	9.88
	250 CF	mm	432	305	317	330	114	94	7	260	467	251
		in.	17.01	12.01	12.48	12.99	4.49	3.70	0.38	10.24	18.39	9.88
MAG W 2200/2201	250 ISO-F	mm	450	335	349	355	114	94	7	260	492	251
		in.	17.18	13.19	13.74	13.19	4.49	3.70	0.38	10.24	19.37	9.88
	250 CF	mm	446	305	349	372	114	94	7	260	506	251
		in.	17.56	12.01	13.74	14.65	4.49	3.70	0.38	10.24	19.92	9.88
			h ₇	l	l ₁	l ₂	s ₁	s ₂	s ₃	s ₄	s ₅	s ₆
MAG W 1300	200 ISO-F	mm	114	311 ¹⁾	311 ¹⁾	332 ¹⁾	42	140	0	15	241	98
		in.	4.49	12.24 ¹⁾	12.24 ¹⁾	13.07 ¹⁾	1.65	5.51	0	0.59	9.49	3.86
	200 CF	mm	114	307	307	–	32	164	0	–	–	98
		in.	4.49	12.09	12.09	–	1.26	6.46	0	–	–	3.86
MAG W 1600/1601/1700	250 ISO-F	mm	114	335	331	374	39	154	0	14	259	98
		in.	4.49	13.19	12.24	14.72	1.54	6.06	0	0.55	10.20	3.86
	250 CF	mm	114	335	322	–	29	173	0	9	285	98
		in.	4.49	13.19	12.68	–	1.14	6.81	0	0.35	11.22	3.86
MAG W 2200/2201	250 ISO-F	mm	114	343	340	392	34	165	0	12	272	98
		in.	4.49	13.50	13.39	15.43	1.34	6.50	0	0.47	10.71	3.86
	250 CF	mm	114	339	340	–	26	187	0	8	302	98
		in.	4.49	13.35	13.39	–	1.02	7.36	0	0.32	11.89	3.86

¹⁾ 4 mm (0.16 in.) for cooling coil

Dimensional drawing for the MAG INTEGRA, dimensions in mm

Advantages to the User

- Highest pumping speed and gas throughput from a very small size
- Rugged and reliable operation in industrial applications
- Sets new benchmarks for maintenance-free systems
- Suited for vibration sensitive applications in the areas of analytical, thin-film, electron microscopy, research and development among others.
- Flexibility through the modular concept; the converter is either attached to the side or under the pump

Technical Data

TURBOVAC MAG W

1300 iP(L) 1600 iP(L) 1601 iP(L) 1700 iP(L) 2200 iP(L) 2201 iP(L)
 Booster Booster

Inlet flange	DN	200 ISO-F 200 CF	250 ISO-F	250 ISO-F	250 ISO-F 250 CF	250 ISO-F 250 CF	250 ISO-F
Pumping speed							
N ₂	l/s	1100	1600	1600	1610	2100	2100
Ar	l/s	1050	1470	1470	1480	1900	1900
He	l/s	1220	1770	1770	1710	2050	2050
H ₂	l/s	1130	1570	1570	1500	1750	1750
Operating speed							
standby speed adjustable from to nominal speed	min ⁻¹ min ⁻¹	37 800 13 800 (230 Hz)	33 000 13 800 (230 Hz)	33 000 13 800 (230 Hz)	33 000 13 800 (230 Hz)	30 600 13 800 (230 Hz)	30 000 13 800 (230 Hz)
Max. compression ratio							
N ₂		> 10 ⁸	> 10 ⁷	> 10 ⁷	> 10 ⁸	> 10 ⁸	> 10 ⁸
Ar		> 10 ⁸	> 10 ⁷	> 10 ⁷	> 10 ⁸	> 10 ⁸	> 10 ⁸
He at 1 sccm		2 x 10 ⁵	6 x 10 ⁴	3 x 10 ³	2 x 10 ⁵	5 x 10 ⁴	5 x 10 ³
H ₂ at 1 sccm		8 x 10 ³	1 x 10 ³	5 x 10 ²	4 x 10 ³	5 x 10 ³	5 x 10 ²
Max. gas throughput							
N ₂ briefly, e.g. during pumpdown	mbar x l/s	30	60	60	30	30	50
N ₂ in continuous operation	mbar x l/s	20	30	40	20	17	36
Ar briefly, e.g. during pumpdown	mbar x l/s	20	30	30	20	20	30
Ar in continuous operation	mbar x l/s	15	20	25	15	12	24
Ultimate pressure							
ISO-F flange	mbar (Torr)	< 10 ⁻⁸ (< 7.5 x 10 ⁻⁹)	< 10 ⁻⁸ (< 7.5 x 10 ⁻⁹)	< 10 ⁻⁸ (< 7.5 x 10 ⁻⁹)	< 10 ⁻⁸	< 10 ⁻⁸	< 10 ⁻⁸ (< 7.5 x 10 ⁻⁹)
CF flange	mbar (Torr)	< 10 ⁻¹⁰ (< 7.5 x 10 ⁻¹¹)	—	—	< 10 ⁻¹⁰ (< 7.5 x 10 ⁻¹¹)	< 10 ⁻¹⁰ (< 7.5 x 10 ⁻¹¹)	—
Max. degassing temperature	°C (°F)	80 (176)					
Max. foreline pressure							
N ₂	mbar (Torr)	4.0 (3.00)	1.0 (0.75)	1.0 (0.75)	4.0 (3.00)	2.5 (1.9)	1.2 (0.91)
Ar	mbar (Torr)	0.6 (0.45)	1.0 (0.75)	1.0 (0.75)	0.6 (0.45)	2.5 (1.9)	1.2 (0.91)
Recommended backing pump		TRIVAC B or dry compressing pumps					
Run-up time	min	< 5	< 7	< 7	< 7	< 10	< 10
Foreline flange	DN	40 KF					
Purge / vent port (clamped)	DN	16 KF					
Water cooling connection	G	1/8"					
Weight, approx.	kg (lbs)	40 (88)	45 (99)	45 (99)	45 (99)	50 (110)	50 (110)
Noise level acc. ISO 3744	dB(A)	< 41					
Vibration level at high vacuum flange at max. speed	µm	0.01					

Technical Data


Integrated Frequency Converter

MAG.DRIVE iM

Power supply	V	200 – 240 ±10%
Mains frequency	Hz	50 / 60
Power consumption		
maximum	W	750
at ultimate pressure	W	150
Contact rating for the relays, max.		32 V; 0.5 A
Permissible ambient temperature		
during operation	°C (°F)	+10 to +45 (+50 to +113)
during storage	°C (°F)	-10 to +60 (+14 to +140)
Relative humidity of the air, non-condensing	%	5 to 85
Protection class	IP	54
Overvoltage category		II
Pollution category		2

Ordering Information

TURBOVAC MAG W1300/1600/1601/ 1700/2200/2201 iP(L)

TURBOVAC MAG W 1300 with Integrated Frequency Converter and Purge Gas Connection	Part No.	
MAG W 1300 iP, DN 200 ISO-F, Profibus MAG W 1300 iP, DN 200 ISO-F, 24 V SPS interface MAG W 1300 iP, DN 200 CF, Profibus MAG W 1300 iP, DN 200 CF, 24 V SPS interface MAG W 1300 iPL, DN 200 ISO-F, Profibus MAG W 1300 iPL, DN 200 ISO-F, 24 V SPS interface MAG W 1300 iPL, DN 200 CF, Profibus MAG W 1300 iPL, DN 200 CF 24 V SPS interface	411300V0504 411300V0514 411300V0506 411300V0516 411300V0704 411300V0714 411300V0706 411300V0716	
TURBOVAC MAG W 1600 Booster with Integrated Frequency Converter and Purge Gas Connection	Part No.	
MAG W 1600 iP Booster, DN 250 ISO-F, Profibus MAG W 1600 iP Booster, DN 250 ISO-F, 24 V SPS interface MAG W 1600 iPL Booster, DN 250 ISO-F, Profibus MAG W 1600 iPL Booster, DN 250 ISO-F, 24 V SPS interface	411600V0504 411600V0514 411600V0704 411600V0714	
TURBOVAC MAG 1601 Booster with Integrated Frequency Converter and Purge Gas Connection	Part No.	
MAG 1601 iP Booster, DN 250 ISO-F, Profibus MAG 1601 iP Booster, DN 250 ISO-F, 24 V SPS interface MAG 1601 iPL Booster, DN 250 ISO-F, Profibus MAG 1601 iPL Booster, DN 250 ISO-F, 24 V SPS interface	411600V2504 411600V2514 411600V2704 411600V2714	
TURBOVAC MAG W 1700 with Integrated Frequency Converter and Purge Gas Connection	Part No.	
MAG W 1700 iP, DN 250 ISO-F, Profibus MAG W 1700 iP, DN 250 ISO-F, 24 V SPS interface MAG W 1700 iP, DN 250 CF, Profibus MAG W 1700 iP, DN 250 CF, 24 V SPS interface MAG W 1700 iPL, DN 250 ISO-F, Profibus MAG W 1700 iPL, DN 250 ISO-F, 24 V SPS interface MAG W 1700 iPL, DN 250 CF, Profibus MAG W 1700 iPL, DN 250 CF, 24 V SPS interface	411700V0504 411700V0514 411700V0506 411700V0516 411700V0704 411700V0714 411700V0706 411700V0716	
TURBOVAC MAG W 2200 with Integrated Frequency Converter and Purge Gas Connection	Part No.	
MAG W 2200 iP, DN 250 ISO-F, Profibus MAG W 2200 iP, DN 250 ISO-F, 24 V SPS interface MAG W 2200 iP, DN 250 CF, Profibus MAG W 2200 iP, DN 250 CF, 24 V SPS interface MAG W 2200 iPL, DN 250 ISO-F, Profibus MAG W 2200 iPL, DN 250 ISO-F, 24 V SPS interface MAG W 2200 iPL, DN 250 CF, Profibus MAG W 2200 iPL, DN 250 CF, 24 V SPS interface	412200V0504 412200V0514 412200V0506 412200V0516 412200V0704 412200V0714 412200V0706 412200V0716	
TURBOVAC MAG 2201 Booster with Integrated Frequency Converter and Purge Gas Connection	Part No.	
MAG 2201 iP, DN 250 ISO-F, Profibus MAG 2201 iP, DN 250 ISO-F, 24 V SPS interface MAG 2201 iPL, DN 250 ISO-F, Profibus MAG 2201 iPL, DN 250 ISO-F, 24 V SPS interface	412200V2504 412200V2514 412200V2704 412200V2714	

Other interfaces upon request

With integrated Frequency Converter and Power Supply

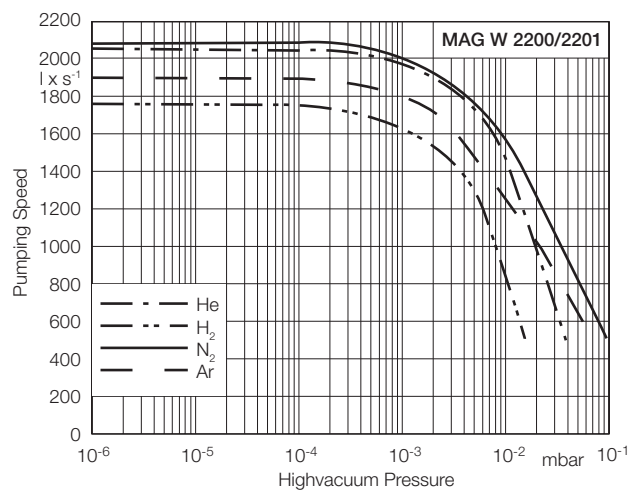
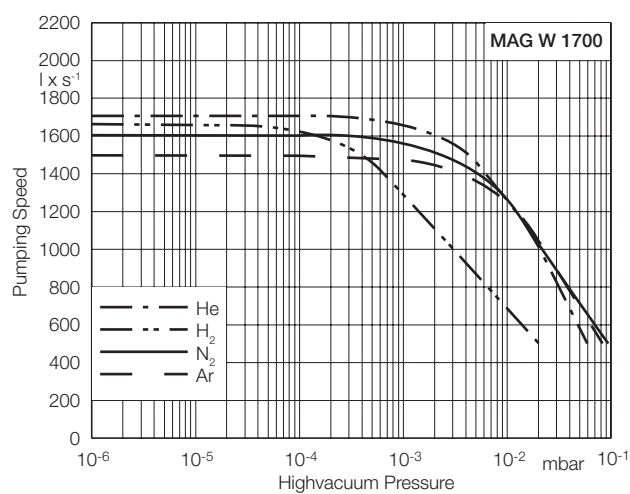
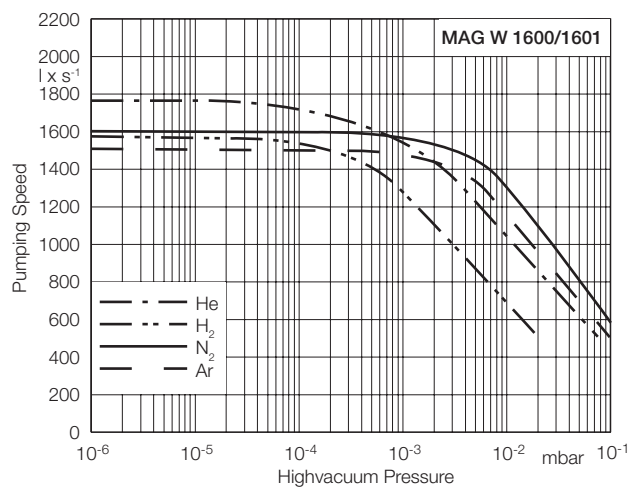
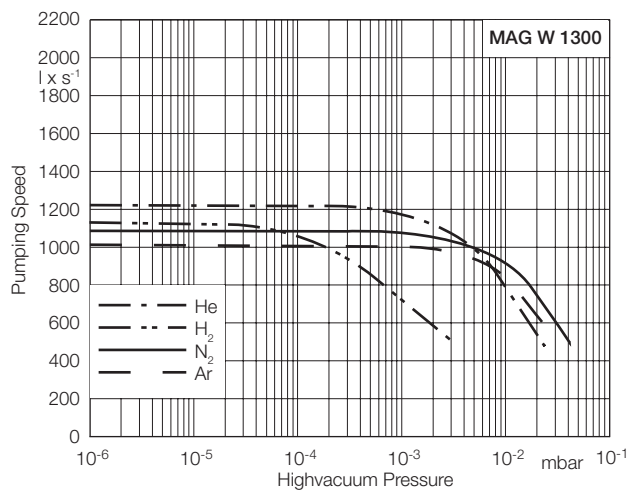


MAG W 1300 iP(L),
MAG W 1600/1601 iP(L) Booster,
MAG W 1700 iP(L),
MAG W 2200/2201 iP(L)

Ordering Information

TURBOVAC MAG W1300/1600/1601/ 1700/2200/2201 iP(L)

Mandatory Accessories P	Part No.
Set of bolts, nuts and washers for ISO-F flange (12 each) Bolts M 10 x 50 Bolts M 10 x 35	400153V0012 400153V0010
Centering with O-ring Al/FPM DN 200 DN 250 Stainless steel/FPM DN 200 DN 250	268 44 268 45 887 02 887 08
Set of bolts, nuts and washers for CF flange (8 each) Bolts M 8 x 40 (For DN 200, 3 sets are required; for DN 250, 4 sets)	400153V0016
Copper gasket rings for CF flange DN 200 (Set of 10 pieces) DN 250 (Set of 5 pieces)	839 47 839 48
Set of hex. bolts with nuts, bolts and washers for CF flange DN 200 DN 250 (2 sets required)	839 07 839 07
Accessories, optional P FC PS	
Mains cable, 2.5 m (8.75 ft) with EURO plug with US plug	411310V03 411320V03
Seal Kit DN 250 Metal	200 07 901
Seal kit, metal, for other flanges	Upon request
Purge gas and venting valve 24 V DC 0.6 mbar·l/s at 1.5 to 6 bar 0.6 mbar·l/s at 1 to 1.5 bar Cable set (2 pieces) for connection to the pump	121 33 800152V0010 411300V01
Cooling water valve kit	411300V02
Spare Parts Inlet screen DN 200 ISO-F and DN 200 CF DN 250 ISO-F and DN 250 CF	E 200 04 558 E 200 04 557
Included in the Delivery of the Pump P	
Flanges for forevacuum, venting and purge gas are blank-flanged	
Converter-side mains plug (IP 54)	
Inlet screen	



Pumping speed curves of the MAG W 1300, W 1600, W 1700 and W 2200

MAG INTEGRA – Magnetic Rotor Suspension with separate Frequency Converter, with Compound Stage

TURBOVAC MAG W 300/400 P



Typical Applications

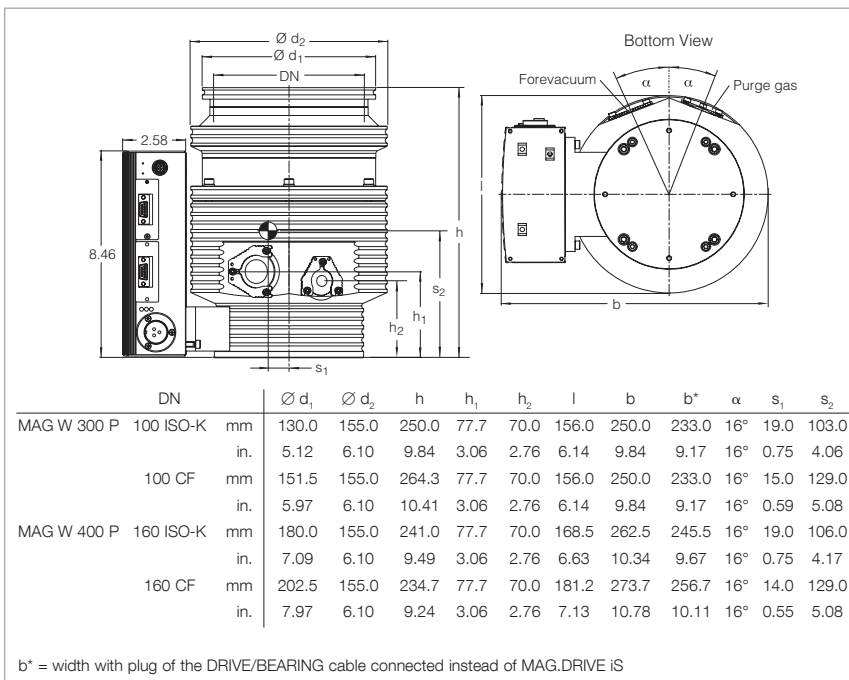
- Gas analysis systems
- Particle accelerators
- Electron microscopes
- Research
- Coating systems

Technical Features

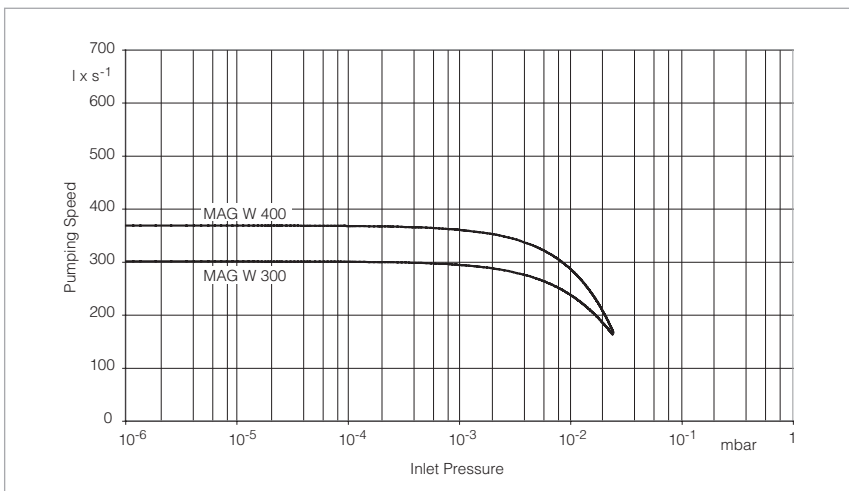
- Installation in any orientation
- DN 100 or 160 ISO-K and/or CF high vacuum connection
- DN 16 ISO-KF with clamped forevacuum connection
- Purge gas/venting connection DN 16 ISO-KF with clamped connection (purge/vent)
- Water or air cooling optional

Advantages to the User

- Highest pumping speed from the smallest possible size
- New standard regarding maintenance-free systems
- Suitability for vibration sensitive applications in the area of analytical engineering, thin-film technology, electron microscopes, research, development among others
- Flexibility due to the modular concept; alternatively the pump is available also with an integrated frequency converter



Dimensional drawing for the TURBOVAC MAG W 300/400 P



Pumping speed for N₂ of the TURBOVAC MAG W 300/400 P as a function of the inlet pressure

Technical Data

TURBOVAC MAG

W 300 P

W 400 P

Inlet flange	DN	100 ISO-K	100 CF	160 ISO-K	160 CF
Pumping speed					
N ₂	l/s	300	300	365	365
Ar	l/s	260	260	330	330
He	l/s	260	260	280	280
H ₂	l/s	190	190	200	200
Operating speed	min ⁻¹	58 800			
Compression ratio					
N ₂		1,0 x 10 ¹⁰			
H ₂		3,2 x 10 ³			
He		9,2 x 10 ⁴			
Ultimate pressure	mbar (Torr)	< 10 ⁻⁸ (< 0.75 x 10 ⁻⁸)	< 10 ⁻¹⁰ (< 0.75 x 10 ⁻¹⁰)	< 10 ⁻⁸ (< 0.75 x 10 ⁻⁸)	< 10 ⁻¹⁰ (< 0.75 x 10 ⁻¹⁰)
Max. degassing temperature	°C (°F)	–	80 (176)	–	80 (176)
Max. foreline pressure for N ₂	mbar (Torr)	8 (6)			
Recommended backing pump		TRIVAC D 2,5 E TRIVAC D 8 B			
Run-up time	min	< 5			
Foreline flange (clamped)	DN	16 ISO-KF			
Purge / vent port (clamped)	DN	16 ISO-KF			
Water cooling connection (optional)	G	1/8"			
Weight, approx.	kg (lbs)	12 (26)			



Technical Data

MAG.DRIVE S

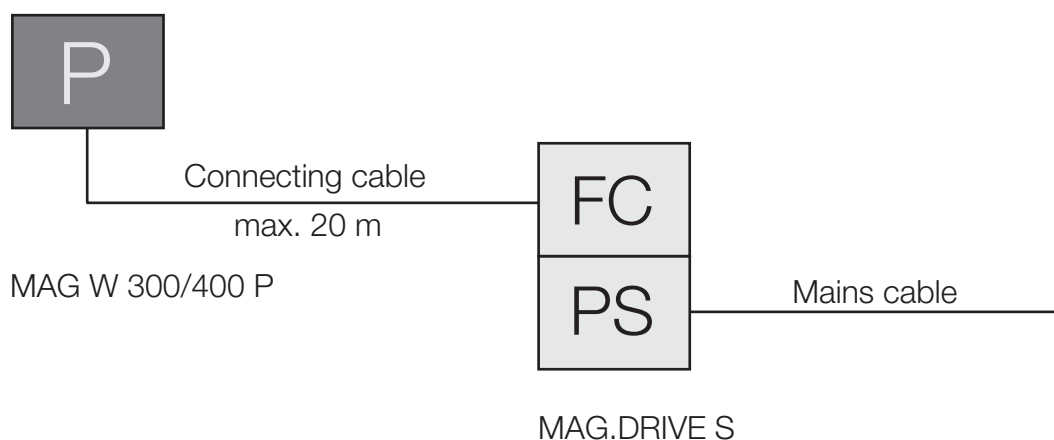
Voltage range	V	100 – 240, ±10 %
Nominal frequency	Hz	50 / 60
Power consumption		
stand-by	W	100
maximum	W	400
Max. motor voltage	V	48
Max. pump current	A	6
Fuses F1, F2 5 x 20 mm		10 A fast blow high breaking capacity 250 V
System fuse		L or G characteristic
Max. frequency	Hz	0 to 2000
Load capability, relay output X1	V/A	32 / 0.5
Temperature		
during operation	°C (°F)	0 to +45 (+32 to +113)
during storage	°C (°F)	-10 to +60 (+14 to +140)
Relative humidity of the air	%	95 (non-condensing)

Ordering Information

TURBOVAC MAG W 300/400 P

TURBOVAC MAG W 300 P with separate Frequency Converter and Compound Stage		Part No.	
<div> <div>P</div> </div> DN 100 ISO-K DN 100 CF		410300V0005 410300V0006	
TURBOVAC MAG W 400 P with separate Frequency Converter and Compound Stage		Part No.	
<div> <div>P</div> </div> DN 160 ISO-K DN 160 CF		410400V0005 410400V0006	
Mandatory Accessories		Part No.	
<div> <div>P</div> <div>FC</div> </div> Electronic frequency converter MAG.DRIVE S with display		410300V0212	
Connecting cable DRIVE/BEARING (connection between pump and MAG.DRIVE S) 3.0 m (10.5 ft) 5.0 m (17.5 ft) 10.0 m (35.0 ft) 20.0 m (70.0 ft)		410300V4003 410300V4005 410300V4010 410300V4020	
Mains cable 3.0 m (10.5 ft) EURO plug US plug 5-15 P		800102V0002 800102V1002	
Mains cable 2.0 m (7.5 ft) US plug 115 V AC		992 76 513	
Forevacuum pump TRIVAC D 2,5 E 220 – 240 V, 50 Hz; 230 V, 60 Hz; Schuko plug, EURO version 110 – 120 V, 50/60 Hz; NEMA plug, US version		140 000 140 002	
TRIVAC D 8 B 1 phase motor; 230 V, 50/60 Hz 3 phase motor; 230/400 V, 50 Hz; 250/440 V, 60 Hz		112 55 112 56	

With separate Frequency Converter



Ordering Information

TURBOVAC MAG W 300/400 P

Accessories, optional P	Part No.
Inlet screen DN 100 ISO-K coarse (3.2 x 3.2 mm (0.13 x 0.13 in.)) fine (1.6 x 1.6 mm (0.06 x 0.06 in.)) DN 100 CF coarse (3.2 x 3.2 mm (0.13 x 0.13 in.)) fine (1.6 x 1.6 mm (0.06 x 0.06 in.)) DN 160 ISO-K DN 160 CF	800132V0101 800132V0102 200 91 514 E 200 17 195 E 200 00 307 E 200 17 247
Flange heater 100 CF, 230 V, 50 Hz 100 CF, 115 V, 60 Hz 160 CF, 230 V, 50 Hz 160 CF, 115 V, 60 Hz	854 27 854 28 854 37 854 38
Water cooling unit	410300V0101
Air cooling unit	410300V0102
Solenoid venting valve, normally closed 24 V DC, DN 16 ISO-KF	800120V0011
Power failure venting valve, normally open	800120V0021
Included in the Delivery of the Pump P	
Flanges for forevacuum, venting and purge gas are blank-flanged	
Centering ring with FPM sealing ring and a clamping yoke	

MAG INTEGRA – Magnetic Rotor Suspension with separate Frequency Converter, with Compound Stage

TURBOVAC MAG W 600/700 P



Typical Applications

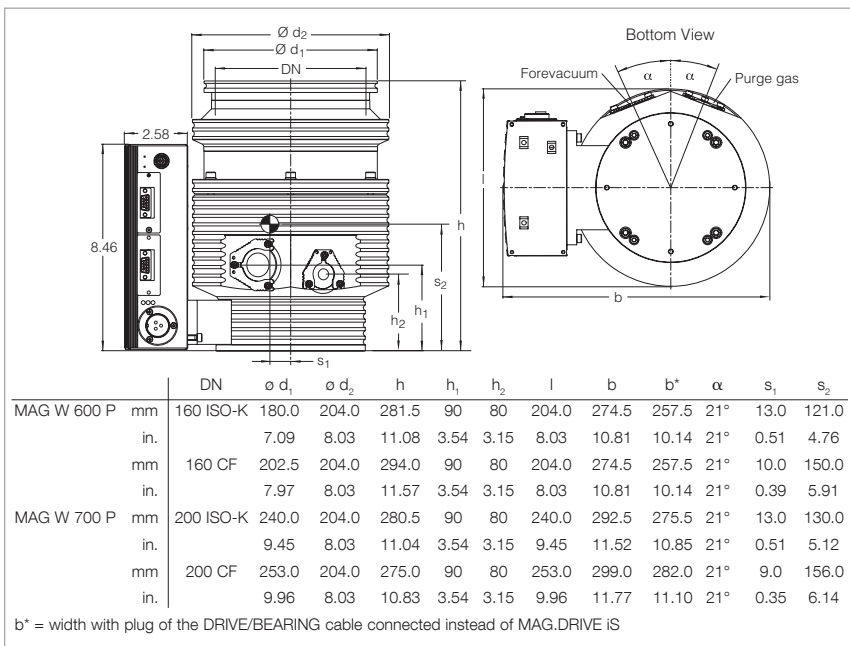
- Gas analysis systems
- Particle accelerators
- Electron microscopes
- Research
- Coating systems

Technical Features

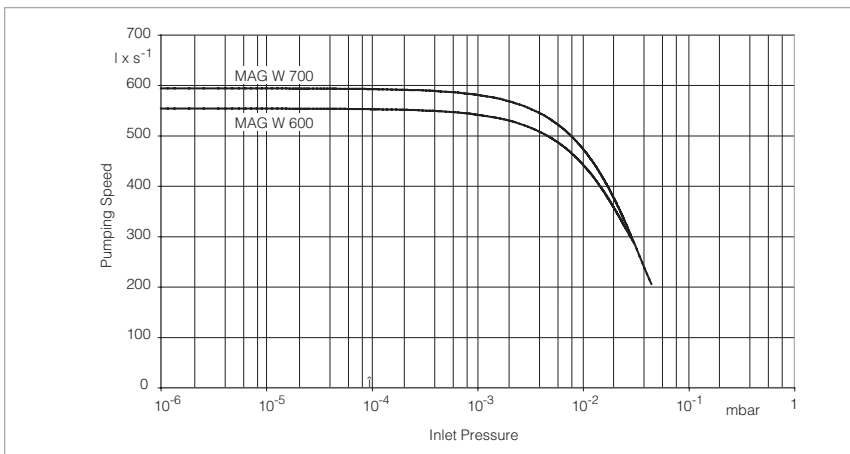
- Installation in any orientation
- DN 160 or 200 ISO-K and/or CF high vacuum connection
- DN 25 ISO-KF with clamped forevacuum connection
- Purge gas/venting connection DN 16 ISO-KF with clamped connection (purge/vent)
- Water or air cooling optional

Advantages to the User

- Highest pumping speed from the smallest possible size
- New standard regarding maintenance-free systems
- Suitability for vibration sensitive applications in the area of analytical engineering, thin-film technology, electron microscopes, research, development among others
- Flexibility due to the modular concept; alternatively the pump is available also with an integrated frequency converter



Dimensional drawing for the TURBOVAC MAG W 600/700 P



Pumping speed for N₂ of the TURBOVAC MAG W 600/700 P as a function of the inlet pressure

Technical Data**TURBOVAC MAG****W 600 P****W 700 P**



Inlet flange	DN	160 ISO-K	160 CF	200 ISO-K	200 CF
Pumping speed					
N ₂	l/s	550	550	590	590
Ar	l/s	520	520	540	540
He	l/s	570	570	600	600
H ₂	l/s	410	410	430	430
Operating speed	min ⁻¹	48 000			
Compression ratio					
N ₂		1.6 x 10 ¹⁰			
H ₂		3.4 x 10 ⁴			
He		1.7 x 10 ⁶			
Ultimate pressure	mbar (Torr)	< 10 ⁻⁸ (< 0.75 x 10 ⁻⁸)	< 10 ⁻¹⁰ (< 0.75 x 10 ⁻¹⁰)	< 10 ⁻⁸ (< 0.75 x 10 ⁻⁸)	< 10 ⁻¹⁰ (< 0.75 x 10 ⁻¹⁰)
Max. degassing temperature	°C (°F)	–	80 (176)	–	80 (176)
Max. foreline pressure for N ₂	mbar (Torr)	6.0 (4.5)			
Recommended backing pump		TRIVAC D 2,5 E TRIVAC D 8 B			
Run-up time	min	< 6			
Foreline flange (clamped)	DN	25 ISO-KF			
Purge / vent port (clamped)	DN	16 ISO-KF			
Water cooling connection (optional)	G	1/8"			
Weight, approx.	kg (lbs)	17 (37.5)			

Technical Data**MAG.DRIVE S**

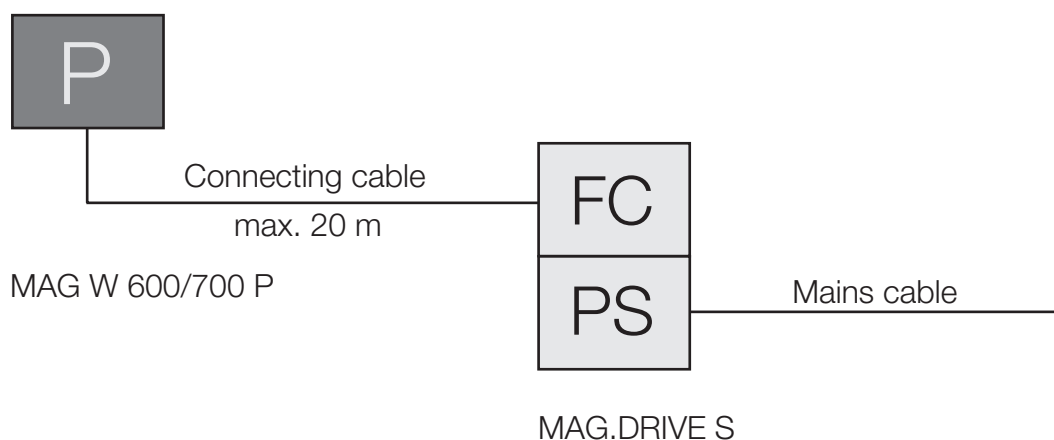
Voltage range	V	100 – 240, ±10 %
Nominal frequency	Hz	50 / 60
Power consumption		
stand-by	W	100
maximum	W	400
Max. motor voltage	V	48
Max. pump current	A	6
Fuses F1, F2 5 x 20 mm		10 A fast blow high breaking capacity 250 V
System fuse		L or G characteristic
Max. frequency	Hz	0 to 2000
Load capability, relay output X1	V/A	32 / 0.5
Temperature		
during operation	°C (°F)	0 to +45 (+32 to +113)
during storage	°C (°F)	-10 to +60 (+14 to +140)
Relative humidity of the air	%	95 (non-condensing)

Ordering Information

TURBOVAC MAG W 600/700 P

TURBOVAC MAG W 600 P with separate Frequency Converter and Compound Stage		Part No.	
<div> <div>P</div> </div> DN 160 ISO-K DN 160 CF		410600V0005 410600V0006	
TURBOVAC MAG W 700 P with separate Frequency Converter and Compound Stage		Part No.	
<div> <div>P</div> </div> DN 200 ISO-K DN 200 CF		410700V0005 410700V0006	
Mandatory Accessories		Part No.	
<div> <div>P</div> <div>FC</div> </div> Electronic frequency converter MAG.DRIVE S with display		410300V0212	
Connecting cable DRIVE/BEARING (connection between pump and MAG.DRIVE S) 3.0 m (10.5 ft) 5.0 m (17.5 ft) 10.0 m (35.0 ft) 20.0 m (70.0 ft)		410300V4003 410300V4005 410300V4010 410300V4020	
Mains cable 3.0 m (10.5 ft) EURO plug US plug 5-15 P		800102V0002 800102V1002	
Mains cable 2.0 m (7.5 ft) US plug 115 V AC		992 76 513	
Forevacuum pump TRIVAC D 2,5 E 220 – 240 V, 50 Hz; 230 V, 60 Hz; Schuko plug, EURO version 110 – 120 V, 50/60 Hz; NEMA plug, US version		140 000 140 002	
TRIVAC D 8 B 1 phase motor; 230 V, 50/60 Hz 3 phase motor; 230/400 V, 50 Hz; 250/440 V, 60 Hz		112 55 112 56	

With separate Frequency Converter



Ordering Information

TURBOVAC MAG W 600/700 P

Accessories, optional P	Part No.
Inlet screen	
DN 160 ISO-K	E 200 00 307
DN 160 CF	E 200 17 247
DN 200 ISO-K	200 91 639
DN 200 CF	400 001 515
Flange heater	
160 CF, 230 V, 50 Hz	854 37
160 CF, 115 V, 60 Hz	854 38
Water cooling unit	410300V0101
Air cooling unit	410300V0102
Solenoid venting valve, normally closed	
24 V DC, DN 16 ISO-KF	800120V0011
Power failure venting valve, normally open	800120V0021
Included in the Delivery of the Pump P	
Flanges for forevacuum, venting and purge gas are blank-flanged	
Centering ring with FPM sealing ring and a clamping yoke	

Accessories

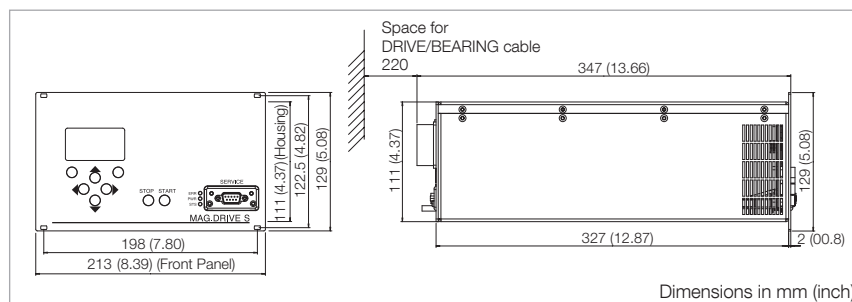
Electronic Frequency Converters for Pumps with Magnetic Rotor Suspension MAG.DRIVE S



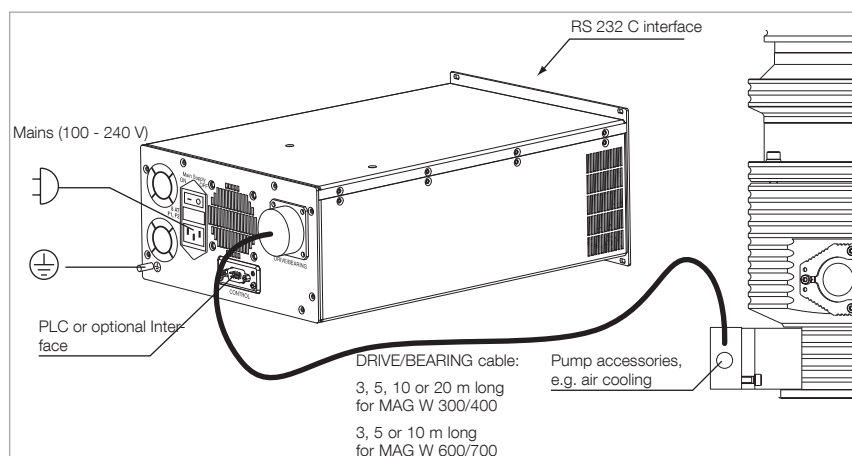
MAG.DRIVE S with display

Advantages to the User

- Operation of turbomolecular pumps with magnetically levitated rotors:
MAG W 300/400 P and
MAG W 600/700 P
- Easy operation through the controls
- Communication to host computer of the customer via serial interface and conventional interface possible
- Setting of speed and other functions
- Warning in case the pump is running out of specification
- Storing of all parameters in the pump's memory
- Small size and low weight
- Integrated fan
- 2 slots for industrial communications modules
- rear side:
Standard 9 pin 24 V SPS
PLC-IO in Control Slot
- front side:
RS 232 C in Service Slot
- further interfaces can be fitted:
Ethernet, Profibus, DeviceNet, RS 485 C



Dimensional drawing for the MAG.DRIVE S



Connection schematic MAG.DRIVE S

Technical Data**MAG.DRIVE S**

Voltage range	V	100 – 240, ±10 %
Nominal frequency	Hz	50 / 60
Power consumption		
stand-by	W	100
maximum	W	400
Max. motor voltage	V	48
Max. pump current	A	6
Fuses F1, F2 5 x 20 mm		10 A fast blow high breaking capacity 250 V
System fuse		L or G characteristic
Max. frequency	Hz	0 to 2000
Load capability, relay output X1	V/A	32 / 0.5
Temperature		
during operation	°C (°F)	0 to +45 (+32 to +113)
during storage	°C (°F)	-10 to +60 (+14 to +140)
Relative humidity of the air	%	95 (non-condensing)
Weight, approx.	kg (lbs)	65 (14.35)

Ordering Information**MAG.DRIVE S**

	Part No.
Electronic frequency converter MAG.DRIVE S with display	410300V0212
Connecting cable DRIVE/BEARING (connection between pump and MAG.DRIVE S)	
3.0 m (10.5 ft)	410300V4003
5.0 m (17.5 ft)	410300V4005
10.0 m (35.0 ft) ¹⁾	410300V4010
20.0 m (70.0 ft) ¹⁾	410300V4020
Mains cable	
3.0 m (10.5 ft)	
EURO plug	800102V0002
US plug 5-15 P	800102V1002
2.0 m (7.5 ft)	
US plug 115 V AC	992 76 513

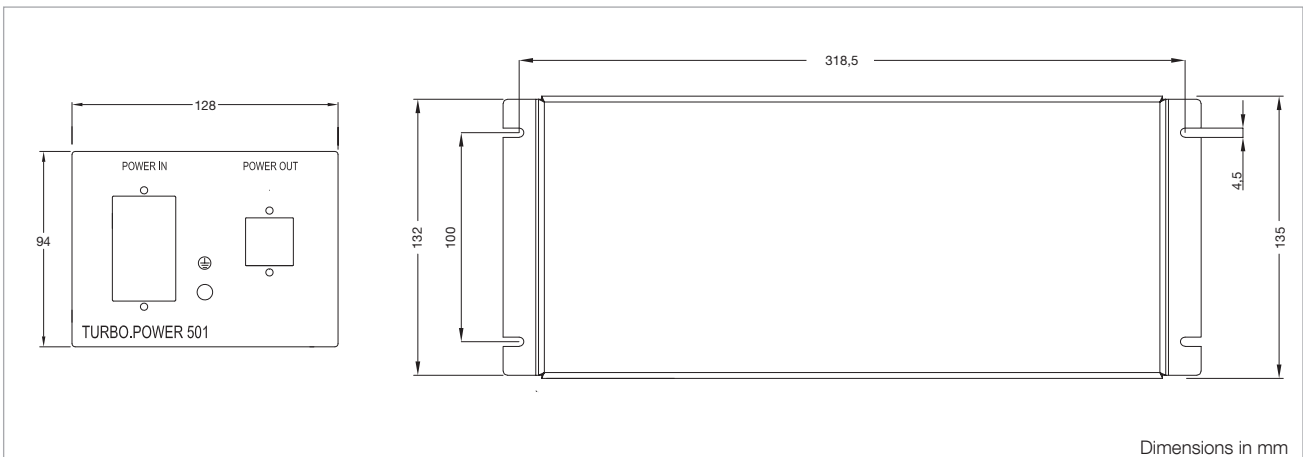
¹⁾ Suited for operating the MAG W 300/400 only

Power Supply TURBO.POWER 501

for TURBOVAC MAG W 300/400/600/700 iP



TURBO.POWER 501 (Fig.similar)



Dimensional drawing for the power supply TURBO.POWER 501

Technical Features

- For supplying 48 V DC power to the MAG W 300/400/600/700 iP
- Bench top unit or for cabinet mounting

Technical Data**Power Supply****TURBO.POWER 501**

Power supply (POWER IN)	V	100 – 240, ±10 %
Nominal frequency	Hz	50 / 60
Power consumption maximum	VA	650
at ultimate pressure operation of the pump	VA	450
DC voltage range		
POWER OUT	V DC	48
max.	A	10
Length of the DC connection cable, max.		
at 3 x 1.5 mm ²	m (ft)	5 (17.5)
at 3 x 2.5 mm ²	m (ft)	20 (70.0)
Ambient temperature during operation	°C (°F)	+10 to +40 (+50 to +104)
during storage	°C (°F)	-10 to -70 (+14 to -94)
Relative humidity of the air	%	5 to 85 (non-condensing)
Protection class	IP	30
Overvoltage category		II
Pollution category		2
Weight, approx.	kg (lbs)	4.0 (8.8)

Ordering Information**Power Supply****TURBO.POWER 501**

	Part No.
Power supply TURBO.POWER 501	410300V5221
DC cable (connection between TURBO.POWER 501 and MAG.DRIVE iS)	
1.0 m (3.5 ft)	410300V2001
3.0 m (10.5 ft)	410300V2003
5.0 m (17.5 ft)	410300V2005
10.0 m (35.0 ft)	410300V2010
20.0 m (70.0 ft)	410300V2020
Mains cable	
3.0 m (10.5 ft)	
EURO plug	800102V0002
US plug 5-15 P	800102V1002
2.0 m (7.5 ft)	
US plug 115 V AC	992 76 513

Vibration Absorber

Vibration absorbers are used to inhibit the propagation of vibrations from the turbomolecular pump to highly sensitive instruments like electron beam microscopes, micro-balances or analytical instruments.



Ordering Information

Vibration Absorber

	Part No.
Vibration absorber	
DN 63 ISO-K 66 mm (2.60 in.) long	800131V0063
DN 63 CF 81 mm (3.19 in.) long	500 070
DN 100 ISO-K 84 mm (3.31 in.) long	800131V0100
DN 100 CF 100 mm (4.09 in.) long	500 071
DN 160 ISO-K 84 mm (3.31 in.) long	500 073
DN 160 CF 104 mm (4.09 in.) long	500 072

Flange Heater for CF High Vacuum Flanges

Most TURBOVAC pumps can be baked out in order to improve the ultimate pressure attained in the UHV range. Degassing of the turbomolecular pump will only be useful when simultaneously baking out the vacuum chamber.



Technical Data

Flange Heater

Rated power consumption of the flange heater		
DN 63 CF, DN 100 CF	W	100
DN 160 CF	W	150
Voltage	V AC	230 or 115
Cable length	mm	1600
Max. temperature	°C	100

Ordering Information

Flange Heater

	Part No.	Part No.
Flange heater	230 V	115 V
DN 63 CF	800137V0003	800137V0004
DN 100 CF	800137V0005	800137V0006
DN 160 CF	800137V0007	800137V0008

Fine Filter

A fine filter integrated in the centering ring protects the pump against particles and dust on the high vacuum side.

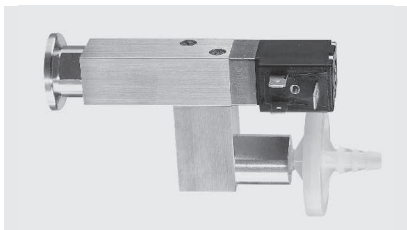


Ordering Information

Fine Filter

	Part No.
Connection flange of the fine filter	
DN 40 ISO-KF	883 98
DN 63 ISO-K	887 20
DN 100 ISO-K	887 21

Solenoid Venting Valve



Technical Data

Venting Valve

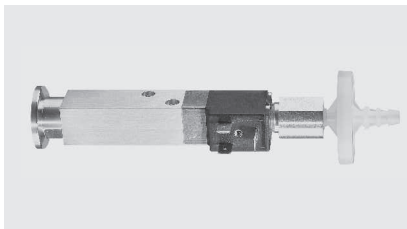
Drive voltage	V DC	24
Power consumption	W	4
Connecting flange	DN	16 ISO-KF
Weight, approx.	kg (lbs)	0.3 (0.66)

Ordering Information

Venting Valve

	Part No.
Solenoid venting valve, normally closed	800120V0011

Power Failure Venting Valve



Technical Data

Power Failure Venting Valve

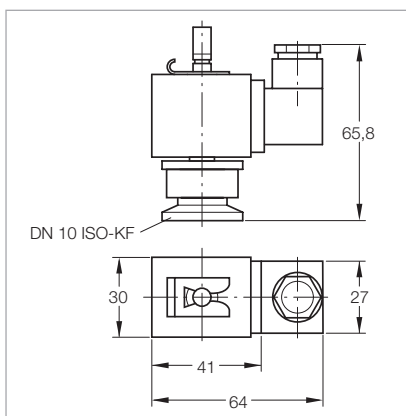
Drive voltage	V DC	24
Power consumption	W	4
Connecting flange	DN	16 ISO-KF
Weight, approx.	kg (lbs)	0.3 (0.66)

Ordering Information

Power Failure Venting Valve

	Part No.
Power failure venting valve, normally open	800120V0021

Power Failure Venting Valve, Electromagnetically Actuated



Dimensional drawing for the electromagnetically actuated power failure venting valve

Technical Data

Power Failure Venting Valve

Technical data	See Catalog "Valves", para. "Special Valves"
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Ordering Information

Power Failure Venting Valve

	Part No.
Power failure venting valve DN 10 ISO-KF, electromagnetically actuated	
24 V DC	174 46
230 V AC / 50/60 Hz	174 26

Purge Gas and Venting Valve



Technical Data

Connecting flange	DN	10 ISO-KF
Weight, approx.	kg (lbs)	0.7 (1.55)

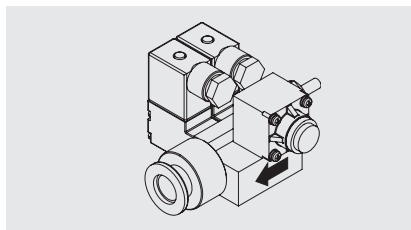
Purge Gas and Venting Valve

Ordering Information

Purge Gas and Venting Valve

	Part No.
Purge gas and venting valve, 230 V 0.2 mbar x l/s (12 sccm) 0.4 mbar x l/s (24 sccm)	855 19 855 29

Purge Gas and Venting Valve



Technical Data

Connecting flange	DN	1/4" tube pump specific or DN 16 ISO-KF
Inlet Outlet		
SPurge gas pressure, abs.	bar	1.5 to 6,0
Weight, approx.	kg (lbs)	0.5 (1.1)

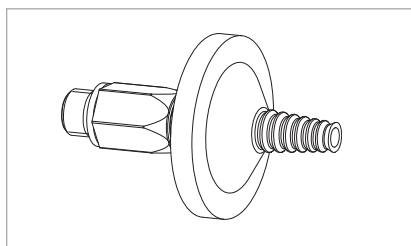
Purge Gas and Venting Valve

Ordering Information

Purge Gas and Venting Valve

	Part No.
Purge gas and venting valve 24 V DC; 0,6 mbar x l/s Further 0.6 mbar x l/s valves upon request	121 33

Gas Filter to G 1/4" for Purge Gas and Venting Valve



Technical Data

Gas filter including fitting G 1/4" and 2 gaskets	
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Gas filter

Ordering Information

Gas Filter

	Part No.
Gas filter to G 1/4" for seal gas and venting valve	800110V0012
Replacement filter for gas filter to G 1/4" for seal gas and venting valve	E 200 18 515

Accessories for Serial Interfaces RS 232 C and RS 485 C

Through these accessories many control, monitoring and information capabilities can be implemented in

connection with the electronic frequency converters and turbomolecular pumps.

All turbomolecular pumps or electronic frequency converters are supported.

PC Software LEYASSIST



Software for PC-based communication, control and monitoring of turbomolecular pumps via USB, RS 485 or RS 232 interface with automatic pump detection.

Functions

- Display of vacuum system status
- Configuring the accessory functions of the TURBOVAC i / iX
- Reading/writing of parameters
- Data logging
- Alarm/warning message logging

Ordering Information

PC Software LEYASSIST

	Part No.
PC software LEYASSIST	230439V01

Interface Adaptor for Frequency Converter with RS 232 C/RS 485 C Interface

Ordering Information

Interface Adaptor RS 232 C/RS 485 C

	Part No.
Adaptor RS 232 C/RS 485 C mains connection 230 V, 50 Hz, EURO plug	800110V0101
Adaptor USB/RS 232 C for connection of RS 232 C to USB (PC), including CD with drivers and manual	800110V0103

Miscellaneous

Services for Mechanically Suspended Turbomolecular Pumps

Complete Refurbishing at the Service Centre

Complete refurbishing at the service centre includes the following:

Complete disassembly, cleaning, replacement of all wearing parts, mounting, electrical safety test, final test including vibration measurement

Complete Refurbishing with Decontamination at the Service Centre

Complete refurbishing with decontamination at the service centre includes the following:

Complete disassembly, cleaning and decontamination, replacement of all wearing parts, mounting, electrical safety test, final test including vibration measurement

Ordering Information

Complete Refurbishing at the Service Centre

Complete Refurbishing with Decontamination at the Service Centre

	Part No.	Part No.
For Pump		
TURBOVAC 35 / 50D	AS 2165	AS 2165 D
TURBOVAC 50	AS 2133	AS 2133 D
TURBOVAC SL 80	LAS 2368	LAS 2368 D
TURBOVAC TW 70 H	AS 2368	AS 2368 D
TURBOVAC 151	AS 2134	AS 2134 D
TURBOVAC TW 250 S	AS 2168	AS 2168 D
TURBOVAC SL 300	LAS 2369	LAS 2369 D
TURBOVAC TW 300	AS 2369	AS 2369 D
TURBOVAC 361	AS 2135	AS 2135 D
TURBOVAC 600 / 1000	AS 2136	AS 2136 D
TURBOVAC TW 701 / 690	AS 2330	AS 2330 D
TURBOVAC 1100	AS 2137	AS 2137 D

Services for Magnetically Levitated Turbomolecular Pumps

Complete Refurbishing at the Service Centre

Complete refurbishing at the service centre includes the following:

Complete disassembly, cleaning, replacement of all wearing parts, mounting, electrical safety test, final test including vibration measurement

Complete Refurbishing with Decontamination at the Service Centre

Complete refurbishing with decontamination at the service centre includes the following:

Complete disassembly, cleaning and decontamination, replacement of all wearing parts, mounting, electrical safety test, final test including vibration measurement

Ordering Information

Complete Refurbishing at the Service Centre

Complete Refurbishing with Decontamination at the Service Centre

	Part No.	Part No.
For pump		
MAG W 300 / 400	AS 2300	AS 2300 D
MAG W 600 / 700	AS 2600	AS 2600 D
MAG W 1300 iP (L) – 2201 iP (L)	AS 2700	AS 2700 D
MAG (W) 1600 / 2000	AS 2164 ¹⁾	AS 2164 D ¹⁾
MAG (W) 830 / 1300 / 1500	AS 2370 ¹⁾	AS 2370 D ¹⁾
MAG 900 / 1000 / 1200	AS 2160 ¹⁾	AS 2160 D ¹⁾
MAG 2200	AS 2200 ¹⁾	AS 2200 D ¹⁾
MAG 2800 / 3200	AS 2800 ¹⁾	AS 2800 D ¹⁾

Notes

The listed services include the costs for material and working hours for standard pumps. Services for pump variants upon request.

If additional spare parts are needed for repairs, then these are invoiced separately according to a cost estimate.

¹⁾ Including rotor replacement

General

Applications and Accessories for Oil Diffusion Pumps

Pumps	Application														
		DIP 3000	DIP 8000	DIP 12000	DIP 20000	DIP 30000	DIP 50000	DIJ 10* / 320	DIJ 16* / 500	DIJ 20 / 630	DIJ 35* / 1000	OB 6000	OB 12000	OB 18000	LEYBOJET 630
	Vacuum coating (e.g. Sputtering)	■	■	■	■	■	■	■	■	■	■	■	■	■	■
	Research and development	■	■	■	■	■	■	■	■	■	■	■	■	■	■
	Metallurgy/furnaces	■	■	■	■	■	■	■	■	■	■	■	■	■	■
	Mechanical engineering	■	■	■	■	■	■	■	■	■	■	■	■	■	■
	Sputtering process						■	■	■	■	■	■	■	■	■
	Secondary metallurgy (e.g. VIM, VID)										■	■	■		
	High vacuum furnaces										■	■	■		
	Cristal growing plants						■	■	■	■					
	Electron beam welding						■	■	■	■					
	Nitride hardening						■	■	■	■					
	Drying plants						■	■	■	■					

* DIJ 35 available from November 2017, DIJ 10 and DIJ 16 available from March 2018

Accessories	Page														
Astrotorus baffle	84	■	■	■	■	■	■	■	■	■	■				■
Over-temperature protection switch	86	■	■	■	■	■	■	■	■	■	■				■
Contact thermometer	86	■	■	■	■	■									■
Resistance thermometer Pt100	86	■	■	■	■	■									■
Water flow monitor	87	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Power controller	88				■	■	■					■	■	■	■
Adsorption trap	90	For generating an oil-free vacuum with oil sealed backing pumps													
Valve	92	Right-angle valve with, electropneumatically operated, DN 250 ISO-K to DN 1000 ISO-K													

Oil for Diffusion Pumps for different fields of application

Applications	LEYBONOL Oils					
		Vacuum coating	Research and development	Metallurgy/furnaces	Mechanical engineering	Sputter processes
	LVO 500	■	■	■	■	■
	LVO 510	●	●	●	●	●
	LVO 520	●	●			
	LVO 530	●	●			
	LVO 540 ¹⁾	■	■	■	■	■

■ = Standard

● = Possible

¹⁾ Only for OB pumps

The table only lists general applications. Your specific requirements might be subject to deeper analysis. For further questions, please contact our technical Sales support.

Oil for Diffusion Pumps for different pump types

Pumps														
	DIP 3000	DIP 8000	DIP 12000	DIP 20000	DIP 30000	DIP 50000	DIJ 10* / 320	DIJ 16* / 500	DIJ 20 / 630	DIJ 35* / 1000	OB 6000	OB 12000	OB 18000	LEYBOJET 630
LEYBONOL Oils														
LVO 500	■	■	■	■	■	■	■	■	■	■				■
LVO 510	●	●	●	●	●	●	●	●	●	●				●
LVO 520	●	●	●	●	●	●	●	●	●	●				●
LVO 530	●	●	●	●	●	●	●	●	●	●				●
LVO 540											■	■	■	

■ = Standard
 ● = Possible

Note

All oils may be used.

The pumps are supplied as standard without oil.

The table only lists general applications. Your specific requirements might be subject to deeper analysis.
For further questions, please contact our technical Sales support.

**For information on oil specifications please refer to Catalog Part
“Oils / Greases / Lubricants LEYBONOL®”.**

Operating Principle of Fluid Entrainment Vacuum Pumps

The main components of diffusion pumps, the operation of which relies on vapor-phase pump fluids are:

- Cooled pump body with intake and exhaust ports
- System of nozzles
- Pump boiler

In the case of diffusion pumps a pump fluid contained in a boiler is heated to such an extent that it is vaporized. The vapor is then forced through nozzles within the pump. The nozzles are generally designed in such a way, that they accelerate the vapor to a speed exceeding the speed of sound (Laval nozzles), thus creating a high speed vapor jet. The vapor is then deflected by the nozzles at a specific angle onto the pump body. The pump body is

cooled, so that the vaporized pump fluid condenses and is returned back to the boiler as a liquid. The pumping action of diffusion pumps and fluid entrainment pumps in general is based on the transporting capacity of the vapor jet.

The gas which is to be pumped is compressed sufficiently at the fore-vacuum port so that it can be pumped out by a backing pump.

Oil Diffusion Pumps

Compared to other fluid entrainment pumps the density of the vapor in the boiler and in the vapor jet is fairly low so that the gas molecules may almost completely diffuse into the vapor jet. Thus most of the molecules which enter the vapor jet are also pumped out.

For this reason, the pumping speed of diffusion pumps is extremely high with respect to the intake area and constant – starting at an inlet pressure of approx. 10^{-3} mbar (0.75×10^{-3} Torr) down to very low pressures – as within the pressure range the vapor jet is not influenced in any way by the pressure within the vacuum vessel.

Operating Oil Diffusion Pumps

Forevacuum

In all cases diffusion pumps require a sufficiently sized backing pump (see Technical Data). The size and type of

forevacuum pump depends on the operating conditions and the quantities of gas which are to be pumped.

1. Continuous operation at operating pressures above 10^{-4} mbar (0.75×10^{-4} Torr) – large quantities of gas.
2. Continuous operation at operating pressures below 10^{-4} mbar (0.75×10^{-4} Torr) – smaller quantities of gas.

In applications which rely on diffusion pumps, the vacuum chamber must be connected via a valve (3) and a roughing line directly to the backing pump. This is done so that the vacuum chamber may be pre-evacuated by the backing pump down to a pressure where the diffusion pump can take over. Until the high vacuum valve (4) opens, both diffusion pump and pump fluid are preserved. Before venting the vacuum chamber the forevacuum valve (2) and the high vacuum valve (4) must be closed, whereby the diffusion pump remains in the ready status.

Pumping Speed

The pumping speed of any pump is equivalent to the volume throughput through the intake opening of a pump. In the case of diffusion pumps the pumping speed for lighter gases is higher compared to heavier gases.

Backstreaming of the Pump Fluid

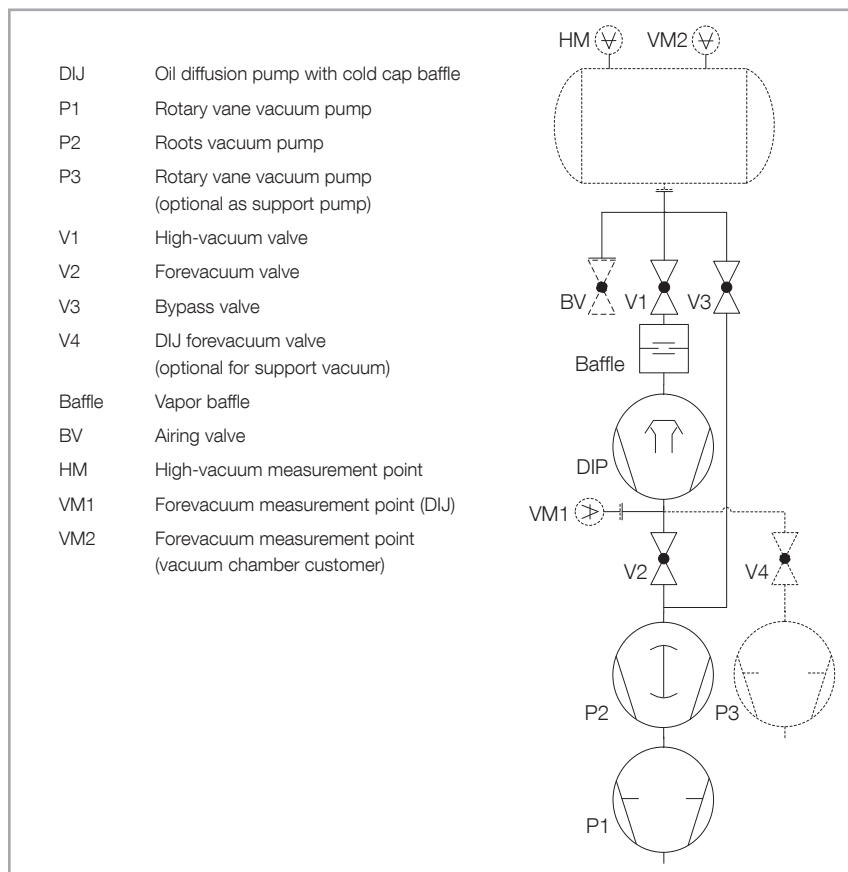
Undesirable backstreaming of molecules from the pump fluid is caused by the effect that some molecules are able to leave the vapor jet and thus do not arrive at the cooled pump body. Because of collisions between each other and due to reflection at the pump body, these molecules are then able to move in the direction of the vacuum chamber.

For DIP pumps the backstreaming effect amounts only to a few μg per cm^2 of intake area per minute. Backstreaming may be almost completely suppressed by including a cold cap baffle or an additional Astrotorus baffle.

Backstreaming of Oil in the Case of Diffusion Pumps

- Pump without baffle
approx. $1 \times 10^{-2} \text{ mg} \times \text{cm}^{-2} \times \text{min}^{-1}$
- Pump with cold cap baffle
approx. $1 \times 10^{-3} \text{ mg} \times \text{cm}^{-2} \times \text{min}^{-1}$
- Pump with Astrotorus baffle
($T = 10^\circ\text{C}$ (50°F))
approx. $1 \times 10^{-5} \text{ mg} \times \text{cm}^{-2} \times \text{min}^{-1}$

The values stated have been measured at an intake pressure of $< 1 \times 10^{-4}$ mbar and apply to LEYBONOL LVO 500.



Schematic for a diffusion-type vacuum pump system

Attainable Ultimate Pressure

The attainable ultimate pressure for a particular vacuum system depends not only on the type and pumping speed rating of the diffusion pump, but also on the vapor pressure of the pump fluid, shape and temperature of the baffle, leaks at connecting flanges or welded joints and the condition of the surfaces within the vacuum chamber.

When excluding all effects which contribute to an increase in pressure within

the vacuum chamber due to leaks and contamination of the vacuum chamber walls, it will be possible to attain the ultimate pressures stated in the table "Attainable Ultimate Pressures with Oil Diffusion Pumps (DIP)" given in chapter "General".

In practice the following combination has been found to work very well when needing a low vacuum free of oil vapors.

- Water-cooled cold cap baffle as a integral part of the diffusion pump together with a water-cooled Astrotorus baffle which may be installed as an additional component on the high vacuum flange of the diffusion pump.

Sealing Methods

For ultimate pressures down to 10^{-8} mbar (0.75×10^{-8} Torr) bakeout temperatures of up to 150 °C (302 °F) are sufficient. FPM [FKM (= Fluor caoutchouc), temperature resistant up to 150 °C (302 °F)] sealing rings or ultra sealing rings made of aluminum must be used.

In order to prevent pressure variations, ultra sealing rings must be used in the connections, between diffusion pump and baffle.

Ultimate pressures below 10^{-8} mbar (0.75×10^{-8} Torr) require bakeout temperatures up to 400 °C (752 °F). However, it is only necessary to bake out the vacuum chamber to 400 °C (752 °F) and to maintain a temperature gradient across the baffle or the cold trap so that a temperature of 150 °C (302 °F) is not exceeded at the intake flange of the pump.

In this way, it is still acceptable to use FPM (FKM) sealing rings or ultra sealing rings made of aluminium.

Cooling

The cooling water temperature should not exceed 25 °C (77 °F) at the intake and 30 °C (86 °F) at the discharge, otherwise sufficient condensation of the pump fluid cannot be ensured. When connecting the cooling system of the pump and the baffle in series, the cooling water must always be made to flow through the baffle first and then through the diffusion pump, because the attainable ultimate pressure in the vacuum chamber depends strongly on the condensation temperature of the pump fluid in the baffle.

Attainable Ultimate Pressures with Oil Diffusion Pumps

Attainable Ultimate Pressure ¹⁾

LEYBONOL LVO 500

Without baffle	mbar (Torr)	1.5×10^{-6} (1.1×10^{-6})
With cold cap baffle	mbar (Torr)	5.0×10^{-7} (3.8×10^{-7})
With Astrotorus baffle	mbar (Torr)	1.5×10^{-7} (1.1×10^{-7})

¹⁾ Attained in consideration of the notes given under "Sealing Methods" in the chapter "General" para. "Oil Diffusion Pumps" and after degassing the connected vacuum chamber for several hours at 200 °C (392 °F)

Products

DIP Pumps Water-Cooled



DIP 12 000



DIP 20 000 with Power Controller

The DIP range of pumps was developed for operation in industrial systems. Excellent vacuum performance data combined with the inherent ruggedness of this kind of pump, make our diffusion pumps a reliable component in high and medium vacuum applications.

Advantages to the User

- High pumping speeds in the fine and high vacuum ranges
- Low attainable ultimate pressure
- Integrated, water-cooled cold cap baffle guarantees low oil backstreaming rates into the vacuum chamber
- Low oil losses (even at high gas throughputs) by integrated water-cooled forevacuum baffle
- High forevacuum resistance even at reduced heating power
- The heating cartridges are accessible from the outside via heating inserts which are built into the boiler. This ensures a quick exchange of single heating cartridges (even when the pump is hot)
- A separate automatic circuit breaker for each heating cartridge ensures a high level of electrical safety
- A standard built-in thermostat acts as an thermal overload switch and ensures that the heating cartridges can not overheat
- All pumps are prepared for installation with an over-temperature switch (optional) for checking the cooling water circuit, and a contact thermometer (optional) to monitor the operating temperature of the diffusion pump
- Indication of the oil level by sight-glass permits simple checking of the current oil level
- All DIP pumps are delivered with their inside chamber cleaned in such a manner that it is free of oil. The inside is evacuated. In the condition as delivered, the pumps may be also operated with silicone oil
- Utilisation of the DIP power controller cuts power consumption by up to 30% without impairing pump performance (option)

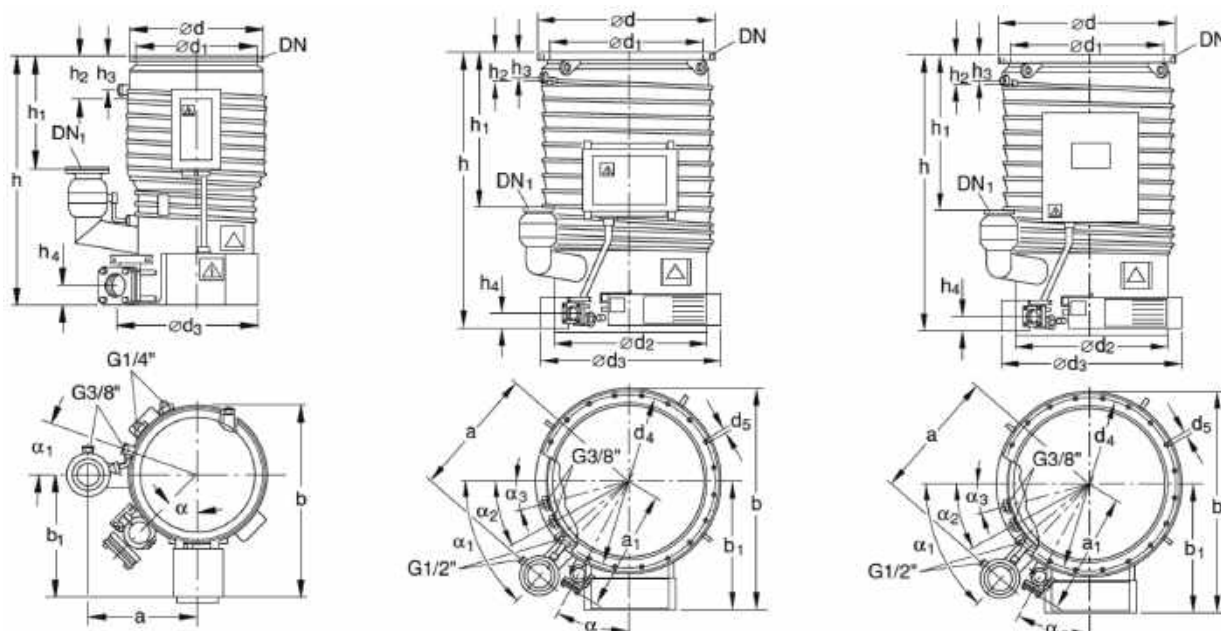
Typical Applications

The diffusion pumps from the DIP range are used in coating systems, vacuum melting and drying systems as well as in vacuum furnaces in the area of metallurgy.

Supplied Equipment

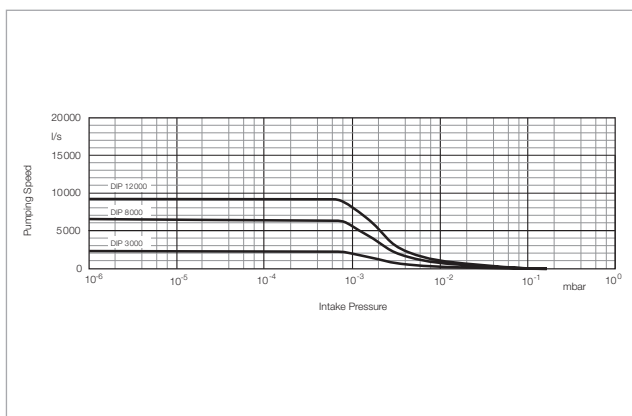
The DIP pumps are supplied ready for connection but without the filling of pump fluid.

The inside of the pump is cleaned before delivery to such an extent that it is free of oil. The inside is evacuated. High and forevacuum flanges are equipped with gaskets and centering rings having shipping flanges and complete with clamping components.

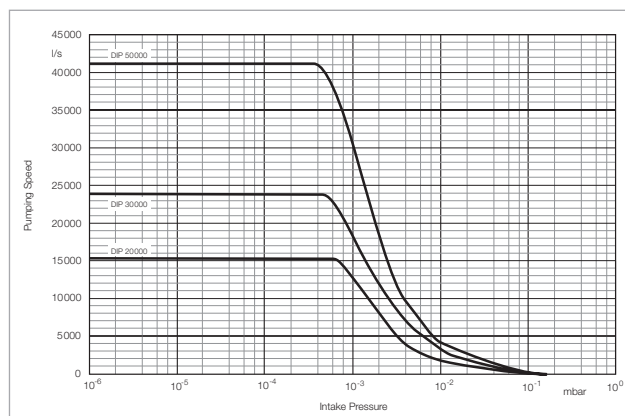


DIP	3 000	8 000	12 000	20 000	30 000	50 000
DN	250 ISO-K	400 ISO-K	500 ISO-K	630 ISO-F	800 ISO-F	1000 ISO-F
DN ₁	63 ISO-K	63 ISO-K	100 ISO-K	100 ISO-K	160 ISO-K	160 ISO-K
a	240 (9.45)	350 (13.78)	420 (16.54)	540 (21.26)	600 (23.62)	800 (31.5)
a ₁	250.5 (9.86)	375.5 (14.78)	432 (17)	496 (19.53)	536 (21.10)	636 (25.04)
b	443 (17.44)	643 (25.31)	775 (30.51)	980 (38.58)	1150 (45.28)	1350 (53.15)
b ₁	276 (10.87)	373 (14.69)	460 (18.11)	600 (23.62)	690 (27.17)	790 (31.10)
d	290 (11.42)	450 (17.72)	550 (21.65)	750 (29.53)	920 (36.22)	1120 (44.09)
d ₁	261 (10.28)	400 (15.75)	501 (19.72)	651 (25.63)	800 (31.5)	1000 (39.37)
d ₂	—	405 (15.94)	506 (19.92)	636 (25.04)	716 (28.19)	916 (36.06)
d ₃	278 (10.94)	530 (20.87)	630 (24.80)	760 (29.92)	840 (33.07)	1040 (40.94)
d ₄	—	—	—	720 (28.35)	890 (35.04)	1090 (42.91)
d ₅	—	—	—	14 (0.55)	14 (0.55)	14 (0.55)
Quantity of holes	—	—	—	20	24	32
h	560 (22.05)	785 (30.91)	940 (37)	1130 (44.49)	1450 (57.09)	1880 (74.02)
h ₁	250 (9.84)	400 (15.75)	470 (18.5)	620 (24.41)	870 (34.25)	1275 (50.2)
h ₂	68 (2.68)	88 (3.46)	92 (3.62)	97 (3.82)	102 (4.02)	102 (4.02)
h ₃	75 (2.95)	102 (4.02)	106 (4.17)	110 (4.33)	116 (4.57)	116 (4.57)
α	45°	30°	30°	30°	20°	25°
α ₁	20°	45°	45°	45°	45°	45°
α ₂	—	30°	30°	30°	30°	25°
α ₃	—	15°	15°	15°	15°	15°

Dimensional drawing for the DIP 3000 [left], DIP 8000 and DIP 12000 [middle], DIP 20 000 to DIP 50 000 [right]; dimensions in brackets () are in inch



Pumping speed characteristics of the DIP 3000 to 12000 pumps as a function of intake pressure



Pumping speed characteristics of the DIP 20000 to 50000 pumps as a function of intake pressure

Technical Data

DIP 3 000

DIP 8 000

DIP 12 000

High vacuum / forevacuum connection	DN	250 ISO-K/63 ISO-K	400 ISO-K/63 ISO-K	500 ISO-K/100 ISO-K
Pumping speed for air ¹⁾ below 1×10^{-4} mbar	l/s	3 000	8 000	12 000
Operating range	mbar (Torr)	$< 10^{-2}$ to 10^{-7} (0.75×10^{-2} to 0.75×10^{-7})		
Ultimate total pressure ¹⁾	mbar (Torr)	$< 5.0 \times 10^{-7}$ (3.75×10^{-7})		
Max. permissible forevacuum pressure	mbar (Torr)	6.0×10^{-2} (4.5×10^{-2})		
Pump fluid filling, min. / max.	l (qts)	1.0 / 1.4 (1.1 / 1.5)	1.7 / 3.4 (1.8 / 3.6)	2.4 / 5.3 (2.5 / 5.6)
Mains connection				
Standard EURO, 50/60 Hz	V	230 ~ 1 Ph	400 ~ 3 Ph Y	400 ~ 3 Ph Y
Standard Americas, 50/60 Hz	V	230 ~ 1 Ph	460 ~ 3 Ph Y	460 ~ 3 Ph Y
Special, 50/60 Hz	V	–	230 ~ 3 Ph Δ	230 ~ 3 Ph Δ
Heating power	kW	2.4	4.8	7.2
Number of heating cartridges		2	6	9
Heating up time	min	< 25		
Cooling water (minimum)				
for pump ²⁾	l/h (gal/min)	160 (0.7)	290 (1.28)	500 (2.2)
for cold cap baffle	l/h (gal/min)	20 (0.09)	30 (0.13)	50 (0.22)
max. supply pressure	bar (psig)	6 (87)	6 (87)	6 (87)
Number of cooling circuits (including cold cap baffle)		2		
Cooling water connection				
for pump	G (BPS)	3/8"	1/2"	1/2"
for cold cap baffle	G (BPS)	1/4"	3/8"	3/8"
Weight, approx.	kg (lbs)	29 (64)	70 (154)	102 (225)
Recommended backing pump ³⁾				
at operating pressures > 10^{-4} mbar (> 0.75×10^{-4} Torr)		TRIVAC D 65 B + W 251	SV 300 + W 251	SV 300 + W 501
at operating pressures < 10^{-4} mbar (< 0.75×10^{-4} Torr)		–	TRIVAC D 65 B + W 251	TRIVAC D 65 B + W 251

Ordering Information

DIP 3 000

DIP 8 000

DIP 12 000

	Part No.	Part No.	Part No.
Oil diffusion pump			
Standard EURO	222 10	222 20	222 25
Standard Americas	222 10	500 670	500 591
Special	–	500 649	22225V003
Astrotorus baffle	227 50	227 60	227 65
Water flow monitor	500006623		
Over-temperature protection switch	122 84		
Contact thermometer	218 81		
Resistance thermometer Pt100 sensor	200 02 958		
Pump fluid ⁴⁾	see Catalog Part "Oils / Greases / Lubricants LEYBONOL"		

¹⁾ Measured to DIN 28 427 with LEYBONOL LVO 500 as the pump fluid

²⁾ The required quantity of cooling water refers to $\Delta T = 10^\circ \text{C}$ (50°F). The discharge temperature should not exceed 30°C (86°F)

³⁾ Single- or two-stage rotary vane vacuum pump (TRIVAC; SOGEVAC) from our range of forevacuum pumps jointly with Roots vacuum pumps (RUVAC) in pump systems

⁴⁾ Oil must be purchased separately

Technical Data

DIP 20 000

DIP 30 000

DIP 50 000

High vacuum / forevacuum connection	DN	630 ISO-F / 100 ISO-K	800 ISO-F / 160 ISO-K	1000 ISO-F / 160 ISO-K
Pumping speed for air ¹⁾ below 1×10^{-4} mbar	l/s	20 000	30 000	50 000
Operating range	mbar (Torr)	$< 10^{-2}$ to 10^{-7} (0.75×10^{-2} to 0.75×10^{-7})		
Ultimate total pressure ¹⁾	mbar (Torr)	$< 5.0 \times 10^{-7}$ (3.75×10^{-7})		
Max. permissible forevacuum pressure	mbar (Torr)	6.0×10^{-2} (4.5×10^{-2})		
Pump fluid filling, min. / max.	l (qts)	7.0 / 11.0 (7.4 / 11.6)	10.0 / 15.0 (10.6 / 15.9)	15.0 / 25.0 (15.9 / 26.4)
Mains connection				
Standard EURO, 50/60 Hz	V	400 ~ 3 Ph Y		
Standard Americas, 50/60 Hz	V	460 ~ 3 Ph Y		
Special, 50/60 Hz	V	230 ~ 3 Ph Δ		
Reduced power consumption through power controller (saves up 30%)	kW	8.4	12.6	16.8
Heating power	kW	12	18	24
Number of heating cartridges		12	18	24
Heating up time	min	< 25	< 30	< 30
Cooling water (minimum)				
for pump ²⁾	l/h (gal/min)	600 (2.6)	900 (4.0)	1500 (6.6)
for cold cap baffle	l/h (gal/min)	60 (0.26)	80 (0.35)	150 (0.66)
max. supply pressure	bar (psig)	6 (87)	6 (87)	6 (87)
Number of cooling circuits (including cold cap baffle)		2	3	3
Cooling water connection				
for pump	G (BPS)	1/2"		
for cold cap baffle	G (BPS)	3/8"		
Weight, approx.	kg (lbs)	172 (379)	296 (653)	560 (1235)
Recommended backing pump ³⁾				
at operating pressures > 10^{-4} mbar (> 0.75×10^{-4} Torr)		SV 200 + W 501	SV 300 + W 1001	SV 630 B + W 2001
at operating pressures < 10^{-4} mbar (< 0.75×10^{-4} Torr)		TRIVAC D 65 B + W 251	SV 300 + W 251	SV 300 + W 501

Ordering Information

DIP 20 000

DIP 30 000

DIP 50 000

	Part No.	Part No.	Part No.
Oil diffusion pump			
Standard EURO with control unit	222 30V001	222 35V001	222 40V001
Standard Americas with control unit	222 30V002	222 35V002	222 40V002
Standard EURO	222 30	222 35	222 40
Standard Americas	500 882	500 665	500 728
Special	22230V004	22235V006	500 654
Retrofit kit energy control unit	503 647V001	503 648V001	503 649V001
Retrofit kit energy control unit US	503 647V002	503 648V002	503 649V002
Astrotorus baffle	227 70	227 75	227 80
Water flow monitor	500006623		
Over-temperature protection switch	122 84		
Contact thermometer	218 81		
Resistance thermometer Pt100 sensor	200 02 958		
Pump fluid ⁴⁾	see Catalog Part "Oils / Greases / Lubricants LEYBONOL"		

¹⁾ Measured to DIN 28 427 with LEYBONOL LVO 500 as the pump fluid

²⁾ The required quantity of cooling water refers to $\Delta T = 10^\circ \text{C}$ (50°F). The discharge temperature should not exceed 30°C (86°F)

³⁾ Single- or two-stage rotary vane vacuum pump (TRIVAC; SOGEVAC) from our range of forevacuum pumps jointly with Roots vacuum pumps (RUVAC) in pump systems

⁴⁾ Oil must be purchased separately

DIJ Pumps

Water-Cooled



DIJ 20 with plug (right), DIJ 20 with fuse box (middle) and DIJ 630 with energy saving unit (EER) (right)

The Leybold oil diffusion pumps are ideal for all industrial high vacuum applications.

The DIJ series impresses with innovative and energy-efficiency construction.

Important features are a new heating conception; variable flange connections; fully equipped with fore line baffle and cold cap baffle; electrical connect variants and a powerful five stage nozzle system.

Advantages to the User

- Lowest operation costs by minimized energy consumption
- Stable throughput in the 10^{-2} to 10^{-3} mbar range (e.g. for sputtering or steel degassing)
- Flexible flange design
Flange variants:
 - ANSI / Inch flanges (with O-ring)
 - ISO-F or ISO-K flanges (with centering ring)
- Highest system uptime
- Smart temperature control ensures minimum load and longest lifetime for heaters and oil
- Unique baffle design
- Various electrical connection possibilities:
 - Three different connection variants available incl. energy control system (ECU)
- 4 + 1 stage system design:
 - The 4 diffusion pump stages provide excellent high-vacuum pumping speed
 - The additional jet-stage ensures stable throughput at pressures $> 10^{-3}$ mbar

Typical Applications

The diffusion pumps from the DIP range are used in coating systems, vacuum melting and drying systems as well as in vacuum furnaces in the area of metallurgy.

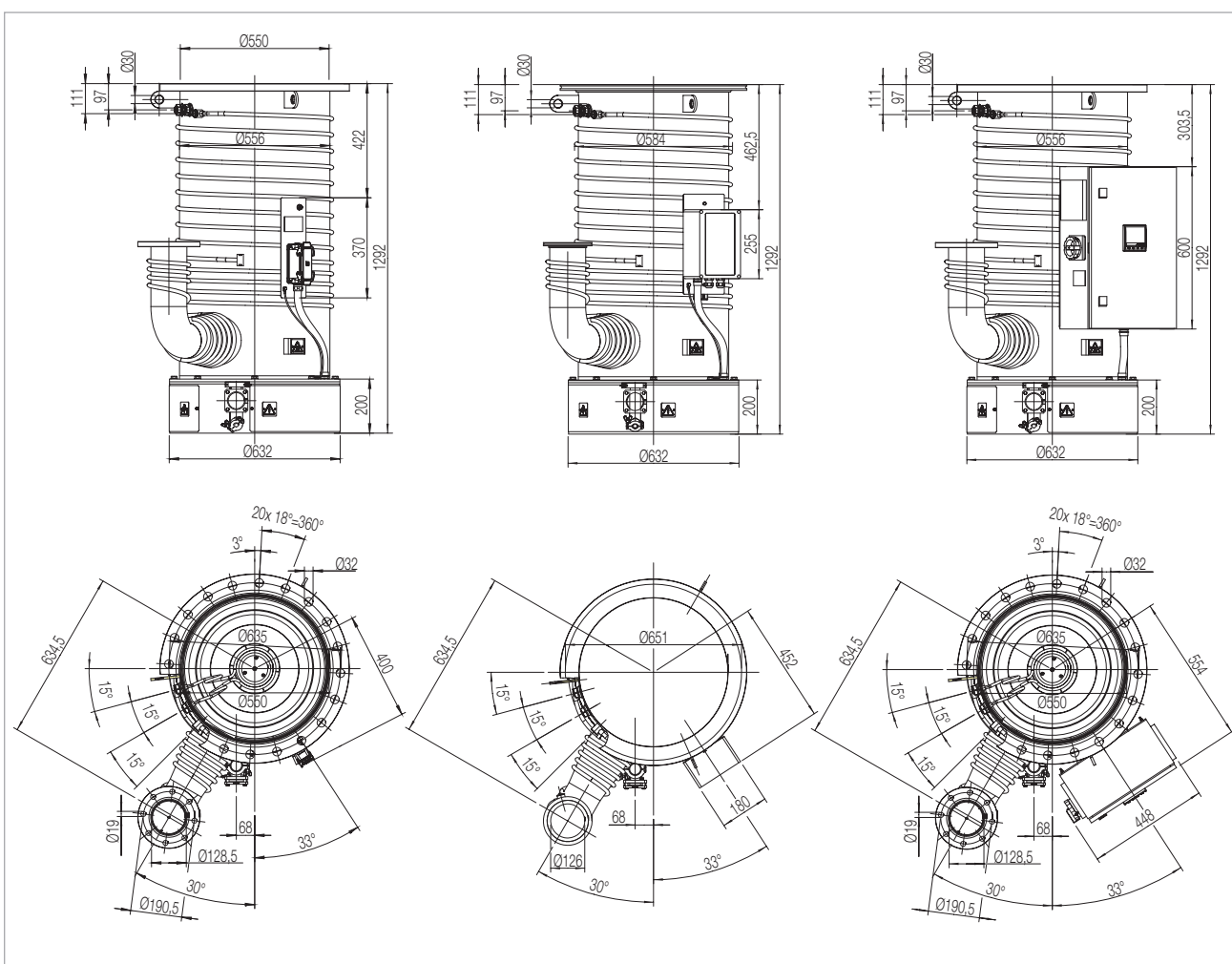
Supplied Equipment

All DIJ pumps are shipped from the factory without pump fluid installed.

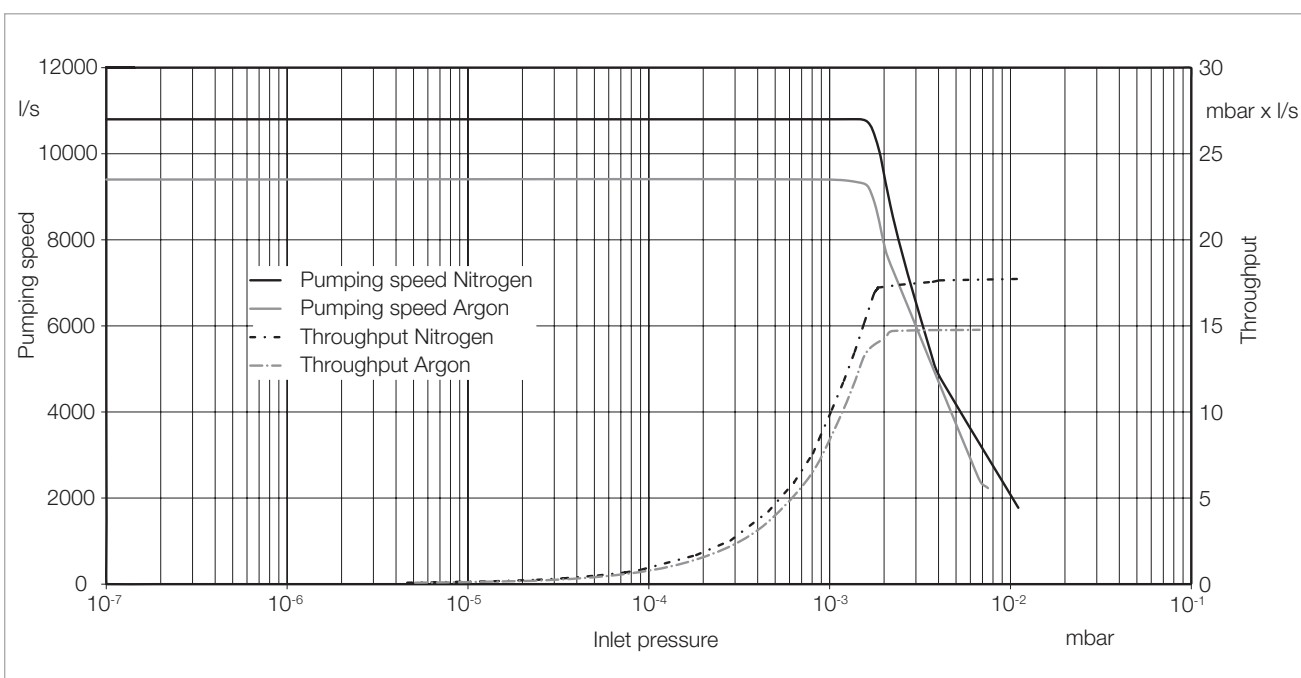
Included as standard equipment with the pump are

- centering ring with centering star, O-ring and outer ring for the high-vacuum flange,
- centering ring with insert for forevacuum baffle, O-ring and outer ring for the forevacuum flange.

The high-vacuum and forevacuum flanges are closed with shipping flanges and claws. The insides of the pumps have been cleaned; they are evacuated prior to shipment.



Dimensional drawings for DIJ 20 with plug, (left), DIJ 20 with ESU (middle) and DIJ 630 with junction box (EER) (right)



Pumping speed overview for nitrogen and argon

Technical Data

		DIJ 10	DIJ 320	DIJ 16	DIJ 500	DIJ 20	DIJ 630	DIJ 35	DIJ 1000
High vacuum connection	DN	10" ANSI	320 ISO-K	16" ANSI	500 ISO-K	20" ANSI	630 ISO-K	35" ANSI	1000 ISO-F
Forevacuum connection	DN	2" ANSI	63 ISO-K	3" ANSI	100 ISO-K	4" ANSI	160 ISO-K	6" ANSI	200 ISO-K
Pumping speed ¹⁾ for Nitrogen < 10 ⁻⁴ mbar		2 800		6 800		10 800		28 000	
Working range	mbar	< 10 ⁻² to 10 ⁻⁷		< 10 ⁻² to 10 ⁻⁷		< 10 ⁻² to 10 ⁻⁷		< 10 ⁻² to 10 ⁻⁷	
Ultimate total pressure ²⁾	mbar	< 5 x 10 ⁻⁷		< 5 x 10 ⁻⁷		< 5 x 10 ⁻⁷		< 5 x 10 ⁻⁷	
Max. permissible forevacuum pressure	mbar	5 x 10 ⁻¹		5 x 10 ⁻¹		5 x 10 ⁻¹		5 x 10 ⁻¹	
Pump fluid fill, min. / max.	l	1.0 / 1.4		1.7 / 3.4		5.0 / 7.0		12.0 / 18.0	
Mains voltage	V	1 ~ 230 /N/PE		3 ~ 400 /N/PE		3 ~ 400 /N/PE		3 ~ 400 /N/PE	
depending on variant, 50 / 60 Hz	V	1 ~ 230 /N/PE		3 ~ 460 /N/PE		3 ~ 460 /N/PE		3 ~ 460 /N/PE	
Heating power	kW	2.4		3.6		10.8		21.6	
Number of heating cartridges		2		3		9		18	
Warm up period	min	< 25		< 25		< 25		< 30	
Coolant (minimum) ²⁾									
for the pump	l/h	160		290		600		1 200	
for the cold cap baffle	l/h	20		50		80		150	
Number of cooling circuits (including cold cap baffle)		2		2		2		2	
Coolant connection									
for the pump	G	3/8"		1/2"		1/2"		1/2"	
for the cold cap baffle	G	1/4"		3/8"		3/8"		3/8"	
Weight, approx.	kg	45		110		208		720	
Recom. forevacuum pumps ³⁾									
at working pressure > 10 ⁻⁴ mbar		SV 100 B & W 501		SV 200 & W 501		SV 300 B & W 1001		SV 630 B & W 2001	
oil-sealed		-		DV 450 & W 501		DV 450 & W 1001		DV 650 & W 2001	
dry-compressing									
at working pressure < 10 ⁻⁴ mbar		D 25 B		D 65 B & W 251		SV 100 B & W 501		SV 300 B & W 1001	
oil-sealed		ECODRY plus 60		ECODRY plus 60 & W 251		-		DV 450 & W 1001	
dry-compressing									
Recom. supporting pump ³⁾		TRIVAC D 25 B		TRIVAC D 40 B		TRIVAC D 65 B		TRIVAC D 65 B	

1) Measured as per DIN 28 427 using DC 704 normal as the pump fluid.

2) The coolant water volume is referenced to $\Delta T = 10$ K. The discharge temperature should not exceed 30 °C.

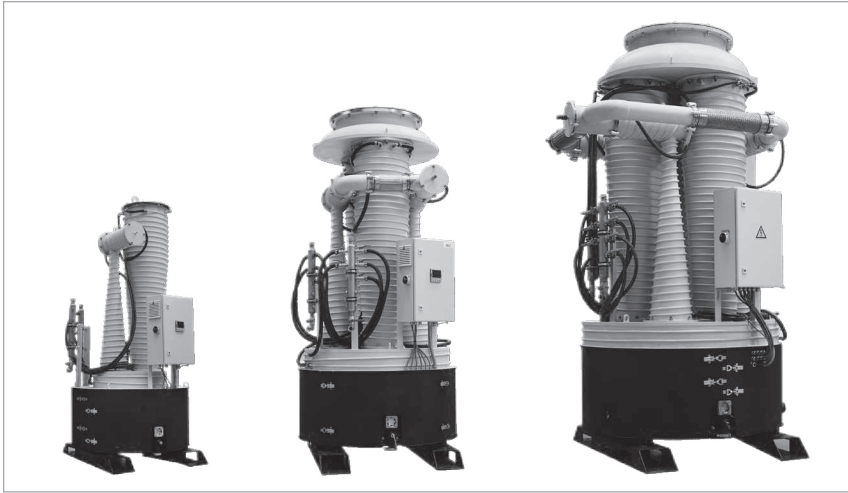
3) Single- and two-stage rotary vane pumps (TRIVAC; SOGEVAC), or dry-compressing pumps (ECODRY plus ;DRYVAC) from our line of forevacuum pumps in conjunction with roots pumps (RUVAC) in pumping systems.

Ordering Information

	DIJ 10	DIJ 320	DIJ 16	DIJ 500	DIJ 20	DIJ 630	DIJ 35	DIJ 1000
	Part No.	Part No.	Part No.	Part No.	Part No.	Part No.	Part No.	Part No.
with plug 400V / 50/60 Hz / 3ph PN/Y	22213V000	22214V000	22223V000	22224V000	22227V000	22228V000	22243V000	22244V000
with plug 460V / 50/60 Hz / 3ph PN/Y	22213V001	22214V001	22223V001	22224V001	22227V001	22228V001	22243V001	22244V001
with fuse box 400V / 50/60 Hz / 3ph PN/Y	22213V005	22214V005	22223V005	22224V005	22227V005	22228V005	22243V005	22244V005
with fuse box 460V / 50/60 Hz / 3ph PN/Y	22213V006	22214V006	22223V006	22224V006	22227V006	22228V006	22243V006	22244V006
with energy saving unit (EER) 400V / 50/60 Hz / 3ph PN/Y	-	-	-	-	22227V009	22228V009	22243V009	22244V009
with energy saving unit (EER) 460V / 50/60 Hz / 3ph PN/Y	-	-	-	-	22227V010	22228V010	22243V010	22244V010
Accessories								
Water flow monitor	500006623	500006623	500006623	500006623	500006623	500006623	500006623	500006623
Over-temperature protection switch	122 84	122 84	122 84	122 84	122 84	122 84	122 84	122 84
Astrotorus baffle	227 51	227 50	227 61	227 60	227 71	227 70	227 81	227 80
Right angle valve	504138V008	504138V002	504138V008	504138V002	504138V008	504138V002	504138V008	504138V002
Pump fluid ¹⁾	see Catalog Part "Oils / Greases / Lubricants LEYBONOL"							

1) Oil must be purchased separately

Oil Booster OB 6000 to OB 18000



Oil Booster OB 6000 (left), OB 12000 (middle) and OB 18000 (right)

The design of the oil booster pumps from Leybold is well proven in industrial high vacuum applications. They excel above all through excellent vacuum performance data and are, owing to their rugged design a reliable component in many medium and high vacuum units.

The water cooled oil booster pump was developed in particular for applications in the rough and medium vacuum range. The pumps from the OB line from Leybold deliver when properly deployed, a maximum pumping speed at high gas throughputs.

Advantages for the User

- Very high pumping speed from a small sized pump
- Pump sizes 6000, 12,000 and 18,000 m³ per hour
- Simple to operate
- Rugged and long life
- Selectable flange connections (OB 12,000 and 18,000 only)
- Small manageable amount of spare parts
- Pump components (e.g. heating elements, diffusion corpus, jet corpus) are similar for all OB sizes and can be exchanged easily
- Modern electronic pump monitoring (PLC controlled)
- High efficiency due to direct heating
- Optimized heating design for long oil change intervals

Typical Applications

- Vacuum Induction Melting (VIM) or Vacuum Induction Degassing (VID) of special alloys are utmost important process steps in the metallurgy.
- Depending on the required steel-quality, the required process pressure in such applications is particularly low.
- Secondary metallurgy processes are becoming more popular thanks to the greater demand for better steels e.g. in the automotive, construction and rail markets.

Supplied Equipment

The OB pumps are plug-and-play but are delivered without pump fluid.

The pump chamber is free of oil and has been cleaned.

The inside volume is evacuated. The high vacuum and forevacuum flanges are equipped with sealing and centering rings as well as shipping flanges. Moreover, the electric circuit breaker box and the cooling water manifold have been installed for immediate connection.

The included Pt100 temperature sensor ensures safe oil temperature monitoring.

The installed overtemperature protection switch monitors and ensures safe operation of the pump.

Technical Data

Oil Booster

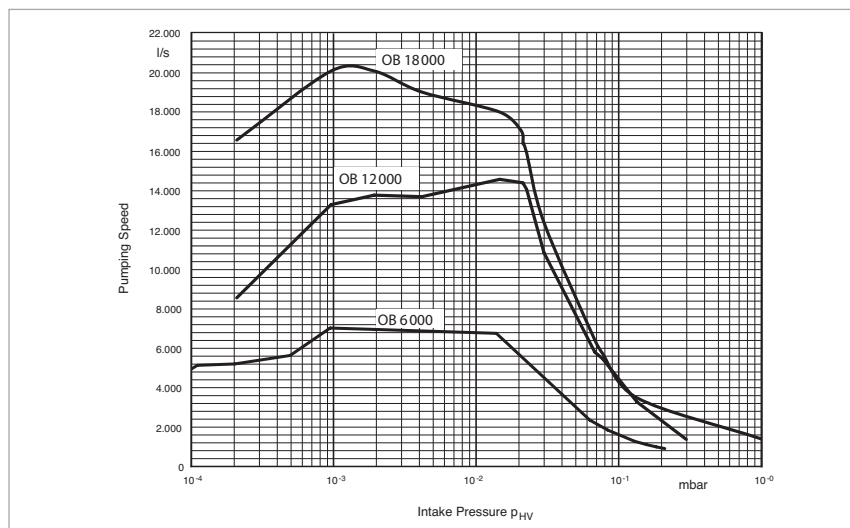
		OB 6000	OB 12000	OB 18000
Pumping speed for air below 1.0×10^{-3} mbar (7.5×10^{-3} Torr)	mbar x l/s	6.000	12.000	18.000
High vacuum connection				
standard	DN	400 ISO-K	630 ISO-F	630 ISO-F
Optional	DN	400 ISO-K / ASA 16 / ASA 18	500 ISO-K / 800 ISO-F / ASA 16 / ASA 20	800 ISO-F / 1000 ISO-F / ASA 32 / ASA 35
Fore vacuum connection (standard)	DN	160 ISO-K		
Operating range	mbar (Torr)	1 to 10^{-6} (0.75 to 10^{-6})		
Ultimate total pressure	mbar (Torr)	5×10^{-6} ($< 3.75 \times 10^{-6}$)		
Pump fluid filling	l (qts)	45 (47.6)	60 (63.4)	90 (95.1)
Mains connection				
Standard EURO, 50/60 Hz	V	400 ~ 3 Ph Y		
Standard Americas, 50/60 Hz	V	460 ~ 3 Ph Y		
Special, 50/60 Hz	V	230 ~ 3 Ph Δ		
Cooling water				
consumption	l/h (gal/min)	700 (3.1)	800 (3.5)	1360 (6.0)
connection	G	1"	1"	1"
Weight	kg (lbs)	450 (992)	850 (1874)	1400 (3086)

High
Vacuum Pumps

Ordering Information

Oil Booster

	OB 6000	OB 12000	OB 18000
	Part No.	Part No.	Part No.
Oil diffusion pump			
Standard EURO	503750V001	503654V001	503508V001
Standard US	503750V006	503654V006	503508V006
with control unit			
EURO version	503750V002	503654V002	503508V002
US version	503750V005	503654V005	503508V005
with control unit and waterflow/ -temperature monitoring			
EURO version (400 V)	503750V003	503654V003	503508V003
US version (460 V)	503750V004	503654V004	503508V004
Pump fluid	see Catalog Part "Oils / Greases / Lubricants LEYBONOL"		



Pumping speed curves of the Oil Booster OB 6000 to OB 18000 as a function of the intake pressure

LEYBOJET 630

Water-Cooled



LEYBOJET 630

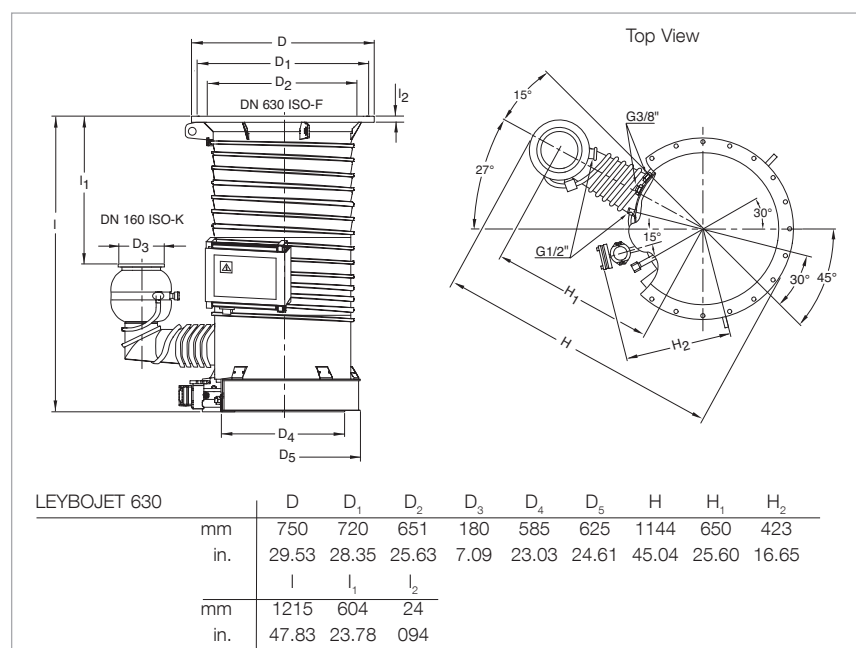
The oil diffusion pumps from Leybold are well proven in industrial high vacuum applications.

They excel through their excellent vacuum performance data and owing to their rugged design are a reliable component in many medium and high vacuum systems.

The water-cooled LEYBOJET 630 was developed especially with the medium vacuum in mind.

Advantages for the User

- High and stable pumping speed well into medium vacuum range
- Low ultimate pressure
- Low oil backstreaming due to integrated water-cooled cold cap baffle
- High forevacuum tolerance
- Each heating cartridge is protected by a separate circuit breaker
- In maintaining the well proven heating system - heating insert with thermally conducting panels and heating cartridges - the LEYBOJET 630 is now equipped with an additional ejector nozzle for the purpose of obtaining a stable pumping speed well into the medium vacuum range



Dimensional drawing for the LEYBOJET 630

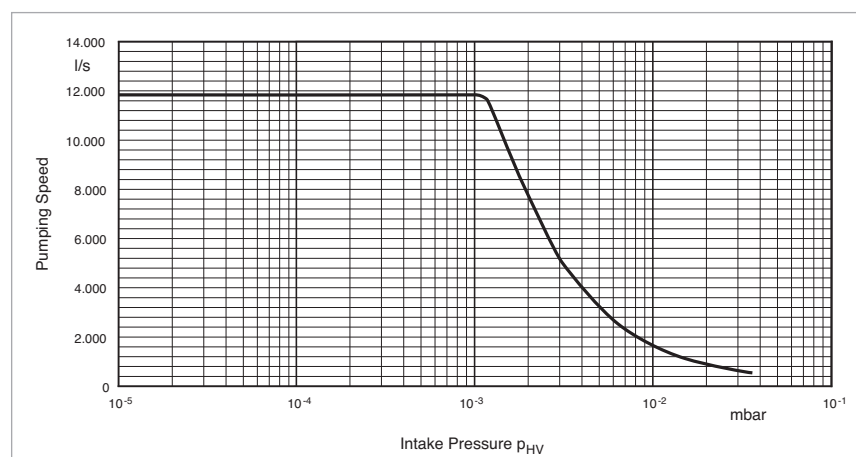
Typical Applications

The principal areas of application of the LEYBOJET 630 are modern sputtering processes as well as vacuum melting and drying plants.

Supplied Equipment

The LEYBOJET 630 are supplied ready for connection but without the filling of pump fluid.

The inside of the pump is cleaned before delivery to such an extent that it is free of oil. The inside is evacuated. High and forevacuum flanges are equipped with gaskets, centering rings, shipping flanges, and clamping components.



Pumping speed curve of the LEYBOJET 630 as a function of the intake pressure

Technical Data

LEYBOJET 630

High vacuum connection	DN	630 ISO-F
Forevacuum connection	DN	160 ISO-K
Pumping speed for air ¹⁾		
at 1×10^{-2} mbar	l/s	1 700
at 1×10^{-3} mbar	l/s	12 000
< 1×10^{-4} mbar	l/s	12 000
Operating range	mbar (Torr)	< 10^{-2} (< 0.75×10^{-2})
Ultimate total pressure ¹⁾	mbar (Torr)	< 5×10^{-7} (< 3.75×10^{-7})
Max. permissible forevacuum pressure	mbar (Torr)	6×10^{-1} (4.5×10^{-1})
Pump fluid filling, min. / max.	l (qts)	5.0 / 8.0 (5.3 / 8.5)
Mains connection 50/60 Hz	V	400, 3 Ph
Heating power	kW	10.8
Number of heating cartridges		9
Heating up time	min	< 30
Cooling water		
min. throughput ²⁾	l/h (gal/min)	500 (2.2)
connection	G	1/2"
Number of cooling circuits (including cold cap baffle)		2
Cooling water connection		
for pump	G (BPS)	1/2"
for cold cap baffle	G (BPS)	3/8"
Weight, approx.	kg (lbs)	145 (320)
Recommended backing pump ³⁾		
at operating pressures > 10^{-4} mbar (> 0.75×10^{-4} Torr)		SV 200 + W 501
at operating pressures < 10^{-4} mbar (< 0.75×10^{-4} Torr)		TRIVAC D 65 B + W 251

Ordering Information

LEYBOJET 630

	Part No.
Oil diffusion pump LEYBOJET 630	502 180
Astrotorus baffle	227 70
Water flow monitor	500006623
Over-temperature protection switch	122 84
Contact thermometer	218 81
Resistance thermometer Pt100 sensor	200 02 958
Pump fluid ⁴⁾	see Catalog Part "Oils / Greases / Lubricants LEYBONOL"

¹⁾ Measured to DIN 28 427 with LEYBONOL LVO 500 as the pump fluid

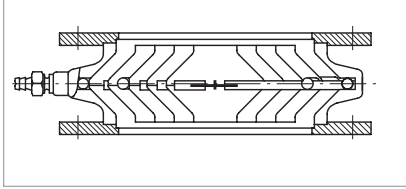
²⁾ The required quantity of cooling water refers to $\Delta T = 10^\circ\text{C}$ (50°F). The discharge temperature should not exceed 30°C (86°F)

³⁾ Single- or two-stage rotary vane vacuum pump (TRIVAC; SOGEVAC) from our range of forevacuum pumps jointly with Roots vacuum pumps (RUVAC) in pump systems

⁴⁾ Oil must be purchased separately

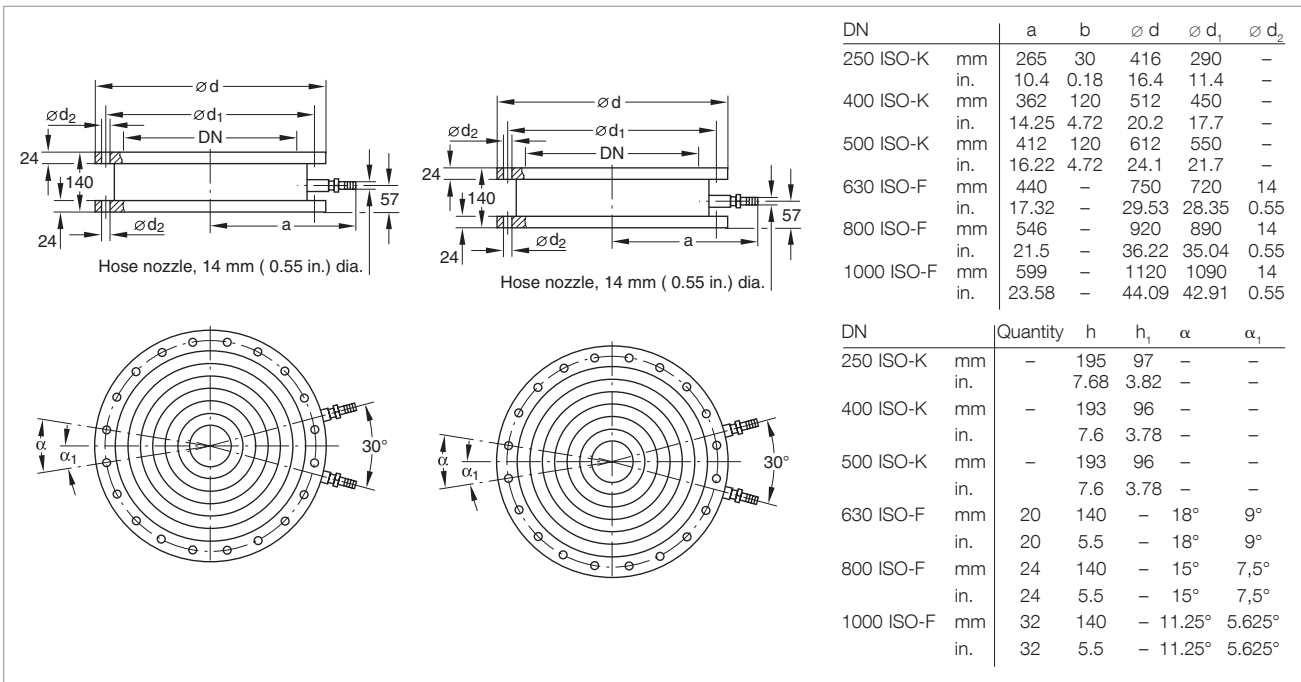
Accessories for Oil Diffusion Pumps

Astrotorus Baffles



Section through an astrotorus baffle

The cooling inserts of the astrotorus baffles are made of copper, whereas the housing and the connection flange are made of standard steel.



Dimensional drawing for the astrotorus baffle ISO-K (left) and ISO-F (right)

Technical Data

Astrotorus Baffles

Connection to pump	DIP	3 000	8 000	12 000
HV connection flanges	DN	250 ISO-K	400 ISO-K	500 ISO-K
Throttling of the pumping speed, approx.	%	30		
Conductance	l/s	3000	9000	12 000
Weight	kg (lbs)	25.0 (55.2)	30.0 (66.2)	65.0 (143.5)

Ordering Information

Astrotorus Baffles

	Part No.	Part No.	Part No.
Astrotorus Baffles			
250 ISO-K	227 50	-	-
400 ISO-K	-	227 60	-
500 ISO-K	-	-	227 65

High
Vacuum Pumps

Technical Data

Astrotorus Baffles

Connection to pump	DIP	20 000	30 000	50 000
HV connection flanges	DN	630 ISO-F	800 ISO-F	1000 ISO-F
Throttling of the pumping speed, approx.	%	30		
Conductance	l/s	18 000	28 000	50 000
Weight	kg (lbs)	120.0 (264.9)	170.0 (375.3)	190.0 (419.4)

Ordering Information

Astrotorus Baffles

	Part No.	Part No.	Part No.
Astrotorus Baffles			
630 ISO-F	227 70	-	-
800 ISO-F	-	227 75	-
1000 ISO-F	-	-	227 80

For matching valves, please ask us for a quotation.

Temperature dependant Switching Components for Automatic Pump System Control

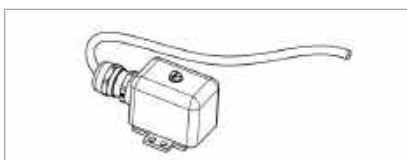
The operational status of the diffusion pump depends on the temperature of the pump fluid in the pump boiler. Through temperature dependent switching components which are inserted into the pump boiler it is possible to monitor the operational status of the diffusion pump and signal its status to a process controller.

For this, the diffusion pump requires two thresholds. Depending on the type of pump, the upper threshold should be between 180 and 200 °C (356 and 392 °F) and the lower threshold between 90 and 100 °C (194 and 212 °F).

The upper threshold indicates that the diffusion pump is ready for operation and thus actuates certain devices, for example opening of the high vacuum valve ahead of the diffusion pump.

The lower threshold indicates that the diffusion pump has cooled down to such an extent that the backing pump and the cooling water supply may be switched off.

Over-temperature protection switches are used to monitor the temperature of the cooling water in the cooling water circuit of the diffusion pumps. When the temperature rises to unacceptably high levels (for example when the cooling water supply fails) the heater in the diffusion pump is switched off (correct electrical connection to the main supply is required). The use of over-temperature protection switches avoids unnecessary alarms that may be triggered by contaminated water when only a water flow monitor is used. The over-temperature protection switch is screwed on to a contact plate which is soldered to the cooling pipe on the



Over-temperature protection switch

pump's body.

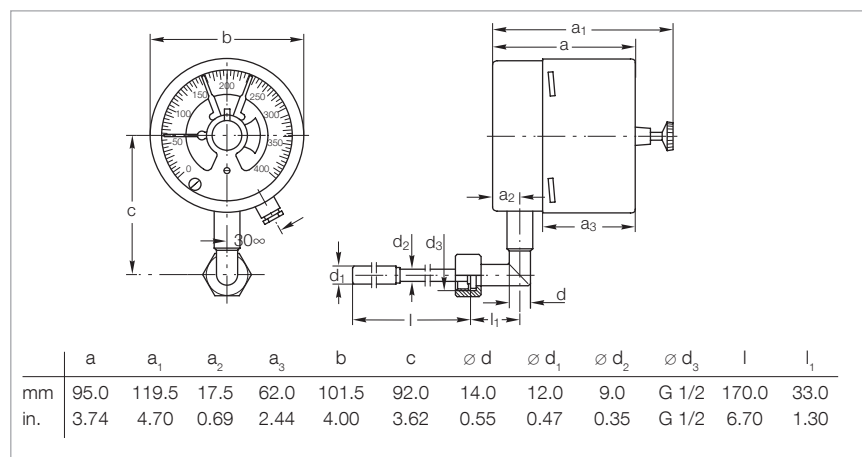
Max. switching current: 5 A (230 V, 50/60 Hz).

Contact thermometer with a range from 0 to 400 °C (32 to 752 °F).

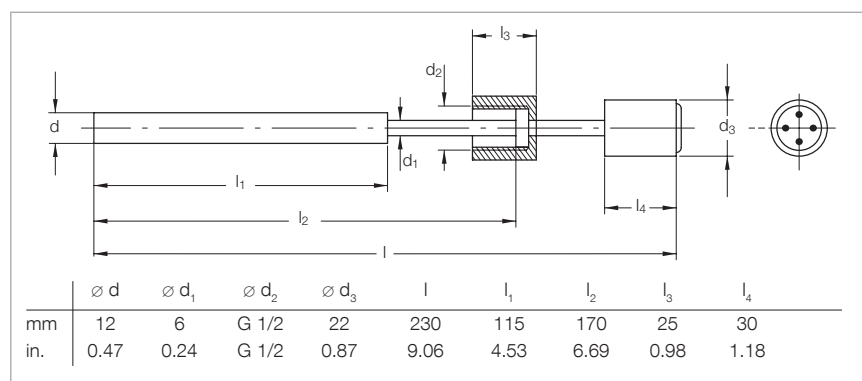
Through a trailing pointer two switching thresholds may be set up independently. The current oil temperature and the thresholds which have been set up can be read off at the

location of the diffusion pump. The contacting thermometer is not suited for remote signaling of temperatures.

Resistance thermometer Pt100 sensor. The measurement range of this sensor depends on the temperature display unit used by the customer where also the required thresholds are set up. The Pt100 sensor is ideal for remote signaling of temperatures.



Dimensional drawing for the contact thermometer



Dimensional drawing for the resistance thermometer Pt100 sensor

Ordering Information

Monitoring Instruments

	Part No.
Over-temperature protection switch	122 84
Contact thermometer (Measurement range 0 to +400 °C (+32 to +752 °F), Rating at 220 V AC: 250 mA [resistive load], Weight: 1.7 kg (3.7 lbs))	218 81
Resistance thermometer Pt100 sensor	200 02 958

Monitoring Instruments

Protection against Overheating

Water flow monitors are installed in the cooling water return section of the diffusion pump. When the cooling water throughput drops below a certain level, either the heater in the diffusion pump is switched off or a warning light or signal is triggered, depending of the type of circuit.

Measurement range: 1 to 40 l/min
(0.2 to 10.6 gal/min)

The water throughput may be set within the limits stated with a high degree of reproducibility.

Water flow monitors may be installed in any orientation.

Max. switching capacity:
100 VA (230 V, 50/60 Hz).

Ordering Information

Water Flow Monitor

	Part No.
Water flow monitor	500006623

Protection against Power Failure

A SECUVAC valve (see Product Section "Vacuum Valves") must be installed in the forevacuum line in order to prevent damage to the diffusion pump or the pump fluid in the event of a power failure affecting backing pumps which are not equipped with an automatic isolation valve. Rotary vane vacuum pumps from the TRIVAC B series are equipped with an automatic Pressure relief valve (intake isolation valve) as standard.

Protection against Pressure Increases in the Forevacuum Line

For protection against a pressure increase in the forevacuum line which is not caused by a power failure you may use our vacuum gauges which offer an adjustable switching threshold (see Product Section "Vacuum - Measuring, Controlling").

Power Controller



Power controller with integrated USB interface



Ethernet interface for PLC data integration

When it comes to the aspect of economic and efficient operation of diffusion pumps, power consumption plays an important role.

Through our DIP power controller, you may now drastically cut your power consumption – and this without impairing pump performance in any way!

Leybold Solutions provides a unique energy control unit with less thermal loss to control the heating power to save energy significantly!

Advantages to the User

- Energy saving up to 30% (low costs and ROI in less than three years)
- Further potential savings through temperature decrease in standby-mode
- High quality regulation with customized software
- Increased operation safety and comfort
- Improved service life for oil and heating cartridges
- Easy and exact to operate via PLC or manual directly at the pump
- Uncomplicated integration of generated data into your own process control or export data via USB port
- Strategically process analysis and optimization by interpretation of energy control unit data

Technical Data**Power Controller for**

		DIP 20 000	DIP 30 000	DIP 50 000
Pumping speed for air below 1×10^{-4} mbar	l/s	20 000	30 000	50 000
Installed heating power	kW	12	18	24
Number of heating cartridges		2	6	9
Heating up time	min	< 25	< 30	< 30
Cooling water (minimum) for the pump	l/h	600	900	1500
for the cold cap baffle	l/h	60	80	150

Ordering Information**Power Controller for**

	DIP 20 000	DIP 30 000	DIP 50 000
	Part No.	Part No.	Part No.
Oil diffusion pump with power controller			
DIP 20 000	22230V001	-	-
DIP 30 000	-	22235V001	-
DIP 50 000	-	-	22240V001
Retrofit kit (DIP power controller)			
DIP 20 000	503647V001	-	-
DIP 30 000	-	503648V001	-
DIP 50 000	-	-	503649V001
Full-service retrofit kit ¹⁾			
DIP 20 000	AS8100F	-	-
DIP 30 000	-	AS8101F	-
DIP 50 000	-	-	AS8102F
Mineral oil LVO 500			
1 l		L50001	
5 l		L50005	
20 l		L50020	
Mineral oil LVO 510			
1 l		L51001	
5 l		L51005	
Silicone oil LVO 520			
1 l		L52001	
5 l		L52005	
Silicone oil LVO 530			
1 l		L53001	

¹⁾ Delivery, installation, commissioning and instruction of the staff is included

Adsorption Traps with Aluminium Oxide Insert



Adsorption traps are installed in all those cases where an oil-free vacuum is to be produced with oil-sealed vacuum pumps.

Advantages to the User

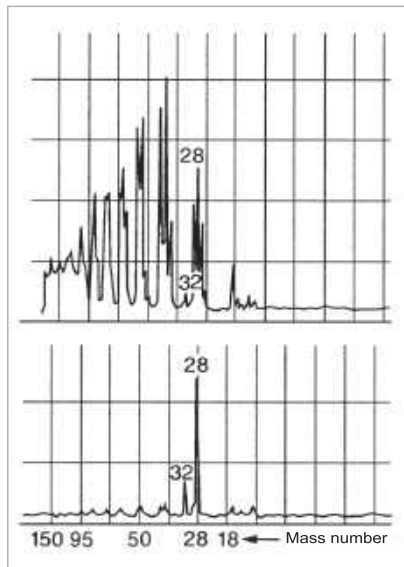
- Backstreaming of oil is reduced by 99%
- Long service life
- High conductance
- Filling can be easily exchanged
- Improvement in the ultimate pressure attained by backing pumps by one order of magnitude
- Stainless steel housing and insert
- NBR gasket

Typical Applications

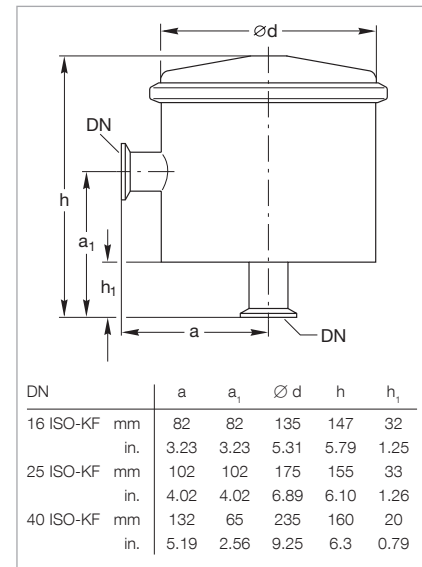
- Product of an oil-free vacuum

Supplied Equipment

- Complete with insert
- Without adsorbent



Residual gas spectrum; top ahead of a rotary vacuum pump, bottom ahead of a rotary vacuum pump with adsorption trap



Dimensional drawing for the adsorption traps

Technical Data

		16 ISO-KF	25 ISO-KF	40 ISO-KF
Conductance at 10 ⁻² mbar (Torr)	l/s	4	6	12
Service live with Al oxide	Month	3		
Al oxide filling	l (qts)	0.5 (0.53)	1.0 (1.06)	2.0 (2.1)
Weight, approx.	kg (lbs)	1.3 (2.9)	1.3 (2.9)	4.0 (8.8)

Adsorption Traps

Ordering Information

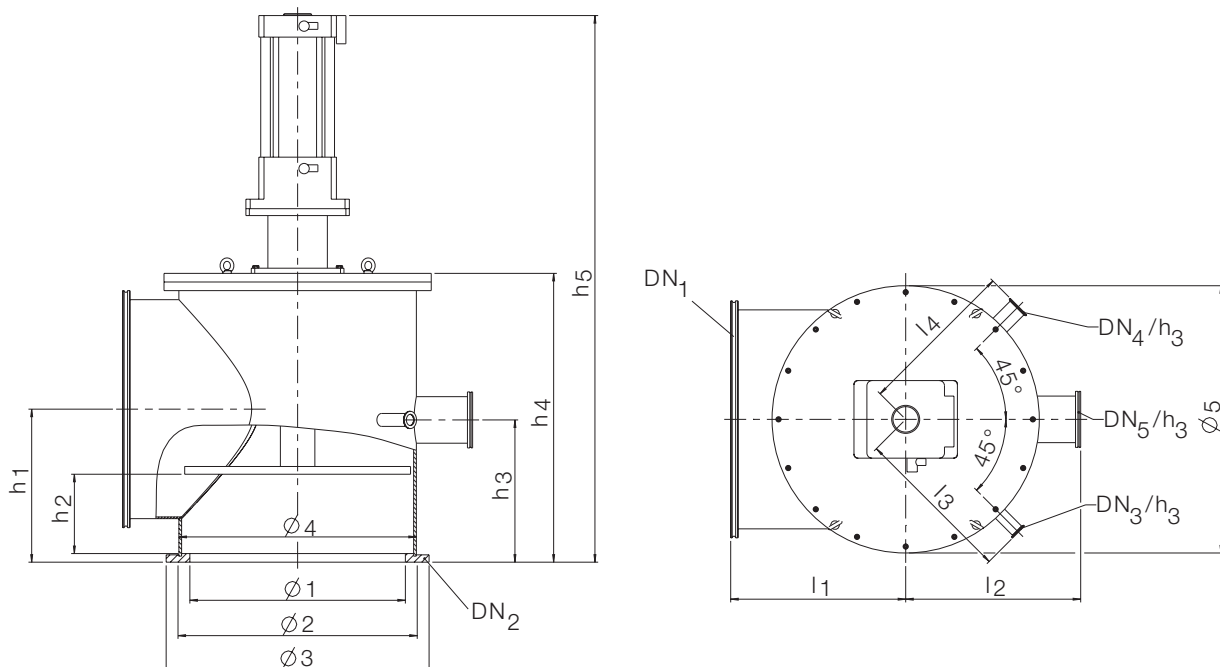
Adsorption Traps

	16 ISO-KF	25 ISO-KF	40 ISO-KF
	Part No.	Part No.	Part No.
Adsorption trap	854 14	854 15	854 16
Activated aluminum oxide in tin 1.6 l (approx. 1.2 kg (2.65 lbs))	854 10		

A stainless steel pressure washer with a black trigger gun and a black hose. The device has a cylindrical body with a side handle and a spray lance attached to the side. The trigger gun is black and has a black hose connected to it. The entire unit is made of polished stainless steel.

Advantages to the User

- Electropneumatically actuated right-angle valves, stainless steel, DN 250 ISO-K



Nominal width (DN ₁ /DN ₂)	DN ₃	DN ₄	DN ₅	h ₁	h ₂	h ₃	h ₄	h ₅	o ₁	o ₂	o ₃	o ₄	o ₅	l ₁	l ₂	l ₃	l ₄
DN 250 ISO-K	16 KF	40 KF	63 ISO-K	211	83	211	392	565	262	-	290	292	330	208	206	206	206
DN 320 ISO-K	16 KF	40 KF	63 ISO-K	208	107	208	433	934	318	395	425	398,5	470	279	279	258	258
DN 400 ISO-K	25 KF	40 KF	63 ISO-K	246	148	220	538	1045,5	400	480	510	450	510	350	325	300	300
DN 500 ISO-K	25 KF	40 KF	100 ISO-K	355	184	330	670	1268	500	580	610	551	620	406	406	370	370
DN 630 ISO-K	25 KF	40 KF	160 ISO-K	403	233	355	821	1469	630	720	750	690	759	537	470	436	436
DN 800 ISO-F	25 KF	40 KF	250 ISO-K	491	267	440	1002	1668	800	890	920	899	990	595	533	505	505
DN 1000 ISO-F	25 KF	40 KF	250 ISO-K	592	333	542	1206	2133	1000	1090	1120	1110	1220	700	635	603	603

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Technical Data	DN 250 ISO-K	DN 320 ISO-K	DN 400 ISO-K	DN 500 ISO-K	DN 630 ISO-K	DN 800 ISO-F – F	DN1000 ISO-F
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Installation orientation	vertical / pneumatic Cylinder at the top						
Conductance	4,000	6,000	9,000	12,000	20,000	30,000	50,000
Weight (kg)	51	110	150	190	270	350	450
Drive pneumatic	(opening and closing)						
Pressure difference when opening	Max. 200 mbar						
Opening time ²⁾ (sec)	2	3	5	5	6	8	8
Closing time ²⁾ (sec)	2	3	5	5	6	8	8
Service life (actuations)	> 1 x 10 ⁵	> 1 x 10 ⁵	> 1 x 10 ⁵	> 1 x 10 ⁵	> 1 x 10 ⁵	> 5 x 10 ⁴	> 5 x 10 ⁴
Helium leak rate	< 1 x 10 ⁻⁷ mbar l/s						
Pressure range	1 x 10 ⁻⁷ mbar to atmospheric pressure						
Max operating temp.	60 °C						
Connecting flange ¹⁾	DN 250 ISO-K – K	DN 320 ISO-K – F	DN 400 ISO-K – F	DN 500 ISO-K – F	DN 630 ISO-K – F	DN 800 ISO-F – F	DN1000 ISO-F – F
Bypass Flange	63 ISO-K	63 ISO-K	63 ISO-K	100 ISO-K	160 ISO-K	250 ISO-K	250 ISO-K
Further Flanges	NW40 NW16	NW40 NW16	NW40 NW25	NW40 NW25	NW40 NW25	NW40 NW25	NW40 NW25

Materials

Housing and disk	Stainless steel 1.4301
Seals	FKM
Sealing bellows	Stainless steel 1.4373

Pilot valve

Nominal voltage	24 V DC
Nom. power consumption	4,5 W
Duty ratio	100 %

End position switch (max. contact ratings)

Nominal voltage	5 – 240 V AC/DC
Current	100 mA
Power consumption	10 W

Compressed air supply

Air connection	¼" NPT
Pressure range	5 – 7 bar

¹⁾ per flange, 12 clamping screws are needed for mounting (Part No. 267 10)

²⁾ under vacuum, differential pressure $\Delta p = 0$ and compressed air = 6 bar (overpressure)

Ordering Information	DN 250 ISO-K	DN 320 ISO-K	DN 400 ISO-K	DN 500 ISO-K	DN 630 ISO-K	DN 800 ISO-F – F	DN1000 ISO-F
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	Part. No.	Part. No.	Part. No.	Part. No.	Part. No.	Part. No.	Part. No.
Right-angle Valve, electropneumatic drive	504137V002	504138V002	504139V002	504140V002	504141V002	504142V002	504143V002
Seal kit with bellows	EK121870-00	EK121871-00	EK121872-00	EK121873-00	EK121874-00	EK121875-00	EK121876-00
Seal kit without bellows	EK121870-01	EK121871-01	EK121872-01	EK121873-01	EK121874-01	EK121875-01	EK121876-01
Electronics-solenoid and position indicators	EK121870-02	EK121871-02	EK121872-02	EK121873-02	EK121874-02	EK121875-02	EK121876-02

More valves please find in the catalog part "Valves"

Applications and Accessories, Cryo Pumps

Cryo pumps											
		COOLVAC 1500	COOLVAC 2000	COOLVAC 3000	COOLVAC 5000	COOLVAC 10000	COOLVAC 18000	COOLVAC 30000	COOLVAC 60000	COOLVAC 30000 LN ₂	COOLVAC 60000 LN ₂
Application											
General research		■	■	■	■	■	■	■	■	■	■
Evaporation coating systems		■	■	■	■	■	■	■	■		
Transfer chambers / Loadlock		■	■	■	■	■	■				
Metallization systems		■	■	■	■	■	■	■	■		
Sputtering systems		■	■	■	■	■					
Ion implanters		■	■	■	■						
Electron beam welding systems		■	■	■	■	■	■				
Space simulation chambers		■	■	■	■	■	■	■	■	■	■
UHV systems		■	■	■							
Beam tubes in particle accelerators		■	■								
Vacuum furnaces					■	■	■	■	■	■	■

Model versions

BasicLine Version without electronics, with temperature sensors	■	■	■	■	■	■	■	■		
iClassicLine version with electronics and integrated controller, with temperature sensors and electrical heaters	■	■	■	■	■	■	■	■		
BasicLine LN ₂ version with liquid nitrogen cooling, temperature sensors and electrical heaters and over-temperature protection									■	■

Accessories

Purge gas option, on request	■	■	■	■	■					
Compressor unit COOLPAK 2000 Series	■	■	■							
Compressor unit COOLPAK 6000 Series	[■]	[■]	[■]	■	■	■	■	■	■	■
Flexible pressure lines	■	■	■	■	■	■	■	■	■	■
Gas manifold GD 2 for multiple operation of up to two cryo pumps	■	■	■	■*)	■*)					
Gas manifold GD 4 for multiple operation of up to four cryo pumps	■	■	■							
Low temperature measuring instrument MODEL 211 S (BasicLine Series only)	■	■	■	■	■	■	■	■	■	■

[■] = For dual and multiple operation only *) Multiple operation only after consultation with technical support

Applications and Accessories, Cryogenics

				single-stage		double-stage
	COOLPOWER 50	COOLPOWER 140 T	COOLPOWER 250 MD	COOLPOWER 7/25	COOLPOWER 5/100	COOLPOWER 10 MD
Cold heads						
Application						
Cooling of samples, sensors and detectors	■	■	■	■	■	■
Cooling of detectors in astronomy	■	■	■	■	■	■
Cooling of samples for spectroscopy				■	■	■
Cooling of samples for applications in medical technology and R&D				■	■	■
Cooling of HTS superconductors	■	■	■	■	■	■
Cooling of LTS superconductors				(■)	(■)	(■)
Cooling in medical equipment	■	■	■	■	■	■
Cooling of surfaces for pumping of gases	■	■	■	■	■	■
Cryogenic process gas cleaning	■	■	■	■	■	■
Condensation, resublimation and freezing of gases	■	■	■	■	■	■

(■) = Only LTS superconductors with $T_c > 10$ K

Accessories

Compressor unit COOLPAK 2000 Series	■			■		
Compressor unit COOLPAK 6000 Series	(■)	■	■	(■)	■	■
Low temperature measurement instrument MODEL 211S	■	■	■	■	■	■
Temperature sensor	■	■	■	■	■	■

(■) = Only high T_c superconductors

Conversion of Units

Kelvin (K), Celsius (°C), Fahrenheit (°F)

Calculation from	Calculation to	Formula
Celsius	Fahrenheit	$^{\circ}\text{F} = ^{\circ}\text{C} \times 1.8 + 32$
Celsius	Kelvin	$\text{K} = ^{\circ}\text{C} + 273.15$
Kelvin	Celsius	$^{\circ}\text{C} = \text{K} - 273.15$
Kelvin	Fahrenheit	$^{\circ}\text{F} = \text{K} \times 1.8 - 459.67$
Fahrenheit	Celsius	$^{\circ}\text{C} = (^{\circ}\text{F} - 32) / 1.8$
Fahrenheit	Kelvin	$\text{K} = (^{\circ}\text{F} + 459.67) / 1.8$

The following applies to absolute zero:
 $0 \text{ K} = -273.15 \text{ }^{\circ}\text{C} = -459.67 \text{ }^{\circ}\text{F}$

Cryo Pumps

Cryo pumps are gas entrapment vacuum pumps for the pressure range from 10^{-3} to $\leq 10^{-11}$ mbar (0.75×10^{-3} to $\leq 0.75 \times 10^{-11}$ Torr). The principle of operation is that gaseous substances are bound to the cold surfaces within the pump by means of cryocondensation, cryosorption or cryotrapping.

In order to be able to produce a high or ultra-high vacuum, the cold surfaces (cryopanel) must be cooled to a sufficiently low temperature. Depending on the type of cooling system used a distinction is made between refrigerator cryo pumps, bath cryo pumps and evaporator cryo pumps.

Leybold manufactures refrigerator-cooled cryo pumps as well as liquid nitrogen supported cryo pumps.

Advantages to the User

Advantages offered by the pumping principle

- High effective pumping speed for all gases
- Extremely high pumping speed for H_2O (water) and H_2 (hydrogen)

For a given diameter of the high vacuum flange, the cryopump offers the highest pumping speed of all high vacuum pumps.

Advantages offered by Design

In contrast to gas transfer high vacuum pumps, cryo pumps do not have any mechanically moving, oil or grease lubricated parts on the vacuum side.

The following advantages are a direct result of this design characteristic:

- Hydrocarbon-free vacuum in the pressure range from 10^{-3} to $\leq 10^{-11}$ mbar (0.75×10^{-3} to $\leq 0.75 \times 10^{-11}$ Torr).
- Insensitivity to mechanical disturbances from particles coming from the process or external vibrations.

Further Advantages

- More compact than comparable pump systems offering a pumping speed of over 1500 l/s
- Backing pump is only required during start-up and during regeneration
- User friendly process control and pump control
- Favorable price-performance ratio and low running costs especially at higher pumping speeds

The cryo pumps are cooled by the well-proven two-stage refrigerators from Leybold's COOLPOWER line (Gifford/McMahon principle).

The design of a refrigerator cryopump from the COOLVAC range is shown schematically in the figure below.

The first stage of the cold head (6) cools the thermal radiation shield (7) and the baffle (8) of the pump.

Both are made of copper with high thermal conductivity in order to optimally utilize the available refrigerating capacity.

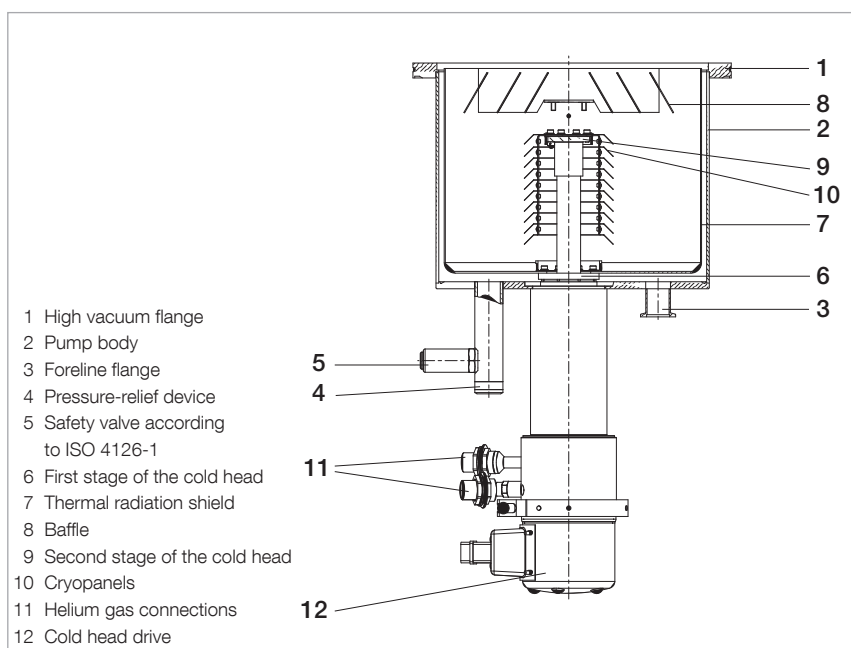
Operating temperatures of 45 K to 80 K are reached depending on the type of pump and on the operating conditions. Mainly water but also carbon oxides are pumped here.

The second stage of the cold head (9) is used to cool the cryopanel (10). These pumping surfaces are also made of copper of high thermal conductivity and they are tightly linked thermally to the second stage of the cold head.

Depending on the operating conditions, operating temperatures of 10 to 20 K are attained.

Here the process of cryocondensation of N_2 (nitrogen), O_2 (oxygen) and Ar (argon) will take place.

The inner part of the pumping surfaces are additionally covered with activated charcoal. Here the process of adsorption (cryosorption) of H_2 (hydrogen), Ne (neon) and He (helium) will take place.



COOLVAC refrigerator cryopump

All cryo pumps from the COOLVAC range are equipped with all safety related components, particularly with a pressure-relief device and safety valve with flange hub (4, 5) which is equipped with an additional DN 40 KF flange for connection of an exhaust line.

The pump's body is made of high-quality stainless steel.

Helium compressors from the COOLPAK range are required for operating the COOLPOWER cold heads, which are incorporated with-in the COOLVAC range of cryo pumps.

Regenerating Cryo Pumps

An important aspect of the operation of cryo pumps is that of regeneration. Since a cryo pump is a gas entrapment pump, the pumped gases must be removed from the pump before the capacity limit is exceeded.

The so-called "regeneration" occurs by switching off the compressor unit and heating up the cold surfaces to room temperature. The pumped gases are pumped out by means of a roughing pump. As soon as the vacuum pressure is low enough, the cryo pump can be cooled down again. Finally, when the operating temperature has been reached, the regeneration process is complete.

Various procedures are available for regeneration as listed below:

- Heating up through self-heating after the refrigerator has been switched off, and subsequent re-cooling
- Heating up with the support of a dry, warm inert gas
- Heating up by means of an electrical heater on the cold surfaces.

These methods can be combined with each other.

iClassicLine Cryo pumps with regulated regeneration system

The cryo pumps from the *iClassicLine* (iCL) range are gradually heated up to room temperature by means of electrical heaters at both cold head stages. Pressure, temperature and heating power are monitored in detail within the cryo pumps.

During the process the pumped gases are released one after the other in the following sequence:

- Gases adsorbed at the cryopanel (e.g. hydrogen, helium, neon),
- Gases condensed at the cryopanel (e.g. nitrogen, oxygen, argon),
- Gases and vapors which have condensed on to the baffle and thermal radiation shield (e.g. water vapor).

The benefit of Leybold's regeneration process described above is that no additional purge gas is required during the regeneration of inert, unreactive gases.

Our application support team is on hand to answer any safety questions you may have in relation to client-specific process gases.

The accessories required for automatic regeneration, such as temperature sensors on both cold head stages, pressure gauge head, fore-vacuum valve and electrical controller are an integral part of the cryo pump in the *iClassicLine* range. Additional accessories can be supplied on request.

BasicLine cryo pumps with no regulated regeneration system

In the case of cryo pumps from the *BasicLine* (BL) range, regeneration takes place manually in two sub-steps:

- Switching off the refrigerator system and waiting until room temperature is reached. (The temperature can be read off by the customer from the built-in silicon diode).
- Re-cooling after a sufficiently low pressure is reached in the cryo pump.

Additional components such as temperature display unit, pressure gauge head and fore-vacuum valve are not part of the standard scope of delivery for *BasicLine* cryo pumps, although they are available as accessories on request. Leybold will be pleased to advise you on the optimum component configuration for your application.

The cryo pumps from both the *BasicLine* range as well as those from the *iClassicLine* range are available in suction capacity classes from 1500 l/s to 60000 l/s.

Multiple Operation of Refrigerator Cryo Pumps

The powerful Leybold compressor units COOLPAK 6000 H open up the possibility of operating up to three refrigerator cryo pumps simultaneously.

Advantages to the User

- Significantly reduced investment and operating costs
- Small footprint

Cold Heads

A refrigerator is a cooling machine which operates on the basis of a thermodynamic cycle (Carnot) to produce cryogenic temperatures ($T \leq 120 \text{ K}$).

Refrigerators operating according to the Gifford/McMahon principle have succeeded over other methods of cooling cryo pumps and cryogenic applications. Exclusively such coolers are produced and used by Leybold.

The cold heads consist essentially of three modules:

- Drive module
- Displacement unit
- Cold head stage(s)

Helium compressors from the COOL-PAK range are used to drive the cold heads from the COOLPOWER range.

In addition to the standard products, Leybold also offers these cold heads, as well as cryo pumps, in custom designs in accordance with customer requirements.

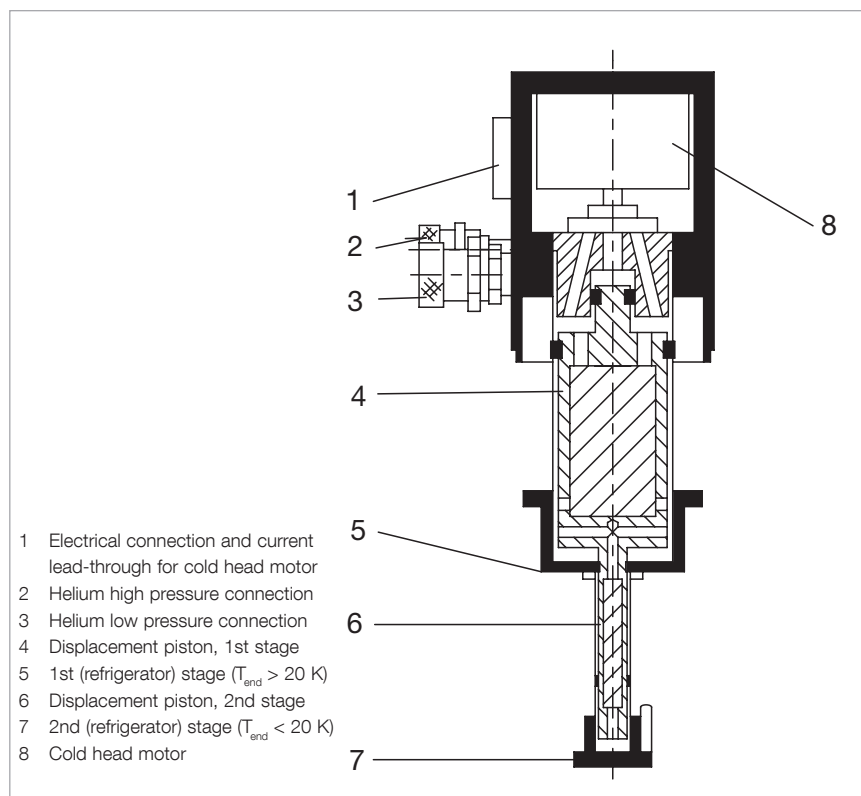
Gifford/McMahon-Refrigerators

Advantages to the User

- No liquid helium and no liquid nitrogen are required
- Very simple to operate
- Easy process control and temperature control via a computer
- No space problems since cold head and compressor unit can be installed and operated apart
- Installation of the cold head basically in any orientation
- High reliability
- Long periods of operation without maintenance

Typical Applications

- Cooling of
 - cryopanel in cryo pumps thereby producing high or ultra-high vacuum
 - superconducting magnets; for instance in magnetic resonance tomography
 - samples for spectroscopic analysis in solid state and surface physics
 - high-temperature and low-temperature superconductors
 - semiconductors
 - infrared and gamma detectors
- Recondensation of liquids and cleaning of gases
- Calibration of sensors



Dual-stage Gifford/McMahon cold head (schematic diagram)

Cold heads from the COOLPOWER range

The standard range of single-stage and double-stage cold heads matches a wide range of applications.

Leybold is offering refrigerators with usable refrigerating powers from 20 W to 250 W at 80 K (single-stage).

In two-stage systems, the refrigeration capacities of the second stage range in between 5 W and 20 W at 20 K.

Pneumatically driven cold heads

Advantages

- **Simple Design**
The pneumatic drive system for the displacer of these cold heads from Leybold consists of only two mechanically moving components: the rotating control valve and the synchronous motor driving the control valve.
- **Easy and quick maintenance**
Owing to the simple design of the built-in cold heads, maintenance is easy. Maintenance can be performed in place without detaching the cold head from the vacuum chamber.

Mechanically driven cold heads

Advantages through low vibrations

With these cold heads, movement of the displacer unit is automatically controlled via a crank drive, which leads to low vibration levels.

Here, too, maintenance at the place of use can be carried out without impacting the surrounding infrastructure, in particular with no breaking of the chamber's vacuum by the service personnel.

Advantages through high reliability

Leybold cold heads are used in applications which place particularly high demands on reliability, such as magnetic resonance imaging in medical technology, the cooling of low and high temperature superconductors, and the cooling of detectors in telescopes for astronomy.

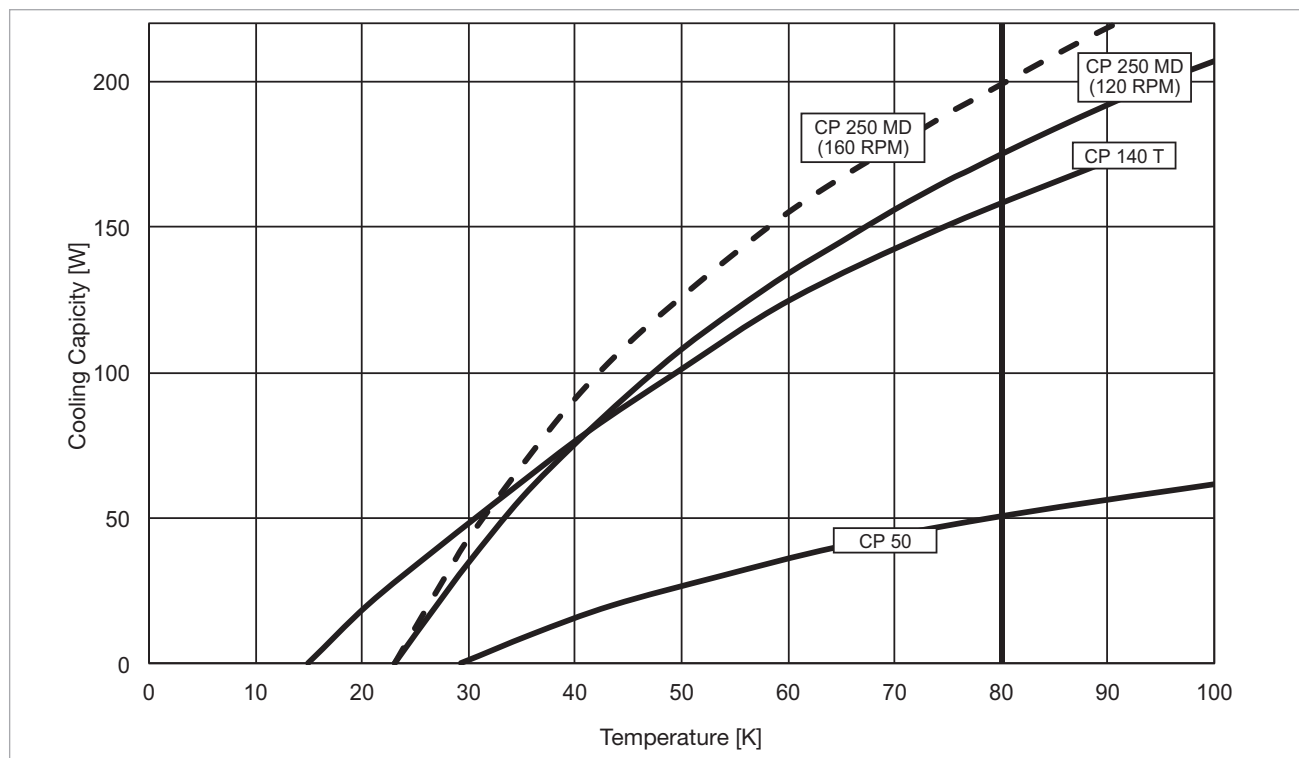
Refrigeration capacity diagrams (see next page of the catalogue)

On the following page of the catalogue you will find the refrigeration capacity diagrams for our single-stage and double-stage COOLPOWER cold heads.

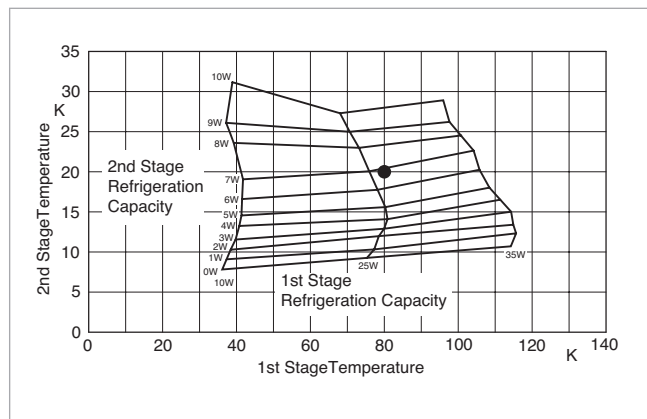
The interpretation of the diagrams for our double-stage cold heads is explained using the example of the refrigerator cold head COOLPOWER 5/100 (see diagram on next page). If applying heat loads of 100 W on the 1st stage and of 6 W on the 2nd stage, simultaneously, then the intersection point (●) 100 W / 6 W of the two lines gives the expected 1st stage and 2nd stage temperature of 80 K and of 20 K, respectively.

Without thermal load (left lower intersection point (○) 0 W / 0 W of this "load map"), ultimate temperatures of < 30 K and of < 10 K will be reached on the 1st stage and on the 2nd stage, respectively.

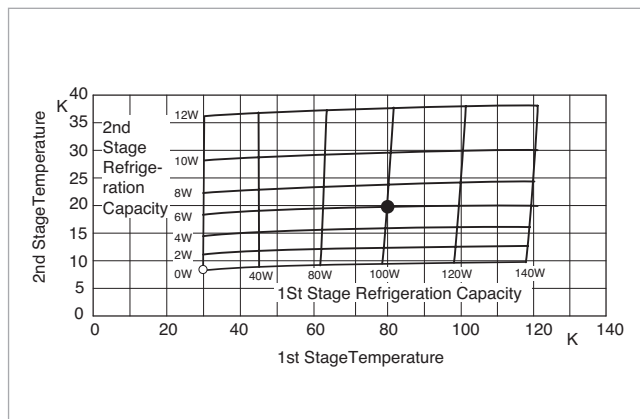
Refrigerating Capacity of Cryogenic Cold Heads



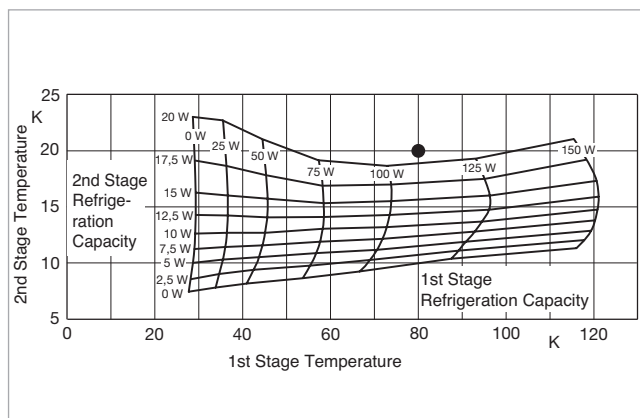
Typical refrigerating capacity of the single-stage cold heads COOLPOWER 50, COOLPOWER 140 T and COOLpower 250 MD



Typical refrigerating capacity of the cold head COOLPOWER 7/25



Typical refrigerating capacity of the cold head COOLPOWER 5/100



Typical refrigerating capacity of the cold head COOLPOWER 10 MD

The refrigerating capacities stated apply to vertical operation with the cold end at the bottom.

Compressor Units

COOLPAK 2000 and COOLPAK 6000 H compressors are available for single and multiple operation of the cold heads from the COOLPOWER line as well as for operation of cryo pumps from the COOLVAC line.

The compressors are characterised by high reliability and ease of maintenance. The maintenance interval is as long as 30,000 hours depending on the application. The low level of noise and vibration is achieved through the

exclusive use of scroll compressors and specially selected components.

The possibilities for single and multiple operation of refrigerator cryo pumps are given in the table below:

Compressor Unit	For the operation of	
	Cold Heads	Cryo Pumps
COOLPAK 2000/2200	1 x COOLPOWER 50 1 x COOLPOWER 7/25	1 x COOLVAC 1500 / 2000 / 3000
COOLPAK 6000 HD	2 x COOLPOWER 50 2 x COOLPOWER 7/25	2 x COOLVAC 1500 BL / 2000 BL / 3000 BL 2 x COOLVAC 5000 BL / 10000 BL *)
COOLPAK 6000 H/6200 H	1 x COOLPOWER 140 T 1 x COOLPOWER 5/100	up to 3 x COOLVAC 1500 iCL / 2000 iCL up to 2 x COOLVAC 3000 iCL up to 2 x COOLVAC 5000 iCL / 10000 iCL *) 1 x COOLVAC 5000 BL / 10000 BL
COOLPAK 6000 HMD/6200 HMD	1 x COOLPOWER 250 MD 1 x COOLPOWER 10 MD	1 x COOLVAC 30000 BL LN ₂ 1 x COOLVAC 60000 BL LN ₂

*) only after consulting with our technical support

Products Cryo Pumps

Cryo Pumps with fully Automatic Control, iClassicLine COOLVAC 1500 iCL

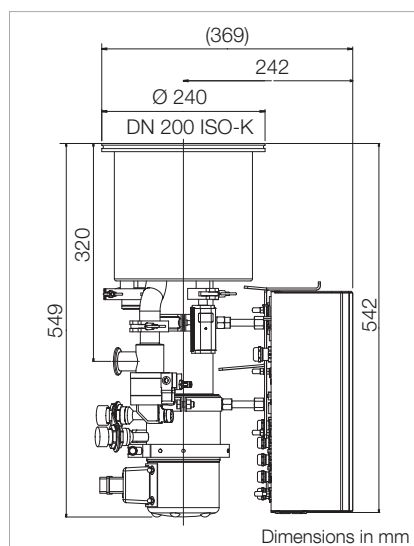


Advantages to the User

- Hydrocarbon-free high vacuum
- High capacity for argon and hydrogen
- High crossover value
- Simple operation
- Trouble-free integration into complex systems
- Fully automatic regeneration through Cryo Compact Control ¹⁾
- Easy servicing

Typical Applications

- Evaporators
- Sputtering systems
- Ion implanters
- Optical coating systems
- Metallization systems



Dimensional drawing for the COOLVAC 1500 iCL (DN 200 ISO-K)

Technical Data

COOLVAC

1500 iCL

High vacuum (HV) flange	DN	200 ISO-K / 200 CF / 6" ANSI
Fore vacuum flange ²⁾	DN	25 ISO-KF
Flange for connection a gauge head ³⁾	DN	16 ISO-KF
Flange for the electrical connection	DN	16 ISO-KF
Pressure-relief device with flange connection for gas exhaust line	DN	40 ISO-KF
4-way current feedthrough for Si diode on a flange	DN	16 ISO-KF
Heaters		
1st stage	W	160
	V AC	42
2nd stage	W	90
	V AC	42
Temperature sensor		
1st stage		Pt100
2nd stage		Si diode
Pumping speed		
H ₂ O	l/s	4600 ± 10%
Ar / N ₂	l/s	1200 / 1500 ± 10%
H ₂	l/s	2500 ± 10%
Capacity		
Ar / N ₂	bar x l	1000 / 1000
H ₂ at 10 ⁻⁶ mbar	bar x l	15 ⁴⁾
Max. throughput		
Ar / N ₂	mbar x l/s (Torr x l/s)	12 (9) / 12 (9)
H ₂	mbar x l/s (Torr x l/s)	6 (4.5) ⁴⁾
Built-in cold head	COOLPOWER	7/25
Crossover value	mbar x l (Torr x l)	210 (155)
Cooldown time to T ₂ = 20 K	min	60
Weight	kg (lbs)	25 (55.1)
Helium connections (Self-sealing couplings: outside thread, type 5400-S2-8)	DN	1/2"

¹⁾ Accessories, necessary for automatic operations (i.e. electrical regeneration heaters, forevacuum valve DN 25 ISO-KF, and vacuum gauge DN 16 ISO-KF), are included with the scope of delivery and are connected to the integrated COOL.DRIVE.

²⁾ Electropneumatic angle valve included.

³⁾ Vacuum gauge head included.

⁴⁾ The maximum throughput values given for hydrogen (H₂) are true for regenerated cryo pumps under short-term loads only. For continuous operations, both throughput and capacity values will be lower.

Ordering Information

COOLVAC 1500 iCL

	Single Operation		Dual operation		Multiple operation	
	Europe	USA/Japan	High Voltage	Low Voltage	High Voltage	Low Voltage
	Part No.		Part No.		Part No.	
COOLVAC 1500 iCL						
DN 200 CF	844201V0002		844201V0002 (2x)		844201V0002 (3x)	
DN 6" ANSI	844201V0004		844201V0004 (2x)		844201V0004 (3x)	
DN 200 ISO-K	844201V0006		844201V0006 (2x)		844201V0006 (3x)	

Compressors, flexlines and cables

Compressor						
CP 2000	840000V2000	–	–	–	–	–
CP 2200	–	840000V2200	–	–	–	–
CP 6000 H	–	–	840000V6001	–	840000V6001	–
CP 6200 H	–	–	–	840000V6201	–	840000V6201
Power supply cable for compressor	–		see Ordering Information of the compressor units			
Set of flexlines						
FL 4.5 (1/2", 1/2")	892 87		892 87 (2x)		892 87 (3x)	
or FL 9.0 (1/2", 1/2")	892 88		892 88 (2x)		892 88 (3x)	
or FL 18.0 HP (1/2") + FL 18.0 LP (1/2")	840203 + 840204		840203 (2x) + 840204 (2 x)		840203 (3x) + 840204 (3 x)	
Gas manifold (1 piece each)						
GD 2	–		840 253 (2x)		–	
GD 4	–		–		840 254 (2x)	
Compressor unit control cable ¹⁾						
COOLPAK control cable, 5 m (16.4 ft)	844231V4005		844231V4005 (2x)		844231V4005 (3x)	
or COOLPAK control cable, 10 m (32.81 ft)	844231V4010		844231V4010 (2x)		844231V4010 (3x)	
or COOLPAK control cable, 20 m (65.62 ft)	844231V4020		844231V4020 (2x)		844231V4020 (3x)	
COOLPAK adapter for multi control	–		844231V5003		844231V5003	

Optional electronics, cables and equipment

CRYOVISION control and display unit	844231V0002		844231V0002		844231V0002	
CRYOVISION control cables						
CRYOVISION control cable, 5 m (16.4 ft)	844231V2005		844231V2005		844231V2005	
or CRYOVISION control cable, 10 m (32.81 ft)	844231V2010		844231V2010		844231V2010	
or CRYOVISION control cable, 20 m (65.62 ft)	844231V2020		844231V2020		844231V2020	
Network control cable for the link between the pumps						
CRYOVISION / Network control cable, 5 m (16.4 ft)	–		844231V2005		844231V2005 (2x)	
or CRYOVISION / Network control cable, 10 m (32.81 ft)	–		844231V2010		844231V2010 (2x)	
or CRYOVISION / Network control cable, 20 m (65.62 ft)	–		844231V2020		844231V2020 (2x)	

Optional interface module

COOLVAC ProfiBus module ProfiBus – RS232 Converter for COOL.DRIVE and CRYOVISION either COOLVAC ProfiBus module connected to COOL.DRIVE control and monitoring unit of each cryo pump (in this case CRYOVISION and network control not to apply)	844000V1		844000V1 (2x)		844000V1 (3x)	
or COOLVAC ProfiBus module connected to CRYOVISION ²⁾	844000V1		844000V1		844000V1	

The arrangement of the components is shown in the chapter "Accessories" under the heading "iCOOLVAC iClassicLine, System Components".

¹⁾ The length of the control cable should match to the length of the flexlines.

²⁾ At multiple operation with reduced communication speed to single cryo pumps.

COOLVAC 2000 iCL

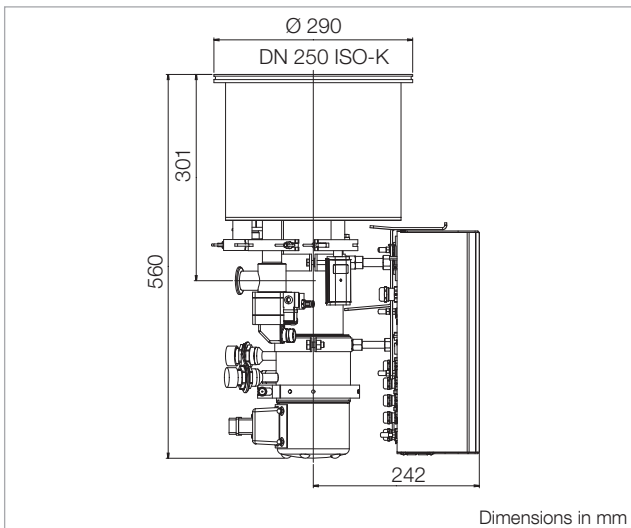


Advantages to the User

- Hydrocarbon-free high vacuum
- High capacity for argon and hydrogen
- High crossover value
- Simple operation
- Trouble-free integration into complex systems
- Fully automatic regeneration through integrated COOL.DRIVE controller ¹⁾
- Easy on-site servicing without pump disassembling and reconditioning of the vacuum system possible

Typical Applications

- Evaporators
- Sputtering systems
- Ion implanters
- Optical coating systems
- Metallization systems



Dimensional drawing for the COOLVAC 2000 iCL (DN 250 ISO-K)

COOLVAC 3000 iCL

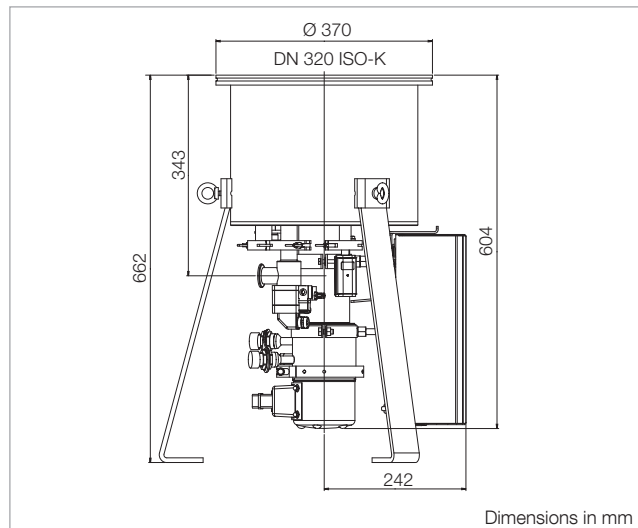


Advantages to the User

- Hydrocarbon-free high vacuum
- High capacity for argon and hydrogen
- High crossover value
- Simple operation
- Trouble-free integration into complex systems
- Fully automatic regeneration through integrated COOL.DRIVE controller ¹⁾
- Easy on-site servicing without pump disassembling and reconditioning of the vacuum system possible

Typical Applications

- Evaporators
- Sputtering systems
- Ion implanters
- Optical coating systems
- Metallization systems



Dimensional drawing for the COOLVAC 3000 iCL (DN 320 ISO-K)

Technical Data

COOLVAC

		2000 iCL	3000 iCL
High vacuum (HV) flange	DN	250 ISO-K / 250 CF / 8" ANSI	320 ISO-K / 10" ANSI
Fore vacuum flange ²⁾	DN	25 ISO-KF	
Flange for connection a gauge head ³⁾	DN	16 ISO-KF	
Flange for the electrical connection	DN	16 CF	
Pressure-relief device with flange connection for gas exhaust line	DN	40 ISO-KF	
4-way current feedthrough for Si diode on a flange	DN	16 ISO-KF	
Heaters			
1st stage	W	160	
	V AC	42	
2nd stage	W	90	
	V AC	42	
Temperature sensor			
1st stage		Pt100	
2nd stage		Si diode	
Pumping speed			
H ₂ O	l/s	7000	10500
Ar / N ₂	l/s	1600 / 2100	2500 / 3000
H ₂	l/s	3200	6000
Capacity			
Ar / N ₂	bar x l	1600 / 1600	2500 / 2500
H ₂ at 10 ⁻⁶ mbar	bar x l	15 ⁴⁾	28 ⁴⁾
Max. throughput			
Ar / N ₂	mbar x l/s (Torr x l/s)	12 (9) / 12 (9)	15 (11.2) / 15 (11.2)
H ₂	mbar x l/s (Torr x l/s)	6 (4.5) ⁴⁾	10 (7.5) ⁴⁾
Built-in cold head	COOLPOWER	7/25	
Crossover value	mbar x l (Torr x l)	250 (187)	500 (375)
Cooldown time to T ₂ = 20 K	min	70	120
Weight	kg (lbs)	29 (64)	35 (101.4)
Helium connections (Self-sealing couplings: outside thread, type 5400-S2-8)	DN	1/2"	

¹⁾ Accessories, necessary for automatic operations (i.e. electrical regeneration heaters, forevacuum valve DN 25 ISO-KF, and vacuum gauge DN 16 ISO-KF), are included with the scope of delivery and are connected to the integrated COOL.DRIVE.

²⁾ Electropneumatic angle valve included.

³⁾ Vacuum gauge head included.

⁴⁾ The maximum throughput values given for hydrogen (H₂) are true for regenerated cryo pumps under short-term loads only. For continuous operations, both throughput and capacity values will be lower.

Ordering Information

COOLVAC 2000 iCL

	Single Operation		Dual operation		Multiple operation	
	Europe	USA/Japan	High Voltage	Low Voltage	High Voltage	Low Voltage
	Part No.	Part No.	Part No.	Part No.	Part No.	Part No.
COOLVAC 2000 iCL						
DN 250 CF	844251V0002		844251V0002 (2x)		844251V0002 (3x)	
DN 8" ANSI	844251V0004		844251V0004 (2x)		844251V0004 (3x)	
DN 250 ISO-K	844251V0006		844251V0006 (2x)		844251V0006 (3x)	

Compressors, flexlines and cables

Compressor						
CP 2000	840000V2000	–	–	–	–	–
CP 2200	–	840000V2200	–	–	–	–
CP 6000 H	–	–	840000V6001	–	840000V6001	–
CP 6200 H	–	–	–	840000V6201	–	840000V6201
Power supply cable for compressor	–		see Ordering Information of the compressor units			
Set of flexlines						
FL 4.5 (1/2", 1/2")	892 87		892 87 (2x)		892 87 (3x)	
or FL 9.0 (1/2", 1/2")	892 88		892 88 (2x)		892 88 (3x)	
or FL 18.0 HP (1/2") + FL 18.0 LP (1/2")	840203 + 840204		840203 (2x) + 840204 (2 x)		840203 (3x) + 840204 (3 x)	
Gas manifold (1 piece each)						
GD 2	–		840 253 (2x)		–	
GD 4	–		–		840 254 (2x)	
Compressor unit control cable ¹⁾						
COOLPAK control cable, 5 m	844231V4005		844231V4005 (2x)		844231V4005 (3x)	
or COOLPAK control cable, 10 m	844231V4010		844231V4010 (2x)		844231V4010 (3x)	
or COOLPAK control cable, 20 m	844231V4020		844231V4020 (2x)		844231V4020 (3x)	
COOLPAK adapter for multi control	–		844231V5003		844231V5003	

Optional electronics, cables and equipment

CRYOVISION control and display unit	844231V0002		844231V0002		844231V0002	
CRYOVISION control cables						
CRYOVISION control cable, 5 m	844231V2005		844231V2005		844231V2005	
or CRYOVISION control cable, 10 m	844231V2010		844231V2010		844231V2010	
or CRYOVISION control cable, 20 m	844231V2020		844231V2020		844231V2020	
Network control cable for the link between the pumps						
CRYOVISION / Network control cable, 5 m	–		844231V2005		844231V2005 (2x)	
or CRYOVISION / Network control cable, 10 m	–		844231V2010		844231V2010 (2x)	
or CRYOVISION / Network control cable, 20 m	–		844231V2020		844231V2020 (2x)	

Optional interface module

COOLVAC ProfiBus module				
ProfiBus – RS232 Converter for COOL.DRIVE and CRYOVISION				
either				
COOLVAC ProfiBus module connected to COOL.DRIVE control and monitoring unit of each cryo pump (in this case CRYOVISION and network control not to apply)	844000V1		844000V1 (2x)	844000V1 (3x)
or				
COOLVAC ProfiBus module connected to CRYOVISION ²⁾	844000V1		844000V1	844000V1

The arrangement of the components is shown in the chapter "Accessories" under the heading "COOLVAC iClassicLine, System Components".

¹⁾ The length of the control cable should match to the length of the flexlines.

²⁾ At multiple operation with reduced communication speed to single cryo pumps.

Ordering Information

COOLVAC 3000 iCL

	Single Operation		Dual operation	
	Europe	USA/Japan	High Voltage	Low Voltage
	Part No.		Part No.	
COOLVAC 3000 iCL				
DN 10" ANSI	844321V0004		844321V0004 (2x)	
DN 320 ISO-K	844321V0006		844321V0006 (2x)	
Compressors, flexlines and cables				
Compressor				
CP 2000	840000V2000	–	–	–
CP 2200	–	840000V2200	–	–
CP 6000 H	–	–	840000V6001	–
CP 6200 H	–	–	–	840000V6201
Power supply cable for compressor	–		see Ordering Information of the compressor units	
Set of flexlines				
FL 4.5 (1/2", 1/2")	892 87		892 87 (2x)	
or FL 9.0 (1/2", 1/2")	892 88		892 88 (2x)	
or FL 18.0 HP (1/2") + FL 18.0 LP (1/2")	840203 + 840204		840203 (2x) + 840204 (2 x)	
Gas manifold (1 piece each)				
GD 2	–		840 253 (2x)	
Compressor unit control cable ¹⁾				
COOLPAK control cable, 5 m (16.4 ft)	844231V4005		844231V4005 (2x)	
or COOLPAK control cable, 10 m (32.81 ft)	844231V4010		844231V4010 (2x)	
or COOLPAK control cable, 20 m (65.62 ft)	844231V4020		844231V4020 (2x)	
COOLPAK adapter for multi control	–		844231V5003	
Optional electronics, cables and equipment				
CRYOVISION control and display unit	844231V0002		844231V0002	
CRYOVISION control cables				
CRYOVISION control cable, 5 m (16.4 ft)	844231V2005		844231V2005	
or CRYOVISION control cable, 10 m (32.81 ft)	844231V2010		844231V2010	
or CRYOVISION control cable, 20 m (65.62 ft)	844231V2020		844231V2020	
Network control cable for the link between the pumps				
CRYOVISION / Network control cable, 5 m (16.4 ft)	–		844231V2005	
or CRYOVISION / Network control cable, 10 m (32.81 ft)	–		844231V2010	
or CRYOVISION / Network control cable, 20 m (65.62 ft)	–		844231V2020	
Optional interface module				
COOLVAC ProfiBus module				
ProfiBus – RS232 Converter for COOL.DRIVE and CRYOVISION				
either				
COOLVAC ProfiBus module connected to COOL.DRIVE control and monitoring unit of each cryo pump (in this case CRYOVISION and network control not to apply)	844000V1		844000V1 (2x)	
or				
COOLVAC ProfiBus module connected to CRYOVISION ²⁾	844000V1		844000V1	

The arrangement of the components is shown in the chapter "Accessories" under the heading "COOLVAC iClassicLine, System Components".

¹⁾ The length of the control cable should match to the length of the flexlines.

²⁾ At multiple operation with reduced communication speed to single cryo pumps.

COOLVAC 5000 iCL

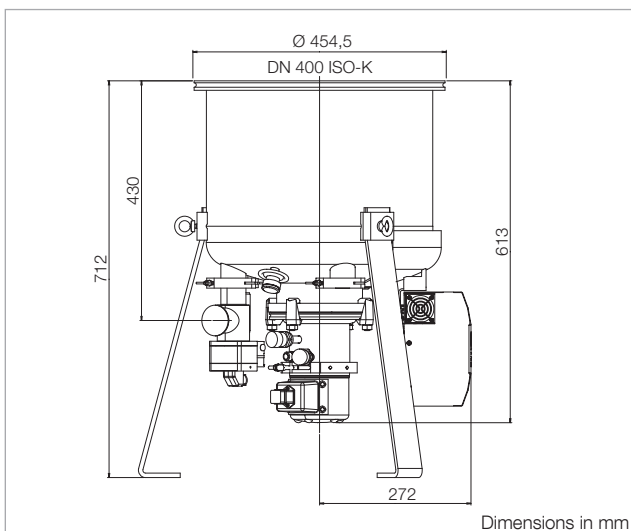


Advantages to the User

- Hydrocarbon-free high vacuum
- High capacity for argon and hydrogen
- High crossover value
- Simple operation
- Trouble-free integration into complex systems
- Fully automatic regeneration through integrated COOL.DRIVE controller ¹⁾
- Easy on-site servicing without pump disassembling and reconditioning of the vacuum system possible

Typical Applications

- Evaporators
- Electron beam welding systems
- Ion implanters
- Optical coating systems
- Metallization systems



Dimensional drawing for the COOLVAC 5000 iCL

COOLVAC 10000 iCL

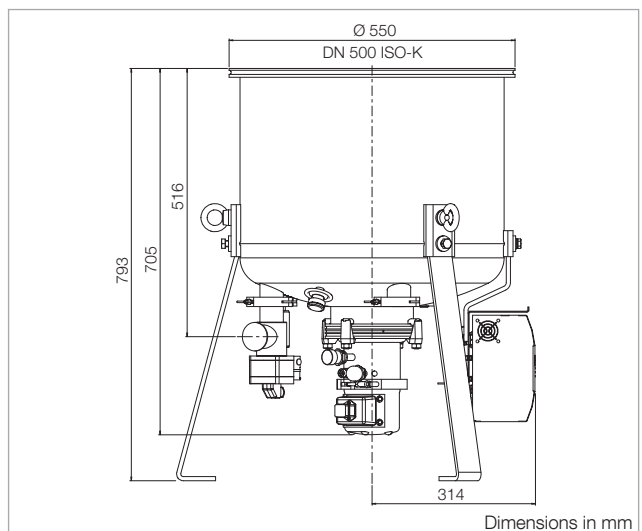


Advantages to the User

- Hydrocarbon-free high vacuum
- High capacity for argon and hydrogen
- High crossover value
- Simple operation
- Trouble-free integration into complex systems
- Fully automatic regeneration through integrated COOL.DRIVE controller ¹⁾
- Easy on-site servicing without pump disassembling and reconditioning of the vacuum system possible

Typical Applications

- Evaporators
- Electron beam welding systems
- Ion implanters
- Optical coating systems
- Metallization systems



Dimensional drawing for the COOLVAC 10000 iCL

Technical Data

COOLVAC

		5000 iCL	10000 iCL
High vacuum (HV) flange	DN	400 ISO-K	500 ISO-K / 500 – 20" ANSI
Fore vacuum flange ²⁾	DN	40 ISO-KF	
Flange for connection a gauge head ³⁾	DN	16 ISO-KF	
Flange for the electrical connection	DN	40 ISO-KF	
Pressure-relief device with flange connection for gas exhaust line	DN	40 ISO-KF	
4-way current feedthrough for Si diode on a flange	DN	16 ISO-KF	
Heaters			
1st stage	W	160	
	V AC	42	
2nd stage	W	90	
	V AC	42	
Temperature sensor			
1st stage		Pt100	
2nd stage		Si diode	
Pumping speed			
H ₂ O	l/s	18000	30000
Ar / N ₂	l/s	4000 / 5200	8400 / 10000
H ₂	l/s	6200	10000
Capacity			
Ar / N ₂	bar x l	3000 / 3000	5500 / 5500
H ₂ at 10 ⁻⁶ mbar	bar x l	32 ⁴⁾	45 ⁴⁾
Max. throughput			
Ar / N ₂	mbar x l/s (Torr x l/s)	10 (7.5) / 10 (7.5)	
H ₂	mbar x l/s (Torr x l/s)	7 (5.3) ⁴⁾	
Built-in cold head	COOLPOWER	5/100	
Crossover value	mbar x l (Torr x l)	700 (525)	800 (600)
Cooldown time to T ₂ = 20 K	min	100	150
Weight	kg (lbs)	53 (116.9)	70 (154.3)
Helium connections (Self-sealing couplings: outside thread, type 5400-S2-8)	DN	1/2"	

¹⁾ Accessories, necessary for automatic operations (i.e. electrical regeneration heaters, forevacuum valve DN 25 ISO-KF, and vacuum gauge DN 16 ISO-KF), are included with the scope of delivery and are connected to the integrated COOL.DRIVE.

²⁾ Electropneumatic angle valve included.

³⁾ Vacuum gauge head included.

⁴⁾ The maximum throughput values given for hydrogen (H₂) are true for regenerated cryo pumps under short-term loads only. For continuous operations, both throughput and capacity values will be lower.

Ordering Information

COOLVAC 5000 iCL

COOLVAC 10000 iCL

	High Voltage	Low Voltage	High Voltage	Low Voltage
	Part No.		Part No.	
COOLVAC 5000 iCL, DN 400 ISO-K	844411V0006		-	
COOLVAC 10000 iCL, DN 500 20" ANSI	-		844511V0004	
COOLVAC 10000 iCL, DN 500 ISO-K	-		844511V0006	

Compressors, flexlines and cables

Compressor				
CP 6000 H	840000V6001	-	840000V6001	-
CP 6200 H	-	840000V6201	-	840000V6201
Power supply cable for compressor	see Ordering Information of the compressor units			
Set of flexlines				
FL 4.5 (1/2", 1/2")	892 87		892 87	
or FL 9.0 (1/2", 1/2")	892 88		892 88	
or FL 18.0 HP (1/2") + FL 18.0 LP (1/2")	840203 + 840204		840203 + 840204	
Compressor unit control cable ¹⁾				
COOLPAK control cable, 5 m (16.4 ft)	844231V4005		844231V4005	
or COOLPAK control cable, 10 m (32.81 ft)	844231V4010		844231V4010	
or COOLPAK control cable, 20 m (65.62 ft)	844231V4020		844231V4020	

Optional electronics, cables and equipment

CRYOVISION control and display unit	844231V0002	844231V0002
CRYOVISION control cables		
CRYOVISION control cable, 5 m (16.4 ft)	844231V2005	844231V2005
or CRYOVISION control cable, 10 m (32.81 ft)	844231V2010	844231V2010
or CRYOVISION control cable, 20 m (65.62 ft)	844231V2020	844231V2020

Optional interface module

COOLVAC ProfiBus module ProfiBus – RS232 Converter for COOL.DRIVE and CRYOVISION	844000V1	844000V1
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The arrangement of the components is shown in the chapter "Accessories" under the heading "COOLVAC iClassicLine, System Components".

¹⁾ The length of the control cable should match to the length of the flexlines.

COOLVAC 18000 iCL



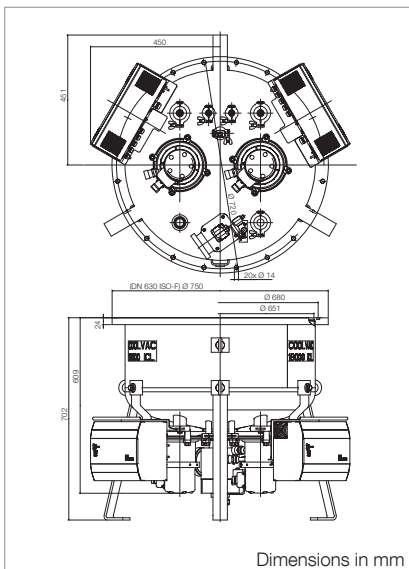
COOLVAC 18000 iCL with flange DN 630 ISO-F

Advantages to the User

- Hydrocarbon-free high vacuum
- High pumping speed for water vapor and nitrogen
- Fast, safe and efficient regeneration with the electric regeneration system ¹⁾
- Simple operation

Typical Applications

- Space simulation chambers
- Evaporators
- Electron beam welding systems
- Optical coating systems
- Metallization systems



Dimensional drawing for the COOLVAC 18000 iCL

COOLVAC 30000 iCL



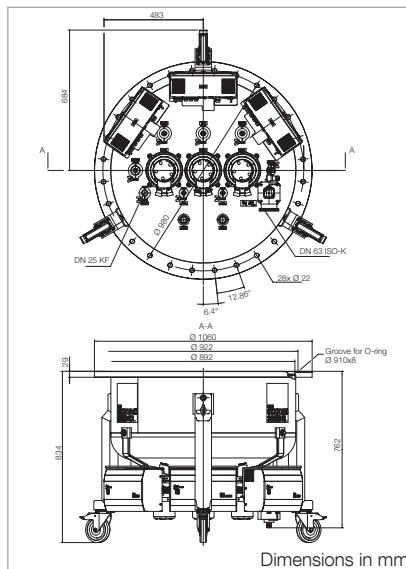
COOLVAC 30000 iCL with special flange

Advantages to the User

- Hydrocarbon-free high vacuum
- High pumping speed for water vapor and nitrogen
- Fast, safe and efficient regeneration with the electric regeneration system ¹⁾
- Simple operation

Typical Applications

- Space simulation chambers
- Evaporators
- Electron beam welding systems
- Optical coating systems
- Metallization systems



Dimensional drawing for the COOLVAC 30000 iCL

COOLVAC 60000 iCL



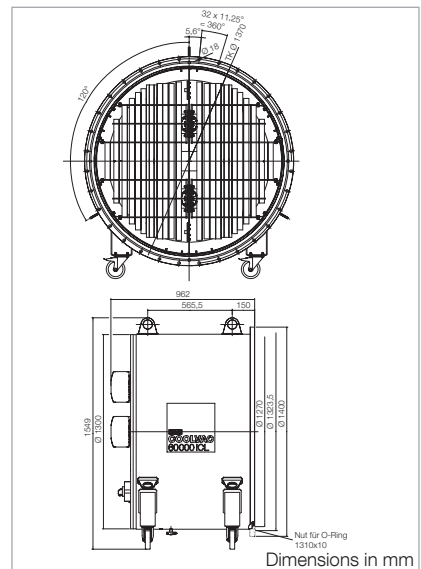
COOLVAC 60000 iCL with flange DN 1250 ISO-F

Advantages to the User

- Hydrocarbon-free high vacuum
- High pumping speed for water vapor and nitrogen
- Fast, safe and efficient regeneration with the electric regeneration system ¹⁾
- Simple operation

Typical Applications

- Space simulation chambers
- Evaporators
- Electron beam welding systems
- Optical coating systems
- Metallization systems



Dimensional drawing for the COOLVAC 60000 iCL

Technical Data

COOLVAC 18000 iCL COOLVAC 30000 iCL COOLVAC 60000 iCL

High vacuum flange	DN	630 ISO-F	35"ANSI	1250 ISO-F
Fore vacuum flange ²⁾	DN	63 ISO-K	63 ISO-K	63 ISO-K
Flange with current feedthrough for silicon diode	DN	25 ISO-KF (2x)	16 ISO-KF (2x)	16 ISO-KF (2x)
Flange for other purposes	DN	40 ISO-KF	-	-
Flange with 11-way feedthrough with additional Pt 100 on flange	DN	-	40 ISO-KF	40 ISO-KF
Pressure-relief device with flange connection for gas exhaust line	DN	40 ISO-KF	40 ISO-KF	40 ISO-KF
Pumping speed				
H ₂ O	l/s	46000	93000	180000
Ar / N ₂	l/s	13500 / 18000	25000 / 30000	47000 / 57000
H ₂	l/s	14000	30000	60000
Capacity				
Ar / N ₂	bar x l	6000	6500	9000
H ₂ at 10 ⁻⁶ mbar	bar x l	65 ³⁾	100 ³⁾	150 ³⁾
Built-in cold head	COOLPOWER	5/100 (2x)	5/100 (2x) and 140T (1x)	5/100 (2x) and 140T (2x)
Max. throughput				
Ar / N ₂	mbar x l/s (Torr x l/s)	14 (10.5)	14 (10.5)	25 (18.75)
H ₂	mbar x l/s (Torr x l/s)	7 (5.25) ³⁾	7 (5.25) ³⁾	12 (9) ³⁾
Crossover value at 20 K	mbar x l (Torr x l)	800 (600)	1200 (900)	1000 (750)
Cool down time to 20 K	min	180	260	330
Overall height	mm	see drawing	see drawing	see drawing
Weight	kg (lbs)	131 (289)	262 (577.6)	503 (1109)
Silicon diode for temperature measurements at the second stage of the cold head		built-in (2x)	built-in (2x)	built-in (2x)
Regeneration heaters at the first stage of the cold head		built-in (2x)	built-in (3x)	built-in (4x)
second stage of the cold head		built-in (2x)	built-in (2x)	built-in (2x)

¹⁾ Accessories, necessary for automatic operations (i.e. electrical regeneration heaters, forevacuum valve DN 63 ISO-KF, and vacuum gauge DN 16 ISO-KF), are included with the scope of delivery and are connected to the integrated COOL.DRIVE.

²⁾ Electropneumatic angle valve included.

³⁾ The maximum throughput values given for hydrogen (H₂) are true for regenerated cryo pumps under short-term loads only. For continuous operations, both throughput and capacity values will be lower.

Ordering information

Ordering information		COOLVAC 18000 iCL		COOLVAC 30000 iCL		COOLVAC 60000 iCL	
		High Voltage	Low Voltage	High Voltage	Low Voltage	High Voltage	Low Voltage
	Part No.	Part No.		Part No.			
COOLVAC 18 000 iCL, DN 630 ISO-F	844631V0006	-		-			
COOLVAC 30 000 iCL, 35" ANSI	-	844891V9005		-			
COOLVAC 60 000 iCL, DN 1250 ISO-F	-	-		844896V9005			
Compressors, flexlines and cables							
Compressor	840000V6001	-	840000V6001	-	840000V6001	-	
CP 6000 H	(2x)	-	(3x)	-	(4x)	-	
CP 6200 H	-	840000V6201	-	840000V6201	-	840000V6201	
		(2x)		(3x)		(4x)	
Power supply cable for compressor	see Ordering Information of the compressor units						
Set of flexlines	892 87 (2x)		892 87 (3x)		892 87 (4x)		
FL 4.5 (1/2", 1/2")	892 88 (2x)		892 88 (3x)		892 88 (4x)		
or FL 9.0 (1/2", 1/2")	840203 (2x) + 840204 (2x)		840203 (3x) + 840204 (3x)		840203 (4x) + 840204 (4x)		
or FL 18.0 HP (1/2") + FL 18.0 LP (1/2")							
Compressor unit control cable ¹⁾	844231V4005 (2x)		844231V4005 (3x)		844231V4005 (4x)		
COOLPAK control cable, 5 m (16.4 ft)	844231V4010 (2x)		844231V4010 (3x)		844231V4010 (4x)		
or COOLPAK control cable, 10 m (32.81 ft)	844231V4020 (2x)		844231V4020 (3x)		844231V4020 (4x)		
or COOLPAK control cable, 20 m (65.62 ft)							
Optional electronics, cables and equipment							
CRYOVISION control and display unit	844231V0002						
CRYOVISION network / control cable	844231V2005						
CRYOVISION / Network control cable, 5 m (16.4 ft)	844231V2010						
or CRYOVISION / Network control cable, 10 m (32.81 ft)	844231V2020						
or CRYOVISION / Network control cable, 20 m (65.62 ft)							
Optional interface module							
COOLVAC ProfiBus module	844000V1						
ProfiBus – RS232 Converter for COOL.DRIVE and CRYOVISION							

The arrangement of the components is shown in the chapter "Accessories" under the heading "COOLVAC iClassicLine, System Components".

¹⁾ The length of the control cable should match to the length of the flexlines.

Cryo Pumps for Manual Operation, BasicLine

The COOLVAC cryo pumps of the BasicLine version are identical to the COOLVAC cryo pumps of the iClassicLine version concerning the technical data for pumping speed, capacity, cooldown time, built-in cold heads, maximum throughput, built-in temperature sensors for the second stage (Si diode) and the corresponding current feedthroughs.

The standard BasicLine models do **not** include the following components:

- Electrical regeneration heaters
- Temperature sensors for the first stages of the cold head(s)
- Vacuum gauge head
- Fore vacuum valve
- Temperature readout / display unit for the silicon diode(s)

We are glad to advise you of our assortment of accessories for our COOLVAC BasicLine range of cryo pumps.

All cryo pumps of the *iClassicLine* series (iCL) described above can be delivered as *BasicLine* types, too. Please consult with our technical support.

E.g. for the following part numbers:

	Part No.
COOLVAC 10000 BL-V, DN 500 20" ANSI	844511V1004
COOLVAC 10000 BL-V, DN 500 ISO-K	844511V1006

Cryo Pumps with Liquid Nitrogen Cooling of Radiation Shield and Baffle of Cryo Pump

COOLVAC 30000 BL LN₂ and COOLVAC 60000 BL LN₂



COOLVAC 30000 BL LN₂



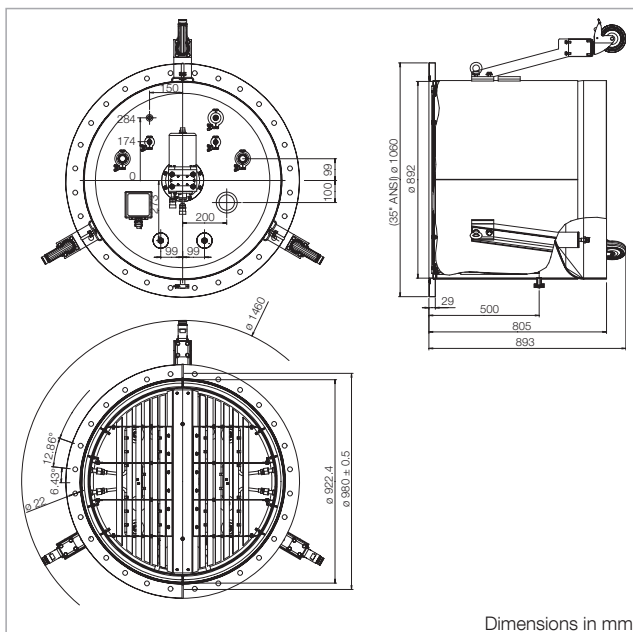
COOLVAC 60000 BL LN₂ with flange DN 1250 ISO-F

Advantages to the User

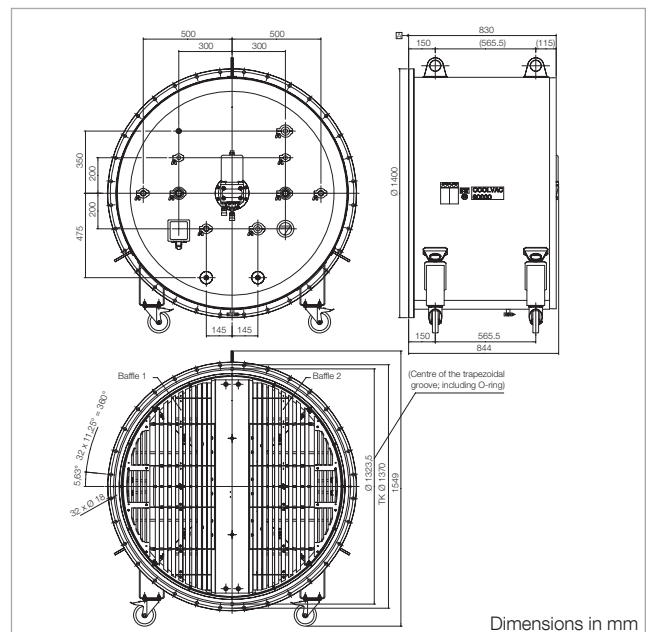
- Hydrocarbon-free high vacuum
- High pumping speed for water vapor and nitrogen
- Operating with only one compressor unit through liquid nitrogen (LN₂) cooling of radiation shield and baffle
- Controlling of radiation shield and baffle temperatures by additional temperature sensor

Typical Applications

- Space simulation chambers
- Vacuum furnaces



Dimensional drawing of COOLVAC 30000 BL LN₂



Dimensional drawing of COOLVAC 60000 BL LN₂

Technical Data

COOLVAC 30000 BL LN₂

COOLVAC 60000 BL LN₂

High vacuum flange	DN	35"ANSI	1250 ISO-F
Fore vacuum flange	DN	63 ISO-K	63 ISO-K
Flange with 4-pole current feedthrough for silicon diode*	DN	16 ISO-KF (2x)	16 ISO-KF (2x)
Flange with 6-pole current feedthrough for 3 Pt 100 (radiation shield and baffle halves)	DN	40 ISO-KF	40 ISO-KF
Pressure-relief device with flange connection for gas exhaust line	DN	40 ISO-KF	40 ISO-KF
Flange with abnormal temperature protection for the regeneration heaters of the built-in cold head	DN	40 ISO-KF	40 ISO-KF
Pumping speed			
H ₂ O	l/s	93000	180000
Ar / N ₂	l/s	25000 / 30000	47000 / 57000
H ₂	l/s	30000	60000
Capacity			
Ar / N ₂	bar x l	6500	9000
H ₂ at 10 ⁻⁶ mbar	bar x l	100 ¹⁾	150 ¹⁾
Built-in cold head	COOLPOWER	10 MD	10 MD)
Max. throughput			
Ar / N ₂	mbar x l/s (Torr x l/s)	> 15 (11.25) ¹⁾	> 30 (22.5) ¹⁾
Crossover value at 20 K	mbar x l (Torr x l)	2000 (1500)	3000 (2250)
LN ₂ consumption, ca.	l/h	7	10
LN ₂ connections		SS-8-VCR (1/2")	SS-8-VCR (1/2")
Cool down time to 20 K, approx.	h	5	6
Overall height	mm	see drawing	see drawing
Weight, approx.	kg (lbs)	300 (661)	400 (882)
Silicon diode for temperature measurements at the second stage of the cold head		built-in	built-in
Regeneration heaters at the first stage of the cold head		built-in	built-in
second stage of the cold head		built-in	built-in

* temperature sensor at the second stage of the cold head.

¹⁾ The maximum throughput values given for hydrogen (H₂) are true for regenerated cryo pumps under short-term loads only. For continuous operations, both throughput and capacity values will be lower.

Ordering information

COOLVAC 30000 BL LN₂

High Voltage Low Voltage

COOLVAC 60000 BL LN₂

High Voltage Low Voltage

	Part No.	Part No.
COOLVAC 30 000 BL LN ₂ , 35" ANSI	844890V9501	–
COOLVAC 60 000 BL LN ₂ , DN 1250 ISO-F	–	844895V9503

Compressors, flexlines and cables

Compressor				
CP 6000 HMD, 400 V / 50 Hz / 460 V / 60 Hz / 3-ph.	840000V6002	–	840000V6002	–
CP 6200 HMD, 200 V / 50 Hz / 200 – 230 V / 60 Hz / 3-ph.	–	840000V6202	–	840000V6202
Power supply cable for compressor	see Ordering Information of the compressor units			
Flexible pressure line (for operating mechanically driven cold heads)				
9 m (29.53 ft), FL9 HP – DN20 (8f/8f) + FL9 LP – DN32 (8f/8f)	840217 + 840218V0032			
20 m (65.62 ft), FL20 HP – DN20 (8f/8f) + FL20 LP – DN32 (8f/8f)	840230V2020 + 840231V2032			
Cable cold head motor compressor unit ¹⁾				
9 m (29.53 ft)	842 110			
20 m (65.62 ft)	842 112			

Optional equipment and cables

Low temperature measuring instrument MODEL 211S	844 110
HV cable, 4-way, with plug to the MODEL 211S	
10 m (32.81 ft)	844 113
20 m (65.62 ft)	844113V20

Additional accessories (selection)

Forevacuum valves ²⁾	
Right-Angle DN 63 ISO-K, electropneumatically operated, with pilot valve 24 V DC, Aluminum body	10800V01
Right-Angle DN 63 ISO-K, electropneumatically operated, with pilot valve 24 V DC, stainless steel body	10810V01
Pressure sensor	
THERMOVAC Transmitter TTR 91 N, DN 16 ISO-KF (without switching threshold)	230035V02
THERMOVAC Transmitter TTR 91 N, DN 16 ISO-KF, (with switching threshold, 2SP)	230040V02
Connection cable to TTR 91 N, FCC 68 on both ends, 8-way shielded ³⁾	Type A
10 m (32.81 ft)	230 012
20 m (65.62 ft)	124 28
30 m (98.43 ft)	124 29

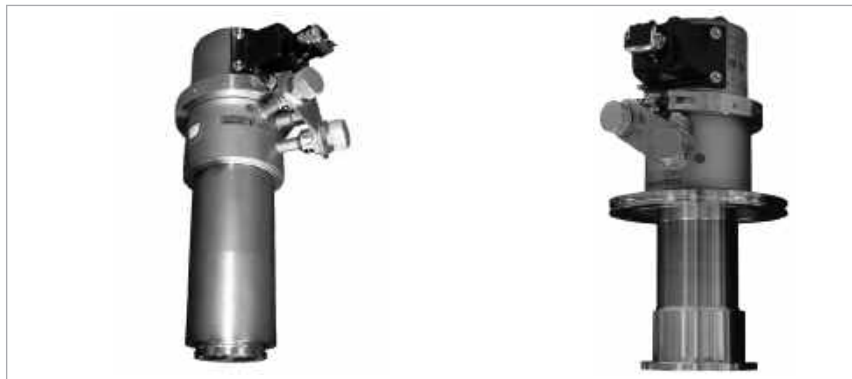
¹⁾ The length of the control cable should match to the length of the flexlines.

²⁾ See catalog "Valves" for additional right-angle valves.

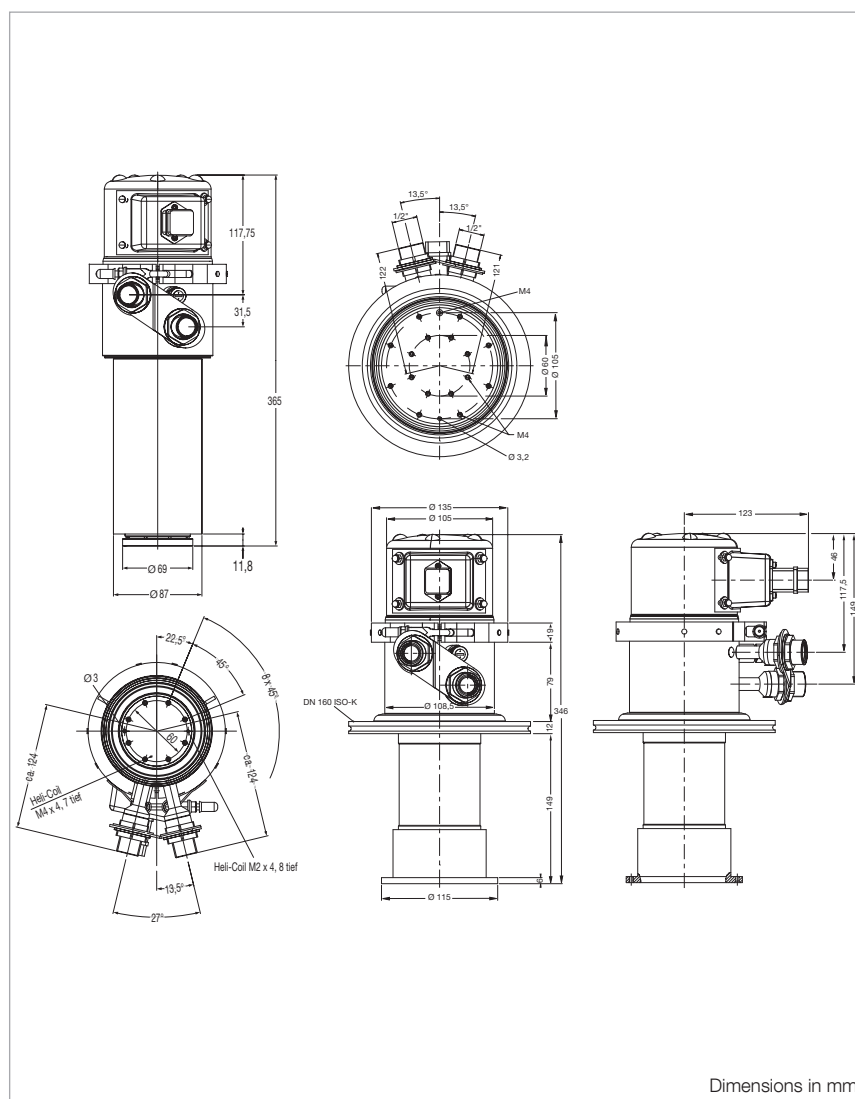
³⁾ The length of the control cable should match to the length of the flexlines.

Products Cryogenics

Cold Heads, Pneumatically Driven Single-Stage Cold Heads COOLPOWER 50 and 140 T



Single-stage cold head's COOLPOWER 50 (left) and 140 T (right)



Dimensional drawing for the COOLPOWER 50 (left) and COOLPOWER 140 T (right)

Advantages to the User

- For installation mostly in any orientation
- High refrigerating capacity
- No liquid refrigerants are required
- Very simple to operate
- Short cooldown time

Typical Applications

- Cooling of samples, sensors and detectors
 - e. g. cooling of detectors in astronomy
- Cooling of HTS superconductors
- Cooling in magnetic equipment
- Cooling of surfaces for pumping of gases
- Cryogenic process gas cleaning
- Condensation, resublimation and freezing of gases

Technical Data

COOLPOWER 50

COOLPOWER 140 T

Refrigeration capacity at 50/60 Hz ¹⁾			
at 80 K, approx.	W	50	140
at 20 K, approx.	W	–	20
Lowest attainable temperature ¹⁾	K	≤ 26	≤ 15
Cooldown time down			
to 20 K, approx.	min	–	55
to 80 K, approx.	min	20	–
Permissible ambient temperature	°C (°F)	+10 to +40 (+50 to +104)	+10 to +40 (+50 to +104)
He filling pressure at room temperature	barg	16	16
He connections			
Self-sealing screwed connections			
High pressure connection		1/2" ²⁾	1/2" ²⁾
Low pressure connection		1/2" ²⁾	1/2" ²⁾
Weight	kg (lbs)	8 (17.7)	12 (26.5)

Ordering Information

COOLPOWER 50

COOLPOWER 140 T

	Part No.		Part No.		
Cold head					
with DN 100 CF-R (rotatable)	842050V0001	–	–	–	–
with DN 160 CF-R (rotatable)	–	–	–	842030V9004	–
with DN 160 ISO-K	842050V0002	–	842 030	–	–
with weld-on pipe	–	842050V0000	–	–	842030V0001
Distance Flange - Cold stage	mm	149.5	–	148.5	111.4

Accessories

Compressor unit (for operation of one cold head)		
COOLPAK 2000, 230 V / 50 Hz	840000V2000	–
COOLPAK 2200, 208 V / 60 Hz	840000V2200	–
COOLPAK 6000 H, 400 V/50 Hz; 470 V / 60 Hz	–	840000V6001
COOLPAK 6200 H, 200 V/50 Hz; 200 V, 230 V / 60 Hz	–	840000V6201
Power supply cable	–	see Ordering Information for the compressor units COOLPAK
Set of flexlines		
FL 4.5 (1/2", 1/2") (= 1 Set)	892 87	892 87
FL 9.0 (1/2", 1/2") (= 1 Set)	892 88	892 88
FL 18.0 HP (1/2") (= Single line high pressure)	840 203	840 203
FL 18.0 LP (1/2") (= Single line low pressure)	840 204	840 204
Connecting cable compressor – cold head		
Power cord 4.5 m (15.75 ft)	E 400000323	E 400000323
Power cord 18 m (59.06 ft)	840002964V0018	840002964V0018
Extension cord 4.5 m (15.75 ft)	893 74	893 74

Options

Temperature measurement		
Silicon diode	844000V5	844000V5
Low temperature measuring instrument	844 110	844 110
Measuring cable	see Ordering Information low tempera- ture measuring instrument	see Ordering Information low tempera- ture measuring instrument

¹⁾ The refrigerating capacities and temperatures stated apply only to vertical operation with the cold end at the bottom.

²⁾ Series 5400 from Aeroquip, coupling size "-8" (#8), or compatible types.

Dual-Stage Cold Heads

COOLPOWER 7/25 and 5/100



Dual-stage cold head COOLPOWER 7/25



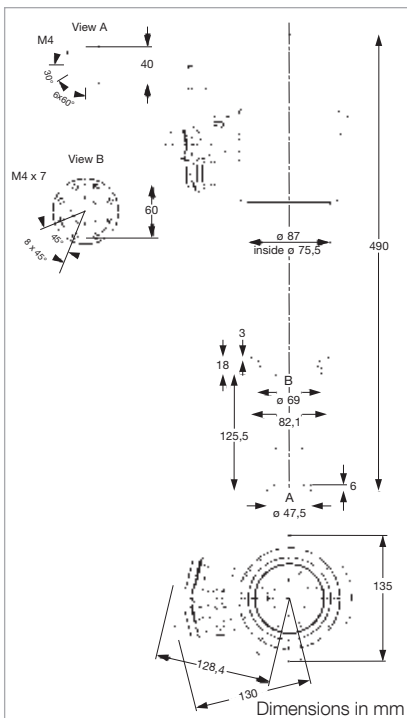
Dual-stage cold heads COOLPOWER 5/100

Advantages to the User

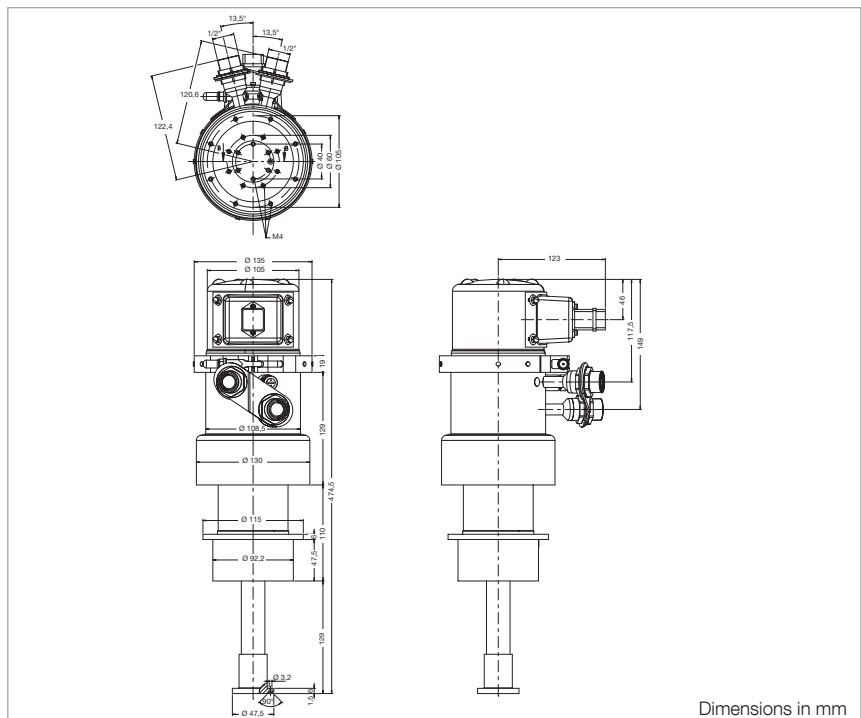
- For installation in any orientation
- High refrigerating capacity
- No liquid refrigerants are required
- Very simple to operate
- Short cooldown time

Typical Applications

- Cooling of samples, sensors and detectors
- Cooling of detectors in astronomy
- Cooling of samples for spectroscopy
- Cooling of samples for applications in medicine and R&D
- Cooling of HTS superconductors
- Cooling in magnetic equipment
- Cooling of surfaces for pumping of gases
- Cryogenic process gas cleaning
- Condensation, resublimation and freezing of gases



Dimensional drawing for the COOLPOWER 7/25



Dimensional drawing for the COOLPOWER 5/100

Technical Data**COOLPOWER 7/25****COOLPOWER 5/100**

Refrigeration capacity at 50/60 Hz ¹⁾			
1st stage at 80 K, approx.	W	25	100
2nd stage at 20 K, approx.	W	7	6
Lowest attainable temperature ¹⁾			
1st stage, approx.	K	≤ 35	≤ 35
2nd stage, approx.	K	≤ 10	≤ 10
Cooldown time of the			
2nd stage to 20 K, approx.	min	35	25
Permissible ambient temperature	°C (°F)	+5 to +40 (+41 to +104)	+5 to +40 (+41 to +104)
He filling pressure at room temperature	barg	16	16
He connections			
Self-sealing screwed connections			
High pressure connection		1/2" (#8 ²⁾)	1/2" (#8 ²⁾)
Low pressure connection		1/2" (#8)	1/2" (#8)
Weight, approx.	kg (lbs)	10 (22,1)	10,5 (23,2)

Ordering Information**COOLPOWER 7/25****COOLPOWER 5/100**

	Part No.	Part No.
Cold head		
COOLPOWER 7/25		
- with weld-on pipe	842 040	-
- with Flange DN 160 ISO-K (Space Flange – 2. Stage = 250 mm)	842 040V0002	-
- with Flange DN 100 CF-R (rotatable) (Space Flange – 2. Stage = 275 mm)	842 040V0005	-
COOLPOWER 5/100		
- with weld-on pipe	-	893 05
- with Flange DN 160 ISO-K (Space Flange – 2. Stage = 277,5 mm)	-	893 04
- with Flange DN 100 CF-R (rotatable) (Space Flange – 2. Stage = 265,5 mm)	-	842021V0001

Accessories

Compressor unit (for operation of one cold head)		
COOLPAK 2000, 230 V / 50 Hz	840000V2000	-
COOLPAK 2200, 208 V / 60 Hz	840000V2200	-
COOLPAK 6000 H 400 V/50 Hz; 470 V / 60 Hz	-	840000V6001
COOLPAK 6200 H 200 V/50 Hz; 200 V, 230 V / 60 Hz	-	840000V6201
Power supply cable	-	see Ordering Information for the compressor units COOLPAK
Set of flexlines		
FL 4.5 (1/2", 1/2") (= 1 Set)	892 87	892 87
FL 9.0 (1/2", 1/2") (= 1 Set)	892 88	892 88
FL 18.0 HP (1/2") (= Single line high pressure)	840 203	840 203
FL 18.0 LP (1/2") (= Single line low pressure)	840 204	840 204
Connecting cable compressor – cold head		
Power cord 4.5 m (15.75 ft)	E 400000323	E 400000323
Power cord 18 m (59.06 ft)	840002964V0018	840002964V0018
Extension cord 4.5 m (15.75 ft)	893 74	893 74

Options

Temperature measurement / control		
Silicon diode	844000V5	844000V5
Low temperature measuring instrument	844 110	844 110
Measuring cable	see Ordering Information low temperature measuring instrument	see Ordering Information low temperature measuring instrument

¹⁾ The refrigerating capacities and temperatures stated apply only to vertical operation with the cold end at the bottom.

²⁾ Series 5400 from Aeroquip, coupling size "-8" (#8), or compatible types.

Cold Heads, Mechanically Driven

Single-Stage Cold Head COOLPOWER 250 MD

Dual-Stage Cold Head COOLPOWER 10 MD



Single-stage Cold Head COOLPOWER 250 MD



Dual-stage Cold Head COOLPOWER 10 MD

Advantages to the User

- Excellent cooling performance
- up to 250 W at 80 K by press-button operation ^{1) 2)} (COOLPOWER 250 MD)
- 18 W at 20 K by press-button operation (COOLPOWER 10 MD)
- High reliability
- Design optimized for MTBF 100,000 h
- Long and maintenance-free operation
- Low vibration due to directly driven displacer
- No liquid refrigerants are required
- Very simple to operate
- Short cooldown time
- Easy operation
- Plug & Cool – as usual for all Leybold GM coolers
- Simple variation of motor speed via the COOLPAK MD compressor unit

COOLPOWER 250 MD – one of the strongest single-stage GM cooler available on the market:

- High cooling capacity of > 175 W at 80 K
- Cooling capacity up to 250 W at 80 K possible ^{1) 2)}

COOLPOWER 10 MD - the strongest 10 K GM cooler available on the market:

- High 2nd stage cooling capacity of > 18 W at 20 K
- High 1st stage cooling capacity of > 25 W at 40 K and 110 W at 80 K

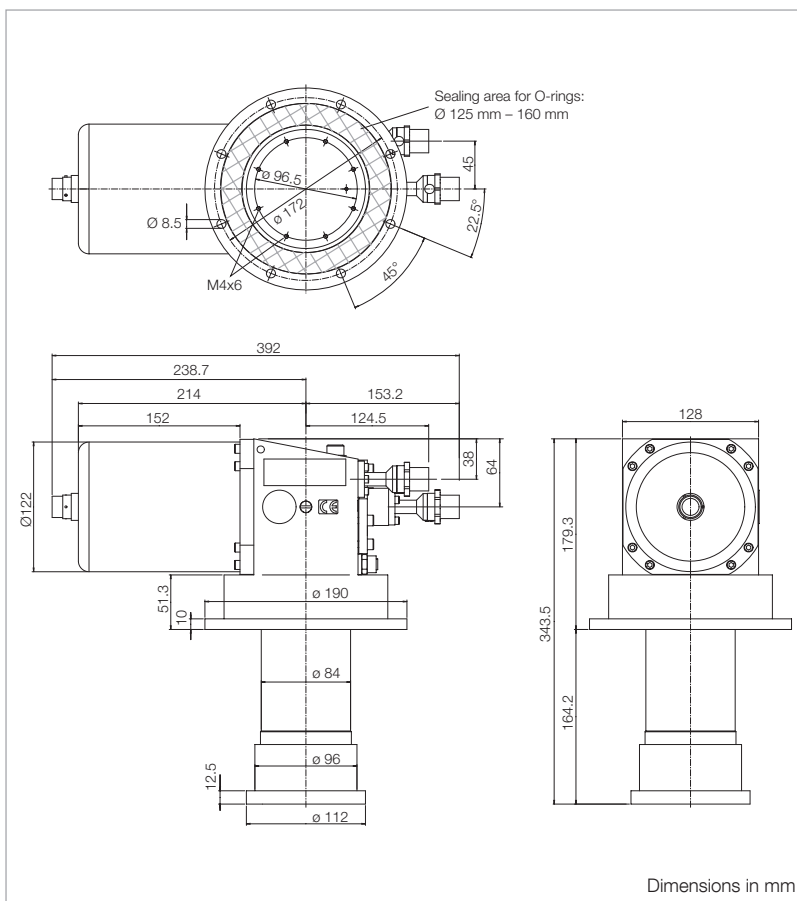
Typical Applications

The COOLPOWER 250 MD is a mechanically driven single-stage Gifford McMahon (GM) cryo cooler and ideally suited for

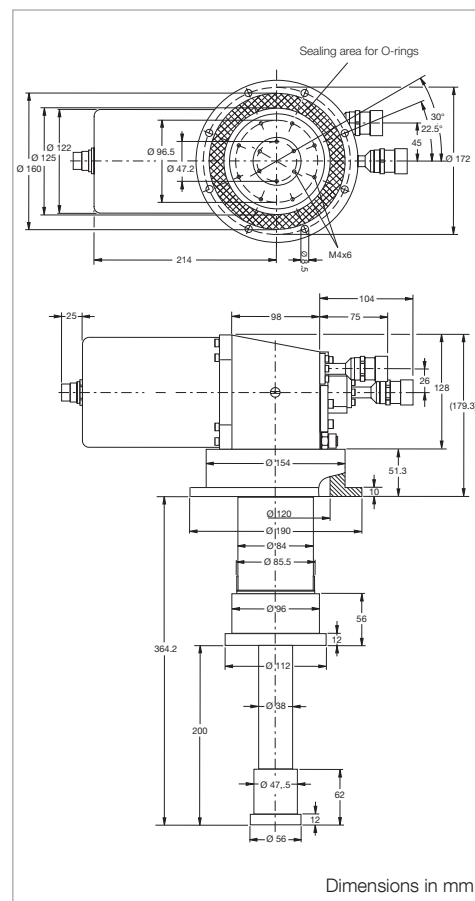
- Shield cooling of superconducting magnets in MRI
- Cooling of cryopanel in special Cryo pumps
- Cooling of larger samples and devices; especially
 - High temperature superconductor coils, wires and bulk materials
 - Recondensation of liquid refrigerants such as nitrogen and argon
 - Cleaning of gases
 - Samples for spectroscopic investigations in solid state and surface physics
 - Infrared and gamma detectors
 - Calibration of sensors

The COOLPOWER 10 MD is a mechanically driven double-stage Gifford McMahon (GM) cryo cooler and ideally suited for

- Cooling of cryo probes in NMR spectrometers
- Shield cooling of superconducting magnets in MRI
- Cooling of cryopanel in special Cryo pumps and thus generation of high vacuum and ultra-high vacuum pressures
- Cooling of larger samples and devices; especially
 - High temperature superconductor coils, wires and bulk materials
 - Recondensation of liquid refrigerants such as H₂, Ne
 - Samples for spectroscopic investigations in solid state and surface physics
 - Infrared and gamma detectors
- Calibration of sensors



Dimensional drawing for the COOLPOWER 250 MD



Dimensional drawing for the COOLPOWER 10 MD

Technical Data

COOLPOWER 250 MD

COOLPOWER 10 MD

Refrigeration capacity at 50/60 Hz ¹⁾			
1st stage at 80 K, approx.	W	175 ²⁾	110
2nd stage at 20 K, approx.	W	n/a	18
Lowest attainable temperature ¹⁾			
1st stage, approx.	K	≤ 25	≤ 28
2nd stage, approx.	K	n/a	≤ 8
Cooldown time of the			
1st stage to 80 K, approx.	min	35	n/a
2nd stage to 20 K, approx.	min	n/a	25
Permissible ambient temperature	°C (°F)	+5 to +40 (+41 to +104)	
He filling pressure at room temperature	barg	15 ₋₁	
He connections			
Self-sealing screwed connections			
High pressure connection		1/2" (#8 ³⁾)	1/2" (#8 ³⁾)
Low pressure connection		1/2" (#8)	1/2" (#8)
Weight, approx.	kg (lbs)	21 (46.3)	22 (48.5)

¹⁾ The refrigerating capacities and temperatures stated apply to vertical operation with the cold end at the bottom and with cold head motor rotation speed 120 RPM, He system filling pressure 13 barg, compressor unit COOLPAK 6000 HMD / 6200 HMD and mit flexlines FL 9.0 HP – DN20 (840217) and FL 9.0 LP – DN32 (840218V0032).

²⁾ Higher refrigeration capacities of up to 250 W at 80 K (CP 250 MD) can be achieved with special parameters and accessories in consultation with our technical support team.

³⁾ Series 5400 "8" from Aeroquip.

Ordering Information

COOLPOWER 250 MD

COOLPOWER 10 MD

	Part No.	Part No.
Cold head		
COOLPOWER 250 MD	842015V0001	-
COOLPOWER 250 MD; DN 160 CF-R (rotatable)	842015V0002	-
COOLPOWER 10 MD	-	842010
COOLPOWER 10 MD; DN 160 CF-R (rotatable)	-	842010V0002
Accessories		
Compressor unit		
COOLPAK 6000 HMD, 400 V/3-ph. 50 Hz or 460 V/3-ph. 60 Hz \pm 10%	840000V6002	840000V6002
COOLPAK 6200 HMD, 200 V/3-ph. 50 Hz or 200-230 V/3-ph. 60 Hz \pm 10%	840000V6202	840000V6202
Power supply cable	see Ordering Information for the compressor unit COOLPAK	see Ordering Information for the compressor unit COOLPAK
Flexible pressure line (for operating mechanically driven cold heads)		
9 m (31.5 ft) (High-pressure) FL9 HP-DN 20 (8f/8f)	840 217	
9 m (31.5 ft) (Low-pressure) FL9 LP-DN 32 (8f/8f)	840218V0032	
20 m (75.0 ft) (High-pressure) FL20 HP-DN 20 (8f/8f)	840230V2020	
20 m (75.0 ft) (Low-pressure) FL20 LP-DN 32 (8f/8f)	840231V2032	
Connection cable for the cold heads		
COOLPOWER 250 MD, 10 MD		
9,0 m	842 110	
20,0 m	842 112	

Compressor Units for Pneumatically Driven Cold Heads and Pumps, Water Cooling

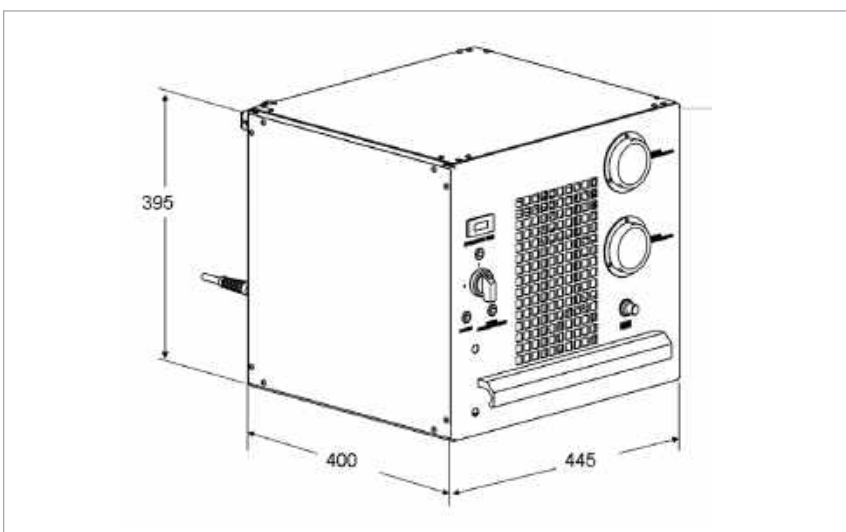
COOLPAK 2000/2200



Compressor unit COOLPAK 2000 (2200 is similar)

Advantages to the User

- High efficiency and increased performance for cryogenic pumps and refrigerators
- High long-term reliability due to long-life and highly efficient components and improved oil management
- Very quiet and low vibration operation through the innovative horizontally suspended scroll compressor
- Simple installation and operation
- Global mains voltage compatibility
- Perfect integration within complex systems due to the 24 V Sub-D interface
- Simple adsorber replacement, otherwise maintenance-free
- Small footprint
- Low cost of ownership



Dimensional drawing of the COOLPAK 2000/2200

Technical Data**COOLPAK 2000 (50 Hz)****COOLPAK 2200 (60 Hz)**

Number of electrical connections for cold heads		1	1
Helium system filling pressure at room temperature	barg	15	14
Ambient temperature	°C (°F)	+5 to +40 (+41 to +104)	+5 to +40 (+41 to +104)
Cooling water consumption	l/min	< 5	< 5
Cooling water feed temperature	°C (°F)	+5 to +25 (+41 to +77)	+5 to +25 (+41 to +77)
Mains voltage (single phase)	V	230 ± 10%	208 ± 10%
Operating current			
with cooled down cold head	A	9.5 to 10.5	11.5 to 12.5
with warmed up cold head	A	12.0	13.0
Electric power consumption			
with cooled down cold head	kW	2.2	2.3
with warmed up cold head	kW	2.4	2.5
Remote control through interface	V DC	24	24
Helium connections			
self-sealing fittings			
high-pressure side (outside thread)		1/2" ¹⁾	1/2" ¹⁾
low-pressure side (outside thread)		1/2" ¹⁾	1/2" ¹⁾
Water connections	DN	10	10
Noise level (at a distance of 1 m (3.5 ft))	dB(A)	< 55	< 55
Dimensions (W x H x D)	mm (in.)	445 x 395 x 400 (17.52 x 15.55 x 15.74)	445 x 395 x 400 (17.52 x 15.55 x 15.74)
Weight, approx.	kg (lbs)	69 (152.32)	69 (152.32)

Ordering Information**COOLPAK 2000 (50 Hz)****COOLPAK 2200 (60 Hz)**

	Part No.	Part No.
Compressor unit	840000V2000	840000V2200
Accessories, optional		
Tool-Kit	E20004779	E20004779
Spare parts		
Adsorber CPS-V8	E 840001973	E 840001973

¹⁾ Series 5400 from Aeroquip, coupling size "-8", or compatible types.

COOLPAK 6000 H/6200 H/6000 HD



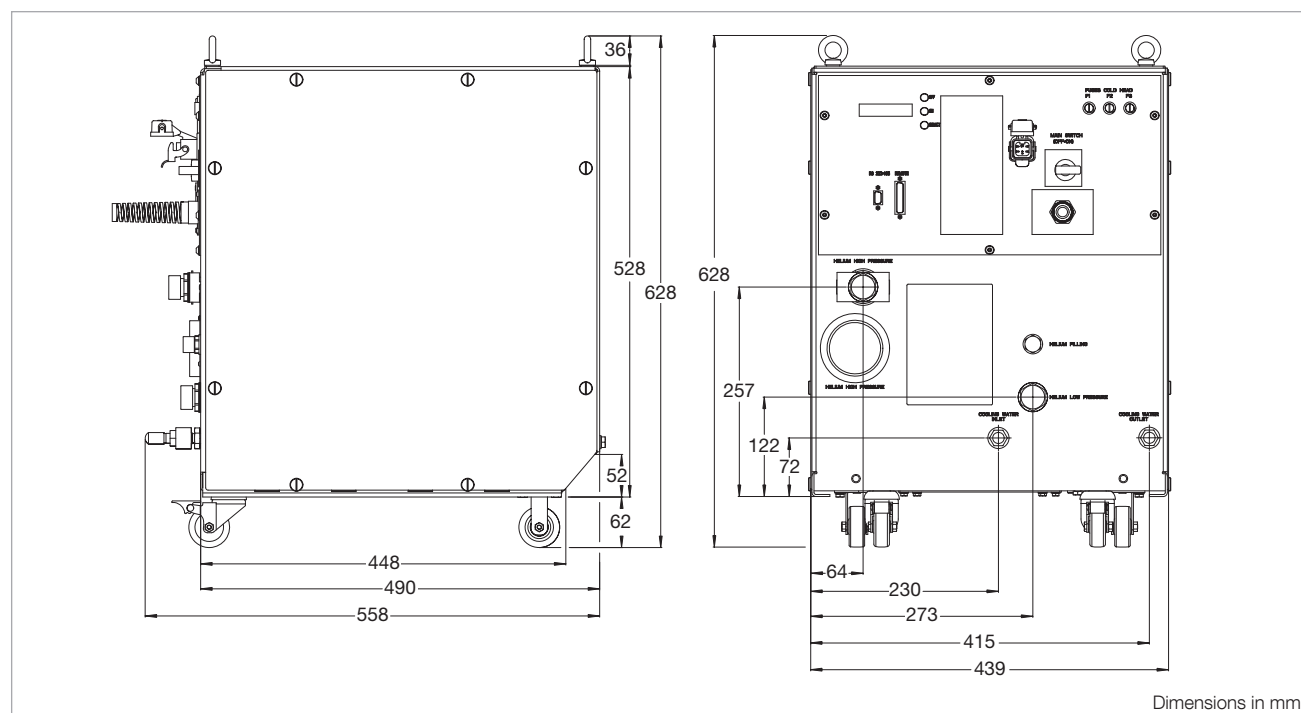
Used to drive cold heads with pneumatically driven displacer pistons, i.e. for individual operation of the COOLPOWER cold heads 140 T and 5/100, but also older cold heads such as the RGS 120, RGD 580 and 1245, as well as the multiplexing of COOLPOWER cold heads 50 and 7/25.

In addition, these compressors are used to operate COOLVAC cryo pumps with integrated cold heads of these types.

Compressor units COOLPAK 6000 H/6200 H/6000 HD

Advantages to the User

- Highly effective and even more powerful when connected with Leybold cryo pumps and refrigerators
- Excellent long-term reliability owing to the modular design and the long life components
- Silent and low vibration operation through scroll compressors
- Simple installation and operation
- Global power supply compatibility
- Easy integration in complex systems due to 24 V DC or RS 232 C interfaces
- Almost maintenance-free
- Small footprint
- Low cost of ownership



Dimensional drawing for the COOLPAK 6000 H/6200 H/6000 HD

Technical Data

COOLPAK

		6000 H / 6000 HD		6200 H	
		50 Hz	60 Hz	50 Hz	60 Hz
Number of electrical connections for cold heads		1 / 2		1	
Helium system filling pressure at room temperature	barg	17	16	15	14
Ambient temperature	°C (°F)	+5 to +40 (+41 to +104)			
Cooling-water consumption ¹⁾	l/min	5			
Cooling-water entry temperature	°C (°F)	+5 to +25 (+41 to +77)			
Main voltage (3 phase)					
upon delivery	V	400 ± 10%	–	230 ²⁾ + 1% / -10%	230 ± 10%
alternative setting	V	–	470 ± 10%	200 ± 10%	200 ± 10%
Operating currents					
with cooled down cold head	A	10 to 12	–	20 to 22	–
with warmed up cold head	A	11 to 13	–	22 to 25	–
Electrical power consumption					
with cooled down cold head	kW	6.5 to 7.5	7.0 to 8.0	6.5 to 7.5	7.0 to 8.0
with warmed up cold head	kW	7.0 to 8.0	7.5 to 8.5	7.0 to 8.0	7.5 to 8.5
Remote control via interface		24 V DC or RS 232 C			
Helium connections					
Self-sealing couplings					
High pressure connection (outside thread)		1/2" ⁴⁾			
Low pressure connection (outside thread)		1/2" ⁴⁾			
Water connections		Hose nozzle DN 10 / G 1/2" outside thread			
Sound level (at 1 m (3.5 ft) distance)	dB(A)	60			
Dimensions (W x H x D)	mm (in.)	440 x 589 x 558 (17.32 x 23.19 x 21.97)			
Weight, approx.	kg (lbs)	104 (230)			

Ordering Information

COOLPAK

	6000 H / 6000 HD		6200 H	
	50 Hz	60 Hz	50 Hz	60 Hz
	Part No.	Part No.	Part No.	Part No.
Compressor unit				
without power supply cable				
Connection for 1 cold head (CP ... H)	840000V6001		840000V6201	
Connection for 2 cold heads (CP ... H)	840000V6004		–	
Power supply cable				
CEE plug, 32 A/6h, 3-pol +N+PE, 3.5 m (12.25 ft)	893 95	–	–	
NEMA plug, L 16-20 P, 20 A/480 V, 3-pol +PE (AWG 12), 3.5 m (12.25 ft)	–	893 96	–	
- with end splice (AWG 10), 10 m (35.0 ft)	840 111		840 111	
- with end splice (AWG 10), 20 m (70.0 ft)	840 112		840 112	
Accessories				
Tool-Kit	E 20004779		E 20004779	
Water cooling discharge throttle	E 840000133 ³⁾		–	
Spare parts				
Adsorber CP6000H	E 840002863			

¹⁾ At a cooling water entry temperature of 25 °C (77 °F).

²⁾ At 14 barg filling pressure.

³⁾ Only for COOLPAK 6000 HD.

⁴⁾ Series 5400 from Aeroquip, coupling size "-8", or compatible types.

Compressor Units for Mechanically Driven Cold Heads and Pumps, Water Cooling

COOLPAK 6000 HMD/6200 HMD



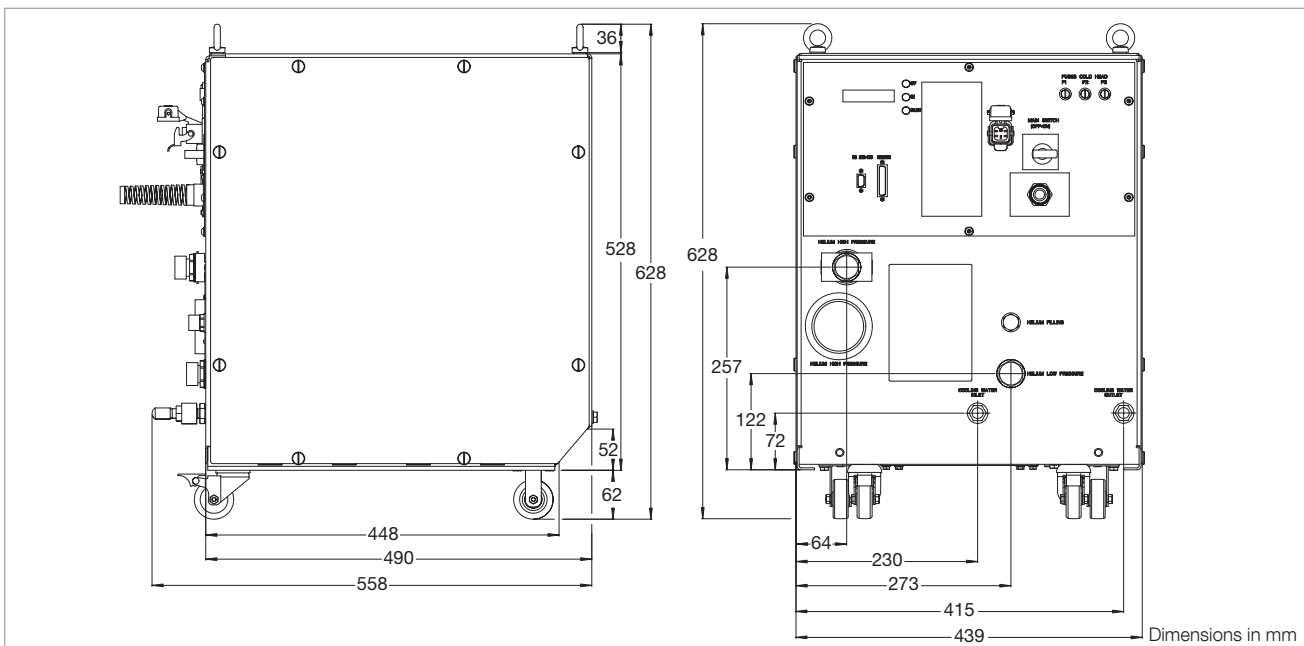
Compressor unit COOLPAK 6000 HMD/6200 HMD

Serves the purpose of individually driving the cold heads with mechanically driven displacers; i.e. COOLPOWER 250 MD and 10 MD.

In addition, these compressor units are also used for operating the COOLVAC cryo pumps 30000 BL LN₂ and COOLVAC 60000 BL LN₂.

Advantages to the User

- Highly effective and even more powerful when connected with Leybold cryo pumps and refrigerators
- Excellent long-term reliability owing to the modular design and the long life components
- Silent and low vibration operation through scroll compressors
- Small footprint
- Simple installation and operation
- Global power supply compatibility
- Easy integration in complex systems due to 24 V DC or RS 232 C interfaces
- Variable cold head motor speed, adjustable using keys on the power module or RS232C interface
- Long maintenance-free period of operation



Dimensional drawing for the COOLPAK 6000 HMD/6200 HMD

Technical Data

		COOLPAK			
		6000 HMD		6200 HMD	
		50 Hz	60 Hz	50 Hz	60 Hz
Mains voltage (3 phase)	V	400 ± 10%	460 ± 10%	200 ± 10%	200 - 230 ± 10%
Helium system filling pressure at room temperature	barg	15	14	14	13
For all other Technical Data, see COOLPAK 6000 H and 6200 H					

Ordering Information

		COOLPAK	
		6000 HMD	6200 HMD
		Part No.	Part No.
Compressor type			
400 V/3-ph. 50 Hz or			
460 V/3-ph. 60 Hz ± 10%		840000V6002	–
200 V/3-ph. 50 Hz or			
200 – 230 V/3-ph. 60 Hz ± 10%		–	840000V6202
Flexible pressure line (for operating mechanically driven cold heads)			
9 m (31.5 ft) (High-pressure)			
FL9 HP-DN 20 (8f/8f)		840 217	
9 m (31.5 ft) (Low-pressure)			
FL9 LP-DN 32 (8f/8f)		840218V0032	
20 m (75.0 ft) (High-pressure)			
FL20 HP-DN 20 (8f/8f)		840230V2020	
20 m (75.0 ft) (Low-pressure)			
FL20 LP-DN 32 (8f/8f)		840231V2032	
Connection cable for the cold heads			
COOLPOWER 250 MD, 10 MD			
9,0 m (31.5 ft)		842 110	
20,0 m (75.0 ft)		842 112	
Power supply cable			
CEE plug, 32 A/6h, 3 pol+N+PE,			
3,5 m (12.25 ft)	893 95		–
NEMA plug, L 16-20 P, 20 A/480 V,			
3 pol+PE (AWG 12), 3,5 m (12.25 ft)	893 96		–
10 m (35.0 ft) with end splice (AWG 10)		840 111	
20 m (70.0 ft) with end splice (AWG 10)		840 112	
Accessories			
Tool-Kit		E 20004779	
Water cooling discharge throttle		E 840000133	
Spare parts			
Adsorber CP6000H		E 840002863	

General Accessories for Compressor Units COOLPAK 2000, 6000 H

Technical Data

Length

Connections on both sides (inside thread)

High pressure line (HD)

Low pressure line (ND)

Flexlines ^{1), 2)}

FL 4.5 (1/2", 1/2") (= 1 Set)	4.5 m (14.76 ft)	1/2"	1/2"
FL 9.0 (1/2", 1/2") (= 1 Set)	9,0 m (29.53 ft)	1/2"	1/2"
FL 18.0 HP (1/2") (= single high pressure line)	18 m (59.06 ft)	1/2"	-
FL 18.0 LP (1/2") (= single low pressure line)	18 m (59.06 ft)	-	1/2"

Connections

(m = Outside thread, f = Inside thread)

Accessories for Flexlines

Adaptor for flexlines		
AD (1/2" m, 3/4" f)	1/2" m	3/4" f
AD (1/2" f, 3/4" m)	3/4" m	1/2" f
90°-Elbow 1/2" for flexlines	1/2" m	1/2" f
Coupling 1/2" for interconnecting two 1/2" flexlines	1/2" m	1/2" m
Coupling 3/4"	3/4" m	3/4" m

Gas Distributors

(required quantity)

Gas Manifold – Connections

At the compressor
(Inside thread)

At the cold head
(Outside thread)

Gas manifold (1 piece each)			
GD 2 (for dual operation) ²⁾	2	1/2"	2 x 1/2"
GD 4 (for up to quad operation) ²⁾	2	1/2"	4 x 1/2"

Ordering Information

General Accessories

	Part No.
Flexlines ^{1), 2)}	
FL 4.5 (1/2", 1/2") (= 1 Set)	892 87
FL 9.0 (1/2", 1/2") (= 1 Set)	892 88
FL 18.0 HP (1/2") (= single high pressure line)	840 203
FL 18.0 LP (1/2") (= single low pressure line)	840 204
Adaptor for flexlines	
AD (1/2" m, 3/4" f)	892 89
AD (1/2" f, 3/4" m)	892 90
90°-Elbow 1/2" for flexlines	891 73
Coupling 1/2" for interconnecting two 1/2" flexlines	891 71
Gas manifold (1 piece each)	
GD 2 (for dual operation) ²⁾	840 253 (2x)
GD 4 (for up to quad operation) ²⁾	840 254 (2x)
Connection cable for linking cold head and compressor unit ²⁾	
Power supply cable 4.5 m (14.76 ft)	E400 000 323
Power supply cable 18 m (59.06 ft)	840 002 964V0018
Extension cable for linking cold head and compressor unit ²⁾	
EL 4.5 (4.5 m / 14.76 ft)	893 74

All flexible pressure lines, adaptor pieces, bends, isolating pieces, line couplings and gas manifolds are equipped with self-sealing Aeroquip fittings and filled in the factory with high-purity helium gas (purity: 99.999%). The filling pressure is 16 barg.

¹⁾ Minimum bending radius: 30 cm (11.81 in.).

²⁾ Only suited for pneumatically driven cold heads and cryo pumps.

Accessories for Cryo Pumps / Cryogenics

Controllers and Monitoring Units for Cryo Pumps

CRYOVISION

Optional Display Unit for COOLVAC iCL Cryo Pumps with COOL.DRIVE pump controller

Advantages to the User

- Visualisation of all *iClassicLine* cryo pump control processes with COOL.DRIVE integrated control unit via the integrated 7" (177.8 mm) touchscreen.
- Interface to customer's system controller for single or multiplex operation for cryo pumps from the *iClassicLine* range

- Output of measurement signals of all pressure and temperature sensors that are connected, along with the display of status reports of all pumps connected to the network
- Easily integrated within customer's system control

Typical Applications

- For automated operation of the COOLVAC cryo pumps of the *iClassicLine*

Control and Display Unit CRYOVISION



The intelligent control unit CRYOVISION automatically controls and monitors up to 10 COOLVAC *iClassicLine* cryo pumps.

Online monitoring, help functions and a service interface for ease of diagnosis and software updates via the built-in USB interface are just a few of its user-friendly features.

The CRYOVISION can be installed as a "stand alone system" or remote controlled via an interface.

Furthermore, an optional ProfiBus module is available for communication with the individual cryo pumps in single and multiplex operation via the Profi-Bus.

Technical specifications

- Deployable as a desktop unit or as a mounted unit in a 19" rack
- Operation via 7" (177.8 mm) touchscreen or rear-sided interfaces

Scope of delivery

- Stylus
- Power supply connector
- Adhesive rubber feet for use as a desktop unit
- Installation kit for 19" rack installation
- Installation and operation manual

Technical Data**CRYOVISION**

Operating voltage, $\pm 10\%$	V DC	24 ¹⁾
Power consumption	W	11
Ambient temperature during operation	°C	+5 to +40
Dimensions (W x H x D)	mm (in.)	213 x 128.5 x 160 (8.39 x 5.06 x 6.3) [1/2 19" 3 HU]
Weight	kg (lbs)	1.9 (4.19)

¹⁾ Provided via the CRYOVISION – COOL.DRIVE control line or optionally via an external, separate power supply.

Ordering Information**CRYOVISION**

	Part No.
Control and Display Unit CRYOVISION	844231V0002

Accessories

Connection line CRYOVISION – COOL.DRIVE / COOL.DRIVE – COOL.DRIVE	
Length	
5 m (16.4 ft)	844231V2005
10 m (32.8 ft)	844231V2010
20 m (65.6 ft)	844231V2020

Optional Interface Module

COOLVAC ProfiBus Module ProfiBus – RS232 converter for COOL.DRIVE und CRYOVISION	844000V1
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COOLVAC ProfiBus Module

Optional ProfiBus – RS232 converter for COOLVAC iClassicLine cryo pumps with COOL.DRIVE control unit and CRYOVISION display unit

Advantages to the User

- Direct control and monitoring of the current *iClassicLine* range of pumps with COOL.DRIVE controllers using the ProfiBus DP protocol
- Control and monitoring of all *iClassicLine* cryo pumps connected to the CRYOVISION display unit on the network using the ProfiBus DP protocol
- Control and monitoring of older cryo pumps from the ClassicLine range via the corresponding COOLVAC system controller
- Configured as a top-hat rail module for straightforward rack installation.

Typical Applications

- Conversion of Profibus DP commands into RS232 commands and of RS232 response messages into Profibus DP response messages for the RS232 interfaces of the COOL.DRIVE controllers on the *iClassicLine* cryo pumps and/or for the RS232 interfaces of the optional CRYOVISION display unit, and for the RS232 interface of the COOLVAC system controller of the earlier COOLVAC ClassicLine range of cryo pumps.

COOLVAC ProfiBus Module



The COOLVAC ProfiBus module enables the simple and straightforward control and monitoring of cryo pumps from the current *iClassicLine* range and/or the earlier ClassicLine range of pumps via the RS232 interface of the attendant control and display units COOL.DRIVE and CRYOVISION or COOLVAC SC via the Profibus DP standard.

The attendant GSD file is available on our homepage.

Technical specifications

- Plastic casing, ventilated
- Combination installation feet for top-hat and C-section rails
- ProfiBus DP slave interface module
- ProfiBus DP V0 conforming to IEC 61158-2 and IEC 61784 Type 3
- ProfiBus DP address range Hex \$01...\$7D selectable via switches and \$7E selectable via software; corresponds to decimal numbers 1...126.
- ProfiBus terminating resistor can be cut in using a switch in the module
- ProfiBus connection via a 9-way D-sub socket
- RS232 interface lead connection using pluggable screw terminals

Scope of delivery

- ProfiBus module for top-hat rail installation
- 3m RS232 connection lead
- Installation and operating instructions

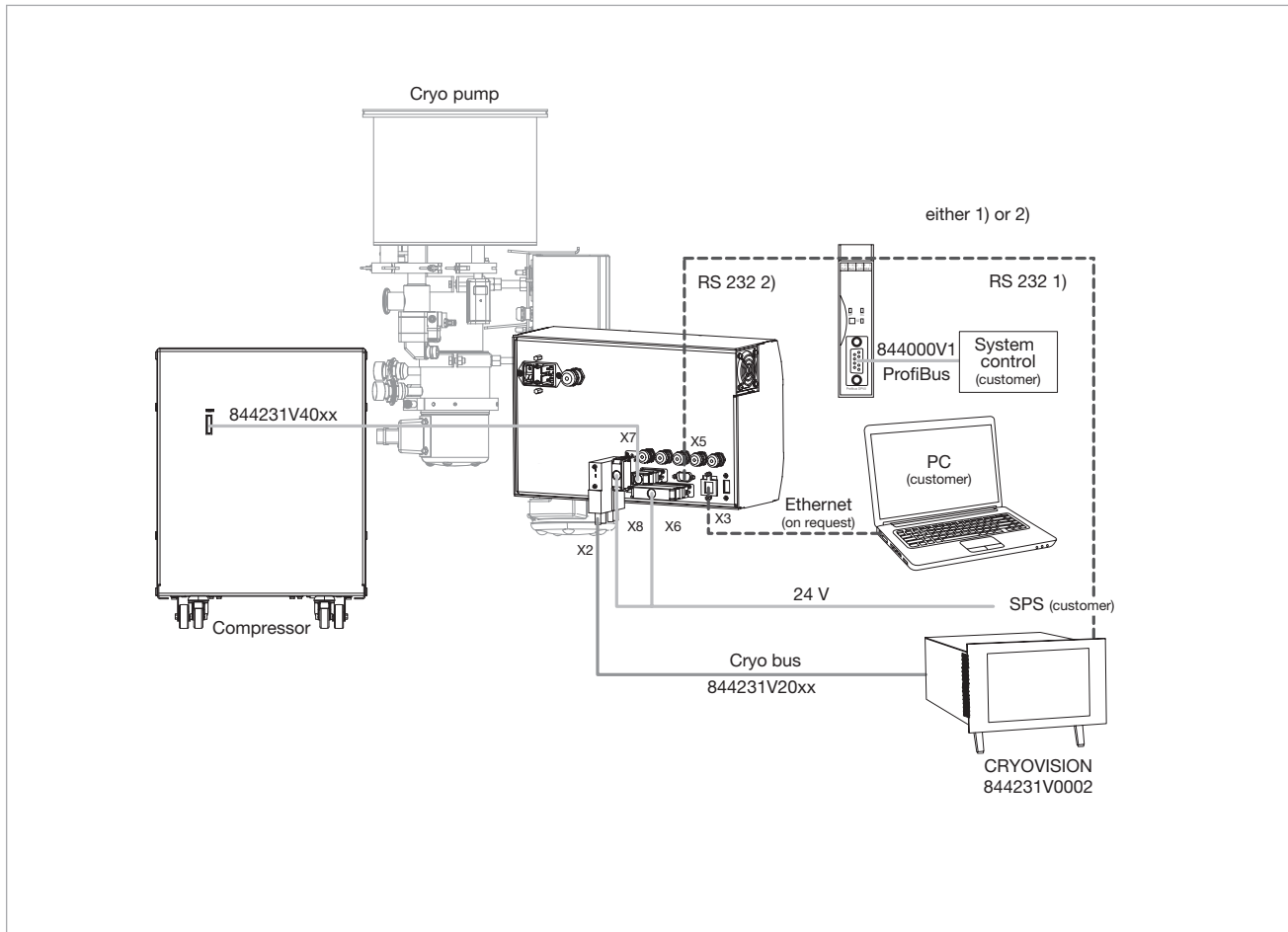
Technical Data**COOLVAC ProfiBus Module**

Operating voltage, $\pm 10\%$	V DC	24
Power consumption, approx.	mA	90
Ambient temperature during operation	$^{\circ}\text{C}$	+5 to +40
Dimensions (W x H x D)	mm (in.)	22.5 x 100 x 115 (0.89 x 3.94 x 4.53)
Weight	kg (lbs)	0.13 (0.29)

Ordering Information**COOLVAC ProfiBus Module**

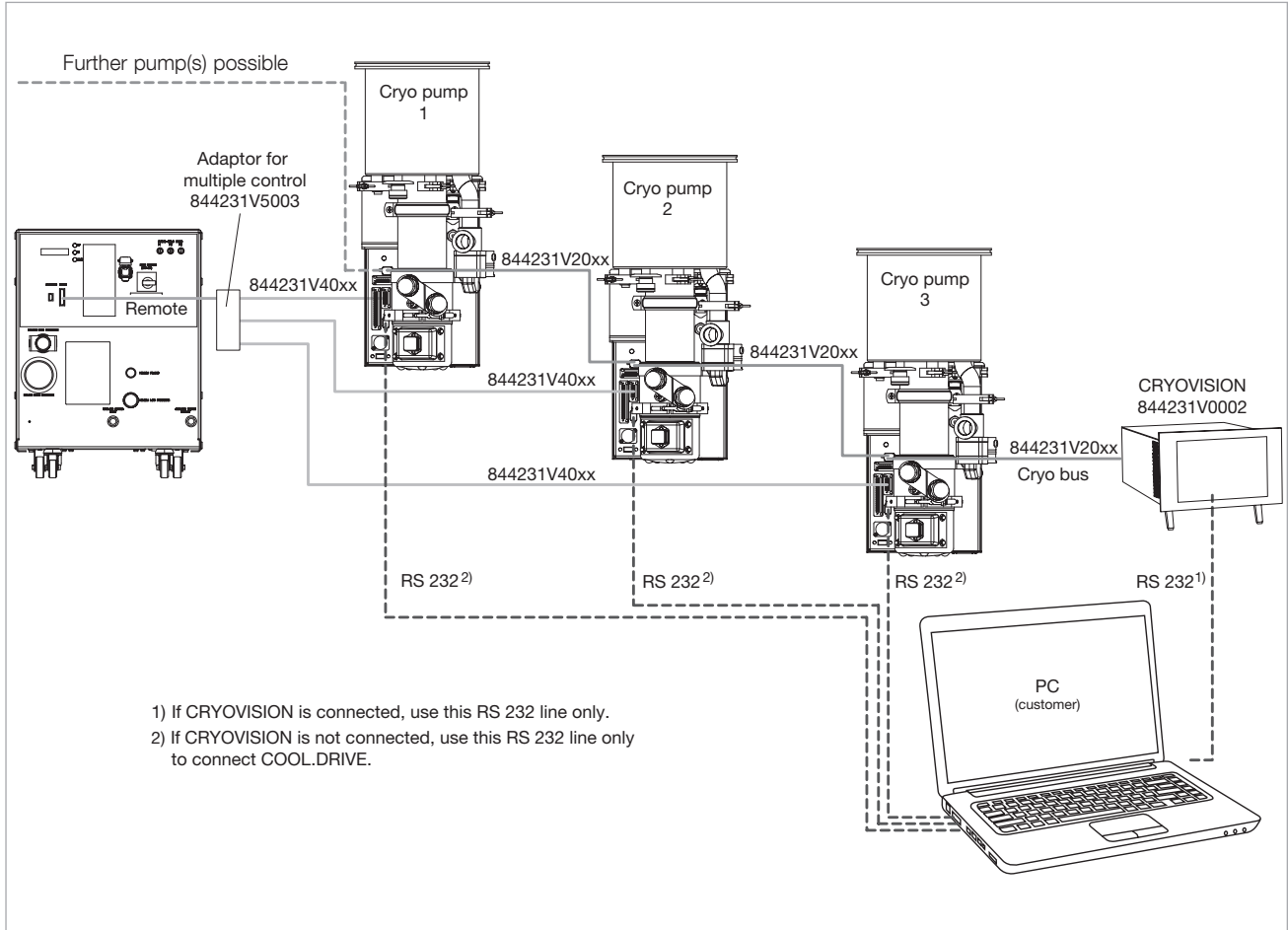
	Part No.
COOLVAC ProfiBus Module	844000V1

COOLVAC iClassicLine, Single System Configuration



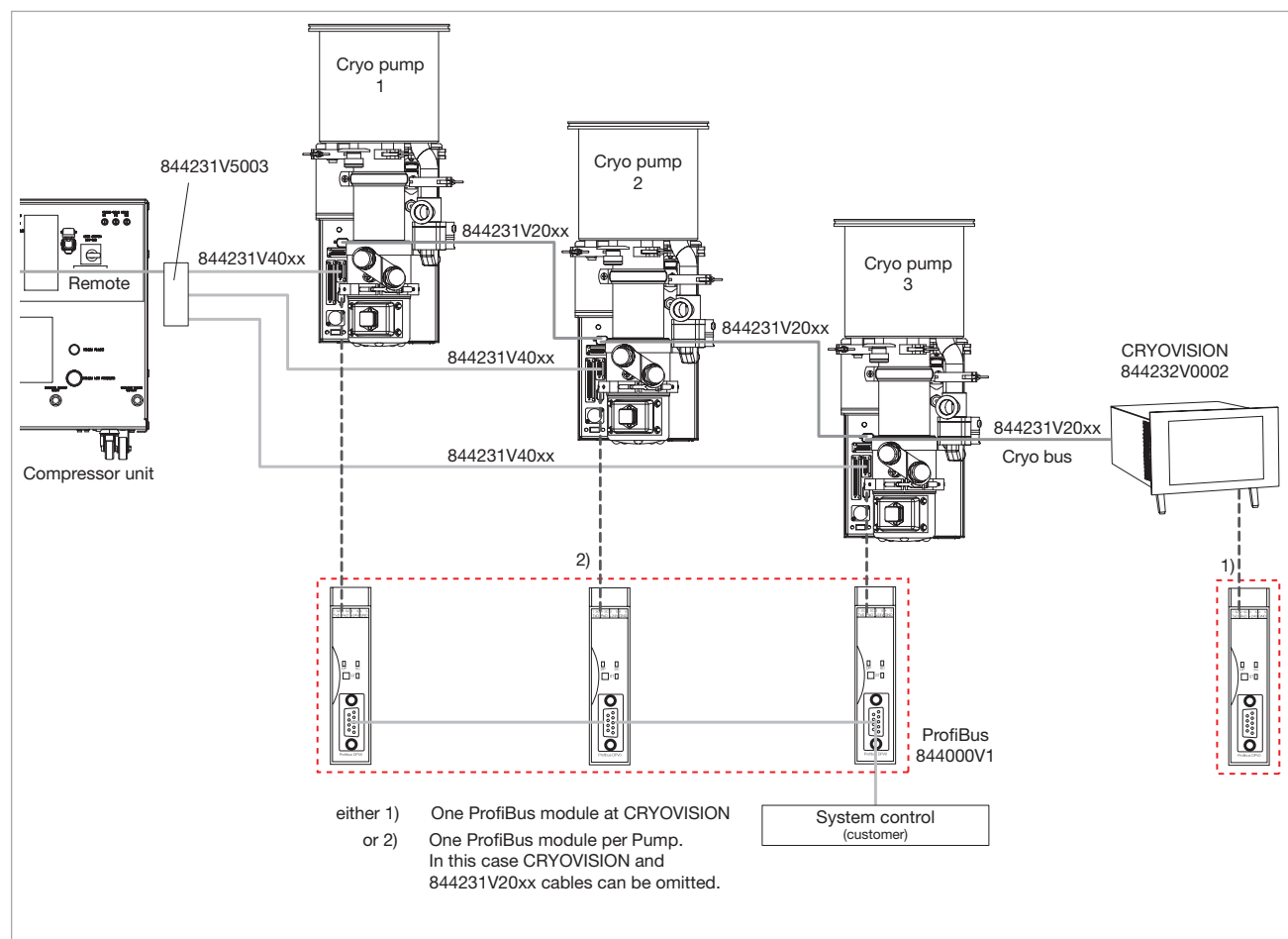
Control options for one pump and one compressor unit

COOLVAC iClassicLine, Dual and Multiple System Configuration



Control options for three pumps

COOLVAC iClassicLine, Dual and Multiple System Configuration



Control options for several pumps with one built-in COOL.DRIVE each

Low Temperature Measuring Instrument MODEL 211S



Advantages to the User

- Supports one silicon diode
- 3-digit LED display
- Temperature readout between 1 and 450 Kelvin
- Two trigger thresholds
- RS 232 C interface

Typical Applications

- Temperature measurements on cryostats
- Temperature measurements on cryo pumps for monitoring their operation and to control pump systems

Technical Data

Measurement current	μA	10
Display		LED, 5-digits
Temperature range	K	1.4 to 475
Resolution		0.001 K from 1.4 to 99.9 K 0.01 K from 100 to 475 K
Accuracy		±0.05 K from 1.5 to 99.9 K ±0.05 K from 100 to 475 K
Power supply voltage		5 V DC at 1 A through the supplied 100 – 240 V AC power adaptor
Trigger thresholds		2
Switched output		2 relays (n.c. and n.o.) 30 V DC at 1 A
Analog output		
Voltage	V	0 to 10
Current	mA	4 to 20
RS 232 C interface		a) Temperature output b) External adjustment of switching thresholds
Admissible ambient temperature	°C (°F)	+15 to +35 (+59 to +95)
Mechanical design/housing		Benchtop unit
Dimensions (W x H x D)	mm	96 x 48 x 166 (3.78 x 1.89 x 6.54)
Weight (including packaging), approx.		0.45 (1.0)

Ordering Information

MODEL 211S

	Part No.
Low temperature measuring instrument MODEL 211S	844 110
HV cable 2-way with plug, 10 m (35.0 ft) long ¹	844 112
HV cable 4-way with plug, 10 m (35.0 ft) long ²⁾	844 113
UHV cable 4-way with plug, 10 m (35.0 ft) long ²⁾	844 114
Silicon diode, type E, with connecting cable and micro plugs ⁴⁾ without current feedthrough	844000V5
HV current feedthrough on a flange DN 25 KF, 2-way ⁵⁾	E20019256
UHV current feedthrough on a flange DN 16 CF, 4-way ⁶⁾	500 217

¹⁾ Compatible with HV current feedthrough on a flange DN 25 ISO-KF (E20019256) and for older cryo pumps of type RPK.

²⁾ Compatible with current ranges BasicLine (BL) and BL LN₂.

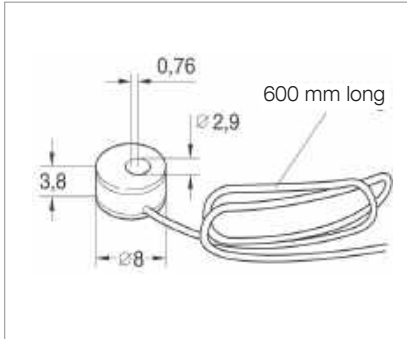
³⁾ Compatible with UHV current feedthrough on a flange DN 16 CF (500217) and cryo pumps from the BL-UHV range.

⁴⁾ Compatible with HV current feedthrough (E20019256).

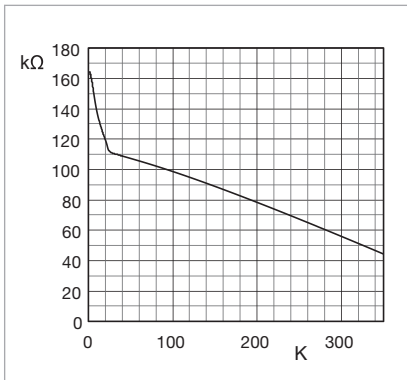
⁵⁾ Compatible with 844000V5 and measurement line 844112.

⁶⁾ Compatible with measurement line 844114.

Temperature Sensor



Dimensional drawing for the silicon diode, type E



Standard characteristic of the silicon diode

In contrast to vapor pressure thermometers, electric temperature sensors can be used for continuous measurements within a wide range of temperatures.

Silicon diodes offer a negative temperature coefficient of resistance, i.e. their resistance drops as the temperature increases. The slope of the temperature/resistance characteristic and the absolute resistance are decisive regarding the suitability of these diodes. The slope determines the sensitivity of the sensor and a high electrical resistance permits accurate measurements while keeping the thermal load small (microwatts).

In systems which are degassed at high temperatures, silicon diodes can only be fitted after degassing has been completed.

The silicon diode type E matches the low temperature display unit.

Technical Data

Silicon Diode Type E

Temperature range	K	1.4 to 325
Temperature coefficient (dR/dT)		
qualitative		Negative in the entire temperature range
quantitative	Ω/K	Non-linear characteristic
Measurement current	μA	10
Bakeable to	°C (°F)	+60 (+140)

Ordering Information

Silicon Diode Type E

	Part No.
Temperature sensor	844000V5
Silicon diode with 4-way electrical feedthrough	E6512948

Vacuum Pump Systems

RUTA

Forevacuum Pump Systems

DRYVAC

Dry Compressing Vacuum Pump Systems

Central Vacuum Supply Systems
with SOGEVAC Pumps

TURBOLAB

High Vacuum Pump Systems

UNIVEX

High Vacuum Experimentation Systems

CS

Calibration Systems

250.00.02

Excerpt from the Leybold Full Line Catalog (Edition 02/2019)

Catalog Part Vacuum Pump Systems

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General to Vacuum Pump Systems

Overview

A continually increasing number of applications in industry and research are relying on vacuum technology. Thus widely differing requirements result regarding the vacuum generating systems.

The comprehensive range of vacuum pumps from Leybold offers, in combination with the matching accessories, all options of selecting the optimum pump system for your application in each case.

Based on the longstanding experience in the design and manufacture of vacuum pump systems, Leybold offers standardized pump systems which will match most applications – the RUTA pump systems.

RUTA pump systems excel by being compact, reliable and service-friendly.

The pump systems are equipped as standard with 400 V, 50 Hz three-phase motors.

Motors for special supply voltages, special mains frequencies or explosion protected pumps are available.

Standards

Leybold pump systems are rated according to CE, ISO, DIN and VDE regulations. Compliance with other standards is possible upon request.

The technical data of the vacuum pump systems given in this catalog part are based on the PNEUROP Acceptance Specifications for Vacuum Pumps, Part 1, and comply with DIN 28 426. The characteristic curves in our pumping speed diagrams are plotted in accordance with DIN 28 426. The curves represent the mean of several measurements. Our warranty refers to the values indicated in the technical data table.

Designation of Roots Vacuum Pump Systems

Leybold pump combinations of Roots vacuum pumps with backing pumps are called “RUTA”.

In order to identify the standard pump systems the name “RUTA” is followed by the brief designations of the pumps which make up a particular pump system.

Brief designation of the largest Roots vacuum pump (Pumping speed of the pump system)

Brief designation of the smaller Roots vacuum pump

Cooler or condenser (if present)

Brief designation of the backing pump

Type of pump system (adaptor (A) or frame (G))

The pump system designation is arranged as follows:

RUTA WAU 2001 / WAU 501 / K / D 65 B / G

Part Numbers

The part numbers listed refer in each case to the standard version of the respective systems. Minor deviations are indicated by way of variants.

The variant V001 designates in each case the described version of the system.

The pump system RUTA WAU 2001/ SP630 F/G has Part No. 502 511 V001. When using the air-cooled screw pump SCREWLINE SP 630 then the variant will have the Part No. 502 511 V002. Minor deviations are special operating voltage, fitted accessories and custom painting for frame or pumps, for example.

The use of a different type of Roots vacuum pump, use of the WS 2001 instead of the WAU 2001, for example, is also treated as a variant. All variants with the same basic number have the same frame dimensions, the same distance between intake flange of the Roots pump and the exhaust flange of the backing pump.

Types of Pump Systems

Typical areas of application for RUTA pump systems are industry, research and chemistry. Here the focus is on processes for metal production and processing, drying and degassing, thermal treatment, coating in the area of solar components and semiconductor manufacture as well as surface refinement. RUTA pump systems are also used as backing pump sets for high vacuum systems in combination with diffusion pumps, turbomolecular pumps and cryo pumps.



RUTA WH7000/4xSV750BF/G

The RUTA pump systems described here have been designed for rough and medium vacuum operation, i.e. for the pressure range from atmospheric pressure down to 10^{-4} mbar (0.75×10^{-4} Torr). RUTA pump systems consist of a combination of individual pumps whereby Roots vacuum pumps are employed on the intake side. Further compression to atmospheric pressure may be performed either by oil sealed or dry compressing vacuum pumps, liquid ring pumps or Roots vacuum pumps with pre-inlet cooling. All combinations may be equipped at suitable places with condensers.

The selection criteria for a RUTA pump system are as follows:

- Pumping speed
- Operating pressure
- Process conditions
- Characteristics of the media
- Standards and regulations which depend on the area of application and the produced products.

Standard RUTA Pump Systems

Our Roots vacuum pumps WA, WH, WS and RA or WAU and WSU with integrated bypass line are combined with oil sealed backing pumps for conventional generation of the vacuum. Single-stage arrangements are capable of delivering pumping speeds of 250 to 16000 m³/h (147.3 to 9424 cfm). Higher pumping speeds can be attained by paralleling several pumps. The attainable operating pressures depend on the number of pumping stages.

For higher pumping speeds or lower ultimate pressures, also three-stage or multi-stage pump systems are available.

RUTA Pump Systems with Condensers

If vacuum systems must pump larger quantities of vapor or vapor gas mixtures, it is economical to insert condensers which are cooled with water or a different coolant at a suitable place within the pump system. Cooled condensers are themselves effective partial pumps which condense most of the vapors from the pumped media. The downstream mechanical pumps will then only need to pump those gases which have not already condensed.

The quantity of vapor present in each case determines the size of the condenser and the temperature at which it is operated. The size of the downstream pump is determined by the quantity of non-condensable gases, the required pressure and the required pump-down time for the system.

All pump systems of the WA/WAU, WS/WSU, WH and RA series may be equipped with one or several condensers. These are often used in the chemical industry. Here RUTA vacuum pump systems with condensers are not only used to generate a vacuum, but they are also often employed in the recovery of solvents. When installing one or several Roots pumps upstream of a condenser, low operating pressures and high condensation pressures can be attained. Thus the condenser may in many cases be operated with cooling water instead of brine. The vapor components pumped together with inert gases may be separated once more in an emission condenser on the exhaust side so that the quality of the exhaust gas can be maintained within close tolerance regarding its cleanness.

Dry Compressing RUTA Vacuum Pump Systems

Increasing environmental awareness, pumping of condensable vapors or high requirements regarding cleanliness when pumping high quality media which must not be contaminated by other media for recycling, often requires the use of universal pumps where the pump chamber is free of operating agents (dry pumps).

Here Leybold offers two solutions:

1. Pump systems with dry compressing vacuum pumps combined with one or several Roots vacuum pumps.
2. Single-stage RUTA RAV vacuum pump systems, consisting of Roots vacuum pumps with pre-admission cooling.

The operating pressure ranges of the pump systems depend on the number of Roots vacuum pumps, but will extend in any case without interruptions to atmospheric pressure.

Already in connection with one Roots pump, pump systems with a screw pump are capable of attaining base pressures of $< 1 \times 10^{-3}$ mbar (7.5×10^{-4} Torr).

Single-stage RAV combinations attain an ultimate pressure of 150 mbar (112.5 Torr).

Multi-stage combinations with Roots vacuum pumps of all systems are capable of attaining pressures below 10^{-4} mbar (7.5×10^{-5} Torr).

RUTA Custom Pump Systems

Most users will be able to select the right pump system for their application from our range of standard pump systems. In special cases a custom design may be required for special processes and high pumping speeds.

We are prepared to design and manufacture custom pump systems according to customers specifications. If required we will use – besides oil-sealed and dry compressing backing pumps – liquid ring and ejector pumps.

RUTA Pump Systems for the Metal Producing and Processing Industry

In common vacuum furnace processes such as hardening, annealing, brazing, melting and casting, preferably oil sealed or dry compressing standard vacuum pump systems are usually used.

The oil sealed systems consist of a combination of Roots vacuum pumps with a single or two-stage rotary vane or rotary piston pump.

In the dry compressing systems our screw vacuum pump SCREWLINE is used as the backing pump.

The vacuum pumps are mounted in a rugged frame. The design of the pump systems is service-friendly, modular and can be easily upgraded with additional equipment.

On smaller furnaces RUVAC WAU Roots vacuum pumps are the most suitable because these may be cut-in at a higher operating pressure, while on larger furnaces and particularly where short pump-down cycles are required, the use of RUVAC WH Roots vacuum pumps with suitably sized backing pumps is advisable. For special processes, e.g. fusion or degassing of molten masses, due to the high dust contents, the additional use of a dust separator is required as well as equipping the backing pumps with oil filtering units.

These additional units ensure utmost operational reliability of the pump systems even under the toughest operating conditions.



Pump system for the field of steel degassing

RUTA Pump Systems for the Photovoltaic and Coating Industry

In photovoltaic coating processes reactive, toxic and corrosive substances are generally used.

Frequently large quantities of dust for the pump system need to be expected. For such applications, Leybold has developed process pump combinations consisting of pumps from the DRYVAC line and Roots pumps from the RUVAC WS/WH line with optionally integrated controller.

The integrated electronics and sensor systems permit easy integration of the pump systems within the plant control system.

(For information on possible applications, see Catalog Part "Dry Compressing Screw Vacuum Pumps DRYVAC").

RUTA Pump Systems for the Chemical Industry

In chemical processes it is often necessary to remove corrosive, condensable and reactive gases and vapors. Leybold designs and manufactures custom-built pump systems for specific process applications. Depending on the type of application, either a rotary vane pump, or a dry compressing screw vacuum pump (SCREWLINE, for example), a liquid ring pump or a combination of gas jet pump and liquid ring pump may be used as the backing pump.

To ensure dependable monitoring of the system, the following monitoring devices, among others, may be installed:

- Temperature sensors to monitor the gas temperatures between the pump stages and the pump body temperature,
- Water flow monitors for the cooling water supply to pumps and condensers,
- Differential pressure indicator with control setpoint to monitor the exhaust filters of the rotary vane vacuum pump.

Pump Systems for Drying, Evaporation and Distillation Applications (TVD)

More and more vacuum applications are finding their way into the areas of environmental protection, recycling and waste disposal. "Waste disposal of used oil and aromatic compounds" and "Cleaning processes in metal-processing factories" demonstrate that the combination of vacuum know-how, innovative engineering and applications know-how is indispensable for the successful application of vacuum technology in most widely differing applications.



TVD pump system, mobile with control cabinet

The product is no longer in the foreground, solutions to problems are demanded instead.

Leybold has developed some continuously operating vacuum pump systems for these applications. These systems basically consist of a rotary vane pump with a condenser unit. Upon request the condenser arrangement may also be equipped with a cold water set. This version will then be independent of any cooling water connections and - being a mobile system - it is well-suited for operation at varying locations.

Products

Oil Sealed RUTA Pump Systems – Three-Stage, with Two-Stage TRIVAC Backing Pumps, Adaptor Version



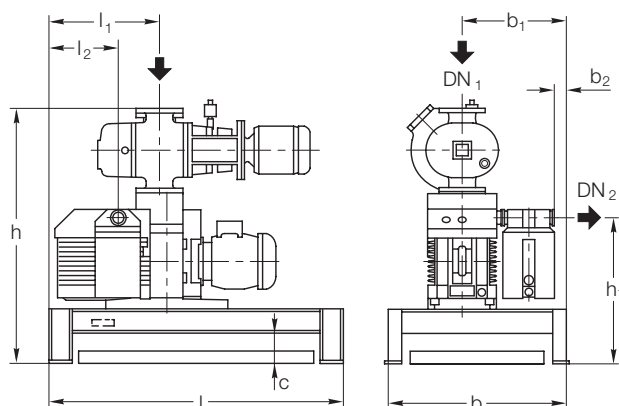
RUTA WAU501/D65B/A

Standard Equipment

- Exhaust filter
- Oil collecting pan
- Manually operated gas ballast
- Crane eyes on the frame
- Floor mounting
- The oil is supplied with the pump
- CE approval

Options

- Frequency converter RUVATRONIC RT for controlling the speed of the Roots pump
- Oil filter
- 24 V DC gas ballast valve
- Sound proofing box
- Vibration absorbers
- Castors
- Different types of floor mounts
- Oil drain valve on each pump
- Exhaust filter with oil return line
- Special motors
- Electric control systems



Type	RUTA	251/D40B/A	251/D65B/A	501/D65B/A
RUVAC WA/WAU/WS/WSU	P2	251	251	501
Backing pump TRIVAC	P1	D 40 B	D 65 B	D 65 B
	DN ₁	63 ISO-K	63 ISO-K	63 ISO-K
	DN ₂	40 ISO-KF	40 ISO-ISO-KF	40 ISO-KF
	l	1000 (39.37)	1000 (39.37)	1000 (39.37)
	l ₁	375 (14.76)	375 (14.76)	375 (14.76)
	l ₂	234 (9.21)	234 (9.21)	234 (9.21)
	b	600 (23.62)	600 (23.62)	600 (23.62)
	b ₁	350 (13.78)	350 (13.78)	350 (13.78)
	b ₂	40 (1.57)	40 (1.57)	40 (1.57)
	h	854 (33.62)	854 (33.62)	894 (35.20)
	h ₁	488 (19.21)	488 (19.21)	488 (19.21)
	c	100 (3.94)	100 (3.94)	100 (3.94)

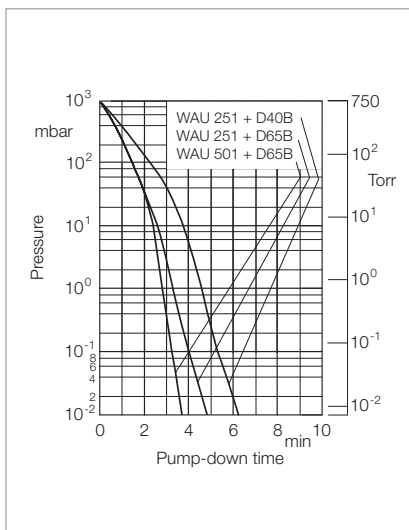
Dimensional drawing for the pump systems with TRIVAC D40/65 B backing pumps on pallet; dimensions in brackets () are in inch

Technical Data, 50 Hz

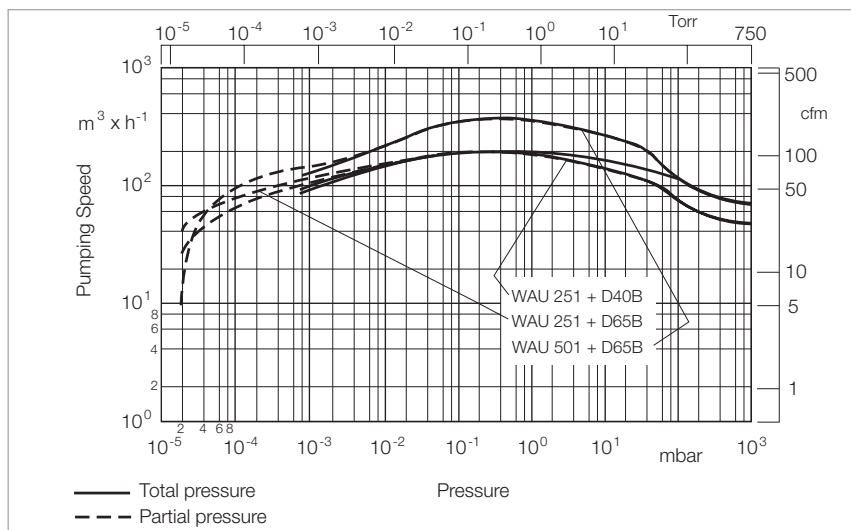
		RUTA WAU		
		251/D40B/A	251/D65B/A	501/D65B/A
RUVAC (WA/WAU/WS/WSU possible)	P2	251	251	501
Backing pump TRIVAC	P1	D 40 B	D 65 B	D 65 B
Pumping speed, 50 Hz at 10^{-1} mbar (7.5×10^{-2} Torr)	m ³ /h (cfm)	200.0 (117.8)	210.0 (123.7)	380.0 (223.8)
Ultimate partial pressure	mbar (Torr)	$< 2 \times 10^{-5}$ ($< 1.5 \times 10^{-5}$)		
Ultimate total pressure with gas ballast	mbar (Torr)	$< 8 \times 10^{-4}$ ($< 6 \times 10^{-4}$)		
Installed motor power 400 V, 50 Hz	kW (hp)	2.6 (3.5)	3.3 (4.5)	4.4 (6.0)
Electrical power consumption at 10^{-1} mbar (7.5×10^{-2} Torr)	kW (hp)	2.0 (2.7)	2.5 (3.4)	2.7 (3.7)
Noise level				
max.	dB(A)	64	65	67
without gas ballast at 1 mbar (0.75 Torr)	dB(A)	62	63	63
Oil filling, total, approx.	l (qt)	3.3 (3.49)	4.0 (4.23)	4.3 (4.55)
Weight, total, approx.	kg (lbs)	245.0 (540.2)	260.0 (573.3)	305.0 (627.5)
Connecting flange				
Inlet port	DN ₁	63 ISO-K		
Outlet port	DN ₂	40 ISO-KF		

Ordering Information

		RUTA WAU		
		251/D40B/A	251/D65B/A	501/D65B/A
		Part No.	Part No.	Part No.
RUVAC (WA/WAU/WS/WSU possible)	P2	WAU 251	WAU 251	WAU 501
Backing pump TRIVAC	P1	D 40 B	D 65 B	D 65 B
Pump system, complete (adaptor version), pallet mounted, with Roots vacuum pump RUVAC WAU		023 06	023 07	023 08
Frequency converter RUVATRONIC (see description in Chapter "Accessories")		RT 5/251 500 001 381	RT 5/251 500 001 381	RT 5/501 500 001 382



Pump-down time diagram
for a 1000 l tank at 50 Hz



Pumping speed diagram at 50 Hz

Oil Sealed RUTA Pump Systems – Three-Stage, with Two-Stage TRIVAC Backing Pumps, Frame Version



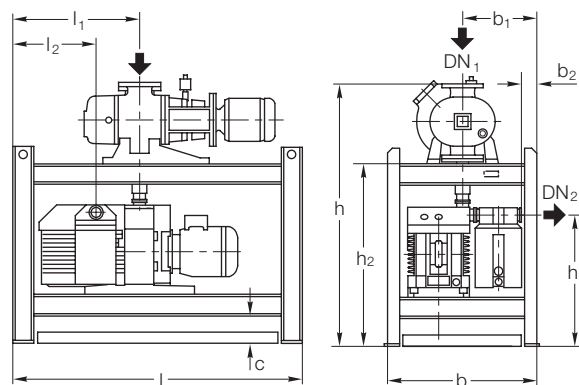
RUTA WAU501/D65B/G

Standard Equipment

- Exhaust filter
- Oil collecting pan
- Manually operated gas ballast
- Crane eyes on the frame
- Floor mounting
- The oil is supplied with the pump
- CE approval

Options

- Frequency converter RUVATRONIC RT for controlling the speed of the Roots pump
- Oil filter
- 24 V DC gas ballast valve
- Sound proofing box
- Vibration absorbers
- Castors
- Different types of floor mounts
- Oil drain valve on each pump
- Exhaust filter with oil return line
- Special motors
- Electric control systems



Type	RUTA	251/D40B/G	251/D65B/G	501/D65B/G	1001/D65B/G
RUVAC WA/WAU/WS/WSU	P2	251	251	501	1001
Backing pump TRIVAC	P1	D 40 B	D 65 B	D 65 B	D 65 B
	DN ₁	63 ISO-K	63 ISO-K	63 ISO-K	100 ISO-K
	DN ₂	40 ISO-KF	40 ISO-KF	40 ISO-KF	40 ISO-KF
	l	1000 (39.37)	1100 (43.31)	1150 (45.28)	1300 (51.18)
	l ₁	400 (15.75)	480 (18.90)	480 (18.90)	480 (18.90)
	l ₂	234 (9.21)	314 (12.36)	314 (12.36)	314 (12.36)
	b	560 (22.05)	560 (22.05)	560 (22.05)	600 (23.62)
	b ₁	280 (11.02)	280 (11.02)	280 (11.02)	280 (11.02)
	b ₂	59 (2.32)	59 (2.32)	59 (2.32)	59 (2.32)
	h	977 (38.46)	977 (38.46)	1017 (40.04)	1067 (42.01)
	h ₁	488 (19.21)	488 (19.21)	488 (19.21)	488 (19.21)
	h ₂	677 (26.65)	677 (26.65)	677 (26.65)	671 (26.42)
	c	100 (3.94)	100 (3.94)	100 (3.94)	100 (3.94)

Dimensional drawing for the pump systems with TRIVAC D40/65 B backing pumps in a frame; dimensions in brackets () are in inch

Technical Data, 50 Hz

RUTA WAU

251/D40B/G 251/D65B/G 501/D65B/G 1001/D65B/G

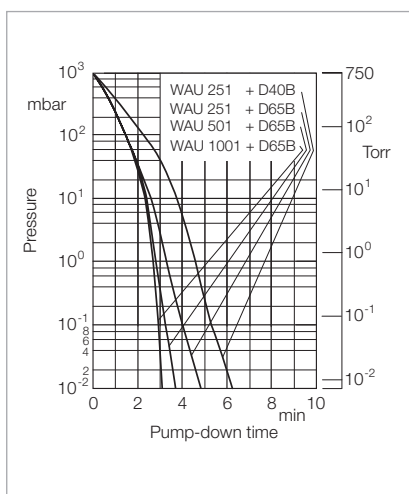
RUVAC (WA/WAU/WS/WSU possible)	P2	251	251	501	1001
Backing pump TRIVAC	P1	D 40 B	D 65 B	D 65 B	D 65 B
Pumping speed, 50 Hz at 10^{-1} mbar (7.5×10^{-2} Torr)	m^3/h (cfm)	185.0 (109.0)	205.0 (120.7)	340.0 (200.3)	620.0 (365.2)
Ultimate partial pressure	mbar (Torr)	$< 2 \times 10^{-5}$ ($< 1.5 \times 10^{-5}$)			
Ultimate total pressure with gas ballast	mbar (Torr)	$< 8 \times 10^{-4}$ ($< 6 \times 10^{-4}$)			
Installed motor power 400 V, 50 Hz	kW (hp)	2.6 (3.5)	3.3 (4.5)	4.4 (6.0)	6.2 (8.4)
Electrical power consumption at 10^{-1} mbar (7.5×10^{-2} Torr)	kW (hp)	2.0 (2.7)	2.5 (3.4)	2.7 (3.7)	3.0 (4.1)
Noise level					
max.	dB(A)	64	65	67	77
without gas ballast at 1 mbar (0.75 Torr)	dB(A)	62	63	63	70
Oil filling, total, approx.	l (qt)	3.3 (4.5)	4.0 (4.23)	4.3 (4.55)	5.3 (5.60)
Weight, total, approx.	kg (lbs)	280.0 (617.4)	310.0 (683.6)	350.0 (771.8)	460.0 (1014.3)
Connecting flange					
Inlet port	DN ₁	63 ISO-K	63 ISO-K	63 ISO-K	100 ISO-K
Outlet port	DN ₂	40 ISO-KF	40 ISO-KF	40 ISO-KF	40 ISO-KF

Ordering Information

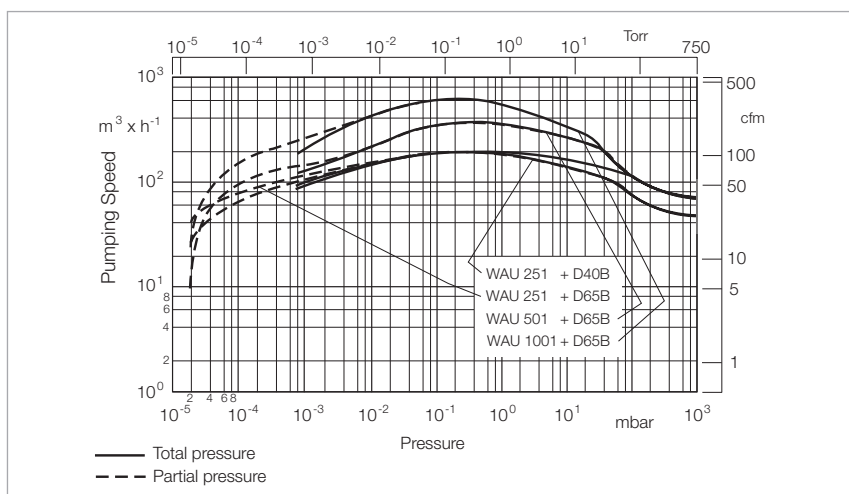
RUTA WAU

251/D40B/G 251/D65B/G 501/D65B/G 1001/D65B/G

		Part No.	Part No.	Part No.	Part No.
RUVAC (WA/WAU/WS/WSU possible)	P2	WAU 251	WAU 251	WAU 501	WAU 1001
Backing pump TRIVAC	P1	D 40 B	D 65 B	D 65 B	D 65 B
Pump system, complete (frame version), frame mounted, with Roots vacuum pump RUVAC WAU		023 16	023 17	023 18	023 19
Frequency converter RUVATRONIC (see description in Chapter "Accessories")		RT 5/251 500 001 381	RT 5/251 500 001 381	RT 5/501 500 001 382	RT 5/1001 500 001 383



Pump-down time diagram for a 1000 l tank at 50 Hz



Pumping speed diagram at 50 Hz

Oil Sealed RUTA Pump Systems – Two-Stage, with Single-Stage SOGEVAC Backing Pumps, Adaptor Version



RUTA WAU1001/SV200/A

Standard Equipment

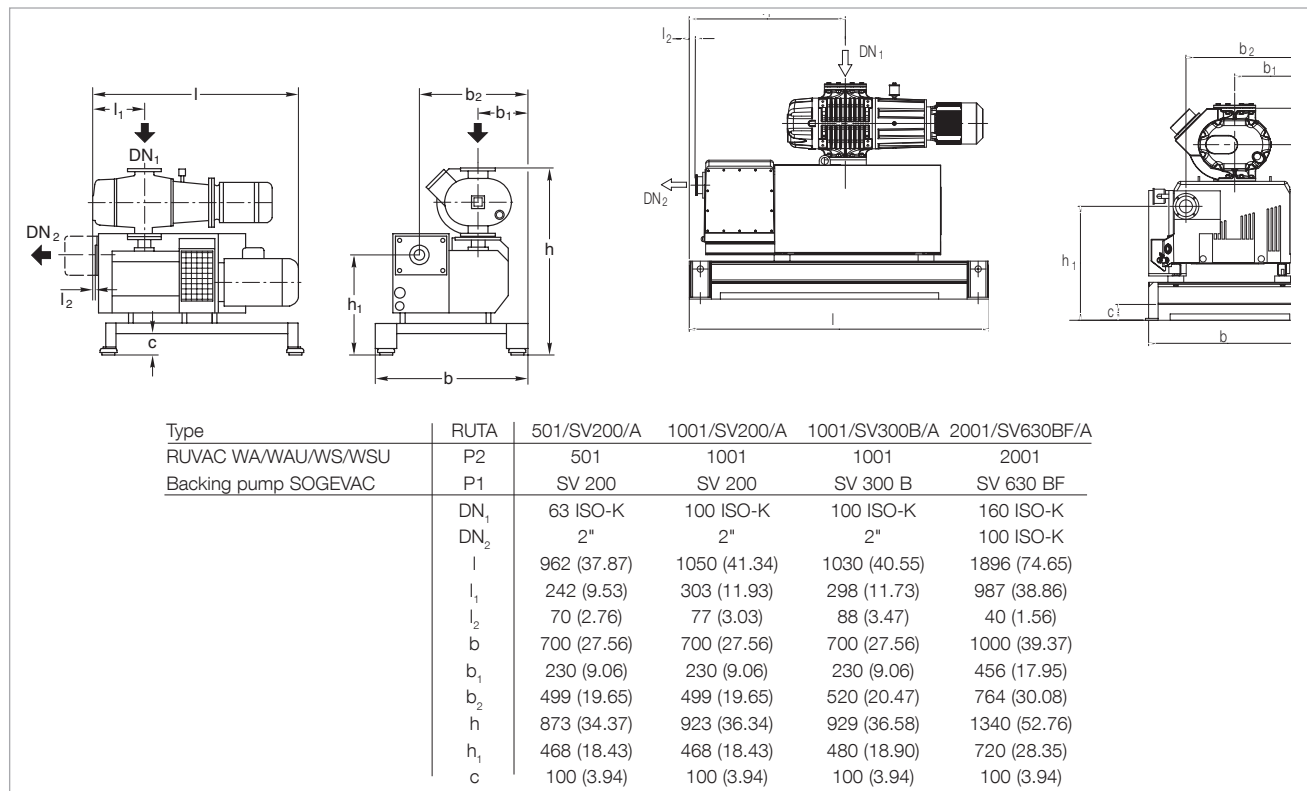
- Exhaust filter with oil return line
- Oil filter
- Oil collecting pan
- Gas ballast valve:
SV 200/300 B manually operated
SV 630 BF 24 V DC
- SV 200/300 B with air cooling
- SV 630 BF with water cooling
- Floor mounting

- The oil is supplied with the pump
- CE approval

Options

- Frequency converter
RUVATRONIC RT for controlling the speed of the Roots pump
- 24 V DC gas ballast valve or manually operated

- Sound proofing box
- Vibration absorbers
- Castors
- Different types of floor mounts
- Oil drain valve on each pump
- Special motors
- Electric control systems



Dimensional drawing for the pump systems with SOGEVAC SV 200 and 300 B backing pumps [left], SOGEVAC SV 630 BF [right]; dimensions in brackets () are in inch

Technical Data, 50 Hz

RUTA WAU

501/SV200/A 1001/SV200/A 1001/SV300B/A 2001/SV630BF/A

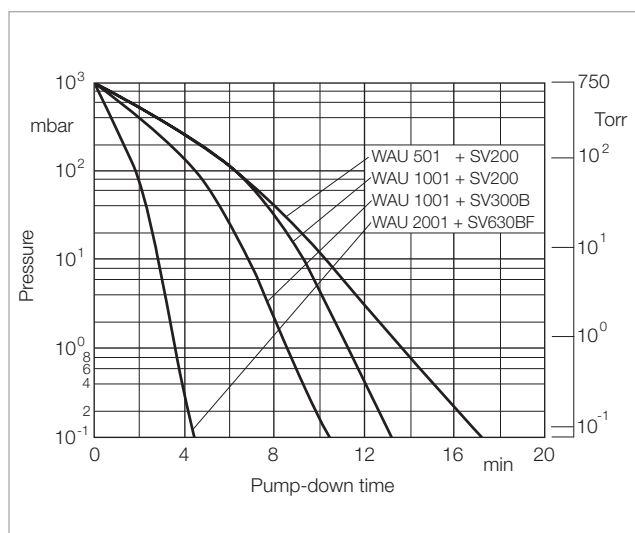
RUVAC (WA/WAU/WS/WSU possible)	P2	501	1001	1001	2001
Backing pump TRIVAC	P1	SV 200	SV 200	SV 300 B	SV 630 BF
Pumping speed, 50 Hz at 10^{-1} mbar (7.5×10^{-2} Torr)	m ³ /h (cfm)	365.0 (215.0)	715.0 (421.0)	730.0 (430.0)	1690.0 (995.4)
Ultimate partial pressure	mbar (Torr)	$< 8 \times 10^{-3}$ ($< 6 \times 10^{-3}$)			
Ultimate total pressure with gas ballast	mbar (Torr)	$< 4 \times 10^{-2}$ ($< 3 \times 10^{-2}$)			
Installed motor power 400 V, 50 Hz	kW (hp)	6.2 (8.4)	8.0 (10.9)	9.5 (12.9)	22.5 (30.6)
Electrical power consumption at 10^{-1} mbar (7.5×10^{-2} Torr)	kW (hp)	3.0 (4.1)	3.5 (4.8)	4.0 (5.4)	16.5 (22.4)
Noise level without gas ballast at 10^{-1} mbar (7.5×10^{-2} Torr)	dB(A)	70	75	76	80
Oil filling, total, approx.	l (qt)	6.0 (6.34)	7.0 (7.4)	11.0 (11.63)	26.0 (27.47)
Weight, total, approx.	kg (lbs)	335.0 (738.7)	430.0 (948.2)	480.0 (1058.4)	1140.0 (2513.7)
Connecting flange					
Inlet port	DN ₁	63 ISO-K	100 ISO-K	100 ISO-K	160 ISO-K
Outlet port	DN ₂	2"	2"	2"	100 ISO-K

Ordering Information

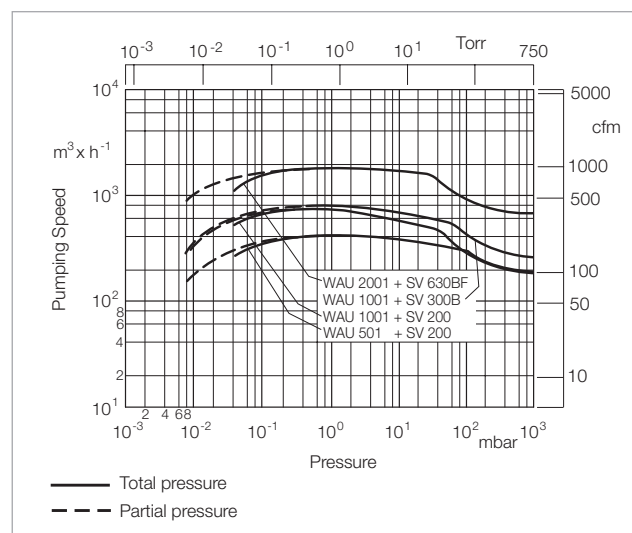
RUTA WAU

501/SV200/A 1001/SV200/A 1001/SV300B/A 2001/SV630BF/A

		Part No.	Part No.	Part No.	Part No.
RUVAC (WA/WAU/WS/WSU possible)	P2	WAU 501	WAU 1001	WAU 1001	WAU 2001
Backing pump SOGEVAC	P1	SV 200	SV 200	SV 300 B	SV 630 BF
Pump system, complete (adaptor version), pallet mounted, with Roots vacuum pump RUVAC WAU		022 06	022 08	502 462 V001	502 463 V001
Frequency converter RUVATRONIC (see description in Chapter "Accessories")		RT 5/501 500 001 382	RT 5/1001 500 001 383	RT 5/1001 500 001 383	RT 5/2001 500 001 384

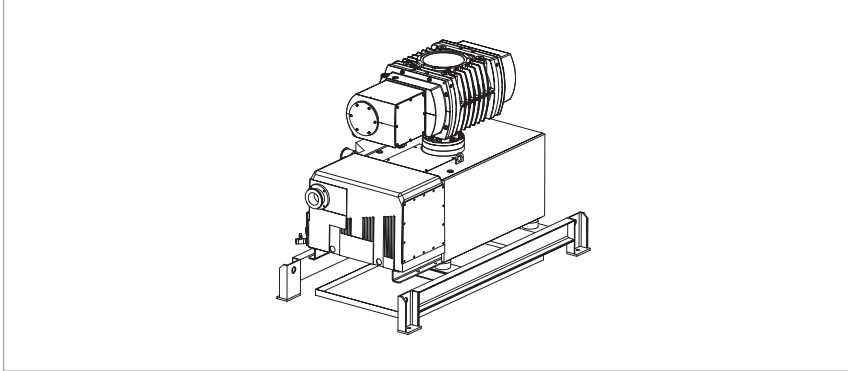


Pump-down time diagram for a 10 m³ tank at 50 Hz



Pumping speed diagram at 50 Hz

Oil Sealed RUTA Pump Systems – Two-Stage, with Single-Stage SOGEVAC Backing Pumps, Adaptor Version



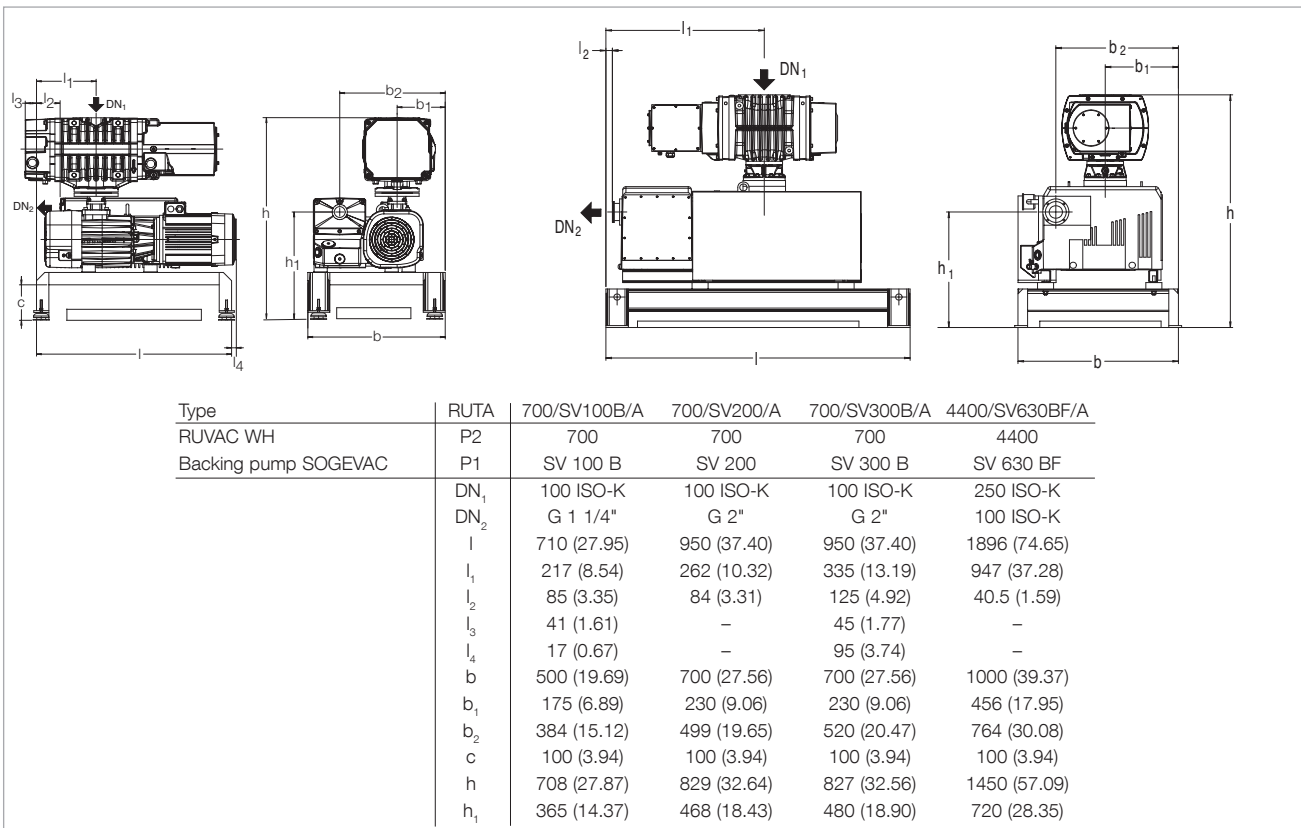
RUTA WH4400/SV630BF/A

Standard Equipment

- RUVAC WH with water cooling
- Exhaust filter with oil return line
- Oil filter
- Oil collecting pan
- Gas ballast valve:
SV 100 to 300 manually operated
SV 630 BF 24 V DC
- SV 100 to 300 with air cooling
- SV 630 BF with water cooling
- Floor mounting
- The oil is supplied with the pump
- RUVAC WH including external frequency converter (frequency converter permits pumping speed control)
- CE approval

Options

- 24 V DC gas ballast valve or manually operated
- Sound proofing box
- Vibration absorbers
- Castors
- Different types of floor mounts
- Oil drain valve on each pump
- Special motors
- Electric control systems



Dimensional drawing for the pump systems with SOGEVAC SV 100 B, 200 and 300 B backing pumps [left], SOGEVAC SV 630 BF [right]; dimensions in brackets () are in inch

Technical Data, 50 Hz

RUTA WH

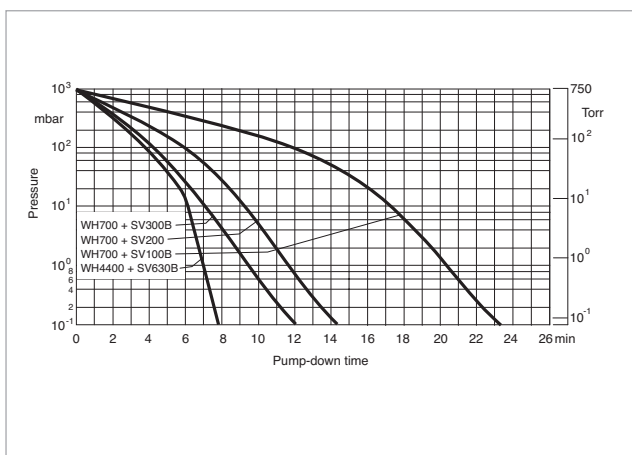
		700/SV100B/A	700/SV200/A	700/SV300B/A	4400/SV630BF/A
RUVAC WH	P2	700	700	700	4400
Backing pump SOGEVAC	P1	SV 100 B	SV 200	SV 300 B	SV 630 BF
Pumping speed, 50 Hz at 10^{-1} mbar (7.5×10^{-2} Torr)	m ³ /h (cfm)	520 (306)	570 (335)	600 (353)	3332 (1961)
Ultimate pressure without gas ballast	mbar (Torr)	$< 5 \times 10^{-3}$ ($< 3.75 \times 10^{-3}$)	$< 2 \times 10^{-3}$ ($< 1.5 \times 10^{-3}$)	$< 3 \times 10^{-3}$ ($< 2.25 \times 10^{-3}$)	$< 3 \times 10^{-3}$ ($< 2.25 \times 10^{-3}$)
Installed motor power 400 V, 50 Hz	kW (hp)	4.4 (5.9)	6.2 (8.3)	7.7 (10.3)	26.0 (34.9)
Electrical power consumption at 10^{-1} mbar (7.5×10^{-2} Torr)	kW (hp)	1.6 (2.2)	2.9 (3.9)	6.0 (8.0)	9,68 (12.98)
Noise level at 10^{-1} mbar (7.5×10^{-2} Torr)	dB(A)	62	69	70	73
Oil filling, total, approx.	l (qt)	2.9 (2.6.)	9.9 (8.7)	12.4 (10.9)	27.0 (23.8)
Weight, total, approx.	kg (lbs)	350 (722)	415 (915)	465 (1025)	1 330 (2932)
Connecting flange					
Inlet port	DN ₁	100 ISO-K	100 ISO-K	100 ISO-K	250 ISO-K
Outlet port	DN ₂	G 1 1/4"	G 2"	G 2"	100 ISO-K

Ordering Information

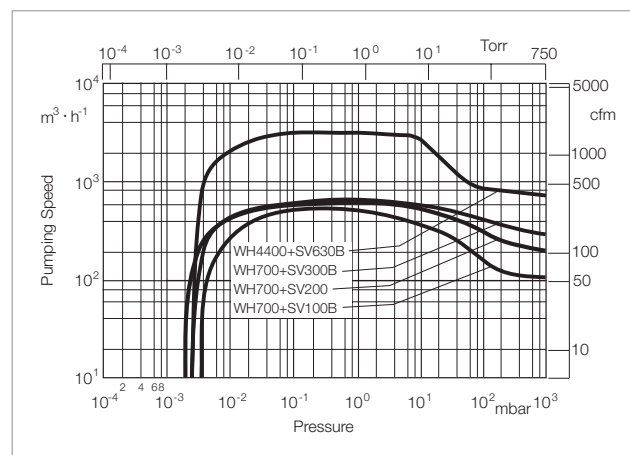
RUTA WH

		700/SV100B/A	700/SV200/A	700/SV300B/A	4400/SV630BF/A
		Part No.	Part No.	Part No.	Part No.
RUVAC WH	P2	700	700	700	4400
Backing pump SOGEVAC					
air-cooled	P1	SV 100 B	SV 200	SV 300 B	–
water-cooled	P1	–	–	–	SV 630 BF
Pump system, complete (adaptor version), pallet mounted, with Roots vacuum pump RUVAC WH		503155V001 ¹⁾	503156V001 ¹⁾	503157V001 ¹⁾	503164V001 ¹⁾

¹⁾ Including external frequency converter



Pump-down time diagram for a 10 m³ tank at 50 Hz



Pumping speed diagram at 50 Hz

Oil Sealed RUTA Pump Systems – Two-Stage, with Single-Stage SOGEVAC Backing Pumps, Frame Version



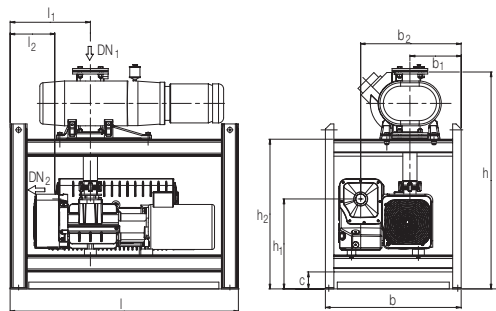
RUTA WAU2001/SV300B/G

Standard Equipment

- RUVAC WAU with air cooling
- SOGEVAC SV 300 B with air cooling
- Exhaust filter with oil return line
- Oil filter
- Oil collecting pan
- Gas ballast valve: SV 300 B manually operated
- Crane eyes on the frame
- Floor mounting
- The oil is supplied with the pump
- CE approval

Options

- Frequency converter RUVATRONIC RT for controlling the speed of the Roots pump
- 24 V DC gas ballast valve or manually operated
- Sound proofing box
- Vibration absorbers
- Castors
- Different types of floor mounts
- Oil drain valve on each pump
- Special motors
- Electric control systems



Type	RUTA	1001/SV300B/G	2001/SV300B/G
RUVAC WA/WAU/WS/WSU	P2	1001	2001
Backing pump SOGEVAC	P1	SV 300 B	SV 300 B
	DN ₁	100 ISO-K	160 ISO-K
	DN ₂	2"	2"
	l	1340 (52.76)	1340 (52.76)
	l ₁	470 (18.50)	470 (18.50)
	l ₂	260 (10.24)	260 (10.24)
	b	750 (29.53)	800 (31.50)
	b ₁	252 (9.92)	302 (11.89)
	b ₂	208 (8.19)	208 (8.19)
	h	1278 (50.32)	1338 (52.68)
	h ₁	530 (20.87)	530 (20.87)
	h ₂	882 (34.72)	808 (31.81)
	c	100 (3.94)	100 (3.94)

Dimensional drawing for the pump systems with SOGEVAC SV 300 B backing pumps; dimensions in brackets () are in inch

Technical Data, 50 Hz

RUTA WAU

1001/SV300B/G

2001/SV300B/G

RUVAC (WA/WAU/WS/WSU possible)	P2	1001	2001
Backing pump SOGEVAC	P1	SV 300 B	
Pumping speed, 50 Hz at 10^{-1} mbar (7.5×10^{-2} Torr)	m ³ /h (cfm)	730 (430)	1445 (850)
Ultimate partial pressure	mbar (Torr)	$< 8 \times 10^{-3}$ ($< 6 \times 10^{-3}$)	
Ultimate total pressure with gas ballast	mbar (Torr)	$< 4 \times 10^{-2}$ ($< 3 \times 10^{-2}$)	
Installed motor power 400 V, 50 Hz	kW (hp)	9.5 (12.9)	13.0 (17.7)
Electrical power consumption at 10^{-1} mbar (7.5×10^{-2} Torr)	kW (hp)	4.0 (5.4)	4.5 (6.1)
Noise level without gas ballast at 10^{-1} mbar (7.5×10^{-2} Torr)	dB(A)	75	79
Oil filling, total, approx.	l (qt)	11 (11.63)	13 (13.74)
Weight, total, approx.	kg (lbs)	560.0 (1234.8)	740.0 (1631.7)
Connecting flange			
Inlet port	DN ₁	100 ISO-K	160 ISO-K
Outlet port	DN ₂	2"	2"

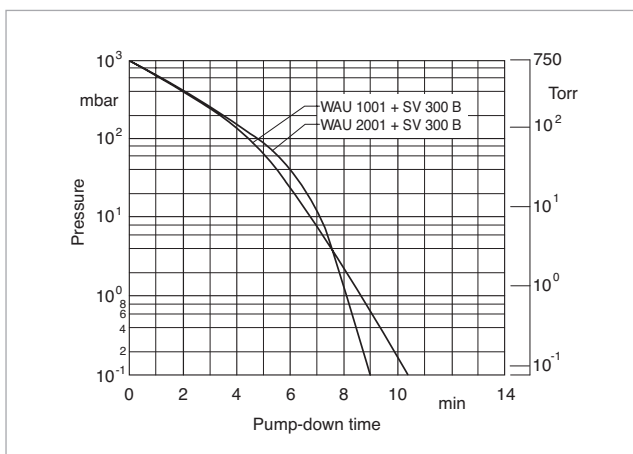
Ordering Information

RUTA WAU

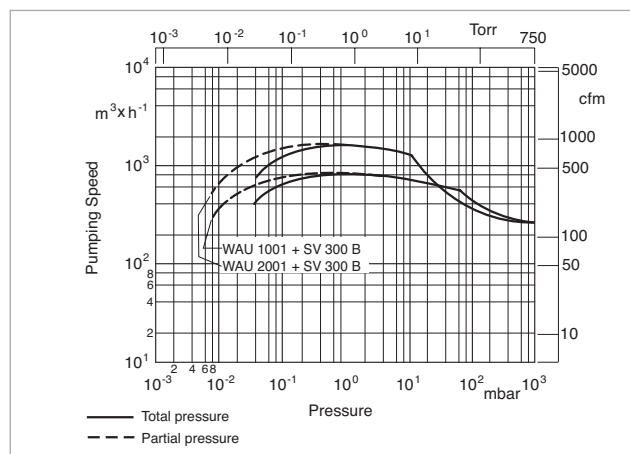
1001/SV300B/G

2001/SV300B/G

		Part No.	Part No.
RUVAC (WA/WAU/WS/WSU possible)	P2	WAU 1001	WAU 2001
Backing pump SOGEVAC	P1	SV 300 B	
Pump system, complete (frame version), frame mounted, with Roots vacuum pump RUVAC WAU		502 452 V001	502 453 V001
Frequency converter RUVATRONIC (see description in Chapter "Accessories")		RT 5/1001 500 001 383	RT 5/2001 500 001 384

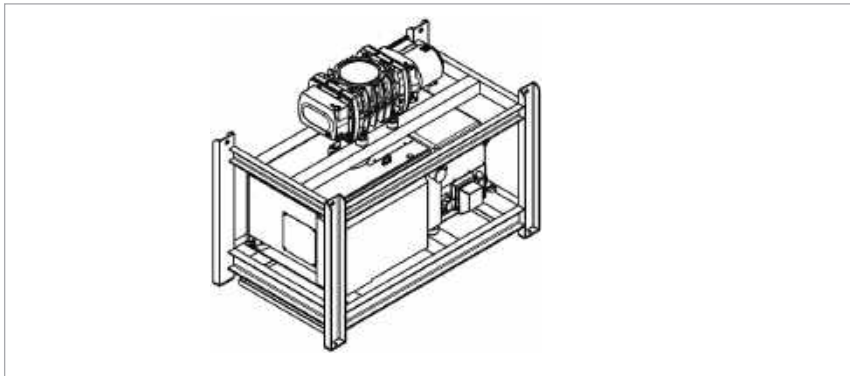


Pump-down time diagram for a 10 m³ tank at 50 Hz



Pumping speed diagram at 50 Hz

Oil Sealed RUTA Pump Systems – Two-Stage, with Single-Stage SOGEVAC Backing Pumps, Frame Version



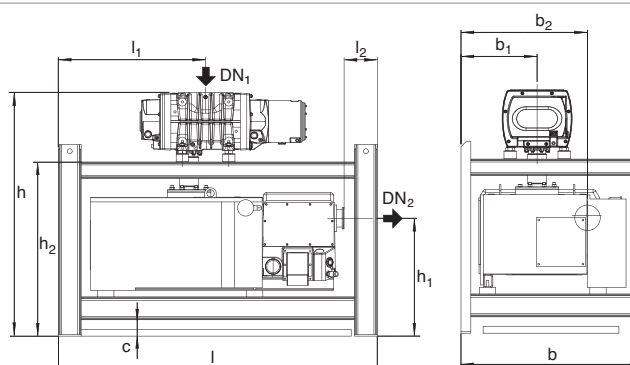
RUTA WH2500/SV630BF/G

Standard Equipment

- RUVAC WH with water cooling
- Exhaust filter with oil return line
- Oil filter
- Oil collecting pan
- Gas ballast valve: SOGEVAC SV 630 BF 24 V DC
- SOGEVAC SV 630 BF with water cooling
- SOGEVAC SV 1200 with air cooling
- Crane eyes on the frame
- Floor mounting
- The oil is supplied with the pump
- RUVAC WH including external frequency converter (frequency converter permits pumping speed control)
- CE approval

Options

- Frequency converter for controlling the speed of the Roots pump (only RUVAC WA/WS)
- 24 V DC gas ballast valve or manually operated
- Sound proofing box
- Vibration absorbers
- Castors
- Different types of floor mounts
- Oil drain valve on each pump
- Special motors
- Electric control systems



Type	RUTA	2500/SV630BF/G	4400/SV630BF/G	7000/SV630BF/G
RUVAC WH	P2	2500	4400	7000
Backing pump SOGEVAC	P1	SV 630 BF	SV 630 BF	SV 630 BF
	DN ₁	250 ISO-K	250 ISO-K	320 ISO-K
	DN ₂	100 ISO-K	100 ISO-K	100 ISO-K
	l	1950 (76.77)	1950 (76.77)	1950 (76.77)
	l ₁	900 (35.43)	800 (31.50)	800 (31.50)
	l ₂	204 (8.03)	204 (8.03)	204 (8.03)
	b	1100 (43.31)	1100 (43.31)	1100 (43.31)
	b ₁	465 (18.31)	465 (18.31)	465 (18.31)
	b ₂	773 (30.43)	773 (30.43)	773 (30.43)
	h	1064 (41.89)	1518 (59.76)	1518 (59.76)
	h ₁	720 (28.35)	720 (28.35)	720 (28.35)
	h ₂	1064 (41.89)	1081 (42.56)	1093 (43.03)
	c	100 (3.94)	100 (3.94)	100 (3.94)

Dimensional drawing for the pump systems with SOGEVAC SV backing pumps

Technical Data, 50 Hz

RUTA WH

		2500/ SV630BF/G	4400/ SV630BF/G	7000/ SV630BF/G
RUVAC WH ¹⁾	P2	2500	4400	7000
Backing pump SOGEVAC	P1	SV 630 BF		
Pumping speed, 50 Hz at 10 ⁻¹ mbar (7.5 x 10 ⁻² Torr)	m ³ /h (cfm)	1902 (1119)	3332 (1961)	4990 (2937)
Ultimate total pressure with gas ballast	mbar (Torr)	< 5 · 10 ⁻³ (< 3.7 x 10 ⁻³)	— —	— —
without gas ballast	mbar (Torr)	— —	< 5 · 10 ⁻³ (< 3.7 x 10 ⁻³)	< 5 · 10 ⁻³ (< 3.7 x 10 ⁻³)
Installed motor power 400 V, 50 Hz	kW (hp)	21.5 (28.8)	26.0 (34.9)	26.0 (34.9)
Electrical power consumption at 10 ⁻¹ mbar (7.5 x 10 ⁻² Torr)	kW (hp)	8.5 (11.4)	9.68 (12.98)	9.84 (13.20)
Noise level without gas ballast at 10 ⁻¹ mbar (7.5 x 10 ⁻² Torr)	dB(A)	73		
Oil filling, total, approx.	l (qt)	16.2 (17.1)	27.0 (4.6)	27.0 (4.6)
Weight, total, approx.	kg	1360 (2998)	1530 (3373)	1590 (3505)
Connecting flange				
Inlet port	DN ₁	250 ISO-K	250 ISO-K	320 ISO-K
Outlet port	DN ₂	100 ISO-K	100 ISO-K	100 ISO-K

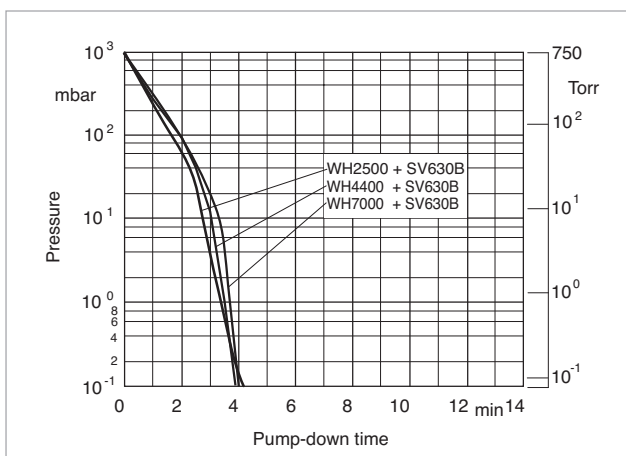
Ordering Information

RUTA WH

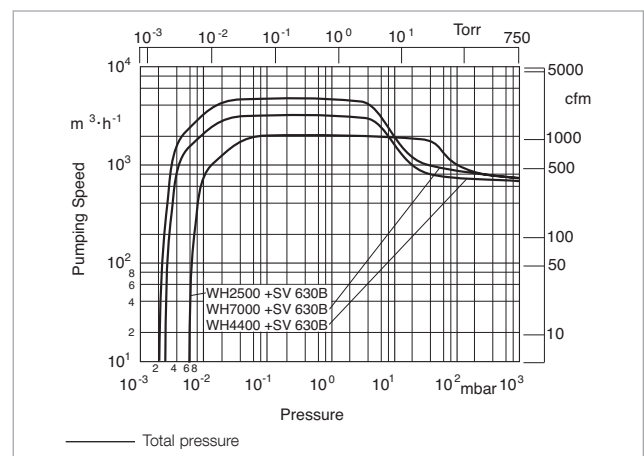
		2500/ SV630BF/G	4400/ SV630BF/G	7000/ SV630BF/G
		Part No.	Part No.	Part No.
RUVAC WH ¹⁾	P2	2500	4400	7000
Backing pump SOGEVAC	P1	SV 630 BF		
Pump system, complete (frame version), frame mounted, with Roots vacuum pump RUVAC WH		503161V001 ^{1), 2)}	503165V001 ^{1), 2)}	503169V001 ^{1), 2)}

¹⁾ Including external frequency converter

²⁾ With this combination, continuous operation of the Roots pump is not possible at atmospheric pressure



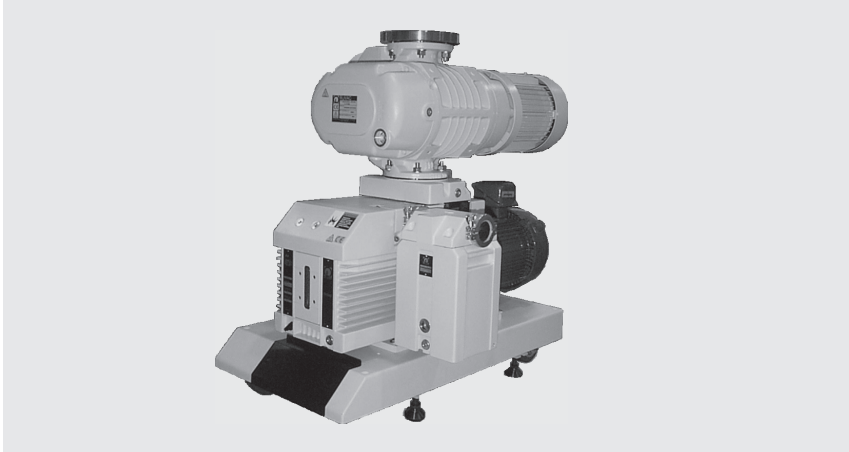
Pump-down time diagram for a 10 m³ tank at 50 Hz



Pumping speed diagram at 50 Hz

Pump Systems (Only available for purchase in North and South America)

RBS – B/BCS Roots Pump Systems with Two-Stage TRIVAC Backing Pumps



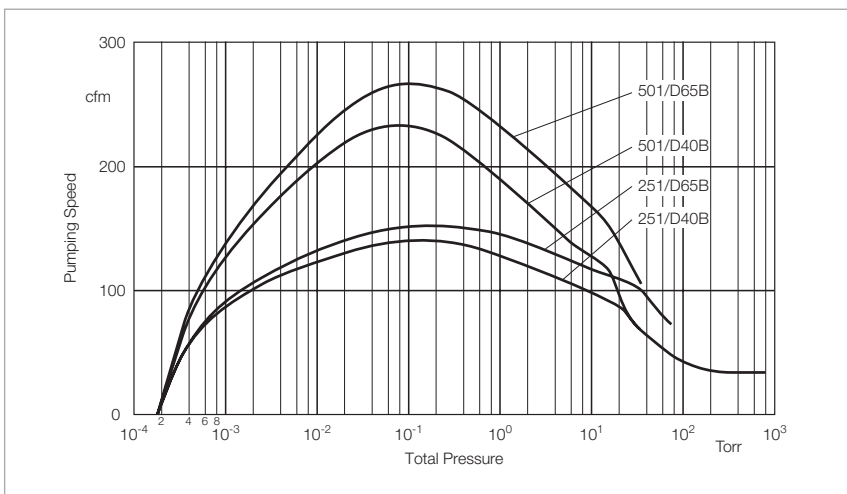
RBS - B/BCS Roots pumping system, shown with optional AF exhaust filter

Standard Equipment

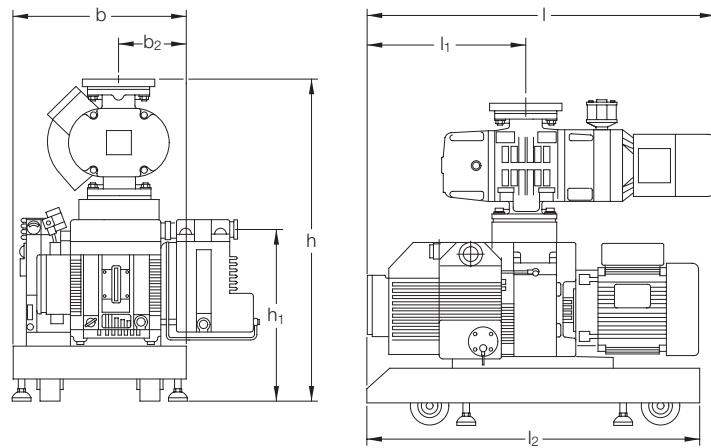
- System consists of TRIVAC dual-stage B or BCS direct drive vane pump and RUVAC blower
- Complete air-cooled system
- 18" wide frame base equipped with caster wheels and leveling pads
- Compact construction with quiet operation
- Manual operation of gas ballast
- Close-coupled RUVAC blower with ANSI inlet flange

Options

- All TRIVAC accessories, Exhaust filter, 24 V DC gas ballast valve, chemical oil filter, and electrical limit switch system
- Full frame drip pan
- Oil drain valves
- Special motor voltages and frequencies
- Special oil for unique applications
- Full electrical controls for control start/stop and monitoring of system



Pumping speed diagram for the RBS systems with WSU series Roots blowers at 60 Hz



System	b	b ₁	b ₂	h	h ₁	l	l ₁	l ₂
Close-coupled								
D 40 B/BCS								
WSU 251	18 (457)	8 (203)	7 (178)	33 3/16 (853)	17 15/16 (456)	32 3/4 (832)	14 (356)	34 (864)
WSU 501	18 (457)	8 (203)	7 (178)	34 3/4 (883)	17 15/16 (456)	33 13/16 (859)	14 (356)	34 (864)
D 65 B/BCS								
WS/WSU 251	18 (457)	8 (203)	7 (178)	33 3/16 (853)	17 15/16 (456)	34 3/4 (883)	16 (406)	34 (864)
WS/WSU 501	18 (457)	8 (203)	7 (178)	34 3/4 (883)	17 15/16 (456)	35 13/16 (910)	16 (406)	34 (864)

Dimensional drawing for the RBS – B/BCS Roots pumping systems 18" with TRIVAC D 40/65 B backing pumps, close-coupled package;
dimensions in brackets () are in mm

Technical Data

RBS – B/BCS Roots Pump Systems

		251/D40B	251/D65B	501/D40B	501/D65B
RUVAC (WA/WAU/WS/WSU possible)		251	251	501	501
TRIVAC backing pump		D 40 B/BCS	D 65 B/BCS	D 40 B/BCS	D 65 B/BCS
Pumping speed at 0.1 Torr	cfm (m³/h)	140 (237)	150 (254)	232 (394)	267 (453)
Ultimate total pressure	Torr (mbar)	< 2 x 10 ⁻⁴ (< 4 x 10 ⁻⁴)			
Connecting flanges					
Inlet port					
WSU	DN	3" ANSI			
Outlet port	DN	40 ISO-KF			
Operating voltage	V	208/230/460			
Phase / Frequency ¹⁾	– / Hz	3 / 60			
Full load amps ²⁾					
RUVAC WSU		5.5/5.5/3.2	5.5/5.5/3.2	9.0/9.0/5.2	9.0/9.0/5.2
TRIVAC		9.0/8.8/4.5	9.0/8.8/4.5	9.0/8.8/4.5	9.0/8.8/4.5
Displacement					
RUVAC	cfm (m³/h)	179 (304)	179 (304)	357 (606)	357 (606)
TRIVAC	cfm (m³/h)	32 (54)	53 (90)	32 (54)	53 (90)
Maximum differential pressure	Torr (mbar)	60 (80)			
Normal starting pressure ³⁾	Torr (mbar)	20 (27)	30 (40)	12 (16)	16 (21)
Oil capacity					
RUVAC WSU	qt (l)	0.75 (0.7)	0.75 (0.7)	1.1 (1.0)	1.1 (1.0)
TRIVAC	qt (l)	2.7 (2.6)	3.4 (3.2)	2.7 (2.6)	3.4 (3.2)
Nominal rotation speed					
RUVAC WSU	rpm (min ⁻¹)	3600 (3600)			
TRIVAC	rpm (min ⁻¹)	1800 (1800)			
Motor power					
RUVAC WSU	hp (kW)	1.9 (1.4)	1.9 (1.4)	3.3 (2.4)	3.3 (2.4)
TRIVAC	hp (kW)	3.0 (2.2)	3.0 (2.2)	3.0 (2.2)	3.0 (2.2)

Ordering Information

RBS – B/BCS Roots Pump Systems

	251/D40B	251/D65B	501/D40B	501/D65B
	Part No.			
RUVAC WH RBS – B/BCS Roots pump system (supplied with hydrocarbon oil)	Ordering Information see right page			

¹⁾ For 50 Hz systems, consult the factory

²⁾ Determined by operating voltage

³⁾ WSU pumps permit start-up at atmospheric pressure (760 Torr)

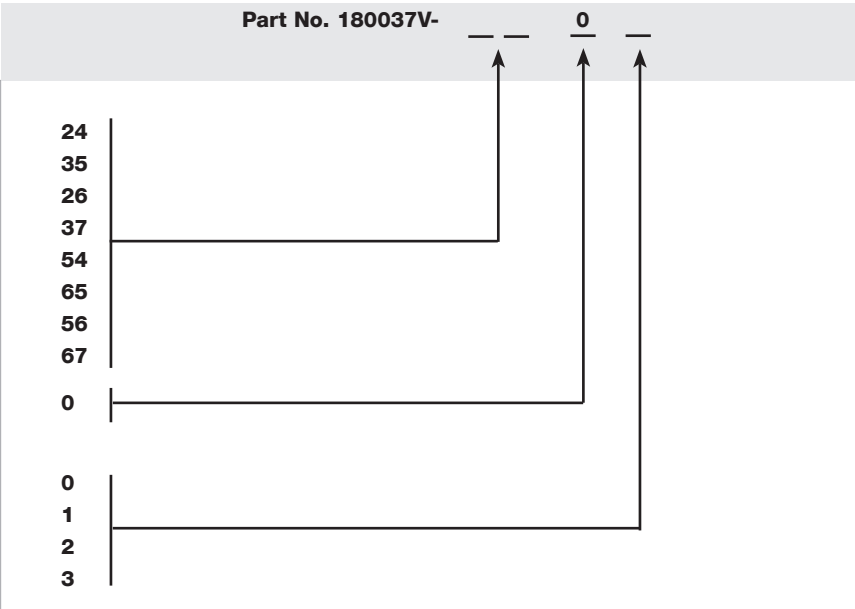
Ordering Information

- Blower / TRIVAC pump
- WSU 251 / D 40 B
 - WSU 251 / D 40 BCS-LVO 400
 - WSU 251 / D 65 B
 - WSU 251 / D 65 B-LVO 400
 - WSU 501 / D 40 B
 - WSU 501 / D 40 BCS-LVO 400
 - WSU 501 / D 65 B
 - WSU 501 / D 65 BCS-LVO 400

Reserved

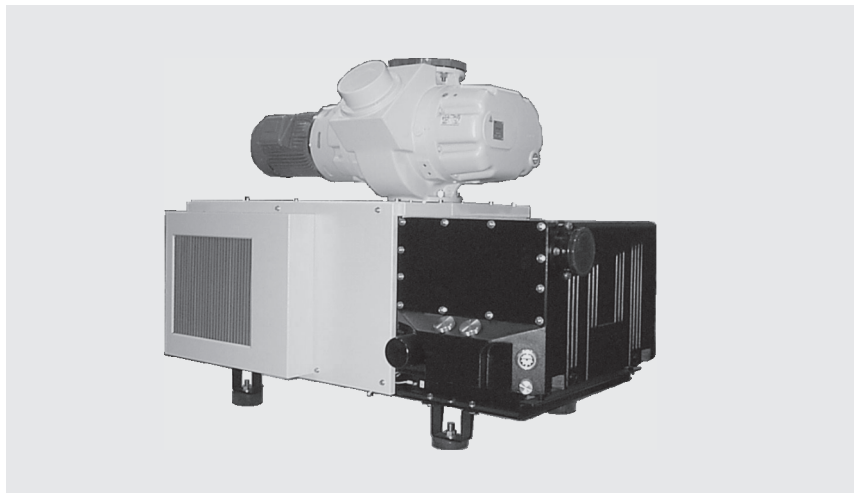
Electrical Control Panel

- None
- 208 V
- 230 V
- 460 V



Pump Systems (Only available for purchase in North and South America)

HTS Close-Coupled Systems with Single-Stage SOGEVAC Backing Pumps



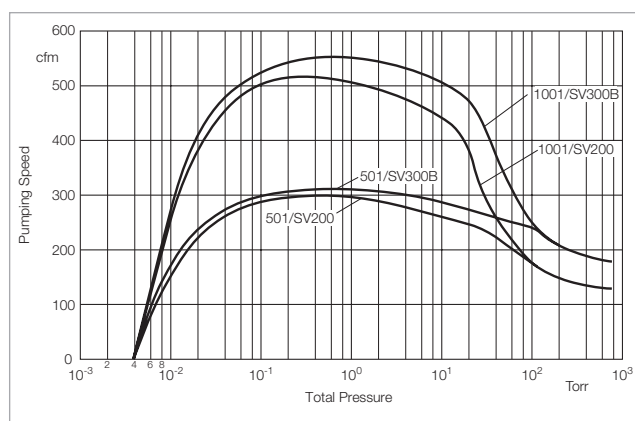
HTS close-coupled system

Standard Equipment

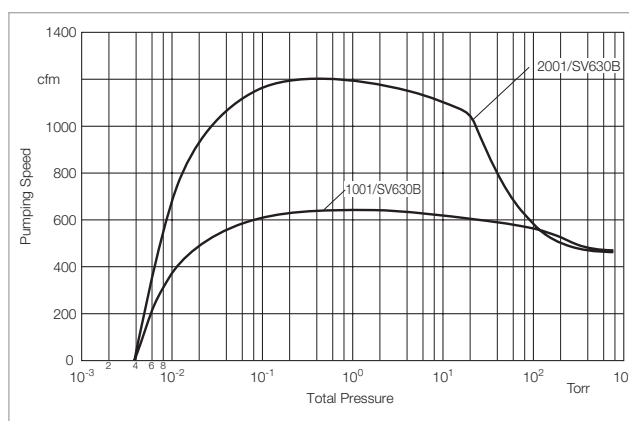
- System consists of single-stage SOGEVAC vane pump
- Complete air-cooled system
- Close-coupled RUVAC blower
- Compact construction with quiet operation
- Manual operation of gas ballast
- Spin-on type oil filter

Options

- SOGEVAC accessories: oil level monitoring, exhaust case gauge, 24 V DC gas ballast purge, water cooling
- Frame base mounted caster wheels
- Frame base mounted leveling pads
- Oil drain valves
- Inlet dust filter
- Special motor voltages and frequencies
- Special oil for unique applications
- Full NEMA12 electrical controls for stand/stop operation and monitoring of system from remote and local locations
- 24 V DC gas ballast valve

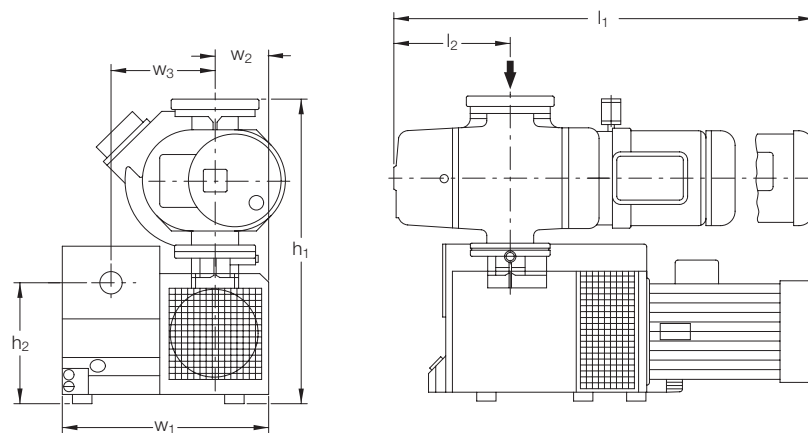


Pumping speed diagram for the HTS close-coupled systems with WSU series Roots blowers and SOGEVAC SV 200/300B at 60 Hz

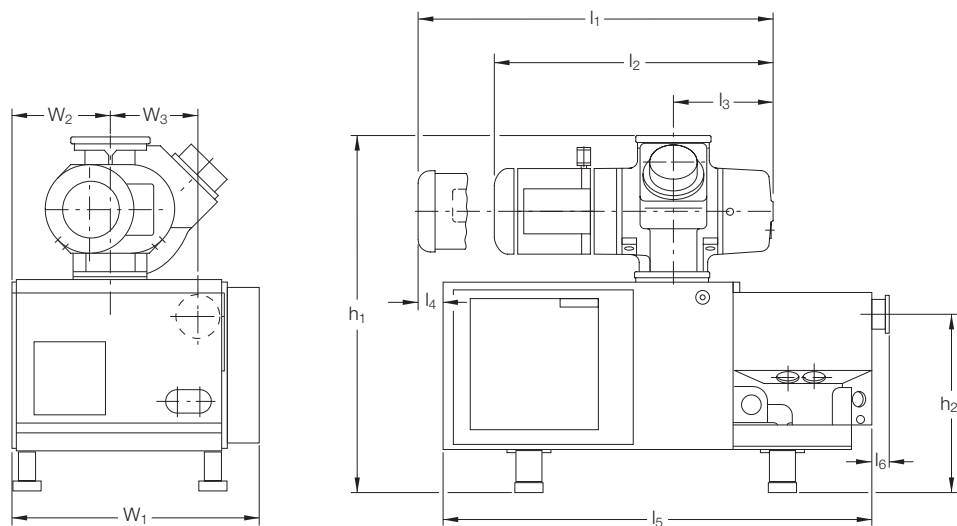


Pumping speed diagram for the HTS close-coupled systems with WSU series Roots blowers and SOGEVAC SV 630B at 60 Hz

Dimensions for SV 200 and SV 300 B only



Dimensions for SV 630 B only



Roots Pump	Vane Pump	h_1	h_2	l_1	l_2	l_3	l_4	l_5	l_6	w_1	w_2	w_3
WSU 501	SV 200	29 7/16 (748)	12 17/32 (318)	—	9 17/32 (242)	—	—	—	—	21 11/16 (551)	6 1/8 (156)	10 19/32 (269)
WSU 501	SV 300 B	29 7/16 (748)	12 17/32 (318)	—	9 17/32 (242)	—	—	—	—	21 11/16 (551)	6 1/8 (156)	10 19/32 (269)
WSU 1001	SV 200	31 7/16 (799)	12 17/32 (318)	—	11 15/16 (303)	—	—	—	—	21 1/16 (535)	5 1/2 (140)	10 19/32 (269)
WSU 1001	SV 300 B	31 7/16 (799)	12 17/32 (318)	—	11 15/16 (303)	—	—	—	—	22 13/16 (579)	7 1/4 (184)	10 19/32 (269)
WSU 2001	SV 630 B	48 5/16 (1227)	23 13/16 (605)	50 3/16 (1275)	—	14 9/16 (370)	60 3/4 (1543)	2 1/2 (64)	34 15/16 (887)	13 7/8 (352)	12 13/32 (315)	

Dimensional drawing for the HTS close-coupled system with single-stage SOGEVAC backing pumps; dimensions in brackets () are in mm

Technical Data

HTS Close-Coupled Systems

		501/SV200	501/SV300B	1001/SV200	1001/SV300B
RUVAC		WSU 501	WSU 501	WSU 1001	WSU 1001
SOGEVAC		SV 200	SV 300 B	SV 200	SV 300 B
Pumping speed at 0.1 Torr	cfm (m³/h)	277 (470)	285 (483)	504 (855)	545 (925)
Ultimate total pressure	Torr (mbar)	< 8 x 10 ⁻³ (< 1 x 10 ⁻²)			
Connecting flanges					
Inlet port WSU	DN	3" ANSI			
Exhaust port SOGEVAC	DN	2" NPT			
Operating voltage	V	208/230/460			
Phase / Frequency ¹⁾	- / Hz	3 / 60			
Full load amps ²⁾					
RUVAC WSU		7.8/10.0/5.8	7.8/10.0/5.8	13.0/14.7/8.5	13.0/14.7/8.5
SOGEVAC		21.0/18.0/9.0	29.0/25.0/12.5	21.0/18.0/9.0	29.0/25.0/12.5
Displacement					
RUVAC	cfm (m³/h)	357 (606)	357 (606)	707 (1200)	707 (1200)
SOGEVAC	cfm (m³/h)	130 (606)	200 (340)	130 (606)	200 (340)
Oil capacity					
RUVAC WSU	qt (l)	1.1 (1.0)	1.1 (1.0)	2.1 (2.0)	2.1 (2.0)
SOGEVAC	qt (l)	5.3 (5.0)	9.0 (8.5)	5.3 (5.0)	9.0 (8.5)
Nominal rotation speed					
RUVAC WSU	rpm (min ⁻¹)	3600 (3600)			
SOGEVAC	rpm (min ⁻¹)	1800 (1800)			
Motor power					
RUVAC WSU	hp (kW)	3.3 (2.4)	3.3 (2.4)	6.0 (4.4)	6.0 (4.4)
SOGEVAC	hp (kW)	7.5 (5.5)	10.0 (7.4)	7.5 (5.5)	10.0 (7.4)

Ordering Information

HTS Close-Coupled Systems

	501/SV200	501/SV300B	1001/SV200	1001/SV300B
	Part No.			
HTS - close-coupled systems	Ordering Information see right page			

¹⁾ For 50 Hz systems, consult the factory

²⁾ Determined by operating voltage

Technical Data

HTS Close-Coupled Systems

1001/SV630B

2001/SV630B

RUVAC		WSU 1001	WSU 2001
SOGEVAC		SV 630 B	
Pumping speed at 0.1 Torr	cfm (m³/h)	610 (1035)	1186 (2031)
Ultimate total pressure	Torr (mbar)	< 8 x 10 ⁻³ (< 1 x 10 ⁻²)	
Connecting flanges			
Inlet port WSU	DN	4" ANSI	6" ANSI
Exhaust port SOGEVAC	DN	4" ANSI	4" ANSI
Operating voltage	V	460	
Phase / Frequency ¹⁾	- / Hz	3 / 60	
Full load amps ²⁾			
RUVAC WSU		8.5	5.0
SOGEVAC		29.5	29.5
Displacement			
RUVAC WSU	cfm (m³/h)	707 (1200)	1449 (2460)
SOGEVAC	cfm (m³/h)	495 (840)	495 (840)
Oil capacity			
RUVAC WSU	qt (l)	2.1 (12.0)	4.2 (4.0)
SOGEVAC	qt (l)	37.0 (35.0)	37.0 (35.0)
Nominal rotation speed			
RUVAC WSU	rpm (min ⁻¹)	3600 (3600)	
SOGEVAC	rpm (min ⁻¹)	1170 (1170)	
Motor power			
RUVAC WSU	hp (kW)	6.1 (4.5)	11.4 (8.4)
SOGEVAC	hp (kW)	25.0 (13.4)	25.0 (13.4)

Ordering Information

Part No. 180036V-	
Blower / TRIVAC pump	
WSU 501 / SV 200	52
WSU 501 / SV 300 B	53
WSU 1001 / SV 200	12
WSU 1001 / SV 300 B	13
WSU 1001 / SV 630 B	16
WSU 2001 / SV 630 B	26
Casters & Levelers (SV 200 & SV 300 only)	
None	0
Casters & Levelers	1
Casters only	2
Levelers only	3
Electrical Control Panel	
None	0
208 V (SV 200 & SV 300 only)	1
230 V (SV 200 & SV 300 only)	2
460 V	3

Central Vacuum Supply Systems with SOGEVAC Pumps



Central vacuum supply systems: CVS500 with 3 SOGEVAC SV 100 B, CVS 160 with 2 SOGEVAC SV 100 B, CVS 60 with 1 SOGEVAC SV 40 B

Central vacuum supply systems are frequently used in those cases where a large number of minor requirements for vacuum need to be economically covered. Moreover, the systems serve the purpose of compensating for large variations in the number of vacuum consumers and increase the availability of the vacuum service.

A typical central vacuum supply system from Leybold consists chiefly of one or more SOGEVAC rotary vane vacuum pumps, a buffer vessel, an electrical cabinet with controller as well as the corresponding connection components. The systems are supplied by us fully assembled, tested as plug and play units.

Standard Equipment

Typically consisting of

- up to 3 SOGEVAC pumps
- buffer vessel
- manual valve (basic control) or electropneumatic valve (PLC control)
- dust filter at the pump inlet
- pressure sensor
- two-stage pressure controller
- electrical cabinet with controller
- all connecting components

Advantages to the User

- Industrial grade vacuum generator consisting of proven SOGEVAC single-stage rotary vane vacuum pumps
- Covers the demands of numerous small vacuum consumers
- Modular design, customized to customer specific processes
- Simple to operate
- Space-saving system solution
- High return on investment, excellent price-to-performance ratio
- Energy saving capabilities
- Low cost of ownership
- Cycle time reduction due to the buffer volume
- Complete turn-key systems, ready for operation

Typical Applications

General applications demanding vacuum:

- Transportation
- Handling / lifting
- Degassing
- Automation (pick and place)

Automotive industry

- Thermoforming
- Break filling, degassing

Composites manufacturing

- Resin Transfer Moulding (RTM)

Vacuum pressing, like rubber, plastics, gaskets

Food packaging/food processing

- Vacuum filling
- Thermoforming
- Vacuum transportation, handling, lifting
- Tray sealing / MAP packaging
- Degassing

Hospitals/Medical engineering

- Bacteriological filters

Controller Types for the Central Vacuum Supply Systems from Leybold

Generally a difference is made between the controller types **BASIC** and **FF** (Full Featured).

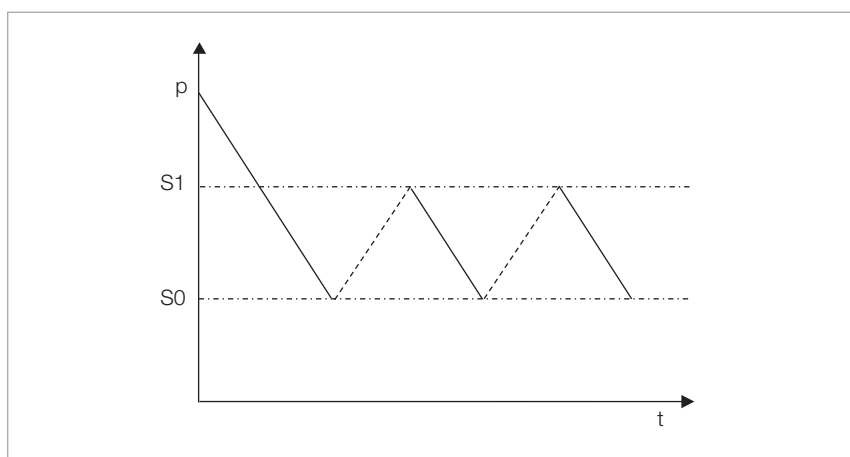
Differing custom solutions are available upon request.

BASIC Controller

The Basic controller provides for two freely selectable switching thresholds, through which an individual vacuum pump or alternatively a blocking valve (optional) can be driven.

Moreover, the controller includes an electronic pressure display and an operating hours counter.

This type of controller is suited for systems equipped with a single pump up to a nominal pumping speed of 100 m³/h (58.9 cfm).



Basic control with one pump

Operating Principle of the BASIC Controller

Starting at atmospheric pressure, the central vacuum supply system is evacuated down to the intended "lower operating pressure" S0. As soon as the pressure has attained the level of S0, the vacuum pump is switched off automatically, respectively the optional blocking valve is closed.

When switching on the consumers, the pressure in the system rises again until the "upper operating pressure" is reached thereby tripping the switch-on threshold S1 of the pump, respectively attaining the opening pressure of the valve.

Provided pumping speed of the pump and vacuum consumption are balanced, the operating pressure will change between S0 and S1. At reduced consumption, the system pressure will reduce until the switching threshold S0 is reached again causing the pump to switch off, respectively the valve to close etc.

FF Controller

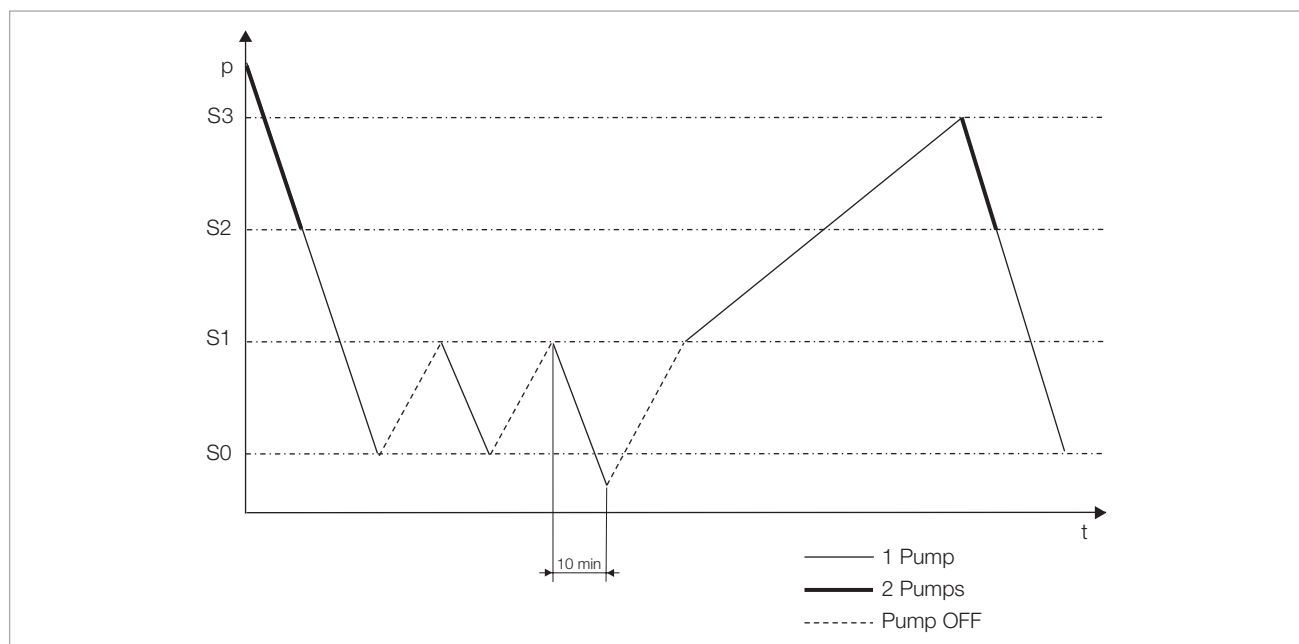
Basically the FF controller provides for four freely selectable switching thresholds and has thus been designed to operate two pumps running in parallel. Depending on the design rating and current demand, the base load or master pump will operate alone or jointly together with the spare pump.

In order to spread the number of operating hours equally between the pumps, master pump and spare pump are interchanged in regular intervals. In case a pump fails, the controller effects an automatic change to the spare pump.

For operating vacuum pumps having a nominal pumping speed of over

100 m³/h (58.9 cfm), a delayed shut-down facility has been integrated which will restrict the number of switching cycles to 6 per hour.

Through the use of a Programmable Logic Controller (PLC), the FF controller permits flexible coverage of quite differing requirements.



FF controller with two pumps and an example for delayed shutdown (pumps over 100 m³/h (58.9 cfm))

Operating Principle of the FF Controller

Just as for the Basic controller, the system is, upon switching on, evacuated down to the lower operating pressure S0. This is effected with both pumps running in parallel (master pump and spare pump) until the shutdown threshold for the spare pump S2 is reached. Thereafter, the master pump alone will ensure that the lower operating pressure is reached and is then also switched off. When the system pressure increases due to the number of consumers or leaks to the level of S1, then the master pump will be switched on automatically etc.

In the case of vacuum pumps having a pumping speed of over 100 m³/h (58.9 cfm) and a running time of the pump of less than 10 minutes, then the standard switch off delay can be responsible for the pressure to drop below S0. This will prevent too frequent switching on and off of the pumps.

If for process reasons the pressure is not allowed to drop below the lower operating pressure, we recommend

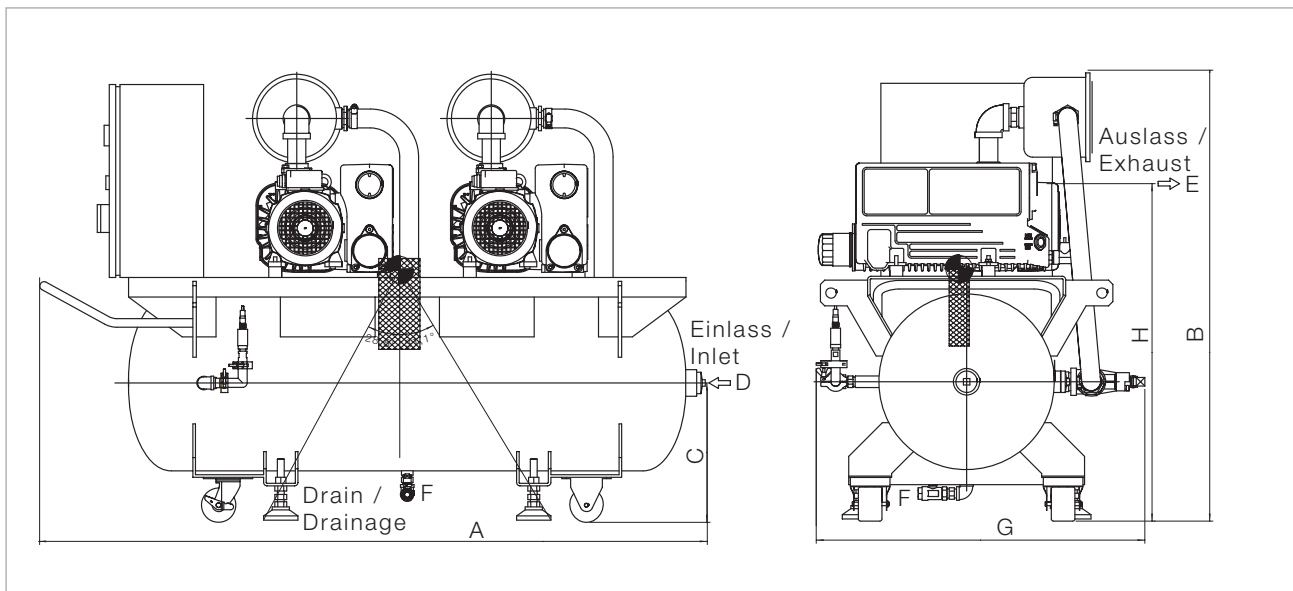
the use of electropneumatic or solenoid blocking valves.

If the current vacuum demand cannot be met by the master pump alone, the system pressure will increase to the upper switching pressure S3 upon which the spare pump is automatically started.

With both pumps running in parallel, the system is then again evacuated until the switch off threshold S2 for the spare pump is reached again etc.

CVS-System *	A	B	C	D	E	F	G	H
CVS60 1xSV25B	973	1163	280	G 1 1/4"	G 3/4"	G 1/2"	656	653
CVS60 1xSV40B	973	1163	280	G 1 1/4"	G 1 1/4"	G 1/2"	656	697

leybold



Dimensional drawing CVS160 with 2x SV65B

CVS-System *	A	B	C	D	E	F	G	H
CVS500 2xSV100B	1976	1310	485	G 2"	G 1 1/4"	G 1 1/4"	940	1051
CVS500 2xSV200	1976	1509	485	G 2"	G2"	G 1 1/4"	1107	1149
CVS1000 2xSV200	2395	1719	585	G 2"	G2"	G 1 1/4"	1223	1359
CVS500 2xSV300B	1976	1514	485	G 2"	G2"	G 1 1/4"	1107	1161
CVS1000 2xSV300B	2395	1724	585	G 2"	G2"	G 1 1/4"	1189	1371

* Dimensions in mm

Technical Data and Ordering Information

CVS BASIC Systems

Part No.	Designation	Nominal pumping speed* m ³ /h	Weight, approx. kg	Connection Inlet / Exhaust G or NPT	Noise level** dB(A)	Motor power kW	Nominal current max. A	Power connection
504309V001	CVS60 – 1 x SV25B	26	145	1¼" / ¾"	64	0,9 1,1	2,3 2,6	400 V / 50 Hz 460 V / 60 Hz
504309V002	CVS60 – 1 x SV40B	44	165	1¼" / 1¼"	58	1,1 1,5	2,8 2,7	400 V / 50 Hz 460 V / 60 Hz
504310V001	CVS160 – 1 x SV65B	59	255	1¼" / 1¼"	60	1,5 1,8	3,8 3,7	400 V / 50 Hz 460 V / 60 Hz
504310V004	CVS160 – 1 x SV100B	97,5	295	1¼" / 1¼"	61	2,2 3,5	4,5 5,3	400 V / 50 Hz 460 V / 60 Hz
504311V001	CVS300 – 1 x SV65B	59	340	2" / 1¼"	60	1,5 1,8	3,8 3,7	400 V / 50 Hz 460 V / 60 Hz
504311V004	CVS300 – 1 x SV100B	97,5	335	2" / 1¼"	61	2,2 3,5	4,5 5,3	400 V / 50 Hz 460 V / 60 Hz
504312V006	CVS500 – 1 x SV100B	97,5	415	2" / 1¼"	61	2,2 3,5	4,5 5,3	400 V / 50 Hz 460 V / 60 Hz
504312V007	CVS500 – 2 x SV100B	195	550	2" / 1¼"	64	4,4 7,0	9,0 10,6	400 V / 50 Hz 460 V / 60 Hz
504312V011	CVS500 – 1 x SV200	180	460	2" / 2"	69	4,0 4,6	8,9 10,0	400 V / 50 Hz 460 V / 60 Hz
504312V012	CVS500 – 2 x SV200	360	630	2" / 2"	72	8,0 9,2	17,8 20,0	400 V / 50 Hz 460 V / 60 Hz
504312V014	CVS500 – 1 x SV300B	280	500	2" / 2"	72	5,5 6,3	10,5 9,3	400 V / 50 Hz 460 V / 60 Hz
504312V015	CVS500 – 2 x SV300B	560	725	2" / 2"	75	11,0 12,6	21,0 18,6	400 V / 50 Hz 460 V / 60 Hz
504313V011	CVS1000 – 1 x SV200	180	600	2" / 2"	69	4,0 4,6	8,9 10,0	400 V / 50 Hz 460 V / 60 Hz
504313V012	CVS1000 – 2 x SV200	360	775	2" / 2"	72	8,0 9,2	17,8 20,0	400 V / 50 Hz 460 V / 60 Hz
504313V016	CVS1000 – 1 x SV300B	280	640	2" / 2"	72	5,5 6,3	10,5 9,3	400 V / 50 Hz 460 V / 60 Hz
504313V017	CVS1000 – 2 x SV300B	560	860	2" / 2"	75	11,0 12,6	21,0 18,6	400 V / 50 Hz 460 V / 60 Hz

* 50 Hz

** At ultimate pressure without gas ballast, free-field measurement, distance 1 m

Beyond the equipment which is supplied as standard, the modular design of the central vacuum supply systems from Leybold allows for customization according to your specific requirements.

Optionally available are, for example:

- Higher pumping speeds and larger buffer volumes
- Electropneumatic or solenoid blocking valves
- Mobile construction on castors
- Other mains voltages
- Additional pumps, filters, fittings etc.

Technical Data and Ordering Information

CVS FF Systems

Part No.	Designation	Nominal pumping speed* m³/h	Weight, approx. kg	Connection Inlet / Exhaust G or NPT	Noise level** dB(A)	Motor power kW	Nominal current max. A	Power connection
504310V050	CVS160 – 2 x SV65B	118	350	1¼" / 1¼"	63	3,0 3,6	7,6 7,4	400 V / 50 Hz 460 V / 60 Hz
504310V051	CVS160 – 2 x SV100B	195	430	1¼" / 1¼"	64	4,4 7,0	9,0 10,6	400 V / 50 Hz 460 V / 60 Hz
504311V050	CVS300 – 2 x SV65B	118	410	2" / 1¼"	63	3,0 3,6	7,6 7,4	400 V / 50 Hz 460 V / 60 Hz
504311V051	CVS300 – 2 x SV100B	195	470	2" / 1¼"	64	4,4 7,0	9,0 10,6	400 V / 50 Hz 460 V / 60 Hz
504312V050	CVS500 – 3 x SV65B	177	560	2" / 1¼"	65	4,5 5,4	11,4 11,1	400 V / 50 Hz 460 V / 60 Hz
504312V051	CVS500 – 2 x SV100B	195	550	2" / 1¼"	64	4,4 7,0	9,0 10,6	400 V / 50 Hz 460 V / 60 Hz
504312V052	CVS500 – 3 x SV100B	292,5	680	2" / 1¼"	66	6,6 10,5	13,5 15,9	400 V / 50 Hz 460 V / 60 Hz
504312V053	CVS500 – 2 x SV200	360	630	2" / 2"	72	8,0 9,2	17,8 20,0	400 V / 50 Hz 460 V / 60 Hz
504312V054	CVS500 – 2 x SV300B	560	725	2" / 2"	75	11,0 12,6	21,0 18,6	400 V / 50 Hz 460 V / 60 Hz
504313V050	CVS1000 – 3 x SV65B	177	700	2" / 1¼"	65	4,5 5,4	11,4 11,1	400 V / 50 Hz 460 V / 60 Hz
504313V051	CVS1000 – 2 x SV300B	195	690	2" / 1¼"	64	4,4 7,0	9,0 10,6	400 V / 50 Hz 460 V / 60 Hz
504313V052	CVS1000 – 3 x SV100B	292,5	820	2" / 1¼"	66	6,6 10,5	13,5 15,9	400 V / 50 Hz 460 V / 60 Hz
504313V053	CVS1000 – 2 x SV200	360	775	2" / 2"	72	8,0 9,2	17,8 120,0	400 V / 50 Hz 460 V / 60 Hz
504313V054	CVS1000 – 3 x SV200	540	950	2" / 2"	74	12,0 13,8	26,7 230,0	400 V / 50 Hz 460 V / 60 Hz
504313V055	CVS1000 – 2 x SV300B	560	860	2" / 2"	75	11,0 12,6	21,0 18,6	400 V / 50 Hz 460 V / 60 Hz
504313V056	CVS1000 – 3 x SV300B	840	1080	2" / 2"	77	16,5 18,9	31,5 27,9	400 V / 50 Hz 460 V / 60 Hz

* 50 Hz

** At ultimate pressure without gas ballast, free-field measurement, distance 1 m

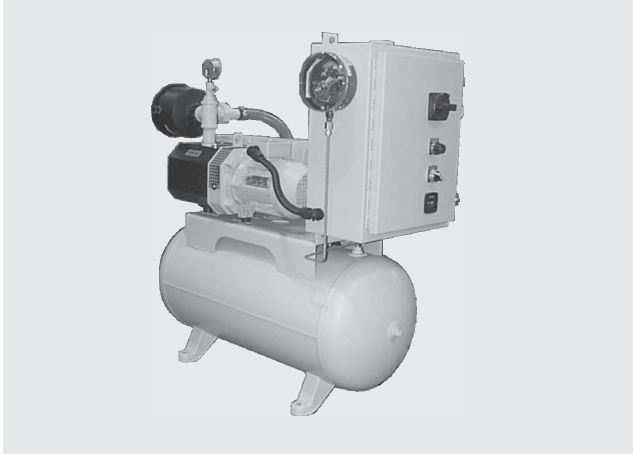
Beyond the equipment which is supplied as standard, the modular design of the central vacuum supply systems from Leybold allows for customization according to your specific requirements.

Optionally available are, for example:

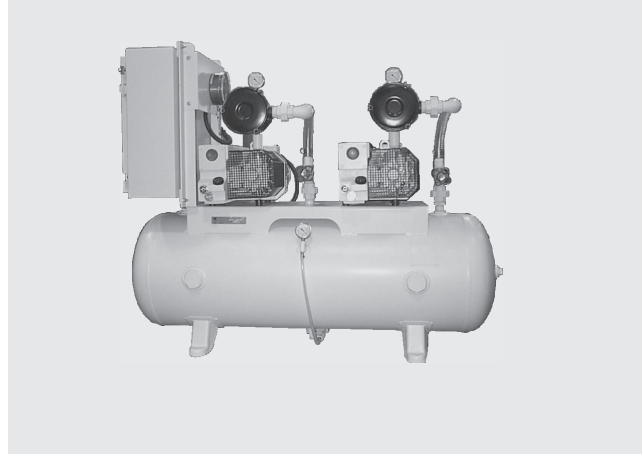
- Higher pumping speeds and larger buffer volumes
- Electropneumatic or solenoid blocking valves
- Mobile construction on castors
- Other mains voltages
- Additional pumps, filters, fittings etc.

Only available for purchase in North and South America

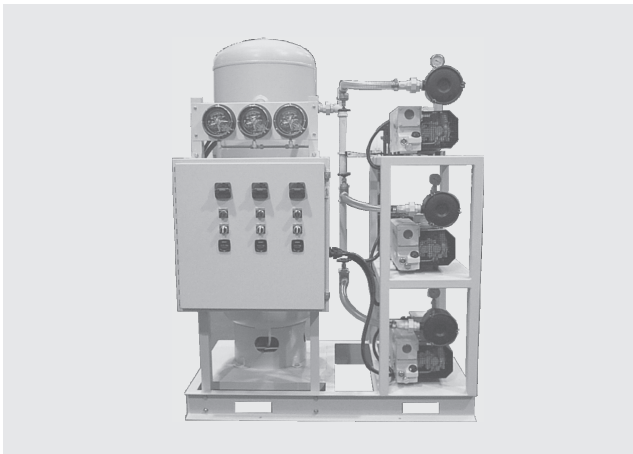
Central Vacuum Supply Systems



Central vacuum supply system, simplex



Central vacuum supply system, duplex



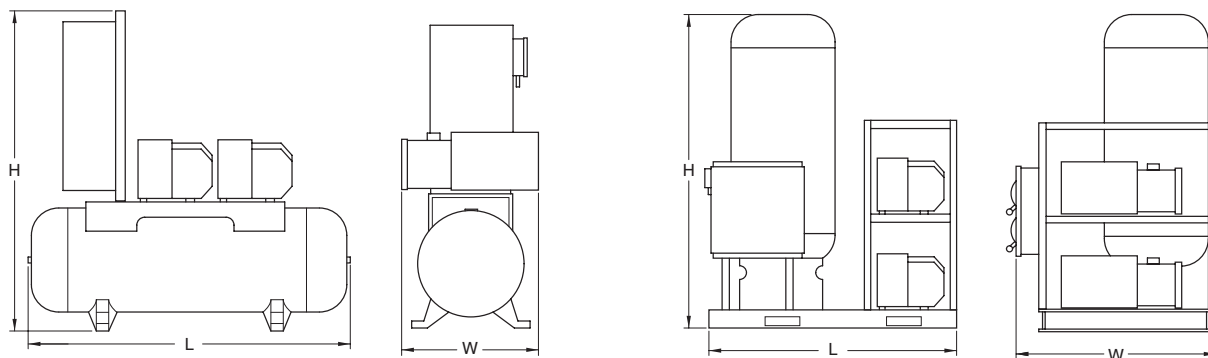
Central vacuum system, triplex

Standard Equipment

- ASME® rated receiver tank
- Flexible configurations for one, two, or three SOGEVAC pumps
- Manual isolation valves
- Simple operation, high reliability, easy maintenance
- Complete package with gauges and NEMA12 controls
- Standard “ON/OFF/AUTO” switch
- Elapsed time meters
- Inlet particulate filters
- Lead/Lag or continuous operation of pumps
- Adjustable pressure switch for control of vacuum level
- Air-cooled SOGEVAC pumps with built-in “anti-suckback” valves

Options

- Tank or stack mounted pumps
- Larger receiver tank
- Special inlet filters
- Automatic isolation valves
- Special design controls per customer specification



Pump model	Tank size (gal)	L	W	H
Tank mount - simplex				
SV 16, SV 25	30	42 (1067)	20 (508)	51 (1295)
SV 40 B, SV 65 B	60	50 (1270)	25 (635)	48 (1219)
SV 100 B	80	65 (1651)	25 (635)	56 (1422)
SV 200, SV 300	120	70 (1778)	28 (711)	58 (1473)
Tank mount - duplex				
SV 16, SV 25	60	50 (1270)	27 (686)	53 (1346)
SV 40 B, SV 65 B	80	65 (1651)	30 (762)	53 (1346)
SV 100 B	120	71 (1803)	32 (813)	53 (1346)
SV 200	240	84 (2134)	38 (965)	64 (1626)
SV 300	240	84 (2134)	43 (1092)	64 (1626)
Stack mount - duplex and triplex				
SV 16, SV 25	60	45 (1143)	38 (965)	56 (1422)
SV 40 B	80	49 (1245)	42 (1067)	56 (1422)
SV 65 B	120	62 (1575)	45 (1143)	88 (2235)
SV 100 B	120	68 (1727)	42 (1067)	88 (2235)
SV 200	200	68 (1727)	50 (1270)	91 (1626)
SV 300	200	68 (1727)	58 (1473)	91 (1626)

Central vacuum supply systems, tank mounted [left] and stack mounted [right]; dimensions in inch, dimensions in brackets () are in mm

Technical Data

Performance Characteristics

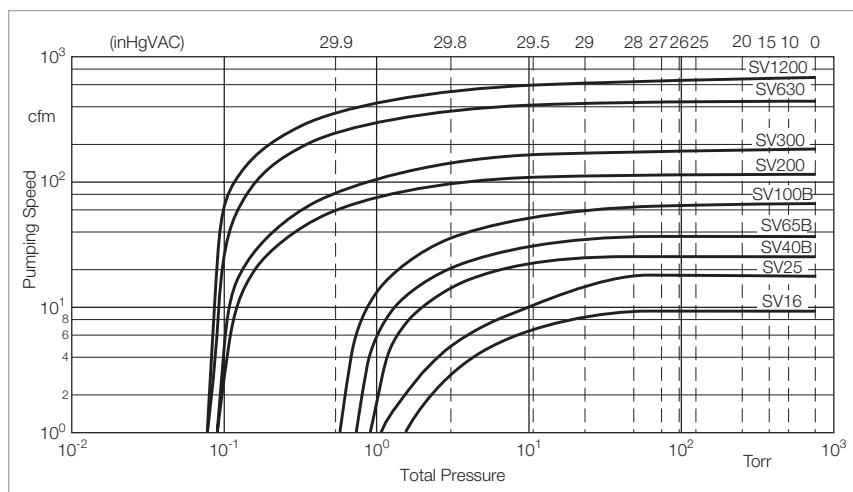
		SV 16	SV 25	SV 40 B	SV 65 B	SV 100 B	SV 200	SV 300
Free air displacement	cfm (m³/h)	11 (18.6)	17.0 (29.0)	31.2 (53.0)	41.8 (71.0)	68.9 (117.0)	129.5 (219.8)	200.3 (340.0)
Actual pumping speed	cfm (m³/h)	10 (16.9)	15 (25.5)	27.7 (47.0)	37.7 (64.0)	61.8 (105.0)	117.8 (200.0)	170.8 (289.9)
Guaranteed base pressure	Torr	0.4	0.4	0.4	0.4	0.4	0.06	0.06
Base pressure with gas ballast	Torr	1.1	1.1	1.1	1.1	1.0	0.5	0.5
Water vapor tolerance	Torr	30.0	30.0	22.5	22.5	22.5	30.0	30.0
Water vapor pumping with gas ballast	qt/hr	0.32	0.48	0.95	1.32	1.8	5.7	7.8
Noise level at 3 feet with 1 pump running without gas ballast	dB(A)	56	56	63	64	64	73	74
Motor	hp	1.0	1.5	2.0	2.5	4.0	7.5	10.0
Pump rotational speed	rpm	1750	1500	1750	1750	1750	1750	1750
Oil capacity	qt	2.0	2.0	1.05	2.1	2.1	5.5	9.0
Inlet / exhaust – NPT	in.	1/2 / 1/2	1/2 / 1/2	1-1/4 / 1-1/4	1-1/4 / 1-1/4	1-1/4 / 1-1/4	2 / 2	2 / 2
Pump weight	lbs	50.7	52.9	99.3	114.8	194.3	341.8	430.0

Technical Data

		Tank Mount	Tank Mount	Stack Mount
		Simplex	Duplex	Duplex and Simplex
SV 16, SV 25	Tank size (gal)	30	60	60
SV 40 B	Tank size (gal)	60	80	80
SV 65 B	Tank size (gal)	60	120	120
SV 100 B	Tank size (gal)	80	120	120
SV 200	Tank size (gal)	120	240	200
SV 300	Tank size (gal)	120	240	200

Ordering Information

System	Part No.	C	-					XX
Simplex	S							
Duplex	D							
Triplex	T							
Pumps								
SV 16 (1 hp)	016							
SV 25 (1.5 hp)	025							
SV 40 B (2.5 hp)	040							
SV 65 B (3 hp)	065							
SV 100 B (4 hp)	100							
SV 200 (7.5 hp)	200							
SV 300 (10 hp)	300							
Mounting								
Tank mount	T							
Stack mount	S							
Voltage								
460/3/60	A							
230/3/60	B							
230/1/60 (available for SV 16/SV 25 only)	C							
208/3/60 (available for SV 25 only)	D							
115/1/60 (available for SV 16 only)	E							
Duty								
Continuous	C							
Demand Start/Stop	D							



Pumping speed characteristics for the central vacuum supply systems at 60 Hz

Only available for purchase in North and South America

Tank Mounted Medical Vacuum Systems

**NFPA 99C compliant and designed for use in medical applications –
hospitals, out-patient surgical and other medical facilities**



Tank mounted medical vacuum system

Leybold tank mounted systems are completely assembled with interconnecting piping, are factory tested and leak-checked prior to shipment. Some items may be disassembled for protection during shipment. Required mechanical re-assembly requirements will be clearly noted, as well as needed electrical connections, and are the responsibility of the installer.

System Features

Key features for these duplex systems include two SOGEVAC series oil sealed rotary vane vacuum pumps with displacements up to 69 cfm each, an ultimate vacuum of better than 29.95" Hg, and automatic oil recirculation system with integral coalescing exhaust demisters as standard. ASME rated receiver tanks, NEMA12 / UL listed electrical enclosure and inter-connecting hardware. Each turn-key system is fully assembled and tested at Leybold Vacuum's factory and includes an operation manual and 12 month warranty.

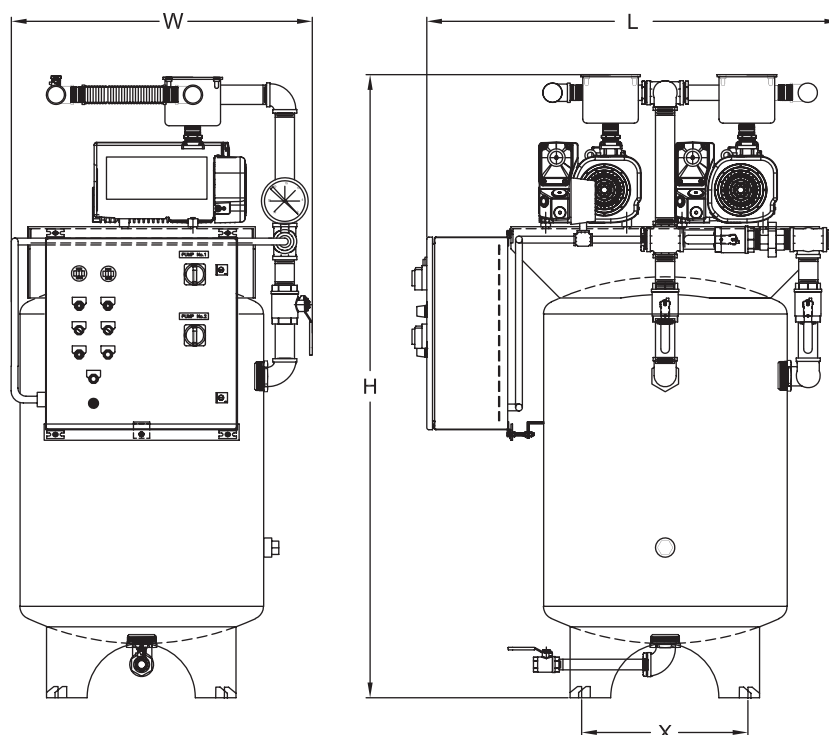
Other System Features

Vacuum pumps and systems:

- Direct-coupled TEFC, IP 55 rated motors
- Integral gas ballast
- Anti suck back valve
- Air-cooled design
- NPT type inlet and exhaust connections
- Inlet protection
 - particulate filters rated for 10 micron retention
 - Isolation ball valves
 - Pump check valves
- Vacuum gauge, 0 – 30" Hg
- Vertical receiver, ASME coded, manual drain valve and tank bypass

Local duplex motor control center:

- 2x magnetic motor starters with overload protection
- Main fused disconnect switch
- 2x through the door disconnect switches
- 2x individual control transformers
- 2x elapsed time meters
- 2x hand-off-auto switches
- Lag pump audible alarm with indicator light
- Automatic alternation
 - Lead / Lag operation
- 2x dual set-point vacuum switches
- Emergency stop
- NEMA12, UL listed enclosure
- System wired for either 208/230/460 V, 3 phase, 60 Hz operation



Model	Vacuum tank (gal)	Length (L)	Height (H)	Width (W)	Base (X)
VTMD-25-M	80	42 (1067)	72 (1829)	32 (813)	14.8 (376)
VTMD-40-M	80	42 (1067)	72 (1829)	32 (813)	14.8 (376)
VTMD-65-M	120	52 (1321)	76 (1930)	34 (864)	19.0 (483)
VTMD-100-M	120	52 (1321)	76 (1930)	35 (889)	19.0 (483)

Tank mounted medical vacuum systems; dimensions in inch, dimensions in brackets () are in mm

Technical Data

VTMD-25-M VTMD-40-M VTMD-65-M VTMD-100-M

Displacement (per pump)	cfm	18.3	31.2	41.8	69.0
Capacity 19" HG (VAC) (per pump)	scfm	6.7	11.4	15.3	25.1
Motor (per pump)	hp (W)	1.5 (2.0)	2.0 (2.7)	3.0 (4.1)	5.0 (6.8)
Vacuum tank	gal	80	80	120	120
Vacuum inlet	NPT	1.5"			
Vacuum outlet ¹⁾	NPT	1.25"			
Weight	lbs (kg)	700 (305)	750 (340)	1125 (510)	1300 (589)

Ordering Information

VTMD-25-M VTMD-40-M VTMD-65-M VTMD-100-M

	Part No.	Part No.	Part No.	Part No.
Tank mounted medical vacuum system				
208 V, 3 phase, 60 Hz	S 170 530	S 170 533	S 170 499	S 170 490
230 V, 3 phase, 60 Hz	S 170 531	S 170 534	S 170 536	S 170 538
460 V, 3 phase, 60 Hz	S 170 532	S 170 535	S 170 537	S 170 539

¹⁾ System consists of two outlet flanges

Dry Compressing Vacuum Pump System RUTA with SCREWLINE Backing Pump, Adaptor Version, without palette



RUTA WAU2001/SP630/A

Standard Equipment

- RUVAC WAU with air cooling
- RUVAC WH with water cooling
- Silencer
- SP-GUARD
- Manually operated gas ballast
- Gear oil collecting pan integrated within the screw pump
- Gear oil supplied with the pump
- Screw pump SCREWLINE SP 630 F with water cooling
- Screw pump SCREWLINE SP 250 with air cooling
- RUVAC WH including external frequency converter (frequency converter permits pumping speed control)
- CE approval
- Condensate drain valve at the silencer
- Sound proofing box
- Vibration absorbers
- Castors
- Different types of floor mounts
- Oil drain valve on each pump
- Electric control systems
- Non-return valve
- Screw pump SCREWLINE SP 630 with air cooling

Options

- Frequency converter for controlling the speed of the Roots pump (only RUVAC WA/WS)

Type	RUTA	501/SP250/A	1001/SP250/A	2001/SP630F/A	700/SP250/A
RUVAC WA/WAU/WS/WSU	P2	501	1001	2001	—
RUVAC WH	P2	—	—	—	700
Backing pump SCREWLINE	P1	SP 250	SP 250	SP 630 F	SP 250
	DN ₁	63 ISO-K	100 ISO-K	160 ISO-K	100 ISO-K
	DN ₂	63 ISO-K	63 ISO-K	100 ISO-K	63 ISO-K
	l	1350 (53.15)	1409 (55.47)	1804 (71.02)	1350 (53.15)
	l ₁	239 (9.41)	298 (11.73)	367 (14.45)	258 (10.16)
	l ₂	533 (20.98)	592 (23.31)	882 (34.72)	552 (21.73)
	l ₃	160 (6.30)	219 (8.62)	336 (13.23)	179 (7.05)
	l ₄	880 (34.65)	880 (34.65)	880 (34.65)	880 (34.65)
	b	761 (29.96)	828 (32.60)	1059 (41.69)	648 (25.51)
	b ₁	260 (10.24)	306 (12.05)	403 (15.87)	260 (10.24)
	b ₂	438 (17.24)	438 (17.24)	546 (21.50)	438 (17.24)
	b ₄	783 (30.83)	783 (30.83)	783 (30.83)	783 (30.83)
	b ₅	470 (18.50)	470 (18.50)	470 (18.50)	470 (18.50)
	h	1213 (47.76)	1239 (48.78)	1342 (52.84)	1158 (45.59)
	h ₁	954 (37.56)	954 (37.56)	1221 (48.07)	949 (37.36)

Dimensional drawing of the pump systems with dry compressing SCREWLINE SP backing pump, adaptor version, without palette.
Left with WAU pumps, right with WH pump. Dimensions in brackets () are in inch

Technical Data, 50 Hz

RUTA

WAU 501/SP250/A WAU 1001/SP250/A WAU 2001/SP630(F)/A WH 700/SP250/A

RUVAC (WA/WAU/WS/WSU possible)	P2	501	1001	2001	–
RUVAC WH	P2	–	–	–	700
Backing pump SCREWLINE	P1	SP 250	SP 250	SP 630 (F)	SP 250
Pumping speed, 50 Hz at 10^{-1} mbar (7.5×10^{-2} Torr)	m ³ /h (cfm)	445.0 (262.1)	830.0 (488.9)	1745.0 (1027.8)	635 (374)
Ultimate total pressure without gas ballast	mbar (Torr)	$< 1 \times 10^{-3}$ ($< 7.5 \times 10^{-4}$)			
Installed motor power 400 V, 50 Hz	kW (hp)	9.7 (13.0)	11.5 (15.6)	22.5 (30.6)	9.7 (13.0)
Electrical power consumption at 10^{-1} mbar (7.5×10^{-2} Torr)	kW (hp)	6.3 (8.6)	6.7 (9.1)	12.0 (16.3)	6.6 (8.9)
Noise level with silencer at 10^{-1} mbar (7.5×10^{-2} Torr)	dB(A)	75	77	79	75
Total weight with palette, approx.	kg (lbs)	720 (1187)	850 (1876)	1100 (2428)	720 (1587)
Connecting flange					
Inlet port	DN ₁	63 ISO-K	100 ISO-K	160 ISO-K	100 ISO-K
Outlet port	DN ₂	63 ISO-K	63 ISO-K	100 ISO-K	63 ISO-K

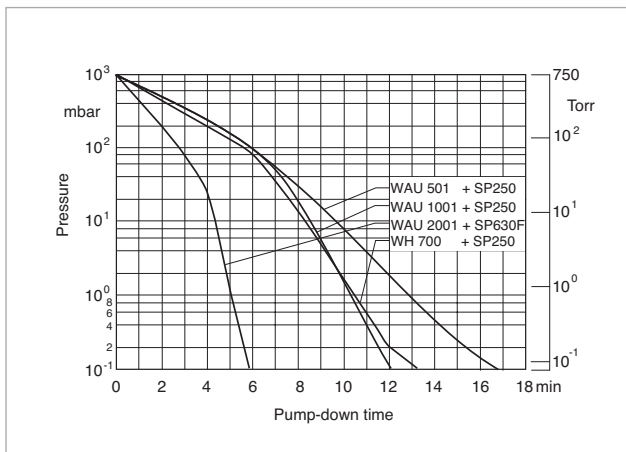
Ordering Information

RUTA

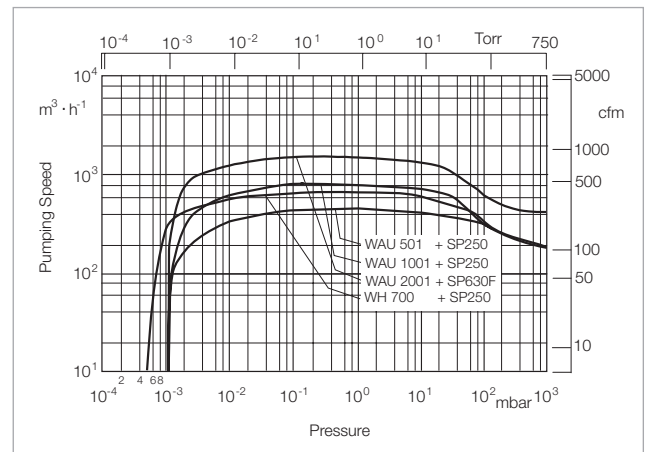
WAU 501/SP250/A WAU 1001/SP250/A WAU 2001/SP630(F)/A WH 700/SP250/A

		Part No.	Part No.	Part No.	Part No.
RUVAC (WA/WAU/WS/WSU possible)	P2	WAU 501	WAU 1001	WAU 2001	–
RUVAC WH	P2	–	–	–	WH 700
Backing pump	P1	SP 250	SP 250	SP 630 (F)	SP 250
Pump system, complete (adaptor version), without pallet					
with water-cooled SCREWLINE		502 465 V001	502 467 V001	502 471 V001	503153V001 ¹⁾
Frequency converter RUVATRONIC		RT 5/501	RT 5/1001	RT 5/2001	–
(see description in Chapter “Accessories”)		500 001 382	500 001 383	500 001 384	–

¹⁾ Including external frequency converter



Pump-down time diagram for a 10 m³ tank at 50 Hz



Pumping speed diagram at 50 Hz

Dry Compressing Vacuum Pump System RUTA with SCREWLINE Backing Pump, Adaptor Version, with palette



RUTA WAU2001/SP630/A

Standard Equipment

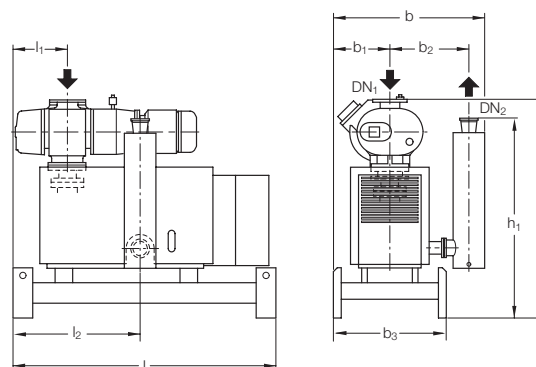
- RUVAC WAU with air cooling
- Silencer
- SP-GUARD
- Manually operated gas ballast
- Gear oil collecting pan integrated within the screw pump
- Gear oil supplied with the pump
- Screw pump SCREWLINE SP 630 F with water cooling

- Screw pump SCREWLINE SP 250 with air cooling
- CE approval

Options

- Condensate drain valve at the silencer
- Sound proofing box
- Vibration absorbers

- Castors
- Different types of floor mounts
- Oil drain valve on each pump
- Electric control systems
- Non-return valve
- Screw pump SCREWLINE SP 630 with air cooling



Type		with palette		
RUTA	P2	501/SP250/A	1001/SP250/A	2001/SP630F/A
Backing pump SCREWLINE	P1	501	1001	2001
		SP 250	SP 250	SP 630 F
	DN ₁	63 ISO-K	100 ISO-K	160 ISO-K
	DN ₂	63 ISO-K	63 ISO-K	100 ISO-K
	l	1448 (57.01)	1488 (58.58)	1850 (72.84)
	l ₁	287 (11.30)	327 (12.87)	379 (14.92)
	l ₂	581 (22.87)	621 (24.45)	894 (35.20)
	b	923 (36.34)	923 (36.34)	1056 (41.58)
	b ₁	400 (15.75)	400 (15.75)	400 (15.75)
	b ₂	438 (17.24)	438 (17.24)	546 (21.50)
	b ₃	800 (31.50)	800 (31.50)	800 (31.50)
	h	1377 (54.21)	1403 (55.24)	1509 (59.41)
	h ¹	1121 (44.13)	1121 (44.13)	1388 (54.65)

Dimensional drawing of the pump systems with dry compressing SCREWLINE SP backing pump, adaptor version; left and middle with palette, right on castors
Dimensions in brackets () are in inch

Technical Data, 50 Hz

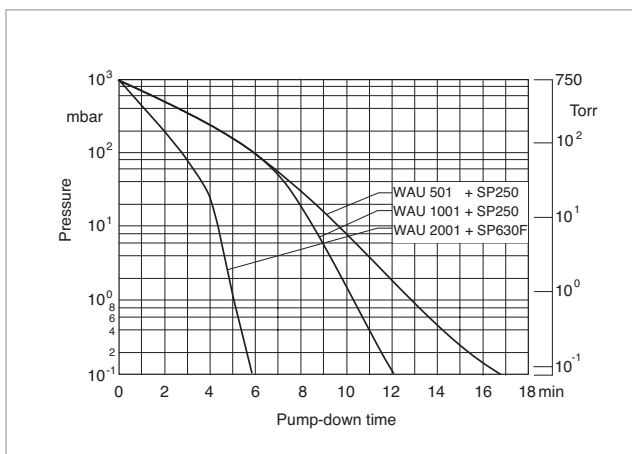
RUTA WAU

		501/SP250/A	1001/SP250/A	2001/SP630(F)/A
RUVAC (WA/WAU/WS/WSU possible)	P2	501	1001	2001
Backing pump SCREWLINE	P1	SP 250	SP 250	SP 630 (F)
Pumping speed, 50 Hz at 10^{-1} mbar (7.5×10^{-2} Torr)	m ³ /h (cfm)	445.0 (262.1)	830.0 (488.9)	1745.0 (1027.8)
Ultimate total pressure without gas ballast	mbar (Torr)	$< 1 \times 10^{-3}$ ($< 7.5 \times 10^{-4}$)		
Installed motor power 400 V, 50 Hz	kW (hp)	9.7 (13.2)	11.5 (15.6)	22.5 (30.6)
Electrical power consumption at 10^{-1} mbar (7.5×10^{-2} Torr)	kW (hp)	6.3 (8.6)	6.7 (9.1)	12.0 (16.3)
Noise level with silencer at 10^{-1} mbar (7.5×10^{-2} Torr)	dB(A)	75	77	79
Total weight with palette, approx.	kg (lbs)	720.0 (1589.4)	850.0 (1876.4)	1100.0 (2428.3)
Connecting flange				
Inlet port	DN ₁	63 ISO-K	100 ISO-K	160 ISO-K
Outlet port	DN ₂	63 ISO-K	63 ISO-K	100 ISO-K

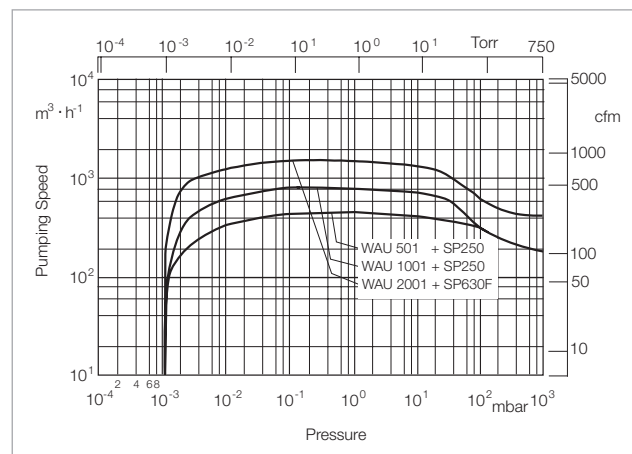
Ordering Information

RUTA WAU

		501/SP250/A	1001/SP250/A	2001/SP630(F)/A
		Part No.	Part No.	Part No.
RUVAC (WA/WAU/WS/WSU possible)	P2	WAU 501	WAU 1001	WAU 2001
Backing pump	P1	SP 250	SP 250	SP 630 (F)
Pump system, complete (adaptor version), pallet mounted, with water-cooled SCREWLINE with air-cooled SCREWLINE		- 502 466 V001	- 502 468 V001	502 472 V002 502 472 V003
Frequency converter RUVATRONIC (see description in Chapter "Accessories")		RT 5/501 500 001 382	RT 5/1001 500 001 383	RT 5/2001 500 001 384

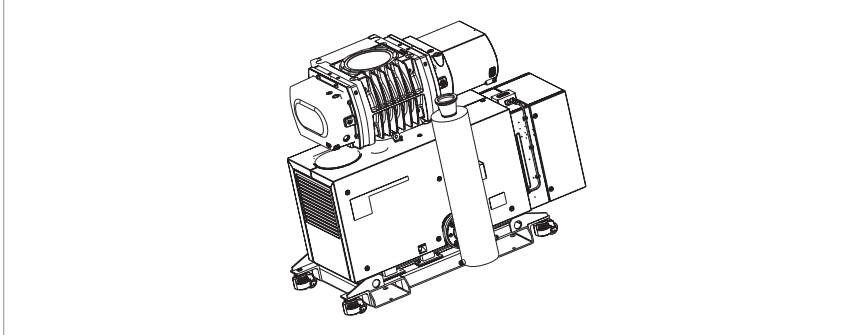


Pump-down time diagram for a 10 m³ tank at 50 Hz



Pumping speed diagram at 50 Hz

Dry Compressing Vacuum Pump System RUTA with SCREWLINE Backing Pump, Adaptor Version, with palette



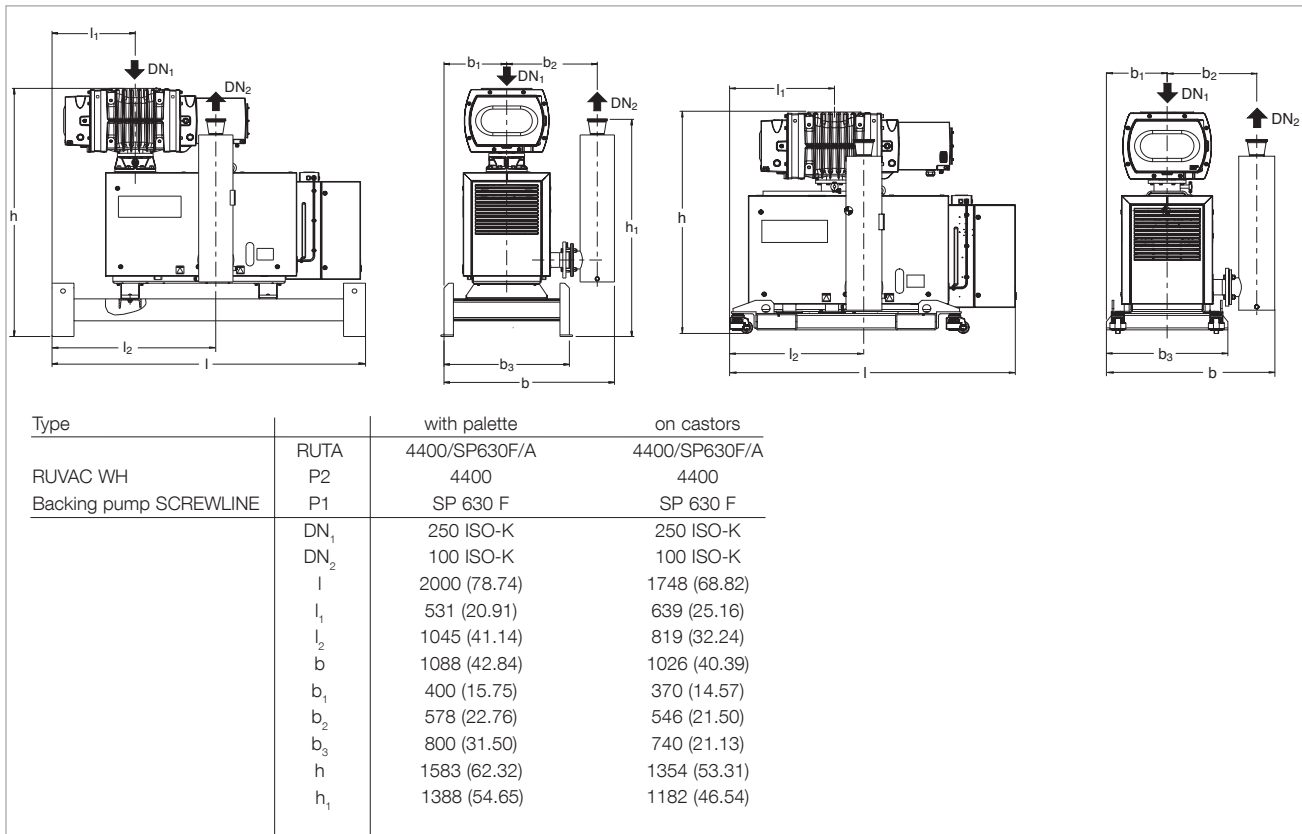
RUTA WH4400/SP630/A on castors

Standard Equipment

- RUVAC WH with water cooling
- Silencer
- SP-GUARD
- Manually operated gas ballast
- Gear oil collecting pan integrated within the screw pump
- Gear oil supplied with the pump
- Screw pump SCREWLINE SP 630 F with water cooling
- RUVAC WH including external frequency converter (frequency converter permits pumping speed control)
- CE approval
- Sound proofing box
- Vibration absorbers
- Castors
- Different types of floor mounts
- Oil drain valve on each pump
- Electric control systems
- Non-return valve
- Screw pump SCREWLINE SP 630 with air cooling

Options

- Condensate drain valve at the silencer



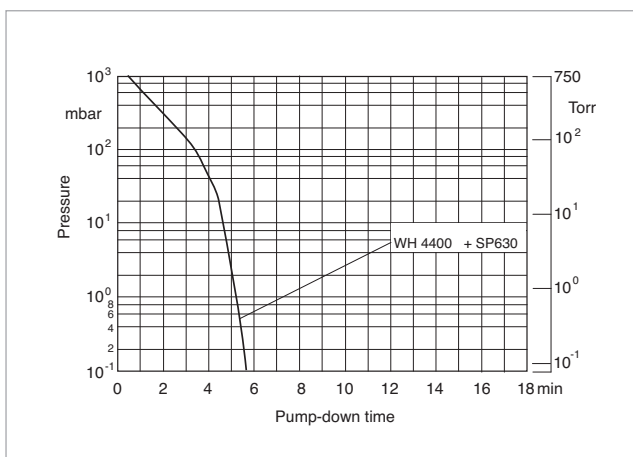
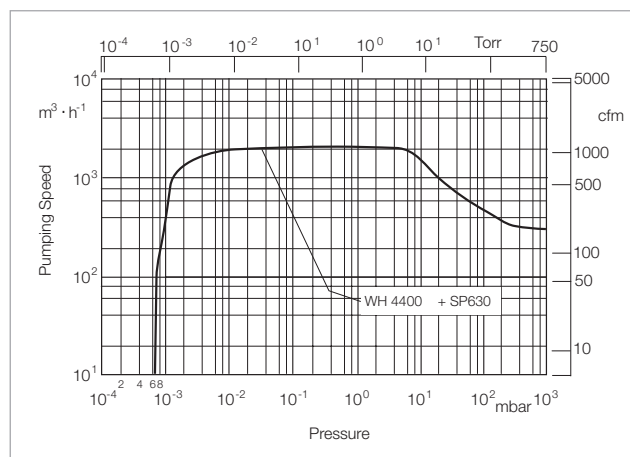
Dimensional drawing of the pump systems with dry compressing SCREWLINE SP backing pump, adaptor version; left with palette, right on castors. Dimensions in brackets () are in inch

Technical Data, 50 Hz**RUTA WH
4400/SP630F/A**

RUVAC WH	P2	4400
Backing pump SCREWLINE	P1	SP 630 F
Pumping speed, 50 Hz at 10^{-1} mbar (7.5×10^{-2} Torr)	m ³ /h (cfm)	3380 (1990)
Ultimate total pressure without gas ballast	mbar (Torr)	$< 1 \times 10^{-3}$ ($< 7.5 \times 10^{-4}$)
Installed motor power 400 V, 50 Hz	kW (hp)	26.0 (34.9)
Electrical power consumption at 10^{-1} mbar (7.5×10^{-2} Torr)	kW (hp)	12.93 (17.34)
Noise level with silencer at 10^{-1} mbar (7.5×10^{-2} Torr)	dB(A)	73
Total weight		
with palette, approx.	kg (lbs)	1350 (2932)
on castors, approx.	kg (lbs)	1980 (4365)
Connecting flange		
Inlet port	DN ₁	250 ISO-K
Outlet port	DN ₂	100 ISO-K

Ordering Information**RUTA WH
4400/SP630F/A**

		Part No.
RUVAC (WA/WAU/WS/WSU possible)	P2	4400
Backing pump	P1	SP 630 F
Pump system, complete (adaptor version), with water-cooled SCREWLINE pallet mounted castor mounted		503 162 V001 ¹⁾ 502 873 V001 ¹⁾

¹⁾ Including external frequency converterPump-down time diagram for a 10 m³ tank at 50 Hz

Pumping speed diagram at 50 Hz

Dry Compressing Vacuum Pump System RUTA with SCREWLINE SP 250 Backing Pump, Frame Version



RUTA WAU2001/SP630/G

Standard Equipment

- RUVAC WH with water cooling
- RUVAC WAU with air cooling
- SCREWLINE SP 250 with air cooling
- Silencer
- SP-GUARD
- Manually operated gas ballast
- SECUVAC valve 24 V DC
- Gear oil collecting pan integrated within the screw pump

- Crane eyes on the frame
- Floor mounting
- Gear oil supplied with the pump
- Screw pump with air cooling
- RUVAC WH including external frequency converter (frequency converter permits pumping speed control)
- CE approval

Options

- Condensate drain valve at the silencer
- Sound proofing box
- Vibration absorbers
- Castors
- Different types of floor mounts
- Oil drain valve on each pump
- Electric control systems
- Non-return valve

Type	RUTA	501/SP250/G	1001/SP250/G	2001/SP250/G	700/SP250/G	2500/SP250/G
RUVAC WA/WAU/WS/WSU	P2	501	1001	2001	—	—
RUVAC WH	P2	—	—	—	700	2500
Backing pump SCREWLINE	P1	SP 250	SP 250	SP 250	SP 250	SP 250
	DN ₁	63 ISO-K	100 ISO-K	160 ISO-K	100 ISO-K	250 ISO-K
	DN ₂	63 ISO-K	63 ISO-K	63 ISO-K	63 ISO-K	63 ISO-K
	l	1650 (64.96)	1650 (64.96)	1650 (64.96)	1650 (64.96)	1650 (64.96)
	l ₁	565 (22.24)	565 (22.24)	565 (22.24)	564 (22.21)	664 (26.14)
	l ₂	678 (26.69)	678 (26.69)	678 (26.69)	678 (26.69)	678 (26.69)
	b	863 (33.98)	863 (33.98)	863 (33.98)	863 (33.98)	863 (33.98)
	b ₁	340 (13.39)	340 (13.39)	340 (13.39)	340 (13.39)	340 (13.39)
	b ₂	438 (17.24)	438 (17.24)	438 (17.24)	438 (17.24)	438 (17.24)
	b ₃	680 (26.77)	680 (26.77)	680 (26.77)	680 (26.77)	680 (26.77)
	h	1670 (65.75)	1771 (69.72)	1947 (76.65)	1580 (62.21)	1739 (68.47)
	h ₁	1101 (43.35)	1101 (43.35)	1101 (43.35)	1101 (43.35)	1081 (42.56)
	h ₂	1330 (52.36)	1375 (54.13)	1417 (55.79)	1290 (50.79)	1315 (51.77)

Dimensional drawing of the pump systems with dry compressing SCREWLINE SP 250 backing pump, frame version; dimensions in brackets () are in inch

Technical Data, 50 Hz

RUTA

		WAU 501/ SP250/G	WAU 1001/ SP250/G	WAU 2001/ SP250/G	WH 700/ SP250/G	WH 2500/ SP250/G
RUVAC (WA/WAU/WS/WSU possible)	P2	501	1001	2001	–	–
RUVAC WH	P2	–	–	–	700	2500
Backing pump SCREWLINE	P1	SP 250				
Pumping speed, 50 Hz at 10 ⁻¹ mbar (7.5 x 10 ⁻² Torr)	m ³ /h (cfm)	445 (262)	830.0 (489)	1530 (901)	635 (374)	1680 (988)
Ultimate total pressure without gas ballast	mbar (Torr)	< 1 x 10 ⁻³ (< 0.75 x 10 ⁻³)	< 1 x 10 ⁻³ (< 0.75 x 10 ⁻³)	< 1 x 10 ⁻³ (< 0.75 x 10 ⁻³)	< 1 x 10 ⁻³ (< 0.75 x 10 ⁻³)	< 3 x 10 ⁻³ (< 2.2 x 10 ⁻³)
Installed motor power 400 V, 50 Hz	kW (hp)	9.7 (13.2)	11.5 (15.6)	15.0 (20.4)	9.7 (13.2)	13.5 (18.1)
Electrical power consumption at 10 ⁻¹ mbar (7.5 x 10 ⁻² Torr)	kW (hp)	6.3 (8.6)	6.7 (9.1)	7.6 (10.3)	6.6 (8.9)	7.3 (9.8)
Noise level with silencer at 10 ⁻¹ mbar (7.5 x 10 ⁻² Torr)	dB(A)	74	77	80	75	70
Weight, total, approx.	kg (lbs)	860 (1896)	950 (2097)	1140 (2517)	860 (1896)	1000 (2205)
Connecting flange						
Inlet port	DN ₁	63 ISO-K	100 ISO-K	160 ISO-K	100 ISO-K	250 ISO-K
Outlet port	DN ₂	63 ISO-K	63 ISO-K	63 ISO-K	63 ISO-K	63 ISO-K

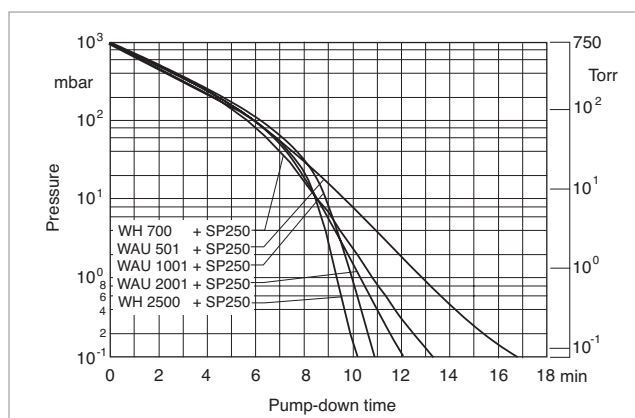
Ordering Information

RUTA

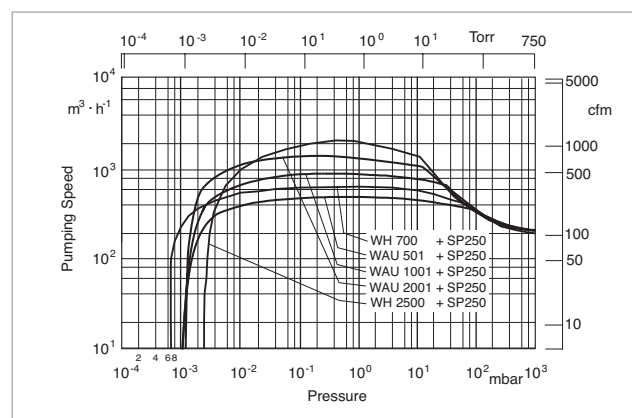
		WAU 501/ SP250/G	WAU 1001/ SP250/G	WAU 2001/ SP250/G	WH 700/ SP250/G	WH 2500/ SP250/G
		Part No.	Part No.	Part No.	Part No.	Part No.
RUVAC (WA/WAU/WS/WSU possible)		WAU 501	WAU 1001	WAU 2001	–	–
RUVAC WH	P2	–	–	–	700	2500
Backing pump SCREWLINE	P1	SP 250				
Pump system, complete (adaptor version), frame mounted, with Roots vacuum pump						
RUVAC WAU		502 531 V001	502 532 V001	502 533 V001	–	–
RUVAC WH		–	–	–	503 154 V001 ¹⁾	503 158 V001 ^{1) 2)}
Frequency converter RUVATRONIC (see description in Chapter “Accessories”)		RT 5/501 500 001 382	RT 5/1001 500 001 383 ²⁾	RT 5/2001 500 001 384 ²⁾	–	–

¹⁾ Including external frequency converter

²⁾ With this combination, continuous operation of the Roots pump is not possible at atmospheric pressure



Pump-down time diagram for a 10 m³ tank at 50 Hz



Pumping speed diagram at 50 Hz

Dry Compressing Vacuum Pump System RUTA with SCREWLINE SP 630 F Backing Pump, Frame Version



RUTA WAU2001/SP630F/G

Standard Equipment

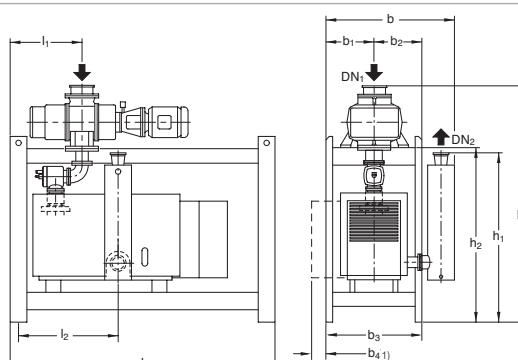
- RUVAC RA with water cooling
- SCREWLINE SP 630 F with water cooling
- Silencer
- SP-GUARD
- Manually operated gas ballast
- SECUVAC valve 24 V DC
- Gear oil collecting pan integrated within the screw pump
- Crane eyes on the frame

- Floor mounting
- Gear oil supplied with the pump
- CE approval

Options

- Frequency converter RUVATRONIC RT for controlling the speed of the Roots pump
- Condensate drain valve at the silencer

- Sound proofing box
- Vibration absorbers
- Castors
- Different types of floor mounts
- Oil drain valve on each pump
- Electric control systems
- Non-return valve
- Screw pump with air cooling



Type	RUTA	3001/SP630F/G	5001/SP630F/G	7001/SP630F/G	9001/SP630F/G
RUVAC RA	P2	3001	5001	7001	9001
Backing pump SCREWLINE	P1	SP 630 F	SP 630 F	SP 630 F	SP 630 F
	DN ₁	250 ISO-K	250 ISO-K	250 ISO-K	320 ISO-K
	DN ₂	100 ISO-K	100 ISO-K	100 ISO-K	100 ISO-K
	l	1960 (77.17)	2400 (94.49)	1960 (77.17)	2340 (92.13)
	l ₁	600 (23.62)	701 (27.60)	600 (23.62)	727 (28.62)
	l ₂	895 (35.24)	995 (39.17)	895 (35.24)	1021 (40.20)
	b	1056 (41.58)	1116 (43.94)	1116 (43.94)	1171 (46.10)
	b ₁	400 (15.75)	460 (18.11)	460 (18.11)	515 (20.28)
	b ₂	546 (21.50)	546 (21.50)	546 (21.50)	546 (21.50)
	b ₃	800 (31.50)	930 (36.61)	920 (36.22)	1030 (40.55)
	h	2025 (79.72)	2215 (87.21)	2156 (84.88)	2235 (87.99)
	h ₁	1388 (54.65)	1388 (54.65)	1388 (54.65)	1388 (54.65)
	h ₂	1411 (55.55)	1411 (55.55)	1411 (55.55)	1411 (55.55)

Dimensional drawing of the pump systems RUTA with dry compressing SCREWLINE SP 630 F backing pump, frame version;
dimensions in brackets () are in inch

Technical Data, 50 Hz

RUTA RA

3001/SP630F/G 5001/SP630F/G 7001/SP630F/G 9001/SP630F/G

RUVAC RA	P2	3001	5001	7001	9001
Backing pump SCREWLINE	P1	SP 630 F			
Pumping speed, 50 Hz at 10^{-1} mbar (7.5×10^{-2} Torr)	m ³ /h (cfm)	3050 (1797)	4040 (2379.6)	5030 (2963)	6000 (3534)
Ultimate total pressure without gas ballast	mbar (Torr)	$< 1 \times 10^{-3}$ ($< 7.5 \times 10^{-4}$)			
Installed motor power 400 V, 50 Hz	kW (hp)	26.0 (35.0)	30.0 (40.0)	33.5 (45.0)	37.0 (50.0)
Electrical power consumption at 10^{-1} mbar (7.5×10^{-2} Torr)	kW (hp)	13.4 (18.2)	13.5 (18.4)	13.6 (18.5)	13.2 (18.0)
Noise level with silencer at 10^{-1} mbar (7.5×10^{-2} Torr)	dB(A)	82	79	82	80
Total weight with palette, approx.	kg (lbs)	1550 (3420)	1900 (4190)	2000 (4410)	2630 (5800)
Connecting flange					
Inlet port	DN ₁	250 ISO-K	250 ISO-K	250 ISO-K	320 ISO-K
Outlet port	DN ₂	100 ISO-K	100 ISO-K	100 ISO-K	100 ISO-K

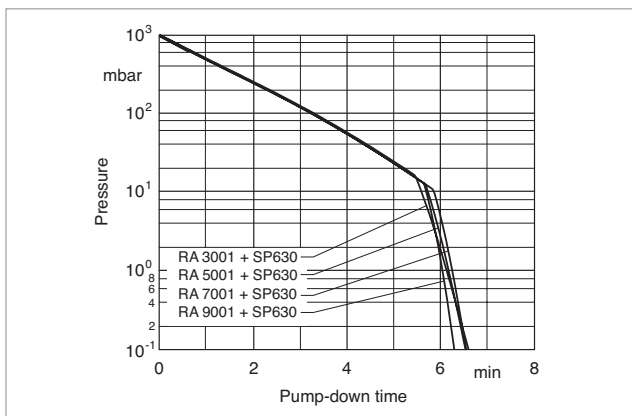
Ordering Information

RUTA RA

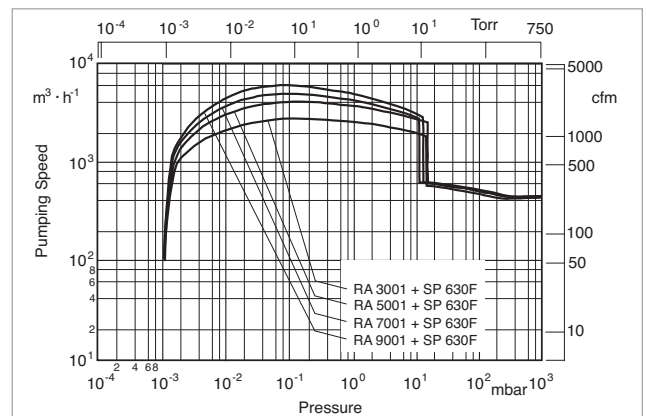
3001/SP630F/G 5001/SP630F/G 7001/SP630F/G 9001/SP630F/G

		Part No.	Part No.	Part No.	Part No.
RUVAC RA	P2	3001	5001	7001	9001
Backing pump SCREWLINE	P1	SP 630 F			
Pump system, complete (adaptor version), frame mounted, with Roots vacuum pump RUVAC RA with air-cooled vacuum pump Screw pump SCREWLINE SP 630		502 512 V001	502 513 V001	502 514 V001	502 515 V001
Frequency converter RUVATRONIC (see description in Chapter "Accessories")		RT 5/3001 500 001 385 ¹⁾	RT 5/5001 500 001 386 ¹⁾	RT 5/7001 500 001 387 ¹⁾	RT 5/9001 500 001 388 ¹⁾

¹⁾ With this combination, continuous operation of the Roots pump is not possible at atmospheric pressure



Pump-down time diagram for a 10 m³ tank at 50 Hz



Pumping speed diagram at 50 Hz

Dry Compressing Vacuum Pump System RUTA with SCREWLINE SP 630 F Backing Pump, Frame Version



RUTA WAU2001/SP630F/G

Standard Equipment

- RUVAC WH with water cooling
- RUVAC WAU with air cooling
- SCREWLINE SP 630 F with water cooling
- Silencer
- SP-GUARD
- Manually operated gas ballast
- SECUVAC valve 24 V DC
- Gear oil collecting pan integrated within the screw pump
- Crane eyes on the frame
- Floor mounting
- Gear oil supplied with the pump
- RUVAC WH including external frequency converter (frequency converter permits pumping speed control)
- CE approval
- Condensate drain valve at the silencer
- Sound proofing box
- Vibration absorbers
- Different types of floor mounts
- Oil drain valve on each pump
- Electric control systems
- Non-return valve
- Screw pump with air cooling

Options

- Frequency converter for controlling the speed of the Roots pump (only RUVAC RA/WA/WS)

Type	RUTA	2001/SP630F/G	2500/SP630F/G	4400/SP630F/G	7000/SP630F/G
RUVAC WA/WAU/WS/WSU	P2	2001	—	—	—
RUVAC WH	P2	—	2500	4400	7000
Backing pump SCREWLINE	P1	SP 630 F	SP 630 F	SP 630 F	SP 630 F
	DN ₁	160 ISO-K	250 ISO-K	250 ISO-K	320 ISO-K
	DN ₂	100 ISO-K	63 ISO-K	100 ISO-K	100 ISO-K
	l	1960 (77.17)	2100 (82.68)	2100 (82.68)	2100 (82.68)
	l ₁	600 (23.62)	819 (32.24)	719 (28.31)	719 (28.31)
	l ₂	895 (35.24)	1012 (39.84)	1012 (39.84)	1012 (39.84)
	b	1056 (41.58)	1068 (42.05)	1068 (42.05)	1068 (42.05)
	b ₁	400 (15.75)	400 (15.75)	400 (15.75)	400 (15.75)
	b ₂	546 (21.50)	548 (21.58)	548 (21.58)	548 (21.58)
	b ₃	800 (31.50)	800 (31.50)	800 (31.50)	800 (31.50)
	h	1784 (70.24)	1834 (72.21)	1915 (75.39)	1923 (75.71)
	h ₁	1388 (54.65)	1388 (54.65)	1388 (54.65)	1388 (54.65)
	h ₂	1254 (49.37)	1410 (55.51)	1410 (55.51)	1410 (55.51)

Dimensional drawing of the pump systems RUTA with dry compressing SCREWLINE SP 630 F backing pump, frame version; dimensions in brackets () are in inch

Technical Data, 50 Hz

RUTA

WAU 2001/SP630F/G WH 2500/SP630F/G WH 4400/SP630F/G WH 7000/SP630F/G

RUVAC (WA/WAU/WS/WSU possible)	P2	2001	–	–	–
RUVAC WH	P2	–	2500	4400	7000
Backing pump SCREWLINE	P1	SP 630 F			
Pumping speed, 50 Hz at 10^{-1} mbar (7.5×10^{-2} Torr)	m ³ /h (cfm)	1745 (1028)	1956 (1151)	3380 (1990)	5093 (2998)
Ultimate total pressure without gas ballast	mbar (Torr)	$< 1 \times 10^{-3}$ ($< 0.75 \times 10^{-3}$)	$< 5 \times 10^{-3}$ ($< 3.7 \times 10^{-3}$)	$< 1 \times 10^{-3}$ ($< 0.75 \times 10^{-3}$)	$< 1 \times 10^{-3}$ ($< 0.75 \times 10^{-3}$)
Installed motor power 400 V, 50 Hz	kW (hp)	22.5 (30.0)	21.5 (28.8)	26.0 (34.9)	26.0 (34.9)
Electrical power consumption at 10^{-1} mbar (7.5×10^{-2} Torr)	kW (hp)	12.0 (16.3)	11.7 (16.7)	12.93 (17.34)	13.11 (17.58)
Noise level with silencer at 10^{-1} mbar (7.5×10^{-2} Torr)	dB(A)	79	73	73	73
Weight, total, approx.	kg (lbs)	1300 (2866)	1300 (2866)	1550 (3417)	1600 (3527)
Connecting flange					
Inlet port	DN ₁	160 ISO-K	250 ISO-K	250 ISO-K	320 ISO-K
Outlet port	DN ₂	100 ISO-K	63 ISO-K	100 ISO-K	100 ISO-K

Ordering Information

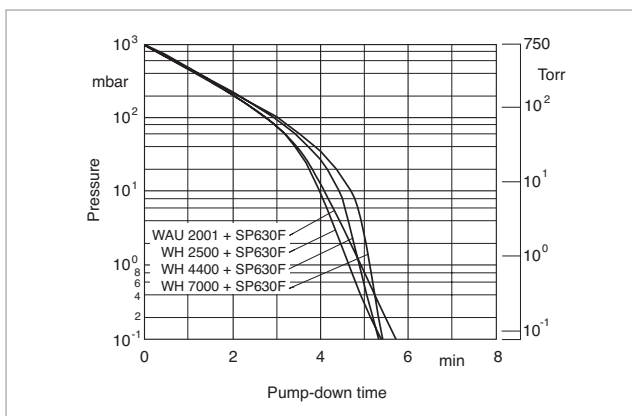
RUTA

WAU 2001/SP630F/G WH 2500/SP630F/G WH 4400/SP630F/G WH 7000/SP630F/G

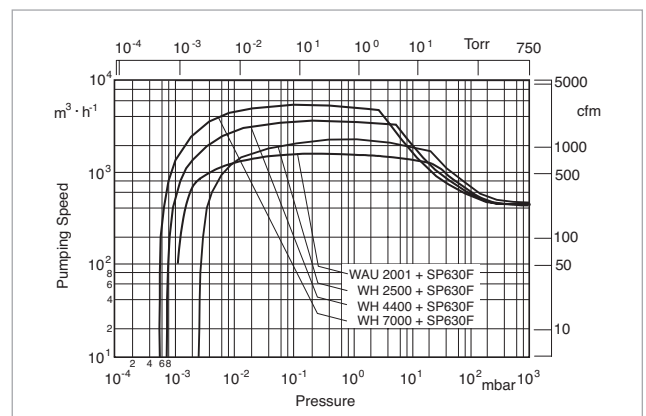
	Part No.	Part No.	Part No.	Part No.
RUVAC (WA/WAU/WS/WSU possible)	WAU 2001	–	–	–
RUVAC WH	P2	–	2500	4400
Backing pump SCREWLINE	P1	SP 630 F		
Pump system, complete (adaptor version), frame mounted, with Roots vacuum pump RUVAC WAU with Roots vacuum pump RUVAC WH	502 511 V001 –	– 503 159 V001 ^{1), 2)}	– 503 163 V001 ^{1), 2)}	– 503 168 V001 ^{1), 2)}
Frequency converter RUVATRONIC (see description in Chapter “Accessories”)	RT 5/2001 500 001 384	– –	– –	– –

¹⁾ Including external frequency converter

²⁾ With this combination, continuous operation of the Roots pump is not possible at atmospheric pressure

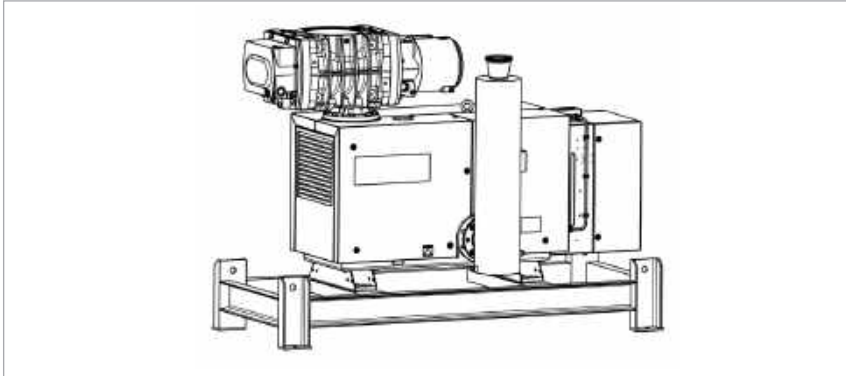


Pump-down time diagram for a 10 m³ tank at 50 Hz



Pumping speed diagram at 50 Hz

Dry Compressing Vacuum Pump System RUTA with SCREWLINE SP 630 F Backing Pump, Adaptor Version



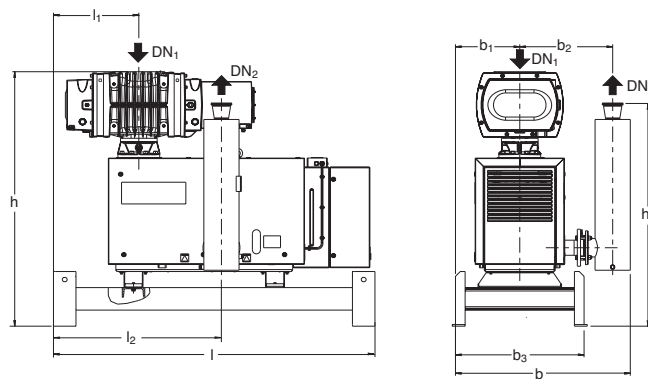
RUTA WH2500/SP630F/A

Standard Equipment

- RUVAC WH with water cooling
- SCREWLINE SP 630 F with water cooling
- Silencer
- SP-GUARD
- Manually operated gas ballast
- SECUVAC valve 24 V DC
- Gear oil collecting pan integrated within the screw pump
- Crane eyes on the frame
- Floor mounting
- Gear oil supplied with the pump
- RUVAC WH including external frequency converter (frequency converter permits pumping speed control)
- Sound proofing box
- Vibration absorbers
- Different types of floor mounts
- Oil drain valve on each pump
- Electric control systems
- Non-return valve
- Screw pump with air cooling

Options

- Condensate drain valve at the silencer



Type	RUTA	2001/SP630F/A
RUVAC WH	P2	2500
Backing pump SCREWLINE	P1	SP 630 F
	DN ₁	250 ISO-K
	DN ₂	100 ISO-K
	l	431 (16.97)
	l ₁	1045 (41.14)
	l ₂	2000 (78.74)
	b	1088 (42.84)
	b ₁	400 (15.75)
	b ₂	578 (22.76)
	b ₃	800 (31.50)
	h	1473 (57.99)
	h ₁	1388 (54.65)

Dimensional drawing of the pump system with dry compressing SCREWLINE SP 630 F backing pump, adaptor version; dimensions in brackets () are in inch

Technical Data, 50 Hz

RUTA WH 2500/SP630F/A

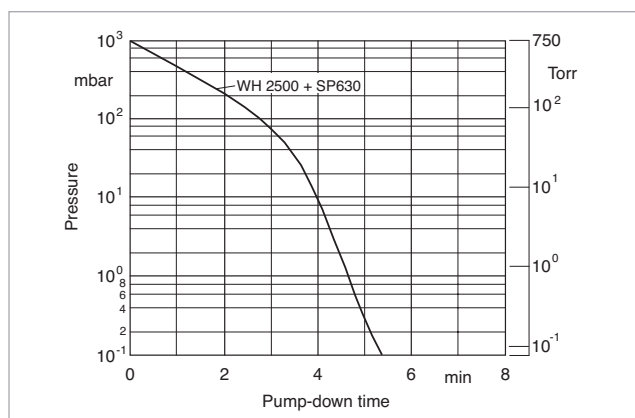
RUVAC WH	P2	2500
Backing pump SCREWLINE	P1	SP 630 F
Pumping speed, 50 Hz at 10^{-1} mbar (7.5×10^{-2} Torr)	m ³ /h (cfm)	1956 (1151)
Ultimate total pressure without gas ballast	mbar (Torr)	$< 5 \times 10^{-3}$ ($< 3.7 \times 10^{-3}$)
Installed motor power 400 V, 50 Hz	kW (hp)	21.5 (28.8)
Electrical power consumption at 10^{-1} mbar (7.5×10^{-2} Torr)	kW (hp)	11.7 (16.7)
Noise level with silencer at 10^{-1} mbar (7.5×10^{-2} Torr)	dB(A)	73
Weight, total, approx.	kg (lbs)	1200 (2645)
Connecting flange		
Inlet port	DN ₁	250 ISO-K
Outlet port	DN ₂	100 ISO-K

Ordering Information

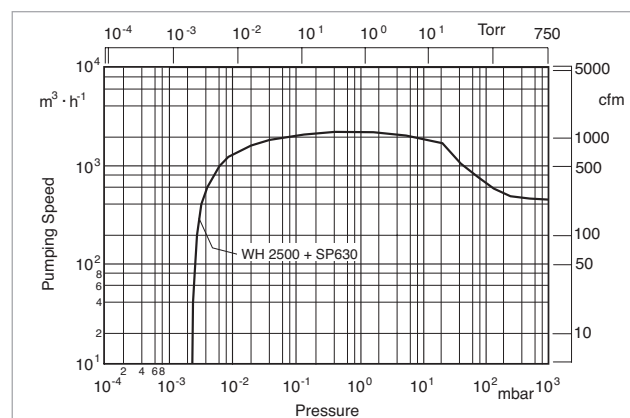
RUTA WH 2500/SP630F/A

		Part No.
RUVAC WH	P2	2500
Backing pump SCREWLINE	P1	SP 630 F
Pump system, complete (adaptor version), pallet mounted, with Roots vacuum pump RUVAC WH		503 160 V001 ¹⁾

¹⁾ Including external frequency converter



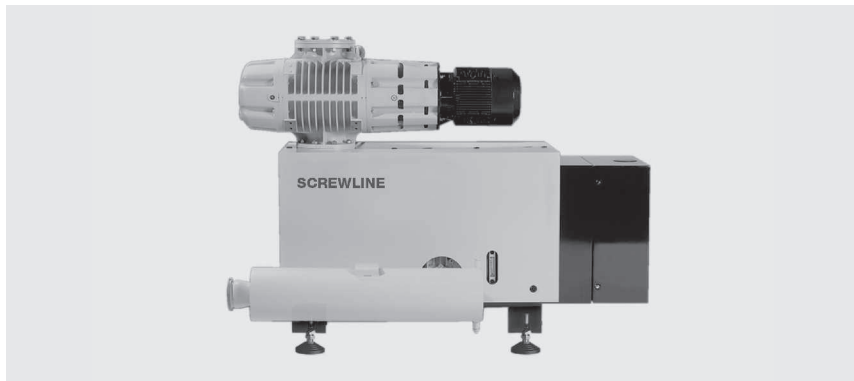
Pump-down time diagram for a 10 m³ tank at 50 Hz



Pumping speed diagram at 50 Hz

Pump Systems (Only available for purchase in North and South America)

SP Close-Coupled Systems with SP Dry Compressing Backing Pumps



SP close-coupled system

Advantages to the User

- Reduced maintenance and lower operating costs
- Compact close-coupled design without frame
- Oil-free compression in multiple pump stages
- Optimum leak tightness with WSU boosters
- Air-cooled
- Assembled and tested

Standard Equipment

- SCREWLINE SP 630 / WSU 1001 close-coupled pump system offering 645 ACFM at 0.3 Torr vacuum
- SCREWLINE SP 630 / WSU2001 close-coupled pump system offering 1235 ACFM at 0.3 Torr vacuum

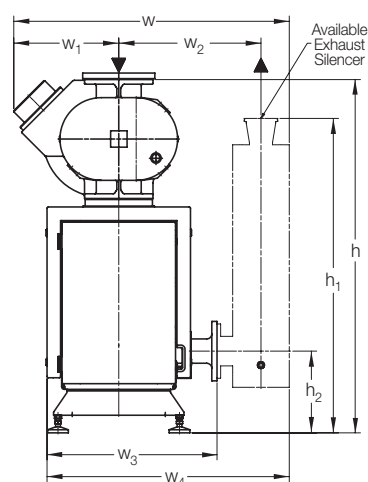
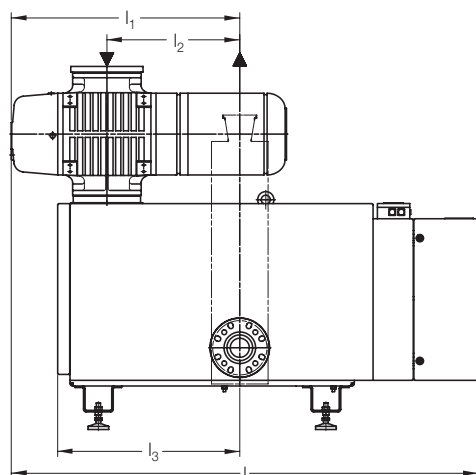
Options

- Electrical controls
- Exhaust silencer (loose)
- Inlet filter (loose)

The screw pump SCREWLINE SP 630 dry compressing screw-type vacuum pump is an environmentally friendly alternative to traditional oil sealed rotary piston and vane vacuum pumps. This innovative and robust vacuum pump produces a pumping speed of 371 cfm and better than 0.0075 Torr vacuum. SP 630 major advantages include improved environment, reduced maintenance, lower operating costs through less disposal and the elimination of expensive water cooling all with no oil contamination as the need for lubricating oil in the pumps' compression stage has been eliminated.

When used in conjunction with the Leybold WSU booster pumps, pumping speeds can be significantly increased while achieving oil-free compression in multiple vacuum pump stages.

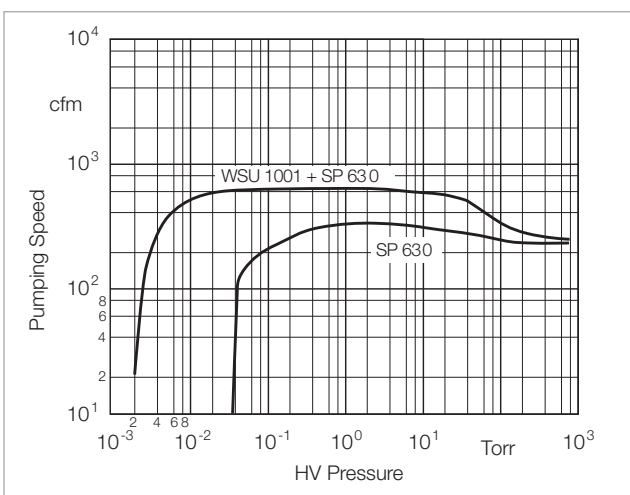
Leybold WSU boosters offer a canned motor design, which eliminates the need for shaft seals and flanged-on motors. A vacuum tight can separates the motor rotor and stator coils. This unique Leybold design provides the advantage of a more leak tight vacuum system. The WSU version booster incorporates a by-pass valve feature, which allows for automatic adjustment to varying pressure differentials between the inlet and outlet of the pump. The result is elimination of costly pressure switches/ amplifiers and faster pump down while starting at atmospheric pressure with the aforementioned SP 630 vacuum pump.



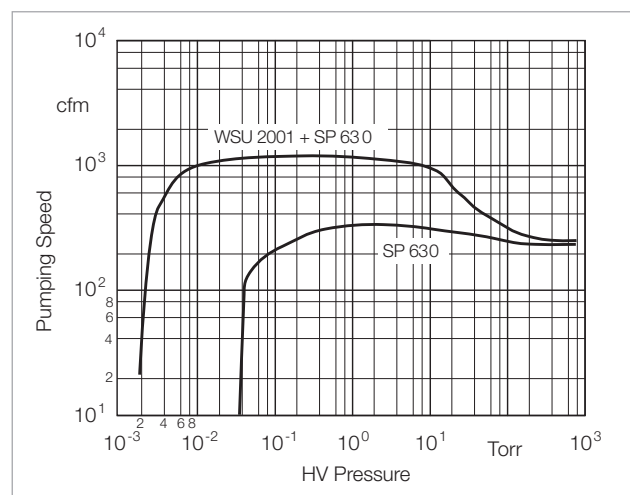
Roots Pump	Vane Pump	h	h ₁	h ₂	l	l ₁	l ₂
WSU 1001	SP 630	50 1/4 (1276)	47 7/8 (1216)	12 7/16 (316)	68 1/2 (1740)	32 3/16 (818)	20 1/4 (514)
WSU 2001	SP 630	53 25/32 (1366)	47 7/8 (1216)	12 7/16 (316)	71 5/32 (1807)	34 13/16 (884)	20 1/4 (514)

Roots Pump	Vane Pump	l ₃	w	w ₁	w ₂	w ₃	w ₄
WSU 1001	SP 630	27 3/4 (705)	37 31/32 (964)	12 (305)	21 21/32 (550)	25 7/8 (657)	36 29/32 (937)
WSU 2001	SP 630	27 3/4 (705)	41 31/32 (1066)	16 (406)	21 21/32 (550)	25 7/8 (657)	36 29/32 (937)

Dimensional drawing for the SP close-coupled system with SCREWLINE SP 630 dry compressing backing pumps; dimensions in brackets () are in mm



Pumping speed diagram for the SP close-coupled system with WSU 1001 Roots blower and SCREWLINE SP 630 at 60 Hz



Pumping speed diagram for the SP close-coupled system with WSU 2001 Roots blower and SCREWLINE SP 630 at 60 Hz

Technical Data, 50 Hz

SP Close-Coupled Systems

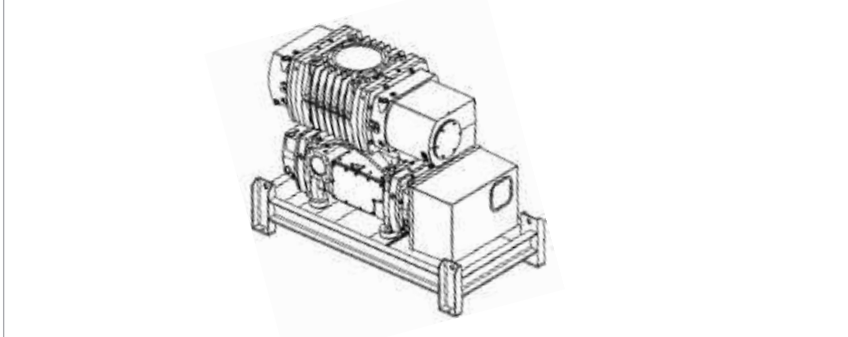
		1001/SP630	2001/SP630
RUVAC (WSU possible)	P2	1001	2001
Backing pump SCREWLINE	P1	SP 630 F	
Pumping speed 60 Hz at 0.3 Torr	m ³ /h (cfm)	1.092 (643)	2.085 (1,227)
Ultimate total pressure without gas ballast	mbar (Torr)	< 1 x 10 ⁻³ (< 7.5 x 10 ⁻⁴)	
Installed motor power	kW (hp)	16.2 (21.6)	22.5 (30.0)
Noise level with silencer at 10 ⁻¹ mbar (7.5 x 10 ⁻² Torr)	dB(A)	78	79
Weight, total, approx.	kg (lbs)	870 (1922)	1100 (2430)
Connecting flange			
Inlet port	DN ₁	160 ISO-K	
Outlet port	DN ₂	100 ISO-K	

Ordering Information

SP Close-Coupled Systems

		1001/SP630	2001/SP630
		Part No.	
RUVAC (WSU possible)	P2	1001	2001
Backing pump SCREWLINE	P1	SP 630 F	
Pump system, complete (adaptor version), pallet mounted, with Roots vacuum pump RUVAC WAU		180 038 V1600	180 038 V2600

Dry Compressing Vacuum Pump System RUTA with DRYVAC DV 650 Backing Pump, Adaptor Version



RUTA WH4400/DV650/A

Standard Equipment

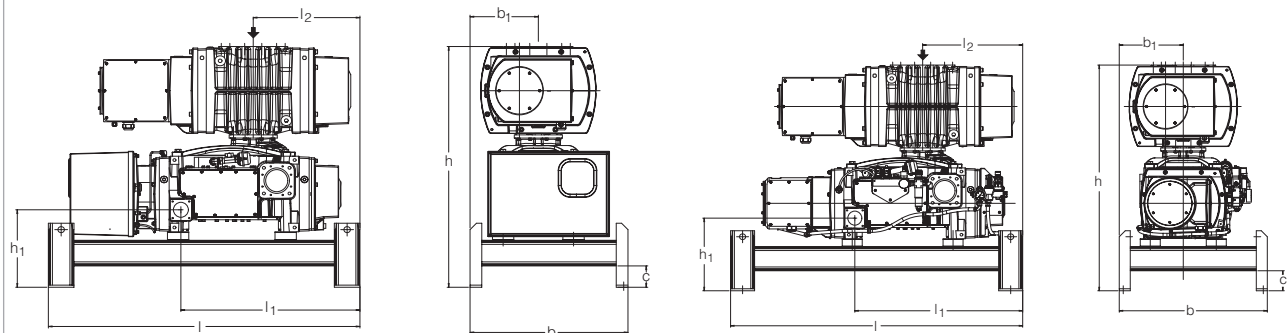
- RUVAC WH and DRYVAC with water cooling
- DRYVAC DV with built-in frequency converter
- DRYVAC DV-r including external frequency converter
- RUVAC WH including external frequency converter (frequency converter permits pumping speed control)
- Hermetically sealed
- Integrated protection functions (discharge pressure, temperatures and current consumption)

- Innovative motor design with efficiency class IE2
- Gas ballast with manual valve
- Leak detection port
- Lubricant: synthetic oil (LVO 210)

Options

- Exhaust silencer
- Bus interface
- Non-return valve for DRYVAC

- Seal gas connection
- Gear chamber evacuation RUVAC WH
- Frequency converter for RUVAC pump
- Electrical controller
- Oil drain tap
- Cooling water monitoring
- Quick couplings for water connections, blocking on both sides
- Frame



Type	RUTA	WH4400/DV650/A	WH4400/DV650-r/A
RUVAC WH	P2	4400	4400
Backing pump DRYVAC DV	P1	650	650-r
	DN ₁	250 ISO-K	250 ISO-K
	DN ₂	100 ISO-K	100 ISO-K
	l	1460 (57.48)	1460 (57.48)
	l ₁	839 (33.03)	839 (33.03)
	l ₂	500 (19.69)	500 (19.69)
	b	740 (29.13)	740 (29.13)
	b ₁	320 (12.60)	320 (12.60)
	c	100 (3.94)	100 (3.94)
	h	1128 (44.41)	1128 (44.41)
	h ₁	363 (14.29)	363 (14.29)

Dimensional drawing of the pump system with dry compressing DRYVAC DV 650 (left) and DV 650-r (right) backing pump, adaptor version; dimensions in brackets () are in inch

Technical Data, 50 Hz

RUTA WH

4400/DV650/A

4400/DV650-r/A

RUVAC WH	P2	4400	
Backing pump DRYVAC DV	P1	650	650-r
Pumping speed, 50 Hz at 10^{-1} mbar (7.5×10^{-2} Torr)	m ³ /h (cfm)	3400 (2000)	
Ultimate total pressure without gas ballast	mbar (Torr)	< 5.0×10^{-4} (3.8×10^{-4})	
Installed motor power 400 V, 50 Hz	kW (hp)	26.0 (34.9)	
Electrical power consumption at 10^{-1} mbar (7.5×10^{-2} Torr)	kW (hp)	9.3 (12.5)	
Noise level with silencer at 10^{-1} mbar (7.5×10^{-2} Torr)	dB(A)	< 68	
Weight, total, approx.	kg (lbs)	1550 (3417)	
Connecting flange			
Inlet port	DN ₁	250 ISO-K	
Outlet port	DN ₂	100 ISO-K	

Ordering Information

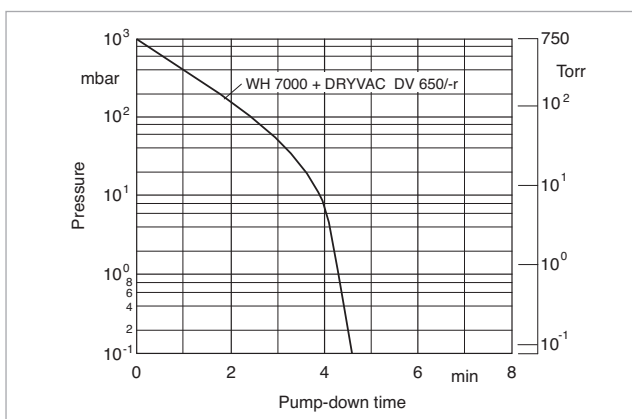
RUTA WH

4400/DV650/A

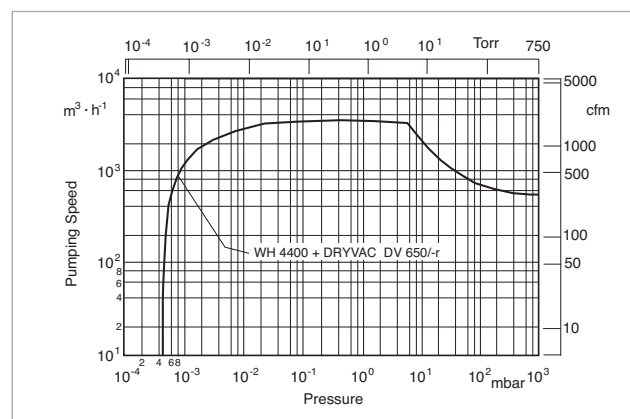
4400/DV650-r/A

		Part No.	Part No.
RUVAC WH	P2	4400	
Backing pump DRYVAC DV		650	650-r
Pump system, complete (adaptor version), pallet mounted, with Roots vacuum pump RUVAC WH		503 166 V001 ¹⁾	503 167 V001 ¹⁾

¹⁾ Including external frequency converter

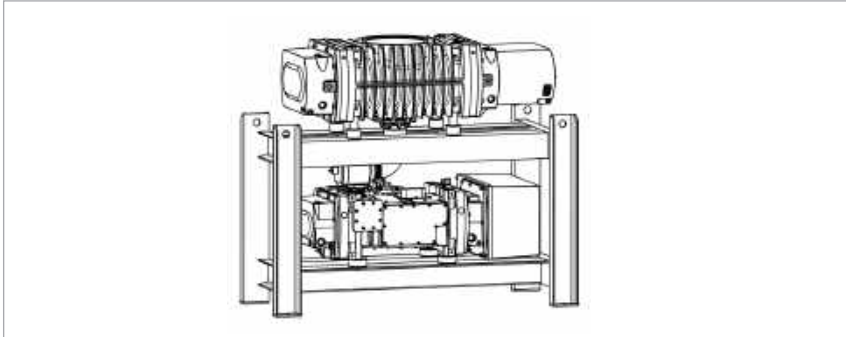


Pump-down time diagram for a 10 m³ tank at 50 Hz



Pumping speed diagram at 50 Hz

Dry Compressing Vacuum Pump System RUTA with DRYVAC DV 650 Backing Pump, Frame Version



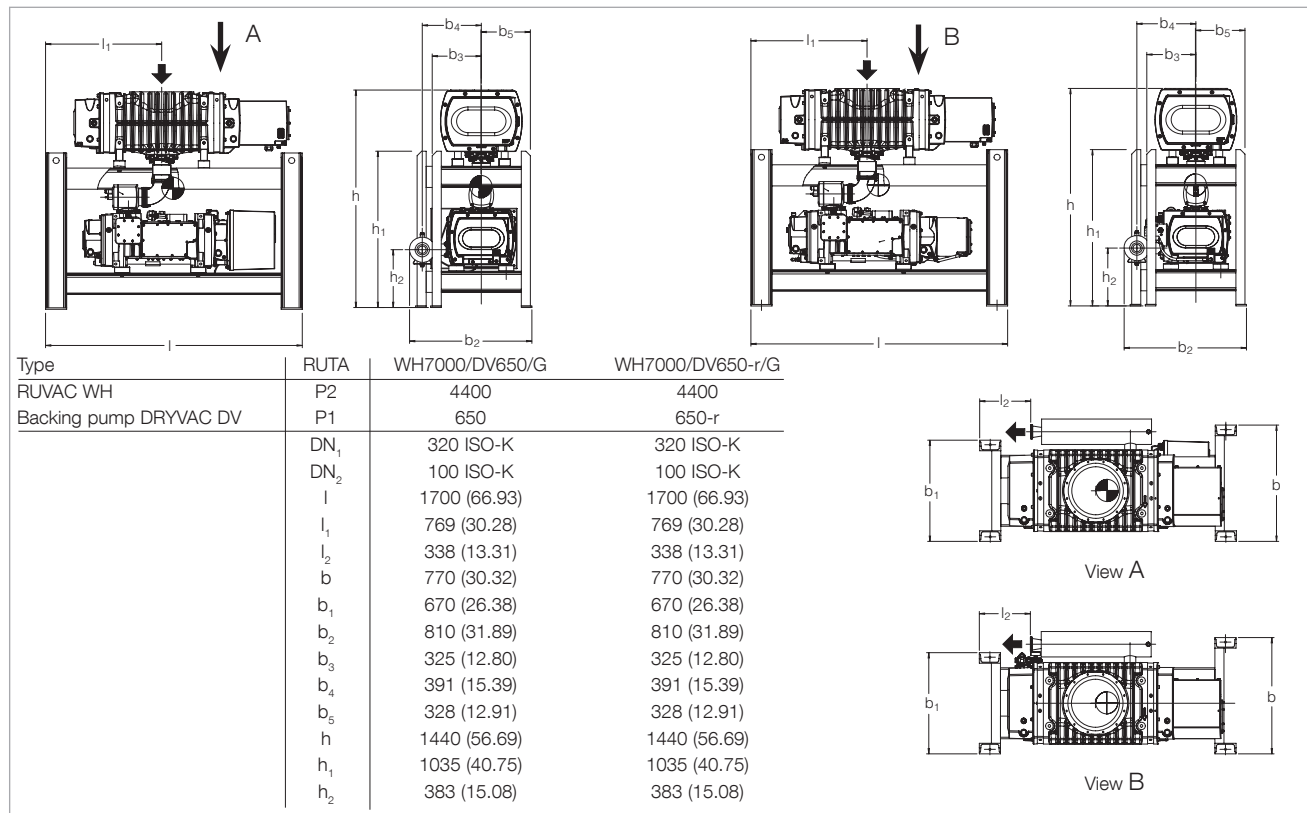
RUTA WH7000/DV650/G

Standard Equipment

- RUVAC WH and DRYVAC with water cooling
- DRYVAC DV with built-in frequency converter
- DRYVAC DV-r including external frequency converter
- RUVAC WH including external frequency converter (frequency converter permits pumping speed control)
- Hermetically sealed
- Integrated protection functions (discharge pressure, temperatures and current consumption)
- Innovative motor design with efficiency class IE2
- Gas ballast with manual valve
- Leak detection port
- Lubricant: synthetic oil (LVO 210)
- SECUVAC valve 24 V DC
- Gear chamber evacuation RUVAC WH
- Electrical controller
- Oil drain tap
- Cooling water monitoring
- Quick couplings for water connections, blocking on both sides

Options

- Exhaust silencer
- Bus interface
- Non-return valve for DRYVAC
- Seal gas connection



Dimensional drawing of the pump system with dry compressing DRYVAC DV 650 (left) and DV 650-r (right) backing pump, frame version; dimensions in brackets () are in inch; (shown with optional silencer)

Technical Data, 50 Hz

RUTA WH

7000/DV650/A

7000/DV650-r/A

RUVAC WH	P2	7000	
Backing pump DRYVAC DV	P1	650	650-r
Pumping speed, 50 Hz at 10^{-1} mbar (7.5×10^{-2} Torr)	m ³ /h (cfm)	5100 (3001)	
Ultimate total pressure without gas ballast	mbar (Torr)	< 5.0×10^{-4} (3.8×10^{-4})	
Installed motor power 400 V, 50 Hz	kW (hp)	26.0 (34.9)	
Electrical power consumption at 10^{-1} mbar (7.5×10^{-2} Torr)	kW (hp)	9.36 (12.56)	
Noise level with silencer at 10^{-1} mbar (7.5×10^{-2} Torr)	dB(A)	< 68	
Weight, total, approx.	kg (lbs)	1600 (3527)	
Connecting flange			
Inlet port	DN ₁	320 ISO-K	
Outlet port	DN ₂	100 ISO-K	

Ordering Information

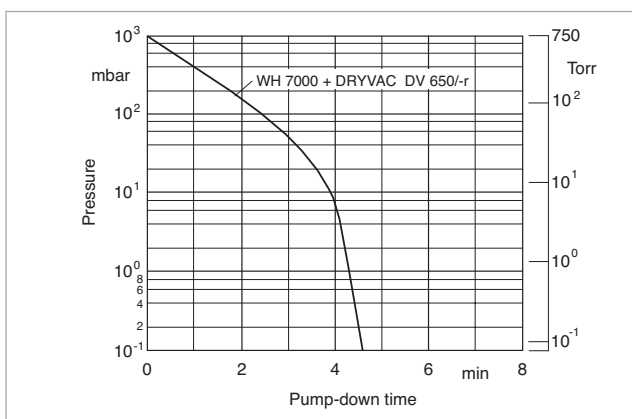
RUTA WH

7000/DV650/A

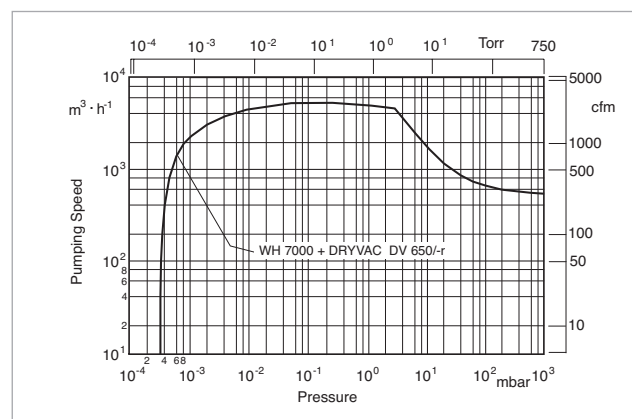
7000/DV650-r/A

		Part No.	Part No.
RUVAC WH	P2	7000	
Backing pump DRYVAC DV	P1	650	650-r
Pump system, complete (frame version), frame mounted, with Roots vacuum pump RUVAC WH		503 170 V001 ¹⁾	503 171 V001 ¹⁾

¹⁾ Including external frequency converter

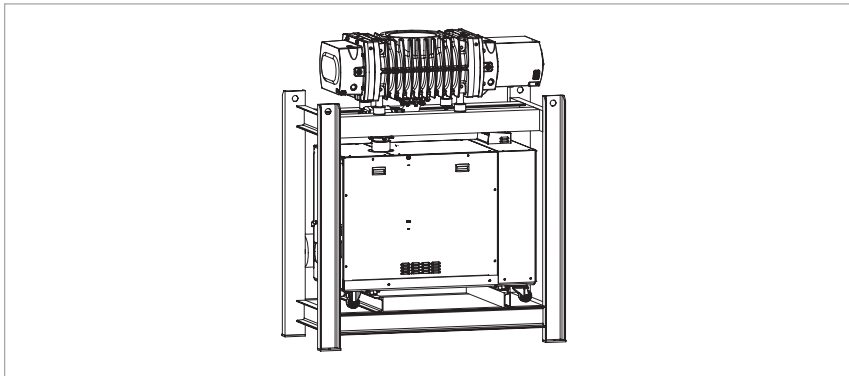


Pump-down time diagram for a 10 m³ tank at 50 Hz



Pumping speed diagram at 50 Hz

Dry Compressing Vacuum Pump System RUTA with DRYVAC DV 1200 Backing Pump, Frame Version



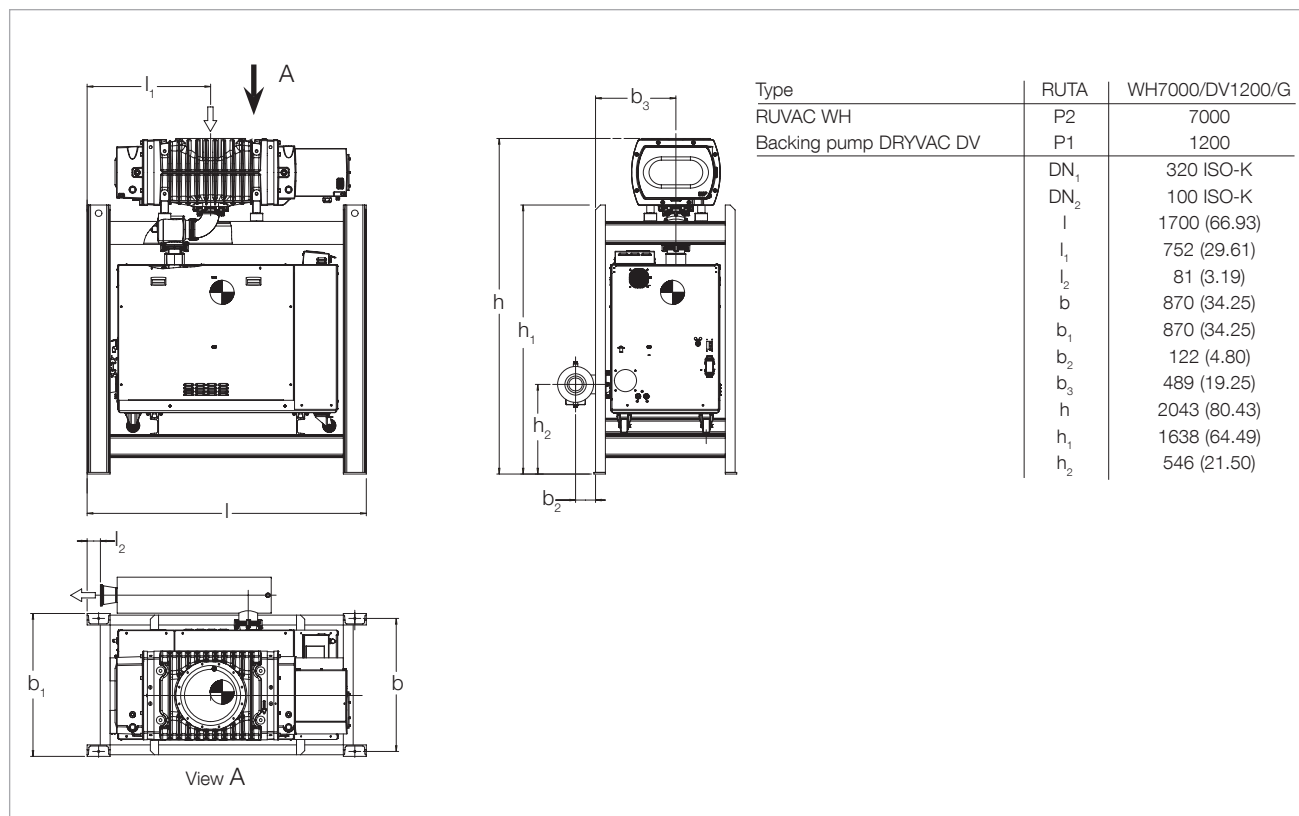
RUTA WH7000/DV1200/G

Standard Equipment

- RUVAC WH and DRYVAC with water cooling
- DRYVAC DV 1200 with built-in frequency converter
- RUVAC WH with water cooling and external frequency converter
- Hermetically sealed
- Integrated protection functions (discharge pressure, temperatures and current consumption)
- Innovative motor design with efficiency class IE2
- Gas ballast with electropneumatic valve 24 V DC
- Integrated valve 24 V DC for seal gas supply
- Leak detection port
- Control via Profibus (DRYVAC)
- Lubricant: synthetic oil (LVO 210)

Options

- Exhaust silencer
- Bus interface
- Non-return valve for DRYVAC
- Seal gas connection
- Gear chamber evacuation
- Electrical controller
- Oil drain tap
- Cooling water monitoring
- Quick couplings for water connections, blocking on both sides



Dimensional drawing of the pump system with dry compressing DRYVAC DV 1200, frame version; dimensions in brackets () are in inch

Technical Data, 50 Hz

RUTA WH 7000/DV1200/G

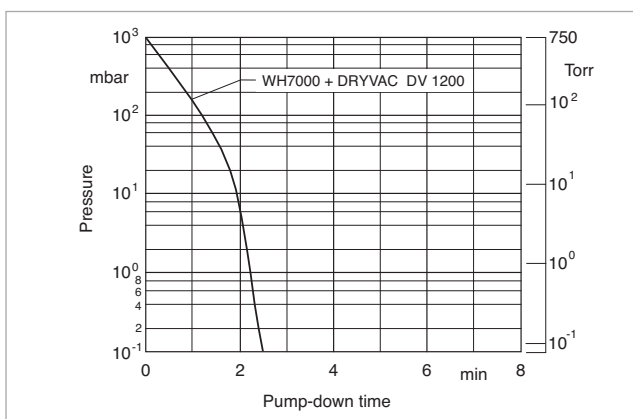
RUVAC WH	P2	7000
Backing pump DRYVAC DV	P1	1200
Pumping speed, 50 Hz at 10^{-1} mbar (7.5×10^{-2} Torr)	m ³ /h (cfm)	5537 (3259)
Ultimate total pressure without gas ballast	mbar (Torr)	$< 6.0 \times 10^{-4}$ (4.5×10^{-4})
Installed motor power 400 V, 50 Hz	kW (hp)	41.0 (55)
Electrical power consumption at 10^{-1} mbar (7.5×10^{-2} Torr)	kW (hp)	16.2 (21.7)
Noise level with silencer at 10^{-1} mbar (7.5×10^{-2} Torr)	dB(A)	< 68
Weight, total, approx.	kg (lbs)	2450 (5410)
Connecting flange		
Inlet port	DN ₁	320 ISO-K
Outlet port	DN ₂	100 ISO-K

Ordering Information

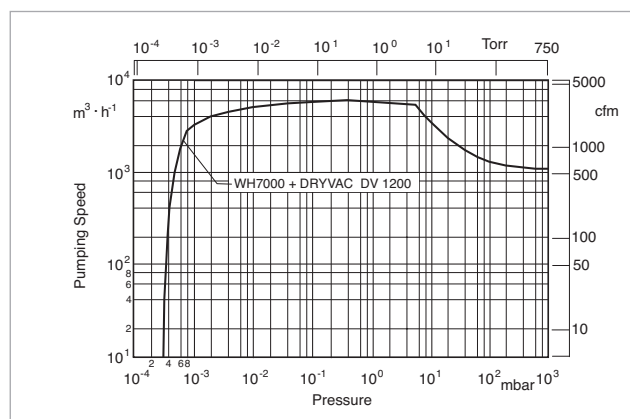
RUTA WH 7000/DV1200/G

		Part No.
RUVAC WH	P2	7000
Backing pump DRYVAC DV	P1	1200
Pump system, complete (frame version), frame mounted, with Roots vacuum pump RUVAC WH		503 172 V001 ¹⁾

¹⁾ Including external frequency converter

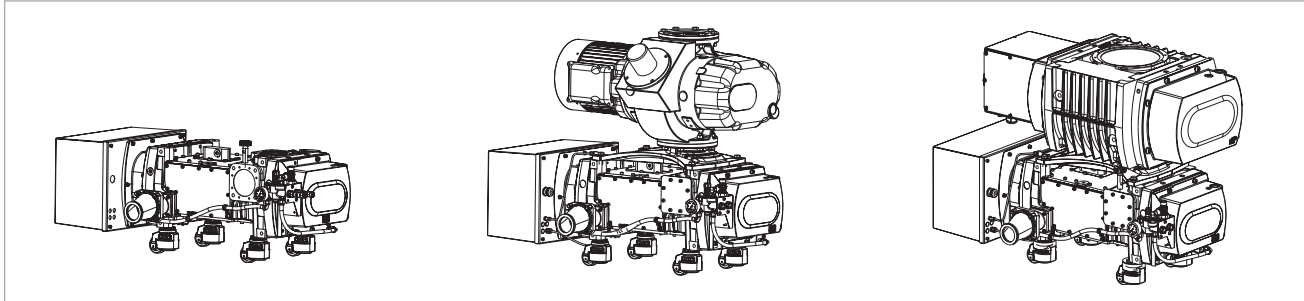


Pump-down time diagram for a 10 m³ tank at 50 Hz



Pumping speed diagram at 50 Hz

DRYVAC Load Lock Pump Systems Adaptor Version



DRYVAC load lock pump system RUTA DV650S (left), RUTA WSU2001/DV650S/A (middle) and RUTA WHU4400/DV650S/A (right)

Standard Equipment

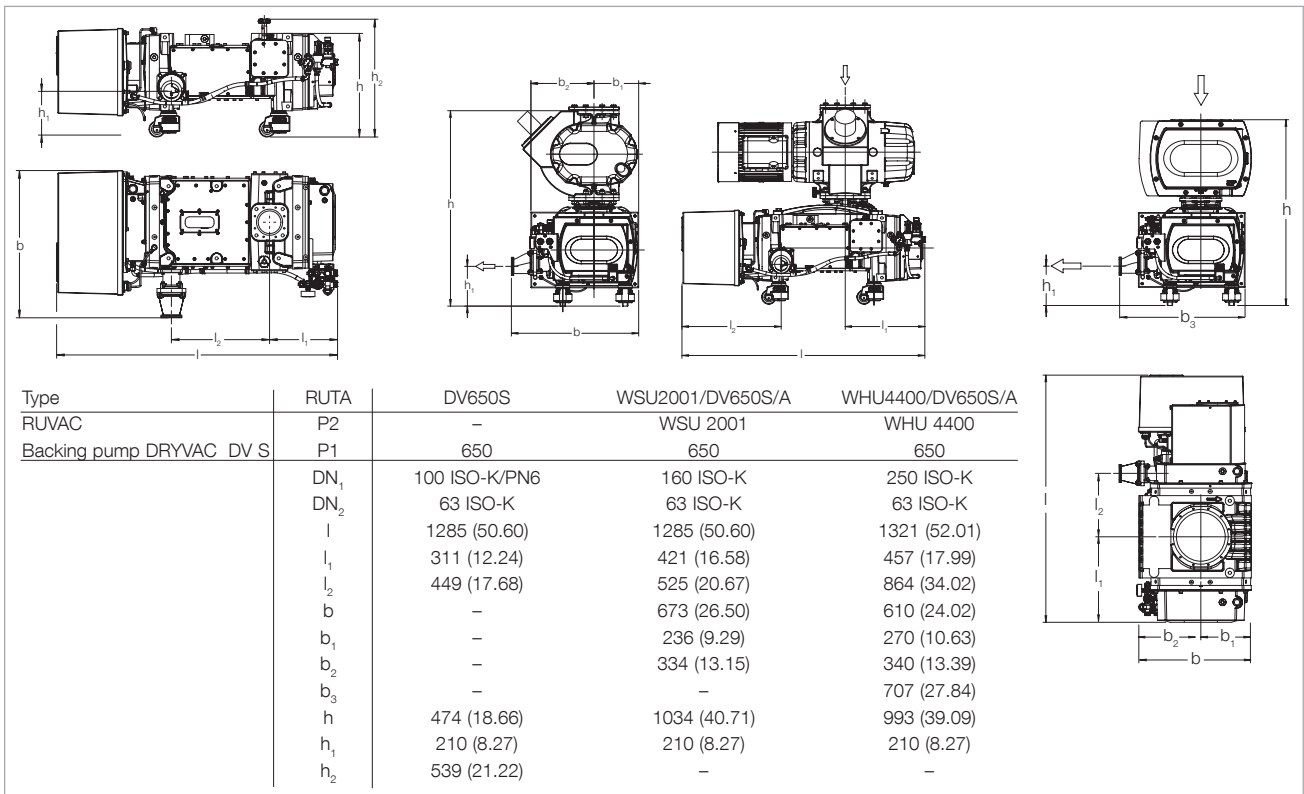
- DRYVAC DV S and RUVAC WHU with water cooling
- RUVAC WSU with air cooling
- Rollable pump system with locking foot
- Hermetically sealed
- Integrated protection functions (discharge pressure, temperatures and current consumption)
- Relay module (digital I/O)
- Non-return valve

- Leak detection port
- Lubricant: synthetic oil (LVO 400/410)

Options

- Exhaust silencer
- Bus interface
- Seal gas connection
- Gear chamber evacuation

- RUVAC WAU
- Frequency converter for RUVAC pump
- Electrical controller
- Oil drain valve
- Cooling water monitoring
- Quick couplings for water connections, blocking on both sides
- Frame



Dimensional drawing of the load lock pump systems with dry compressing DRYVAC backing pump, adaptor version:

RUTA DV650S (left), RUTA WSU2001/DV650S/A (middle) and RUTA WHU4400/DV650S/A (right); dimensions in brackets () are in inch

Technical Data

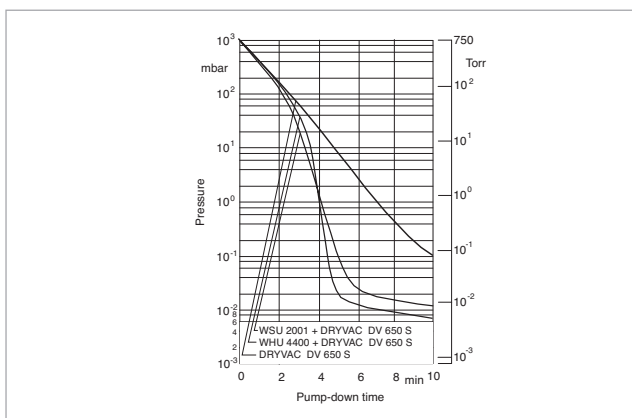
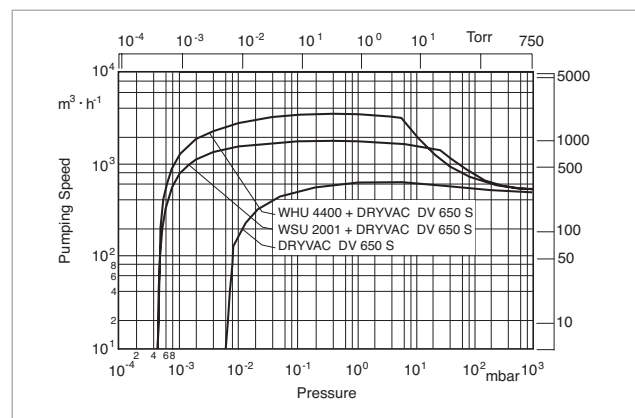
RUTA

		DV650S	WSU2001/DV650S/A	WHU4400/DV650S/A
RUVAC WSU/WHU (WAU possible)	P2	–	WSU 2001	WHU 4400
Backing pump DRYVAC DV S on castors	P1	650		
Pumping speed, 50 Hz at 10^{-1} mbar (7.5×10^{-2} Torr)	m ³ /h (cfm)	520 (306)	1760 (1036)	3400 (2000)
Ultimate total pressure without gas ballast	mbar (Torr)	$< 5.0 \times 10^{-3}$ (3.8×10^{-3})	$< 5.0 \times 10^{-4}$ (3.8×10^{-4})	$< 5.0 \times 10^{-4}$ (3.8×10^{-4})
Installed motor power, 3-ph. 380–480 V, 50/60 Hz	kW (hp)	15.0 (20.4)	–	–
400–460 V, 50/60 Hz	kW (hp)	–	22.5 (30.6)	33.5 (45.6)
Electrical power consumption at 10^{-1} mbar (7.5×10^{-2} Torr)	kW (hp)	6.9 (9.4)	8.4 (11.4)	9.3 (12.6)
Noise level with permanently attached exhaust line at ultimate total pressure	dB(A)	65	70	70
Operating agent	LVO	410	400 / 410	400 / 410
Total oil filling, approx.	l (imp qt)	1.2 (1.05)	4.2 (3.0 / 1.2) 3.65 (2.6 / 1.05)	5.95 (4.75 / 1.2) 5.25 (4.2 / 1.05)
Total weight, approx.	kg (lbs)	590 (1300)	1100 (2425)	1350 (2976)
Permissible ambient temperature	°C	+5 to +50	+12 to +40	+10 to +40
Connecting flange				
Inlet port				
top	1 x DN ₁	100 ISO-K	160 ISO-K	250 ISO-K
side	2 x DN ₁	PN6	–	–
Outlet port	DN ₂	63 ISO-K	63 ISO-K	63 ISO-K

Ordering Information

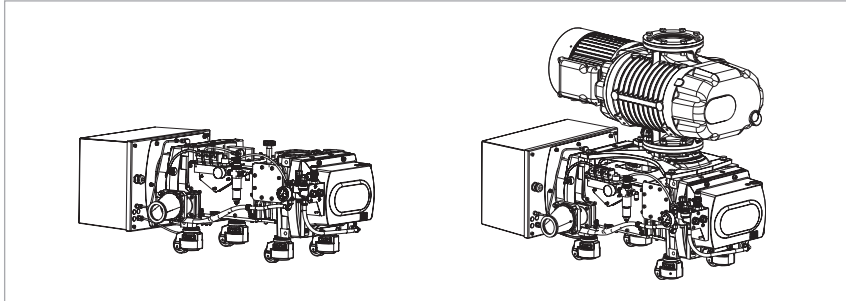
RUTA

		DV650S	WSU2001/DV650S/A	WHU4400/DV650S/A
		Part No.	Part No.	Part No.
RUVAC WSU/WHU	P2	–	WSU 2001	WHU 4400
Backing pump DRYVAC DV S on castors	P1	650		
Load lock pump system, complete (adaptor version) with Roots vacuum pump RUVAC		503 261 V001	503 255 V001	503 256 V001


 Pump-down time diagram for a 10 m³ tank at 50 Hz


Pumping speed diagram at 50 Hz

DRYVAC Process Pump Systems Adaptor Version



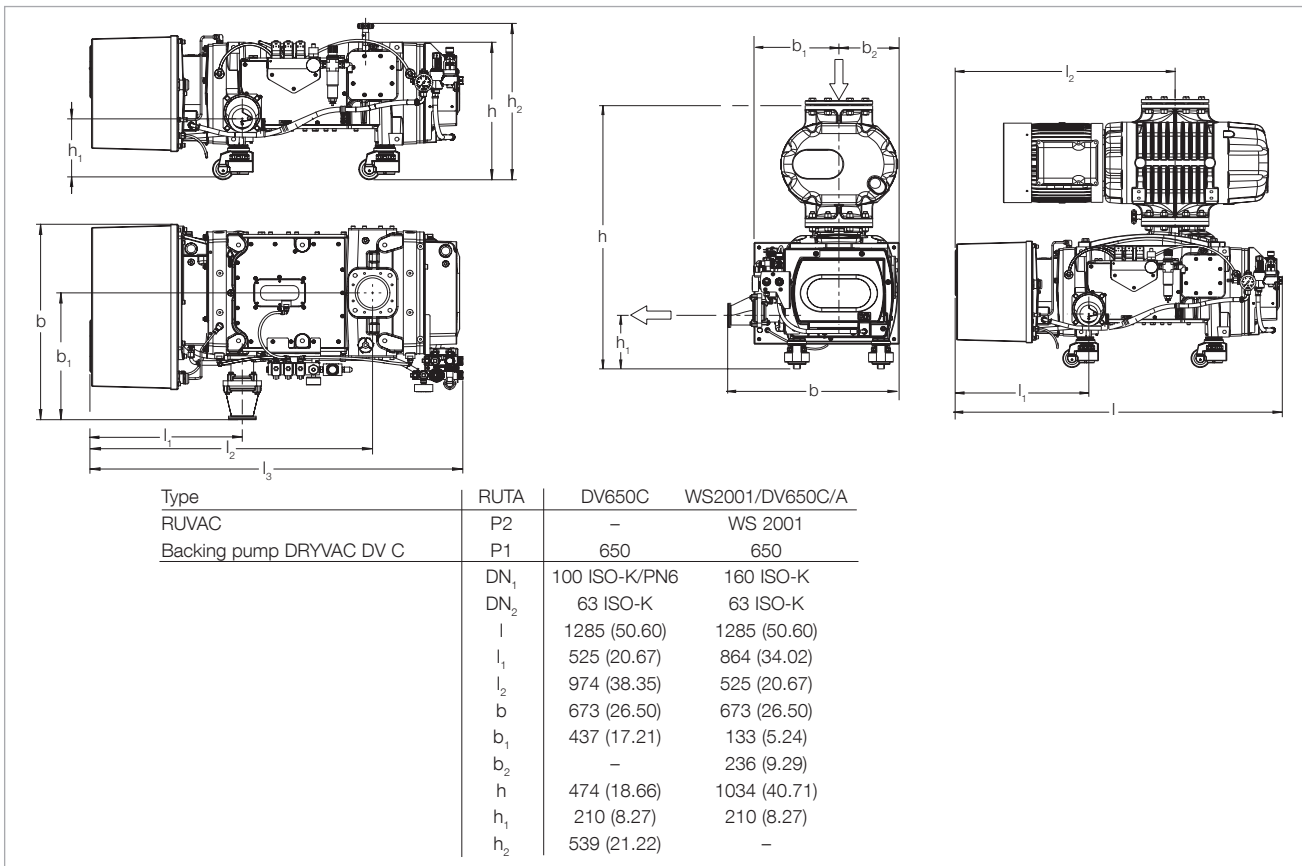
DRYVAC process pump system RUTA DV650C (left) and RUTA WS2001/DV650C/A (right)

Standard Equipment

- DRYVAC DV C with water cooling
- RUVAC WS with air cooling
- Rollable pump system with locking foot
- Hermetically sealed
- Seal gas module, threefold
- Integrated protection functions (discharge pressure, temperatures and current consumption)
- Relay module (digital I/O)
- Non-return valve
- Leak detection port
- Lubricant: synthetic oil (LVO 400/410)

Options

- Exhaust silencer
- Bus interface
- Gear chamber evacuation
- Electrical controller
- Oil drain valve
- Cooling water monitoring
- Quick couplings for water connections, blocking on both sides
- Frame



Dimensional drawing of the process pump systems with dry compressing DRYVAC backing pump, adaptor version:
RUTA DV650C (left) and RUTA WS2001/DV650C/A (right); dimensions in brackets () are in inch

Technical Data

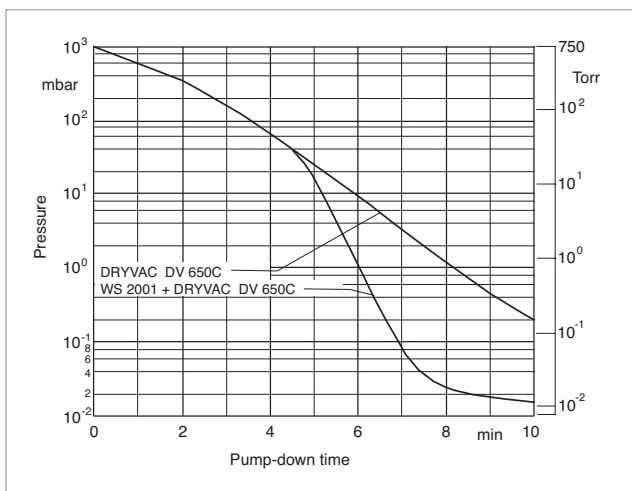
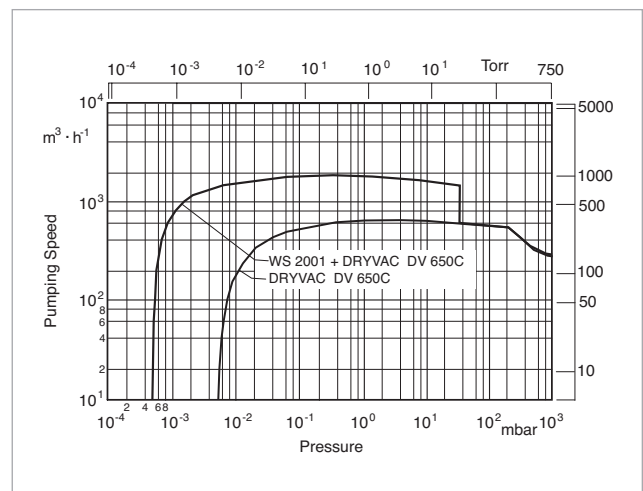
RUTA

		DV650C	WS2001/DV650C/A
RUVAC WS	P2	–	2001
Backing pump DRYVAC DV S on castors	P1	650	
Pumping speed, 50 Hz at 10^{-1} mbar (7.5×10^{-2} Torr)	m ³ /h (cfm)	520 (306)	1760 (1036)
Ultimate total pressure without gas ballast	mbar (Torr)	$< 5.0 \times 10^{-3}$ (3.8×10^{-3})	$< 5.0 \times 10^{-4}$ (3.8×10^{-4})
Installed motor power, 3-ph. 380–480 V, 50/60 Hz	kW (hp)	15.0 (20.4)	–
400–460 V, 50/60 Hz	kW (hp)	–	22.5 (30.6)
Electrical power consumption at 10^{-1} mbar (7.5×10^{-2} Torr)	kW (hp)	6.9 (9.4)	8.4 (11.4)
Noise level with permanently attached exhaust line at ultimate total pressure	dB(A)	65	70
Operating agent	LVO	410	400 / 410
Total oil filling, approx.	l (imp qt)	1.2 (1.05)	4.2 (3.0 / 1.2) (3.65 (2.6 / 1.05))
Total weight, approx.	kg (lbs)	590 (1300)	1100 (2425)
Permissible ambient temperature	°C	+5 to +50	+12 to +40
Connecting flange			
Inlet port			
top	1 x DN ₁	100 ISO-K	160 ISO-K
side	2 x DN ₁	PN6	–
Outlet port	DN ₂	63 ISO-K	63 ISO-K

Ordering Information

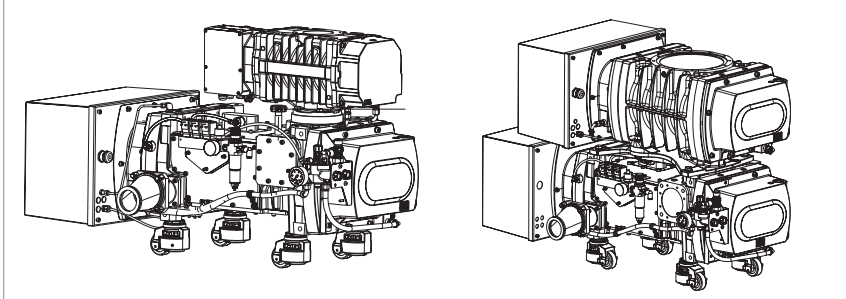
RUTA

		DV650C	WS2001/DV650C/A
		Part No.	Part No.
RUVAC WS	P2	–	2001
Backing pump DRYVAC DV S on castors	P1	650	
Load lock pump system, complete (adaptor version) with Roots vacuum pump RUVAC		503 262 V001	503 263 V001


Pump-down time diagram for a 10 m³ tank at 50 Hz


Pumping speed diagram at 50 Hz

DRYVAC Process Pump Systems with RUVAC WH Backing Pump Adaptor Version



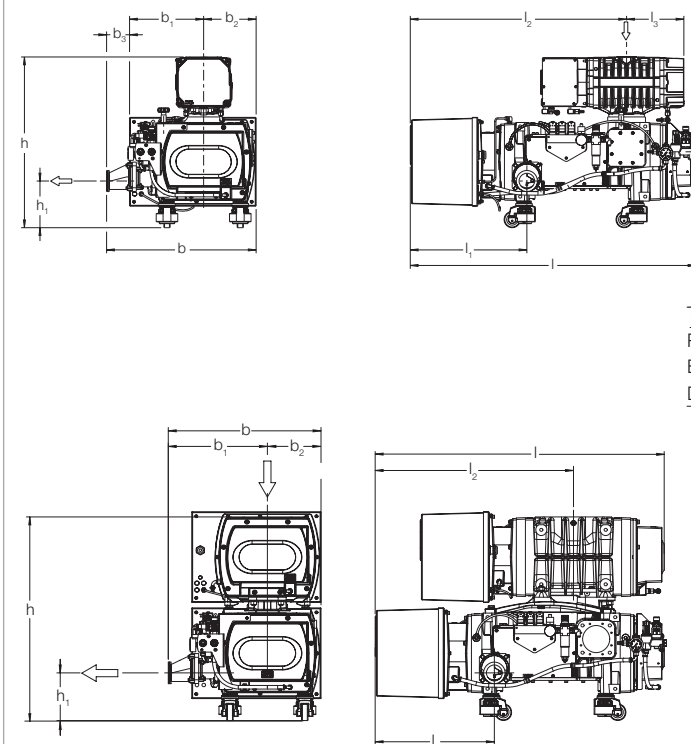
DRYVAC process pump system RUTA WH700FU/DV650C/A (left) and RUTA WH2500/DV650C/A (right)

Standard Equipment

- DRYVAC DV C and RUVAC WH with water cooling
- Rollable pump system with locking foot
- Hermetically sealed
- Seal gas module, threefold
- Integrated protection functions (discharge pressure, temperatures and current consumption)
- Relay module (digital I/O)
- Non-return valve
- Leak detection port
- Lubricant: synthetic oil (LVO 400/410)

Options

- Exhaust silencer
- Bus interface
- Gear chamber evacuation
- Electrical controller
- Oil drain valve
- Cooling water monitoring
- Quick couplings for water connections, blocking on both sides
- Frame



Type	RUTA	WH702/DV650C/A	WH2500/DV650C/A
RUVAC	P2	WH 700FU	WH 2500
Backing pump			
DRYVAC DV C	P1	650	650
DN ₁		100 ISO-K	250 ISO-K
DN ₂		63 ISO-K	63 ISO-K
l		1256 (49.45)	1274 (50.16)
l ₁		525 (20.67)	525 (20.67)
l ₂		974 (38.35)	874 (34.41)
l ₃		258 (10.16)	–
b		673 (26.50)	673 (26.50)
b ₁		334 (13.15)	437 (17.21)
b ₂		236 (9.29)	236 (9.29)
b ₃		103 (4.06)	–
h		769 (30.28)	898 (35.35)
h ₁		210 (8.27)	210 (8.27)

Dimensional drawing of the process pump systems with dry compressing DRYVAC backing pump, adaptor version:
RUTA WH700FU/DV650C/A (top) and RUTA WH2500/DV650C/A (below); dimensions in brackets () are in inch

Technical Data

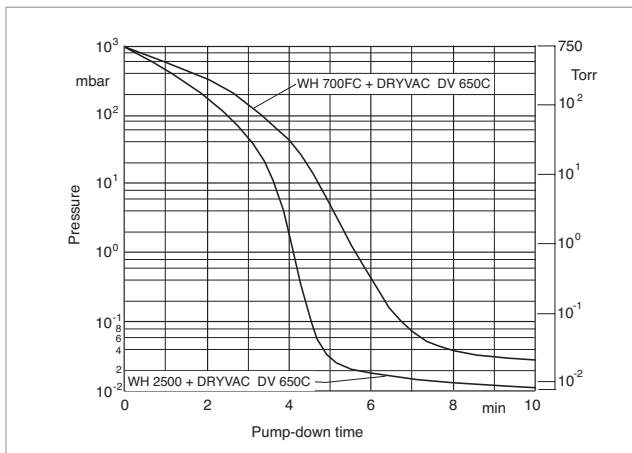
RUTA WH

		700FU/DV650C/A	2500/DV650C/A
RUVAC WH	P2	700FU	2500
Backing pump DRYVAC DV S on castors	P1	650	
Pumping speed, 50 Hz at 10^{-1} mbar (7.5×10^{-2} Torr)	m ³ /h (cfm)	1220 (718)	3115 (1834)
Ultimate total pressure without gas ballast	mbar (Torr)	$< 6 \times 10^{-4}$ (4.5×10^{-4})	$< 5 \times 10^{-4}$ (3.75×10^{-4})
Installed motor power, 3-ph. 380–480 V, 50/60 Hz	kW (hp)	17.2 (23.4)	–
400–460 V, 50/60 Hz	kW (hp)	–	21.2 (28.8)
Electrical power consumption at 10^{-1} mbar (7.5×10^{-2} Torr)	kW (hp)	7.4 (10.1)	8.6 (11.7)
Noise level with permanently attached exhaust line at ultimate total pressure	dB(A)	70	
Operating agent	LVO	400 / 410	410
Total oil filling, approx.	l (imp qt)	2.1 (0.9 / 1.2) 1.9 (0.8 / 1.1)	2.4 (1.2 / 1.2) 2.1 (1.05 / 1.05)
Total weight, approx.	kg (lbs)	800 (1764)	1100 (2425)
Permissible ambient temperature	°C	+12 to +50	+10 to +50
Connecting flange			
Inlet port			
top	1 x DN ₁	100 ISO-K	250 ISO-K
side	2 x DN ₁	–	–
Outlet port	DN ₂	63 ISO-K	63 ISO-K

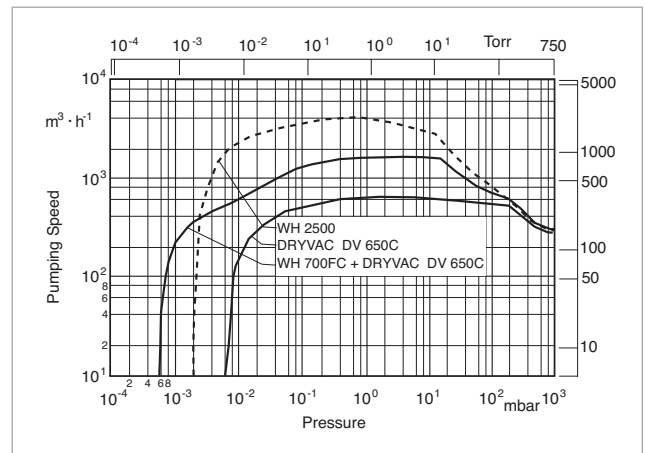
Ordering Information

RUTA WH

		700FU/DV650C/A	2500/DV650C/A
		Part No.	Part No.
RUVAC WH	P2	700FU	2500
Backing pump DRYVAC DV S on castors	P1	650	
Process pump system, complete (adaptor version) with Roots vacuum pump RUVAC		503 257 V001	503 258 V001

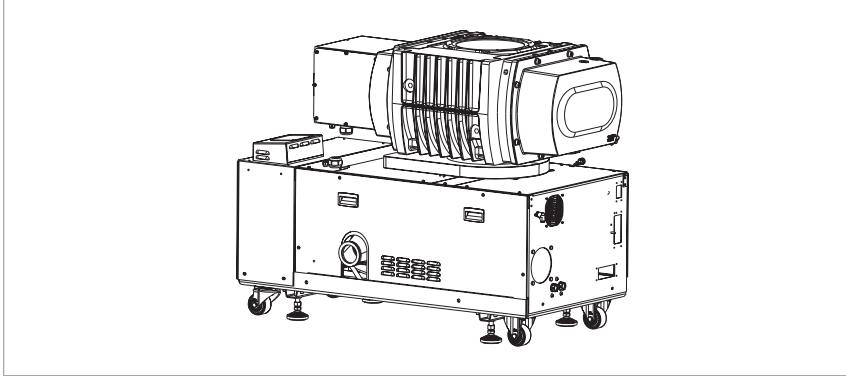


Pump-down time diagram for a 10 m³ tank at 50 Hz



Pumping speed diagram at 50 Hz

DRYVAC Pump Systems, enclosed Adaptor Version



RUTA WHU4400/DV650S-i/A/E

Standard Equipment

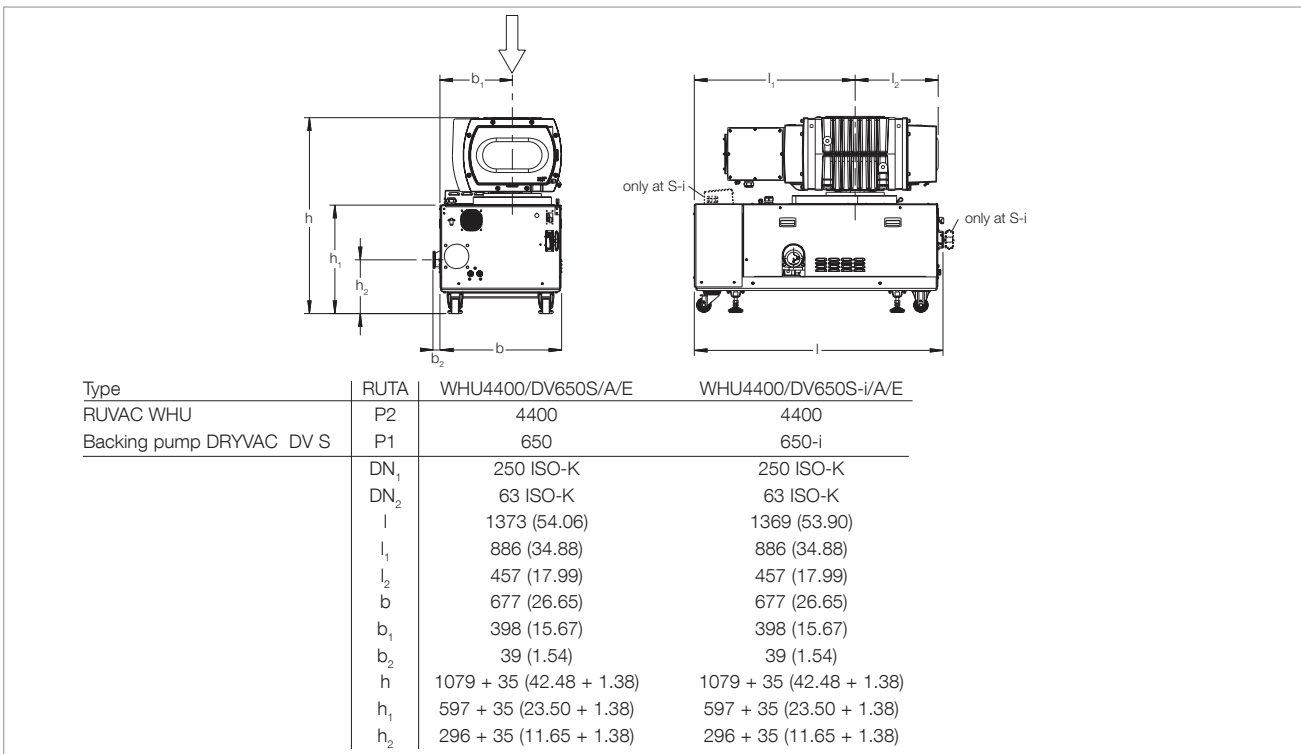
- DRYVAC DV S and RUVAC WHU with water cooling
- Pump system partly enclosed and electrically prewired
- With integrated PLC (Part No. 503259V001)
- Pumps independently electrically controllable (Part No. 503260V001)
- Hermetically sealed
- Integrated protection functions (discharge pressure, temperatures and current consumption)

- Relay module (digital I/O)
- Non-return valve
- Leak detection port
- Lubricant: synthetic oil (LVO 400/410)

Options

- RUVAC WS / WSU / WH
- Exhaust silencer
- Bus interface

- Seal gas connection
- Gear chamber evacuation
- Frequency converter for RUVAC pump
- Oil drain valve
- Cooling water monitoring
- Quick couplings for water connections, blocking on both sides
- Housing suction facility



Dimensional drawing of the enclosed pump systems with DRYVAC DV650S(-i) backing pumps;
dimensions in brackets () are in inch

Technical Data

RUTA WHU

4400/DV650S/A/E

4400/DV650S-i/A/E

RUVAC WHU (WH possible)	P2	4400	
Backing pump DRYVAC DV S with enclosure, silencer, castors and additional PLC	P1 P1	650 –	– 650-i
Pumping speed, 50 Hz at 1×10^{-1} mbar (7.5×10^{-2} Torr)	m ³ /h (cfm)	3400 (2000)	
Ultimate total pressure without gas ballast	mbar (Torr)	< 5.0×10^{-4} (3.75×10^{-4})	
Installed motor power, 3-ph. 400–460 V, 50/60 Hz	kW (hp)	33.5 (45.6)	
Electrical power consumption at 1×10^{-1} mbar (7.5×10^{-2} Torr)	kW (hp)	9.3 (12.6)	
Noise level with permanently attached exhaust line at ultimate total pressure	dB(A)	70	
Operating agent	LVO	400 / 410	
Total oil filling, approx.	l (imp qt)	5.95 (4.75 / 1.2) 5.25 (4.2 / 1.05)	
Total weight, approx.	kg (lbs)	1350 (2976)	
Permissible ambient temperature	°C	+10 to +40	
Connecting flange			
Inlet port	DN ₁	250 ISO-K	
Outlet port	DN ₂	63 ISO-K	

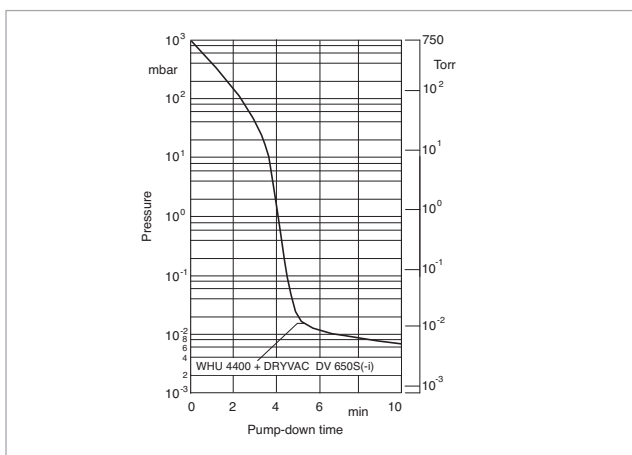
Ordering Information

RUTA WHU

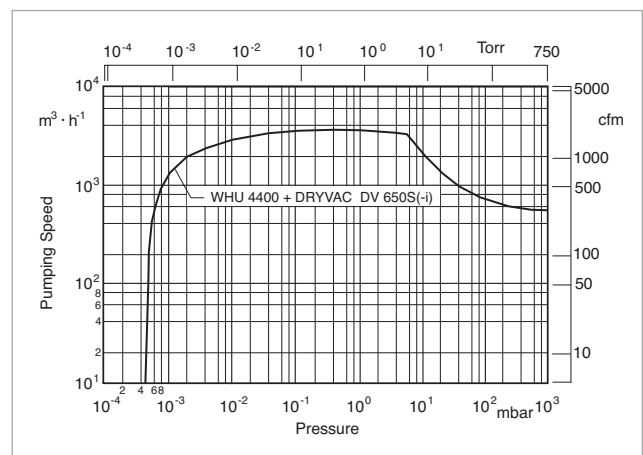
4400/DV650S/A/E

4400/DV650S-i/A/E

		Part No.	Part No.
RUVAC WH	P2	4400	
Backing pump DRYVAC DV S	P1	650	650-i
Enclosed pump system, complete (adaptor version) with Roots vacuum pump RUVAC		503 260 V001	503 259 V001



Pump-down time diagram for a 10 m³ tank at 50 Hz



Pumping speed diagram at 50 Hz

Dry Compressing Pump Systems DRYVAC



DRYVAC SYSTEM: Basic System Configuration (left), Smart System Configuration (middle), PowerBoost (right)

Leybold has refined its Dryvac vacuum pump systems, making them adaptable for a variety of applications

— The recipe is simple and efficient: Take a dry compressing screw vacuum pump and a roots pump, combine both of the proven technologies along with pressure measurement, shut-off devices and electrical control, creating a turn-key smart vacuum system that is cost-effective and completely ready for use by the customer.

For more than five years, the fore vacuum systems of the Dryvac pump series by Leybold are already being used successfully in various processes, which can be simple or very challenging. The pumping systems are known for their maximum suction capacity while operating at minimum operating costs.

Now, Leybold has developed the systems further: The new two-stage Dryvac systems distinguish themselves

particularly by their modular design and the resulting improved user friendliness and easy servicing. All equipment features are aligned to the requirements of the different markets.

Advantage for the User

- Extremely compact design provides more space in production areas
- Very low noise level improves working environment conditions
- Significant cost reduction because of high energy efficiency
- Clean technology with no oil emissions
- Optimized for fast cycle / load lock applications
- Fastest pump down times – by high throughput pump mechanisms
- Highest pumping speed for dry and booster pumps
- Pumping speed from 2,000 m³/h up to 9,800 m³/h
- Integrated smart monitoring of major parameters
- Standard Digital I/O interface and Profibus (optional) for the whole product family
- Platform based product design proven in a huge installed base
- Tolerance to misuse
- Optimized design and screw profile
- Lowest power consumption
- Low cost of ownership
- minimized foot print

Typical Applications

- Glas Coating
- Crystal Pulling
- Sputtering / Decorative Layers
- Furnaces
- Protective Coating
- Battery
- Solar
- Display

Basic System Configuration

Pre-assembled vacuum pump systems (basic version). Monitoring, control, programming, and power electronic components to be provided by the customer.

Standard Configuration:

- exhaust to the side
- triple purge gas module

Optional Configurations:

Double purge gas module, gas ballast system, non-return valve, quick-access couplings (water), mating connector for power & signal supply, relay board (digital I/O)

Advantages

- high performance with excellent cost-performance ratio
- worldwide service & spare parts availability
- rapid response times

Smart System Configuration

The smart pump system versions are characterized by integrated power electronics, monitoring devices for the purge gas system and key parameters, easy and user-friendly operation handling (local / remote), and additional features, e.g. connecting a gauge head.

Standard Configuration:

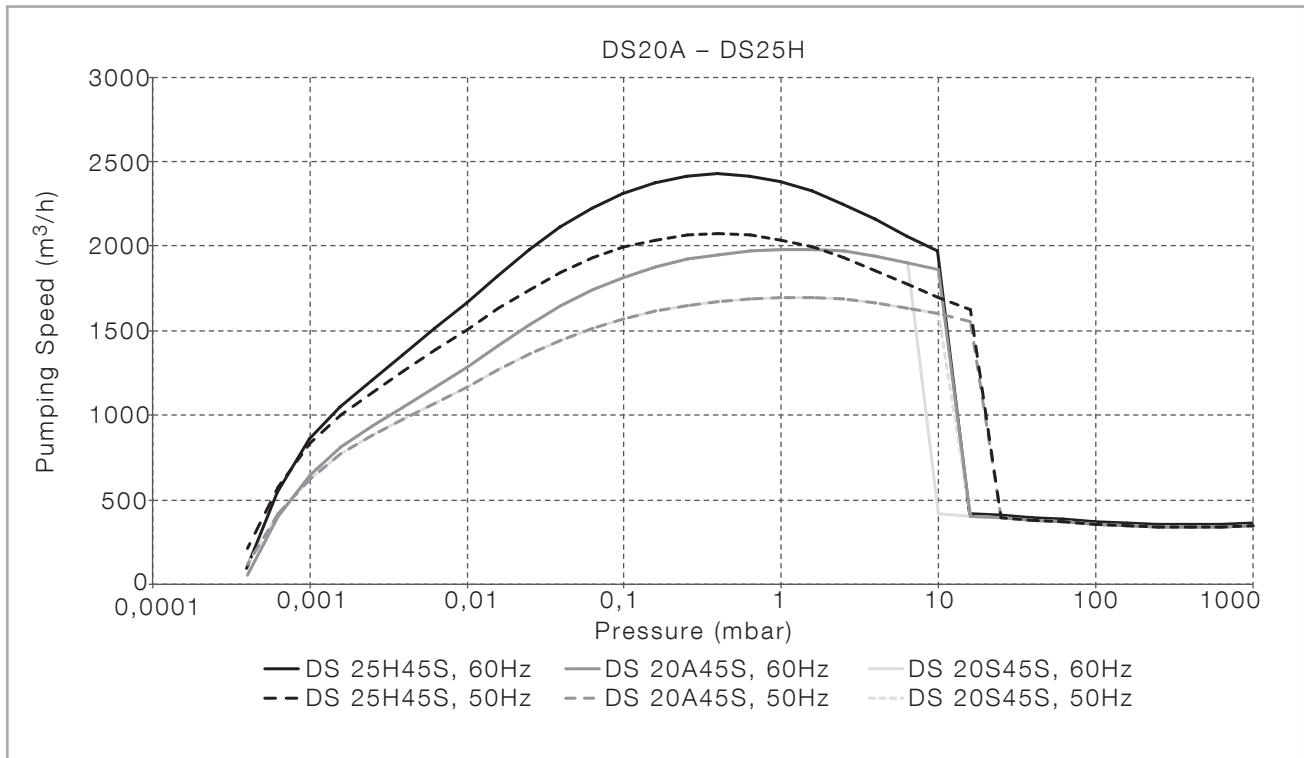
- digital I/O interface
- prepared for connecting a variety of different gauge heads (CTR, DU, TTR)
- Emergency Stop (EMS)
- compensation for voltage drops ($\leq 2s$)
- triple purge gas module
- exhaust to the side

Optional Configurations:

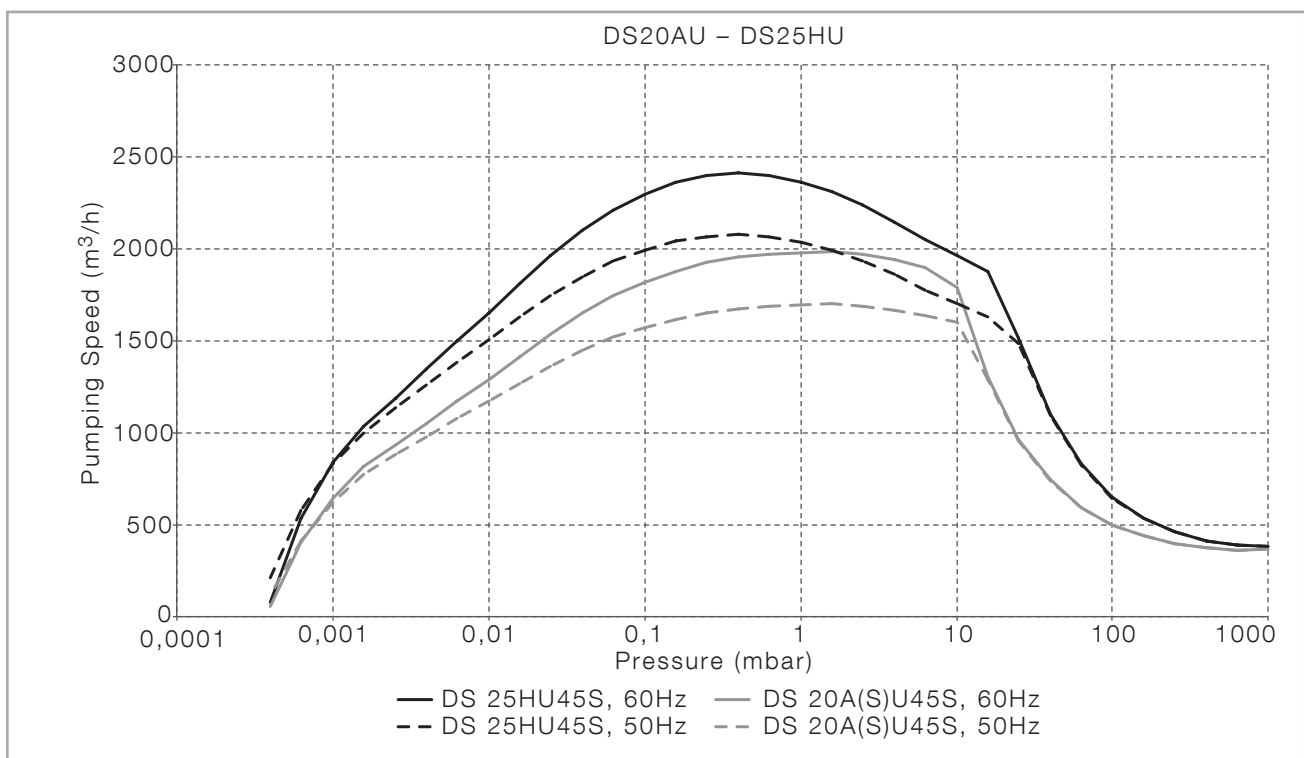
Double purge gas module, gas ballast system, non-return valve, quick-action couplings, Profibus, Ethernet or Profinet interfaces!

Advantages

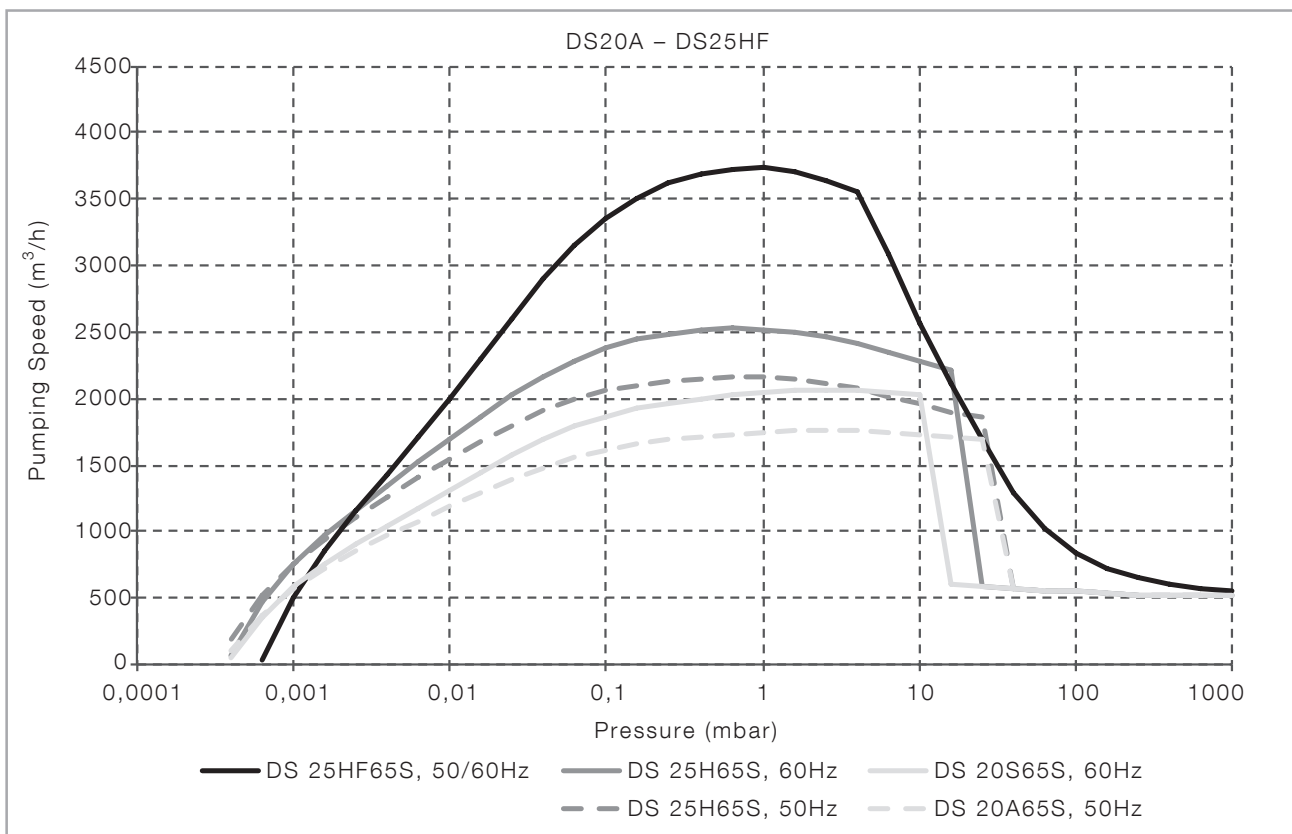
- high performance at attractive prices
- autonomous vacuum pump system
- worldwide service & spare parts availability
- rapid response times



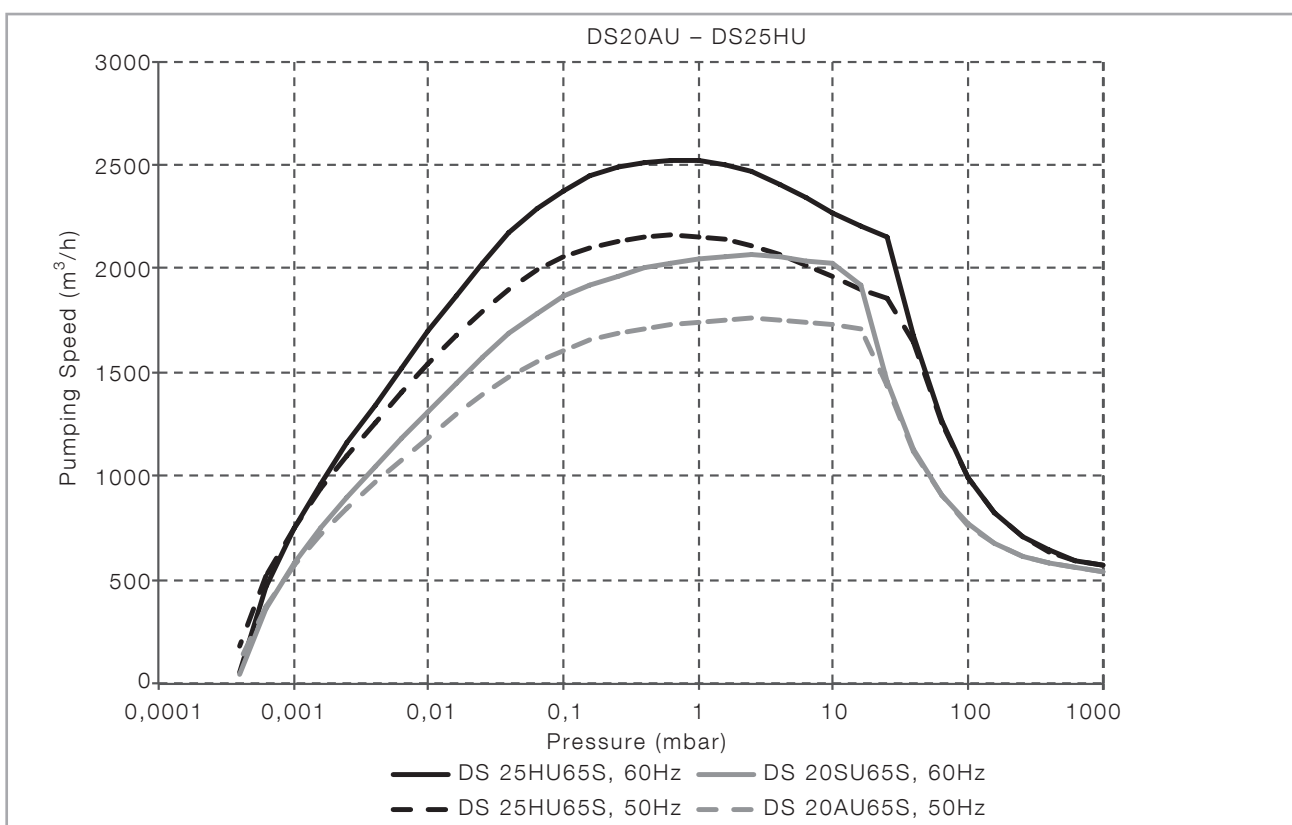
Saugvermögenskurven mit DV 450 (ohne Umwegleitung)



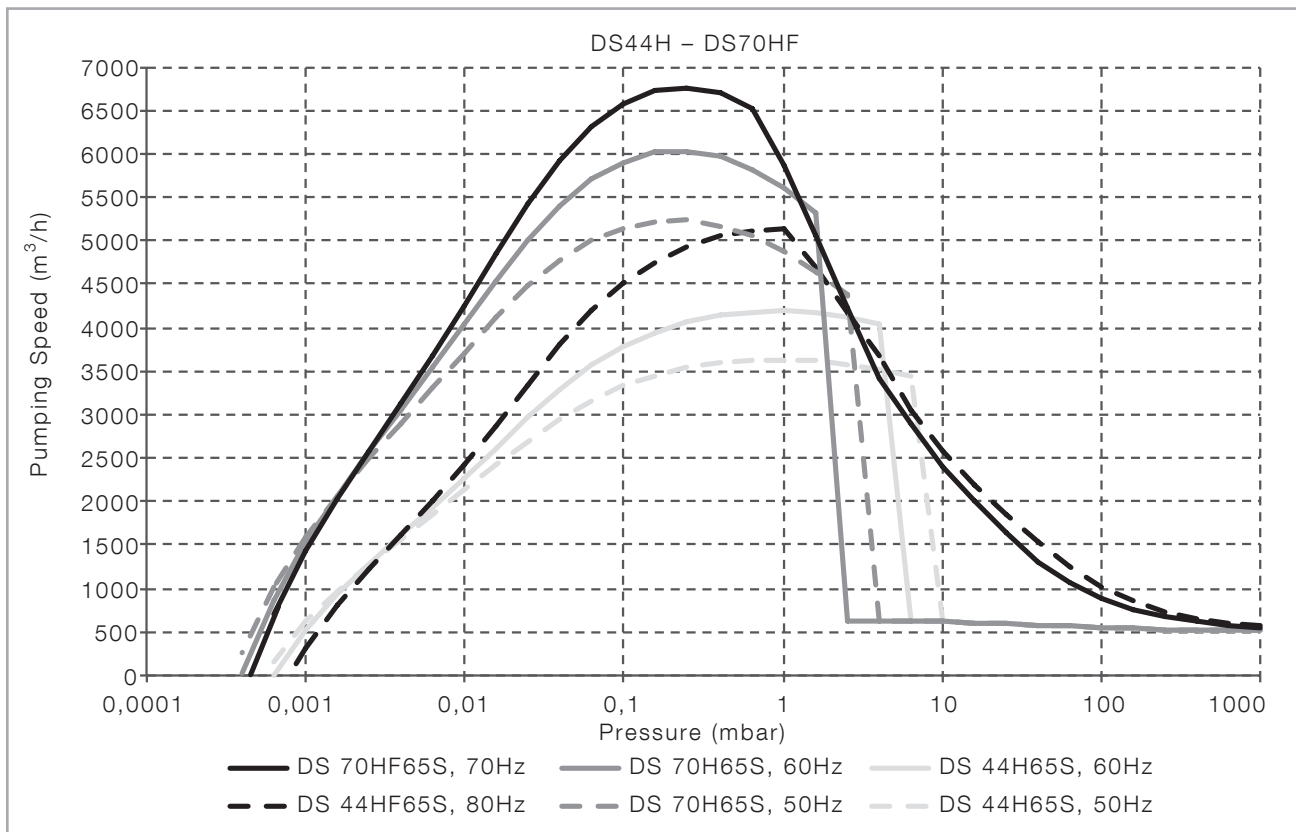
Saugvermögenskurven mit DV 450 (mit Umwegleitung)



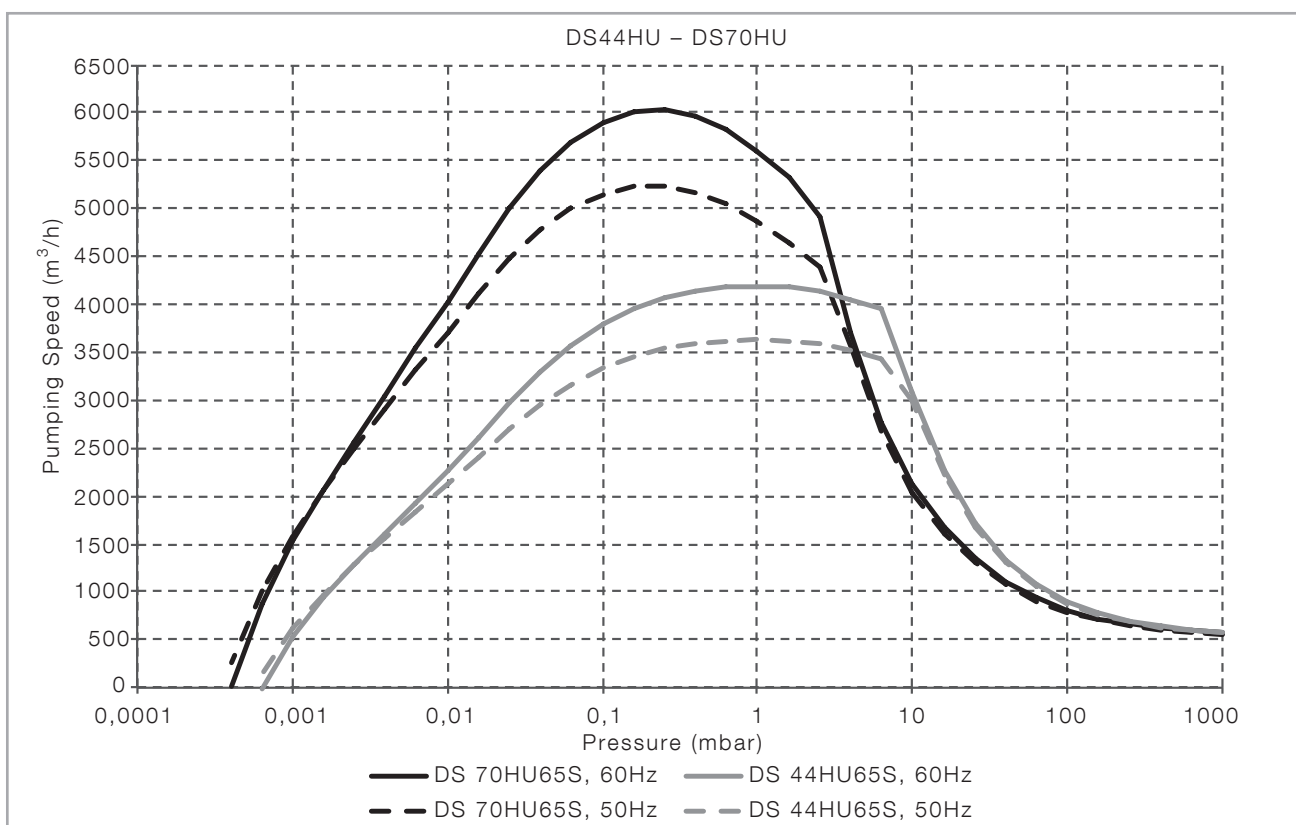
Saugvermögenskurven mit DV 650 (ohne Umwegleitung)



Saugvermögenskurven mit DV 650 (mit Umwegleitung)



Saugvermögenskurven mit DV 650 (ohne Umwegleitung)



Saugvermögenskurven mit DV 650 (mit Umwegleitung)

Dry Compressing Pump Systems DRYVAC Basic System Configuration



The two-stage DRYVAC SYSTEMS consist of a combination of dry compressing Roots pumps and screw pumps. The Roots pump installed on top of the backing pump serves as a booster for increasing the pumping speed.

Various types of pumps may be used with DRYVAC SYSTEMS:

Roots Pumps

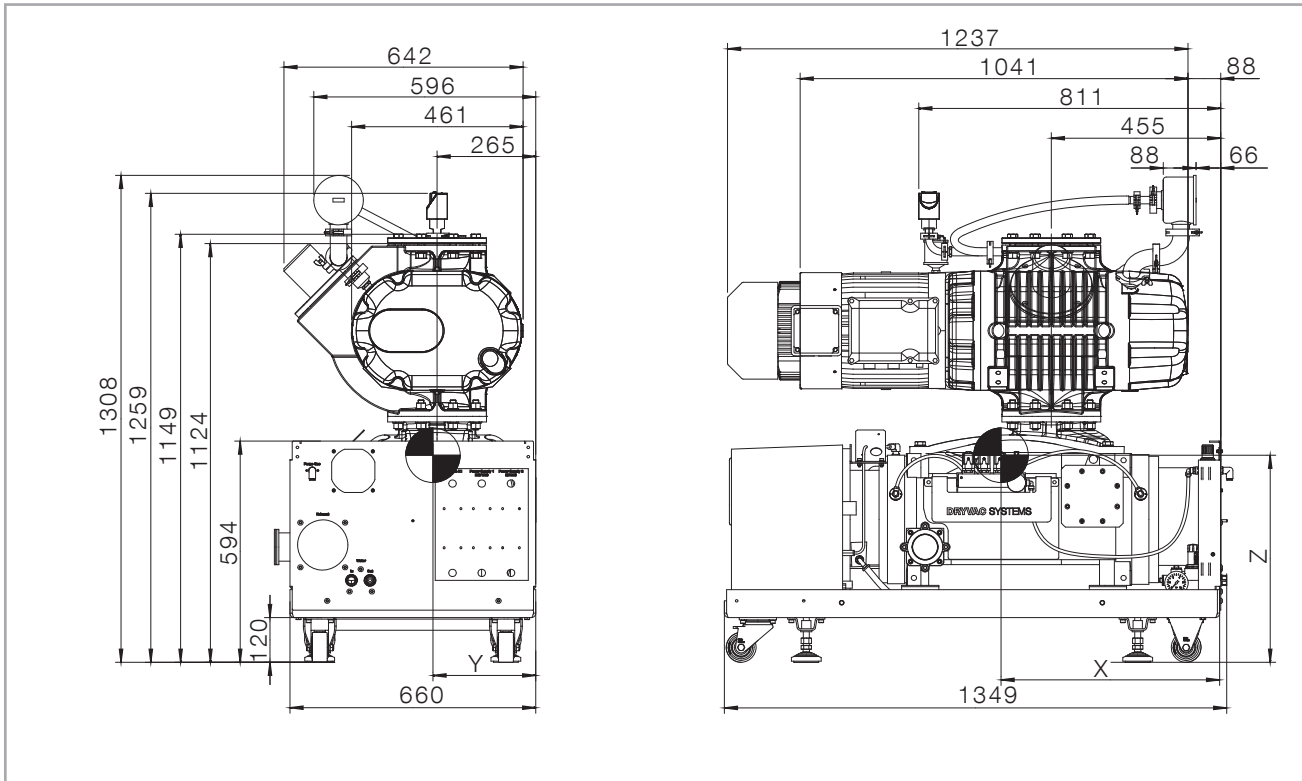
RUVAC WA
RUVAC WAU
RUVAC WH
RUVAC WHU
RUVAC WS
RUVAC WSU

Backing Pumps

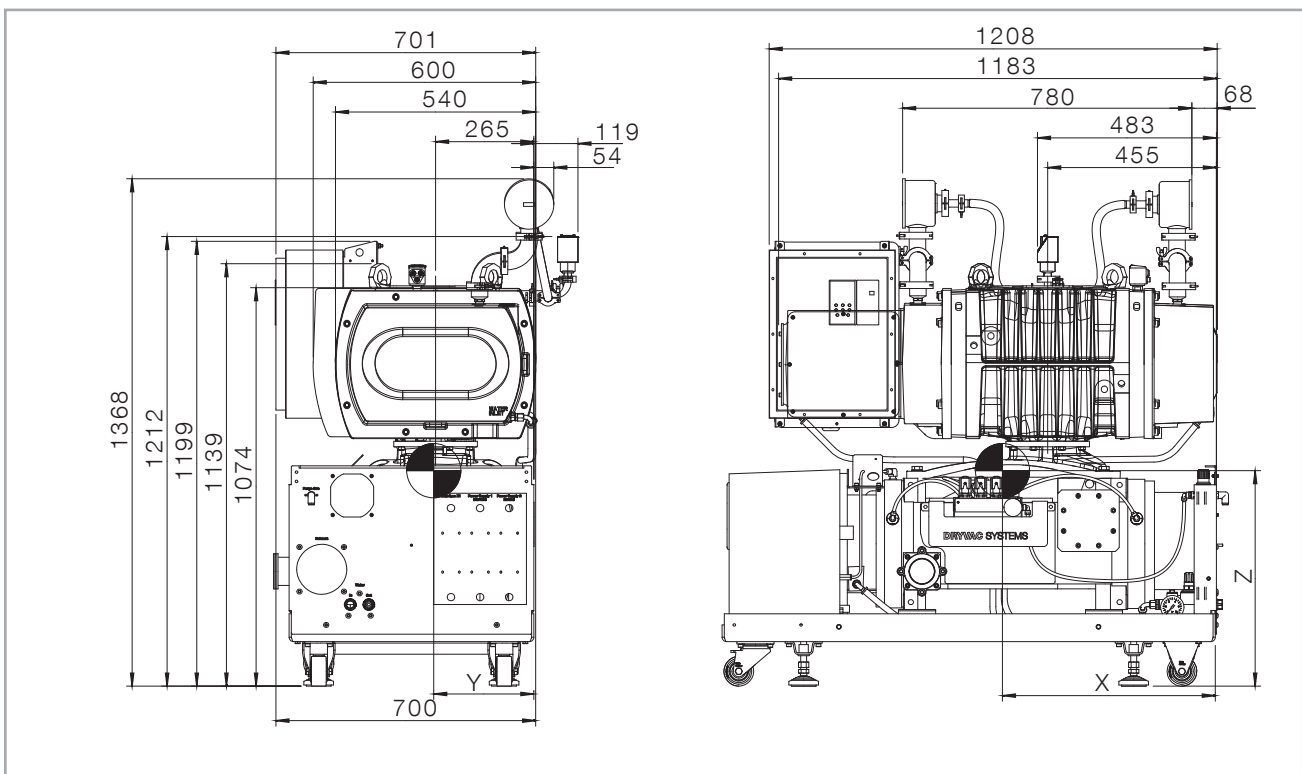
DRYVAC DV S
DRYVAC DV C

All DRYVAC SYSTEMS (b versions) described hereinafter are delivered as basic versions. The basic version can be customized according to individual requirements with accessories (e.g. Harting plug or gas ballast system).

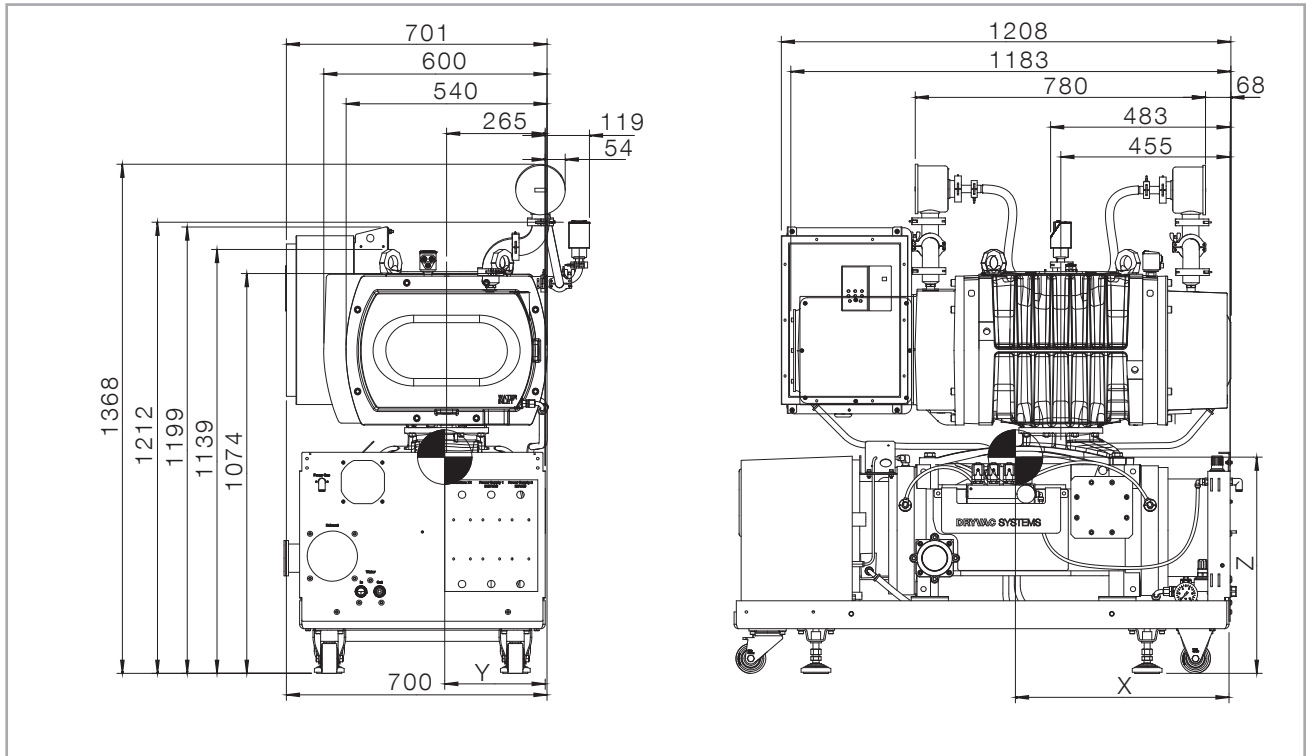
The pumps are water-cooled and lubricated either with synthetic oil or PFPE.



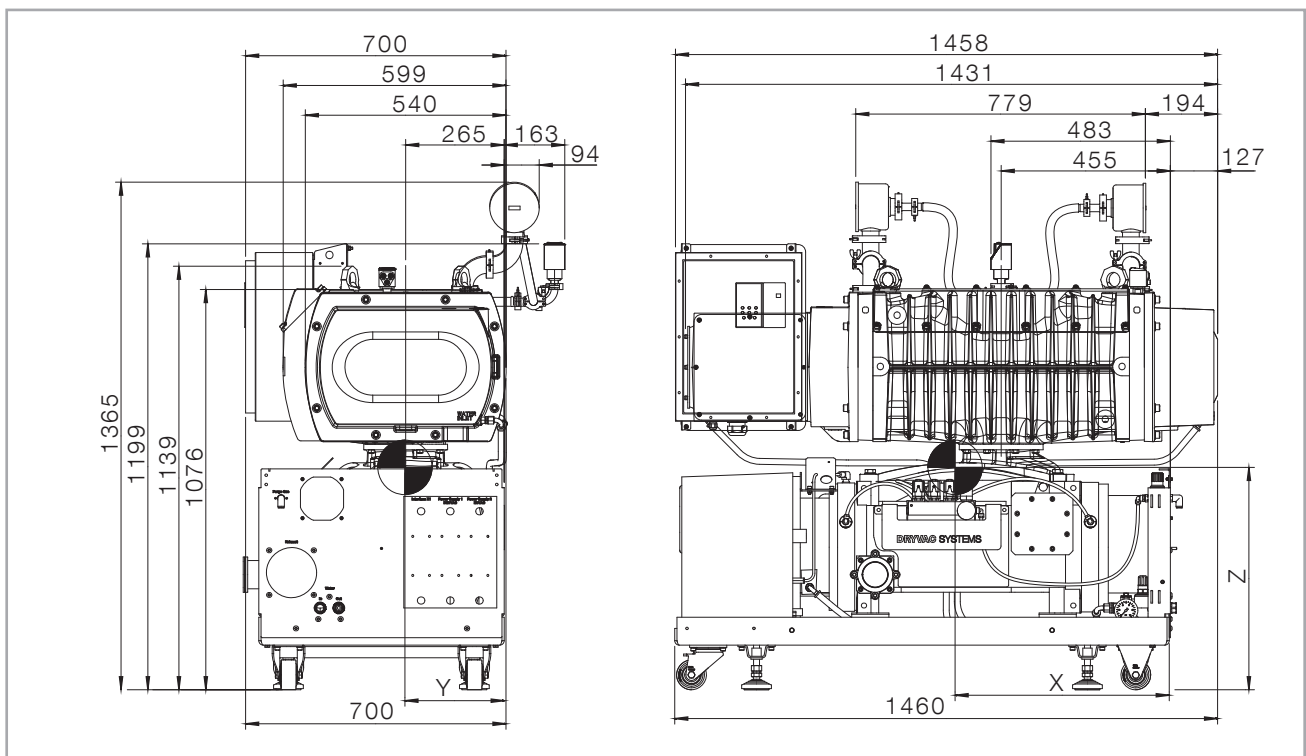
Dimensional drawing for DS 20A(U) 45(S/C) b, DS 20A(U) 65(S/C) b, DS 20S(U) 45(S/C) b, DS 20S(U) 65(S/C) b (Dimensions in mm)



Dimensional drawing for DS 25H(U) 45(S/C) b, DS25H(U) 65(S/C) b, DS 25HF 45(S/C) b, DS 25HF 65(S/C) b (Dimensions in mm)



Dimensional drawing for DS 44H(U) 45(S/C) b, DS 44H(U) 65(S/C) b, DS 44HF 65(S/C) b (Dimensions in mm)



Dimensional drawing for DS 70H(U) 65(S/C) b, DS 70HF 65(S/C) b (Dimensions in mm)

Technical Data

DRYVAC SYSTEMS DS

	20A(U) 45(S/C) b(T)	20S(U) 45(S/C) b(T)	20A(U) 65(S/C) b(T)	20S(U) 65(S/C) b(T)
Max. pump speed w/o gas ballast (50/60 Hz) (± 5 %)	2000 / 2400 m³/h			
Max. effective pumping speed (50/60 Hz) (± 5 %)	1600 / 1850 m³/h		1750 / 2050 m³/h	
Ult. total pressure w/o rotor and inlet purge (± 10 %)	≤ 5 x 10 ⁻³ mbar			
Maximum permissible inlet pressure	1013 mbar			
Maximum permissible discharge pressure (relative to ambient)	+200 mbar			
Integral leak rate	<5 x 10 ⁻⁴ mbar x l/s	<1 x 10 ⁻⁴ mbar x l/s	<5 x 10 ⁻⁴ mbar x l/s	<1 x 10 ⁻⁴ mbar x l/s
Water vapour tolerance with purge gas (SV40)	60 mbar ≥ 20 NI/min			
Water vapour capacity	15 kg/h		25 kg/h	
Permissible ambient temperature	+5 ... + 35 °C			
Storage temperature	-10 ... + 60 °C			
Noise level (rigid exhaust pipe) ⁶⁾	65 dB(A) (K _{pA} = 3dB)			
Screw				
Roots	< 80 dB(A)	< 72 dB(A)	< 80 dB(A)	< 72 dB(A)
Relative atmospheric humidity	95 %, non-condensing			
Installation location	up to 2000 m (NHN) ²⁾			
Cooling	Water / air			
Mains voltages and frequencies	380 – 440V 50Hz / 420 – 480V 60Hz			
Frequency (± 5 %)	50 / 60 Hz			
Phases	3-ph			
Rated power (400 V 50 Hz / 460 V 60 Hz) (± 0,8 kW)				
Screw	11 kW	11 kW	15 kW	15 kW
Roots	7.5 kW	7.5 / 8.5 kW	7.5 kW	7.5 / 8.5 kW
Roots with 18.5 kW (U) totalling	18.5 kW	18.5 / 19.5 kW	22.5 kW	22.5 / 23.5 kW
Roots with 18.5 kW (U) totalling with 18.5 kW (U)				
Rated current (400 V 50 Hz / 460 V 60 Hz)				
Screw	24 / 21 A	24 / 21 A	31 / 27 A	31 / 27 A
Roots	13.6 / 12 A	15 A	13.6 / 12 A	15 A
Roots with 18.5 kW (U) totalling	37.6 / 33 A	39 / 36 A	44.6 / 39 A	46 / 42 A
Roots with 18.5 kW (U) totalling with 18.5 kW (U)				
Power consumption at ultimate pressure (50/60 Hz)				
Motor efficiency class, calculated and configured acc. to EN 60034-30	IE2			
Electrical power rating (400 V 50 Hz / 460 V 60 Hz)				
Screw	17 / 14.9 kVA	17 / 14.9 kVA	21.8 / 19.1 kVA	21.8 / 19.1 kVA
Roots	9.8 / 8.7 kVA	10.7 kVA	9.8 / 8.7 kVA	10.7 kVA
Roots with 18.5 kW (U) totalling	26.8 / 23.6 kVA	27.7 / 25.6 kVA	31.6 / 27.8 kVA	32.5 / 29.8 kVA
Roots with 18.5 kW (U) totalling with 18.5 kW (U)				
Speed Screw / Roots (50 Hz)	7200 / 3000 rpm			
Screw / Roots (60 Hz)	7200 / 3600 rpm			
Min. permissible speed Screw ³⁾	1200 rpm			
Min. permissible speed Roots (off) ⁴⁾	off			
Protection class	IP54	IP20	IP54	IP20

Technical Data

DRYVAC SYSTEMS DS

	20A(U) 45(S/C) b(T)	20S(U) 45(S/C) b(T)	20A(U) 65(S/C) b(T)	20S(U) 65(S/C) b(T)
Lubricant filling				
Screw	LVO 210 / 410	LVO 210 / 410	LVO 210 / 410	LVO 210 / 410
Roots	LVO 210	LVO 210 / 400	LVO 210	LVO 210 / 400
Total lubricant quantity (± 5 %)				
Screw LVO 210	1.2 l	1.2 l	1.2 l	1.2 l
Screw LVO 410	1.2 l	1.2 l	1.2 l	1.2 l
Roots LVO 210	3.6 l	3.6 l	3.6 l	3.6 l
Roots LVO 400		2.7 l		2.7 l
Roots LVO 410				
Intake flange	DN 160 ISO-K			
Discharge flange	DN 63 ISO-K			
Materials (components in contact with gas in the pump chamber)	Grey cast iron /graphite cast iron / steel/stainless steel /epoxy paint / FKM			
Materials sealing the pump off in the pump chamber towards the outside	FKM, grey cast iron			
Weight, approx. (± 40 kg)	1156 kg	1215 kg	1156 kg	1215 kg
Dimensions (L x W x H)				
Conn. flange, w/o acc., side exhaust	1349 x 700 x 1124 mm			
Conn. flange, w/o acc., rear exhaust	1355 x 660 x 1124 mm			
w acc., side exhaust (cf. hint ²⁾)				
w acc., rear exhaust (cf. hint ³⁾)				
Water				
Water connection	G1/2" (female)			
Water temperature				
pumps with LVO 210	5 – 35 °C			
pumps with LVO 400 / 410	5 – 25 °C			
Minimum supply pressure (unobstructed discharge, no backpressure)	2 bar(g) ⁵⁾			
Maximum supply pressure	6 bar(g) ⁵⁾			
Nominal flow				
Screw	6 l/min	6 l/min	7.5 l/min	7.5 l/min
Roots				
total	6 l/min	6 l/min	7.5 l/min	7.5 l/min
Purge gas				
Connection	plug-in connection D10			
Nominal setting pressure “Purge gas” (at nominal flow, valves open)	2.8 bar(g) ⁵⁾ (± 5 %)			
Permissible setting pressure “Purge gas” (at purge gas flow)	2.8 to 4.5 bar(g) ⁵⁾ (± 5 %)			
Permissible supply pressure “Purge gas”	4.0 to 10.0 bar(g) ⁵⁾ (± 5 %)			
Purge gas flow shaft seal 2.8 bar(g) nozzle out- / inlet (d = 0.9 / 2.0 mm)	22 / 92 slm (± 10 %)			
Rotor purge gas flow 2.8 bar(g) nozzle inlet (d = 1.0 mm)	28 slm (± 10 %)			

Technical Data

DRYVAC SYSTEMS DS

	25H(U) 45(S/C) b(T)	25H(U) 65(S/C) b(T)	25HF 45(S/C) b(T)	25HF 65(S/C) b(T)
Max. pump speed w/o gas ballast (50/60 Hz) (± 5 %)	2500 / 3000 m³/h ± 5 %		5000 m³/h ± 5 %	
Max. effective pumping speed (50/60 Hz) (± 5 %)	2100 / 2400 m³/h	2150 / 2500 m³/h	3500 m³/h	3750 m³/h
Ult. total pressure w/o rotor and inlet purge (± 10 %)	< 5 x 10 ⁻³ mbar			
Maximum permissible inlet pressure	1013 mbar			
Maximum permissible discharge pressure (relative to ambient)	+200 mbar			
Integral leak rate	< 1 x 10 ⁻⁴ mbar x l/s			
Water vapour tolerance with purge gas (SV40)	60 mbar ≥ 20 NI/min			
Water vapour capacity	15 kg/h	25 kg/h	15 kg/h	25 kg/h
Permissible ambient temperature	+5 ... + 35 °C			
Storage temperature	-10 ... + 60 °C			
Noise level (rigid exhaust pipe) ⁶⁾ Screw Roots	65 dB(A) (K _{pA} = 3dB) < 63 dB(A)			
Relative atmospheric humidity	95 %, non-condensing			
Installation location	up to 2000 m (NHN) ²⁾		up to 1000 m (NHN) ²⁾	
Cooling	Water			
Mains voltages and frequencies	380 – 440 V 50 Hz / 420 – 480 V 60 Hz		380 – 480 V 50/60 Hz	
Frequency (± 5 %)	50 / 60 Hz			
Phases	3-ph			
Rated power (400 V 50 Hz / 460 V 60 Hz) (± 0,8 kW) Screw Roots Roots with 18.5 kW (U) totalling totalling with 18.5 kW (U)	11 kW 6.2 / 7.4 kW 17.2 / 18.4 kW	15 kW 6.2 / 7.4 kW 21.2 / 22.4 kW	11 kW 11 kW 22 kW	15 kW 11 kW 26 kW
Rated current (400 V 50 Hz / 460 V 60 Hz) Screw Roots Roots with 18.5 kW (U) totalling totalling with 18.5 kW (U)	24 / 21 A 11.6 A 35.6 / 32.6 A	31 / 27 A 11.6 A 42 / 38.6 A	24 / 21 A 20 / 17 A 44 / 38 A	31 / 27 A 20 / 17 A 51 / 44 A
Power consumption at ultimate pressure (50/60Hz)	5.6 / 5.7 kW	7.8 / 7.9 kW	6.2 / 6.2 kW	8.4 / 8.4 kW
Motor efficiency class, calculated and configured acc. to EN 60034-30	IE2			
Electrical power rating (400 V 50 Hz / 460 V 60 Hz) Screw Roots Roots with 18.5 kW (U) totalling totalling with 18.5 kW (U)	17 / 14.9 kVA 8.4 kVA 25.4 / 23.3 kVA	21.8 / 19.1 kVA 8.4 kVA 30.2 / 27.5 kVA	17 / 14.9 kVA 14.2 / 12.1 kVA 31.2 / 27 kVA	21.8 / 19.1 kVA 14.2 / 12.1 kVA 36 / 31.2 kVA
Speed Screw / Roots (50 Hz) Screw / Roots (60 Hz)	7200 / 3000 rpm 7200 / 3600 rpm		7200 / 6000 rpm 7200 / 6000 rpm	
Min. permissible speed Screw ³⁾ Min. permissible speed Roots (off) ⁴⁾	1200 rpm off		1200 rpm 1200 rpm	
Protection class	IP54			

Technical Data

DRYVAC SYSTEMS DS

	25H(U) 45(S/C) b(T)	25H(U) 65(S/C) b(T)	25HF 45(S/C) b(T)	25HF 65(S/C) b(T)
Lubricant filling				
Screw	LVO 210 / 410			
Roots	LVO 210 / 410			
Total lubricant quantity (± 5 %)				
Screw LVO 210	1.2 l			
Screw LVO 410	1.2 l			
Roots LVO 210	1.2 l			
Roots LVO 400				
Roots LVO 410	1.2 l			
Intake flange	DN 250 ISO-K			
Discharge flange	DN 63 ISO-K			
Materials (components in contact with gas in the pump chamber)	Grey cast iron /graphite cast iron / steel/stainless steel /epoxy paint / FKM			
Materials sealing the pump off in the pump chamber towards the outside	FKM, grey cast iron			
Weight, approx. (± 40 kg)	1160 kg		1190 kg	
Dimensions (L x W x H)				
Conn. flange, w/o acc., side exhaust	1349 x 700 x 1074 mm			
Conn. flange, w/o acc., rear exhaust	1355 x 660 x 1074 mm			
w acc., side exhaust (cf. hint ²⁾)				
w acc., rear exhaust (cf. hint ³⁾)				
Water				
Water connection	G1/2" (female)			
Water temperature				
pumps with LVO 210	5 – 35 °C			
pumps with LVO 400 / 410	5 – 25 °C			
Minimum supply pressure (unobstructed discharge, no backpressure)	2 bar(g) ⁵⁾			
Maximum supply pressure	6 bar(g) ⁵⁾			
Nominal flow				
Screw	6 l/min	7.5 l/min	6 l/min	7.5 l/min
Roots	2.2 l/min	2.2 l/min	2.2 l/min	2.2 l/min
total	8.2 l/min	9.7 l/min	8.2 l/min	9.7 l/min
Purge gas				
Connection	plug-in connection D10			
Nominal setting pressure “Purge gas” (at nominal flow, valves open)	2.8 bar(g) ⁵⁾ (± 5 %)			
Permissible setting pressure “Purge gas” (at purge gas flow)	2.8 to 4.5 bar(g) ⁵⁾ (± 5 %)			
Permissible supply pressure “Purge gas”	4.0 to 10.0 bar(g) ⁵⁾ (± 5 %)			
Purge gas flow shaft seal 2.8 bar(g) nozzle out- / inlet (d = 0.9 / 2.0 mm)	22 / 92 slm (± 10 %)			
Rotor purge gas flow 2.8 bar(g) nozzle inlet (d = 1.0 mm)	28 slm (± 10 %)			

Technical Data

DRYVAC SYSTEMS DS

	44H(U) 65(S/C) b(T)	44HF 65(S/C) b(T)	70H(U) 65(S/C) b(T)	70HF 65(S/C) b(T)
Max. pump speed w/o gas ballast (50/60 Hz) (± 5 %)	4400 / 5280 m³/h	7040 m³/h	7040 / 8 400 m³/h	9800 m³/h
Max. effective pumping speed (50/60 Hz) (± 5 %)	3600 / 4200 m³/h	5150 m³/h	5200 m³/h	6800 m³/h
Ult. total pressure w/o rotor and inlet purge (± 10 %)	< 5 x 10 ⁻³ mbar			
Maximum permissible inlet pressure	1013 mbar			
Maximum permissible discharge pressure (relative to ambient)	+200 mbar			
Integral leak rate	< 1 x 10 ⁻⁴ mbar x l/s			
Water vapour tolerance with purge gas (SV40)	60 mbar ≥ 20 NI/min			
Water vapour capacity	25 kg/h			
Permissible ambient temperature	+5 ... + 35 °C			
Storage temperature	-10 ... + 60 °C			
Noise level (rigid exhaust pipe) ⁶⁾ Screw Roots	65 dB(A) (K _{PA} = 3dB) < 63 dB(A)			
Relative atmospheric humidity	95 %, non-condensing			
Installation location	up to 2000 m	up to 1000 m	up to 2000 m	up to 1000 m
Cooling	Water			
Mains voltages and frequencies	380 – 440 V 50 Hz 420 – 480 V 60 Hz	380 – 480 V 50/60 Hz	380 – 440 V 50 Hz 420 – 480 V 60 Hz	380 – 480 V 50/60 Hz
Frequency (± 5 %)	50 / 60 Hz			
Phases	3-ph			
Rated power (400 V 50 Hz / 460 V 60 Hz) (± 0,8 kW) Screw Roots Roots with 18.5 kW (U) totalling totalling with 18.5 kW (U)	15 kW 11 kW 18,5 kW 26 kW 33,5 kW	15 kW 11 kW 26 kW	15 kW 11 kW 18,5 kW 26 kW 33,5 kW	15 kW 11 kW 26 kW
Rated current (400 V 50 Hz / 460 V 60 Hz) Screw Roots Roots with 18.5 kW (U) totalling totalling with 18.5 kW (U)	31 / 27 A 20 / 17 A 35 / 29 A 51 / 44 A 66 / 56 A	31 / 27 A 20 / 17 A 51 / 44 A	31 / 27 A 20 / 17 A 35 / 29 A 51 / 44 A 66 / 56 A	31 / 27 A 20 / 17 A 51 / 44 A
Power consumption at ultimate pressure (50/60 Hz)	8.1 / 8.3 kW	8.9 kW	8.1 / 8.3 kW	8.6 kW
Motor efficiency class, calculated and configured acc. to EN 60034-30	IE2			
Electrical power rating (400 V 50 Hz / 460 V 60 Hz) Screw Roots Roots with 18.5 kW (U) totalling totalling with 18.5 kW (U)	21.8 / 19.1 kVA 14.2 / 12.1 kVA 24.6 / 20.4 kVA 36 / 31.2 kVA 46.4 / 39.5 kVA	21.8 / 19.1 kVA 14.2 / 12.1 kVA 36 / 31.2 kVA	21.8 / 19.1 kVA 14.2 / 12.1 kVA 24.6 / 20.4 kVA 36 / 31.2 kVA 46.4 / 39.5 kVA	21.8 / 19.1 kVA 14.2 / 12.1 kVA 36 / 31.2 kVA
Speed Screw / Roots (50 Hz) Screw / Roots (60 Hz)	7200 / 3000 rpm 7200 / 3600 rpm	7200 / 4800 rpm 7200 / 4800 rpm	7200 / 3000 rpm 7200 / 3600 rpm	7200 / 4200 rpm 7200 / 4200/min
Min. permissible speed Screw ³⁾ Min. permissible speed Roots (off) ⁴⁾	1200 rpm off	1200 rpm 1200 rpm	1200 rpm off	1200 rpm 1200 rpm
Protection class	IP54			
Lubricant filling Screw Roots	LVO 210 / 410 LVO 210 / 400			

Technical Data

DRYVAC SYSTEMS DS

	44H(U) 65(S/C) b(T)	44HF 65(S/C) b(T)	70H(U) 65(S/C) b(T)	70HF 65(S/C) b(T)
Total lubricant quantity (± 5 %)				
Screw LVO 210	1.2 l			
Screw LVO 410	1.2 l			
Roots LVO 210	4.75 l			
Roots LVO 400	4.75 l			
Roots LVO 410				
Intake flange	DN 250 ISO-K	DN 320 ISO-K		
Discharge flange	DN 63 ISO-K			
Materials (components in contact with gas in the pump chamber)	Grey cast iron /graphite cast iron / steel/stainless steel /epoxy paint / FKM			
Materials sealing the pump off in the pump chamber towards the outside	FKM, grey cast iron			
Weight, approx. (± 40 kg)	1370 kg	1400 kg	1465 kg	1495 kg
Dimensions (L x W x H)				
Conn. flange, w/o acc., side exhaust	1349 x 700 x 1074 mm		1460 x 700 x 1076	
Conn. flange, w/o acc., rear exhaust	1355 x 660 x 1074 mm		1460 x 660 x 1076	
w acc., side exhaust (cf. hint ²⁾)				
w acc., rear exhaust (cf. hint ³⁾)				

Water

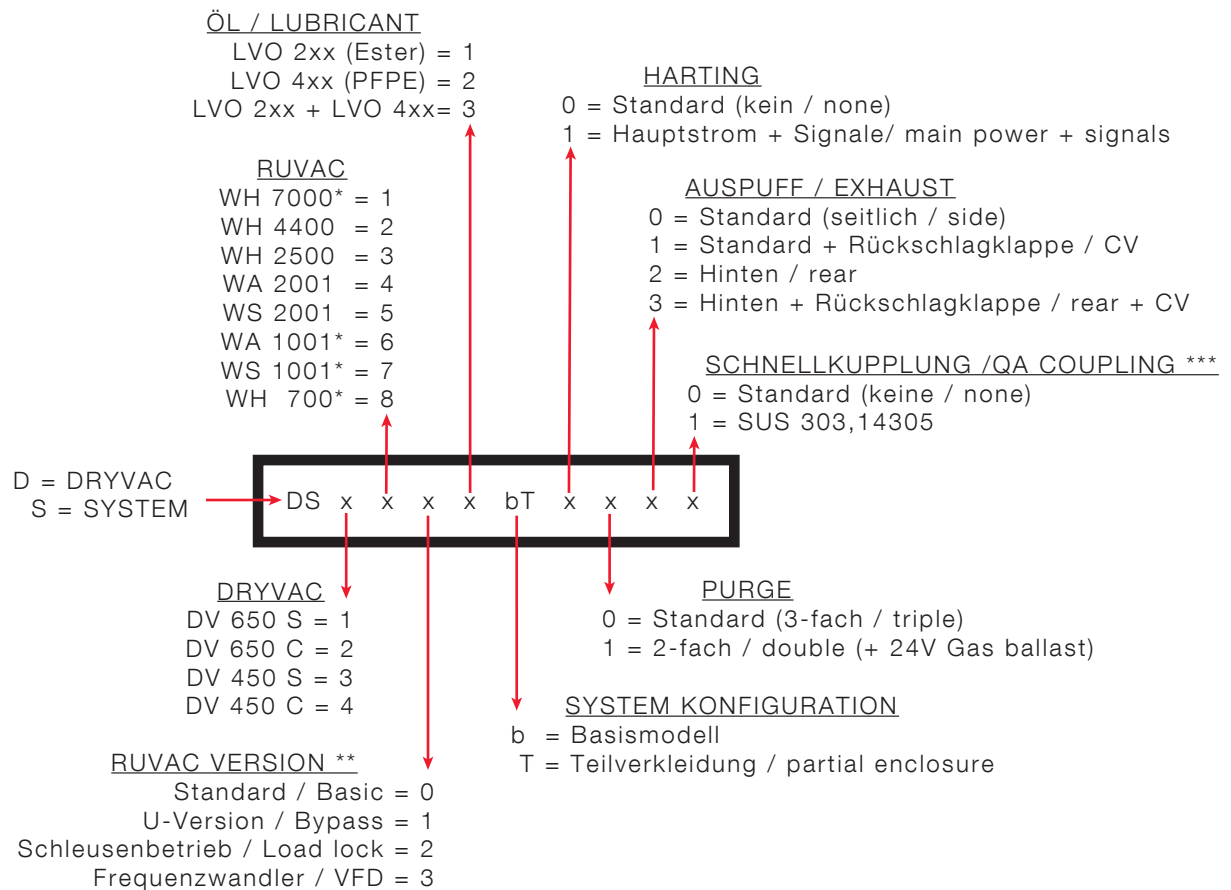
Water connection	G1/2" (female)
Water temperature	
pumps with LVO 210	5 – 35 °C
pumps with LVO 400 / 410	5 – 25 °C
Minimum supply pressure (unobstructed discharge, no backpressure)	2 bar(g) ⁵⁾
Maximum supply pressure	6 bar(g) ⁵⁾
Nominal flow	
Screw	7.5 l/min
Roots	5.7 l/min
total	13.2 l/min

Purge gas

Connection	plug-in connection D10
Nominal setting pressure "Purge gas" (at nominal flow, valves open)	2.8 bar(g) ⁵⁾ (± 5 %)
Permissible setting pressure "Purge gas" (at purge gas flow)	2.8 to 4.5 bar(g) ⁵⁾ (± 5 %)
Permissible supply pressure "Purge gas"	4.0 to 10.0 bar(g) ⁵⁾ (± 5 %)
Purge gas flow shaft seal 2.8 bar(g) nozzle out- / inlet (d = 0.9 / 2.0 mm)	22 / 92 slm
Rotor purge gas flow 2.8 bar(g) nozzle inlet (d = 1.0 mm)	28 slm

Additional information regarding the technical data

- Noise levels of > 100 dB(a) may occur with cyclic operation conditions, e.g. with load-lock operations or plain pump-downs. In this case we recommend to use RUVAC pumps with a pressure balance line („U“-pumps).
- The frequency converter standard ratings are valid for an installation altitude up to 1000 m. If the altitude exceeds 1000 m both the input voltage and the rated output current must be derated for 1% per 100 m.
- In case of overvoltage (> 480 V), bad cooling and permanent operation at nominal power the output power may be reduced in order to prevent thermal overload of the frequency converter. In case of undervoltage (< 380 V) the maximum power is not available by design.
- The minimum permissible frequency is 20 Hz for both the DRYVAC and the RUVAC.
The minimum permissible speed is relevant for the oil lubrication of bearings and gears. Running the pump at less than the minimum speed for more than 1 hour can cause damage to the pump due to a lack of lubrication.
- bar(g): bar (gauge) is the overpressure, i.e. atmospheric pressure = 0 bar(g)
- Valid for 50Hz operations at ult. pressure conditions. Higher speeds, especially pressures >10 mbar, generate higher noise levels.



* auf Anfrage; wenden Sie sich an Leybold Köln / upon request; pls. contact Leybold Cologne

** Hinweis: wenden Sie sich an Leybold für den FW-Einsatz mit RUVAC WA & WS / Note: pls. contact Leybold for operating RUVAC WA & WS + VFD

*** für Kupplungsgegenstände wenden Sie sich an Leybold Köln / for counter couplings pls. contact Leybold Cologne

Configuration matrix

Part numbers for DRYVAC SYSTEMS are based on the matrix shown in the figure above and give hints on the individual configuration and features of the pump combination in question:

Ordering Information

DRYVAC SYSTEMS

Part No.	Description	Lubricants Screw	Lubricants Roots	Purge gas module	Exhaust / Check valve	Quick-release coupling (one-sided)
DS3411b0000	DS 20AU45S-b	LVO210	LVO210	triple	side / no	no
DS1411b0000	DS 20AU65S-b	LVO210	LVO210	triple	side / no	no
DS3301b0000	DS 25H45S-b	LVO210	LVO210	triple	side / no	no
DS1201b0000	DS 44H65S-b	LVO210	LVO210	triple	side / no	no
DS1211b0000	DS 44HU65S-b	LVO210	LVO210	triple	side / no	no
DS1212b0000	DS 44HU65S-b	LVO4x0	LVO4x0	triple	side / no	no
DS2512b0000	DS 20SU65C-b	LVO4x0	LVO4x0	triple	side / no	no
DS1511b0000	DS 20SU65S-b	LVO210	LVO210	triple	side / no	no
DS1301b0000	DS 25H65S-b	LVO210	LVO210	triple	side / no	no
DS1311b0000	DS 25HU65S-b	LVO210	LVO210	triple	side / no	no
DS1312b0000	DS 25HU65S-b	LVO4x0	LVO4x0	triple	side / no	no
DS3511b0000	DS 20SU45S-b	LVO210	LVO210	triple	side / no	no

... to be continued

Accessories

	Part No.
Synthetic Oil LEYBONOL LVO 210, 1 l	L21001
Synthetic Oil LEYBONOL LVO 210, 5 l	L21005
PFPE LEYBONOL LVO 400, 1 l	L40001
PFPE LEYBONOL LVO 410, 1 l	L41001
Roots pump adapter for DRYVAC for RUVAC WH 700	112005A03
RUVAC WS(U) 1001	112005A04
RUVAC WS(U) 2001	112005A05
RUVAC WH(U) 2500	112005A07
RUVAC WH(U) 4400/7000	112005A10
Non-return valve DRYVAC, DN 63 ISO-K	112005A15
Silencer DN 63 ISO-K for DRYVAC SYSTEMS	119002
Serviceable Silencer DN 63 ISO-K for DRYVAC SYSTEMS	119003V
External Display	155213V
Purge gas nozzle set for DRYVAC	112005A30
Permanent purge gas inlet kit	112005A32
Ground fixation	503637V001
Rotatable crane eyes (M 20 x 30; set of 4)	504397V901

GSD file and manual for the Profibus interface see the Leybold homepage.

Dry Compressing Pump Systems DRYVAC Smart System Configuration



The two-stage DRYVAC SYSTEMS consist of a combination of dry compressing Roots pumps and screw pumps. The Roots pump installed on top of the backing pump serves as a booster for increasing the pumping speed.

Various types of pumps may be used with DRYVAC SYSTEMS:

Roots Pumps

RUVAC WA
RUVAC WAU
RUVAC WH
RUVAC WHU
RUVAC WS
RUVAC WSU

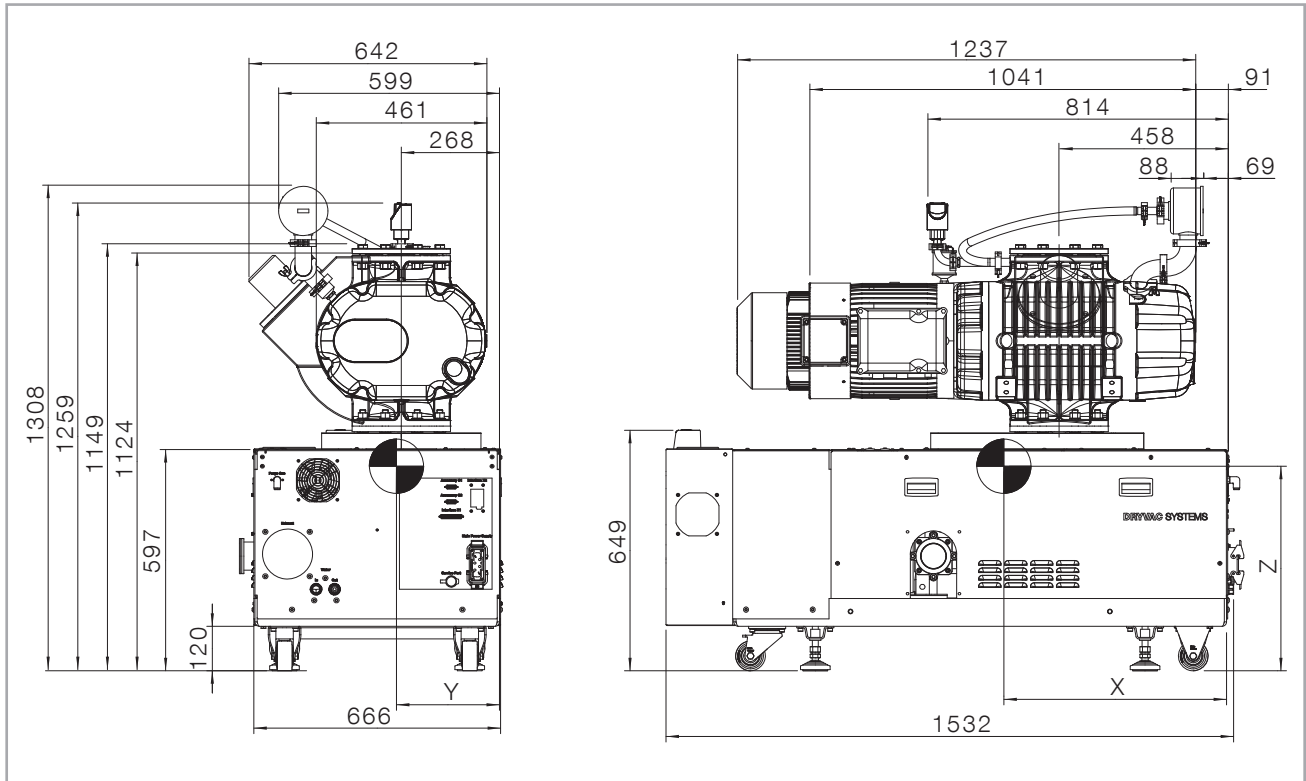
Backing Pumps

DRYVAC DV S
DRYVAC DV C

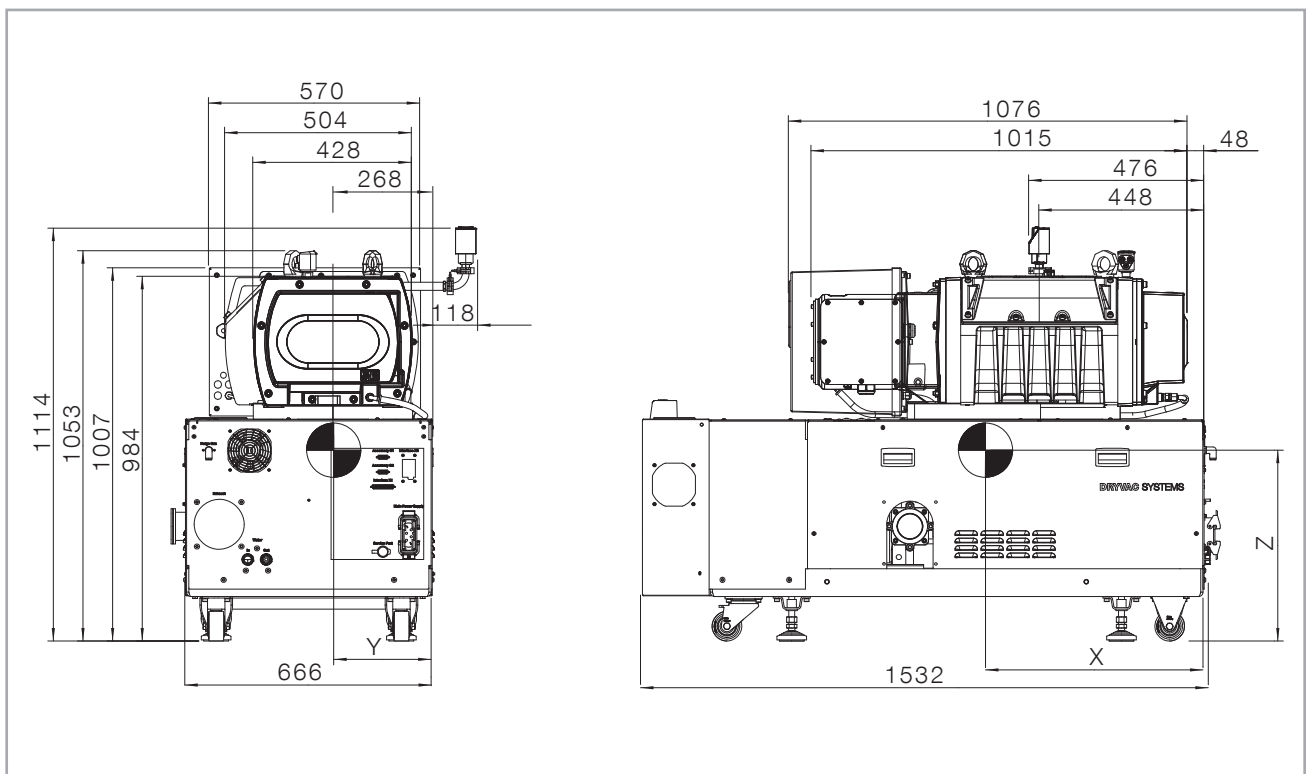
All DRYVAC SYSTEMS (i versions) described hereinafter are equipped with:

- Microcontroller with touchscreen
- Connectivity options for gauge heads
- Harting connections (power supply)
- Digital I/O communication interface (DC37-P)
- Housing, castors and adjustable feet

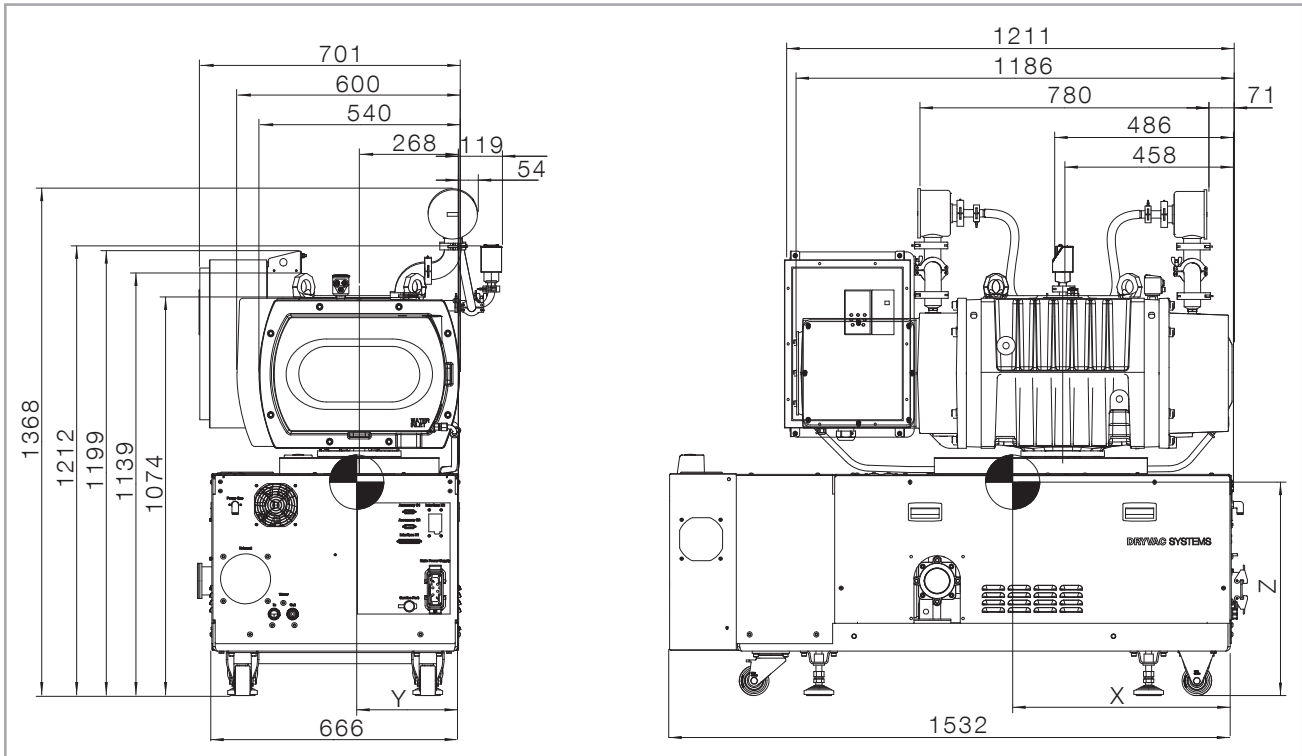
They are water-cooled and lubricated either with synthetic oil or PFPE.



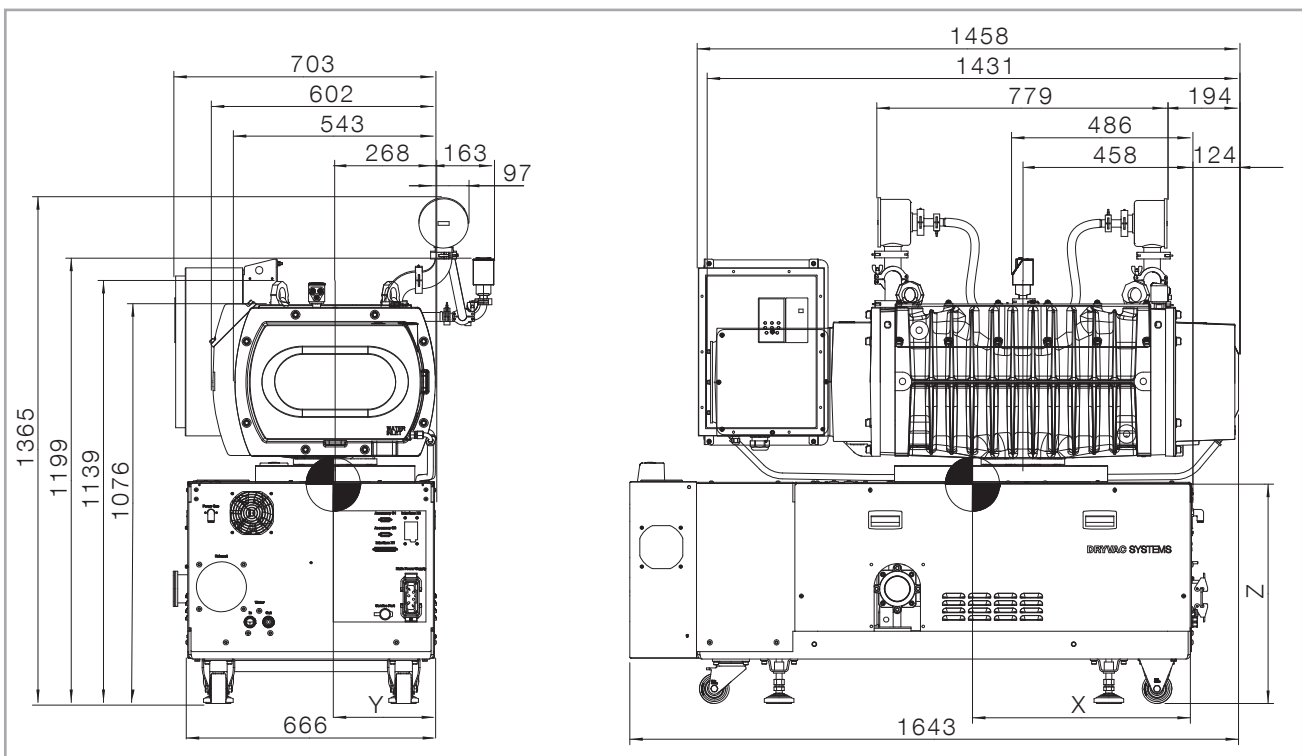
Dimensional drawing for DS 20A(U) 45(S/C) iT, DS 20A(U) 65(S/C) iT, DS 20S(U) 45(S/C) iT, DS 20S(U) 65(S/C) iT (Dimensions in mm)



Dimensional drawing for DS 25H(U) 45(S/C) iT, DS 25H(U) 65(S/C) iT, DS 25HF 45(S/C) iT, DS 25HF 65(S/C) iT (Dimensions in mm)



Dimensional drawing for DS 44H(U) 45(S/C) iT, DS 44H(U) 65(S/C) iT, DS 44HF 65(S/C) iT (Dimensions in mm)



Dimensional drawing for DS 70H(U) 65(S/C) iT, DS 70HF 65(S/C) iT (Dimensions in mm)

Technical Data

DRYVAC SYSTEMS DS

	20A(U) 45(S/C) iT	20S(U) 45(S/C) iT	20A(U) 65(S/C) iT	20S(U) 65(S/C) iT
Max. pump speed w/o gas ballast (50/60 Hz) (± 5 %)	2000 / 2400 m³/h			
Max. effective pumping speed (50/60 Hz) (± 5 %)	1600 / 1850 m³/h		1750 / 2050 m³/h	
Ult. total pressure w/o rotor and inlet purge (± 10 %)	≤ 5 x 10 ⁻³ mbar			
Maximum permissible inlet pressure	1013 mbar			
Maximum permissible discharge pressure (relative to ambient)	+200 mbar			
Integral leak rate	< 5 x 10 ⁻⁴ mbar x l/s	< 1 x 10 ⁻⁴ mbar x l/s	< 5 x 10 ⁻⁴ mbar x l/s	< 1 x 10 ⁻⁴ mbar x l/s
Water vapour tolerance with purge gas (SV40)	60 mbar ≥ 20 NI/min			
Water vapour capacity	15 kg/h		25 kg/h	
Permissible ambient temperature	+5 ... + 35 °C			
Lagerungstemperatur	-10 ... + 60 °C			
Noise level (rigid exhaust pipe) ⁶⁾	65 dB(A) (K _{pA} = 3 dB)			
Screw				
Roots	< 80 dB(A)	< 72 dB(A)	< 80 dB(A)	< 72 dB(A)
Relative atmospheric humidity	95 %, non condensing			
Installation location	up to 2000 m (NHN) ²⁾			
Cooling	Water / air			
Mains voltages and frequencies	380 – 440 V 50 Hz / 420 – 480 V 60 Hz			
Frequency (± 5 %)	50 / 60 Hz			
Phases	3-ph			
Rated power				
at 400 V 50 Hz / 460 V 60 Hz				
at 400 V 50 Hz / 460 V 60 Hz with RUVAC 18,5 kW	18.5 kW	18.5 / 19.5 kW	22.5 kW	22.5 / 23.5 kW
Rated current at 400 V 50 Hz / 460 V 60Hz	38.1 / 33,5 A	39.5 / 36.5 A	45.1 / 39.5 A	46.5 / 42.5 A
Power consumption at ultimate pressure				
Motor efficiency class, calculated and configured acc. to EN 60034-30	IE2			
Electrical power rating				
400V 50Hz	26.4 kVA	27.4 kVA	31.2 kVA	32.2 kVA
460V 60Hz	23.2 kVA	25.3 kVA	27.4 kVA	29.4 kVA
RUVAC rated current f. motor protection				
380 – 440 V 50 Hz / 420 – 480 V 60 Hz	14 / 12 A	15 / 15 A	14 / 12 A	15 / 15 A
Speed Screw / Roots (50 Hz)	7200 / 3000 rpm			
Screw / Roots (60 Hz)	7200 / 3600 rpm			
Min. permissible speed Screw ³⁾	1200 rpm			
Min. permissible speed Roots (off) ⁴⁾	off			
Protection class	IP20			

Technical Data

DRYVAC-SYSTEM DS

	20A(U) 45(S/C) iT	20S(U) 45(S/C) iT	20A(U) 65(S/C) iT	20S(U) 65(S/C) iT
Lubricant filling				
Screw	LVO 210 / 410	LVO 210 / 410	LVO 210 / 410	LVO 210 / 410
Roots	LVO 210	LVO 210 / 400	LVO 210	LVO 210 / 400
Total lubricant quantity (± 5 %)				
Screw LVO 210	1.2 l	1.2 l	1.2 l	1.2 l
Screw LVO 410	1.2 l	1.2 l	1.2 l	1.2 l
Roots LVO 210	3.6 l	3.6 l	3.6 l	3.6 l
Roots LVO 400		2.7 l		2.7 l
Roots LVO 410				
Intake flange	DN 160 ISO-K			
Discharge flange	DN 63 ISO-K			
Materials (components in contact with gas in the pump chamber)	Grey cast iron /graphite cast iron / steel/stainless steel /epoxy paint / FKM			
Materials sealing the pump off in the pump chamber towards the outside	FKM, grey cast iron			
Weight, approx. (± 40 kg)	1156 kg	1215 kg	1156 kg	1215 kg
Dimensions (L x W x H)				
Conn. flange, w/o acc., side exhaust	1532 x 708 x 1124 mm			
Conn. flange, w/o acc., rear exhaust	1532 x 666 x 1124 mm			
w acc., side exhaust (cf. hint ²⁾)				
w acc., rear exhaust (cf. hint ³⁾)				
Water				
Water connection	G1/2" (female)			
Water temperature				
pumps with LVO 210	5 – 35 °C			
pumps with LVO 400 / 410	5 – 25 °C			
Minimum supply pressure (unobstructed discharge, no backpressure)	2 bar(g) ⁵⁾			
Maximum supply pressure	6 bar(g) ⁵⁾			
Nominal flow				
Screw	6 l/min	6 l/min	7.5 l/min	7.5 l/min
Roots				
total	6 l/min	6 l/min	7.5 l/min	7.5 l/min
Purge gas				
Connection	plug-in connection D10			
Nominal setting pressure “Purge gas” (at nominal flow, valves open)	2.8 bar(g) ⁵⁾ (± 5 %)			
Permissible setting pressure “Purge gas” (at purge gas flow)	2.8 to 4.5 bar(g) ⁵⁾ (± 5 %)			
Permissible supply pressure “Purge gas”	4.0 to 10.0 bar(g) ⁵⁾ (± 5 %)			
Purge gas flow shaft seal 2.8 bar(g) nozzle out- / inlet (d = 0.9 / 2.0 mm)	22 / 92 slm (± 10 %)			
Rotor purge gas flow 2.8 bar(g) nozzle inlet (d = 1.0 mm)	28 slm (± 10 %)			

Technical Data

DRYVAC-SYSTEM DS

	25H(U) 45(S/C) iT	25H(U) 65(S/C) iT	25HF 45(S/C) iT	25HF 65(S/C) iT
Max. pump speed w/o gas ballast (50/60 Hz) (± 5 %)	2500 / 3000 m³/h ± 5 %		5000 m³/h ± 5 %	
Max. effective pumping speed (50/60 Hz) (± 5 %)	2100 / 2400 m³/h	2150 / 2500 m³/h	3500 m³/h	3750 m³/h
Ult. total pressure w/o rotor and inlet purge (± 10 %)	< 5 x 10 ⁻³ mbar			
Maximum permissible inlet pressure	1013 mbar			
Maximum permissible discharge pressure (relative to ambient)	+200 mbar			
Integral leak rate	< 1 x 10 ⁻⁴ mbar x l/s			
Water vapour tolerance with purge gas (SV40)	60 mbar ≥ 20 NI/min			
Water vapour capacity	15 kg/h	25 kg/h	15 kg/h	25 kg/h
Permissible ambient temperature	+5 ... + 35 °C			
Lagerungstemperatur	-10 ... + 60 °C			
Noise level (rigid exhaust pipe) ⁶⁾ Screw Roots	65 dB(A) (K _{pA} = 3 dB) < 63 dB(A)			
Relative atmospheric humidity	95 %, non condensing			
Installation location	up to 2000 m (NHN) ²⁾		up to 1000 m (NHN) ²⁾	
Cooling	Water			
Mains voltages and frequencies	380 – 440 V 50 Hz / 420 – 480 V 60 Hz		380 – 480 V 50/60 Hz	
Frequency (± 5 %)	50 / 60 Hz			
Phases	3-ph			
ated power at 400 V 50 Hz / 460 V 60 Hz at 400 V 50 Hz / 460 V 60 Hz with RUVAC 18,5 kW	17.2 / 18.5 kW	21.1/ 22.5 kW	22 kW	26 kW
Rated current at 400 V 50 Hz / 460 V 60 Hz	36.1 / 33.1 A	43.1 / 39.1 A	44.5 / 38.5 A	51.5 / 44.5 A
Power consumption at ultimate pressure	5.6 / 5.7 kW	7.8 / 7.9 kW	6.2 / 6.2 kW	8.4 / 8.4 kW
Motor efficiency class, calculated and configured acc. to EN 60034-30	IE2			
Electrical power rating 400V 50Hz 460V 60Hz	25 kVA 22.9 kVA	29.9 kVA 27.1 kVA	30.8 kVA 26.7 kVA	35.7 kVA 30.8 kVA
RUVAC rated current f. motor protection 380 – 440 V 50 Hz / 420 – 480 V 60 Hz	12 / 12 A	12 / 12 A		
Speed Screw / Roots (50 Hz) Screw / Roots (60 Hz)	7200 / 3000 rpm 7200 / 3600 rpm		7200 / 6000 rpm 7200 / 6000 rpm	
Min. permissible speed Screw 3) Min. permissible speed Roots (off) 4)	1200 rpm off		1200 rpm 1200 rpm	
Protection class	IP 20			

Technical Data

DRYVAC-SYSTEM DS

	25H(U) 45(S/C) iT	25H(U) 65(S/C) iT	25HF 45(S/C) iT	25HF 65(S/C) iT
Lubricant filling				
Screw	LVO 210 / 410			
Roots	LVO 210 / 410			
Total lubricant quantity (± 5 %)				
Screw LVO 210	1.2 l			
Screw LVO 410	1.2 l			
Roots LVO 210	1.2 l			
Roots LVO 400				
Roots LVO 410	1.2 l			
Intake flange	DN 250 ISO-K			
Discharge flange	DN 63 ISO-K			
Materials (components in contact with gas in the pump chamber)	Grey cast iron /graphite cast iron / steel/stainless steel /epoxy paint / FKM			
Materials sealing the pump off in the pump chamber towards the outside	FKM, grey cast iron			
Weight, approx. (± 40 kg)	1160 kg		1190 kg	
Dimensions (L x W x H)				
Conn. flange, w/o acc., side exhaust	1532 x 708 x 984 mm			
Conn. flange, w/o acc., rear exhaust	1532 x 666 x 984 mm			
w acc., side exhaust (cf. hint ²⁾)				
w acc., rear exhaust (cf. hint ³⁾)				
Water				
Water connection	G1/2" (female)			
Water temperature				
pumps with LVO 210	5 – 35 °C			
pumps with LVO 400 / 410	5 – 25 °C			
Minimum supply pressure (unobstructed discharge, no backpressure)	2 bar(g) ⁵⁾			
Maximum supply pressure	6 bar(g) ⁵⁾			
Nominal flow				
Screw	6 l/min	7.5 l/min	6 l/min	7.5 l/min
Roots	2.2 l/min	2.2 l/min	2.2 l/min	2.2 l/min
total	8.2 l/min	9.7 l/min	8.2 l/min	9.7 l/min
Purge gas				
Connection	plug-in connection D10			
Nominal setting pressure “Purge gas” (at nominal flow, valves open)	2.8 bar(g) ⁵⁾ (± 5 %)			
Permissible setting pressure “Purge gas” (at purge gas flow)	2.8 to 4.5 bar(g) ⁵⁾ (± 5 %)			
Permissible supply pressure “Purge gas”	4.0 to 10.0 bar(g) ⁵⁾ (± 5 %)			
Purge gas flow shaft seal 2.8 bar(g) nozzle out- / inlet (d = 0.9 / 2.0 mm)	22 / 92 slm (± 10 %)			
Rotor purge gas flow 2.8 bar(g) nozzle inlet (d = 1.0 mm)	28 slm (± 10 %)			

Technical Data

DRYVAC-SYSTEM DS

	44H(U) 65(S/C) iT	44HF 65(S/C) iT	70H(U) 65(S/C) iT	70HF 65(S/C) iT
Max. pump speed w/o gas ballast (50/60 Hz) (± 5 %)	4400 / 5280 m³/h	7040 m³/h	7040 / 8400 m³/h	9 800 m³/h
Max. effective pumping speed (50/60 Hz) (± 5 %)	3600 / 4200 m³/h	5150 m³/h	5200 m³/h	6 800 m³/h
Ult. total pressure w/o rotor and inlet purge (± 10 %)	< 5 x 10 ⁻³ mbar			
Maximum permissible inlet pressure	1013 mbar			
Maximum permissible discharge pressure (relative to ambient)	+200 mbar			
Integral leak rate	< 1 x 10 ⁻⁴ mbar x l/s			
Water vapour tolerance with purge gas (SV40)	60 mbar ≥ 20 NI/min			
Water vapour capacity	25 kg/h			
Permissible ambient temperature	+5 ... + 35 °C			
Lagerungstemperatur	-10 ... + 60 °C			
Noise level (rigid exhaust pipe) ⁶⁾ Screw Roots	65 dB(A) (K _{pA} = 3 dB) < 63 dB(A)			
Relative atmospheric humidity	95 %, non condensing			
Installation location	up to 2000 m	up to 1000 m	up to 2000 m	up to 1000 m
Cooling	Water			
Mains voltages and frequencies	380 – 440 V 50 Hz 420 – 480 V 60 Hz	380 – 480 V 50/60 Hz	380 – 440 V 50 Hz 420 – 480 V 60 Hz	380 – 480 V 50/60 Hz
Frequency (± 5 %)	50 / 60 Hz			
Phases	3-ph			
ated power at 400 V 50 Hz / 460 V 60 Hz at 400 V 50 Hz / 460 V 60Hz z with RUVAC 18,5 kW	26 kW			
Rated current at 400 V 50 Hz / 460 V 60 Hz	51.5 / 44.5 A	51.5 / 44.5 A	51.5 / 44.5 A	51.5 / 44.5 A
Power consumption at ultimate pressure	8.1 / 8.3 kW	8.9 kW	8.1 / 8.3 kW	8.6 kW
Motor efficiency class, calculated and configured acc. to EN 60034-30	IE2			
Electrical power rating 400V 50 Hz 460V 60 Hz	35.7 kVA 30.8 kVA			
RUVAC rated current f. motor protection 380 – 440V 50Hz / 420 – 480V 60Hz	20 / 17 A		20 / 17 A	
Speed Screw / Roots (50 Hz) Screw / Roots (60 Hz)	35 / 29 A		35 / 29 A	
Min. permissible speed Screw ³⁾	7200 / 3000 rpm	7200 / 4800 rpm	7200 / 3,000 rpm	7200 / 4200 rpm
Min. permissible speed Roots (off) ⁴⁾	7200 / 3600 rpm	7200 / 4800 rpm	7200 / 3,600 rpm	7200 / 4200 rpm
Protection class	1200 rpm off	1200 rpm 1200 rpm	1200 rpm off	
Schutzart	IP20			
Lubricant filling Screw Roots	LVO 210 / 410 LVO 210 / 400			
Total lubricant quantity (± 5 %) Screw LVO 210 Screw LVO 410 Roots LVO 210 Roots LVO 400 Roots LVO 410	1.2 l 1.2 l 4.75 l 4.75 l 4.75 l			

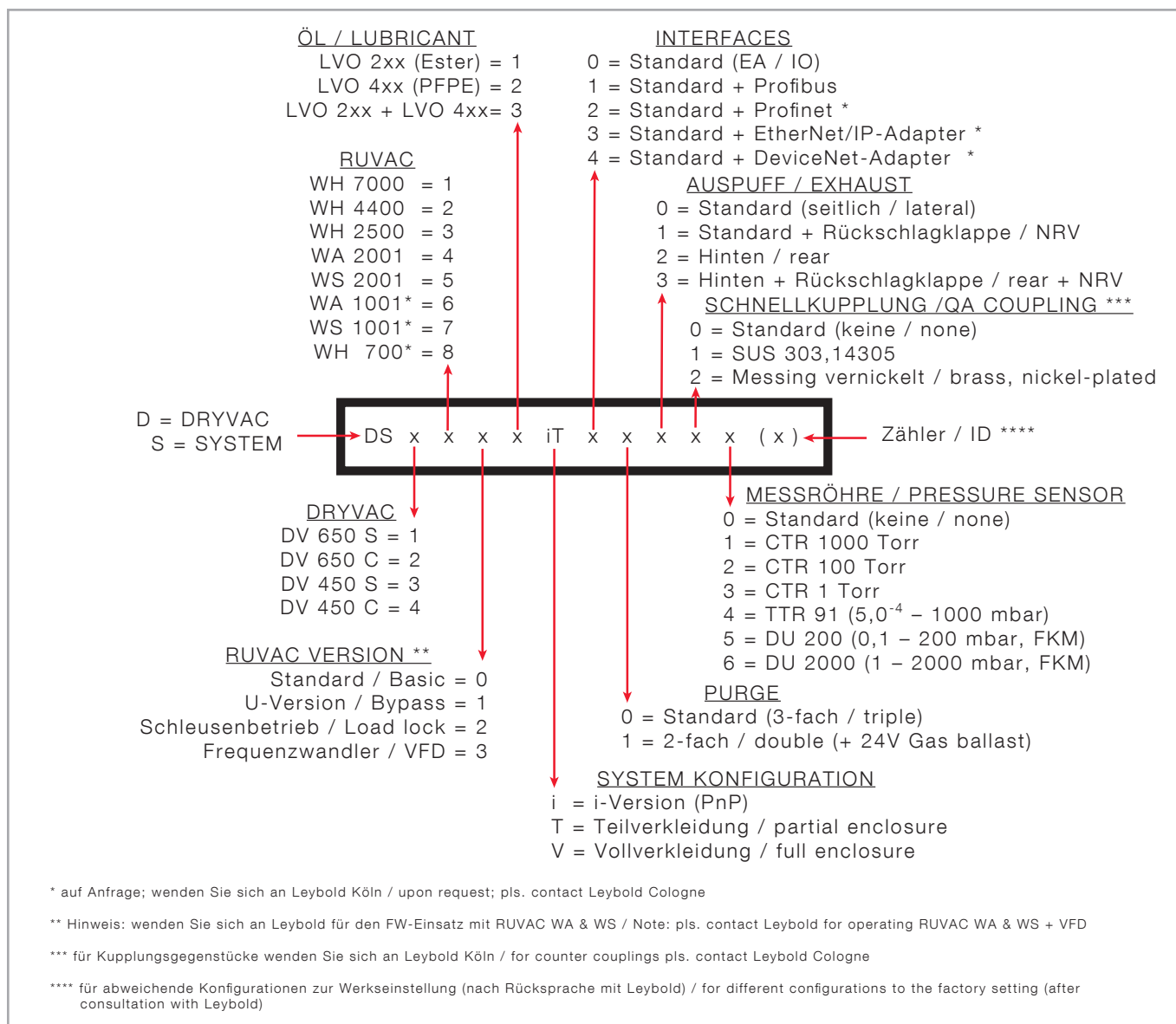
Technical Data

DRYVAC-SYSTEM DS

	44H(U) 65(S/C) iT	44HF 65(S/C) iT	70H(U) 65(S/C) iT	70HF 65(S/C) iT
Intake flange	DN 250 ISO-K	DN 320 ISO-K		
Discharge flange	DN 63 ISO-K			
Materials (components in contact with gas in the pump chamber)	Grey cast iron /graphite cast iron / steel/stainless steel /epoxy paint / FKM			
Materials sealing the pump off in the pump chamber towards the outside	FKM, grey cast iron			
Weight, approx. (± 40 kg)	1370 kg	1400 kg	1465 kg	1495 kg
Dimensions (L x W x H)				
Conn. flange, w/o acc., side exhaust	1532 x 708 x 1074 mm		1643 x 708 x 1074 mm	
Conn. flange, w/o acc., rear exhaust	1532 x 666 x 1074 mm		1643 x 666 x 1074 mm	
w acc., side exhaust (cf. hint ²⁾)				
w acc., rear exhaust (cf. hint ³⁾)				
Water				
Water connection	G1/2" (female)			
Water temperature				
pumps with LVO 210	5 – 35 °C			
pumps with LVO 400 / 410	5 – 25 °C			
Minimum supply pressure (unobstructed discharge, no backpressure)	2 bar(g) ⁵⁾			
Maximum supply pressure	6 bar(g) ⁵⁾			
Nominal flow				
Screw	7.5 l/min			
Roots	5.7 l/min			
total	13.2 l/min			
Purge gas				
Connection	plug-in connection D10			
Nominal setting pressure “Purge gas” (at nominal flow, valves open)	2.8 bar(g) ⁵⁾ (± 5 %)			
Permissible setting pressure “Purge gas” (at purge gas flow)	2.8 to 4.5 bar(g) ⁵⁾ (± 5 %)			
Permissible supply pressure “Purge gas”	4.0 to 10.0 bar(g) ⁵⁾ (± 5 %)			
Purge gas flow shaft seal 2.8 bar(g) nozzle out- / inlet (d = 0.9 / 2.0 mm)	22 / 92 slm (± 10 %)			
Rotor purge gas flow 2.8 bar(g) nozzle inlet (d = 1.0 mm)	28 slm (± 10 %)			

Additional information regarding the technical data

- Noise levels of > 100 dB(a) may occur with cyclic operation conditions, e.g. with load-lock operations or plain pump-downs. In this case we recommend to use RUVAC pumps with a pressure balance line („U"-pumps).
- The frequency converter standard ratings are valid for an installation altitude up to 1000 m. If the altitude exceeds 1000 m both the input voltage and the rated output current must be derated for 1% per 100 m.
- In case of overvoltage (> 480 V), bad cooling and permanent operation at nominal power the output power may be reduced in order to prevent thermal overload of the frequency converter. In case of undervoltage (< 380 V) the maximum power is not available by design.
- The minimum permissible frequency is 20 Hz for both the DRYVAC and the RUVAC.
The minimum permissible speed is relevant for the oil lubrication of bearings and gears. Running the pump at less than the minimum speed for more than 1 hour can cause damage to the pump due to a lack of lubrication.
- bar(g): bar (gauge) is the overpressure, i.e. atmospheric pressure = 0 bar(g)
- Valid for 50Hz operations at ult. pressure conditions. Higher speeds, especially pressures >10 mbar, generate higher noise levels.



Configuration matrix

Part numbers for DRYVAC SYSTEMS are based on the matrix shown in the figure above and give hints on the individual configuration and features of the pump combination in question:

Ordering Information

DRYVAC SYSTEMS

Part No.	Description	Lubricants Screw	Lubricants Roots	Purge gas module	Exhaust / Check valve	Quick-release coupling (one-sided)
DS3411iT00000	DS 20AU45S iT	LVO210	LVO210	triple	side / no	no
DS1411iT00000	DS 20AU65S iT	LVO210	LVO210	triple	side / no	no
DS2512iT00000	DS 20SU65C iT	LVO410	LVO400	triple	side / no	no
DS1512iT00000	DS 20SU65S iT	LVO410	LVO400	triple	side / no	no
DS1511iT00000	DS 20SU65S iT	LVO210	LVO210	triple	side / no	no
DS2302iT00000	DS 25HF65C iT	LVO410	LVO410	triple	side / no	no
DS1303iT00320	DS 25HF65S iT	LVO210	LVO410	triple	rear / yes	yes
DS1303iT00000	DS 25HF65S iT	LVO210	LVO410	triple	side / no	no
DS4332iT00320	DS 25HF45C iT	LVO410	LVO410	triple	rear / yes	yes
DS3332iT00320	DS 25HF45S iT	LVO410	LVO410	triple	rear / yes	yes
DS3331iT00000	DS 25HF45S iT	LVO210	LVO210	triple	side / no	no
DS2332iT00320	DS 25HF65C iT	LVO410	LVO410	triple	rear / yes	yes
DS1333iT00320	DS 25HF65S iT	LVO210	LVO410	triple	rear / yes	yes
DS3313iT00320	DS 25HU45S iT	LVO210	LVO410	triple	rear / yes	yes
DS1313iT00320	DS 25HU65S iT	LVO210	LVO410	triple	rear / yes	yes
DS1311iT00000	DS 25HU65S iT	LVO210	LVO210	triple	side / no	no
DS2202iT00000	DS 44HF65C iT	LVO410	LVO400	triple	side / no	no
DS1201iT00000	DS 44HF65S iT	LVO210	LVO210	triple	side / no	no
DS2232iT00320	DS 44HF65C iT	LVO410	LVO400	triple	rear / yes	yes
DS1223iT00320	DS 44HU65S iT	LVO210	LVO400	triple	rear / yes	yes
DS1223iT00000	DS 44HU65S iT	LVO210	LVO400	triple	side / no	no
DS1212iT00000	DS 44HU65S iT	LVO410	LVO400	triple	side / no	no
DS1211iT00000	DS 44HU65S iT	LVO210	LVO210	triple	side / no	no
DS2132iT00320	DS 70HF65C iT	LVO410	LVO400	triple	rear / yes	yes

... to be continued

Accessories

	Part No.
Synthetic Oil LEYBONOL LVO 210, 1 l	L21001
Synthetic Oil LEYBONOL LVO 210, 5 l	L21005
PFPE LEYBONOL LVO 400, 1 l	L40001
PFPE LEYBONOL LVO 410, 1 l	L41001
Silencer DN 63 ISO-K for DRYVAC SYSTEMS	119002
Serviceable Silencer DN 63 ISO-K for DRYVAC SYSTEMS	119003V
Harting plug for DRYVAC S-i/RS-i/DV-i/DVR-i	112 005A20
Active sensors / gauge heads	
Kit CTR 1 Torr	504391V901
Kit CTR 100 Torr	504392V901
Kit CTR 1000 Torr	504393V901
Kit DU 200	504394V901
Kit DU 2000	504395V901
Kit TTR 91	504396V901
Rotatable crane eyes (M 20 x 30; set of 4)	504397V901
Counter coupling water, BNP	504406V901
Counter coupling water, stainless-steel	504407V901

GSD file and manual for the Profibus interface see the Leybold homepage.

Dry Compressing Pump Systems DRYVAC PowerBoost

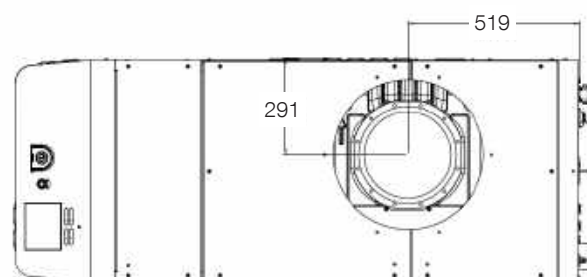
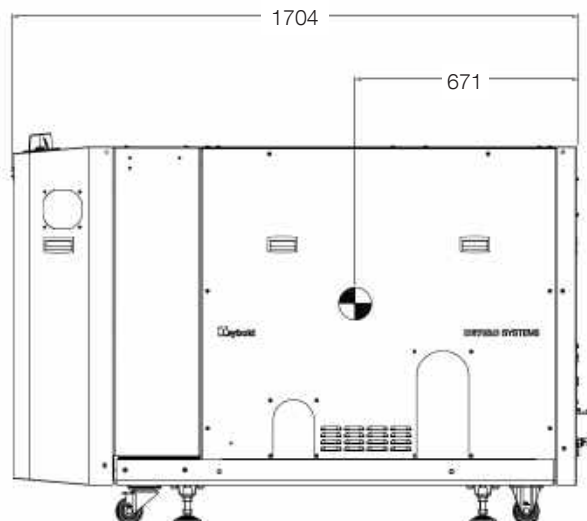
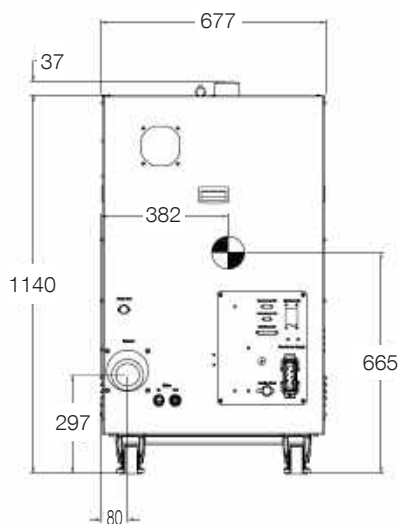


The DRYVAC SYSTEM 44HUF65S IV (DS 4465-U2) consists of a combination of a dry compressing screw pump and a Roots pump. Its design has been specifically optimized for a fast load lock pump-downs, it is equipped with an automatic cycle detection system, and the Roots pump shows a special speed management. Thus, with an optimum utilization of the power, the mechanical stress due to pressure bursts was minimized, and the noise level during pump-downs was significantly reduced.

Furthermore the system described hereinafter is equipped with:

- integrated frequency converters
- Microcontroller with touchscreen
- digital I/O communication interface (DC37-P)
- Harting connections (power supply)
- housing, castors and adjustable feet

The system is water-cooled and lubricated with synthetic oil.



Dimensional drawing for PowerBoost DS 4465 U2 (Dimensions in mm)

Technical Data

DRYVAC SYSTEM DS 44HUF65S iV

Ultimate total pressure w/o purge gas or with purge gas for shaft seal outlet ($\pm 10\%$)	$< 5 \times 10^{-3}$ mbar
Maximum permissible inlet pressure	1050 mbar
Maximum permissible discharge pressure (relative to ambient)	+200 mbar
Integral leak rate	$< 1 \times 10^{-4}$ mbar x l/s
Permissible gas inlet temperature	+5 ... +40 °C
Permissible ambient temperature	+5 ... +30 °C
Storage temperature	-10 ... +60 °C
Noise level with rigid exhaust pipe, at ultimate pressure (acc. to DIN EN ISO 2151)	Screw = 65 dB(A) Roots = 63 dB(A) ⁵⁾ ($K_{pA} = 3$ dB)
Relative atmospheric humidity	95 %, non-condensing
Installation location	up to 1000 m (NHN) ¹⁾
Cooling	Water
Mains voltage	360 – 440 V 50/60 Hz ²⁾
Frequency ($\pm 5\%$)	50 / 60 Hz
Phasen	3-ph
Rated power at 400 V ($\pm 0,8$ kW)	57 kW
Rated current at 400 V	95 A
Power consumption at ultimate pressure ($\pm 0,8$ kW)	9 kW
Motor efficiency class, calculated and configured acc. to EN 60034-30	IE2
Min. permissible speed ³⁾	1200 rpm
Protection class	IP20
Lubricant filling	LVO 210
Total lubricant quantity ($\pm 5\%$)	5.7 l
Intake flange	DN 250 ISO-K
Discharge flange	DN 63 ISO-K
Materials (components in contact with gas in the pump chamber)	Grey cast iron /graphite cast iron / steel/stainless steel /epoxy paint / FKM
Materials sealing the pump off in the pump chamber towards the outside	FKM, grey cast iron
Weight, approx. (± 40 kg)	1500 kg
Dimensions (L x W x H) (± 10 mm)	1704 x 677 x 1140 mm
Water	
Water connection	G1/2" (female)
Water temperature	5 – 35 °C
Minimum supply pressure (unobstructed discharge, no backpressure)	2 bar(g) ⁴⁾
Maximum supply pressure	7 bar(g) ⁴⁾
Nominal flow	14 l/min

Technical Data

DRYVAC SYSTEM DS 44HUF65S iV

Purge gas	
Connection	G1/4" (female)
Nominal setting pressure "Purge gas" (at nominal flow, valves open)	2.8 bar(g) ⁴⁾
Permissible setting pressure "Purge gas" (at purge gas flow)	2.8 to 4.5 bar(g) ⁴⁾
Permissible supply pressure "Purge gas"	4.0 to 10.0 bar(g) ⁴⁾
Purge gas flow shaft seal inlet (d = 2.0 mm) / outlet (d = 0.9 mm) at nominal setting pressure (2.8 bar(g)) at max. setting pressure (3.5 bar(g))	92 slm / 22 slm 107 slm / 26 slm

Additional information regarding the technical data

- 1) The frequency converter standard ratings are valid for an installation altitude up to 1000 m. If the altitude exceeds 1000 m both the input voltage and the rated output current must be derated for 1% per 100 m.
- 2) In case of undervoltage (< 380 V) the maximum power is not available by design.
- 3) The minimum permissible frequency is 20 Hz for both the DRYVAC and the RUVAC.
The minimum permissible speed is relevant for the oil lubrication of bearings and gears. Running the pump at less than the minimum speed for more than 1 hour can cause damage to the pump due to a lack of lubrication.
- 4) bar(g): bar (gauge) is the overpressure, i.e. atmospheric pressure = 0 bar(g)
- 5) The noise level is significantly higher due to flow generated noises during load lock operations. Its accurate value depends on the operational mode used as well as the intake line's design. The pump system DS 44HUF65S iV is equipped with an automatic cycle detection system. With detecting vacuum cycles the pump system will reduce the noise level to a minimum during pump-downs.

Ordering Information

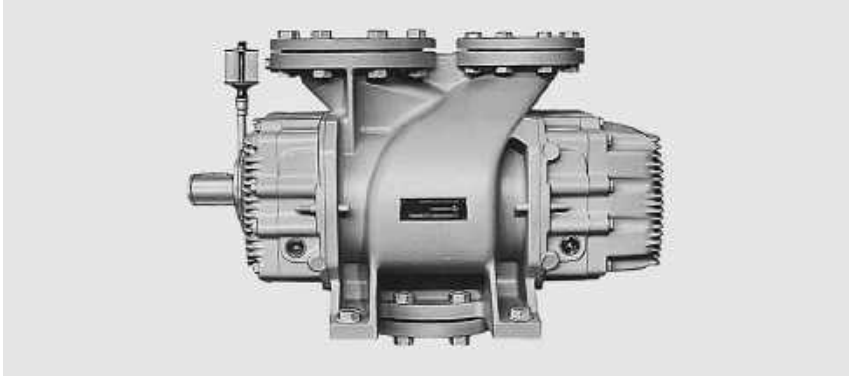
DRYVAC-SYSTEM DS 44HUF65S iV

	Part No.
DRYVAC PowerBoost	
DS 4465 U2	DS1241iV01320
Harting plug for 100 A	504613V901
Counter coupling water, BNP	504406V901
DRYVAC PowerBoost Plus	
DS 4465 U2	DS1241iV01320
Harting plug for 100 A	504613V901
DV650 Plus Upgrade kit	504595V901
Harting plug for 65 A	112005A20
Counter coupling water, BNP (2x)	504406V901

Accessories

	Part No.
Synthetic Oil LEYBONOL LVO 210, 1 litre	L21001
Floor mount (optional; set of 4 with foundation bolts)	503637V001
Rotatable crane eyes	6521504

RUVAC RAV Roots Vacuum Pumps with Pre-Admission Cooling

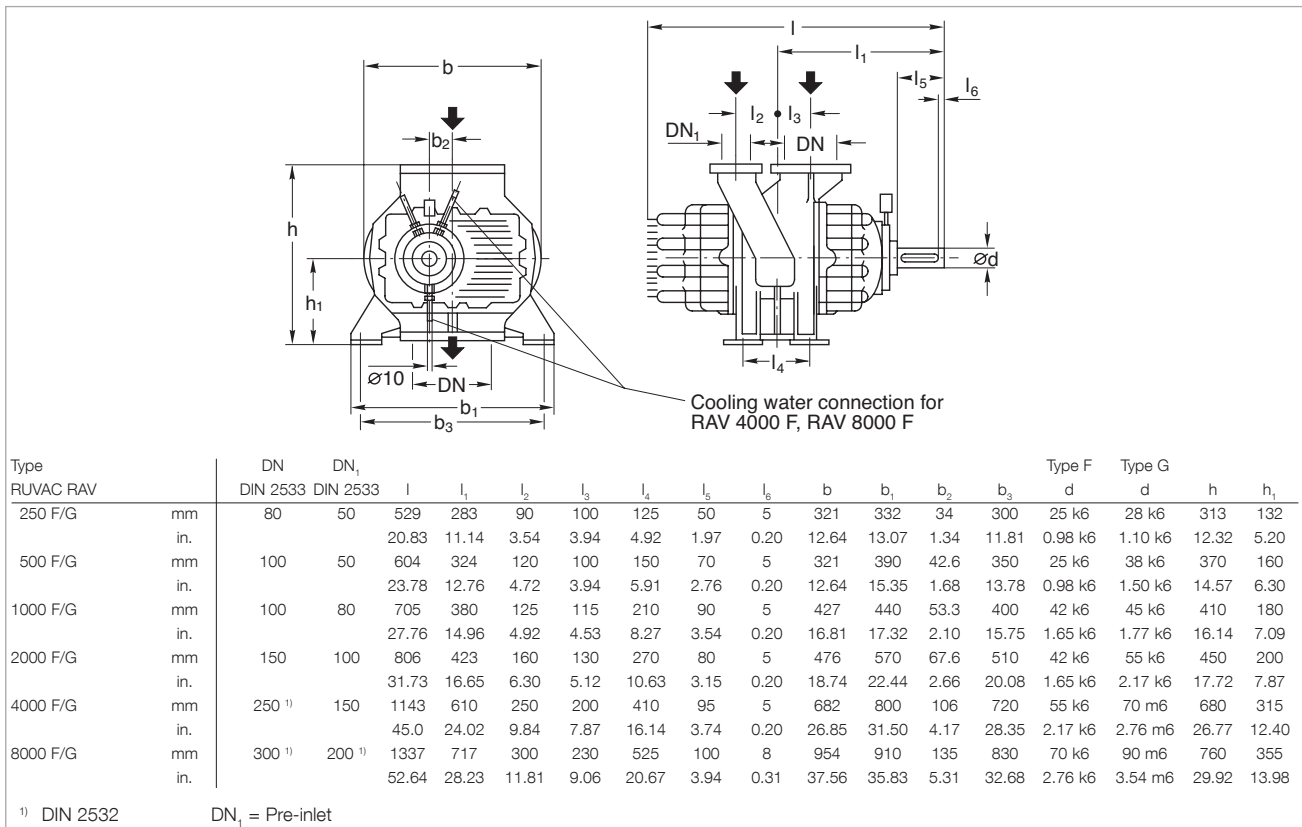


Typical Applications

- Short pump-down cycles on large volumes
- Oil-free compression of high volume flows of gases and vapors against atmospheric pressure
- Single-stage (G) or in combination with RAV F as backing pump
- Operating pressures in the rough vacuum range
- CE approval

Advantages to the User

- **RUVAC RAV G**
Operating pressure range of 150 mbar (112.5 Torr) against atmospheric pressure; total leak rate $< 10^{-1}$ mbar x l/s (7.5×10^{-2} Torr x l/s)
- **RUVAC RAV F**
In combination with backing pumps the attainable operating pressures extend down into the medium vacuum range;
- leak rate $< 10^{-2}$ mbar x l/s (7.5×10^{-3} Torr x l/s)
- When series-connected the operating pressures extend down into the medium vacuum range:
 - two-stages to 25 mbar (18.75 Torr)
 - multiple stage to 10^{-3} mbar (7.5×10^{-4} Torr)
- Motors for special supply voltages and frequencies or protected types are available
- Pre-admission silencer and filter for the cooling gas inlet as well as silencers for the exhaust side (option/single-stage)
- Downstream gas cooler (option/multistage)
- C version (chemical version/option)
- Special materials (option)
- Pressure burst resistant version (option)



Dimensional drawing for the RUVAC RAV pumps

Technical Data, 50 Hz

RUVAC RAV

		250 G	500 G	1000 G	2000 G	4000 G	8000 G
Pumping speed ¹⁾	m ³ /h (cfm)	250 (147)	500 (295)	1000 (589)	2000 (1178)	3700 (2179)	8100 (4771)
Nominal speed	min ⁻¹ (rpm)	3000 (3000)	3000 (3000)	3000 (3000)	3000 (3000)	1500 (1500)	1500 (1500)
Max. permissible pressure difference ²⁾	mbar (Torr)	850 (637)					
Connecting flange	DN	80	100	100	150	250	300
Max. permissible motor power for direct drive	kW (hp)	11.0 (15.0)	18.5 (25.2)	30.0 (40.8)	55.0 (74.8)	95.0 (129.3)	200.0 (272.1)
for belt drive	kW (hp)	11.0 (15.0)	18.5 (25.2)	30.0 (40.8)	55.0 (74.8)	95.0 (129.3)	200.0 (272.1)
Weight	kg (lbs)	95 (210)	160 (353)	225 (496)	310 (684)	720 (1588)	1230 (2712)

Ordering Information

RUVAC RAV

	250 G	500 G	1000 G	2000 G	4000 G	8000 G
	Part No.	Part No.	Part No.	Part No.	Part No.	Part No.
Roots vacuum pump RUVAC RAV G	upon request	upon request	upon request	upon request	upon request	upon request

Technical Data, 50 Hz

RUVAC RAV

		250 F	500 F	1000 F	2000 F	4000 F	8000 F
Pumping speed ¹⁾	m ³ /h (cfm)	250 (147)	500 (295)	1000 (589)	2000 (1178)	3700 (2179)	8100 (4771)
Nominal speed	min ⁻¹ (rpm)	3000 (3000)	3000 (3000)	3000 (3000)	3000 (3000)	1500 (1500)	1500 (1500)
Max. permissible pressure difference ²⁾	mbar (Torr)	850 (637)					
Connecting flange	DN	80	100	100	150	250	300
Max. permissible motor power for direct drive	kW (hp)	11.0 (15.0)	18.5 (25.2)	30.0 (40.8)	55.0 (74.8)	95.0 (129.3)	200.0 (272.1)
for belt drive	kW (hp)	4.0 (5.4)	4.0 (5.4)	7.5 (10.2)	15.0 (20.4)	37.0 (50.3)	75 (102.0)
Gear oil, approx.	l (qt)	0.9 (0.95)	1.1 (1.6)	1.5 (1.59)	2.5 (2.64)	12.0 (12.68)	11.0 (11.63)
Weight	kg (lbs)	95 (210)	160 (353)	225 (496)	310 (684)	720 (1588)	1230 (2712)
Cooling water connection, fitting for tube		–	–	–	–	10 x 1	10 x 1
Cooling water requirement, approx.	l x h ⁻¹	–	–	–	–	60	60

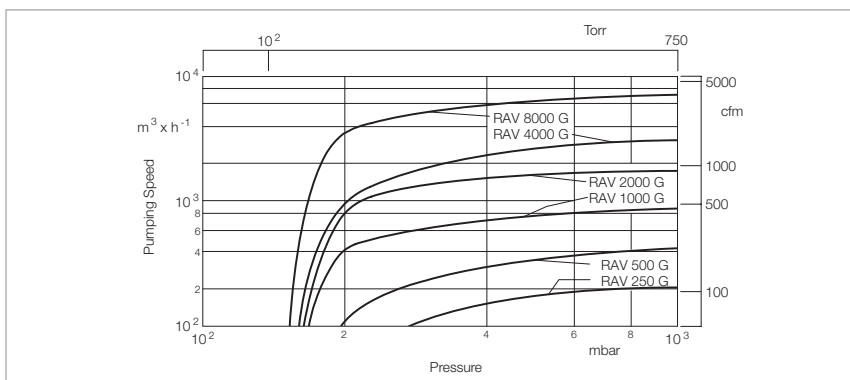
Ordering Information

RUVAC RAV

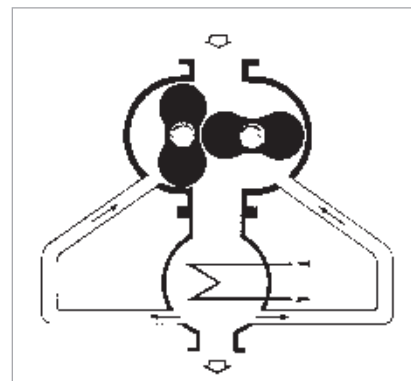
	250 F	500 F	1000 F	2000 F	4000 F	8000 F
	Part No.	Part No.	Part No.	Part No.	Part No.	Part No.
Roots vacuum pump RUVAC RAV F	upon request	upon request	upon request	upon request	upon request	upon request

¹⁾ To DIN 28 400 and following numbers

²⁾ RUVAC RAV G and RAV F with direct drive

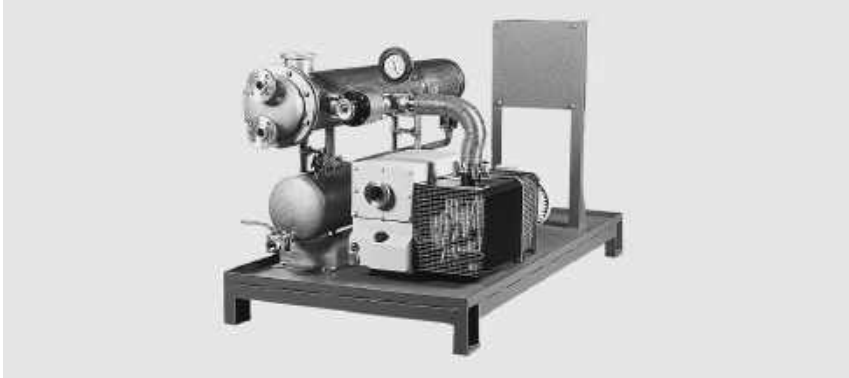


Pumping speed diagram of RUVAC RAV at 50 Hz



Operating diagram of RUVAC RAV vacuum pumps with pre-admission cooling

TVD Pump Systems for Drying, Evaporation and Distillation Applications



TVD 200

Advantages to the User

- Operating agent may be reused, for example by returning cleaned water to the process
- Reduction of the quantities which need to be disposed of by 80%
- Low temperature distillation/drying
- Condensate may be drained during vacuum operation
- CE approval

Typical Applications

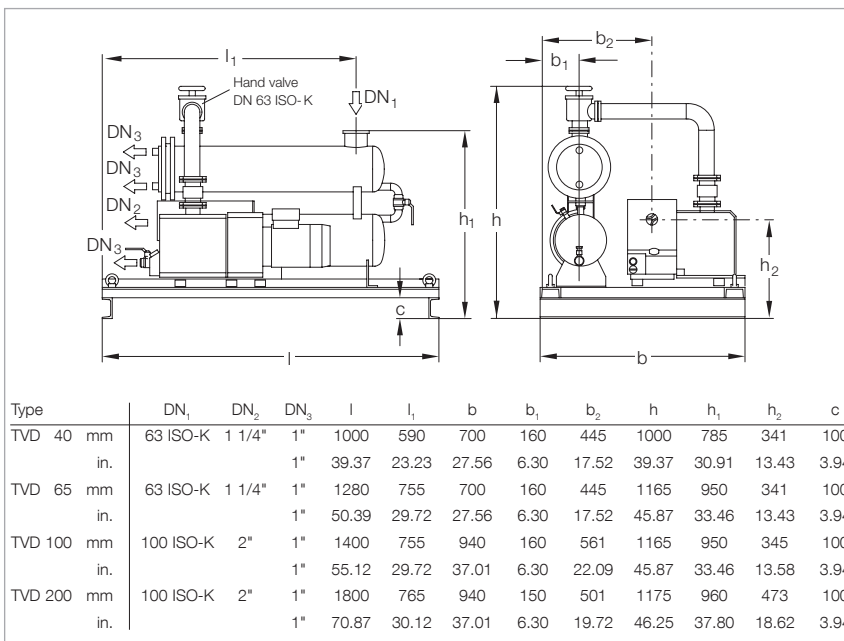
- Drying of powders and solids, for example
- Cleaning of waste water
- Vacuum distillation

Standard Equipment

- Condenser at the intake side
- Receiver with condensate level indicator
- Manually operated valves on the receiver
- SOGEVAC rotary vane vacuum pump with integrated exhaust filters, anti-suckback valve and gas ballast valve

Options

- Valve between condenser and rotary vane vacuum pump
- Pressure gauge for checking the condensate pressure
- Solenoid valves at the receiver
- Receiver with proximity switch for monitoring the condensate level
- Electric control for automatic operation of the pump system
- Mobile pallet with castors
- Cold water replacement for mobile applications



Dimensional drawing for the TVD pump systems

Technical Data, 50 Hz**TVD 40****TVD 65****TVD 100****TVD 200**

Condenser, effective surface area, approx.	m ²	1	2	3	5
Receiver, usable volume	l (qt)	30.0 (31.71)	50.0 (52.85)	50.0 (52.85)	50.0 (52.85)
Rotary vane vacuum pump SOGEVAC		SV 40	SV 65	SV 100	SV 200
Nominal pumping speed	m ³ /h (cfm)	46.0 (27.1)	65.0 (38.3)	100.0 (58.9)	180.0 (106.0)
Pumping speed at 50 Hz for air	m ³ /h (cfm)	46.0 (27.1)	53.0 (31.2)	94.0 (55.4)	170.0 (100.1)
for water vapor at 50 mbar (37.5 Torr)	m ³ /h (cfm)	280.0 (165.0)	560.0 (330.0)	840.0 (495.0)	1400.0 (825.0)
Ultimate total pressure with standard gas ballast	mbar (Torr)	< 1.5 (< 1.1)	< 1.5 (< 1.1)	< 1.5 (< 1.1)	< 0.7 (< 0.53)
Noise level ¹⁾	dB(A)	63	64	70	69
Condensing capacity for water	l/h	10	20	30	50
Installed motor power 400 V, 50 Hz	kW (hp)	1.1 (1.5)	1.5 (2.0)	2.2 (3.0)	4.0 (4.2)

Technical Data, 50 Hz**SV 40****SV 65****SV 100****SV 200**

Weight (with oil filling), approx.	kg (lbs)	125 (276)	150 (331)	200 (441)	300 (662)
Oil filling	l (qt)	2.0 (2.11)	2.0 (2.11)	3.5 (3.70)	5.0 (5.29)
Connecting flanges					
Inlet port	DN ₁	63 ISO-K	63 ISO-K	100 ISO-K	100 ISO-K
Outlet port	DN ₂	1 1/4"	1 1/4"	2"	2"

Ordering Information**TVD 40****TVD 65****TVD 100****TVD 200**

	Part No.	Part No.	Part No.	Part No.
Pump system	021 01	021 02	021 03	021 04

¹⁾ Operating at ultimate pressure with gas ballast

Accessories for oil sealed and dry compressing Pump Systems

Sound Proofing

A sound proofing box is available as an optional extra so as to reduce the noise down to the permissible level.

Depending on the size of the pumping system, noise reductions between 15 and 20 dB(A) are obtained using our standard sound proofing arrangements.

Custom designs of the sound proofing box allow the noise level to be reduced by up to 35 dB(A).



RUTA RA 3001/S630F/G with sound proofing box

The maintenance side is designed as a door component. A window insert may be provided in the door or in the side walls to facilitate checking of the oil levels.

Ventilation is performed by means of an electric fan, the fresh air and exhaust ducts are located within the sound proofing box. Further optional extras which may be fitted include closed air circulation with integrated, water-cooled heat exchanger and a connection port for a central exhaust system.

Isolation against Vibrations

RUTA vacuum pump systems produce only slight vibrations. To reduce these vibrations even further, vibration absorbers can be fitted under the pump system.

Dust Separators

Vacuum processes where large amounts of particles or dusts are contributed by the process require special devices to protect the vacuum pumps.

Leybold has developed – even for high flow rate applications – special dust separators, which can be installed ahead of the intake of the RUTA vacuum pump systems. The dust separators have two stages. The first stage is a cyclone that collects dust particles of coarse and medium size, the fine dust are trapped in filter elements. Dust separators are customdesigned for the specific process and the required pumping speed.

Dust Filter without Cyclone

See further down in this chapter.

Filtering surface suitable for pumping speeds	m ²	0.2	0.5	1.0	2.0	3.0	5.0
min.	m ³ /h (cfm)	100 (58.9)	300 (176.7)	600 (353.4)	1000 (589)	1500 (883.5)	3000 (1767)
max.	m ³ /h (cfm)	300 (176.7)	800 (471.2)	1500 (883.5)	3000 (1767)	4000 (2356)	8000 (4712)
Reduction of pumping speed at							
≤ 1 mbar (< 0.75 Torr)	%	11	11	11	11	11	11
≤ 6 mbar (< 4.5 Torr)	%	9	9	9	9	9	9
≤ 20 mbar (< 15 Torr)	%	5	5	5	5	5	5
without dust load							

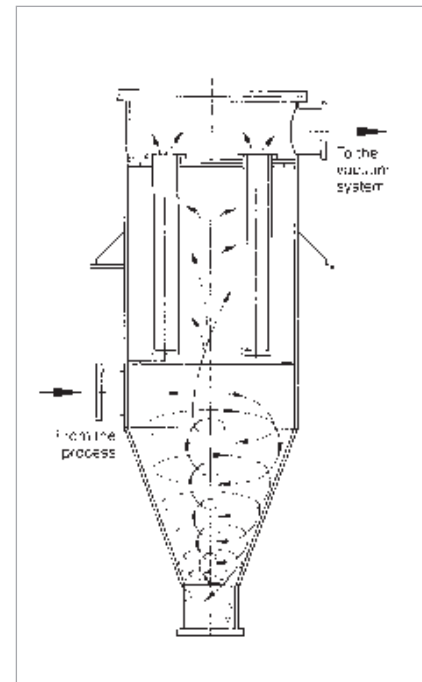
Frequency converter RUVATRONIC RT 5

The electronic frequency inverters RUVATRONIC RT 5/251 to 5/16000 have been designed specially for use in connection with Leybold Roots pumps of the RUVAC type. For each Roots vacuum pump size, a matching frequency converter is available.

The main characteristics of the RUVATRONIC RT 5 are:

Simulation of a pressure equalization line

The software of the frequency inverters is adapted to each pump and ensures that the risk of mechanically overloading the pump can be excluded. In the case of too high pressure differences, the rotational speed will be decreased



Diagrammatic section through a dust separator

automatically until the load is reduced to within the pump's limits.

RUVAC Roots vacuum pumps of the types WA, WS and RA (without pressure equalization line) can be switched on together with the forepump at atmospheric pressure. Through this, the pumpdown time can be reduced drastically. The minimum pumping speed of the backing pump needs to be considered in this case.

Pump	Required pumping speed for the backing pump
WA/WS 251	50 m ³ /h (29 cfm)
WA/WS 501	100 m ³ /h (59 cfm)
WA/WS 1001	200 m ³ /h (118 cfm)
WA/WS 2001	410 m ³ /h (241 cfm)
RA 3001	650 m ³ /h (383 cfm)
RA 5001	930 m ³ /h (547 cfm)
RA 7001	1250 m ³ /h (736 cfm)
RA 9001	3240 m ³ /h (1907 cfm)

Operation at up to 3 predefined speeds

Via floating contacts, the pump can be operated at one of the 3 predefined speeds. Switching over to another pre-defined speed is possible during operation.

Operation at any rotational speed

With a 0 to 10 V signal, any speed can be pre-defined to operate the pump between the minimum and maximum rotational speed. The software reliably ensures that the rotational speed cannot drop below the minimum speed or exceed the maximum speed.

Increase in the pumping speed

By operating the Roots vacuum pumps at frequencies over 50 Hz, the nominal pumping speed of the pumps can be increased. Depending on the type of pump, an increase between 20 and 100% is possible.

Note

Please enquire about possible application limitations (process dependent).

Electric Controller

In order to drive all electrical appliances within the pump systems, the pump systems may be equipped with standard control cabinets which contain:

- Motor protection switch (rated for the pumps used in each case)
- Contactors
- Main switch interlocked in accordance with VDE 0113
- Relays for necessary control/sub-systems
- ON/OFF push-button for each pump
- Power supply for the installed monitoring facilities
- Fault indicators arranged on a lamp panel
- Switch-over (through an external contact) from local to remote operation.

The control cabinet may be fitted either to the frame of the pump system or it may be wallmounted.

Beside the standard systems, we manufacture control systems for much more complex systems:

- Remote control module as a 19" rack module (1/4 width, 3 HU). The start/stop push-buttons and the related indicators for operation and fault are located on the front panel
- Pre- and post-operation control
- Pressure dependent control
- Time-dependent control
- Program control
- Control for explosion hazard areas
- Combinations of the aforementioned versions
- Programmable control (PC)
- Vacuum gauge with pressure read-out in the control cabinet.

Pressure Control

Basically there are several ways in which to control the pressure.

The equipment which is supplied as standard for the **DOWNSTREAM** or **BYPASS** control systems selected by Leybold consists of:

- Pressure measurement
- Controller with control unit
- Control valve with position indicator
- Engineering.

The **Downstream Control System** throttles the pumping speed of the vacuum pump by changing the conductance of the valve.

The advantages offered by this arrangement are:

- No supply of other gases
- Closed system
- The intake pressure of the pump system is lower than its operating pressure (thus saving energy, among other things).

The second method is the **Bypass Control System**. Here the pressure is maintained at a constant level by admitting an additional quantity of gas.

The advantages offered by this arrangement are:

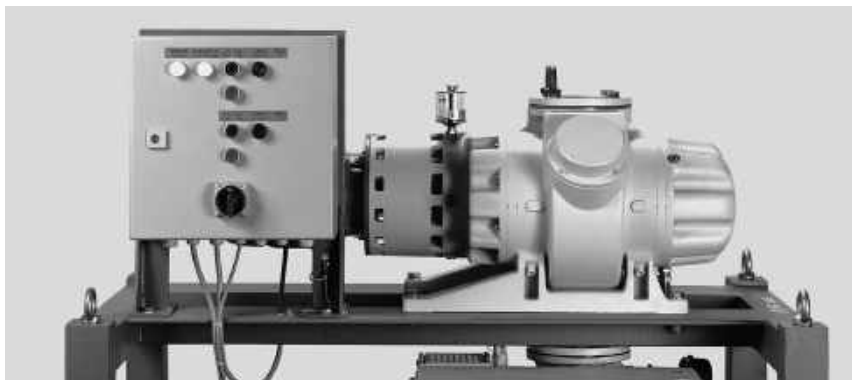
- Simple design
- Much smaller valve
- No reduction of the intermediate pressure within the pump.

In order to design a pressure control system we need the following information:

- Amount of gas
- Type of gas
- Pressure
- Length of the piping
- Type of auxiliary energy (electric/pneumatic)
- Explosion protection required yes/no.

Additional complex control arrangements are available, for example with:

- Adjustable pressure characteristic
- Adjustable timing
- Speed control
- Combination with other control facilities.



Control panel on RUTA WAU1001/SV200/G

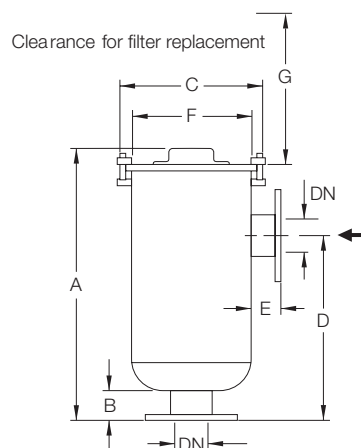
Dust Filter F-xxx-C

The highly efficient dust filters F-xxx-C are fitted to the inlet of the RUVAC pumps. The filter protects the Roots vacuum pumps against the intake of dust.

The dust filters are equipped with an easy to replace filter element. In the case of the filters F-1001-C or larger, the gas enters into the housing above the filter element. Thus the likelihood of puncturing the filter is reduced.

In the case of the dust filter F-501-C, the filter element is protected by a baffle.

All vacuum dust filters are rated for pressures up to 1200 mbar (900 Torr) abs. max.



Type		DN	A	B	Ø C	D	E	F	G
F-501-C	mm	65 ¹⁾	312	76	222	185	76	195	235
	in.		12.28	2.99	8.74	7.28	2.99	7.68	9.25
F-1001-C	mm	100 ¹⁾	692	76	356	470	74	310	381
	in.		27.24	2.99	14.02	18.50	2.91	12.20	15.00
F-2001-C	mm	150 ¹⁾	740	102	470	521	102	406	254
	in.		29.13	4.02	18.50	20.51	4.02	15.98	10.00
F-2001-C plus	mm	150 ¹⁾	740	102	470	521	99	413	508
	in.		29.13	4.02	18.50	20.51	3.90	16.26	20.00
F-5001-C	mm	200 ²⁾	1031	102	572	648	103	505	508
	in.		40.59	4.02	22.52	25.51	4.02	19.88	20.00
F-7001-C	mm	250 ²⁾	1454	102	686	1143	99	616	838
	in.		57.24	4.02	27.01	45.00	3.90	24.33	32.99
F-9001-C	mm	300 ²⁾	1454	102	686	1143	99	616	838
	in.		57.24	4.02	27.01	45.00	3.90	24.33	32.99
F-13001-C	mm	300 ²⁾	1784	102	686	1448	99	616	635
	in.		70.24	4.02	27.01	57.01	3.90	24.33	25.00

¹⁾ The hole pattern corresponds to PN 6 and may be connected by using collar flanges to ISO-K components

²⁾ The hole pattern corresponds to PN 10

Dimensional drawing for the dust filters F-xxx-C

Technical Data

Dust Filter F-xxx-C

		Polyester filter cartridge	Paper filter cartridge
Separation at 10 µm	%	> 99,9	–
Separation at 5 µm	%	> 99,0	> 99,9
Separation at 2 µm	%	–	> 99,0
Temperature	°C (°F)	-25 to +100 (-13 to +212)	
Dust Filter for WA/WS/WAU/WSU 501 WA/WS/WAU/WSU 1001, WH 700 WA/WS/WAU/WSU 2001, WH 2500 RA 3001, RA 5001, WH 4400, WH 7000 RA 7001 RA 9001 RA 13000		F-501-C F-1001-C F-2001-C / F-2001-C plus F-5001-C F-7001-C F-9001-C F-13001-C	

Technical Data

Dust Filter

		F-501-C	F-1001-C	F-2001-C	F-2001-C plus
Surface area, approx.					
Polyester	m²	0.4	1.0	1.5	2.6
Paper	m²	1.3	3.0	4.0	6.3
Weight, approx.	kg (lbs)	7.0 (15.45)	29.0 (64.02)	50.0 (110.38)	51.0 (112.58)

Technical Data

Dust Filter

		F-5001-C	F-7001-C	F-9001-C	F-13001-C
Surface area, approx.					
Polyester	m²	4.5	9.0	9.0	14.0
Paper	m²	11.5	26.0	26.0	37.0
Weight, approx.	kg (lbs)	83.0 (183.22)	171.0 (377.48)	171.0 (377.48)	209.0 (461.37)

Ordering Information

Dust Filter F-xxx-C

	Part No.	Part No.
Dust Filter	Polyester filter element	Paper filter element
F-501-C	500 001 403	500 001 404
Replacement filter element FE-501-C	500 005 629	500 005 630
F-1001-C	500 000 301	500 000 302
Replacement filter element FE-1001-C	500 000 313	500 000 314
F-2001-C	500 000 303	500 000 304
Replacement filter element FE-2001-C	500 000 315	500 000 316
F-2001-C plus ¹⁾	500 001 367	500 001 368
Replacement filter element FE-2001-C plus	500 000 631	500 000 632
F-5001-C	500 000 305	500 000 306
Replacement filter element FE-5001-C	500 000 317	500 000 318
F-7001-C	500 000 307	500 000 308
Replacement filter element FE-7001/9001-C	500 000 319	500 000 320
		(2 pieces are required)
F-9001-C	500 000 309	500 000 310
Replacement filter element FE-7001/9001-C	500 000 319	500 000 320
		(2 pieces are required)
F-13001-C	500 000 311	500 000 312
Replacement filter element FE-13001-C	500 000 321	500 000 322
	(2 pieces are required)	(2 pieces are required)

¹⁾ For increased quantities of dust

Bellows with Vibration Absorbers



Bellows with vibration absorbers

The bellows serve the purpose of connecting pipes to vacuum pumps without introducing any mechanical tensions.

Technical Data

Bellows with Vibration Absorbers

		KIT DN 63 ISO-K	KIT DN 100 ISO-K	KIT DN 160 ISO-K
Length	mm (in.)	132 (5.20)	132 (5.20)	150 (5.91)
Lateral movement, max.	mm (in.)	7.5 (0.30)	9.5 (0.37)	3.5 (0.14)
Axial movement, max.	mm (in.)	20 (0.79)	28 (1.10)	22 (0.87)

Ordering Information

Bellows with Vibration Absorbers

		KIT DN 63 ISO-K	KIT DN 100 ISO-K	KIT DN 160 ISO-K
		Part No.	Part No.	Part No.
Bellows with Vibration Absorbers consisting of		503 189 V001	503 189 V002	503 189 V003
Bellows	Quantity	1	1	1
Centering ring	Quantity	2	2	2
Clamp (set of 4 pieces)	Quantity	2	2	2
Support bracket	Quantity	4	8	8
Rubber/metal absorber	Quantity	2	4	4
Hexagon nut M 12	Quantity	12	24	24
Threaded rod M 12 105 mm long	Quantity	4	8	8
Washer	Quantity	12	24	24

Technical Data

Bellows with Vibration Absorbers

		KIT DN 200 ISO-K	KIT DN 250 ISO-K	KIT DN 320 ISO-K
Length	mm (in.)	150 (5.91)	200 (7.87)	250 (9.84)
Lateral movement, max.	mm (in.)	3.5 (0.14)	4.5 (0.18)	4.5 (0.18)
Axial movement, max.	mm (in.)	20 (0.79)	30 (1.18)	50 (1.97)

Ordering Information

Bellows with Vibration Absorbers

		KIT DN 200 ISO-K	KIT DN 250 ISO-K	KIT DN 320 ISO-K
		Part No.	Part No.	Part No.
Bellows with Vibration Absorbers consisting of		503 189 V004	503 189 V005	503 189 V006
Bellows	Quantity	1	1	1
Centering ring	Quantity	2	2	2
Clamp (set of 4 pieces)	Quantity	3	3	4
Support bracket	Quantity	12	12	16
Rubber/metal absorber	Quantity	6	6	8
Hexagon nut M 12	Quantity	36	36	48
Threaded rod M 12 90 mm long	Quantity	12	12	–
105 mm long	Quantity	–	–	16
Washer	Quantity	36	36	48

Bus Interfaces for Monitoring



Wi-Fi and Profibus interface kit for SP-GUARD

Bus interfaces for remote reading of the SP-GUARD monitoring system for the screw pumps SCREWLINE SP 250 and SP 630. Item can be ordered as retrofit kit or together with the pump unit.

Advantages to the User

- Interface box for assembly on screw pump SCREWLINE SP 250 and SP 630
- Read out of vibration levels, oil temperatures, warning and failure functions
- The interface box is mounted next to the SP-GUARD
- Interface box needs a 24 V DC supply on-site (24 V DC supply of the SP-GUARD can be used)

Available Interfaces

- Profibus
- Wi-Fi

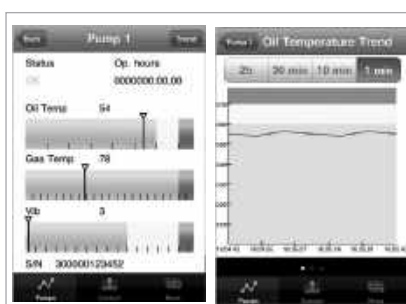
Further interfaces upon request:

- Profinet
- DeviceNet
- Ethernet
- CAN bus
- Interbus
- etc.

Ordering Information

Interface Kit SP-GUARD

	Part No.
Interface kit SP-GUARD Profibus	502 898 V001
Profibus kit and Wi-Fi with iPhone for SP-GUARD	503 264 V901
Profibus interface kit and Wi-Fi for SP-GUARD	503 183 V901
SCREWLINE SP 630 screw pump with Profibus interface	502 899 V001
Further combinations	upon request



Various indications on the mobile equipment



Profibus interface kit for SP-GUARD



Smart phone / tablet PC for readout (Wi-Fi)

Miscellaneous to oil sealed and dry compressing Pump Systems

Checklist for Inquiries

To Leybold GmbH

Dept. Systems

Fax: +49 (0)221/347 - 31206

e-Mail:

vacuum.solutions@leybold.com

From company: _____

Name/Department: _____

Phone: _____ Date: _____

Fax: _____ First page of: _____

MAKE USE OF OUR KNOW-HOW !

Simply fax the completed checklist to us. Our engineers will design a pump system which exactly matches your requirements. You will receive an offer shortly.

1. In what kind of application will the pump system be used (e.g. drying, distillation)?

2. Is the process run
☐ continuously ☐ in batches:

3. What is the volume of the vacuum chamber?

_____ m³

4. What pump-down times are required/desired?

_____ min³ x h⁻¹

5. What operating pressures are planned?

_____ mbar

6. How high is the ambient temperature?

- when installed in the building:

min. _____ °C / max. _____ °C

- when installed out in the open

min. _____ °C / max. _____ °C

7. How high is the intake temperature?

_____ °C

8. What is the composition of the gas which is to be pumped.

Designation:

a) _____ b) _____

c) _____ d) _____

e) _____ f) _____

9. Quantity (kg/h or Nm³/h), traces (%):

a) _____ b) _____

c) _____ d) _____

e) _____ f) _____

10. In case of materials not commonly listed in the tables please state:

a) Molecular mass _____

b) Thermal capacity _____

c) Vapor pressure _____

d) Viscosity _____

e) Melting point _____

f) Special characteristics _____

11. Must explosion hazard regulations be observed?

☐ yes ☐ no

if yes, which? _____

12. What kind of electrical supplies are available?

a) Voltage _____

b) Frequency _____

13. What kind of mechanical connection specifications are planned?

a) Length of the intake line

b) Diameter of the intake line

14. Which cooling media are available (water, brine, etc.)? Which temperature?

_____ min. _____ °C

_____ max. _____ °C

General to High Vacuum Pump Systems TMP

The requirements of production or research engineers concerning the vacuum technology they have to employ are usually widely different. In most cases pumping speed and operating pressure must be accurately matched to suit a particular process. The wide range of vacuum pumps and standard accessories available offers many options.

Sometimes it is just this flexibility which causes difficulties when having to decide between the various configurations of a particular pump system. Based on our experience and by listening to our customers' demands, we have therefore compiled a range of turn-key vacuum systems based on standard components.

Before leaving the factory they are subjected to both functional tests and leak tests. By adding components from our standard range or special of accessories they may be easily adapted to meet specific requirements.

Application and Accessories

Pump systems	TURBOLAB 90	TURBOLAB 250	TURBOLAB 350	TURBOLAB 450
Application				
Microbalances	■	■	■	■
Sputtering	■	■	■	■
Spectroscopy	■	■	■	■
Production of TV and monitor picture tubes	■	■	■	■
Surface refining	■	■	■	■
Evaporation coating systems	■	■	■	■
Beam guidance systems	■	■	■	■
Laboratory pump systems	■	■	■	■

Accessories

Control unit for turbomolecular pump systems				
Air cooling unit	■	■	■	■
Flange heater	■	■	■	■
Venting valve	■	■	■	■
Power failure venting valve	■	■	■	■
Purge gas and venting valve	■	■	■	■
Water cooling unit	■	■	■	■

■ Possible

Products

Dry Pump Systems

Turbomolecular Pump Systems

TURBOLAB 90 i, 250 i, 350 i, 450 i



Turbomolecular pump system TURBOLAB 350 i (top left), TURBOLAB 90 i (down left) and TURBOLAB 350 i Cart (right)

This new smart TURBOLAB generation is built on one basic design platform with the opportunity to create two different variants (Tabletop or Cart-System).

Each version can be customized to individual needs regarding add-ons like vacuum measurement devices, a choice of accessories, e.g. valves and heaters.

Basic Equipment

Turbomolecular pump

TURBOVAC i models from 90 l/s to 450 l/s including frequency converter

Backing pump

Dry or oil-sealed, 1 m³/h - 20 m³/h, 24 V DC/110-230 V

Backlight display

Every TURBOLAB comes with the Turbo Pressure Unit TPU for control, configuration and monitoring of the pump system

Built-in support for accessories

- Purge
- Vent
- Air or water cooling unit
- Flange heaters
- Two pressure gauges (1000 mbar to 1 x 10⁻⁹ mbar)
- Foreline safety valve

Built-in webserver

- Condition monitoring
- Data analysis
- Software updates

- Control, monitor and configure your TURBOLAB system

Easily relocate pump

away from the frame and on your chamber

Remote control

via the X1 Interface

- Configurable X1 Digital/Analog I/O
- Start/Stop
- Error
- Warning
- Analog Output

Advantage to the User

- Enhanced pump performance
- Compact mobile design
- Small foot print
- Easy to relocate pumps out and

away from the frame

- Backlight display (control/monitoring/configuration)
- Monitored data like frequency, temperature, current, pressure are automatically stored to a data log file in the TURBOLAB. Users easily view the log file with the TURBOLAB data viewer software tool which can be downloaded for free from the Leybold website or the last 512 data points can be viewed from the TURBOLAB data viewer in the web server
- Covering more applications with a full range of high vacuum and dry or wet forevacuum pumps to cover more high vacuum applications
- Benchmark turbostation offering dedicated ports for the connection of
 - six different accessories
 - two gauges
- Benchmark functionality, reliability and design
- Prepared for worldwide voltage coverage
- Price-to-performance ratio

Typical Applications

- Analytical Instruments
- Spectroscopy
- Tube manufacturing
- Beam guidance systems
- Micro balances
- Sputtering and evaporation systems
- Surface physics
- Laboratory pump systems

Options

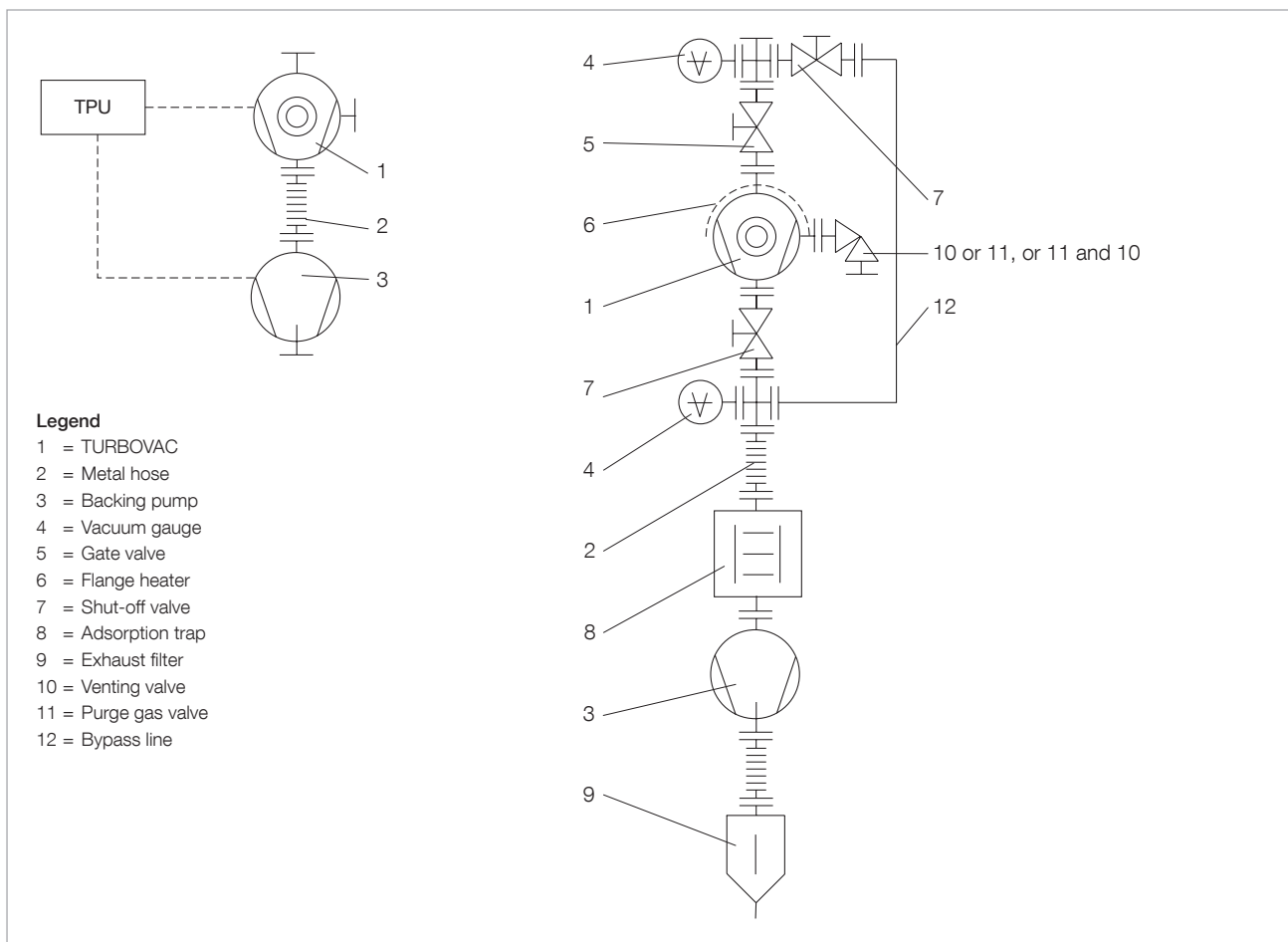
- Alternatively ISO-K or CF connection
- The Cart version comprises a base-plate, mounting column, castors or a benchtop frame with rubber feet
- Relocation kits available to relocate the pumps away from the frame and onto your chamber

The pump system can be upgraded with further components:

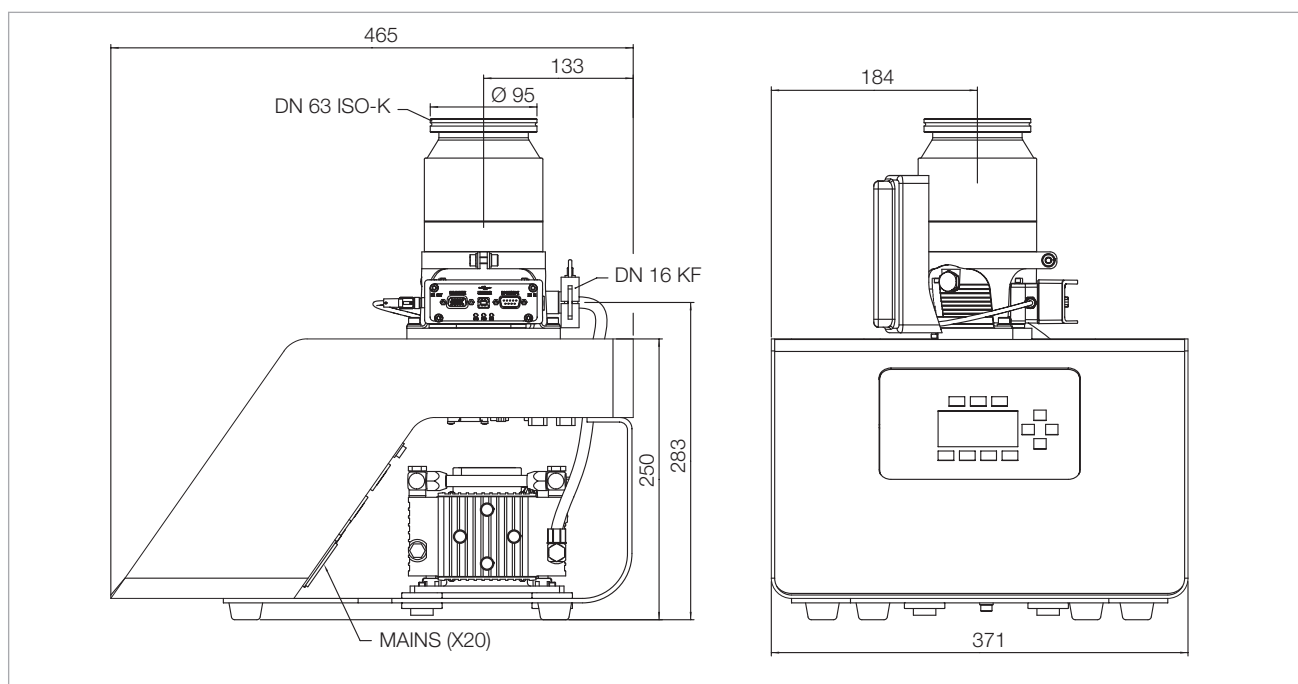
- Vacuum gauges: TTR 91 (N), TTR 101 (N), PTR 91 (N). Simultaneous operation of two gauges is possible
- Adsorption trap
- Exhaust filter
- Air cooling unit
- Water cooling unit
- Flange heater
- Venting valve
- Purge gas valve
- Foreline venting valve
- Vacuum safety valve SECUVAC DN 15/25/40 ISO-KF

Scope of delivery

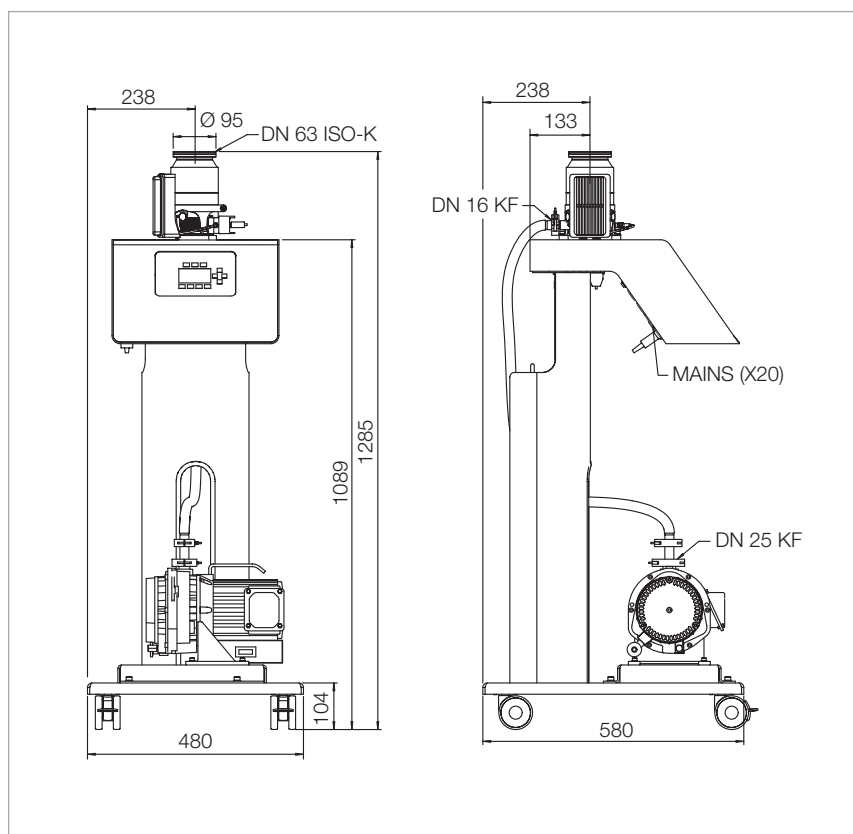
- Transport lock at the high vacuum flange by way of a Plexiglas disc
- Covering caps for the threads of the transport lock
- Exhaust side: centering ring and clamping ring
- Documentation
- The TRIVAC and SOGEVAC are filled with LVO oil



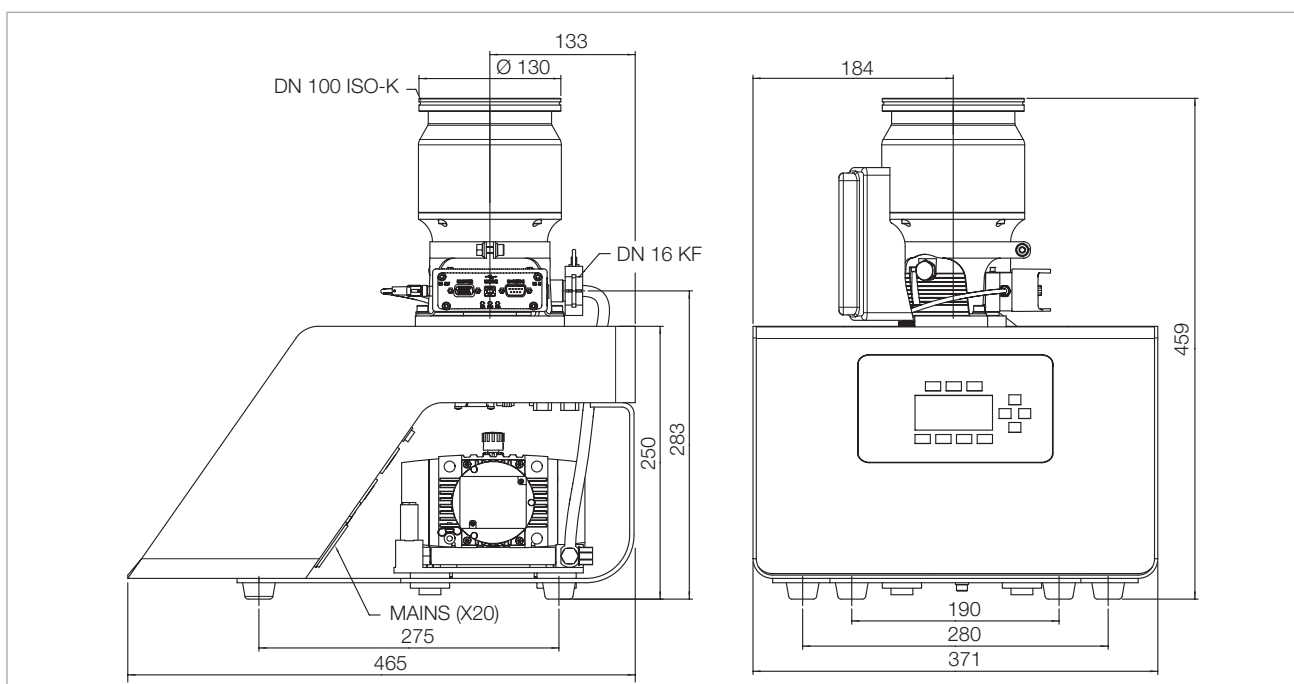
Schematic diagram of the turbomolecular pump systems TURBOLAB (left basic version, right equipment with accessories (TPU not shown))



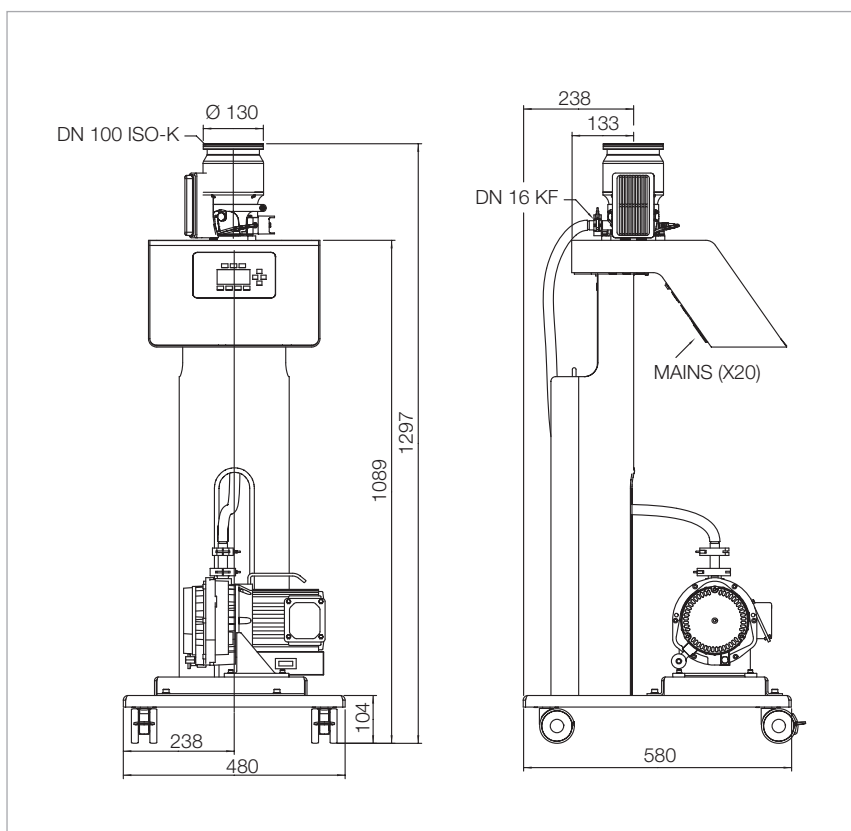
Dimensional drawing TURBOLAB 90 i, dimensions in mm



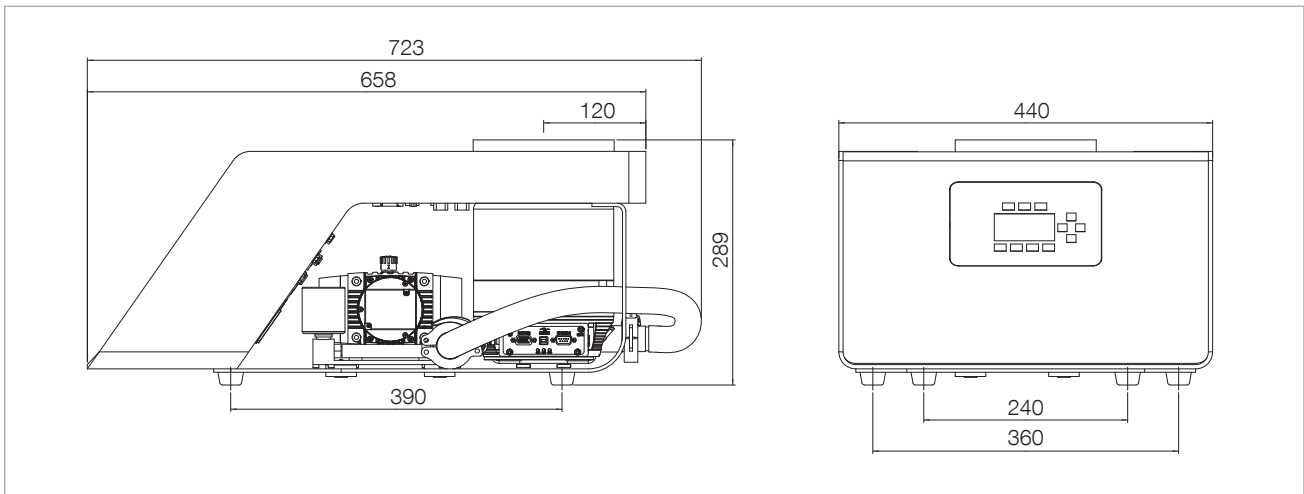
Dimensional drawing TURBOLAB 90 i Cart, dimensions in mm



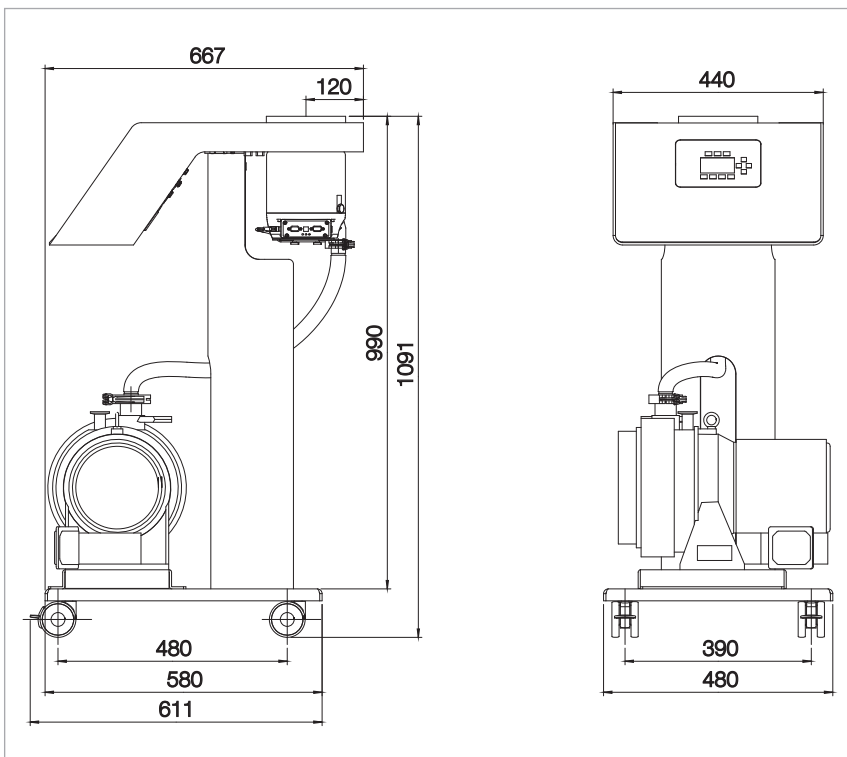
Dimensional drawing TURBOLAB 250 i, dimensions in mm



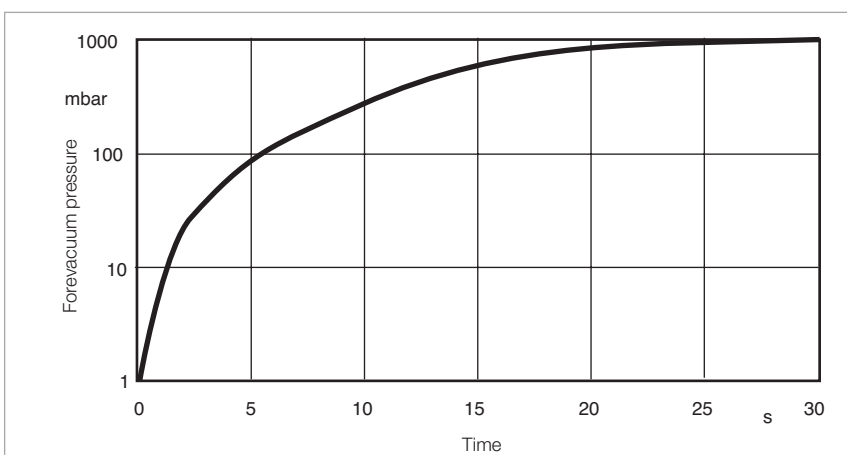
Dimensional drawing TURBOLAB 250 i Cart, dimensions in mm



Dimensional drawing TURBOLAB 350 i / 450 i, dimensions in mm



Dimensional drawing TURBOLAB 350 i / 450 i Cart, dimensions in mm



Maximum rise in pressure

Technical Data Pump system

TURBOLAB

Pump system		90 i		250 i		350 i		450 i	
Inlet flange	DN	63 ISO-K	63 CF	100 ISO-K	100 CF	100 ISO-K	100 CF	160 ISO-K	160 CF
Forevacuum connection	DN	16 ISO-KF		16 ISO-KF		25 ISO-KF		25 ISO-KF	
Pumping speed	l/s	90		225		290		430	
Ultimate pressure	mbar	< 8 x 10 ⁻⁸	< 5 x10 ⁻¹⁰	< 8 x 10 ⁻⁸	< 5 x10 ⁻¹⁰	< 8 x 10 ⁻⁸	< 5 x10 ⁻¹⁰	< 8 x 10 ⁻⁸	< 5 x10 ⁻¹⁰
Mains Supply 50/60 Hz	V AC	110 ± 10% / 230 ± 10%							
Power consumption, max.	VA	1760 / 3680							
Weight (ISO-KF / CF)	kg								
Table top unit		20		20		35		35	
Cart		100		100		110		110	
Number of accessories, max.		6		6		6		6	
Number of gauges, max.		2		2		2		2	
CBM		Internal condition monitoring							
Software		Internal webserver (no software to install)							

Technical Data Backing pumps

Diaphragm vacuum pump	DIVAC	3.0	
Pumping speed	m³/h	3.0	
Exhaust connection	DN	Silencer	
Noise level	dB(A)	54	
Scroll vacuum pump	SCROLLVAC	SC 7 plus	SC 15 plus
Pumping speed	m³/h	6.1	14.5
Exhaust connection	DN	25 KF	25 KF
Noise level	dB(A)	55	55
Rotary vane vacuum pump	TRIVAC	D 4 B	D 8 B
Pumping speed	m³/h	4.8	9.7
Exhaust connection	DN	16 ISO-KF	16 ISO-KF
Noise level	dB(A)	52	52
Rotary vane vacuum pump	SOGEVAC	SV 16 D	
Pumping speed	m³/h	16.0	
Exhaust connection	DN	1/2"	
Noise level	dB(A)	59	

Ordering Information

TURBOLAB 90 i

	Part. No.	Part. No.
Pump system with TURBOVAC 90 i	230 V, 50/60 Hz	110 V, 50/60 Hz
Table top unit with DIVAC 3.0 DN 63 ISO-K DN 63 CF	501592V00001000 501592V01001000	
Cart with SCROLLVAC SC 7 plus DN 63 ISO-K DN 63 CF	501592V00021000 501592V01021000	
Cart with SCROLLVAC SC 15 plus DN 63 ISO-K DN 63 CF	501592V00041000 501592V01041000	
Cart with TRIVAC D 4 B DN 63 ISO-K DN 63 CF	501592V00120000 501592V01120000	501592V00080000 501592V01080000
Cart with TRIVAC D 8 B DN 63 ISO-K DN 63 CF	501592V00130000 501592V01130000	501592V00090000 501592V01090000
Cart with SOGEVAC SV 16 D DN 63 ISO-K DN 63 CF	501592V00100000 501592V01100000	
Table top unit without Forevacuum pump DN 63 ISO-K DN 63 CF	501592V00200000 501592V01200000	
Cart without Forevacuum pump DN 63 ISO-K DN 63 CF	501592V00210000 501592V01210000	

Ordering Information

TURBOLAB 250 i

	Part. No.	Part. No.
Pump system with TURBOVAC 250 i	230 V, 50/60 Hz	110 V, 50/60 Hz
Table top unit with DIVAC 3.0 DN 100 ISO-K DN 100 CF	501592V08001000 501592V09001000	
Cart with SCROLLVAC SC 7 plus DN 100 ISO-K DN 100 CF	501592V08021000 501592V09021000	
Cart with SCROLLVAC SC 15 plus DN 100 ISO-K DN 100 CF	501592V08041000 501592V09041000	
Cart with TRIVAC D 4 B DN 100 ISO-K DN 100 CF	501592V08120000 501592V09120000	501592V08080000 501592V09080000
Cart with TRIVAC D 8 B DN 100 ISO-K DN 100 CF	501592V08130000 501592V09130000	501592V08090000 501592V09090000
Cart with SOGEVAC SV 16 D DN 100 ISO-K DN 63 CF	501592V08100000 501592V09100000	
Table top unit without Forevacuum pump DN 100 ISO-K DN 100 CF	501592V08200000 501592V09200000	
Cart without Forevacuum pump DN 100 ISO-K DN 100 CF	501592V08210000 501592V09210000	

Ordering Information

TURBOLAB 350 i

	Part. No.	Part. No.
Pump system with TURBOVAC 350 i	230 V, 50/60 Hz	110 V, 50/60 Hz
Table top unit with DIVAC 3.0 DN 100 ISO-K DN 100 CF	501592V04001000 501592V05001000	
Cart with SCROLLVAC SC 7 plus DN 100 ISO-K DN 100 CF	501592V04021000 501592V05021000	
Cart with SCROLLVAC SC 15 plus DN 100 ISO-K DN 100 CF	501592V04041000 501592V05041000	
Cart with TRIVAC D 4 B DN 100 ISO-K DN 100 CF	501592V04120000 501592V05120000	501592V04080000 501592V05080000
Cart with TRIVAC D 8 B DN 100 ISO-K DN 100 CF	501592V04130000 501592V05130000	501592V04090000 501592V05090000
Cart with SOGEVAC SV 16 D DN 100 ISO-K DN 100 CF	501592V04100000 501592V05100000	
Table top unit without Forevacuum pump DN 100 ISO-K DN 100 CF	501592V04200000 501592V05200000	
Cart without Forevacuum pump DN 100 ISO-K DN 100 CF	501592V04210000 501592V05210000	

Ordering Information

TURBOLAB 450 i

	Part. No.	Part. No.
Pump system with TURBOVAC 450 i	230 V, 50/60 Hz	110 V, 50/60 Hz
Table top unit with DIVAC 3.0 DN 160 ISO-K DN 160 CF	501592V06001000 501592V07001000	
Cart with SCROLLVAC SC 7 plus DN 160 ISO-K DN 160 CF	501592V06021000 501592V07021000	
Cart with SCROLLVAC SC 15 plus DN 160 ISO-K DN 160 CF	501592V06041000 501592V07041000	
Cart with TRIVAC D 4 B DN 160 ISO-K DN 160 CF	501592V06120000 501592V07120000	501592V06080000 501592V07080000
Cart with TRIVAC D 8 B DN 160 ISO-K DN 160 CF	501592V06130000 501592V07130000	501592V06090000 501592V07090000
Cart with SOGEVAC SV 16 D DN 160 ISO-K DN 160 CF	501592V06100000 501592V07100000	
Table top unit without Forevacuum pump DN 160 ISO-K DN 160 CF	501592V06200000 501592V07200000	
Cart without Forevacuum pump DN 160 ISO-K DN 160 CF	501592V06210000 501592V07210000	

Ordering Information

TURBOLAB 90 i TURBOLAB 250 i TURBOLAB 350 i / 450 i

	Part. No.	Part. No.	Part. No.
Accessories			
Mains cable TURBOLAB 230 V, 5.0 m 110 V, 5.0 m 230 V, UK, 5.0 m		800103V0030 800103V0031 800103V0037	
Accessory cable TURBOVAC i (air cooling & valve connection) M 8 - M 8, 0.3 m M 8 - M 8, 2.0 m		800103V0001 800110V0016	
Y cable TURBOVAC i, M 8		800110V0020	
Start stop switch for connection to X1 Remote		800110V0021	
USB cable 2.0, Type A/B, 1.8 m		800110V0108	
Accessory cable TURBOLAB M 8 - M 8, 0.3 m (air cooling & valve connection) M 8 - M 8, 5.0 m (air cooling & valve connection) M 12 - M 12, 5.0 m (DIVAC 0.8, 3.0) C13 - C14, 5.0 m (SOGEVAC) C14 - NEMA, 5.0 m (SCROLLVAC 110 V) C14 - Schuko, 5.0 m (SCROLLVAC 230 V) C14 - C16-1 (230 V), 5.0 m (TRIVAC 230 V) C14 - C16-1 (110 V), 5.0 m (TRIVAC 110 V)		800103V0001 800103V0003 800103V0005 800103V0017 800103V0008 800103V0011 800103V0014 800103V0016	
Accessory cable TURBOLAB TURBOVAC i, 5.0 m (24 V DC voltage supply)		800103V0020	
Communication TURBOLAB – TMP 5.0 m 1.0 m		800103V0029 800103V0027	
Connection cable Type A 1.5 m 5.0 m		800103V0032 12426	
Connection cable C14 – valve plug, 1.8 m (Control 110/230 V AC SECUVAC valve) Connection cable C14 – valve plug, 5 m (Control 110/230 V AC SECUVAC valve) Connection cable C14 – valve plug, 1.8 m (Control 24 V DC SECUVAC valve) Connection cable C14 – valve plug, 5 m (Control 24 V DC SECUVAC valve)		800103V0033 800103V0035 800103V0034 800103V0036	
LEYASSIST software for TMPs		230439V01	
Air cooling TURBOVAC 90 i radial	800136V0007	-	-
Air cooling TURBOVAC 200 i / 250 i radial	-	800136V0009	-
Air cooling TURBOVAC 350 i / 450 i radial	-	-	800136V0005
Water cooling TURBOVAC 350 i / 450 i with G 1/8" connections	-	-	800135V0005
Water cooling TURBOVAC 350 i / 450 i with G 1/8" connections	-	-	800135V0006

Ordering Information

TURBOLAB 90 i TURBOLAB 250 i TURBOLAB 350 i / 450 i

	Part. No.	Part. No.	Part. No.
Accessories			
Venting valve 24 V DC, G 1/8"	-	800120V0012	
Power failure venting valve 24 V DC, G 1/8"	-	800120V0022	
Purge gas valve 24 V DC, G 1/8", 24 sccm	-	800120V0013	
Purge gas throttle G 1/8", 24 sccm	-	800120V0014	
Air filter for TMP G 1/8"	-	800110V0022	
Purge gas and venting valve 0.4 mbar x l/s at 1 bar, 24 V DC DN 10 KF – G1/4"	800152V0013	-	
Pump connection: Adapter M8 – DN 16 KF incl. O-Ring 9.25 x 1.78 and adapter centering ring DN 10/16 KF with sinter filter	800110V0011	-	
Gas side connection: G1/4" adapter with filter Including O-ring and gasket	800110V0012	-	
Connection cable: Accessory cable M8 – bare wire ends	800110V0017	-	
Venting valve 24 V DC	800120V0011	-	
Power failure venting valve 24 V DC	800120V0021	-	
Spare filter	E 200 18 517	-	
Flange heater DN 63 CF, 230 V DN 63 CF, 115 V DN 100 CF, 230 V DN 100 CF, 115 V DN 160 CF, 230 V DN 160 CF, 115 V	800137V0003 800137V0004 - - - -	- - 800137V0005 800137V0006 800137V0007 800137V0008	
Vibration absorber DN 63 ISO-K DN 63 CF DN 100 ISO-K DN 160 ISO-K DN 160 CF	upon request upon request - - -	- - 800131V1100 upon request upon request	
Centering ring with protection screen DN 63 ISO-K DN 100 ISO-K DN 160 ISO-K	800133V0011 - -	- 800133V0021 800133V0031	
Centering ring with splinter guard DN 63 ISO-K DN 100 ISO-K DN 160 ISO-K	800133V0012 - -	- 800133V0022 800133V0032	
Splinter guard DN 63 CF DN 100 ISO-K coarse) DN 100 ISO-K (fine) DN 100 CF (0.8 mm) DN 160 CF (0,8 mm.	800132V0012 - - - -	- 800132V0101 800132V0102 800132V0022 800132V0032	
Protection screen DN 63 CF DN 100 CF (3.2 mm) DN 160 CF (3.2 mm)	800132V0011 - -	- 800132V0021 800132V0031	

Accessories for High Vacuum Pump Systems TMP

Adsorption Traps with Aluminium Oxide Insert



Adsorption trap (left) and insert (right)

Adsorption traps are installed in all those cases where an oil-free vacuum is to be produced with oil-sealed vacuum pumps.

Advantages to the User

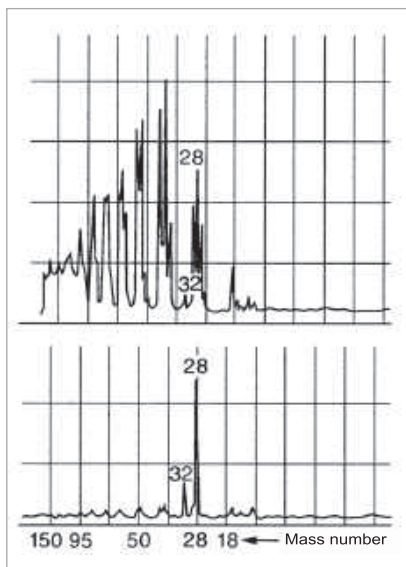
- Backstreaming of oil is reduced by 99%
- Long service life
- High conductance
- Filling can be easily exchanged
- Improvement in the ultimate pressure attained by backing pumps by one order of magnitude
- Stainless steel housing and insert
- NBR gasket

Typical Applications

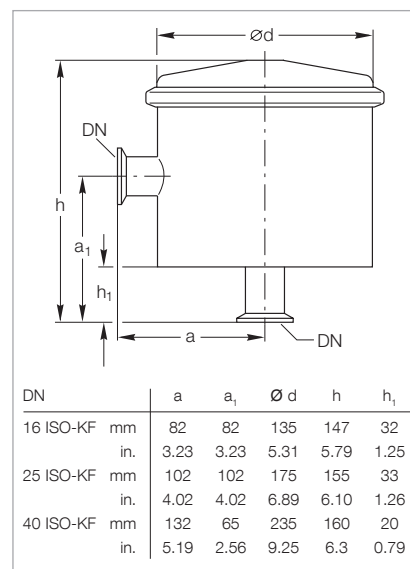
- Product of an oil-free vacuum

Supplied Equipment

- Complete with insert
- Without adsorbent



Residual gas spectrum; top ahead of a rotary vacuum pump, bottom ahead of a rotary vacuum pump with adsorption trap



Dimensional drawing for the adsorption traps

Technical Data

		Adsorption Traps		
		16 ISO-KF	25 ISO-KF	40 ISO-KF
Conductance at 10 ⁻² mbar (Torr)	l/s	4	6	12
Service live with Al oxide	Months	3		
Al oxide filling	l (qts)	0.5 (0.53)	1.0 (1.06)	2.0 (2.1)
Weight, approx.	kg (lbs)	1.3 (2.9)	1.3 (2.9)	4.0 (8.8)

Ordering Information

		Adsorption Traps		
		16 ISO-KF	25 ISO-KF	40 ISO-KF
		Part No.	Part No.	Part No.
Adsorption trap		854 14	854 15	854 16
Activated aluminum oxide in tin 1.6 l (approx. 1.2 kg (2.65 lbs))		854 10		

UNIVEX High Vacuum Experimentation Systems

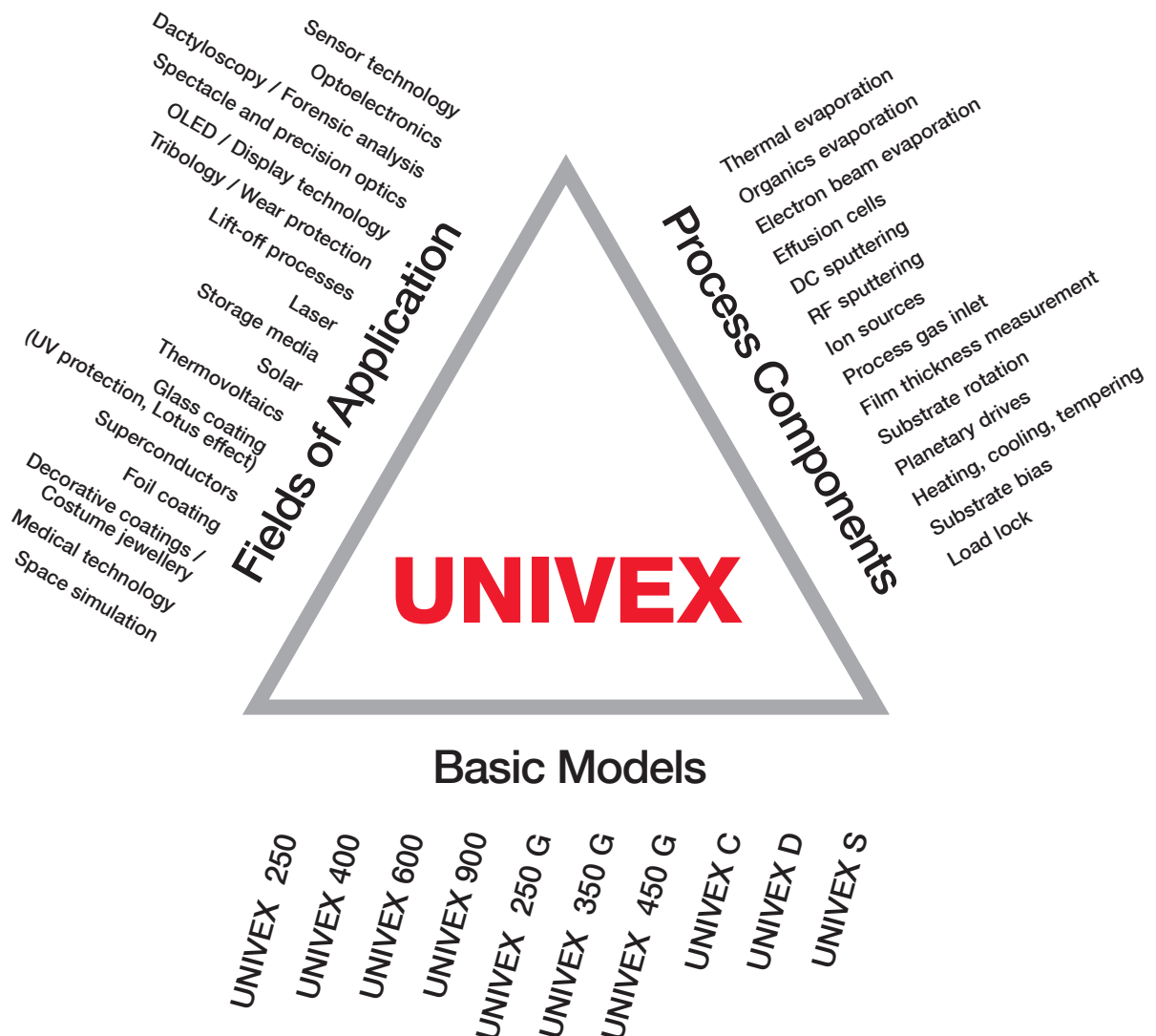
General

The UNIVEX system family was developed by Leybold for applications in research and development as well as for setting up pilot production units.

Their range of applications focuses chiefly on vacuum coating technology as well as vacuum process engineering experiments.

The multi-purpose experimentation systems from Leybold are modular and

can be specified according to specific customer requirements. For this purpose, a corresponding questionnaire is provided on the last pages of this chapter.



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Box Coating Systems

Multi-purpose Vacuum Coating System for the Laboratory

Design

- Compact unit with direct access to the process chamber
- The UNIVEX box coaters systems consist of a process and a control module
- The process module includes the vacuum chamber, the coating components and the pump system
- The control module includes the PLC, respectively PC controller including the visualisation as well as the power supplies for the process components

Vacuum Chamber

- Box-shaped stainless steel vacuum chambers UNIVEX 250-600
- Octagonal stainless steel vacuum chamber UNIVEX 900
- Hinged front door for simple chamber access
- Viewing window with coating protection
- Removable stainless steel coating protection panels
- Flexible connections for chamber bottom and chamber top
- Connecting flanges for pump system and process components
- Coolable and heatable chamber walls optional

Vacuum System

- Mechanical forevacuum pump (dry compressing or oil sealed)
- High vacuum pump (turbomolecular or cryo pump)
- Vacuum valves
- Pressure measurement devices

Advantages to the User

- Modular system design
- Application-wise optimised pump system
- Multi-purpose vacuum chamber
- Convenient access to the chamber installations
- Very simple to operate and use via programmable control
- Suited for retrofitting of process components (configuration dependent)
- For installation into clean-room walls

Basic Models

UNIVEX 250



UNIVEX 400



UNIVEX 600



UNIVEX 900



UNIVEX 250



Design example UNIVEX 250

The UNIVEX 250 is a cost-effective and compact entry-level coating system for the laboratory.

Owing to its low height of only approximately 1.2 meters it is ideally placed on a benchtop or installed in a frame.

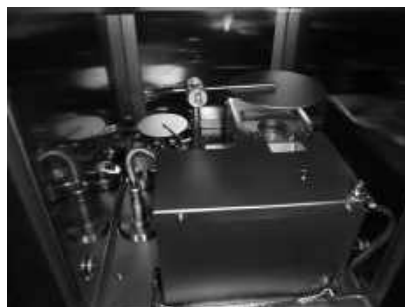
In the vacuum chamber which is 270 mm wide, substrates up to an overall diameter of 220 mm max. can be rotated and coated.

The integrated PLC controller allows you to run manual, respectively semi-automatic coating processes.

Examples of equipped vacuum chambers



Chamber bottom:
double thermal evaporator with source shutter
Chamber top:
rotating substrate table with substrate shutter



Electron beam evaporator with fourfold rotating crucible as well as additional double thermal evaporator, each with source shutter



Effusion cell as well as spare blank flanges for subsequent retrofits

Technical Data

UNIVEX 250

Vacuum chamber		
Material		
Chamber body		Stainless steel
Chamber door		Aluminum
Dimensions		
Inside width	mm	270
Inside depth	mm	370
Inside height	mm	400
Connections ¹⁾		
Front side		Door with window
Rear side	DN	1x 160 ISO-K (pump system connection), 2 x 16 ISO-KF, 1 x 25 ISO-KF, 2 x 40 ISO-KF
Bottom plate		Variable connections
Cover plate		Variable connections
High vacuum pump ¹⁾		TURBOVAC 350 i
Nominal pumping speed for N ₂	l/s	290
Backing pump ¹⁾		SOGEVAC SV 10 B
Nominal pumping speed	m ³ /h	11
Controller		PLC with graphic touchscreen
Required supplies		
Voltage		400 V, 3 phases / N / 50 Hz ²⁾
Cooling water		
Inlet pressure	bar (abs.)	4 to 6
Consumption, approx.	l/min	Dependent on chamber installations
Feed temperature	°C	+18 to +25
Compressed air	bar (abs.)	4 to 6
Weight, approx.	kg	300 ³⁾

¹⁾ Standard configuration, other hole patterns / flanges / viewing windows / pumps upon request

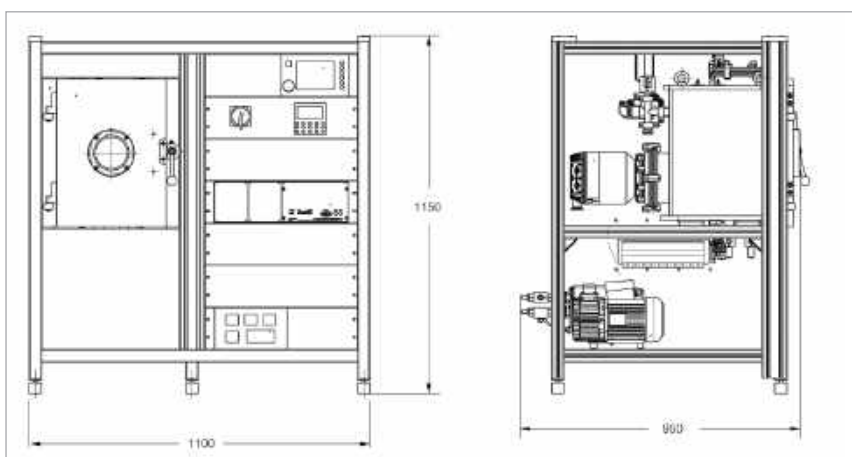
²⁾ Other voltages and frequencies upon request

³⁾ Total weight without chamber installations/process components

Ordering Information

UNIVEX 250

	Part No.
UNIVEX 250	upon request



Dimensional drawing for the UNIVEX 250

UNIVEX 400



Design example UNIVEX 400

The UNIVEX 400 is a compact coating system for laboratory tasks, respectively pilot production runs.

Due to its chamber dimensions, it is ideal for coating of small to medium-sized substrates.

In the vacuum chamber which is 420 mm wide, substrates respectively substrate holders up to an overall diameter of 350 mm max. can be rotated and coated.

The integrated PC/PLC controller allows you to run manual, semiautomatic and fully automatic coating processes.



UNIVEX 400 with loadlock

Examples of equipped vacuum chambers



Two magnetron sputter sources, confocal aligned to the substrate holder rotating at the chamber top. Spare flanges for two further sputter sources



At the foreground: two double thermal evaporators with source shutters

In the background: two organics evaporators with source shutters and two film thickness gauge heads

Technical Data

UNIVEX 400

Vacuum chamber		Water-cooled
Material		
Chamber body		Stainless steel
Chamber door		Stainless steel
Dimensions		
Inside width	mm	420
Inside depth	mm	480
Inside height	mm	550
Connections ¹⁾		
Front side		Door with window
Rear side	DN	1x 200 ISO-K (pump system connection), 2 x 16 ISO-KF, 2 x 40 ISO-KF, 2 x 40 ISO-KF
Bottom plate		Variable connections
Cover plate		Variable connections
High vacuum pump ¹⁾		TURBOVAC 450 i
Nominal pumping speed for N ₂	l/s	430
Backing pump ¹⁾		SOGEVAC SV 25 B
Nominal pumping speed	m ³ /h	26
Controller		PLC with graphic touchscreen
Required supplies		
Voltage		400 V, 3 phases / N / PE / 50 Hz ²⁾
Cooling water		
Inlet pressure	bar (abs.)	4 to 6
Consumption, approx.	l/min	Dependent on chamber installations
Feed temperature	°C	+18 to +25
Compressed air	bar (abs.)	4 to 6
Weight, approx.	kg	500 ³⁾

¹⁾ Standard configuration, other hole patterns / flanges / viewing windows / pumps upon request

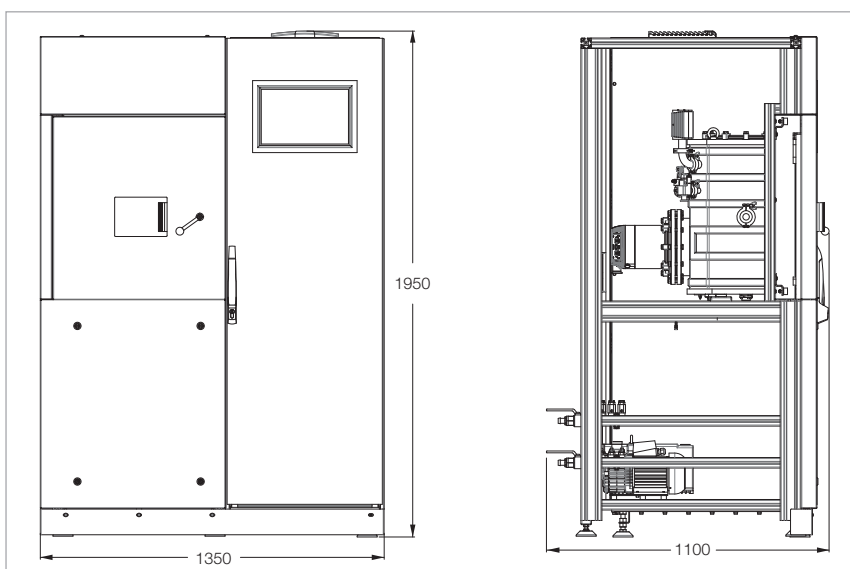
²⁾ Other voltages and frequencies upon request

³⁾ Total weight without chamber installations/process components

Ordering Information

UNIVEX 400

	Part No.
UNIVEX 400	upon request



Dimensional drawing for the UNIVEX 400

UNIVEX 600



Design example UNIVEX 600

The UNIVEX 600 is a compact coating system for the laboratory, respectively pilot production runs.

Because of its chamber size it is suited for medium to large substrate sizes.

The attainable substrate throughput meets the general requirements for small series production runs.

In the vacuum chamber which is 600 mm wide, substrates respectively substrate holders up to an overall diameter of 550 mm max. can be rotated and coated.

The integrated PC/PLC controller allows you to run manual, semiautomatic and fully automatic coating processes.

Examples of equipped vacuum chambers



Chamber bottom: electron beam evaporator with sixfold rotating crucible
Chamber top: planetary drive for substrate rotation



Chamber bottom: rotating substrate table with four heating stations
Chamber top: four magnetron sputter sources



Multiple targets for ion sputtering

Technical Data

UNIVEX 600

Vacuum chamber		Water-cooled
Material		
Chamber body		Stainless steel
Chamber door		Stainless steel
Dimensions		
Inside width	mm	600
Inside depth	mm	600
Inside height	mm	800 (550 sputter version)
Connections ¹⁾		
Front side		Door with window
Rear side	DN	1x 250 ISO-K (pump system connection), 2 x 16 ISO-KF, 2 x 25 ISO-KF, 2 x 40 ISO-KF
Bottom plate		Variable connections
Cover plate		Variable connections
High vacuum pump ¹⁾		TURBOVAC MAG W 1300 iP
Nominal pumping speed for N ₂	l/s	1100
Backing pump ¹⁾		SOGEVAC SV 65 B
Nominal pumping speed	m ³ /h	59
Controller		PLC with graphic touchscreen
Required supplies		
Voltage		400 V, 3 phases / N / PE / 50 Hz ²⁾
Cooling water		
Inlet pressure	bar (abs.)	4 to 6
Consumption, approx.	l/min	Dependent on chamber installations
Feed temperature	°C	+18 to +25
Compressed air	bar (abs.)	4 to 6
Weight, approx.	kg	1000 ³⁾

¹⁾ Standard configuration, other hole patterns / flanges / viewing windows / pumps upon request

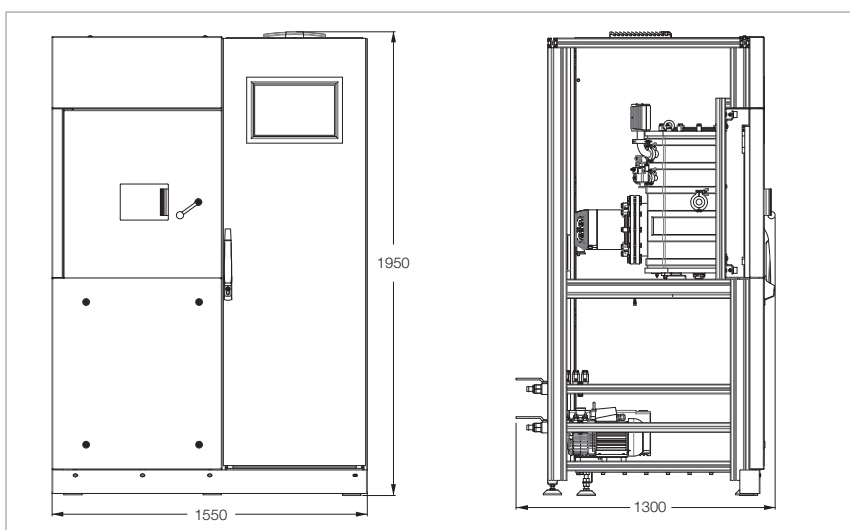
²⁾ Other voltages and frequencies upon request

³⁾ Total weight without chamber installations/process components

Ordering Information

UNIVEX 600

	Part No.
UNIVEX 600	upon request



Dimensional drawing for the UNIVEX 600

UNIVEX 900



Design example UNIVEX 900

The UNIVEX 900 is the sophisticated solution for medium to large substrate sizes, respectively for higher substrate throughputs.

In the octagonal vacuum chamber which is 900 mm wide, substrates respectively substrate holders up to an overall diameter of 800 mm max. can be rotated and coated.

The integrated PC/PLC controller allows you to run manual, semiautomatic and fully automatic coating processes

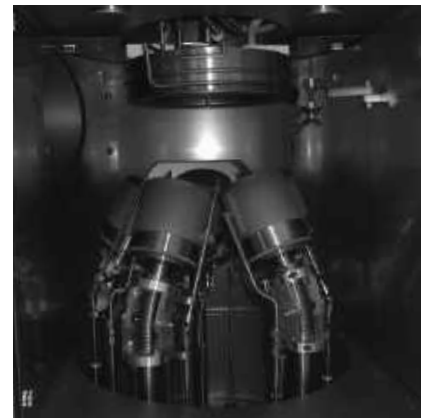
Examples of equipped vacuum chambers



Chamber bottom: electron beam evaporator, thermal evaporator, ion source
Chamber top: rotating substrate dome with turnover device



Rotating substrate table at the chamber top for 10 substrates (in situ combinable with five masks) + 4 high-temperature thermal radiation heaters on the rear



Confocal sputter-up arrangement with rotating high-temperature substrate heater

Technical Data

UNIVEX 900

Vacuum chamber		Water-cooled
Material		
Chamber body		Stainless steel
Chamber door		Stainless steel
Dimensions		
Inside width	mm	900 (octagonal)
Inside depth	mm	900 (octagonal)
Inside height	mm	1100
Connections ¹⁾		
Front side		Door with window
Rear side	DN	2x 250 ISO-K (pump system connection), 2 x 16 ISO-KF, 2 x 25 ISO-KF, 2 x 40 ISO-KF, 1 x DN 63 ISO-KF
Bottom plate		Variable connections
Cover plate		Variable connections
High vacuum pump ¹⁾		TURBOVAC W 2200 iP
Nominal pumping speed for N ₂	l/s	2100
Backing pump ¹⁾		SOGEVAC SV 100 B
Nominal pumping speed	m ³ /h	97.5
Controller		PLC with graphic touchscreen
Required supplies		
Voltage		400 V, 3 phases / N / PE / 50 Hz ²⁾
Cooling water		
Inlet pressure	bar (abs.)	4 to 6
Consumption, approx.	l/min	Dependent on chamber installations
Feed temperature	°C	+18 to +25
Compressed air	bar (abs.)	4 to 6
Weight, approx.	kg	1500 ³⁾

¹⁾ Standard configuration, other hole patterns / flanges / viewing windows / pumps upon request

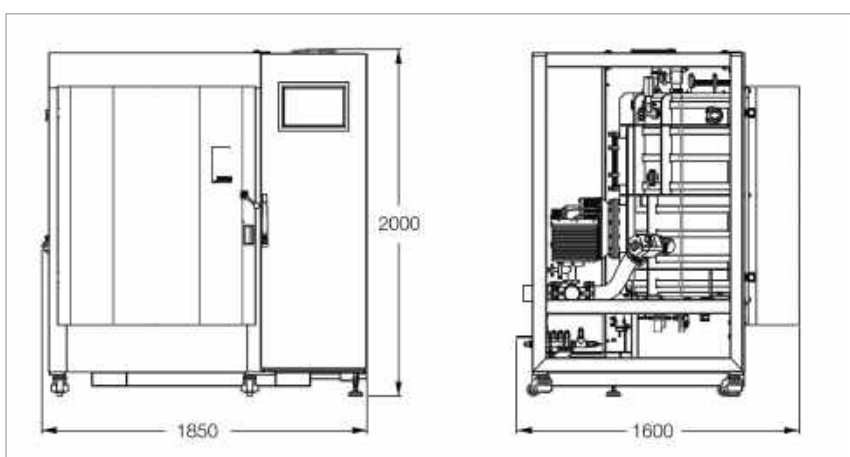
²⁾ Other voltages and frequencies upon request

³⁾ Total weight without chamber installations/process components

Ordering Information

UNIVEX 900

	Part No.
UNIVEX 900	upon request



Dimensional drawing for the UNIVEX 900

Glove Box Systems

Multi-purpose Vacuum Coating System for Fitting to a Glove Box

The UNIVEX glove box systems were developed to coat materials which are sensitive with respect to the environmental conditions like oxygen or humidity, for example

Design

- The UNIVEX glove box systems consist of a process module and a separate electrical cabinet
- The process module includes the vacuum chamber, the coating components and the pump system
- The control module includes the PLC, respectively PC controller including the visualisation as well as the power supplies for the process components

Vacuum Chamber

- Box-shaped stainless steel vacuum chambers UNIVEX 250 G – 450 G
- Sliding front door for easy chamber access through the glove box
- Swivelling rear door for simple chamber access
- Viewing window with coating protection
- Removable stainless steel coating protection panels
- Flexible connections for chamber bottom and chamber top
- Connecting flanges for pump system and process components

Vacuum System

- Mechanical forevacuum pump (dry compressing or oil sealed)
- High vacuum pump (turbomolecular or cryo pump)
- Vacuum valves
- Pressure measurement devices

Advantages to the User

- Modular system design
- Application-wise optimised system
- Flexible utilisation of the vacuum chamber
- Space saving installation to the rear of the glove box
- Convenient process access through

the glove box by means of a front sliding door

- Easy access to the chamber unit through the rear service door
- Very simple to operate and use
- Suited for retrofitting of process

components (configuration dependent)

- All system components with exception of the sliding door are accessible from outside the glove box



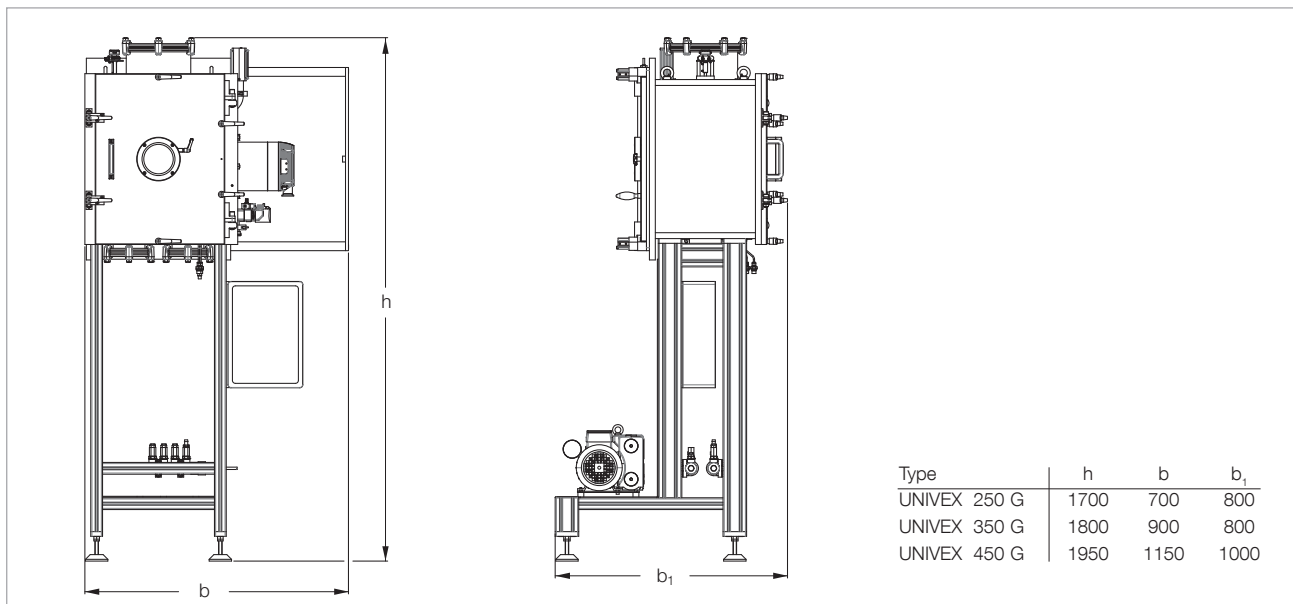
Design example

UNIVEX 350 G, consisting of electrical cabinet (left) and coating module (right)



View through the vacuum chamber: front sliding door and rear swivelling door open

Design example with sputter source (right) and heated substrate table (top)



Dimensional drawing of the glove box units, shown without process installations

Complete Solutions, including Glove Box

Upon request Leybold will also arrange the delivery of turnkey solutions consisting of the UNIVEX 350 G coating system and a glove box from a single source.

For this, please ask us for a quotation.



UNIVEX 350 G rear side



Glove box system with UNIVEX 350 G coating modules fitted to the rear

UNIVEX 250 G

The UNIVEX 250 G is a convenient and cost-effective solution for coating tasks requiring not much space.

Substrates, respectively substrate holders up to an overall diameter of

approximately 220 mm can be processed.

Technical Data

UNIVEX 250 G

Vacuum chamber		
Material		
Chamber body		Stainless steel
Front sliding door		Stainless steel
Rear swivelling door		Aluminum
Dimensions		
Inside width	mm	270
Inside depth	mm	370
Inside height	mm	400
Connections ¹⁾		
Front side		Sliding door for glove box access; manually operated and pneumatically closing
Rear side		turning door for service access; manually locked
Bottom plate		Variable connections
Cover plate		Variable connections
Left side	DN	1 x 160 ISO-K (pump system connection), 2 x 16 ISO-KF, 1 x 25 ISO-KF
High vacuum pump ¹⁾		TURBOVAC 350 i
Nominal pumping speed for N ₂	l/s	290
Backing pump ¹⁾		SOGEVAC SV 10 B
Nominal pumping speed	m ³ /h	11
Controller		PLC with graphic touchscreen
Required supplies		
Voltage		400 V, 3 phases / N / PE / 50 Hz ²⁾
Cooling water		
Inlet pressure	bar (abs.)	4 to 6
Consumption, approx.	l/min	Dependent on chamber installations
Feed temperature	°C	+18 to +25
Compressed air	bar (abs.)	4 to 6
Weight, approx.	kg	350 ³⁾

¹⁾ Standard configuration, other hole patterns / flanges / viewing windows / pumps upon request

²⁾ Other voltages and frequencies upon request

³⁾ Total weight without chamber installations/process components

Ordering Information

UNIVEX 250 G

	Part No.
UNIVEX 250 G	upon request

UNIVEX 350 G

The UNIVEX 350 G combines a compact design with plenty of chamber space.
For many coating tasks the UNIVEX

350 G offers optimum space conditions and operator convenience as to process components and substrate processing.

Substrates, respectively substrate holders up to an overall diameter of approximately 300 mm can be processed.

Technical Data

UNIVEX 350 G

Vacuum chamber		
Material		
Chamber body		Stainless steel
Front sliding door		Stainless steel
Rear swivelling door		Stainless steel
Dimensions		
Inside width	mm	370
Inside depth	mm	380
Inside height	mm	500
Connections ¹⁾		
Front side		Sliding door for glove box access; manually operated and pneumatically closing
Rear side		turning door for service access; manually locked
Bottom plate		Variable connections
Cover plate		1 x 200 ISO-K, 4 x installation bore ø 34,5 mm
Left side	DN	1 x 160 ISO-K (pump system connection), 2 x 16 ISO-KF, 1 x 25 ISO-KF, 1 x 40 ISO-KF
High vacuum pump ¹⁾		TURBOVAC 450 i
Nominal pumping speed for N ₂	l/s	430
Backing pump ¹⁾		SOGEVAC SV 25 B
Nominal pumping speed	m ³ /h	26
Controller		PLC with graphic touchscreen
Required supplies		
Voltage		400 V, 3 phases / N / PE / 50 Hz ²⁾
Cooling water		
Inlet pressure	bar (abs.)	4 to 6
Consumption, approx.	l/min	Dependent on chamber installations
Feed temperature	°C	+18 to +25
Compressed air	bar (abs.)	4 to 6
Weight, approx.	kg	400 ³⁾

¹⁾ Standard configuration, other hole patterns / flanges / viewing windows / pumps upon request

²⁾ Other voltages and frequencies upon request

³⁾ Total weight without chamber installations/process components

Ordering Information

UNIVEX 350 G

	Part No.
UNIVEX 350 G	upon request

UNIVEX 450 G

Owing to its chamber dimensions, the UNIVEX 450 G is suited for all coating tasks requiring much space

Substrates, respectively substrate holders up to an overall diameter of over 400 mm can be processed.

With a height of 650 mm, the vacuum chamber is also suited for lift-off applications.

Technical Data

UNIVEX 450 G

Vacuum chamber		
Material		
Chamber body		Stainless steel
Front sliding door		Stainless steel
Rear swivelling door		Aluminum
Dimensions		
Inside width	mm	500
Inside depth	mm	500
Inside height	mm	650
Connections ¹⁾		
Front side		Sliding door for glove box access; manually operated and pneumatically closing
Rear side		turning door for service access; manually locked
Bottom plate		Variable connections
Cover plate		1 x 250 ISO-K, 4 x installation bore ø 34,5 mm
Left side	DN	1 x 250 ISO-K (pump system connection), 2 x 16 ISO-KF, 1 x 25 ISO-KF, 1 x 40 ISO-KF
High vacuum pump ¹⁾		TURBOVAC MAG W 700 iP
Nominal pumping speed for N ₂	l/s	590
Backing pump ¹⁾		SOGEVAC SV 40 B
Nominal pumping speed	m ³ /h	44
Controller		PLC with graphic touchscreen
Required supplies		
Voltage		400 V, 3 phases / N / PE / 50 Hz ²⁾
Cooling water		
Inlet pressure	bar (abs.)	4 to 6
Consumption, approx.	l/min	Dependent on chamber installations
Feed temperature	°C	+18 to +25
Compressed air	bar (abs.)	4 to 6
Weight, approx.	kg	500 ³⁾

¹⁾ Standard configuration, other hole patterns / flanges / viewing windows / pumps upon request

²⁾ Other voltages and frequencies upon request

³⁾ Total weight without chamber installations/process components

Ordering Information

UNIVEX 450 G

	Part No.
UNIVEX 450 G	upon request

Cluster-Tool Systems UNIVEX C



Design example:
UNIVEX 450 C with coating module and electrical cabinet (example photograph).
The coating module consists of two process chambers (left and right) as well as the loadlock and transfer chamber in between
The substrate transfer between the chambers is effected with the aid of a vacuum robot

For special applications we can also supply cluster systems based on the UNIVEX concept. These clusters are equipped according to customer requirements and incorporate separate processing, load lock and transfer chambers.

Frequently sputter applications are involved since sputter targets remain in place for a long time and because of this, the process chambers need to be vented rarely.

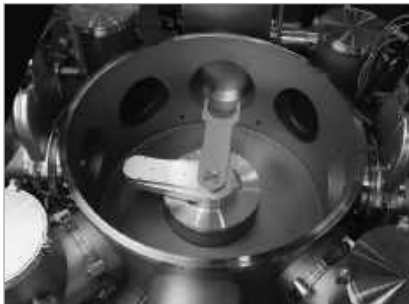
Generally, each vacuum chamber will have its own high vacuum system. The load lock chamber is in the simplest case loaded manually with individual substrates. In addition, magazine processing of several substrates per batch is possible.



Design example:
UNIVEX 450 C with two process chambers as well as load lock chamber arranged at the centre. The substrates are moved using linear transfer rods (left and right)



Design example:
Automatically controlled substrate magazine with
robot arm access

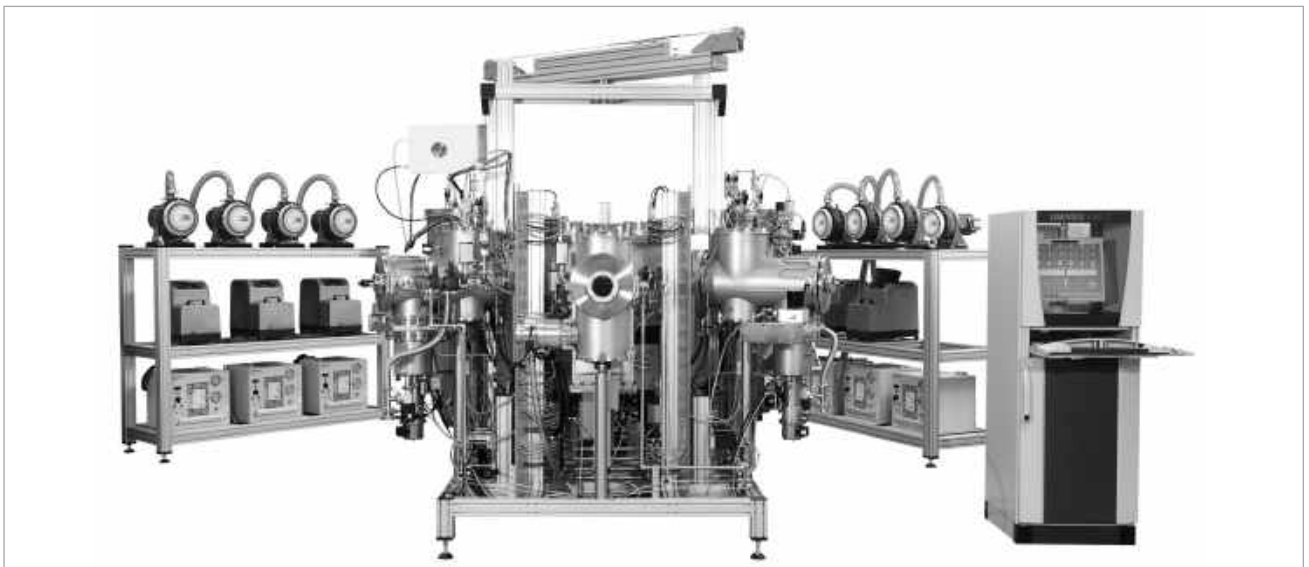


Design example:
Load lock chamber with central vacuum robot for
substrate transportation into radially arranged pro-
cess chambers

For transporting the substrates between the individual vacuum chambers, commonly motor driven robot arms or linear transfer drive units are used.

The UNIVEX control software is customised according to the specific appli-

cation requirements and will generally allow fully automatic running of the process including recipe processing. Additional features like data logging, password protected and priority dependent user access as well as remote access for servicing can be optionally integrated.



Design example:
Coating module (centre) with decentralised pump systems (left and right) and control console

Dactyloscopy Systems UNIVEX D

Leybold has developed a coating system, which relies on a recognized metal evaporation process to reveal fingerprints on items containing fingerprint evidence.

Benefits of this method

- Easily controllable thermal coating process
- Coating of large areas is possible up to 800 x 400 mm
- Short cycle times are possible (depending on the material with the fingerprint evidence)
- Good contrast on multicolor surfaces
- The material containing the fingerprint evidence remains undamaged

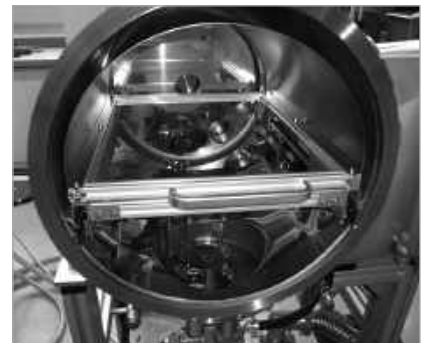


Design example:

UNIVEX 450 D, consisting of vacuum coating module (right) and separate electrical cabinet (left)



Opened coating chamber with retracted substrate receiver



View into the chamber with thermal evaporator and positioned substrate receiver

Space Simulation Systems UNIVEX S

We are offering the UNIVEX S line for simulation of space conditions as well as other thermal vacuum experiments. It generally consists of a cylindrical vacuum chamber with high vacuum sys-

tem and supply module with process controller. The simulation chamber is typically equipped with temperature controllable trays and shrouds, which may be both

heated and cooled, in a vacuum. The process module is moved manually along rails so that the simulation chamber can be opened for loading



Design example:
UNIVEX 1000 S with closed simulation chamber

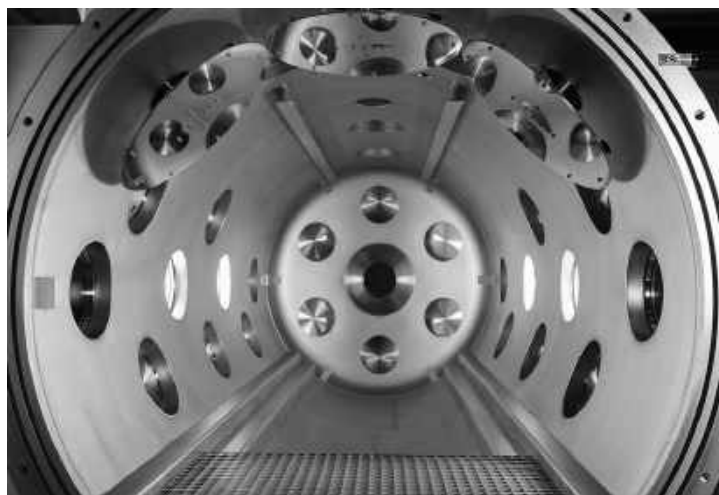


Opened chamber of the UNIVEX 1000 S with temperature controllable shrouds and substrate tray

Vacuum Pump
Systems



Design example:
UNIVEX 700 S



Sample:
UNIVEX S XTT

Process Accessories

Thermal Evaporation of High Melting Point Materials (metals)

Single Thermal Evaporator

Consisting of two water-cooled high voltage feedthroughs with terminal blocks for 34.5 mm dia. holes.



Single thermal evaporator

Technical Data

Rating per conductor	V A	max. 100 500
Seals		FPM
Water connection	mm	Hose 4/6 Ø
Weight	kg	2.5

Single Thermal Evaporator

Ordering Information

	Part No.
Single thermal evaporator	upon request

Single Thermal Evaporator

Dual Thermal Evaporator

Consisting of three water-cooled high voltage feedthroughs with terminal blocks for 34.5 mm dia. holes.



Dual thermal evaporator

Technical Data

Rating per conductor	V A	max. 100 500
Seals		FPM
Water connection	mm	Hose 4/6 Ø
Weight	kg	3.9

Dual Thermal Evaporator

Ordering Information

	Part No.
Dual thermal evaporator	upon request

Dual Thermal Evaporator

High Current Cable

For single and dual thermal evaporators, equipped with terminals and clamping pieces.

Technical Data

Length	m	2 ¹⁾
Rating	V A	max. 100 500
Cross section	mm ²	120
Weight	kg	3.5

High Current Cable

Ordering Information

	Part No.
Power supply cable	upon request ²⁾

High Current Cable

¹⁾ Standard length. Other lengths can be specified

²⁾ For the single thermal evaporator, two high current cables are required
For the dual thermal evaporator, three high current cables are required

AS 153 High current power supply unit

For supplying thermal evaporators.



AS 153 high current power supply unit

Technical Data

Cabinet	19" rack module, 2 HU Installation depth 520 mm
Output voltage/current, max.	8 V, 400 A
Inputs	Remote control unit for controlling the evaporation power (0 to 10 V)
Main power supply	230 V, 50/60 Hz, 10 A
Weight, approx.	kg 10

Power Supply Unit

Ordering Information

	Part No.
AS 153 high current power supply unit	upon request

Power Supply Unit

Thermal Evaporation of Low Melting Point Materials (organics)

Organic material evaporators are special instruments based on the thermal principle developed to evaporate mostly temperature sensitive organic materials.

Such instrumentation ensures a coating

process at precisely controlled heating temperatures in the range between 50 °C and 600 °C.

For installation within the UNIVEX systems, Leybold supplies organic

material evaporators as a complete package, consisting of evaporator source, automatic evaporator shutter and 19" rack mount controller.



Four organic material evaporators, arranged in a semicircle



Single organic material evaporator with shutter, fitted to a DN 40 CF flange



Power supply unit for two organic material evaporators

Upon request we shall be pleased to provide an offer which specifically matches the requirements of your application.

Electron Beam Evaporation

Various models of electron beam evaporators and power supplies are available for installation in the UNIVEX systems.

Electron Beam Evaporator

The selection of a suitable electron beam evaporator will primarily depend on the amount of available space, the desired evaporation rate and the film thickness as well as the number and type of materials which need to be evaporated. Single crucible as well as rotatable multi-crucible evaporators are available.

Power Supplies

The power supply unit for the individual electron beam evaporators is selected depending on the maximum evaporation power which is required, as well as the demanded properties for X/Y beam deflection. Models with output power ratings ranging from 3 kW to 10 kW are available.

Upon request we shall be pleased to provide an offer which specifically matches the requirements of your application.



Electron beam evaporator with single crucible



Electron beam evaporator with rotatable six-pocket crucible

Sputtering

Magnetron Sputter Sources

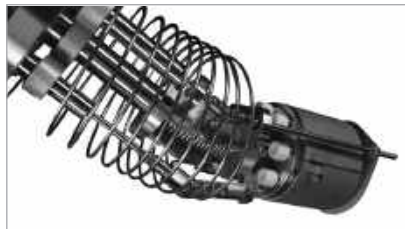
The magnetron sputter sources, which can be built into the UNIVEX systems, are DC/RF compatible. This means, they may be operated either with a DC or also with a RF power supply. In addition, pulsed DC power supplies are possible.

Here as standard round planar sputter sources with target diameters ranging from 2-in. to 6-in. are available. Selection and equipping here depends on the substrate size to be coated, the specified sputtering process and the target material as well as the available installation space.

Other target sizes and magnetron types (rectangular sources, for example) are available upon request.



2-in. magnetron with in-situ tiltable sputter head, pneumatically actuated target shutter and gas feed



4-in. magnetron with in-situ tiltable sputter head, pneumatically actuated target shutter and gas feed



Confocal arrangement of 3-in. sputter sources, aligned for sputter-up

DC Power Supplies

For DC sputtering, power supply units with a rated output power ranging between 500 W and 3 kW are available. These are 19-in. rack mount units which can be installed in the UNIVEX cabinets.

RF Power Supplies

For RF sputtering, power supply units with a rated output power ranging between 300 W and 2 kW are available. These are 19-in. rack mount units which can be installed in the UNIVEX cabinets.

Moreover, automatically controlled RF matchboxes are supplied for impedance matching between the RF power supply and the magnetron.

Gas Inlet

Sputtering sources can only be operated with a process gas present. For this, manually operated variable leak valves or automatically controlled mass flow controllers are available options.

Throttling the Pumping Speed and Process Pressure Control

In order to protect the high vacuum pump against the high pressures present during plasma operation and to control the process pressure, the UNIVEX systems are fitted with suitable components for throttling the high vacuum pumping speed. These may be butterfly valves, control gate valves or also speed controlled turbomolecular pumps.

Upon request we shall be pleased to provide an offer which specifically matches the requirements of your application.

Ion Sources

Ion sources are frequently used to either clean or etch the substrates before running the actual coating process, or to optimise the thin film properties during deposition. In the case of the latter process, the ion source serves to support the coating process (IBAD – Ion Beam Assisted Deposition). However, there are also some PVD processes, during which the ion source is directly needed to produce the thin films, for example during ion beam sputtering

As to design and operating principle, different types of ion sources are available, for example

- Gridded and gridless ion sources
- DC ion sources and RF ion sources
- Flange mounted ion sources and ion sources built in/aligned in the vacuum



Gridless DC ion source with filament for plasma neutralisation



Filamentless RF grid type ion source

**We shall be pleased to assist you in connection with your UNIVEX application.
For this, please ask us for a quotation.**

Process Gas Inlet

In plasma supported processes (sputtering, etching, glow discharge, bias) or reactive deposition methods, generally a gas supply from the outside is necessary. The gas may be supplied either manually with a gas-dosing valve or program-controlled by way of a gas

flow controller (MFC – Mass Flow Controller). The MFC control range is depending on the requirements between approximately 0 to 10 sccm and 0 to 500 sccm.

The available MFC models are equipped either with a 0 to 5 V ana-

logue interface or a EtherCAT interface. The possible gases respectively gas mixtures within a UNIVEX system depend on the type of required application and the installed system hardware (in particular the pump system).

Mass Flow Controller (MFC)

For controlled inlet of gas in connection with automated plasma processes (sputtering, etching, glow discharge). The MFC is controlled by a PC or a PLC provided from the side of the customer.



Technical Data

Gas flow, max.	sccm	selectable between 10 and 500
Supply voltage	V DC	24
Control interface		analog 0 – 5 V or EtherCAT

Mass Flow Controller (MFC)

Ordering Information

	Part No.
Mass flow controller	upon request

Mass Flow Controller (MFC)

Variable Leak Valve with Isolation Valve

For manually controlled inlet of gas in connection with plasma processes (sputtering, etching and glow discharge).



Technical Data

Gas inlet rate q_L	mbar x l/s	5×10^{-6} to 1×10^3
Connection flange	DN	16 ISO-KF

Variable Leak Valve with Isolation Valve

Ordering Information

	Part No.
Variable leak valve with isolation valve	215 010

Variable Leak Valve with Isolation Valve

see also Catalog Part "Valves"

Please ask us for detailed information.

Film Thickness Measurement

Various thin film thickness measuring instruments may be installed in the UNIVEX units.

The selection depends on the measurements needed and the required degree of automation.

As standard, oscillating crystal systems are used. These may consist of one or several sensing heads with or without shutter, and upon request are available for UHV operation (i.e. are suitable for degassing).

The sensor head is driven either by a monitor (allowing only the measurement of deposition rate and film thickness) or by a controller (allowing measurement of the film parameters and control of the deposition rate).

Upon request we can provide an offer which specifically matches the requirements of your application.



Example of a thin film controller



Examples of thin film measurement gauge heads

Substrate Rotation

To attain the desired film properties, a rotary movement of the substrates is very often necessary in deposition processes.

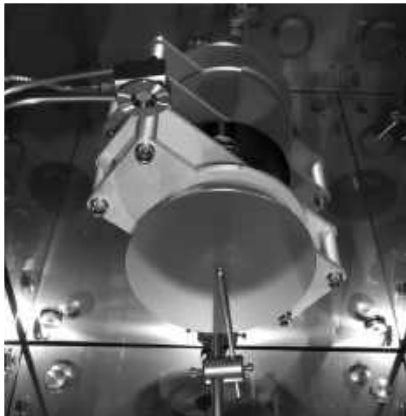
The Leybold UNIVEX system is availa-

ble with a wide range of substrate rotation accessories.

A simple, manually operated rotation axis can be implemented just as a continuously revolving motor shaft or an

angle positionable solution (for placement or transfer tasks).

In addition, coaxial drives with two independently operated rotating tables can be offered.



Motor driven rotary drive with a detachable substrate holder (bayonet coupling).
View from the bottom onto the closed substrate shutter



Coaxial hollow shaft drive for eccentric rotation and positioning of several substrates, with separate shutter table

Planetary Drives

For high demands regarding thickness uniformity of the deposited film, planetary drives are suitable. Here the substrates, which are to be coated, are

placed on so-called planets. The planets revolve eccentrically about a central axis but they additionally rotate about their own centre point.

Different types of planetary drives are possible depending on the specific kind of task (size and number of substrates, angle of inclination, throughput times).



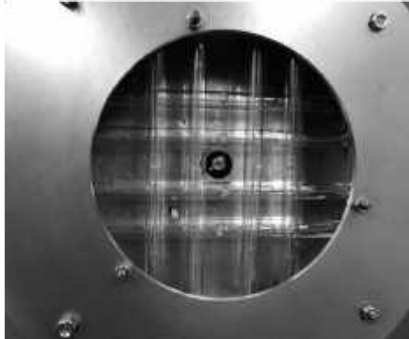
Planetary drive with gear drive and three planets, firmly installed, but where the angle is adjustable



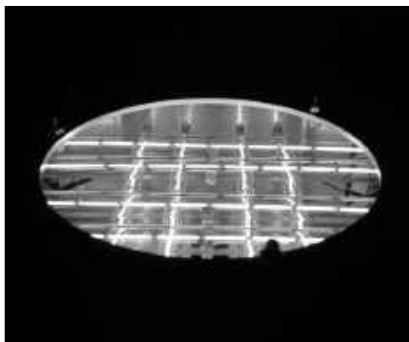
Planetary drive with central friction disc and five free-running planets

**Our consulting experts are available to inform you about substrate movement options.
For these please ask us for a quotation.**

Heating, Cooling, Tempering, Bias



Rotatable thermal radiation heater with quartz lamps



Rotatable thermal radiation heater with quartz lamps during heating operation

The thermal manipulation of substrates is an important method to optimise coating results. For this, Leybold Vacuum offers within the scope of its UNIVEX systems numerous solutions. Depending on requirements and technical feasibility, thermal solutions may also be combined with other properties for example rotation or substrate bias.

Substrate Heating

For temperature-controlled heating, different contact and thermal radiation heaters are available. The selection of the optimal solution depends above all on the desired temperature range, the substrate size and the substrate material.



Rotating contact heater based on the resistance heating principle



Rotating high temperature thermal radiation heater with SiC heating element

Substrate Cooling

Heat sensitive substrates or substrate coatings necessitate during the deposition process some kind of cooling. Leybold offers both inactively as well as actively cooled substrate holders. As cooling media, water, liquid nitrogen (LN_2) or special cooling liquids can be used.



Rotating and water-cooled substrate table

Substrate Tempering

Through the utilisation of a special temperature control liquid, it is possible to heat or also cool a substrate. The possible temperature range lies between approximately $-50\text{ }^{\circ}\text{C}$ and $+150\text{ }^{\circ}\text{C}$ for static substrate holders, respectively $-20\text{ }^{\circ}\text{C}$ and $+100\text{ }^{\circ}\text{C}$ for rotating substrate holders.



Rotatable and temperature controllable substrate holder with substrate shutter

Substrate Bias

Pre-cleaning of the substrate with RF or DC biasing prior to deposition can improve the adhesive properties of the film. Leybold offers insulated substrate holders and upon request matching power supplies.



Insulated substrate fork with RF bias connection

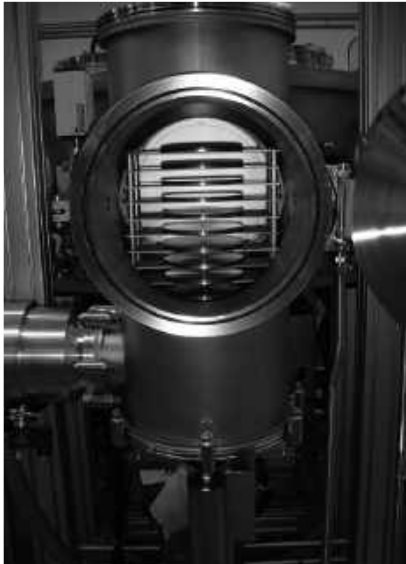
Load Lock Systems

To improve the process conditions and to increase coating throughput, frequently additional load lock chambers are used. These are connected to the process chamber and are vacuum-wise separated by a gate valve. By means of a transport facility (linear transfer rod, vacuum robot or alike) the substrate is transported between the chambers. The load lock system offers the advan-

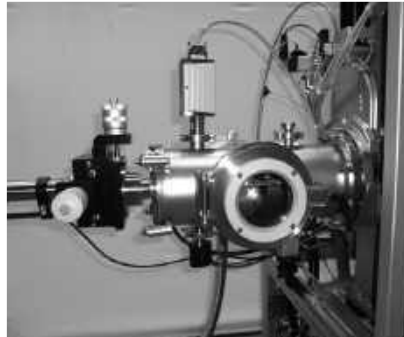
tage to save time during pumpdown and the ability to attain significantly better vacuum pressures in the process chamber, since it will not have to be vented when changing the substrates. Usually the load lock chamber will be significantly smaller compared to the process chamber. Selection of the load lock chamber and

the pump system as well as the design for the substrate transport facility depend on the specific kind of application.

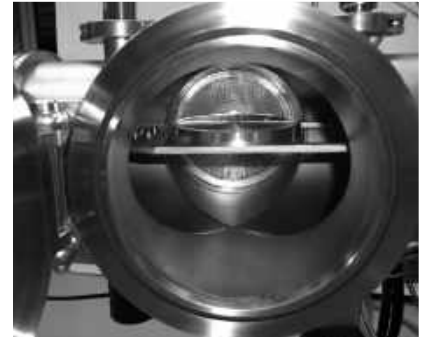
We shall be pleased to assist you as to the possibilities offered by a load lock system in your UNIVEX application.



Manually operated load lock chamber with substrate magazine



Load lock chamber for a single substrate with automatically operated linear transfer unit



View into the opened load lock chamber onto the substrate end effector

General Accessories

Blank-Off Screw Fitting

For 34.5 mm dia. hole.



Blank-off screw fitting

Technical Data

Material	Stainless steel
Seal	FPM (FKM)
Weight	kg 0.1

Ordering Information

	Part No.
Blank-Off screw fitting	030 40

Blank-Off Screw Fitting

PS 113 A Low Pressure Safety Switch

Safety interlock arrangements in connection with the UNIVEX system controller, respectively optionally connected power supply equipment (for sputtering or electron beam evaporation, for example).



PS 113 A Safety Switch

Technical Data

Switching pressure	mbar	approx. 6 below atmospheric pressure
Return switching pressure	mbar	3 below atmospheric pressure
Switching inaccuracy	mbar	2
Switching contact		Changeover contacts, gold-plated, for prog. controls
Switching capacity	mA / V AC mA / V AC	100 / 24 30 / 24
Vacuum connection	DN	16 ISO-KF

Ordering Information

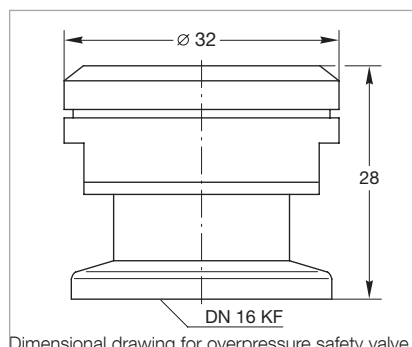
	Part No.
Low Pressure Safety Switch PS 113 A, DN 16 ISO-KF; complete with 3 m long cable	230 011

see also Catalog Part "Measuring, controlling"

Low Pressure Safety Switch

Overpressure Safety Valve

For protecting the vacuum chamber against atmospheric overpressure during gas inlet



Dimensional drawing for overpressure safety valve

Technical Data

Responding pressure	mbar	1150 ± 40, over-pressure
Flow at 140 mbar	l/h	500
Valve disk		Spring loaded, with O-ring seal
Leak rate in the closed state	mbar x l/s (Torr x l/s)	< 1 x 10 ⁻⁸ (< 0.75 x 10 ⁻⁸)
Connection	DN	16 ISO-KF

Ordering Information

	Part No.
Overpressure Safety Valve	890 39

see also Catalog Part "High Vacuum Pumps"

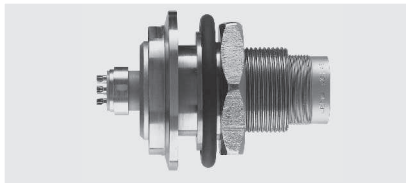
Overpressure Safety Valve

Vacuum Feedthrough for the Transfer of Electrical Signals

For installation in a 34.5 mm diameter installation bore.

Connection on the side of the atmosphere through a six-way plug (included in the delivery).

Connection on the vacuum side through a plug with soldered contacts (included in the delivery).



Vacuum feedthrough

Pneumatically Actuated Swivelling Shutter

For covering substrates or coating sources like thermal, respectively electron beam evaporators.

With pneumatic drive unit and shutter panel; for installation within installation bores having a diameter of 34.5 mm.

Technical Data

Rating per conductor	V A	max. 700 16
Seal		FPM (FKM)
Weight	kg	0.3

Ordering Information

	Part No.
Vacuum feedthrough	upon request

Vacuum Feedthrough

Vacuum Feedthrough

Technical Data

Control voltage	V DC	24
Dimensions of the shutter panel	mm	upon consultation

Ordering Information

	Part No.
Pneumatically actuated swivelling shutter	upon request

Pneumatically Actuated Swivelling Shutter

Pneumatically Actuated Swivelling Shutter

Questionnaire

page 1

Customer

Substrate

Max. substrate dimensions	<input type="text"/>
Substrate material(s)	<input type="text"/>
Substrate per batch	<input type="text"/> pcs.

Substrate heating	<input type="checkbox"/>	yes, max. temp.	<input type="text"/>	°C at Substrate	<input type="checkbox"/>	or at heater	<input type="checkbox"/>
Substrate cooling	<input type="checkbox"/>	yes, min. temp.	<input type="text"/>	°C at Substrate	<input type="checkbox"/>	or at cooler	<input type="checkbox"/>
Substrate rotation	<input type="checkbox"/>	yes					
Substrate shutter	<input type="checkbox"/>	yes					

Substrate pre-treatment (cleaning)

Substrate bias	<input type="checkbox"/>	RF	<input type="checkbox"/>	DC
Ion beam	<input type="checkbox"/>	yes		
Sputter etching	<input type="checkbox"/>	yes		

Deposited film

Coating material(s)	<input type="text"/>
Layers per substrate	<input type="text"/> pcs.

Any materials incompatible with your coating process (i.e. aluminum, copper, viton, etc.)

☐ yes, these materials are

Deposition process

Thermal evaporation	<input type="checkbox"/>	yes
Number of sources	<input type="checkbox"/>	pcs.
Number of power supplies	<input type="checkbox"/>	pcs.
Source shutter(s)	<input type="checkbox"/>	yes

Electron beam evaporation	<input type="checkbox"/>	yes
Number of guns	<input type="checkbox"/>	pcs.
Number and size of pockets	<input type="text"/> (e.g. 1 x 8cc, 4 x 8cc, 6 x 20cc ...)	
Evaporating power	<input type="checkbox"/> 3 kW	<input type="checkbox"/> 5 kW
Source shutter(s)	<input type="checkbox"/> yes	<input type="checkbox"/> 6 kW
		<input type="checkbox"/> 10 kW

Thickness measurement	<input type="checkbox"/> monitor	<input type="checkbox"/> controller
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Magnetron sputtering	<input type="checkbox"/>	yes
Target to substrate alignment	<input type="checkbox"/>	confocal
Source shutter(s)	<input type="checkbox"/>	face to face
	<input type="checkbox"/>	yes

Number of DC sputter sources	<input type="checkbox"/>	pcs.
Target diameter	<input type="checkbox"/> 2"	<input type="checkbox"/> 3"
Targets with special size	<input type="checkbox"/> 4"	<input type="checkbox"/> 6"
Number of DC power supplies	<input type="checkbox"/>	pcs.

Number of RF sputter sources	<input type="checkbox"/>	pcs.
Target diameter	<input type="checkbox"/> 2"	<input type="checkbox"/> 3"
Targets with special size	<input type="checkbox"/> 4"	<input type="checkbox"/> 6"
Number of RF power supplies	<input type="checkbox"/>	pcs.

Ion assisted deposition	<input type="checkbox"/>	yes
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Questionnaire

page 2

Gas inlet (required for all plasma processes)

Required gases

Gas inlet system

☐ MFC ☐ manual leak valve
Vacuum chamber

Best suited standard size

If not, then special size

Chamber wall tempering

Additional load lock system

☐ yes

☐ cooling ☐ heating (by water, max. 65 °C)
☐ manual ☐ automatic ☐ with magazine for ☐ substrates
Pump system

Fore-vacuum pump

High vacuum pump

☐ dry ☐ oil-sealed
☐ cryo ☐ turbomolecular

Process pressure

Ultimate pressure

 mbar/ Torr
 mbar/ Torr
System control

(Standard is PLC with automatic pump system control and manual deposition control)

Manual process control

Semi-automatic proc. control

Automatic process control

☐ yes (i.e. manual deposition steps)
☐ yes (i.e. automatic single deposition steps)
☐ yes (i.e. automatic coating batches, recipe-processing)
Installation**Location**

in a clean room completely

in the clean room wall

☐ yes
☐ yes
Main power supply

Voltage

Number of phases

Frequency

 V

 Hz
Description of other process or system issues, if required

Commercial aspects

Estimated budget

Planned delivery date

 currency ☐ EUR ☐ USD

Calibration Systems

General

CS Calibration Systems

The requirements imposed on vacuum engineering with regard to accuracy of the measurements, reproducibility and unambiguity of the determined vacuum pressures have increased steadily over the last years

Routine calibrations of vacuum gauges are an important component of quality assurance schemes. The calibration systems from Leybold put the customer in a position to check and recalibrate on his own the specified and necessary accuracy of his vacuum gauges. Calibration systems are available for this

purpose which cover a calibration range from 1000 mbar to 1×10^{-7} mbar (750 to 0.75×10^{-7} Torr).

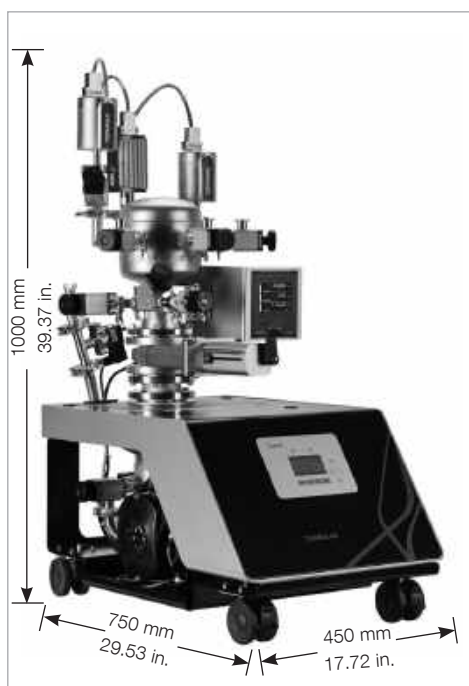
Each system is equipped with several certified reference pressure sensors (transmitter standards), which each cover a part of the specified range of calibration pressures. In the pump system, turbomolecular pumps TURBOVAC with DIVAC diaphragm pumps are used. A variable leak valve is used to let the gas into the calibration chamber. In the case of the calibration system CS7, the gas inlet line is, moreover, equipped with its own pump system.

The CS 3 mobile is an implementation which may be easily transported in a space saving manner. To this end it may be disassembled in to 2 parts for subsequent on-site reassembly.

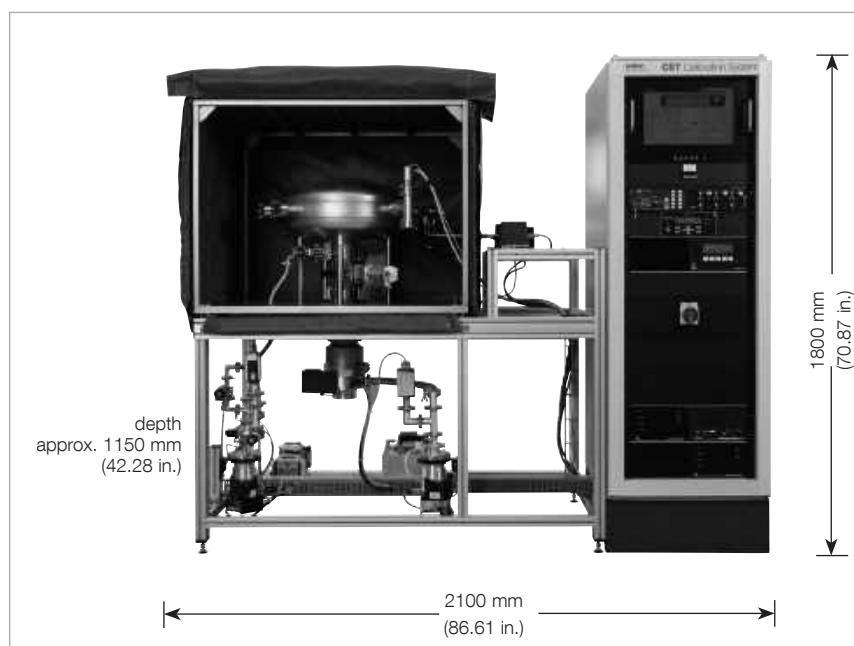
The CS7 is equipped with a heater for the vacuum chamber, for the purpose of attaining lower chamber pressures more rapidly. The temperature of the heating collars can be controlled whereby the maximum degassing temperature will depend on the components installed (flanges, pressure sensors, valves).



CS3 calibration system



Calibration system CS3 mobile



CS7 calibration system

Advantages to the User

- Vacuum gauges and measurement systems of any make may be calibrated
- Designed in accordance with DIN 28 418 resp. ISO/DIS 3567
- Transfer standards with PTB-, DAKKs- or factory certificate
- Easier DIN/ISO 9000 approval
- Reliable and reproducible measurements
- Quick start-up
- Measurement system free of hydrocarbons through the utilisation of dry compressing vacuum pumps
- Simple operation
- CE approval

Products

Technical Data

Calibration System

		CS3	CS3 mobil	CS7
Calibration range	mbar (Torr)	1000 to 1×10^{-3} (750 to 0.75×10^{-3})	1000 to 1×10^{-3} (750 to 0.75×10^{-3})	1000 to 1×10^{-7} (750 to 0.75×10^{-7})
Pressure measurement range	mbar (Torr)	1000 to 2×10^{-6} (750 to 1.5×10^{-6})	1000 to 2×10^{-6} (750 to 1.5×10^{-6})	1000 to 2×10^{-9} (750 to 1.5×10^{-9})
Vacuum chamber connections (in brackets: disposable for user)		5 (3) x DN 16 ISO-KF 1 (0) x DN 25 ISO-KF	5 (3) x DN 16 ISO-KF 1 (0) x DN 25 ISO-KF	3 (0) x DN 16 CF 7 (5) x DN 40 CF
Pump system		Turbomolecular pump and diaphragm vacuum pump	Turbomolecular pump, two- stage rotary vane vacuum pump and pump bypass (manual valves)	Two turbomolecular pumps and diaphragm vacuum pump
Fixed / mobile		fixed	mobile (with castors)	fixed
Gas inlet		via variable leak valve	via variable leak valve	via variable leak valve
Extra pump system for admitting gas		no	no	yes
Heater for the vacuum chamber		no	no	yes

Application examples:

Which pressure sensors may be calibrated with which system?

Type of Sensor

Calibration System

	CS3 / CS3 mobile	CS7
Diaphragm sensors		
BOURDONVAC	■	■
Capsule vacuum gauges	■	■
DIAVAC DV 1000	■	■
DI/DU 200/201/2000/2001	■	■
CTR 90, CTR 91, CTR 100 (1000 – 1 Torr full scale)	■	■
CTR 91 (0.1 Torr full scale) / CTR 101		■
THERMOVAC sensors		
TR 301, TR 306	■	■
TR 211, TR 216, TTR 211, TTR 216, TTR 90, TTR 91, TTR 96, TTR 100, TTR 101	■	■
SRG/VISCOVAC sensor (spinning rotor gauge)		
VK 201, SRG		■
PENNINGVAC sensors		
PR 25, PR 26, PR 27, PR 35, PR 36, PR 37, PTR 90, PTR 225		■
IONIVAC sensors		
ITR 90, ITR 100, ITR 200		■
IE 414, IE 514		■

Ordering Information

Calibration System

	CS3 / CS3 mobile	CS7
	Part No.	Part No.
Ordering information and options	upon request	upon request

Vacuum Measuring, Controlling

Vacuum Gauges

Residual Gas Analyzers

Calibration Service

260.00.02

Excerpt from the Leybold Full Line Catalog (Edition 12/2018)

Catalog Part Vacuum - Measuring, Controlling

Vacuum Measuring, Controlling

General

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THERMOVAC Transmitters TTR 91 N (S), TTR 96 N, TTR 911 N (C), TTR 916 N	24
THERMOVAC Transmitters TTR 91 R	30
THERMOVAC Transmitters TTR 101 N (S)	34
PENNINGVAC Transmitters PTR 90 N	38
PENNINGVAC Transmitters PTR 225 N, PTR 237 N	42
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Pressure Switches PS 115 98

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LEYSPEC view and LEYSPEC ultra 104

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Applications for Vacuum Gauges

	Gauges													
	BOURDONVAC A	BOURDONVAC C	Capsule Vacuum Gauge	DIAVAC DV 1000	Handheld Measuring Instruments	CERAVAC Transmitter CTR	Linear Pressure Sensors DI/DO	THERMOVAC Transmitter TTR	PENNINGVAC Transmitter PTR	IONIVAC IM 540	IONIVAC Transmitter ITR	Low Pressure Switch PS 115	Pressure Safety Switch PS 113 A	Diaphragm Pressure Regulators MR 16/50
Mechanical engineering														
Automotive industry; filling of brake and air conditioning systems														
Vacuum conveying technology														
Packaging technology														
Isolation vacuum														
Chemical processes														
Absolute pressure measurements in gas mixtures														
Drying and degassing processes														
Solvent recovery														
Vacuum pressure control in existing central vacuum supply systems														
Electrics/electronics/optics														
Evaporation and coating systems														
Monitoring and controlling of sputter systems														
Semiconductor technology (CVD, plasma etching etc.)														
Ion implantation														
Lamp production														
Analytical instruments and surface physics														
ESCA, SIMS, AES, XPS														
Electron microscopy														
Crystal growing														
Gas analysis systems, mass spectrometers														
Research														
Measurement of ultimate pressure in UHV systems														
Application in MBE systems														
Application in MBE systems														
Beam guidance systems, cyclotron														
Fusion experiments														
Space simulation chamber														
System control/pressure control														
Pressure checks on backing pumps and vacuum systems														
Safety circuits in vacuum systems, protection of vacuum gate valves														
Control of ionization vacuum gauges														
Pressure measurements on HV pump systems, e.g. diffusion, TMP, cryopump systems														
Venting systems														
Valve control, pressure dependant systems control														
Simple pressure control arrangements														
Calibration														
Calibration of vacuum gauges and mass spectrometers														
Reference instruments for the determination of the physical properties of gases														
Precision measurements of low pressures also, in the presence of corrosive or reactive gases,														
Miscellaneous														
Vacuum annealing, melting, soldering and hardening furnaces														
Cooling and air conditioning technology														
Electron beam welding														
Metallurgy														

Vacuum Measuring, Controlling

Select the Combination of Sensor and

Operating Ranges for Active Sensors

mbar	10 ⁻¹²	10 ⁻¹¹	10 ⁻¹⁰	10 ⁻⁹	10 ⁻⁸	10 ⁻⁷	10 ⁻⁶	10 ⁻⁵	10 ⁻⁴	10 ⁻³	10 ⁻²	10 ⁻¹	10 ⁰	10 ¹	10 ²	10 ³
Capacitance Diaphragm																
CERAVAC Transmitters (x = 2, 3, 4 oder 5)																
CTR 100 / 100 N (1000 Torr)												0,13			1330	
CTR 100 / 100 N (100 Torr)											0,013				133	
CTR 100 / 100 N (10 Torr)										0,0013					13	
CTR 100 / 100 N (1 Torr)									0,00013			1,3				
CTR 100 / 100 N (0,1 Torr)								0,000013			0,13					
CTR 101 / 101 N (1000 Torr)												0,13			1330	
CTR 101 / 101 N (100 Torr)											0,013				133	
CTR 101 / 101 N (10 Torr)										0,0013					13	
CTR 101 / 101 N (1 Torr)									0,00013			1,3				
CTR 101 / 101 N (0,1 Torr)								0,000013			0,13					
Thermal Conductivity (according to Pirani)																
THERMOVAC Transmitters																
TTR 101 (Pirani combined with capacitance diaphragm)									5 · 10 ⁻⁵						1500	
TTR 91 / 91 N									5 · 10 ⁻⁵						1000	
TTR 91 R										5 · 10 ⁻⁴					1000	
TTR 96 S / 96 N S									5 · 10 ⁻⁵						1000	
TTR 911 / 911 N									1 · 10 ⁻⁵						1000	
TTR 911 CC / 911 N C S									5 · 10 ⁻⁵						1000	
TTR 916 / 916 N									5 · 10 ⁻⁵						1000	
Cold Cathode Ionization (according to Penning)																
PENNINGVAC Transmitters																
PTR 90 / 90 N, DN 40 CF					1 · 10 ⁻⁸										1000	
PTR 90 / 90 N, DN 40 ISO-KF					1 · 10 ⁻⁸										1000	
PTR 90 / 90 N, DN 25 CF					1 · 10 ⁻⁸										1000	
PTR 225 / 225 N, DN 25 ISO-KF					1 · 10 ⁻⁸					0,05						
PTR 237 / 237 N, DN 40 CF					1 · 10 ⁻⁸					0,05						
Hot Cathode Ionization																
IONIVAC Transmitters (Bayard-Alpert combined with Pirani)																
ITR 90			5 · 10 ⁻¹⁰												1000	
ITR 200 with and without display			5 · 10 ⁻¹⁰												1000	
Linear Pressure Sensors ¹⁾																
DI/DU 200 and 201												0,1			200	
DI/DU 2000 and 2001													1		2000	
DI/DU 2001 rel.														-1000	+1000	
Handheld Measurement Instruments																
THERMOVAC Sensors																
TM 101								5 · 10 ⁻⁴							1200	
Loadlock Transmitters																
TTR 200 N, DN 16 ISO-KF							5 · 10 ⁻⁵								1500	
PTR 200 N, DN 16 ISO-KF					1 · 10 ⁻⁸										1500	

Vacuum Measuring, Controlling

[illegible]

1) Possible

Select the Combination of Sensor and

Operating Ranges for passive Sensors

mbar	10 ⁻¹²	10 ⁻¹¹	10 ⁻¹⁰	10 ⁻⁹	10 ⁻⁸	10 ⁻⁷	10 ⁻⁶	10 ⁻⁵	10 ⁻⁴	10 ⁻³	10 ⁻²	10 ⁻¹	10 ⁰	10 ¹	10 ²	10 ³
Thermal Conductivity (according to Pirani)																
THERMOVAC Sensors																
TR 211										0,0005					1000	
TR 211 NPT										0,0005					1000	
TR 212										0,0005					1000	
TR 216										0,0005					1000	
Cold Cathode Ionization (according to Penning)																
PENNINGVAC Sensors																
PR 25				1 · 10 ⁻⁹						0,01						
PR 26				1 · 10 ⁻⁹						0,01						
PR 27				1 · 10 ⁻⁹						0,01						
PR 28				1 · 10 ⁻⁹						0,01						
IONIVAC Sensores																
IE 414 (Bayard-Alpert)			2 · 10 ⁻¹¹							0,01						
IE 514 (Extraktor)		1 · 10 ⁻¹²						0,0001								
mbar	10 ⁻¹²	10 ⁻¹¹	10 ⁻¹⁰	10 ⁻⁹	10 ⁻⁸	10 ⁻⁷	10 ⁻⁶	10 ⁻⁵	10 ⁻⁴	10 ⁻³	10 ⁻²	10 ⁻¹	10 ⁰	10 ¹	10 ²	10 ³

Gauges which is ideal for your Application

Operating Units for passive Sensors

	IONIVAC IM 540	COMBIVAC					
		CM 51	CM 52				
Part No. EU / US	230 100	–	–				
Part No. RS 232 C	–	230 110	230 115				
Part No. Profibus	–	230 111	230 116				
		1, 2	1, 2				
		1, 2	1, 2				
		1, 2	1, 2				
		1, 2	1, 2				
		3					
		3					
		3					
		3					
	1, 2		3				
	1, 2		3				

1, 2, 3 indicate the channel to which the sensor may be connected

Basic Terms of Vacuum Metrology

Today, the total range of vacuum pressure accessible to measurement extends from atmospheric pressure (about 1000 mbar (750 Torr)) down to 10^{-12} mbar/Torr, i.e. it extends over 15 powers of ten. The instruments used for measuring the pressure within this wide range are called vacuum gauges. For physical reasons it is not possible to create a single vacuum sensor through which it might be possible to perform quantitative measurements within the entire pressure range. Therefore, a variety of different vacuum gauges are available, each with their own characteristic measurement range which commonly extends over several powers of ten. A difference is made between direct and indirect pressure measurements. In the case of direct (or absolute) pressure measurements, the readings obtained through the vacuum gauge are independent of the type of gas and the pressure which is to be measured. Common are so-called mechanical vacuum gauges where the pressure is determined directly by recording the force acting on the surface of a diaphragm. In the case of so-called indirect pressure measurements the pressure is determined as a function of a pressure dependant property of the gas (thermal conductivity, ionization probability, for example). These properties do not only depend on the pressure, but also on the molar mass of the gases. For this reason, the pressure readings obtained through vacuum gauges which rely on indirect pressure measurements, depend on the type of gas. The readings usually relate to air or nitrogen as the measurement gas. For the measurement of other vapors or gases the corresponding correction factors must be applied.

Vacuum Gauges where the Pressure Readings are Independent of the Type of Gas (Mechanical Vacuum Gauges)

BOURDON Vacuum Gauge

The inside of a tube which is bent into a circular arc (the so-called Bourdon tube) is connected to the vacuum system. Due to the effect of the external atmospheric pressure, the end of the tube bends more or less during the evacuation process. This actuates the pointer arrangement which is attached to this point. The corresponding pressure can be read off on a linear scale. With Bourdon gauges it is possible to roughly determine pressures between 10 mbar (7.5 Torr) and atmospheric pressure.

Capsule Vacuum Gauge

This vacuum gauge contains a hermetically sealed, evacuated, thinwalled diaphragm capsule which is located within the instrument. As the vacuum pressure reduces, the capsule bulges. This movement is transferred via a system of levers to a pointer and can then be read off as the pressure on a linear scale.

Diaphragm Vacuum Gauge

In the case of the diaphragm vacuum gauge which is capable of absolute pressure measurements, a sealed and evacuated vacuum chamber is separated by a diaphragm from the vacuum pressure to be measured. This serves as the reference quantity.

With increasing evacuation, the difference between the pressure which is to be measured and the pressure within the reference chamber becomes less, causing the diaphragm flex. This flexure may be transferred by mechanical means like a lever, for example, to a pointer and scale, or electrically by means of a strain gauge or a bending bar for conversion into an electrical measurement signal. The measurement range of such diaphragm vacuum gauges extends from 1 mbar (0.75 Torr) to over 2000 mbar (1500 Torr).

Capacitance Vacuum Gauge

The pressure sensitive diaphragm of these capacitive absolute pressure sensors is made of Al_2O_3 ceramics. The term "capacitive measurement" means that a plate capacitor is created by the diaphragm with a fixed electrode behind the diaphragm. When the distance between the two plates of this capacitor changes, a change in capacitance will result. This change, which is proportional to the pressure, is then converted into a corresponding electrical measurement signal. Here too, an evacuated reference chamber serves as the reference for the pressure measurements. With capacitance gauges it is possible to accurately measure pressures from 10^{-5} mbar/Torr to well above atmospheric pressure, whereby different capacitance gauges having diaphragms of different thickness (and therefore sensitivity) will have to be used.

Vacuum Gauges where the Pressure Readings depend of the Type of Gas

Thermal Conductivity Gauge (Pirani)

This measurement principle utilizes the thermal conductivity of gases for the purpose of pressure measurements in the range from 10^{-4} mbar/Torr to atmospheric pressure. Today, only the principle of the controlled Pirani gauge is used by Leybold in order to attain a quick response. The filament within the gauge head forms one arm of a Wheatstone bridge. The heating voltage which is applied to the bridge is controlled in such a way, that the filament resistance and thus the temperature of the filament remains constant regardless of the quantity of heat given off by the filament. Since the heat transfer from the filament to the gas increases with increasing pressures, the voltage across the bridge is a measure of the pressure.

Improvements with regard to temperature compensation have resulted in stable pressure readings also in the face of large temperature changes, in particular when measuring low pressures.

Cold Cathode Ionization Vacuum Gauge

Here the pressure is measured through a gas discharge within a gauge head whereby the gas discharge is ignited by applying a high tension. The resulting ion current is output as a signal which is proportional to the prevailing pressure. The gas discharge is maintained also at low pressures with the aid of a magnet.

New concepts for the design of such sensors permit safe and reliable operation of these so-called Penning sensors in the pressure range from 10^{-2} to 1×10^{-9} mbar/Torr.

Hot Cathode Ionization Vacuum Gauge

These sensors commonly use three electrodes. A hot cathode emits electrons which impinge on an anode. The gas, the pressure of which is to be measured, is thus ionized. The resulting positive ion current is detected through the third electrode - the so-called ion detector - and this current is used as the signal which is proportional to the pressure.

The hot cathode sensors which are mostly used today, are based on the Bayard-Alpert principle. With this electrode arrangement it is possible to make measurements in the pressure range from 10^{-10} to 10^{-2} mbar/Torr.

Other electrode arrangements permit access to a higher range of pressures from 10^{-1} mbar/Torr down to 10^{-10} mbar/Torr. For the measurement of pressures below 10^{-10} mbar/Torr so-called extractor ionization sensors after Redhead are employed. In extractor ionization gauges the created ions are focused onto a very thin and short ion detector. Due to the geometrical arrangement of this system, interfering influences such as X-ray effects and ion desorption can be almost completely eliminated. The extractor ionization gauge permits pressure measurements in the range from 10^{-4} to 10^{-12} mbar/Torr.

Selection of the right Vacuum Gauge

When selecting a suitable instrument for pressure measurements, the pressure range is not the only criteria. The operating conditions for the instrument play an important part. If, for example, there is the risk of excessive contamination, vibrations, or if air inrushes are to be expected etc., the instrument must be rugged enough. Thus for industrial applications diaphragm gauges, controlled thermal conductivity gauges as well as cold cathode ionization gauges are strongly recommended. Precision instruments are very often quite sensitive to rough operating conditions. These should therefore only be used while observing the corresponding applications information.

Connection Accessories for Small Flanges

Ordering Information

DN 10 ISO-KF

DN 16 ISO-KF

DN 25 ISO-KF

	Part No.	Part No.	Part No.
Outer centering ring with O-ring Aluminum / FPM (FKM) ((Viton))	183 53	183 53	183 54
Fine filter on centering ring with O-ring Stainless steel / FPM (FKM) ((Viton))	883 95	883 96	883 97
Baffle with centering ring (FPM) ((FKM))	-	-	230 078
Connection accessories for metal seals or bake out room up to 150 °C			
Ultra sealing ring, aluminum (Set of 3)	883 73	883 73	883 75
Outer support ring	883 74	883 74	883 76
Clamping ring	882 75	882 75	882 77

Ordering Information

DN 40 ISO-KF

DN 16 CF

DN 40 CF

	Part No.	Part No.	Part No.
Outer centering ring with O-ring Aluminum / FPM (FKM) ((Viton))	183 55	-	-
Fine filter on centering ring with O-ring Stainless steel / FPM (FKM) ((Viton))	883 98	-	-
Baffle with centering ring (FPM) ((FKM))	230 079	-	-
Connection accessories for metal seals or bake out room up to 150 °C			
Ultra sealing ring, aluminum (Set of 3)	883 77	-	-
Outer support ring	883 78	-	-
Clamping ring	882 78	-	-
Connection accessories for CF connections			
Copper seals, (set of 10 pieces)	-	839 41	839 43
Screw (set of 25 pieces)	-	839 00	839 01
Replacement sinter filter with centering ring	231 93 515	-	-

Products

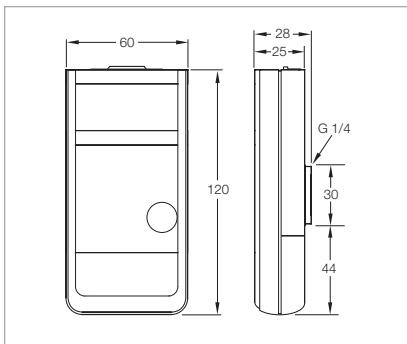
Handheld Measuring Instruments

Digital PIEZOVAC Sensor PV 101

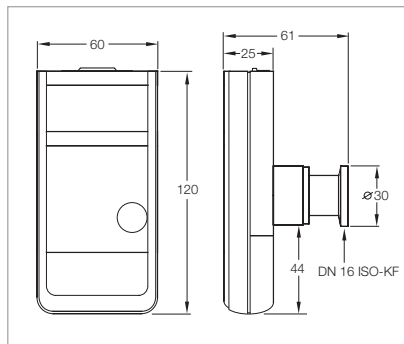
Digital THERMOVAC Sensor TM 101



PIEZOVAC Sensor PV 101 (left) and THERMOVAC Sensor TM 101 (right)



Dimensional drawings PIEZOVAC PV 101 (mm)



Dimensional drawings THERMOVAC TM 101 (mm)

The **PIEZOVAC PV 101** has been specially developed for food sector deployments. The device can be operated directly under vacuum conditions. Thanks to its detachable flange connection the size of the sensor was significantly reduced. In the medium vacuum range pressures of up to 0.1 mbar will be traced and read out. The exclusive use of its piezo sensor significantly increases the battery's service life so that the device is continuously ready for operation. With a measuring rate of minimum 50 ms, you are informed in short process times on the current pressure.

The **THERMOVAC TM 101** is the essential device for on-site service calls. Thanks to the easy use and integrated measurement data memory, pressures can be directly measured at different locations for monitoring the application. Owing to the advanced

measuring range of the high-precision Pirani sensor, pressures of up to 5×10^{-4} mbar can be displayed.

Advantages to the User

- Direct display of measuring values; other monitoring devices are not necessary
- Developed for deployments in demanding environments
- Versatile deployment due to mains-independent power supply
- High-precision measurements of all common gas types
- Export and analysis of stored measurement values via USB interface
- Online analysis of measurement values via USB interface

The digital compact PIEZOVAC PV 101 and THERMOVAC TM 101 combine high-quality sensor technology with modern processor technology in a handy design.

Owing to their battery mode, the devices can be attached and operated at any pressure measuring point, and directly display or store up to 2,000 values for later evaluations and visualizations. All data values stored can be exported and displayed on a computer via USB link and by means of the optional VacuGraph software. The software is especially useful for setting up the devices or calculating rises in pressure for detecting rough leaks.

A carrying case providing space for all required accessories and for storing and transport protection is enclosed with the device and the software.

Typical Applications

- Versatile deployment with vacuum pump and vacuum plant servings
- Comparative measurements of fixed pressure gauges
- Direct measuring inside vacuum vessels or vacuum packs
- Measuring of rough leaks after maintenance services

Technical Data

PIEZO-VAC Sensor

PV 101

THERMO-VAC Sensor

TM 101

Measurement principle		Piezo-resistive	Piezo-resistive (gas type independent) and thermal conductance Pirani
Indicated units of measurement		mbar, Torr, microns, hPa	mbar, Torr, microns, hPa
Measurement range	mbar (Torr)	1200 to 0,1 (900 to 0,075)	1200 to 5×10^{-4} (900 to 3.75×10^{-4})
Maximum overload	bar abs.	2	2
Maximum overload			
1200 – 10 mbar (900 to 75 Torr)		$\pm 0,3$ % of full-scale	$\pm 0,3$ % of full-scale
10 – 2×10^{-3} mbar		-	10 % of measured value
(7.5 to 1.5×10^{-3} Torr)		-	< factor 2 of measured value
< 2×10^{-3} mbar			
(< 1.5×10^{-3} Torr)			
Gas type correction factor		Ar, CO ₂ , He, CO, H ₂ , N ₂ , Kr	Ar, CO ₂ , He, CO, H ₂ , N ₂ , Kr
Materials in contact with the vacuum		Stainless steel 1.4305, Viton®, silicon gel	Stainless steel, gold, tungsten, nickel, glass, Viton
Measurement cycle	s	0,1 (50 ms, from 2018 series)	1.0
Data storing rate	s	0.1 to 6000	1 to 6000
Operating temperature			
Sensor	°C	+5 to +50	+5 to +50
Battery	°C	-20 to +45	-20 to +45
Storage temperature			
Sensor	°C	-20 to +60	-20 to +60
Battery	°C	+10 to +25	+10 to +25
Supply voltage		Rechargeable 9 V battery (recommendation: type Panasonic 6LR61PM, 9 V / 500 mAh) or 12 – 15 V DC external adaptor (miniature jack, + terminal at the tip)	Rechargeable 9 V battery (recommendation: type Panasonic 6LR61PM, 9 V / 500 mAh) or 12 – 15 V DC external adaptor (miniature jack, + terminal at the tip)
Power consumption			
< 200 mbar (< 150 Torr)	mW	2	60
> 200 mbar (> 150 Torr)	mW	2	2
Operating duration			
6LR61 alkaline (vacuum operation)	h	< 2500	up to 75
Display		LCD 12 mm	LCD 12 mm
Connection (stainless steel)		G 1/4 internal thread (DN 16 ISO-KF with adaptor, removable)	DN 16 ISO-KF
PC interface		Mini USB-B connector	Mini USB-B connector
Dimensions	mm	60 x 120 x 50 (DN 10 ISO-KF)	60 x 120 x 61
	mm	60 x 120 x 28 (G 1/4)	
Protection class	IP	40	40
Weight (including battery)	kg (lbs)	0.2 (0.44)	0.23 (0.51)

Ordering Information

PIEZO-VAC Sensor

PV 101

THERMO-VAC Sensor

TM 101

	Part No.	Part No.
Sensor		
Including AlMn battery, 9 V block 6LR 61	230 080 V01	230 081 V01
Accessory kit for VacuGraph Windows software including	230 082 V01	230 082 V01
USB interface cable (2 m)		
protection case with foam insert and		
15 V wall power supply for 100 – 260 V,		
50/60 Hz mains and AlMn battery,		
9 V block 6LR 61		

Active Sensors

CERAVAC Transmitters

CTR 100 N and CTR 101 N



CERAVAC Transmitter CTR 100 N (left) und CERAVAC Transmitter CTR 101 N (right)

The CERAVAC transmitters with an advanced all-welded INCONEL® and stainless steel sensor and microprocessor-based electronics offer excellent accuracy and reproducibility. The CTR 100 N and CTR 101 N allow gas type independent pressure measurements and are able to tolerate bursts of pressure without suffering physical damage or calibration shifts. The robust sensor is suited for the most corrosive processes as the sensor is highly resistant to corrosion from common process chemicals. The sensor of the CTR 101 N is internally heated and regulated to 45 °C to offer full-scale pressure ranges from 1000 to 0.1 Torr.

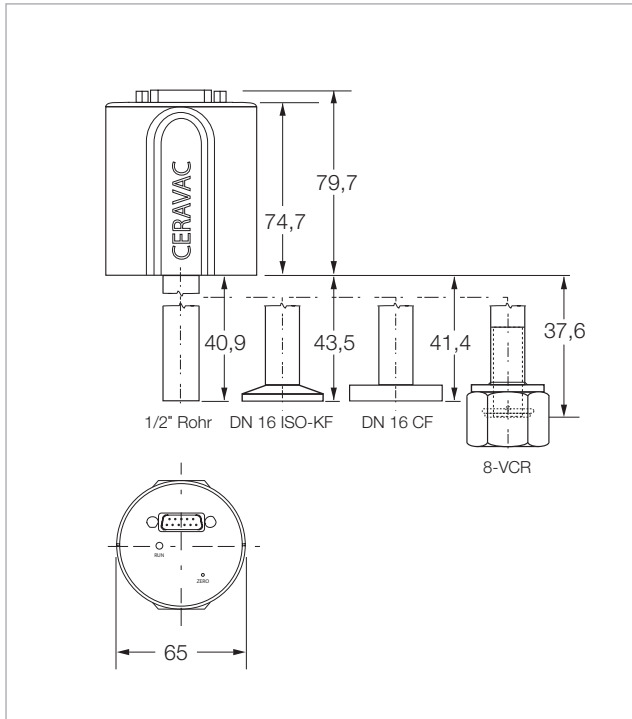
Advantages to the User

- Excellent accuracy and long-term stability
- Very good temperature compensation regardless of ambient conditions
- Highly resistant against corrosion and aggressive gases
- Fast and accurate response to pressure changes
- Improved reliability by high overpressure rating
- Serial Interface (RS 232 protocol)
- Zero adjust push button
- Optional heated (45 °C) version offers 2x better accuracy

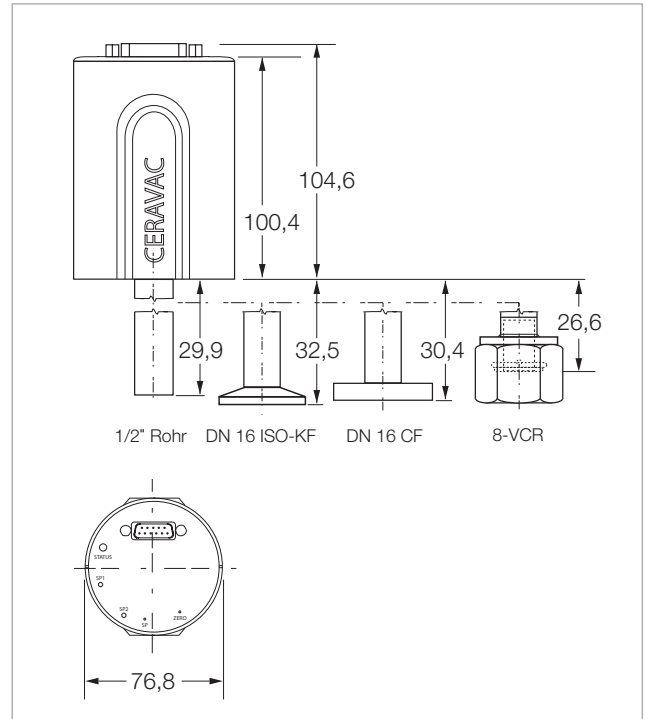
Typical Applications

- General vacuum measurement and control with very low measurement uncertainty
- Fore and medium vacuum pressure measurement
- Research & Development
- System process control
- Chemical and Semiconductor processes
- LED and solar cell manufacturing
- Physical Vapor Deposition (PVD)
- Reference sensor for calibration systems

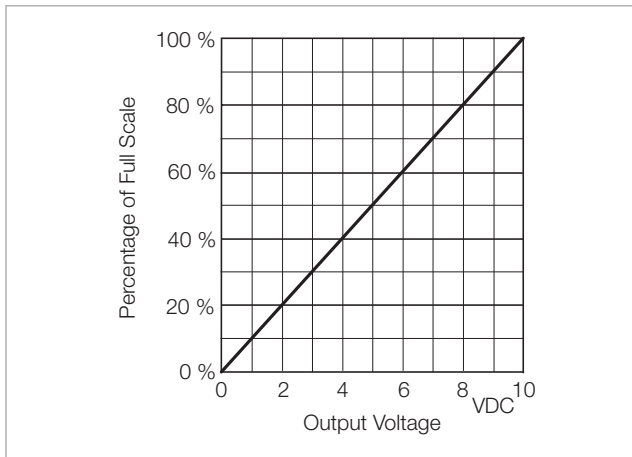
INCONEL® is a registered trademark of Inco Alloys International, Inc.



Dimensional drawing for the CERAVAC Transmitter CTR 100 N (mm)



Dimensional drawing for the CERAVAC Transmitter CTR 101 N (mm)



Characteristic of the CERAVAC Transmitter CTR 100 N and CTR 101 N

Technical Data

CERAVAC Transmitter

CTR 100 N (Temperature Compensated)

CTR 101 N (45 °C heated)

Full scale (FS) / Measurement range		0,1 Torr / 1×10^{-5} – 0,1 Torr 1 Torr / 1×10^{-4} – 1 Torr 10 Torr / 1×10^{-3} – 10 Torr 20 Torr / 2×10^{-3} – 20 Torr 100 Torr / 0,01 – 100 Torr 1000 Torr / 0,1 – 1000 Torr	0,1 Torr / 1×10^{-5} – 0,1 Torr 1 Torr / 1×10^{-4} – 1 Torr 10 Torr / 1×10^{-3} – 10 Torr – 100 Torr / 0,01 – 100 Torr 1000 Torr / 0,1 – 1000 Torr
Measurement uncertainty		0.2% ± temperature effect 0.5% ± temperature effect (0.1 Torr)	0.12% ± temperature effect 0.15% ± temperature effect (0.1 Torr)
Sensor Measurement principle		INCONEL® membrane Capacitance diaphragm gauge	
Supply voltage	V DC	+14 to +30	
Power consumption	W	≤ 1	≤ 11 (at operating temperature ≤ 8)
Electrical connection		15-pol. Sub-D	
Analog output Measurement range	V	0 to 10	
Interface		RS 232	
Setpoints		0	2
Status indicators		LED	
Max. cable length	m	30	
Max. overrange pressure	bar (hPa)	3.1 (3100)	
Operating temperature range	°C (°F)	+15 to +50	+15 to +40
Storage temperature range	°C (°F)	-20 to +80	
Max. bakeout temperature	°C (°F)	Not bakeable	
Max. rel. humidity	% n.c.	25 to 95	
Installation orientation		Any	
Wetted part material		INCONEL®, Stainless steel 316	
Dead volume, approx.	cm³	6.29	
Gewicht	g (lbs)	513 (0.11)	669 (0.15)
Protection class	IP	40	
CE certification		EMC Directive 2014/30/EEC	
Controller type		GRAPHIX ONE / TWO / THREE	
Temperature effects Zero of FS	%/°C	0,005 (1000/100/20/10 Torr) 0,015 (1 Torr) 0,02 (0,1 Torr)	0,0025 (1000/100/10/1 Torr) 0,005 (0,1 Torr)
Span of reading	%/°C	0.01 (1000/100/20/10/1 Torr) 0.03 (0.1 Torr)	0.01 (1000/100/10/1 Torr) 0.03 (0.1 Torr)
Response time (10% to 90% FS)	ms	40 / 80 (1 Torr) / 120 (0.1 Torr)	

Ordering Information

CERAVAC Transmitter

	CTR 100 N	CTR 101 N
	Part No.	Part No.
DN 16 ISO-KF		
1000 Torr	230300V02	230320V02
100 Torr	230301V02	230321V02
20 Torr	230340V02	—
10 Torr	230302V02	230322V02
1 Torr	230303V02	230323V02
0.1 Torr	230304V02	230324V02
DN 16 CF-R		
1000 Torr	230305V02	230325V02
100 Torr	230306V02	230326V02
10 Torr	230307V02	230327V02
1 Torr	230308V02	230328V02
0.1 Torr	230309V02	230329V02
Cajon 8-VCR		
1000 Torr	230310V02	230330V02
100 Torr	230311V02	230331V02
10 Torr	230312V02	230332V02
1 Torr	230313V02	230333V02
0.1 Torr	230314V02	230334V02
1/2" Tube		
1000 Torr	230315V02	230335V02
100 Torr	230316V02	230336V02
10 Torr	230317V02	230337V02
1 Torr	230318V02	230338V02
0.1 Torr	230319V02	230339V02
Calibration	See Section "Miscellaneous", paragraph "Leybold calibration service"	
Operating Units		
GRAPHIX ONE	230680V01	
GRAPHIX TWO	230681V01	
GRAPHIX THREE	230682V01	
Connection cable, Sub-D 15-way female to Sub-D 15-way male, shielded		
5 m	Type C	
10 m	124 55	
15 m	230 022	
20 m	124 56	
30 m	124 57	
	124 58	

Linear Pressure Sensors

DI/DU 200, DI/DU 201, DI/DU 2000, DI/DU 2001, DI/DU 2001 rel.



DI 200 (left) and DI 2000 (right), DU similar

Piezo or capacitive pressure sensor based on ceramics technology. Available as absolute or relative pressure sensor.

Advantages to the User

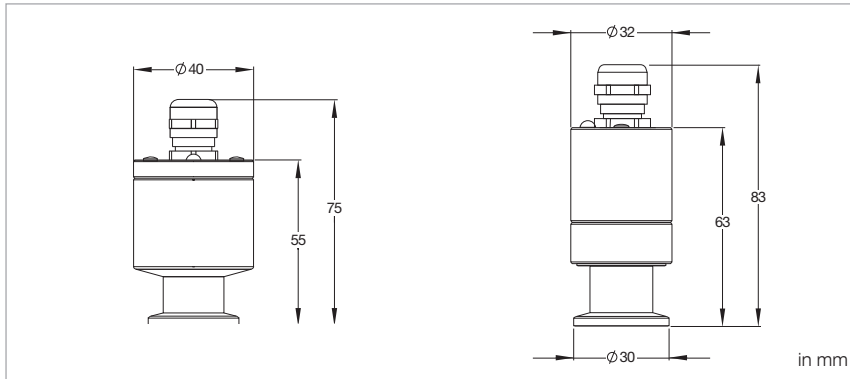
- Absolute pressure ranges from 0.1 to 200 mbar or 1 to 2000 mbar
- Relative pressure range from -1000 mbar to +1000 mbar
- Excellent overload characteristic due to the Al_2O_3 ceramics diaphragm
- Highly corrosion resistant
- Independent of the type of gas
- Vibration resistant
- 2-wire pressure sensor (DI)
- 4-wire pressure sensor (DU)
- Supply voltage range
12 to 30 V DC (DI)
14.5 to 30 V DC (DU)
- Linear output signal 4 to 20 mA (DI)
- Linear output signal 2 to 10 V (DU)
- Compact design
- Digital zero adjustment possible via pushbutton
- IP 54 rated stainless steel housing (DI/DU 200 und DI/DU 201),
IP 54 rated aluminum housing (DI/DU 2000 und DI/DU 2001)
- DN 16 ISO-KF connection with female G 1/4" inside thread

Typical Applications

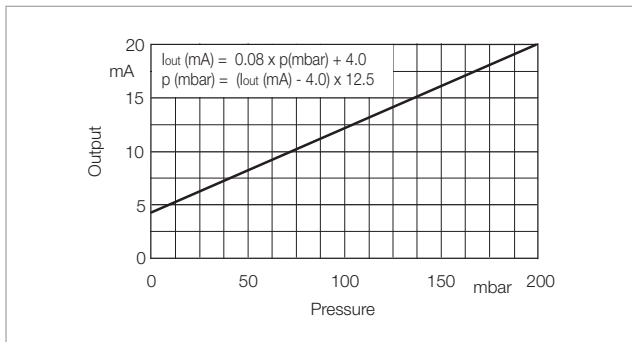
- Pressure measurements in the rough vacuum range, and for corrosive media (Solar, coating)
- Chemical process engineering
- Vacuum packaging
- Drying processes
- Casting resin technology (degassing of potting compounds)
- Measurement of operating and filling pressure, during the production of lamps
- Filling systems for brake fluids (DI 201/DI 2001)
- Filling systems for refrigerants
- Measurement of pressure relative to atmospheric pressure (DI/DU 2001 rel.)

Operating Units for DU sensors

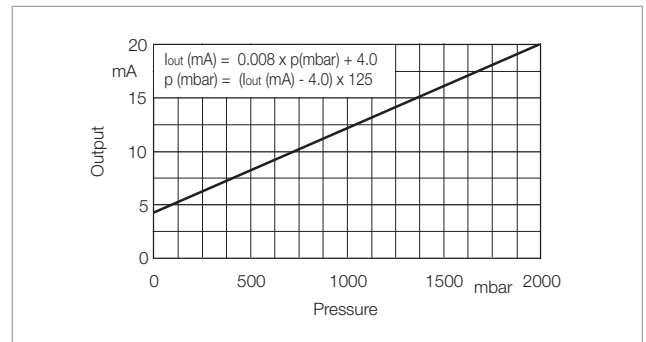
- DISPLAY
- ONE
 - TWO
 - THREE
- CENTER / GRAPHIX
- ONE
 - TWO
 - THREE



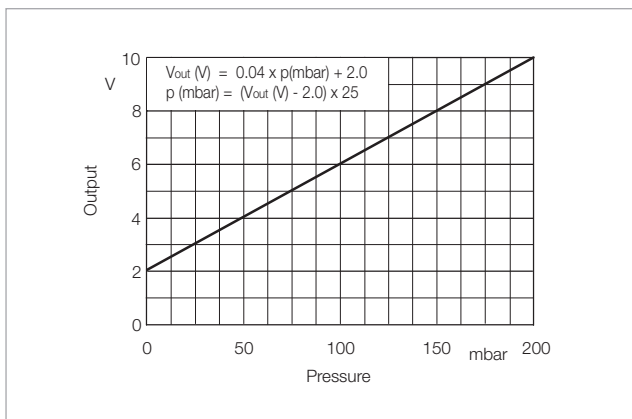
Dimensional drawing for the sensors
DI/DU 200 and DI/DU 201 (left), DI/DU 2000, DI/DU 2001 and DI/DU 2001 rel. (right)



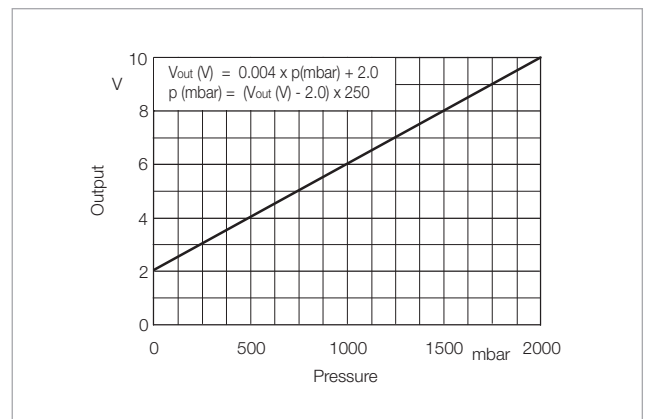
Characteristic of the DI 200 and DI 201 Sensors



Characteristic of the DI 2000 and DI 2001 Sensors



Characteristic of the DU 200 and DU 201 Sensors



Characteristic of the DU 2000 and DU 2001 Sensors

Technical Data

DI/DU 200 DI/DU 201 DI/DU 2000 DI/DU 2001 DI/DU 2001 rel.

Measurement range	mbar (Torr)	0.1 to 200 (0.075 to 150)	0.1 to 200 (0.075 to 150)	1 to 2000 (0.75 to 1500)	1 to 2000 (0.75 to 1500)	-1000 to +1000 (-750 to +750) relative pressure
Overload range, max. (flange side)	bar	6	6	5	5	5
Nominal temperature range	°C	0 to +60				
Measurement uncertainty ¹⁾	% FS	0.25	0.25	0.25	0.25	0.25 ³⁾
Repeatability	% FS	0.05				
Temperature error						
Zero drift	% FS/10°K	0.1				
Sensitivity drift	% FS/10°K	0.15				
Measurement principle, gas type independent		Capacitive	Capacitive	Piezoresistive	Piezoresistive	Piezoresistive
Sensing head supply						
DI		Two-wire system				
DU		Four-wire system				
Output signal						
DI	mA	4 to 20				
DU	V	2 to 10				
Supply voltage						
Operating range						
DI	V DC	12 to 30				
DU	V DC	14.5 to 30				
Dead volume	cm ³	3.9	3.9	1.8	1.8	1.8
Vacuum connection	DN	16 ISO-KF				
Electrical connection						
DI		diode plug 7pole, cable 5 m				
DU		plug FCC 68, cable 5 m				
Weight, approx.						
DI	kg (lbs)	0.36 (0.79)	0.36 (0.79)	0.26 (0.57)	0.26 (0.57)	0.26 (0.57)
DU	kg (lbs)	0.34 (0.75)	0.34 (0.75)	0.24 (0.53)	0.24 (0.53)	0.24 (0.53)
Protection class	IP	54				
Materials in contact with the medium		Stainless Steel 1.4305 Al ₂ O ₃ (96 %) Ceramics FPM (FKM)	Stainless Steel 1.4305 Al ₂ O ₃ (96 %) Ceramics EPDM	Stainless Steel 1.4305 Al ₂ O ₃ (96 %) Ceramics FPM (FKM)	Stainless Steel 1.4305 Al ₂ O ₃ (96 %) Ceramics EPDM	Stainless Steel 1.4305 Al ₂ O ₃ (96 %) Ceramics EPDM
Operating units						
DI series		-				
DU series ²⁾		DISPLAY ONE, TWO, THREE CENTER ONE, TWO, THREE				

¹⁾ Sum of linearity, hysteresis and reproducibility

²⁾ May possibly require a firmware update

³⁾ 0.25 % FS in the range of -1000 ... + 200 mbar / 0.5 % FS in the range of > +200 mbar

Ordering Information

**DI/DU 200 DI/DU 201 DI/DU 2000 DI/DU 2001 DI/DU 2001
rel.**

	Part No.	Part No.	Part No.	Part No.	Part No.
Linear sensor DI complete with 5 m long connection cable and connecting plug (circular connector)	158 12V01	158 14V01	158 13V01	158 15V01	245 000V01
Extension cable circular connector, 7-pole socket/plug 10 m 20 m	200 04 112 200 02 645				

Ordering Information

**DI/DU 200 DI/DU 201 DI/DU 2000 DI/DU 2001 DI/DU 2001
rel.**

	Part No.	Part No.	Part No.	Part No.	Part No.
Linear sensor DU complete with 5 m long connection cable and connecting plug (FCC68)	230500V01	230501V01	230502V01	230503V01	230504V01
Extension cable FCC68, socket/plug 10 m 20 m	230505V01 230506V01				
Operating unit GRAPHIX ONE / TWO / THREE DISPLAY ONE / TWO / THREE	please see chapter "Controller and Operating Units for Active Sensors" please see chapter "Controller and Operating Units for Active Sensors"				

THERMOVAC Transmitter

TTR 91 N (S), TTR 96 N, TTR 911 N (C), TTR 916 N



THERMOVAC Transmitter TTR N analog (left); digital RS232 (middle), with Display (right)

The THERMOVAC Transmitters are active sensors using the unique MEMS-Pirani technology (Micro-Electro-Mechanical-Systems). They offer analog voltage output and the S-versions offer set point relays for improved process control. For chemical and aggressive applications, the C-versions are equipped with a Parylene HT®-coated sensor. The THERMOVAC series is also equipped with a LED-ring (360°) showing the status of the sensor.

The TTR 911 N and 916 N have a touch display and/or digital interfaces available.

Advantages to the User

- Very robust MEMS-Pirani solid state sensor resilient to vibration and shock venting
- Extended measuring range up to 5×10^{-5} mbar and significantly higher accuracy compared to conventional sensors
- Reduced response times because of significantly improved signal processing
- High accuracy
- Individually temperature compensated to ensure stable measurements
- High reproducibility
- Measurement signal insensitive to mounting position
- Robust stainless steel housing
- Available with display for pressure units, set point parameters and operation status
- Available with up to three set point relays for improved process control
- Optional Computer interfaces: EtherCAT and RS 232
- Long tube version for reaching higher chamber bakeout temperatures
- LED ring to indicate status of the sensor

Typical Applications

The THERMOVAC Transmitters offer a high degree of versatility. They are suited for applications in the medium and rough vacuum range.

Typical applications are:

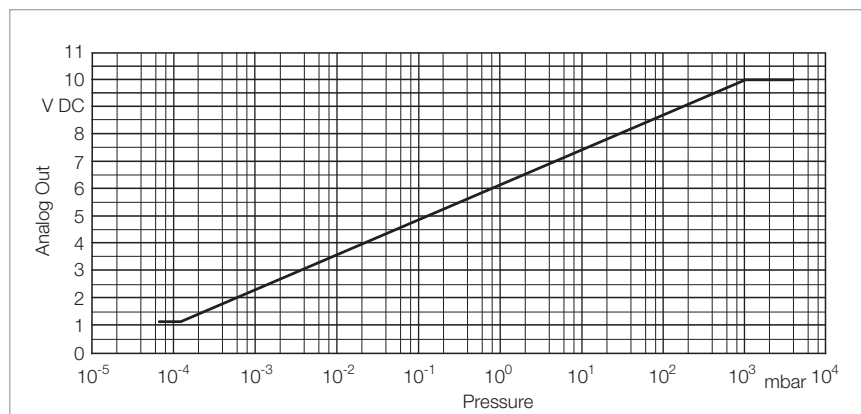
- Analytical instrumentation
- Research and development
- Vacuum Drying
- Controlling of ionization gauges
- Activation of UHV gauges
- System process control
- Process industry
- Coated versions for improved chemical resistance
- General foreline vacuum measurement

Sensor

The THERMOVAC transmitters' measurement principle is based on thermal conductivity. The transmitters are equipped with a MEMS-Pirani sensing cell that consists of a silicon chip with a heated resistive element.

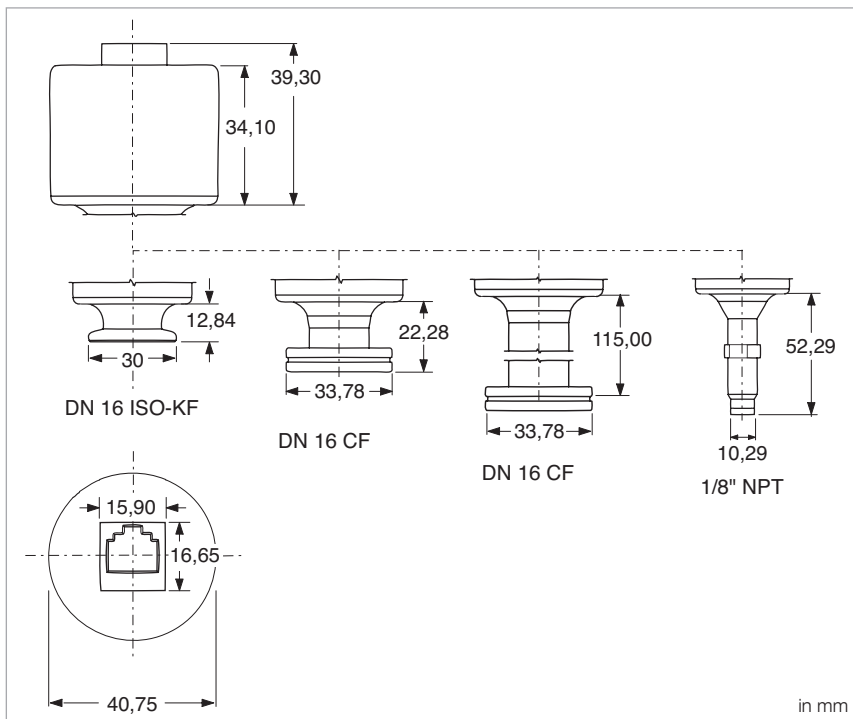
The THERMOVAC transmitters with the coated MEMS-Pirani are well suited for harsh processes and therefore more robust than the uncoated versions. Built-in relays allow switching functions to be performed directly by the transmitter, without the need of a programmable control.

An integration of the transmitters in programmable control systems is facilitated by the linear characteristic, which can be defined by entering a simple equation into a PLC or computer.

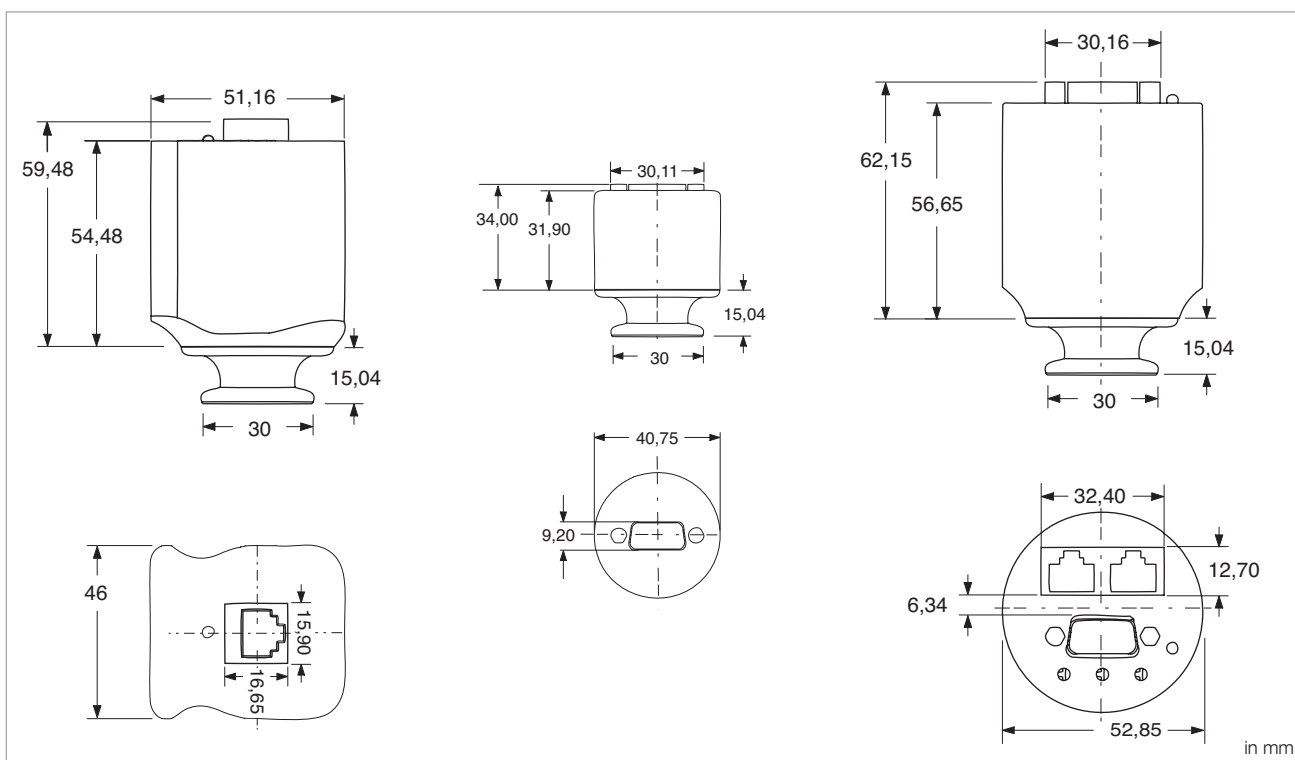


Characteristic of the THERMOVAC Transmitters TTR 91 N (S) / TTR 96 N and TTR 911 N (C) / TTR 916 N

Parylene HT® is a registered trademark of Speciality Coating Systems Inc.



Dimensional drawings for the THERMOVAC Transmitters TTR 91 N (S) / TTR 96 N
(Middle left – DN 16 CF standard version, middle right backable with elongated flange)



Dimensional drawings for the THERMOVAC Transmitters TTR 911 N (C) / TTR 916 N
left: with display, middle: with RS 232, right: with EtherCAT

Technical Data

THERMOVAC Transmitter

TTR 91 N

TTR 91 N S

TTR 96 N S

Measurement range	mbar (Torr)	5.0 x 10 ⁻⁵ to Atmosphere (3.75 x 10 ⁻⁵ to Atmosphere)		
Measurement uncertainty of reading (typical) ¹⁾	mbar	5 x 10 ⁻⁴ to 1 x 10 ⁻³ ±10 % 1 x 10 ⁻³ to 100 ±5 % 100 to atm ±25 %		
Repeatability of reading (typical) ¹⁾	mbar	1 x 10 ⁻³ to 100 ±2 %		
Sensor		MEMS-Pirani	MEMS-Pirani	Coated MEMS-Pirani
Measurement principle		Thermal conductivity according to Pirani		
Supply voltage	V DC	9 to 30		
Power consumption	W	< 1.2		
Electrical connection	V	FCC 68, RJ45 (analog) / Sub-D 15 PIN (digital)		
Analog output	V DC	$V_{out} = \log_{10}(P_{mbar}) \times 1.286 + 6.143$ 0.61 to 10		
Resolution	bit	16		
Impedance	Ω	100		
Update rate	Hz	16		
Interfaces		FCC 68, RJ45 (analog) / RS232, EtherCAT, Profibus (digital)		
Set point				
Range	mbar (Torr)	2,7 x 10 ⁻⁴ to 1000 (2.0 x 10 ⁻⁴ to 750)	2,7 x 10 ⁻⁴ to 1000 (2.0 x 10 ⁻⁴ to 750)	2,7 x 10 ⁻⁴ to 1000 (2.0 x 10 ⁻⁴ to 750)
Relay		0	2	2
Relay contact rating		1 A at 30 V AC / DC, resistive load	1 A at 30 V AC / DC, resistive load	1 A at 30 V AC / DC, resistive load
Relay contact resistance, max.	mΩ	100	100	100
Relay contact endurance, min.				
1.0 A at 30 V DC load		100 000	100 000	100 000
0.2 A at 30 V DC load		2 000 000	2 000 000	2 000 000
Status indicators		LED-ring (360°)		
Max. cable length	m	100		
Overpressure limit (abs.)	bar	6 (10 bar for inert gases)		
Operating temperature range ²⁾	°C (°F)	0 to 60 (32 to 140)		
Storage temperature range	°C (°F)	-20 to +65 (-4 to 149)		
Max. bakeout temperature	°C (°F)	85 (185), non-operating [bakeable version up to 250 (482)]		
Max. rel. humidity	% n.c.	≤ 95		
Installation orientation		Any		
Materials exposed to vacuum		304 stainless steel, Tin, Gold, Viton®	304 stainless steel, Tin, Gold, Viton®	304 stainless steel, Viton®, Parylene-HT®
Dead volume (DN 16 ISO-KF)	cm ³	2.80		
Weight (DN 16 ISO-KF)	g	170		
Protection class	IP	40		
CE certification		EMC Directive 2014/30/EEC		
Controller type		DISPLAY ONE / TWO / THREE and GRAPHIX ONE / TWO / THREE		

¹⁾ Accuracy and repeatability are typical values measured with Nitrogen gas at ambient temperature after zero adjustment

²⁾ There may be minimal deviation tolerances in the range of 40 – 60 °C

Ordering Information

THERMOVAC Transmitter TTR 91 N (S) / TTR 96 N

	Part No.
Without switching threshold	
TTR 91 N, DN 16 ISO-KF	230035V02
TTR 91 N, 1/8" NPT	230038V02
TTR 91 N, DN 16 CF	230036V02
TTR 91 N, DN 16 CF, Flange extended bakeable up to 250 °C (482 °F)	230037V02
With switching threshold	
TTR 91 N, DN 16 ISO-KF, 2SP	230040V02
TTR 91 N, 1/8" NPT, 2SP	230043V02
TTR 96 N C, DN 16 ISO-KF, 2SP, Parylene coated	230045V02
TTR 96 NC, DN 16 CF, 2SP, Flange extended bakeable up to 250 °C (482 °F), Parylene coated	230047V02
Calibration	see chapter "Miscellaneous", para. "Leybold Calibration Service"
Operating Units	
DISPLAY ONE	230 001
DISPLAY TWO	230 024
DISPLAY THREE	230 025
GRAPHIX ONE	230680V01
GRAPHIX TWO	230681V01
GRAPHIX THREE	230682V01
Connection cable, FCC 68 on both ends ¹⁾	Type A
5 m	124 26
10 m	230 012
15 m	124 27
20 m	124 28
30 m	124 29
50 m	124 31
75 m	124 32
100 m	124 33
Optional accessories	
Spiral tube DN 16 ISO-KF	230 082
Connection cable, RS 232 ¹⁾	Type G
5 m	230550V01
10 m	230551V01
15 m	230552V01
20 m	230553V01

¹⁾ See chapter "Connection cables for Active Sensors"

Technical Data

THERMOVAC Transmitter TTR 911 N (C/S) / TTR 916 N

Measurement range	mbar (Torr)	5.0 x 10 ⁻⁵ to Atmosphere (3.75 x 10 ⁻⁵ to Atmosphere) 1.0 x 10 ⁻⁵ to Atmosphere (0.75 x 10 ⁻⁶ to Atmosphere) [RS 232 / Display]
Measurement uncertainty of reading (typical) ¹⁾	mbar	5 x 10 ⁻⁴ to 1 x 10 ⁻³ ±10 % 1 x 10 ⁻³ to 100 ±5 % 100 to atm ±25 %
Repeatability of reading (typical) ¹⁾	mbar	1 x 10 ⁻³ to 100 ±2 %
Sensor		MEMS-Pirani
Measurement principle		Thermal conductivity according to Pirani
Supply voltage	V DC	9 to 30
Power consumption	W	< 1.2
Electrical connection	V	FCC 68, RJ45 (analog) / Sub-D 15 PIN (digital)
Analog output	V DC	$V_{out} = \log_{10}(P_{mbar}) \times 1.286 + 6.143$ 0.61 to 10
Resolution	bit	16
Impedance	Ω	100
Update rate	Hz	16
Interfaces		FCC 68, RJ45 (analog) / RS232, EtherCAT, Profibus (digital)
Set point		
Range	mbar (Torr)	+1.0 x 10 ⁻⁴ to 1000 (0.75 x 10 ⁻⁵ to 750) 2.7 x 10 ⁻⁴ to 1000 (2.0 x 10 ⁻⁴ to 750) [RS 232 / Display] 2 [Profibus / Display] / 2 [RS 232]
Relay		
Relay contact rating		1 A at 30 V AC/ DC, resistive load
Relay contact resistance, max.	mΩ	100
Relay contact endurance, min.		
1.0 A at 30 V DC load		100 000
0.2 A at 30 V DC load		2 000 000
Status indicators		LED-ring (360°)
Max. cable length	m	100
Overpressure limit (abs.)	bar	6 (10 bar for inert gases)
Operating temperature range ²⁾	°C (°F)	0 to 60 (32 to 140)
Storage temperature range	°C (°F)	-20 to +65 (-4 to 149)
Max. bakeout temperature	°C (°F)	85 (185), non-operating
Max. rel. humidity	% n.c.	0 – 95
Installation orientation		Any
Materials exposed to vacuum		304 stainless steel, Tin, Gold, Viton®, Parylene-HT® (coated)
Dead volume (DN 16 ISO-KF)	cm ³	2.80
Weight (DN 16 ISO-KF)	g	168
Protection class	IP	40
CE certification		EMC Directive 2014/30/EEC
Controller type		DISPLAY ONE / TWO / THREE and GRAPHIX ONE / TWO / THREE

¹⁾ Accuracy and repeatability are typical values measured with Nitrogen gas at ambient temperature after zero adjustment

²⁾ There may be minimal deviation tolerances in the range of 40 – 60 °C

Ordering Information

THERMOVAC Transmitter TTR 911 N (C/S) / TTR 916 N

	Part No.
TTR 911 N, DN 16 ISO-KF, EtherCAT	230700V02
TTR 911 N C, DN 16 ISO-KF, EtherCAT, Parylene coated	230701V02
TTR 911 N S, DN 16 ISO-KF, RS 232	89660V02
TTR 911 N, DN 16 ISO-KF, with display, FCC 68 / RJ 45	89654V02
TTR 916 N C, DN 16 ISO-KF, Parylene coated, FCC 68 / RJ 45	89656V02
Replacement sensor, DN 16 ISO-KF TTR 911 N, without Parylene coating TTR 916 N SC, TTR 911 NC, with Parylene coating	230650V02 230651V02
Calibration	see chapter "Miscellaneous", para. "Leybold Calibration Service"
Operating Units DISPLAY ONE DISPLAY TWO DISPLAY THREE GRAPHIX ONE GRAPHIX TWO GRAPHIX THREE	230 001 230 024 230 025 230680V01 230681V01 230682V01
Connection cable, FCC 68 on both ends ¹⁾ 5 m 10 m 15 m 20 m 30 m 50 m 75 m 100 m	Type A 124 26 230 012 124 27 124 28 124 29 124 31 124 32 124 33
Optional accessories Spiral tube DN 16 ISO-KF RS232 / USB Converter for setpoint definition of RS232 gauges	230 082 230399V02

¹⁾ See chapter "Connection cables for Active Sensors"

THERMOVAC Transmitter

TTR 91 R



THERMOVAC Transmitter TTR 91 R

Complementary to the proven range of THERMOVAC TTR gauges, the new TTR 91 R provides an extended capacity for usage in dirty processes without any loss of the high quality expected from products of the THERMOVAC series.

The compact and robust design with an overpressure limit of 9 bar (gauge), removable housing allowing bakeout up to 150 °C, and metal sealings make the TTR 91 R suitable for a wide range of applications.

Advantages to the User

- Very robust heated filament, suitable for harsher processes
- Measuring range up to 5×10^{-4} mbar
- Less sensitive on particle contamination than MEMs technology
- Easily exchangeable measurement-tube
- High accuracy
- Removable electronics housing allows bakeout up to 150 °C
- Glass-metal sealed
- High overpressure limit of 10 bar abs.
- High reproducibility
- Measurement signal insensitive to mounting position
- LED to indicate status of the sensor
- Integrated set point (transistor)

Typical Applications

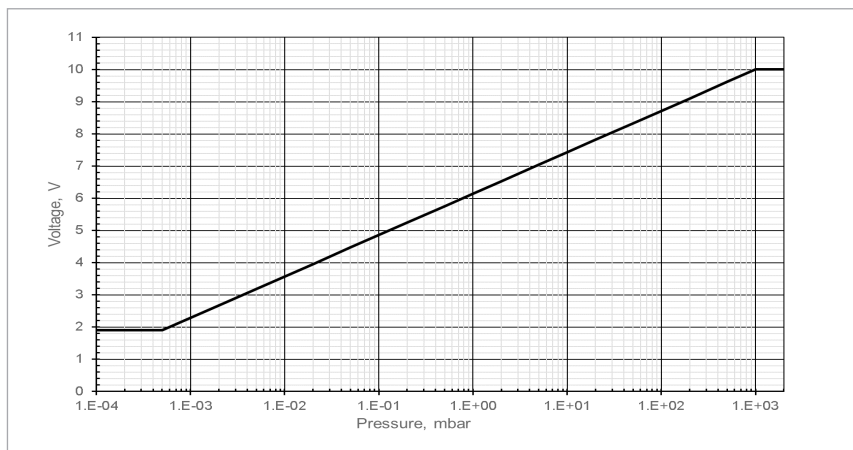
The THERMOVAC Transmitters offer a high degree of versatility. They are suited for applications in the medium and rough vacuum range.

Typical applications are:

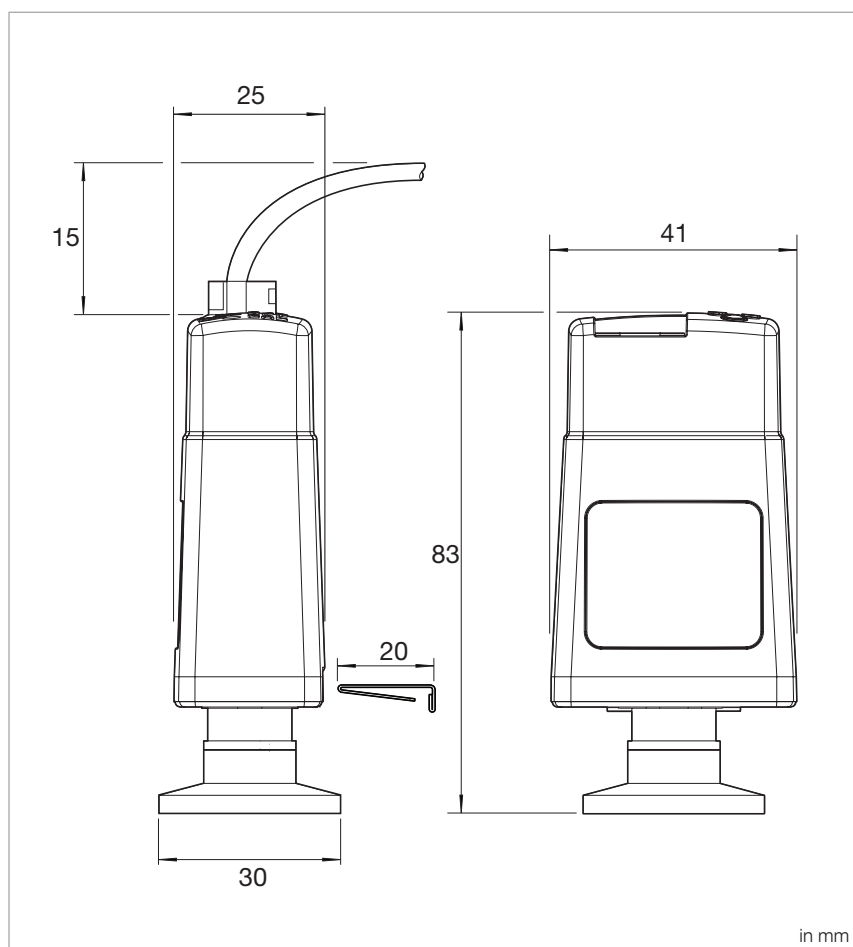
- Chemical/Chemistry processes
- Heat Treatment/Metallurgy
- Automotive Industry
- Space Simulation
- Analytical
- Refrigeration and Air conditioning
- Chemistry / Research laboratories
- High vacuum pump systems
- Mechanical Engineering
- Process Industry

Sensor

The THERMOVAC transmitters' measurement principle is based on thermal conductivity. The transmitter has a Pirani sensing cell equipped with a Tungsten / Rhenium filament. Integration of the transmitters in programmable control systems is facilitated by the linear characteristic, which can be defined by entering a simple equation into a PLC or computer.



Characteristic of the THERMOVAC Transmitter TTR 91 R



Dimensional drawings for the THERMOVAC Transmitter TTR 91 R

Technical Data

THERMOVAC Transmitter

TTR 91 R

Measurement range	mbar (Torr)	5.0 x 10 ⁻⁵ to Atmosphere (3.75 x 10 ⁻⁵ to Atmosphere)
Measurement uncertainty of reading (typical) ¹⁾	mbar	±15 % at < 100 mbar
Repeatability of reading (typical) ¹⁾	mbar	1 x 10 ⁻³ to 100 ±2 %
Sensor measurement principle		Thermal conductivity, heated filament
Supply voltage	V DC	15 to 30
Power consumption	W	1
Electrical connection	V	FCC 68, RJ45 8-way (analog)
Analog output		$V_{out} = \log_{10}(P_{mbar}) \times 1.286 + 6.143$
Sensor	V DC	1.9 to 10
Sensor fail	V	0.5
Min. load impedance	kΩ	10
Max. output current	mA	1
Interfaces		n.a.
Set point		1 (Transistor, max. load 100 mA)
Status indicators		Integrated LED
Max. cable length	m	100 (type A)
Overpressure limit (abs.)	bar	10
Operating temperature range ²⁾	°C (°F)	5 to 60 (41 to 140)
Storage temperature range	°C (°F)	-30 to +70 (-22 to 158)
Filament temperature	°C (°F)	100 (212) above ambient
Max. bakeout temperature	°C (°F)	150 (302), (with electronics housing removed)
Humidity		80 % RH up to 31 °C decreasing linearly to 50 % RH at 40 °C and above
Installation orientation		Any
Materials exposed to vacuum		
Filament		Tungsten / Rhenium
Tube		Stainless steel 316L and 304L
Filter		Stainless steel
others		Glass, Ni, NiFe, Stainless steel
Internal volume of tube	cm ³	5
Weight (DN 16 ISO-KF)	g	85
Protection class	IP	40
CE certification		EMC Directive 2014/30/EEC
Controller type		DISPLAY ONE / TWO / THREE and GRAPHIX ONE / TWO / THREE

¹⁾ Accuracy and repeatability are typical values measured with Nitrogen gas at ambient temperature after zero adjustment

²⁾ There may be minimal deviation tolerances in the range of 40 – 60 °C

Ordering Information

THERMOVAC Transmitter TTR 91 R

	Part No.
TTR 91 R, DN 16 ISO-KF	230049V01
Replacement tube TTR 91 R, DN 16 ISO-KF	E02601801
Calibration	see chapter "Miscellaneous", para. "Leybold Calibration Service"
Operating Units	
DISPLAY ONE	230 001
DISPLAY TWO	230 024
DISPLAY THREE	230 025
GRAPHIX ONE	230680V01
GRAPHIX TWO	230681V01
GRAPHIX THREE	230682V01
Connection cable, FCC 68 on both ends ¹⁾	Type A
5 m	124 26
10 m	230 012
15 m	124 27
20 m	124 28
30 m	124 29
50 m	124 31
75 m	124 32
100 m	124 33
Optional accessories	
Spiral tube DN 16 ISO-KF	230082
Centering Rings (Stainless Steel 1.4305) with O-Ring, DN 16 ISO-KF	88346
Centering Rings (Stainless Steel) with Sintered Metal Filter, DN 16 ISO-KF	88351
Clamping Rings (Aluminum), DN 16 ISO-KF	18341
Centering Ring with fine filter DN 16 ISO-KF	88396

¹⁾ See chapter "Connection cables for Active Sensors"

THERMOVAC Transmitter TTR 101 N (S)



THERMOVAC Transmitter TTR 101 N, analog (left), EtherCAT (middle), Display (right)

The THERMOVAC TTR 101 N models utilize a thermal conductivity MEMS-Pirani combined with a silicon membrane Piezo. They offer superior accuracy and gas type independent readings between 10 mbar and 1500 mbar.

Advantages to the User

- Wide measurement range combining two sensor technologies into a single output
- Extended measuring range up to 5×10^{-5} mbar and significantly higher accuracy compared to conventional sensors
- Robust MEMS-Pirani and Piezo solid state sensors resilient to vibration and shock venting
- Rapid cycling by fast and repeatable pressure measurements
- High reproducibility and high accuracy
- Gas type independent from 10 to 1500 mbar
- Autozero of Piezo
- Individually temperature compensated to ensure stable measurements
- Measurement signal insensitive to mounting position
- Available with display for pressure units, set point parameters and operation status
- Available with up to three set point relays for improved process control
- LED ring to indicate status of the sensor

Typical Applications

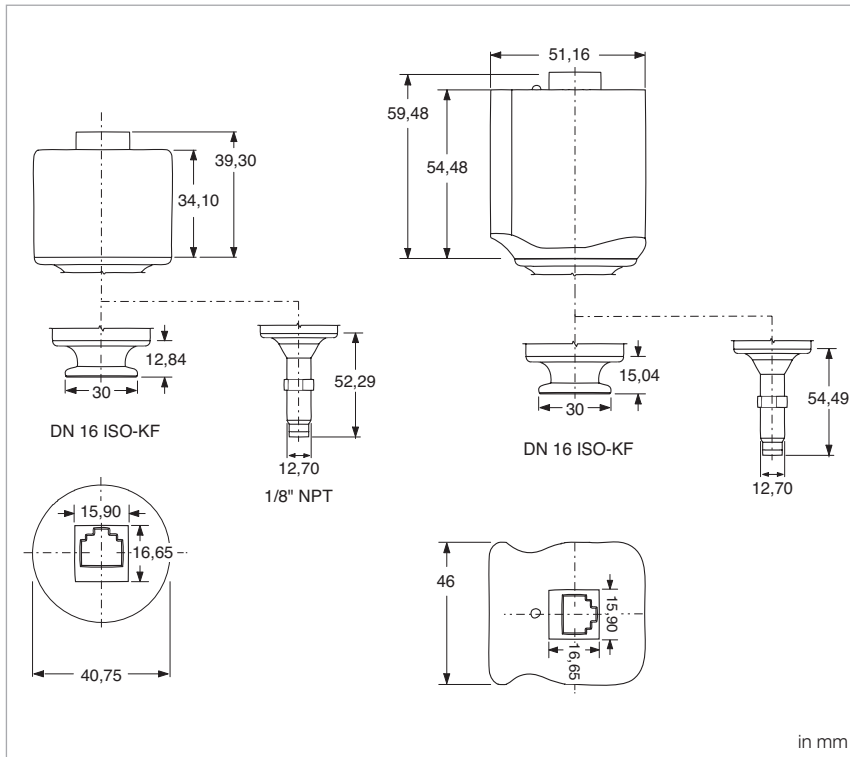
The THERMOVAC TTR 101 N transmitters can be used in any application that requires absolute pressure measurement and switching capabilities.

- General vacuum measurement and control from low to medium vacuum pressure
- Safety circuits in vacuum systems
- Control of high vacuum ionization gauges
- Analytical Instrumentation
- Research and development
- Vacuum Drying
- System process control
- Vacuum furnaces and sintering
- Coating
- Process industry

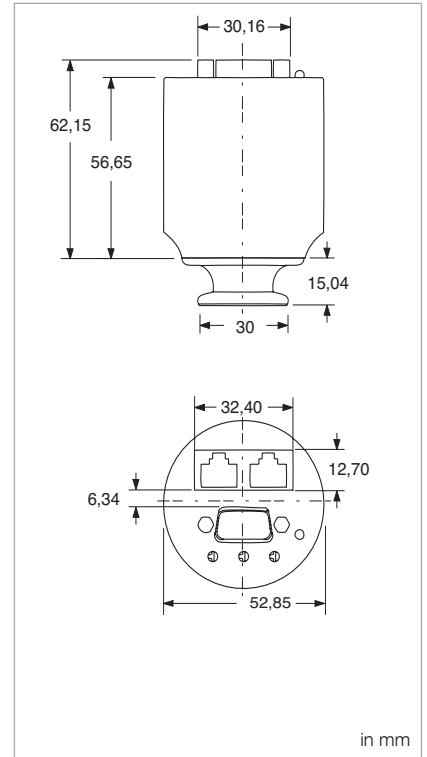
Sensor

Dust and other particles may cause measurement errors and reduced life-time. Therefore we recommend the installation of a fine filter in critical applications.

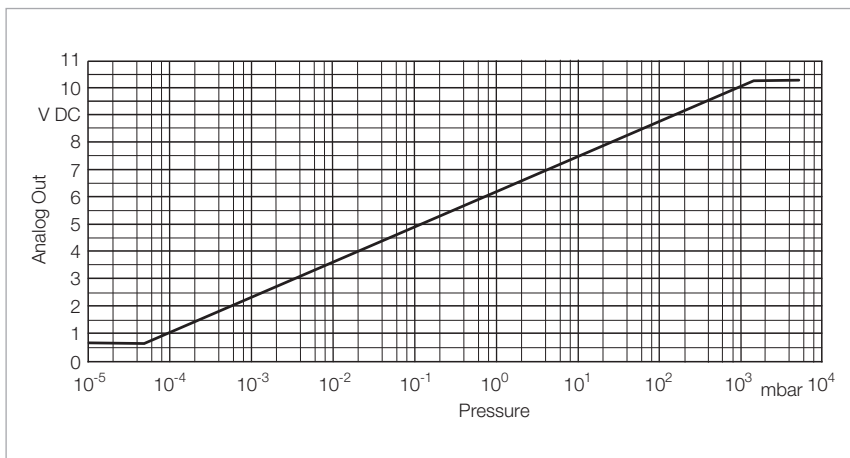
Fine filters are listed in chapter "General", para. "Connection Accessories for Small Flanges".



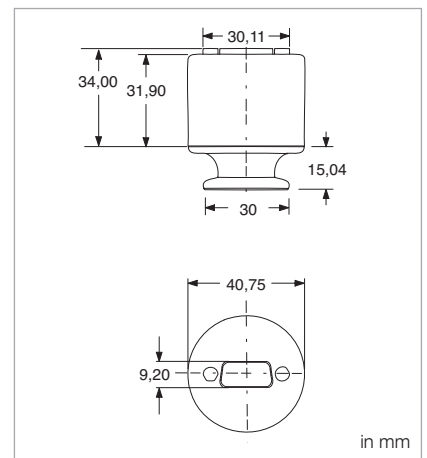
Dimensional drawing for the THERMOVAC Transmitters TTR 101 N (S) (left) and TTR 101 N Display (right)



Dimensional drawing for the TTR 101 N (EtherCAT)



Characteristic of the THERMOVAC Transmitters TTR 101 N (S)



Dimensional drawing for the TTR 101 N (RS 232)

Technical Data

THERMOVAC Transmitter

TTR 101 N (S)

Measurement range	mbar (Torr)	5 x 10 ⁻⁵ to 1500 (3.75 x 10 ⁻⁵ to 1125) 1 x 10 ⁻⁵ to 2000 (0.75 x 10 ⁻⁵ to 1500) [RS 232 / Display / EtherCAT]
Measurement uncertainty of reading (typical) ¹⁾	mbar	5 x 10 ⁻⁴ to 1 x 10 ⁻³ ±10 % 1 x 10 ⁻³ to 10 ±5 % 11 to 1333 ±0.75 % 1333 to 2000 ±2 %
Repeatability of reading (typical) ¹⁾	mbar	5 x 10 ⁻⁴ to 10 ±2 % 11 to 1067 ±0.2 %
Sensor Measurement principle		MEMS-Pirani and Piezo
Supply voltage	V DC	9 to 30
Power consumption	W	< 1.2 [2 for EtherCAT]
Electrical connection	V	FCC 68, RJ45 (analog) / Sub-D 15 PIN (digital)
Analog output	V DC	$V_{out} = \log_{10}(P_{mbar}) \times 1.286 + 6.143$ 0.61 to 10
Resolution	bit	16
Impedance	Ω	100
Update rate	Hz	16
Interfaces		FCC 68, RJ45 (analog) / RS232, EtherCAT, Profibus (digital)
Set point		
Range	mbar (Torr)	2.7 x 10 ⁻⁴ to 1000 (2.7 x 10 ⁻⁴ to 750) / 1.0 x 10 ⁻⁴ to 1000 (0.75 x 10 ⁻⁴ to 750)
Relay		2 / 3
Relay contact rating		1 A at 30 V AC / DC, resistive load
Relay contact resistance, max.	mΩ	100
Relay contact endurance, min.		100 000
1.0 A at 30 V DC load		2 000 000
0.2 A at 30 V DC load		
Status indicators		LED-ring (360°)
Max. cable length	m	100
Overpressure limit (abs.)	bar	2
Operating temperature range ²⁾	°C (°F)	0 to 60 (32 to 140)
Storage temperature range	°C (°F)	-20 to +65 (-4 to 149)
Max. bakeout temperature	°C (°F)	85 (185), non-operating
Max. rel. humidity	% n.c.	0 – 95
Installation orientation		Any
Materials exposed to vacuum		304 stainless steel, Tin, Gold, Viton®
Dead volume (DN 16 ISO-KF)	cm ³	2.80
Weight (DN 16 ISO-KF)	g	168
Protection class	IP	40
CE certification		EMC Directive 2014/30/EEC
Controller type		DISPLAY ONE / TWO / THREE and GRAPHIX ONE / TWO / THREE

¹⁾ Accuracy and repeatability are typical values measured with Nitrogen gas at ambient temperature after zero adjustment

²⁾ There may be minimal deviation tolerances in the range of 40 – 60 °C

Ordering Information

THERMOVAC Transmitter

TTR 101 N (S)

	Part No.
TTR 101 N, DN 16 ISO-KF, FCC 68 / RJ 45	230350V02
TTR 101 N, 1/8» NPT, FCC 68 / RJ 45	230351V02
TTR 101 N, DN 16 ISO-KF, 2SP, FCC 68 / RJ 45	230352V02
TTR 101 N, 1/8» NPT, 2SP, FCC 68 / RJ 45	230353V02
TTR 101 N, DN 16 ISO-KF, Display, FCC 68 / RJ 45	230354V02
TTR 101 N, 1/8» NPT, Display	230355V02
TTR 101 N, DN 16 ISO-KF, Display, 2SP, FCC 68 / RJ 45	230356V02
TTR 101 N, DN 16 ISO-KF, 3SP, RS 232	230366V02
TTR 101 N, DN 16 ISO-KF, 2SP, EtherCAT	230702V02
Replacement sensor Flange DN 16 ISO-KF Flange 1/8» NPT	230361V02 230362V02
Centering ring with fine filter 16 ISO-KF	883 96
Calibration	see chapter "Miscellaneous", para. "Leybold Calibration Service"
Operating Units DISPLAY ONE DISPLAY TWO DISPLAY THREE GRAPHIX ONE GRAPHIX TWO GRAPHIX THREE	230 001 230 024 230 025 230680V01 230681V01 230682V01
Connection cable, FCC 68 on both ends ¹⁾ 5 m 10 m 15 m 20 m 30 m 50 m 75 m 100 m	Type A 124 26 230 012 124 27 124 28 124 29 124 31 124 32 124 33
Optional accessories Spiral tube DN 16 ISO-KF Connection cable, RS 232 ¹⁾ 5 m 10 m 15 m 20 m RS232 / USB Converter for setpoint definition of RS232 gauges	230 082 Type G 230550V01 230551V01 230552V01 230553V01 230399V02

¹⁾ See chapter "Connection cables for Active Sensors"

PENNINGVAC Transmitter PTR 90 N



PENNINGVAC Transmitter PTR 90 N analog (left); digital (middle), with Display (right)

The PENNINGVAC transmitter combines the cold cathode ionization principle with the MEMS-Pirani sensor. This allows the complete coverage of the measurement range from 1×10^{-8} mbar to atmosphere by a single transmitter. The compact design, broad measurement range and cost efficiency make this transmitter the perfect gauge for several applications.

Advantages to the User

- Enhanced reliability through automatically turning on the cold cathode by the MEMS-Pirani
- Significantly higher accuracy in the upper range by using the MEMS Pirani
- Longer lifetime due to low cold cathode turn on pressure
- High reproducibility
- Available with display for pressure units, set point parameters and operation status
- Wide measurement range combining two sensor technologies into a single output
- Ease of serviceability by modular design of the cold cathode
- Automatic zeroing during pump down cycle for improved accuracy
- LED ring to indicate status of the sensor
- Measurement signal insensitive to mounting position

Typical Applications

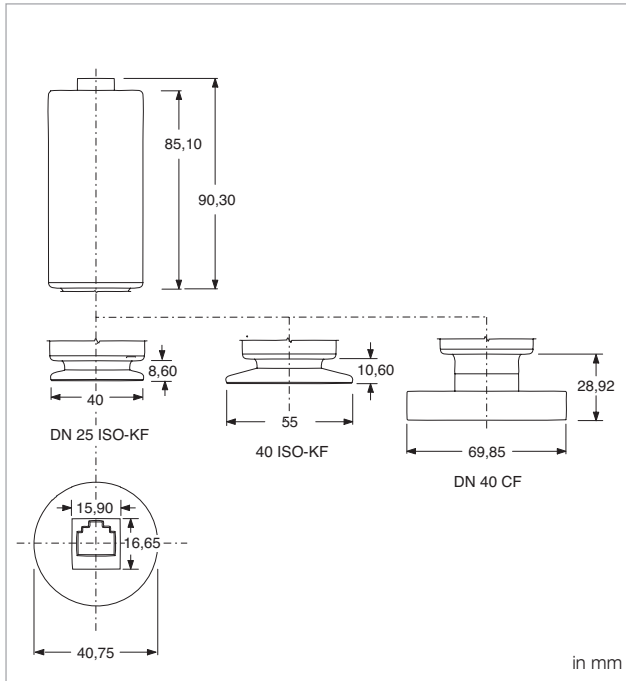
Typical Applications within the measurement range from 1×10^{-8} mbar to atmosphere are:

- General vacuum base pressure measurement
- Sputtering and coating technology
- Analytical technology (e. g. mass spectrometer control)
- Vacuum Furnaces
- Multipurpose pressure measurement and control up to the high vacuum range
- Metallurgy
- Scanning electron microscopes
- Process industry

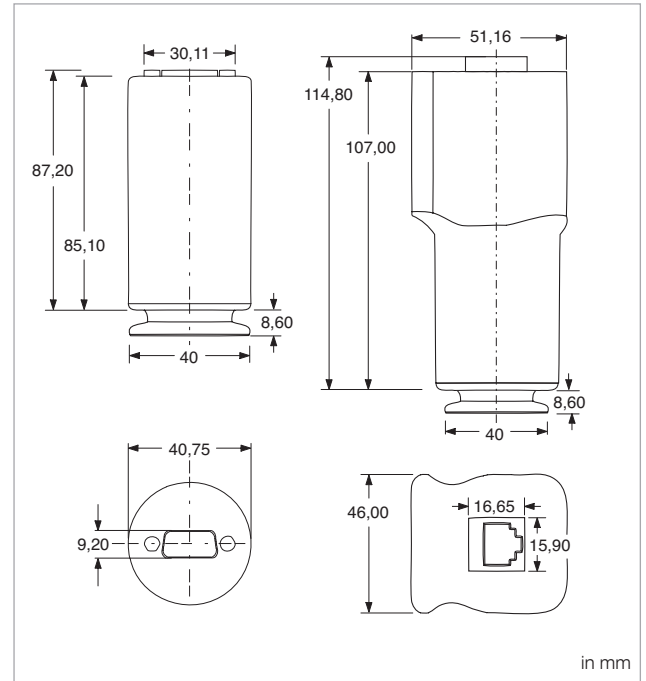
Option

For protection of the sensor PTR 90 N against contamination, radiation and other disturbing factors the installation of a baffle is recommended.

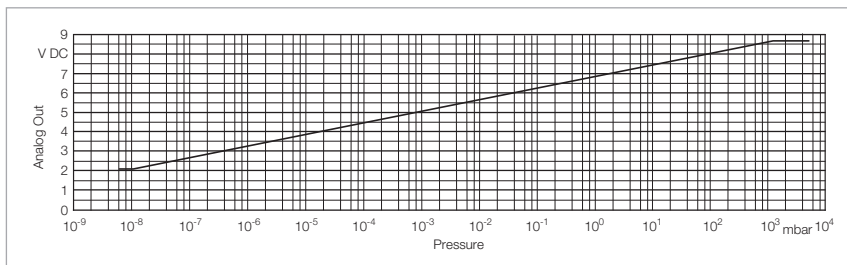
Two types of baffles are available: A build-in version for CF connections is mounted in the sensor; the baffle for ISO-KF connections is integrated in a centering ring.



Dimensional drawing for the PENNINGVAC transmitter PTR 90 N



Dimensional drawing for the PENNINGVAC transmitters
PTR 90 N, RS 232 (left) and PTR 90 N, EtherCAT (right)



Characteristics of the PENNINGVAC Transmitters PTR 90 N

Technical Data

PENNINGVAC Transmitter

PTR 90 N

Measurement range	mbar (Torr)	1.0 x 10 ⁻⁸ to 1000 (0.75 x 10 ⁻⁸ to 750)
Measurement uncertainty of reading (typical) ¹⁾		
Cold cathode	mbar	1 x 10 ⁻⁸ to 5 x 10 ⁻⁴ ±30 %
MEMS Pirani	mbar	5 x 10 ⁻⁴ to 1 x 10 ⁻³ ±10 %
		1 x 10 ⁻³ to 100 ±5 %
		100 to 1000 ±25 %
Repeatability of reading (typical) ¹⁾	mbar	1 x 10 ⁻³ to 100 ±2 %
Sensor		Cold cathode and MEMS Pirani
Measurement principle		Cold cathode ionization and thermal conductivity
Supply voltage	V DC	9 to 30
Power consumption	W	< 2
Electrical connection	V	FCC 68, RJ 45 (analog) / RS232, EtherCAT (digital)
Analog output	V DC	$V_{out} = \log 0.6 (P_{mbar}) + 6.8$ 2.0 to 8.668 / 2.0 to 8.667 [RS 232]
Resolution	bit	16
Impedance	Ω	100
Update rate	Hz	16
Interfaces		FCC 68, RJ45 (analog) / RS232, EtherCAT (digital)
Set point		
Range	mbar (Torr)	1.0 x 10 ⁻⁸ to 1000 (0.75 x 10 ⁻⁸ to 750)
Relay		0 / 2 [RS 232]
Relay contact rating		1 A at 30 V AC / DC, resistive load
Relay contact resistance, max.	mΩ	100
Relay contact endurance, min.		
1.0 A at 30 V DC load		100 000
0.2 A at 30 V DC load		2 000 000
Status indicators		LED-ring (360°)
Max. cable length	m	100
Overpressure limit (abs.)	bar	6
Operating temperature range ²⁾	°C (°F)	0 to 60 (32 to 140)
Storage temperature range	°C (°F)	-20 to +65 (-4 to 149)
Max. bakeout temperature	°C (°F)	85 (185)
Max. rel. humidity	% n.c.	0 – 95
Installation orientation		Any
Materials exposed to vacuum		304 stainless steel, 403 stainless steel, Ceramic (Al ₂ O ₃), Tin, Gold, Viton®, Titanium
Dead volume (DN 25 ISO-KF), approx	cm ³	28.6
Weight (DN 25 ISO-KF)	g	321
Protection class	IP	40
CE certification		EMC Directive 2014/30/EEC
Controller type		DISPLAY ONE / TWO / THREE and GRAPHIX ONE / TWO / THREE

¹⁾ Accuracy and repeatability are typical values measured with Nitrogen gas at ambient temperature after zero adjustment

²⁾ There may be minimal deviation tolerances in the range of 40 – 60 °C

Ordering Information

PENNINGVAC Transmitter PTR 90 N

	Part No.
PTR 90 N, DN 25 ISO-KF, FCC 68 / RJ 45	230070V02
PTR 90 N, DN 25 ISO-KF, Display, FCC 68 / RJ 45	230085V02
PTR 90 N, DN 25 ISO-KF, EtherCAT	230089V02
PTR 90 N, DN 25 ISO-KF, 2 SP, RS 232	230088V02
PTR 90 N, DN 40 ISO-KF, FCC 68 / RJ 45	230071V02
PTR 90 N, DN 40 CF, FCC 68 / RJ 45	230072V02
Replacement cathode plate for PTR 90 N / PTR 225 N (up to serial no. 17022777352)	EK16291V02
for PTR 90 N / PTR 225 N (from serial no. 17022777353)	EK16292V02
Replacement anode ring for PTR 90 N / PTR 225 N (up to serial no. 17022777352)	20028711V02
for PTR 90 N / PTR 225 N (from serial no. 17022777353)	E20028712V02
Baffle, with centering ring (FPM (FKM)) DN 25 ISO-KF DN 40 ISO-KF	230 078 230 079
Calibration	see chapter "Miscellaneous", para. "Leybold Calibration Service"
Operating Units DISPLAY ONE DISPLAY TWO DISPLAY THREE GRAPHIX ONE GRAPHIX TWO GRAPHIX THREE	230 001 230 024 230 025 230680V01 230681V01 230682V01
Connection cable, FCC 68 on both ends ¹⁾ 5 m 10 m 15 m 20 m 30 m 50 m 75 m 100 m	Type A 124 26 230 012 124 27 124 28 124 29 124 31 124 32 124 33
Connection cable, RS 232 ¹⁾ 5 m 10 m 15 m 20 m RS232 / USB Converter for setpoint definition of RS232 gauges	Type G 230550V01 230551V01 230552V01 230553V01 230399V02

¹⁾ See chapter "Connection cables for Active Sensors"

PENNINGVAC Transmitters

PTR 225 N, PTR 237 N



PENNINGVAC Transmitter PTR 225 N analog (left), PTR 225 N digital (middle), PTR 237 N analog (right)

The PENNINGVAC Transmitters are based on the cold cathode measurement principle. The compact design and broad measuring range of the PTR 225 N, makes it well suited for easy system integration and process control from medium to high vacuum pressure. Options include various serial interfaces and programmable setpoint relays, making it an ideal transmitter for control systems.

Advantages to the User

- Good performance to price ratio
- Available with up to three setpoints
- Ease of serviceability by modular design of the cold cathode
- High reproducibility and high accuracy
- Available with display for pressure units, set point parameters and operation status
- LED ring to indicate status of the sensor
- Measurement signal insensitive to mounting position
- Optional Computer interfaces: EtherCAT and RS 232

Typical Applications

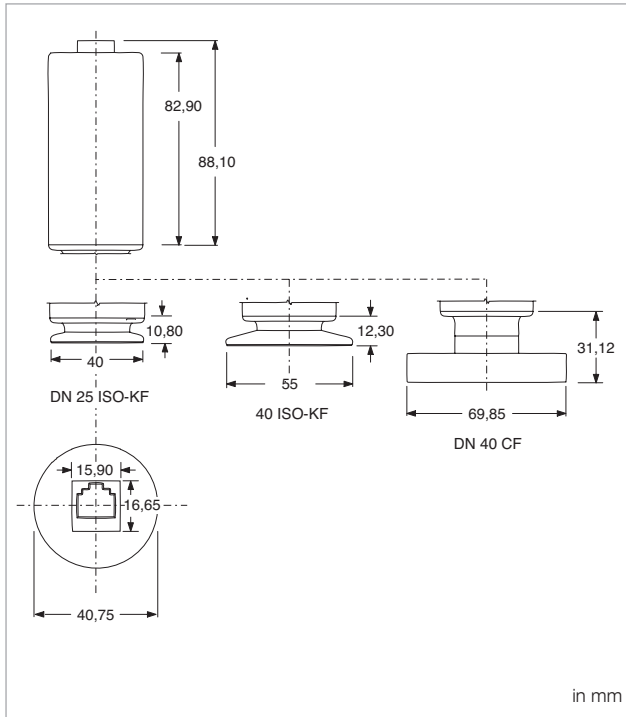
- Analytical Instrumentation
- Scanning electron microscopes
- Evaporation and sputtering systems
- High vacuum systems
- Coating systems
- Vacuum furnaces
- Cryo processes
- Systems control in the medium and high vacuum range

Option

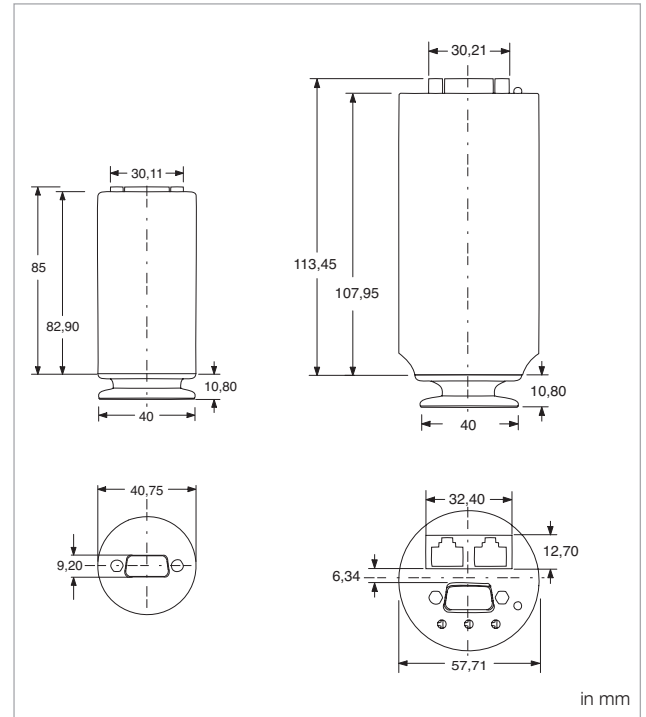
For protection the PTR sensors against contamination, radiation and other disturbing factors the installation of a baffle is recommended.



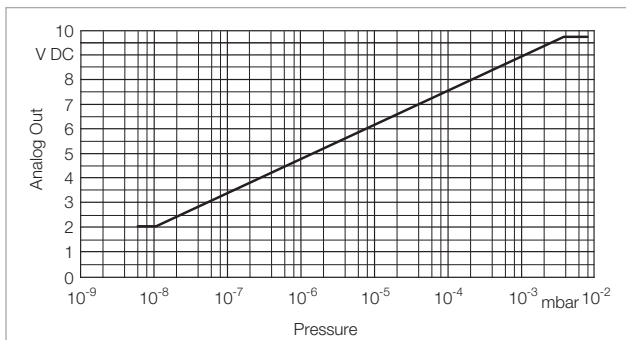
Baffle DN 25 ISO-KF, with centering ring,
Part No. 230 078



Dimensional drawing for the PENNINGVAC transmitters
PTR 225 N and PTR 237 N



Dimensional drawing for the PENNINGVAC transmitters
PTR 225 N, RS 232 (left) and PTR 225 N, EtherCAT (right)



Characteristic of the PENNINGVAC transmitters PTR 225 S/237

Technical Data

PENNINGVAC Transmitter

PTR 225 N / PTR 237 N

Measurement range	mbar (Torr)	1.0 x 10 ⁻⁸ to 5 x 10 ⁻³ (0.75 x 10 ⁻⁸ to 3.75 x 10 ⁻³) 1.0 x 10 ⁻⁸ to 6.7 x 10 ⁻³ (0.75 x 10 ⁻⁸ to 5.0 x 10 ⁻³) [RS 232/EtherCAT]
Measurement uncertainty of reading (typical) ¹⁾		
Cold Cathode	mbar	1 x 10 ⁻⁸ to 1 x 10 ⁻³ ±30 %
Repeatability of reading (typical) ¹⁾	mbar	1 x 10 ⁻⁸ to 1 x 10 ⁻³ ±30 %
Sensor		Cold cathode
Measurement principle		Cold cathode ionization
Supply voltage	V DC	9 to 30
Power consumption	W	< 2
Electrical connection	V	FCC 68 / RJ 45, RS 232
Analog output	V DC	$V_{out} = 1.33 \times \log_{10}(P_{mbar}) + 12.66$ 2.0 to 9.6
Resolution	bit	16
Impedance	Ω	100
Update rate	Hz	16
Interfaces		FCC 68 / RJ 45
Set point		
Range	mbar (Torr)	1 x 10 ⁻⁸ to 5 x 10 ⁻³ (0.75 x 10 ⁻⁸ to 3.75 x 10 ⁻³)
Relay		2 [RS 232]
Relay contact rating		1 A at 30 V AC / DC, resistive load
Relay contact resistance, max.	mΩ	100
Relay contact endurance, min.		
1.0 A at 30 V DC load		100 000
0.2 A at 30 V DC load		2 000 000
Status indicators		LED-ring (360°)
Max. cable length	m	100
Overpressure limit (abs.)	bar	6
Operating temperature range ²⁾	°C (°F)	0 to 60 (32 to 140)
Storage temperature range	°C (°F)	-20 to +65 (-4 to 149)
Max. bakeout temperature	°C (°F)	85 (185)
Max. rel. humidity	% n.c.	0 – 95
Installation orientation		Any
Materials exposed to vacuum		304 stainless steel, 403 stainless steel, Ceramic (Al ₂ O ₃), Viton®, Titanium
Dead volume (DN 25 ISO-KF), approx	cm ³	25.6
Weight (DN 25 ISO-KF)	g	318
Protection class	IP	40
CE certification		EMC Directive 2014/30/EEC
Controller type		DISPLAY ONE / TWO / THREE and GRAPHIX ONE / TWO / THREE

¹⁾ Accuracy and repeatability are typical values measured with Nitrogen gas at ambient temperature after zero adjustment

²⁾ There may be minimal deviation tolerances in the range of 40 – 60 °C

Ordering Information

PENNINGVAC Transmitter PTR 225 N / PTR 237 N

	Part No.
PTR 225 N, DN 25 ISO-KF, FCC 68 / RJ 45	15734V02
PTR 225 N, DN 25 ISO-KF, 3 SP, RS 232	89642V02
PTR 225 N, DN 25 ISO-KF, EtherCAT	230703V02
PTR 237 N, DN 40 CF, FCC 68 / RJ 45	15736V02
Replacement cathode plate for PTR 90 N / PTR 225 N (up to serial no. 17022777352) for PTR 90 N / PTR 225 N (from serial no. 17022777353)	EK16291V02 EK16292V02
Replacement anode ring for PTR 90 N / PTR 225 N (up to serial no. 17022777352) for PTR 90 N / PTR 225 N (from serial no. 17022777353)	20028711V02 E20028712V02
Baffle, with centering ring (FPM (FKM)) DN 25 ISO-KF	230 078
Calibration	see chapter "Miscellaneous", para. "Leybold Calibration Service"
Operating Units DISPLAY ONE DISPLAY TWO DISPLAY THREE GRAPHIX ONE GRAPHIX TWO GRAPHIX THREE	230 001 230 024 230 025 230680V01 230681V01 230682V01
Connection cable, FCC 68 on both ends ¹⁾ 5 m 10 m 15 m 20 m 30 m 50 m 75 m 100 m	Type A 124 26 230 012 124 27 124 28 124 29 124 31 124 32 124 33
Connection cable, RS 232 ¹⁾ 5 m 10 m 15 m 20 m RS232 / USB Converter for setpoint definition of RS232 gauges	Type G 230550V01 230551V01 230552V01 230553V01 230399V02

¹⁾ See chapter "Connection cables for Active Sensors"

Loadlock Transmitter

THERMOVAC TTR 200 N PENNINGVAC PTR 200 N



THERMOVAC Transmitter TTR 200 N (left) and PENNINGVAC Transmitter PTR 200 N (right)

The TTR 200 N and PTR 200 N combine different measurement technologies in one housing making them the perfect gauges for load lock applications. The transmitters offer a wide absolute measurement range and a differential range of -10^{13} to 10^{13} mbar (relative to ambient pressure). The highly accurate differential sensor is ideal for loadlock control since it is insensitive to changes in ambient pressure conditions. Efficient loadlock control will improve throughput due to reduced cycle time.

Advantages to the User

- Fast, accurate and repeatable pressure measurements reduce process cycle time
- Gas type independent pressure measurements from 50 mbar to 1500 mbar
- Combination of absolute and differential measurements offer unprecedented loadlock control
- Three integrated setpoints
- Up to three sensors in one housing for a wide measurement range
- Measurement signal insensitive to mounting position
- Ease of operation via analog output and digital communication
- LED ring to indicate status of the sensor

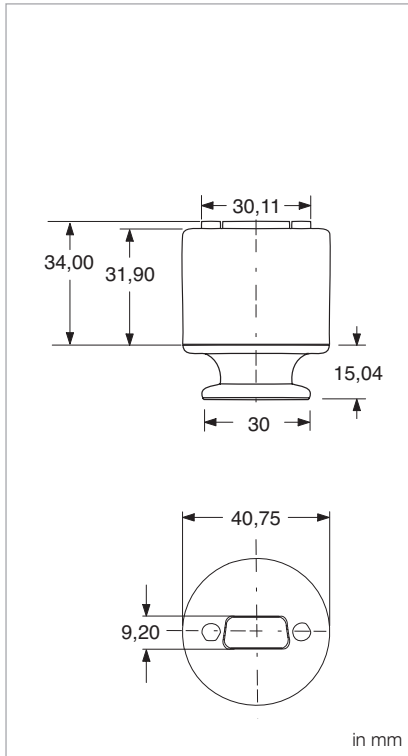
Typical Applications

- Load lock applications
- Chamber over and under pressure control relative to ambient
- Coating Systems (e. g. UNIVEX)
- Vacuum chamber production
- Processes requiring both absolute pressure measurement and atmospheric switching capabilities
- Analytical equipment (e. g. mass spectrometer control)
- Scanning electron microscopes

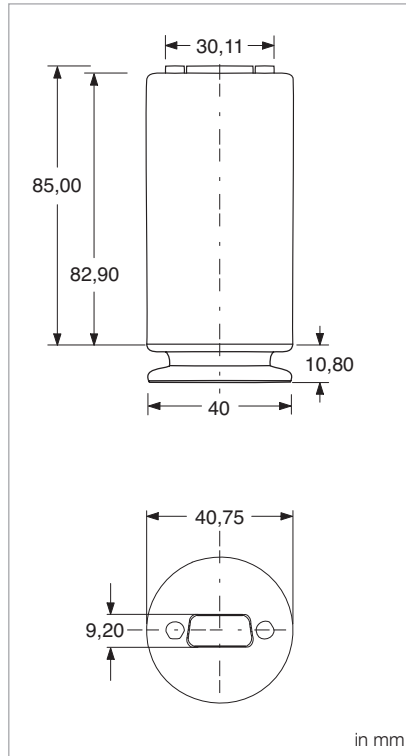
Option

For protection of the sensor TTR 200 N and PTR 200 N against contamination, radiation and other disturbing factors the installation of a baffle is recommended.

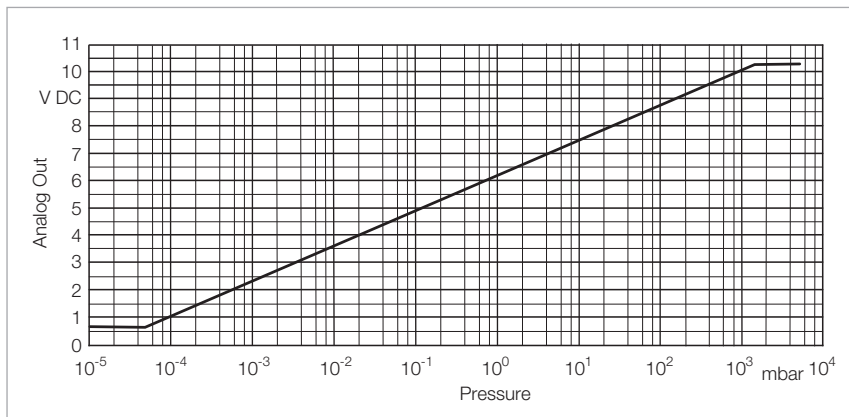
Two types of baffles are available: A build-in version for CF connections is mounted in the sensor; the baffle for ISO-KF connections is integrated in a centering ring.



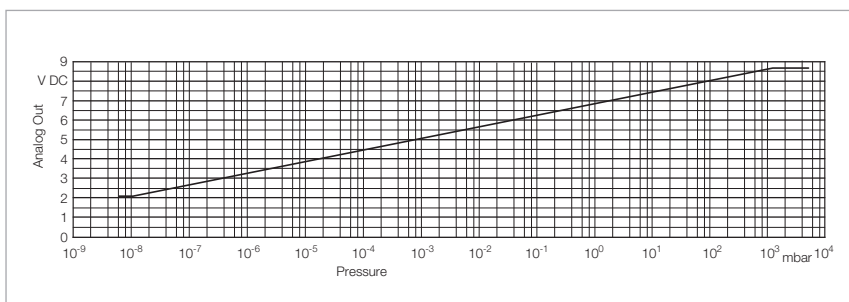
Dimensional drawing for the THERMOVAC transmitter TTR 200 N



Dimensional drawing for the PENNINGVAC transmitter PTR 200 N



Characteristic of the THERMOVAC Transmitter TTR 200 N



Characteristic of the PENNINGVAC transmitter PTR 200 N

Technical Data

Loadlock Transmitter

TTR 200 N

PTR 200 N

Measurement range (N ₂ and air)	mbar (Torr)	5.0 x 10 ⁻⁵ to 1500 (3.75 x 10 ⁻⁵ to 1125) 5 x 10 ⁻⁵ to 1500 [RS 232] (3.75 x 10 ⁻⁵ to 1125) [RS 232] -1013 to 1013 [RS 232] (-760 to 760) [RS 232]	1.0 x 10 ⁻⁸ to 1500 (0.75 x 10 ⁻⁸ to 1125) 1 x 10 ⁻⁸ to atm. [RS 232] (0.75 x 10 ⁻⁸ to atm.) [RS 232] -1013 to 1013 [RS 232] (-760 to 760) [RS 232]
Measurement uncertainty of reading (typical) ¹⁾	mbar	— — — —	1 x 10 ⁻⁸ to 1 x 10 ⁻³ ±30 % 1 x 10 ⁻⁴ to 1 x 10 ⁻³ ±10 % 1 x 10 ⁻³ to 100 ±5 % 100 to atm. ±25 %
Cold Cathode			1 x 10 ⁻⁴ to 1 x 10 ⁻³ ±10 % 1 x 10 ⁻³ to 100 ±5 % 100 to atm. ±25 %
MEMS-Pirani		1 x 10 ⁻⁴ to 1 x 10 ⁻³ ±10 % 1 x 10 ⁻³ to 100 ±5 % 100 to atm. ±25 %	1 x 10 ⁻⁴ to 1 x 10 ⁻³ ±10 % 1 x 10 ⁻³ to 100 ±5 % 100 to atm. ±25 %
Diff. Piezo		-10 to 10 ±10 % ±0.67 mbar -100 to -10 ±8 % -1013 to -100 ±1 % 10 to 100 ±5 %	10 to 10 ±10 % ±0.67 mbar -100 to -10 ±8 % -1013 to -100 ±1 % 10 to 100 ±5 %
Repeatability of reading (typical) ¹⁾	mbar	1 x 10 ⁻³ to 100 ±2 % 1 x 10 ⁻³ to 100 ±2 % -1013 to 10 ±1 %	1 x 10 ⁻⁸ to 100 ±2 % 1 x 10 ⁻³ to 100 ±2 % -1013 to 10 ±1 %
Penning			
MEMS-Pirani			
Diff. Piezo			
Sensor Measurement principle		MEMS-Pirani and Diff. Piezo Thermal conductivity, combined with Piezo	Cold cathode, MEMS-Pirani and Diff. Piezo Thermal conductivity, combined with Piezo and cold cathode ionization
Supply voltage	V DC	9 to 30	
Power consumption	W	< 1.2	< 2
Electrical connection	V	D-Sub 15 pin	
Analog output	V DC	$V_{out} = \log_{10}(P_{mbar}) \times 1.286 + 6.143$ 0.61 to 10.23	$V_{out} = \log 0.6(P_{mbar}) + 6.8$ 2.0 to 8.667
Resolution	bit	16	16
Impedance	Ω	100	100
Update rate	Hz	16	16
Interfaces		RS 232	
Set point			
Range			
Absolute	mbar (Torr)	1 x 10 ⁻⁴ to 1333 (0.75 x 10 ⁻⁴ to 1000)	1 x 10 ⁻⁸ to 1333 (0.75 x 10 ⁻⁸ to 1000)
Differential	mbar (Torr)	-1013 to 133 (-775 to 100)	-1013 to 133 (-775 to 100)
Relay		3	3
Relay contact rating		1 A at 30 V AC / DC, resistive load	1 A at 30 V AC / DC, resistive load
Relay contact resistance, max.	mΩ	100	100
Relay contact endurance, min.			
1.0 A at 30 V DC load		100 000	100 000
0.2 A at 30 V DC load		2 000 000	2 000 000
Status indicators		LED-ring (360°)	
Max. cable length	m	20	
Overpressure limit (abs.)	bar	2	
Operating temperature range ²⁾	°C (°F)	0 to 60 (32 to 140)	
Storage temperature range	°C (°F)	-20 to +65 (-4 to 149)	
Max. bakeout temperature	°C (°F)	85 (185)	
Max. rel. humidity	% n.c.	0 – 95	
Installation orientation		Any	
Materials exposed to vacuum		304 stainless steel, Tin, Gold, Viton®	304 stainless steel, Ceramic (Al ₂ O ₃), Tin, Gold, Viton®, Titaniu
Dead volume (DN 16ISO-KF), approx	cm ³	2.8	28.6
Weight (DN 16 ISO-KF)	g	305	321
Protection class	IP	40	
CE certification		EMC Directive 2014/30/EEC	
Controller type		GRAPHIX ONE / TWO / THREE	

¹⁾ Accuracy and repeatability are typical values measured with Nitrogen gas at ambient temperature after zero adjustment

²⁾ There may be minimal deviation tolerances in the range of 40 – 60 °C

Ordering Information

Loadlock Transmitter

TTR 200 N

PTR 200 N

	Part No.	Part No.
THERMOVAC TTR 200 N DN 16 ISO-KF, 3SP	230365V02	–
PENNINGVAC PTR 200 N DN 25 ISO-KF, RS 232, 3 SP	–	230087V02
Replacement cathode plate for PTR 90 N / PTR 225 N (up to serial no. 17022777352)	–	EK16291V02
for PTR 90 N / PTR 225 N (from serial no. 17022777353)	–	EK16292V02
Replacement anode ring for PTR 90 N / PTR 225 N (up to serial no. 17022777352)	–	20028711V02
for PTR 90 N / PTR 225 N (from serial no. 17022777353)	–	E20028712V02
Baffle, with centering ring (FPM (FKM)) DN 25 ISO-KF	–	230 078
Centering ring with fine filter DN 16 ISO-KF	883 96	–
Optional accessories		
Connection cable, RS 232 ¹⁾		
5 m	Type G	
10 m	230550V01	
15 m	230551V01	
20 m	230552V01	
RS232 / USB Converter for setpoint definition and parametrization of RS232 gauges	230553V01	
	230399V02	

¹⁾ See chapter "Connection cables for Active Sensors"

IONIVAC Transmitter ITR 90



The ITR 90 is a optimized combination transmitter. The combination of a hot cathode ionisation sensor according to Bayard-Alpert and a Pirani sensor permits vacuum pressure measurements of nonignitable gases and gas mixtures in the pressure range from 5×10^{-10} to 1000 mbar.

The ITR 90 can be ordered with integrated display or Profibus interface.

Advantages to the User

- Continuous pressure measurements from 10^{-10} mbar to atmospheric pressure
- High degree of reproducibility within the typical range for process pressures of 10^{-2} to 10^{-8} mbar
- Controlled switching on and off sequencing through the integrated double Pirani optimized the service life of the yttrium coated iridium cathodes
- Compact design
- Enclosed, rugged electrode geometry in a rugged metal housing
- Efficient degassing by electron bombardment
- Simple fitting of the sensor
- Extension for higher bake out temperatures during the measurements
- One signal covering 13 decades
- One flange joint for 13 decade
- ITR 90 model with built-in display for stand-alone operation without additional display components
- RS 232 C interface

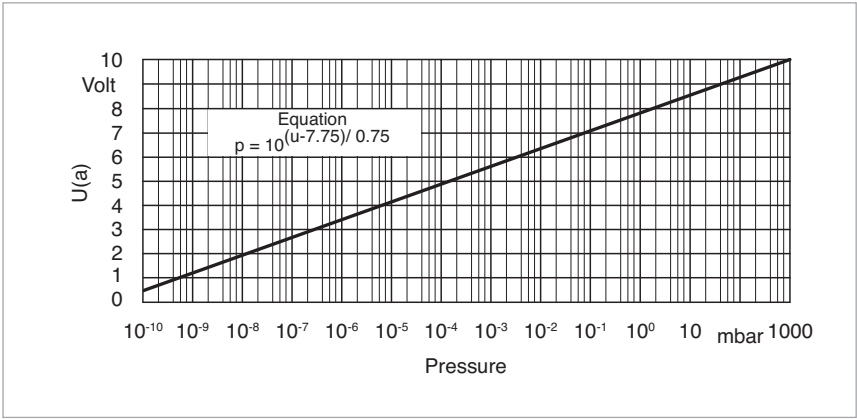
Typical Applications

- Analytical
- Evaporation and coating
- Vacuum furnaces
- General purpose pressure measurements in the fine and high vacuum ranges

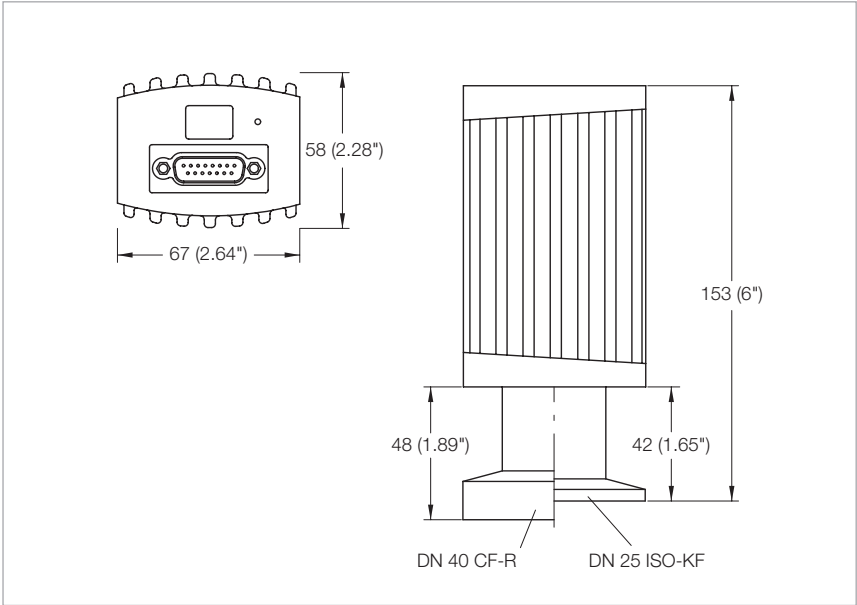
Sensor

The sensor of the ITR 90 contains a dual filament Pirani system as well as a Bayard-Alpert measurement system.

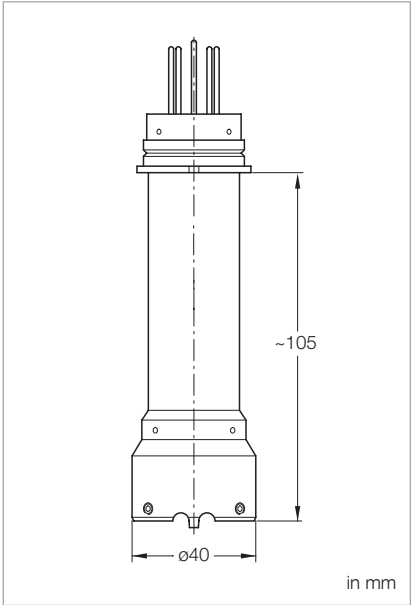
When using the bake out extension, measurements will be possible also at flange temperatures up to 150 °C.



Characteristic of the ITR 90



Dimensional drawing for the ITR 90; dimensions in mm, in brackets () are in inch
 (Image with integrated display; Profibus interface differing)



Dimensional drawing for the bake out extension

Technical Data

IONIVAC Transmitter

ITR 90

Measurement range	mbar (Torr)	5 x 10 ⁻¹⁰ to 1000 (3.75 x 10 ⁻¹⁰ to 750)
Measurement uncertainty, 10 ⁻¹ – 1000 mbar		≥ 15% of the meas. value
Measurement uncertainty, 10 ⁻⁸ – 10 ⁻² mbar		15% of the meas. value
Reproducibility, 10 ⁻⁸ – 10 ⁻² mbar		5% of the meas. value
Principles of measurement		Hot cathode ionization according to Bayard-Alpert combined with thermal conductivity according to Pirani
Degas		Electron bombardment 3 minutes, max.
Supply voltage	V DC	20 to 28 V DC, typ. 24 V DC
Power consumption, max.	W	16
Storage / nominal temperature range	°C	-20 bis +70 / 0 bis +50
Weight, approx.		
ITR 90, DN 25 ISO-KF	kg (lbs)	0.285 (0.64)
ITR 90, DN 40 CF	kg (lbs)	0.550 (1.24)
Sensor		Fully sealed, exchangeable
Degassing temperature, max.	°C	150 ¹⁾
Materials in contact with the medium		Cu, W, Glass, NiFe, Mo, Stainless steel, Aluminum, Iridium, Yttrium, NiCr
Dead volume, approx.	cm ³	24 at DN 25 ISO-KF 34 at DN 40 CF
Overpressure rating (abs.)	bar	2
Signal output (R _a ≥ 10 kΩ)		
Measurement signal		0 bis 10 V; 0.774 to 10 V; 0.75 V decade
Error signal		< 0.5 V
Protection class	IP	30
Interface (standard / optional)		RS 232 C / Profibus
Electrical connection		15-way Sub-D male connector / pin contacts
Cable length, max.	m	100 / 30 bei RS 232 C

¹⁾ Flange temperature when using the bake out extension

Ordering Information

IONIVAC Transmitter ITR 90

without Display

with Display

	Part No.	Part No.
ITR 90, DN 25 ISO-KF	120 90	120 91
ITR 90, DN 25 ISO-KF, Profibus interface	230 030	–
ITR 90, DN 40 CF-R, rotatable CF flange	120 92	120 94
ITR 90, DN 40 CF-R, rotatable CF flange Profibus interface	230 031	–
Options Power supply for IONIVAC transmitter 100 – 240 V AC / 24 V DC incl. 5 m connection cable and 5 m RS 232 C cable Bake out extension (100 mm, approx.) Baffle, DN 25 ISO-KF, with Installation baffle for CF/ISO-KF varian	121 06 127 06 121 07	
Replacement sensor IE 90, DN 25 ISO-KF ¹⁾ IE 90, DN 40 CF-R ¹⁾	E 121 02 E 121 03	
Calibration	see chapter “Miscellaneous”, para. “Leybold Calibration Service”	
Connection cable	see chapter “Products”, para. “Connection Cable for Active Sensors”	

¹⁾ Including hex. socket screw key

IONIVAC Transmitter ITR 200 S



The ITR 200 S is an optimized dual cathode combination transmitter on the basis of the well proven ITR 90. The combination of a hot cathode ionization sensor according to Bayard-Alpert and a Pirani sensor allows vacuum pressure measurements of non-ignitable gases and gas mixtures in the pressure range from 5×10^{-10} to 1000 mbar.

Upon request, the pressure can be displayed on an integrated display.

Advantages to the User

- Service life increase and increased operational reliability through integration of a second hot cathode
- Full coverage of the pressure range from 5×10^{-10} mbar to atmospheric pressure
- High repeatability within the typical process pressure range of 10^{-2} to 10^{-8} mbar
- Controlled switching on and switching off through the integrated dual Pirani optimized the service life of the yttrium-coated iridium cathodes
- Compact design
- Enclosed, stable electrode geometry in rugged metal casing
- Efficient degassing through electron bombardment
- Simple to install
- ITR 200 S version with built-in display allows for stand-alone operation without the necessity for additional displays
- RS 232 C interface

Typical Applications

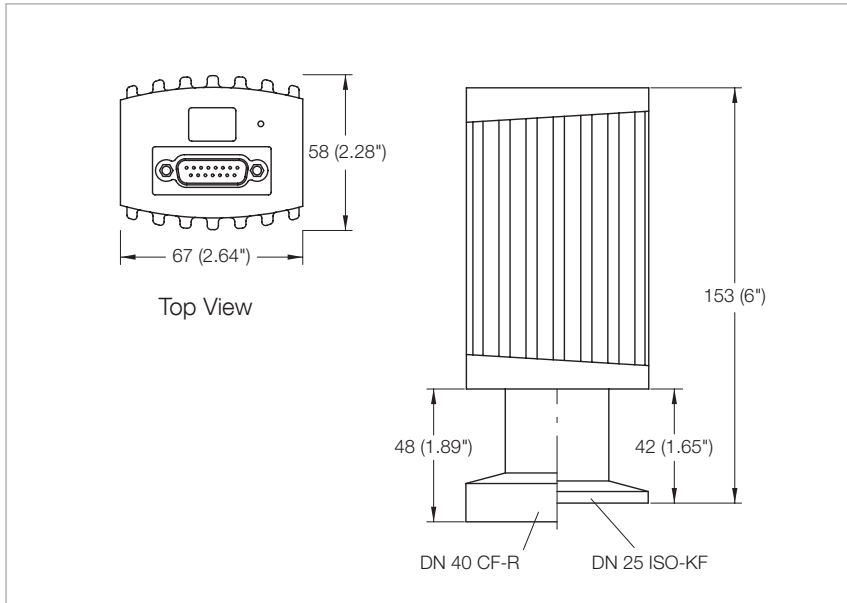
- Analytical engineering
- Sputtering and coating technology
- Vacuum furnaces
- Multipurpose pressure measurement in the medium and high vacuum range

Options

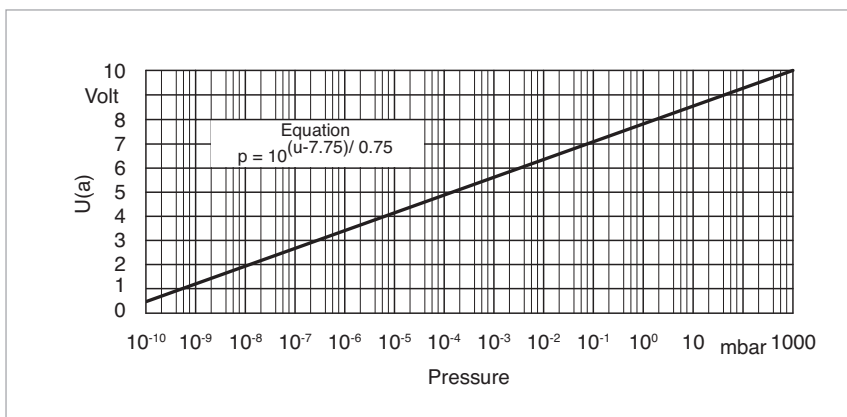
Upon request, the ITR 200 S can be supplied with an integrated display or a Profibus interface.

Sensor

The sensor of the ITR 200 S includes besides the Pirani system a dual cathode measurement system according to Bayard-Alpert. If one of the hot cathodes should burn out during operation, then the second cathode is automatically switched on. Moreover, each sensor contains a memory chip with the relevant system data. Thus after having exchanged a sensor, an automatic alignment is performed between sensor and operating electronics (plug and play).



Dimensional drawing for the ITR 200 S; dimensions in mm, in brackets () are in inch
(Image with integrated display; Profibus interface differing)



Characteristic of the ITR 200 S

Technical Data

IONIVAC Transmitter

ITR 200 S

Measurement range	mbar (Torr)	5 x 10 ⁻¹⁰ to 1000 (3.75 x 10 ⁻¹⁰ to 750)
Measurement uncertainty, 10 ⁻¹ – 1000 mbar		≥ 15% of the meas. value
Measurement uncertainty, 10 ⁻⁸ – 10 ⁻² mbar		15% of the meas. value
Reproducibility, 10 ⁻⁸ – 10 ⁻² mbar		5% of the meas. value
Principles of measurement		Hot cathode ionization according to Bayard-Alpert combined with thermal conductivity according to Pirani
Degas		Electron bombardment 3 minutes, max.
Supply voltage	V DC	20 to 28 V DC, typ. 24 V DC
Power consumption, max.	W	20
Storage / nominal temperature range	°C	-20 bis +70 / 0 bis +50
Weight, approx.		
ITR 200 S, DN 25 ISO-KF	kg (lbs)	0.50 (1.10)
ITR 200 S, DN 40 CF	kg (lbs)	0.75 (1.65)
Sensor		Fully sealed, exchangeable
Degassing temperature, max.	°C	150 ¹⁾
Materials in contact with the medium		Cu, W, Glass, NiFe, Mo, Stainless steel, Aluminum, Iridium, Yttrium, NiCr
Dead volume, approx.	cm ³	24 at DN 25 ISO-KF 34 at DN 40 CF
Overpressure rating (abs.)	bar	2
Signal output (R _a ≥ 10 kΩ)		
Measurement signal		0 bis 10 V; 0.774 to 10 V; 0.75 V decade
Error signal		< 0.5 V
Protection class	IP	30
Interface (standard / optional)		RS 232 C / Profibus
Switching function		
Standard		1 normally open contact
Profibus		2 normally open contacts
Electrical connection		15-way Sub-D male connector / pin contacts
Cable length, max.	m	100 / 30 bei RS 232 C

¹⁾ Flange temperature when using the bake out extension

Ordering Information

IONIVAC Transmitter ITR 200 S

without Display

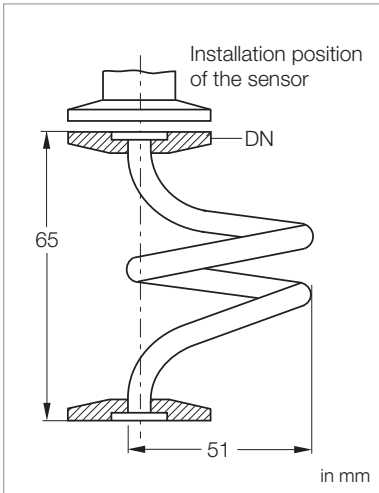
with Display

	Part No.	Part No.
ITR 200 S, DN 25 ISO-KF 1 switching function	230 250	230 251
ITR 200 SP, DN 25 ISO-KF, Profibus interface, 2 switching functions	230 252	–
ITR 200 S, DN 40 CF-R, rotatable CF flange 1 switching function	230 254	230 255
ITR 200 SP, DN 40 CF-R, rotatable CF flange Profibus interface, 2 switching functions	230 256	–
Options Power supply for IONIVAC transmitter 100 – 240 V AC / 24 V DC incl. 5 m connection cable and 5 m RS 232 C cable Baffle, DN 25 ISO-KF, with Installation baffle for CF/ISO-KF varian	121 06 121 07	
Replacement sensor IE 200, DN 25 ISO-KF ²⁾ IE 200, DN 40 CF-R ²⁾ IE 200 SL ¹⁾ , DN 40 CF-R ²⁾	240 020 240 021 –	240 020 240 021 240 022
Calibration	see chapter “Miscellaneous”, para. “Leybold Calibration Service”	
Connection cable	see chapter “Products”, para. “Connection Cable for Active Sensors”	

¹⁾ SL = long version (bake out version)

²⁾ Including hex. socket screw key

Spiral Tube



Dimensional drawing for the spiral tube

Advantages to the User

Pressure sensors may through the use of the spiral tube be better protected against contamination like condensate, vapours and dusts. Thus measurement accuracy is improved and a longer service life of the pressure sensors is attained.

Installation is recommended in connection with

- measurement system TTR (preferred)
- CERA-VAC CTR

Operating Principle

Through the specially developed geometry which provides a constant slope, possibly occurring contamination is removed.

Maintenance

Depending on the type of application regular maintenance on the spiral tube is recommended.

Note

- Measurement errors caused by the increased conductance of the component need to be taken into account
- Low vibration mounting must be ensured
- The sensor must be connected at the upper end

Technical Data

Spiral Tube

Materials	Stainless steel
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Ordering Information

Spiral Tube

	Part No.
Spiral Tube	230 082 230 083 230 084

Connection Cables for Active Sensors

Active Sensors

Operating Units for Active Sensors

DISPLAY ONE

DISPLAY TWO DISPLAY THREE

GRAPHIX ONE GRAPHIX TWO GRAPHIX THREE

THERMOVAC Transmitter (FCC 68) TTR 91 N, TTR 91 NS, TTR 96 NS a. o. TTR 101 N, TTR 101 NS2 TTR 911 N, TTR 916 N	Type A	Type A	Type A
THERMOVAC Transmitter (RS 232) TTR 911 N, TTR 101 N, TTR 200 N	–	–	Type G
PENNINGVAC Transmitter (FCC 68) PTR 90 N, PTR 225 N, PTR 237 N	Type A (only PTR 90)	Type A	Type A
PENNINGVAC Transmitter (RS 232) PTR 90 N, PTR 225 N, PTR 200 N	–	–	Type G
CERAVAC Transmitter (RS 232) CTR 100 N, CTR 101 N (digital signal)	–	–	Type C
IONIVAC Transmitter (RS 232) ITR 90 N, ITR 200 NS	–	–	Type C

Active Sensors

Operating Units for Active Sensors

IONIVAC IM 540 (Channel 3 und 4)

CMove

Lose Drahtenden

THERMOVAC Transmitter (FCC 68) TTR 91 N, TTR 91 NS, TTR 96 NS a. o. TTR 101 N	Type A	Type A	–
CERAVAC Transmitter (RS 232) CTR 91 N, CTR 100 N, CTR 101 N (analog signal)	Type B	Type B	Type E
IONIVAC Transmitter (RS 232) ITR 90 N, ITR 200 NS	–	Type C	Type E

Active Sensors

Operating Units for Active Sensors

TURBOVAC iX Extension Box

THERMOVAC Transmitter (FCC 68) TTR 91 N, TTR 91 NS, TTR 96 NS a. o. TTR 101 N	Type F
PENNINGVAC Transmitter (FCC 68) PTR 90 N, PTR 225 N/NS, PTR 237 N	Type F

Technical Data

Connection Cable

	Sensor side	Controller-/Customer side
Cable Type A	FCC 68 (RJ45) on both ends, 8-way, shielded	
Type B	Sub-D 15-way female, 8-way, shielded	FCC 68 (RJ45) on both ends, 8-way, shielded
Type C	Sub-D 15-way female, 8-way, shielded	Sub-D 15-way male, 8-way, shielded
Type E	Sub-D 15-way female, 8-way, shielded	bare wire ends, shielded
Type F	FCC 68 (RJ45), shielded	Sub-D 15-way male, 8-way, shielded
Type G	Sub-D 15-way HD female, 8-way, shielded	Sub-D 15-way male, 8-way, shielded

Ordering Information

Connection Cable

	Type A Part No.	Type B Part No.
Cable length		
1.5 m	800 103 V0032	-
5 m	124 26	230 013
10 m	230 012	230 014
15 m	124 27	230 015
20 m	124 28	230 016
30 m	124 29	230 017
50 m	124 31	230 019
75 m	124 32	230 020
100 m	124 33	230 021

Ordering Information

Connection Cable

	Type C Part No.	Type E Part No.
Cable length		
5 m	124 55	124 63
10 m	230 022	163 69
15 m	124 56	124 64
20 m	124 57	124 65
30 m	124 58	-
50 m	230 345 V01	-

Ordering Information

Connection Cable

	Type F Part No.	Type G Part No.
Cable length		
5 m	230 032 V01	230 550 V01
10 m	230 023 V01	230 551 V01
15 m	-	230 552 V01
20 m	-	230 553 V01

Controller and Operating Units for Active Sensors

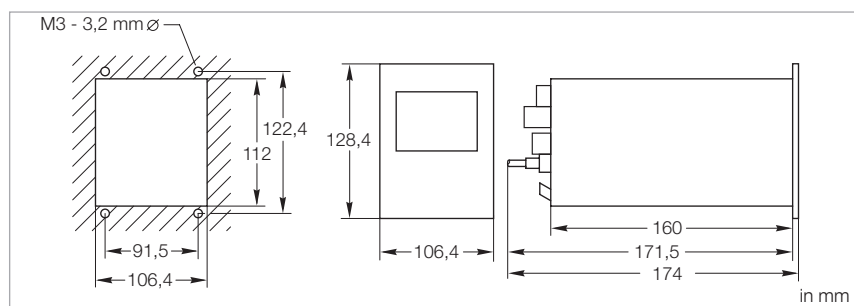
GRAPHIX ONE, TWO, THREE



Controller GRAPHIX with different displays and rear panel (right)

Advantages to the User

- Display range from 1×10^{-10} to 2000 mbar
- 3.5" touch screen display with intuitive menu interface
- Graphic display of the measurement data
- Internal and external (front side USB) storing of measurement data and configuration files
- Leak rate indication based on the pressure rise method
- 6 adjustable variable hysteresis switching thresholds, floating changeover contacts and visual indication of the switching status in the display area, freely assignable to the individual measurement channels
- Different visualisation options (graphs and decimal display with zoom function)
- For connection of all active sensors of other brands
- Degas function for ITR transmitters
- Zero alignment for CTR transmitters
- 3 separate chart recorder outputs 0 to 10 V for each measurement channel (analogue output)
- 4th programmable chart recorder output optional
- RS 232 C / RS 485 C interface with adjustable baud rate
- Relay output for error indication
- Display selectable between mbar, Torr, micron, Pascal or psi
- Compact installation and benchtop enclosure (1/4 19" 3 HU)
- Software update via USB optional
- Languages: English, German, Chinese, Japanese, French; Italian, Spanish, Korean
- Visualisation through LEYASSIST



Front panel cut-out and dimensional drawing for the controller GRAPHIX ONE to THREE

Universal 1 to 3 channel display and operating unit with persistent display of all measurement channels, suited for the active sensors of the THERMOVAC, CERA VAC, linear sensors (DU series), PENNINGVAC and IONIVAC series.

running on a PC

Connectable Sensors

THERMOVAC

- TTR 211 / TTR 216 S
- TTR 90 / TTR 91 / TTR 91 N
- TTR 96 S / TTR 96 N S
- TTR 100 / TTR 100 S2
- TTR 101 / TTR 101 N / TTR 101 S2 / TTR 101 N 2S
- TTR 911 / TTR 911 N
- TTR 916 / TTR 916 N

CERA VAC

- CTR 90 / CTR 91
- CTR 100 / CTR 100 N
- CTR 101 / CTR 101 N

Linear pressure sensors

- DU 200 / DU 201
- DU 2000 / DU 2001
- DU 2001 rel.

PENNINGVAC

- PTR 90 / PTR 90 N
- PTR 225 / PTR 225 N
- PTR 225 S / PTR 225 N S
- PTR 237 / PTR 237 N

IONIVAC

- ITR 90
- ITR 200 S
- ITR 200 SL

Other brands

- Active sensors with linear or logarithmic output

Technical Data

GRAPHIX ONE

GRAPHIX TWO

GRAPHIX THREE

Number of measurement channels	1	2	3
Measured values display	3,5" graph. TFT touch display		
Display range mbar (Torr)	1 x 10 ⁻¹⁰ to 2000 (0.75 x 10 ⁻¹⁰ to 1500)		
Unit of measurement (selectable)	mbar, Torr, Micron, Pa, Psi		
Gas type correction	factor adjustable		
Sensor connection	15-way Sub-D socket and FCC68 (RJ45)		
Sensor power supply V DC	24 ± 5%		
Relay inputs and outputs	25-way Sub-D socket		
Switching threshold	freely assignable to the measurement channels		
Number	6		
Adjustment range	sensor dependent		
Hysteresis	adjustable		
Relay contact	floating changeover contact		
Load rating	1 A / 30 V AC / 30 V DC		
Error message			
Relay contact	floating normally open contact		
Load rating	1 A / 30 V AC / 30 V DC		
Chart recorder output (R _a > 10 kΩ)	0 to 10 V per measurement channel, output characteristic corresponds to the connected sensor, additionally one further chart recorder output can be programmed		
Control input	PTR: high voltage on, ITR 90/200: emission on		
Interface RS 232 C / RS 485 C	9-way Sub-D socket		
Mains connection V AC / Hz	100 – 240 / 50/60		
Power consumption W	< 50	< 70	< 100
Nominal temperature range °C	+5 to +45		
Weight kg (lbs)	1.7 (3.75)		
Protection class IP	20		
Possible languages	English, German, Chinese, Japanese, French, Italian, Spanish, Korean		

Ordering Information

GRAPHIX ONE

GRAPHIX TWO

GRAPHIX THREE

	Part No.	Part No.	Part No.
GRAPHIX controller including 2 m EURO- and US mains cord	230680V01	230681V01	230682V01
THERMOVAC, PENNINGVAC, CERA-VAC, linear sensors (DU) and IONIVAC transmitter	see chapter "Products", para. "Active Sensors"		
Connection cables for THERMOVAC and PENNINGVAC (Type A), CERA-VAC (Type B analog, Type C digital and IONIVAC (Type C)	see chapter "Products", para. "Connection Cables for Active Sensors"		
Adapter USB/RS 232 C	800110V0103		
LEYASSIST GRAPHIX visualisation and operating software, including data storage and export (CSV file)	230440V01		

LabView® ¹⁾ driver, online via download available

¹⁾ LabView is a registered trademark of the company National Instruments

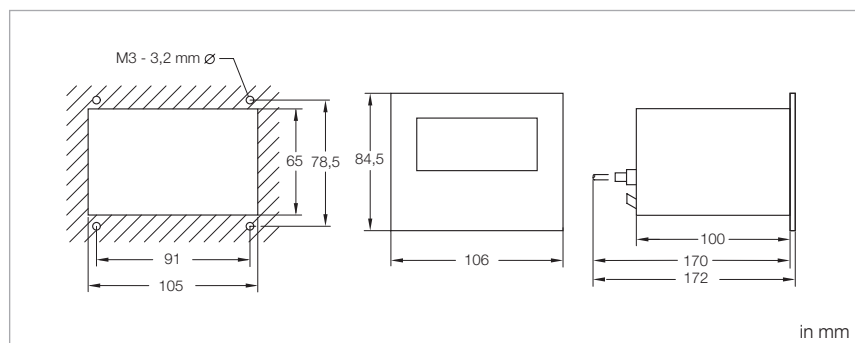
DISPLAY ONE



Cost-effective, compact single channel display unit for the transmitters from the THERMOVAC series and for PTR 90.

Advantages to the User

- Power supply voltage for the transmitters
- Four digit mantissa in the range from 5×10^{-9} to 2000 mbar
- Readout selectable between mbar, Torr or Pascal
- 0 to 10 V chart recorder output via plug-in screw terminals
- The switching threshold of the transmitters has been looped through to plug-in terminals
- The transmitter switching threshold settings are displayed
- Compact bench top enclosure (1/4 19", 2 HU)
- For fitting into 19", 3 HU racks
- Supply voltage 100 – 240 V



Dimensional drawing and panel cut-out for the DISPLAY ONE

Connectable Sensors

THERMOVAC

- TTR 100 *)
- TTR 101 / TTR 101
- TTR 101 S / TTR 101 N S
- TTR 211 *)
- TTR 216 S *)
- TTR 90 *)
- TTR 90 S *)
- TTR 91 / TTR 91 N
- TTR 91 S / TTR 91 N S
- TTR 96 S / TTR 96 N S
- TTR 911 / TTR 911 N
- TTR 916 / TTR 916 N

PENNINGVAC

- PTR 90 / PTR 90 N

Linear pressure sensor

- DU 200
- DU 201
- DU 2000
- DU 2001
- DU 2001 rel.

*) Connecting of older sensors possible

Technical Data

DISPLAY ONE

Number of measurement channels	1
Display for measured values	digital, 7 segment LED
Measurement range mbar (Torr)	5×10^{-9} to 2000 (3.8×10^{-9} to 1500)
Unit of measurement (selectable)	mbar, Torr, Pa
Switching thresholds	from the transmitter are run to a terminal strip
Chart recorder output ($R_a > 2,5 \text{ k}\Omega$)	0 – 10 Volt, characteristic corresponds to the connected transmitter
Mains connection	
EURO version	V AC / Hz 100 – 240 / 50/60
US version	V AC / Hz 100 – 240 / 50/60

Ordering Information

DISPLAY ONE

	Part No.
DISPLAY ONE with mains cord (EURO and US)	230 001
THERMOVAC Transmitter PENNINGVAC Transmitter PTR 90	see chapter "Products", para. "Active Sensors"
Linear pressure sensors DU	see chapter "Products", para. "Additional Sensors"
Connection cables for THERMOVAC and PENNINGVAC (Type A)	see chapter "Products", para. "Connection Cables for Active Sensors"
Adapter panel for installation in a 3 HU, 19" rack	230 005

DISPLAY TWO, THREE



Cost-effective, operating and display units for the transmitters from the THERMOVAC and PENNINGVAC series.

All channels are displayed simultaneously.

Advantages to the User

- Power supply voltage for the transmitters
- Display range from 1×10^{-9} to 2000 mbar (0.75×10^{-9} to 1500 Torr)
- Readout selectable between mbar, Torr or Pascal
- Adjustable switching thresholds with variable hysteresis, floating change-over contacts and visual indication of the switching status in the display
- Option of entering gas correction factors
- Separate chart recorder outputs 0 – 10 V for each measurement channel
- Compact bench top enclosure (1/4 19", 3 HU)
- For fitting into 19", 3 HU racks

Connectable Sensors

THERMOVAC

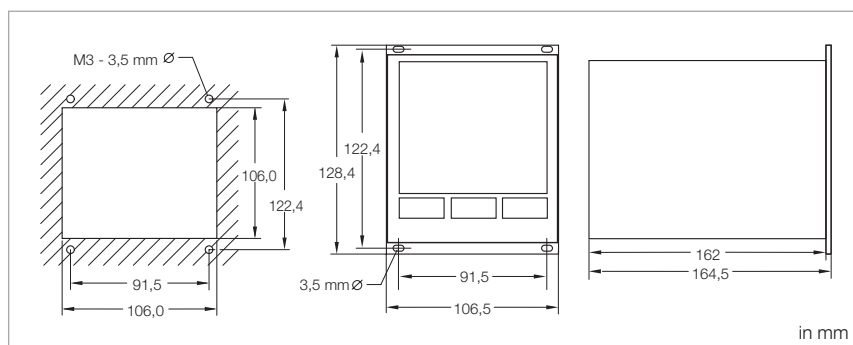
- TTR 211 *)
- TTR 216 S *)
- TTR 90 *)
- TTR 91 / TTR 91 N
- TTR 96 S / TTR 96 N S
- TTR 100 *)
- TTR 100 S *)
- TTR 101 / TTR 101 N
- TTR 101 S / TTR 101 N S
- TTR 911 / TTR 911 N
- TTR 916 / TTR 916 N

PENNINGVAC

- PTR 90 / PTR 90 N
- PTR 225 / PTR 225 N
- PTR 225 S / PTR 225 N S
- PTR 237 / PTR 237 N

Linear pressure sensor

- DU 200
- DU 201
- DU 2000
- DU 2001
- DU 2001 rel.



Dimensional drawing and panel cut-out for the DISPLAY TWO and THREE

*) Connecting of older sensors possible

Technical Data**DISPLAY TWO****DISPLAY THREE**

Number of measurement channels	2	3
Display for measured values	2 (1 per channel)	3 (1 per channel)
Measurement range mbar (Torr)	1 x 10 ⁻¹⁰ to 2000	
Unit of measurement (selectable)	adjustable	
Gas type correction (for PTR)	4 floating changeover contacts	6 floating changeover contacts
Sensor connection	60 V, 1 A DC / 30 V, 1 A AC	
Sensor power supply V DC	1 per channel,	
Electrical outputs	configurable as 2nd switching threshold	
Switching thresholds	2 (1 per channel)	3 (1 per channel)
Number	sensor dependent	sensor dependent
Adjustment range	adjustable	adjustable
Hysteresis	4 floating changeover contacts	6 floating changeover contacts
Relay contact	60 V, 1 A DC / 30 V, 1 A AC	60 V, 1 A DC / 30 V, 1 A AC
Load rating	1 per channel,	1 per channel,
Ready signal relay	configurable as 2nd switching threshold	configurable as 2nd switching threshold
Error message	normally open contact	
Relay contact	60 V, 1 A DC / 30 V, 1 A AC	
Load rating	0 - 10 V per measurement channel,	
Chart recorder output (R _a > 10 kΩ)	output characteristic corresponds to the connected transmitter	
Control input	PENNINGVAC PTR: high voltage on	
Mains connection V AC / Hz	85 - 240 / 50/60	
Power consumption W	< 10	< 15
Nominal temperature range °C	+5 to +50	
Weight kg (lbs)	1.3 (2.87)	1.4 (3.09)
Protection class IP	40	

Ordering Information**DISPLAY TWO****DISPLAY THREE**

	Part No.	Part No.
DISPLAY TWO / THREE with mains cord (EURO and US)	230 024	230 025
THERMOVAC Transmitter	see chapter "Products", para. "Active Sensors"	
PENNINGVAC Transmitter	see chapter "Products", para. "Active Sensors"	
Connection cables for THERMOVAC and PENNINGVAC (Type A)	see chapter "Products", para. "Connection Cables for Active Sensors"	

Passive Sensors

THERMOVAC Sensors

TR 211, TR 211 NPT, TR 212, TR 216



These passive sensors use thermal conductivity technology according to Pirani.

Advantages to the User

- Measurement range 5×10^{-4} to 1000 mbar (3.75×10^{-4} to 750 Torr)
- Tungsten or platinum filament
- Cost-effective sensing cell
- Fully aligned and temperature compensated 0 to +40 °C
- Constant filament temperature

TR 211

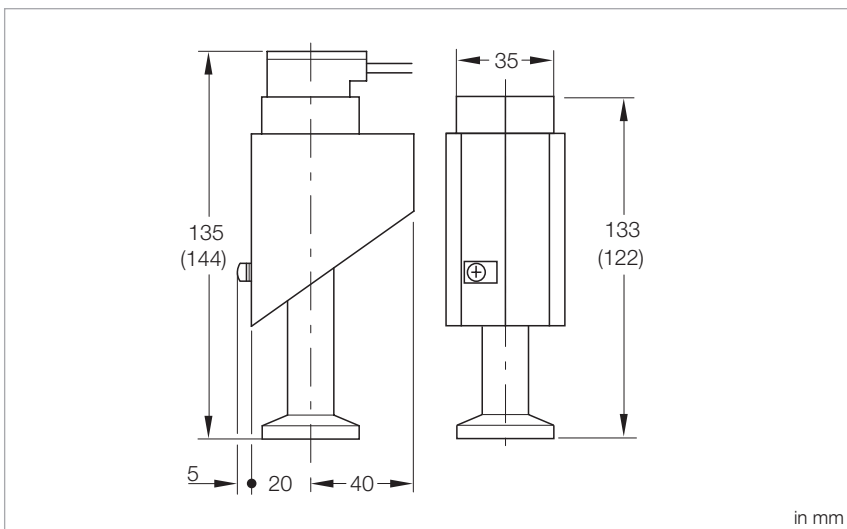
- Aluminum sensing cell with tungsten filament
- Improved temperature compensation

TR 212

- Stainless steel sensing cell with tungsten filament
- Overpressure resistant

TR 216

- Stainless steel sensing cell with platinum filament and ceramics feed through
- Well suited for corrosive processes and water vapor atmospheres



Dimensional drawing for the TR 211, TR 212 and TR 216; TR 211 NPT in brackets

Technical Data

TR 211

TR 211 NPT

TR 212

TR 216

Measurement range	mbar (Torr)	5 x 10 ⁻⁴ to 1000 (3.8 x 10 ⁻⁴ to 7.5 x 10 ²)			
Operating temperature range (compensated)	°C	0 to +40			
Storage temperature range, max.	°C	80			
Filament		Tungsten	Tungsten	Tungsten	Platinum
Filament temperature	°C	110			
Permissible overload (abs.), max.	bar	3	3	10	10
Volume of the sensing cell, approx.	cm ³	11			
Vacuum connection	DN	16 ISO-KF	1/8" NPT	16 ISO-KF/16 CF	16 ISO-KF
Materials in contact with the medium		Aluminium, Vacon, Glass, Tungsten, CrNi 8020, epoxy cement	Aluminium, Vacon, Glass, Tungsten, CrNi 8020, epoxy cement	Stainless steel, Vacon, Glass, Tungsten, CrNi 8020	Stainless steel 1.4301 (SS 304), Al ₂ O ₃ , CrNi 8020, Platinum
Operating units		THERMOVAC TM 21, 22, 23 / COMBIVAC CM 31, 32, 33, 51 / PIEZOVAC PV 20			

Ordering Information

TR 211

TR 211 NPT

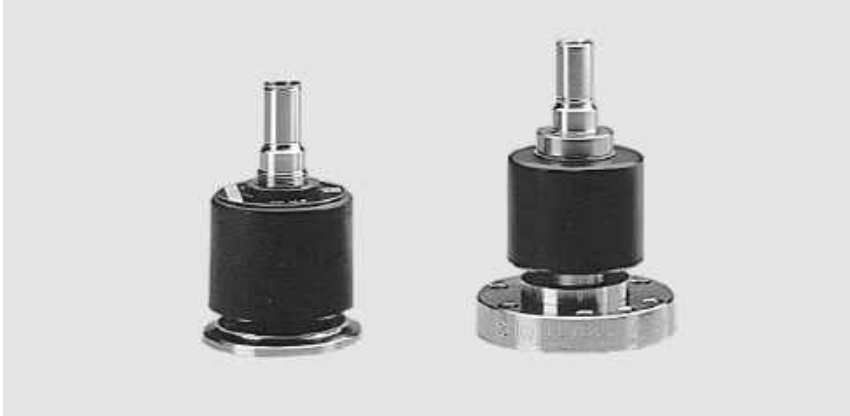
TR 212

TR 216

	Part No.	Part No.	Part No.	Part No.
THERMOVAC sensors Series 200				
DN 16 ISO-KF	157 85	-	158 52	157 87
DN 16 CF	-	-	157 86	-
DN 1/8" NPT	-	896 33	-	-
Replacement sensing cell	E 157 75	E 896 34	-	E 157 77

PENNINGVAC Sensors

PR 25, PR 26, PR 27, PR 28



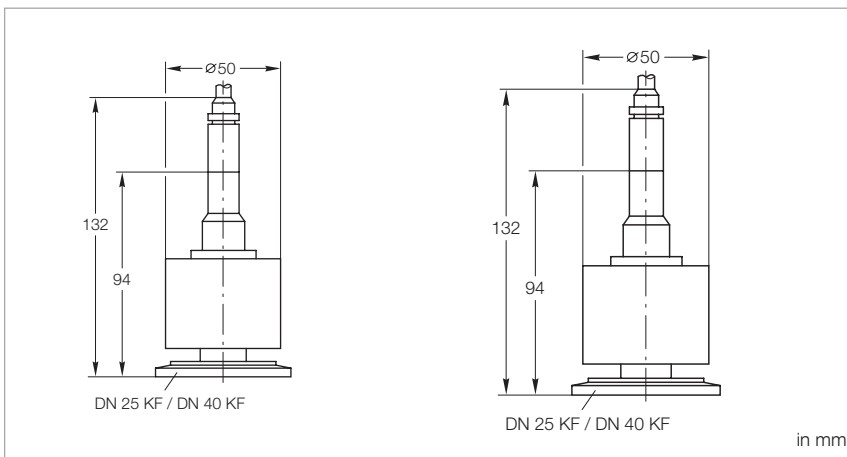
These passive sensors use cold cathode ionization technology according to Penning.

Advantages to the User

- Rugged
- Insensitive to air inrushes and vibrations
- Easy disassembly and cleaning of the measurement system
- Exchangeable cathode plate
- Improved ignition characteristic through titanium cathodes

Option

For protection of the PENNINGVAC sensors against contamination, radiation and other disturbing factors the installation of a baffle is recommended.



Dimensional drawing for the PENNINGVAC PR sensors

Technical Data

PR 25

PR 26

PR 27

PR 28

Measurement range	mbar (Torr)	1 x 10 ⁻⁹ to 10 ⁻² (0.75 x 10 ⁻⁹ to 10 ⁻²)			
High voltage supply (anode potential)					
Trigger voltage	kV	3.3			
Operation voltage	kV	1.6			
Storage temperature range	°C	-25 to +80			
Nominal temperature range	°C	0 to +80			
Bake out temperature (flange)	°C	-	-	-	200
Permissible overload (abs.)	bar	6 ¹⁾			
Dead volume	cm ³	21			
Vacuum connection	DN	25 ISO-KF	40 ISO-KF	40 CF	40 CF
Materials in contact with the medium		Stainless steel, Nichrome, Ceramics, Titanium			
Weight, approx.	kg (lbs)	0.75 (1.66)	0.75 (1.66)	0.8 (1.66) 0.8 (1.66)	0,8
Operating units		COMBIVAC CM 31, 32, 33, 51 / PENNINGVAC PM 31			

Ordering Information

PR 25

PR 26

PR 27

PR 28

	Part No.	Part No.	Part No.	Part No.
PENNINGVAC sensors	157 52	136 46	136 47	136 48
Replacement cathode plate, titanium (5 pcs., incl. 5 ceramics discs)	EK 162 91			
Replacement anode ring	200 28 711			
Baffle, with centering ring (FPM (FKM))				
DN 25	230 078	-	-	-
DN 40	-	230 079	-	-

¹⁾ When using an ultra sealing gasket at the vacuum connection

Note:

PR 26 replaces PR 31, 32, 35

PR 27 replaces PR 36

IONIVAC Sensors IE 414 and IE 514



These passive sensors use hot cathode ionization technology.

IE 414

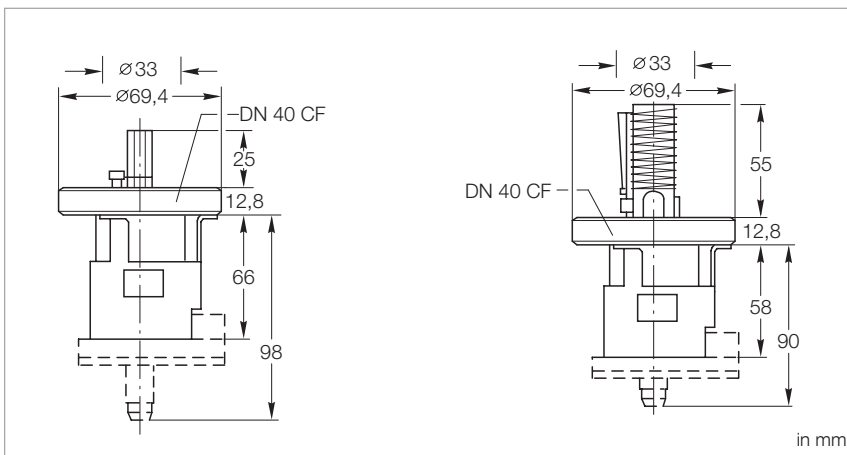
- Bayard-Alpert sensing system
- Measurement range to 2×10^{-11} mbar (1.5×10^{-11} Torr)
- Protection shield welded in place

IE 514

- Extractor sensing system
- Reliable to 1×10^{-12} mbar (0.75×10^{-12} Torr)
- Significant reduction of X-ray and ion desorption effects

Advantages to the User

- Exchangeable cathode
- High accuracy of the measurements due to individually calibrated sensing system



Dimensional drawing for the IE 414 (left) and IE 514 (right)

Technical Data

IE 414

IE 514

Measurement range	mbar (Torr)	2×10^{-11} to 10^{-2} (1.5×10^{-11} to 10^{-2})	10^{-12} to 1×10^{-4} (10^{-12} to 7.5×10^{-5})
X-ray limit	mbar (Torr)	$\leq 10^{-11}$ ($\leq 10^{-11}$)	$\leq 10^{-12}$ ($\leq 10^{-12}$)
Operating temperature range	°C	0 to +80	
Degassing temperature at the flange, max.	°C	250 ¹⁾ / 400 ²⁾	
Material			
Cathode		Iridium with yttric oxid coating	Iridium with yttric oxid coating
Feedthrough pins		NiFe 42	NiFe 42
Anode		Pt/Ir 90/10/pt wire	Mo and CoNiCr
Vacuum connection	DN	40 CF	
Adjustment data			
Ion detector potential	V	0	0
Cathode potential	V	80	100
Anode potential	V	220	220
Emission current	mA	0.06 to 0,6	1.6
Hot cathode current	A	1.4	
Hot cathode voltage	V	2.7	3.7
Sensitivity for Nitrogen	mbar ⁻¹	17.0	6.6
Bake out operation, Electron bombardment	V / mA	700 / 30	
Operating units		IM 540, CM 52	

Vacuum Measuring,
Controlling

Ordering Information

IE 414

IE 514

	Part No.	Part No.
IONIVAC sensors	158 66	158 67
Replacement cathode	158 63	158 61

¹⁾ With bakeable gauge head cable

²⁾ With gauge head cable detached

Operating Unit for Passive Sensors

COMBIVAC CM 51/CM 52



The COMBIVAC CM 51 covers the complete pressure range between 10^{-9} and 1000 mbar by combining two measurement principles - THERMOVAC and PENNINGVAC - providing both monitoring and control functions.

The COMBIVAC CM 52 offers by combining two UHV principles of measurement (THERMOVAC absolute pressure sensor and Bayard-Alpert measurement system IE 414 or extractor measurement system IE 514) measurements of vacuum pressures in the range between 10^{-12} and 1000 mbar.



Rear side of the COMBIVAC CM 51 (left) and CM 52 (right)

Advantages to the User

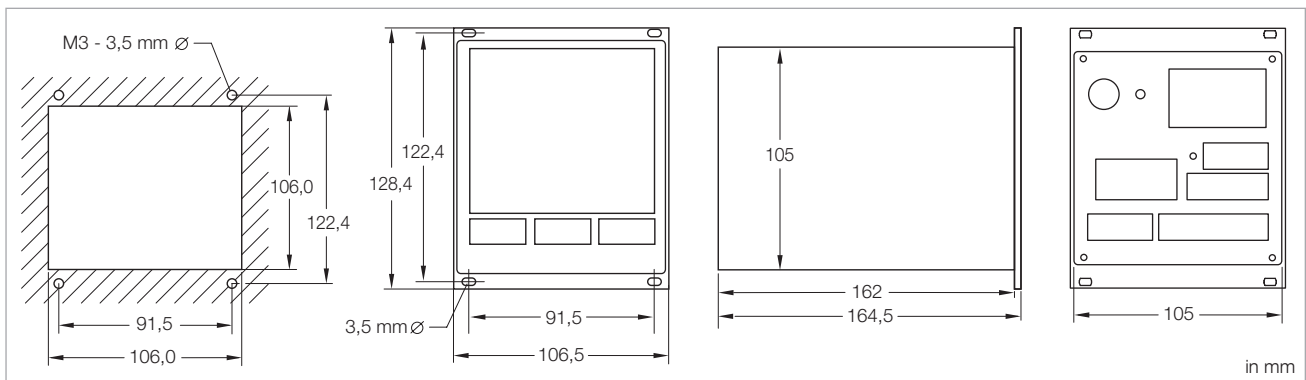
- Compact 3 channel operating unit for a pressure range for passive sensors of
 - 10^{-9} to 1000 mbar (CM 51)
 - 10^{-12} to 1000 mbar (CM 52)
- Automatic switchover from THERMOVAC operation to Penning (cold cathode) operation (CM 51)
- UHV sensors (Bayard-Alpert measurement system IE 414 or extractor measurement system IE 514 (CM 52)
- Measurement cable lengths up to 100 meters are possible depending on the type of application
- Easy to operate
- Keyboard locking through SOFT-LOCK
- Two adjustable switching thresholds with a relay contact for each measurement channel
- Logarithmic chart recorder output 0 – 10 V or 2 – 10 V
- Wide range power supply 100 – 240 V
- Unit of pressure selectable between mbar, Torr und Pascal
- Compact, rugged Penning sensor insensitive to operation at high pressures (see para. "Sensors")
- Aligned and temperature compensated THERMOVAC sensors (see para. "Sensors")
- Cost-effective replacement sensors and electrodes
- Error message for each channel, for example in the case of broken filament, defective sensor line or failed plasma discharge
- Compact benchtop enclosure (1/4 19", 3 HU) made of metal for installation in front panel cut outs and 19" racks
- RS 232 C and Profibus interface
- CE mark
- RoHS-compliant

Typical Applications

- Universal monitoring the operation of high vacuum pump systems like:
 - Turbomolecular pump systems
 - Diffusion pump systems
 - Cryogenic pump systems
- Annealing, melting, brazing and hardening furnaces
- Coating systems
- Analytical instrumentation
- Deployment in thermal radiation resistant and degassable systems is possible
- Particle accelerators

Connectable Sensors

- THERMOVAC
- TR 211
 - TR 211 NPT
 - TR 212
 - TR 216
- PENNINGVAC (only CM 51)
- PR 25
 - PR 26
 - PR 27
 - PR 28
- IONIVAC (only CM 52)
- IE 414
 - IE 514



Front panel cut-out (left) and dimensional drawing (right) for the COMBIVAC CM 51 and CM 52

Technical Data

COMBIVAC

CM 51

CM 52

Number of measurement channels		3	3
Measurement range			
Channel 1, 2 (THERMOVAC)	mbar (Torr)	5 x 10 ⁻⁴ to 1000 (3.5 x 10 ⁻⁴ to 750)	5 x 10 ⁻⁴ to 1000 (3.5 x 10 ⁻⁴ to 750)
Channel 3 (PENNINGVAC)	mbar (Torr)	10 ⁻⁹ to 10 ⁻² (10 ⁻⁹ to 10 ⁻²)	–
Channel 3			
(IE 414 Bayard-Alpert)	mbar (Torr)	–	2 x 10 ⁻¹¹ to 1 x 10 ⁻² (1.5 x 10 ⁻¹¹ to 0.75 x 10 ⁻²)
(IE 514 Extraktor)	mbar (Torr)	–	2 x 10 ⁻¹² to 1 x 10 ⁻⁴ (1.5 x 10 ⁻¹² to 0.75 x 10 ⁻⁴)
Unit of measurement (selectable)		mbar, Torr, Pa	
Measurement uncertainty			
THERMOVAC		≤ 20% of the measured value in the range 10 ⁻³ to 10 ⁻² mbar (± 20%) in the range 10 ⁻² to 10 ² mbar (± 15%)	≤ 20% of the measured value in the range 10 ⁻³ to 10 ⁻² mbar (± 20%) in the range 10 ⁻² to 10 ² mbar (± 15%)
PENNINGVAC		± 30% of the measured value in the range 10 ⁻⁸ to 10 ⁻⁴ mbar	–
IE 414/514		–	± 10% of the displayed value (however, this value may increase depending on the type of application)
Measurement cable	m	up to 100 (application dependent)	
Display for measured values		digital, 7 segment LED, 4 digit mantissa and 2 digit exponent	
Type of gas (selectable)		factor adjustable	
Switching thresholds		2 per channel single, interval-trigger	2 per channel single, interval-trigger
Operating mode			
Adjustable switching thresholds			
THERMOVAC	mbar (Torr)	5 x 10 ⁻³ to 500 (5 x 10 ⁻³ to 375)	5 x 10 ⁻³ to 500 (5 x 10 ⁻³ to 375)
PENNINGVAC	mbar (Torr)	1 x 10 ⁻⁸ to 9.9 x 10 ⁻³ (0.75 x 10 ⁻⁸ to 7.4 x 10 ⁻³)	–
Bayard-Alpert	mbar (Torr)	–	1 x 10 ⁻⁸ to 5 x 10 ⁻³ (0.75 x 10 ⁻⁸ to 3.75 x 10 ⁻³)
Extraktor	mbar (Torr)	–	1 x 10 ⁻¹¹ to 1 x 10 ⁻¹¹ (0.75 x 10 ⁻¹¹ to 0.75 x 10 ⁻¹¹)
Switching relay hysteresis		10% of the trigger value (default), freely adjustable for THERMOVAC and PENNINGVAC	10% of the trigger value (default), freely adjustable for THERMOVAC and IE 414 oder 514
Relay contact load rating		AC/DC, max. 30 V / 1 A	
Chart recorder output (default)			
THERMOVAC		0 to 10 V, log. divisions linear: 3 decades, approximately 10.5 V in case of a failure, logarithmic: (1 x 10 ⁻³ mbar), 1.67 V/decade	0 to 10 V, log. divisions linear: 3 decades, approximately 10.5 V in case of a failure, logarithmic: (1 x 10 ⁻³ mbar), 1.67 V/decade
PENNINGVAC		logarithmic: (1 x 10 ⁻⁹ mbar), 1.43 V/decade	–
IE 414 oder 514		–	logarithmic: (1 x 10 ⁻¹² mbar), 1.00 V/decade
Interface		RS 232 C, RS 485 and Profibus	
Mains connection 50/60 Hz	V AC	100 – 240	
Power consumption	W	< 10	65
Storage temperature range	°C	-20 to +60	
Nominal temperature range	°C	+5 to +50	
Max. rel. humidity	% n.c.	80	
Weight	kg (lbs)	1.4 (3.09)	
Dimension (W x H x D)	mm	106.4 x 128.5 x 164.5	
Installation depth	mm	approx. 220	
Protection class	IP	40	

Ordering Information

COMBIVAC

	CM 51	CM 52
	Part No.	Part No.
Operating unit COMBIVAC CM 51/52 including EURO and US mains cord, 2 m with RS 232 C / 485 with Profibus DB	230 110 230 111	230 115 230 116
Cable adapter CM 31 – CM 51	230 112 V01	–
Options		
19" installation frame	161 00	
1/4 19" blank panel	161 02	
THERMOVAC sensors for CM 51/52		
TR 211, DN 16 ISO-KF	157 85	
TR 211, 1/8" NPT	896 33	
TR 212, DN 16 ISO-KF	158 52	
TR 212, DN 16 CF	157 86	
TR 216, DN 16 ISO-KF	157 87	
Gauge head cables for TR sensors		
5 m	162 26	
10 m	162 27	
15 m	124 34	
20 m	162 28	
30 m	124 35	
50 m	124 37	
75 m	124 38	
100 m	124 39	
PENNINGVAC sensors for CM 51		
PR 25, DN 25 ISO-KF	157 52	–
PR 26, DN 40 ISO-KF	136 46	–
PR 27, DN 40 CF	136 47	–
PR 28, DN 40 CF, bakeable	136 48	–
Gauge cables for PR sensors		
5 m	162 88	–
10 m	162 89	–
15 m	124 49	–
20 m	157 56	–
30 m	124 50	–
50 m	124 52	–
75 m	124 53	–
100 m	124 54	–
IONIVAC sensors for CM 52		
IE 414, DN 40 CF	–	158 66
IE 514, DN 40 CF	–	158 67
Mains cable		
3 m (US)	800 102 V1002	
Gauge head cables for IE sensors		
5 m	–	158 68
10 m	–	150 88
15 m	–	230 670 V01
5 m, bakeable to 200 °C	–	158 44
10 m, bakeable to 200 °C	–	230 671 V01
Extension cables for IE 414/514		
10 m	–	245 002
20 m	–	200 02 937
30 m	–	245 011 V01
50 m	–	245 010 V01
up to 100 m (application dependent)	–	upon request

IONIVAC IM 540



The 3-channel display and operating unit IONIVAC IM 540 offers, by combination of up to 4 different principles of measurement – Pirani, capacitive, Bayard-Alpert and Extractor –, complete coverage and control of the vacuum pressure in the range between 10^{-12} mbar and atmospheric pressure.

Advantages to the User

- Precise UHV pressure measurements with the Bayard-Alpert sensor IE 414 (offering excellent longterm stability) or the Extractor sensor IE 514 (offering an extremely low X-ray limit of $< 1 \times 10^{-12}$ mbar)
- 1 measurement channel for IONIVAC sensor (Bayard-Alpert or Extractor)
- Possibility of simultaneously connecting a second IONIVAC sensor
- Degassing of the anode through electron bombardment with time-limit
- Continuous UHV measurement also during the degassing phase (up to $+250^\circ\text{C}$ with bakeable gauge head cable)
- 2 measurement channels for direct connection of transmitters from the series THERMOVAC TTR and CERA VAC CTR
- Selectable pressure units (mbar, Torr, Pascal, Micron)
- Display of a single measurement channel with pressure trend through analogue bargraph or simultaneous display of all measurement channels
- Two adjustable thresholds with adjustable hysteresis and freely assignable to the measurement channels

- Compact benchtop enclosure (1/2 19", 3 HU)
- RS 232 C interface provided as standard
- Simple software updates possible through the RS 232 interface
- Profibus interface (optional)
- CE mark

Typical Applications

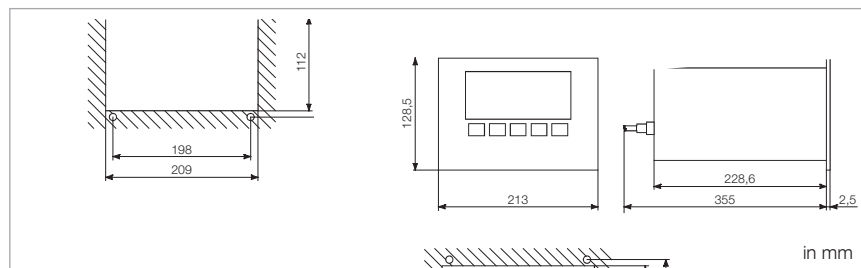
- Pressure measurement and control in the UHV range
- Measurement of ultimate pressure in UHV systems
- Checking of ultimate pressure in semiconductor production
- Total pressure measurements in the area of cryo technology
- Total pressure measurements in calibration systems

Connectable Sensors

- Bayard-Alpert sensor IE 414
- Extractor sensor IE 514
(see Chapter "Additional Sensors") combined with
- THERMOVAC TTR 211, TTR 216 S, TTR 90, TTR 91 and TTR 96 S
- CERA VAC CTR 90, CTR 91 and CTR 100
(see Chapter "Active Sensors")

Two passive sensors working with ionization technology (IE 414 and/or IE 514) could be connected simultaneously to the IONIVAC IM 540 while only one is in operation.

A pressure dependent emission control of these sensors is possible if a THERMOVAC TTR or CERA VAC CTR 100/CTR 91 of suitable range overlap is connected



Front panel cut-out (left) and dimensional drawing (right) for the IONIVAC IM 540

Technical Data

IONIVAC IM 540

Number of measurement channels		3
Bayard-Alpert / Extractor		Channel 1 or 2
THERMOVAC / CERA-VAC		Channel 3 and 4
Measurement range	mbar (Torr)	1×10^{-12} to 1100 (0.75×10^{-12} to 825)
Measurement range Extractor	mbar (Torr)	1×10^{-12} to 1×10^{-4} (0.75×10^{-12} to 0.75×10^{-4})
Measurement range Bayard-Alpert	mbar (Torr)	1×10^{-11} to 1×10^{-2} (0.75×10^{-11} to 0.75×10^{-2})
Measurement range switching		automatic or decade pre-select
Units of measurement (selectable)		mbar, Torr, microns, Pa
Measurement uncertainty	%	± 10 of the value displayed
Trend indication		bargraph
Measurement value display rate		1×10^{-10} to 1×10^{-2} mbar, 5 s^{-1} 1×10^{-12} to 1×10^{-10} mbar, 0.5 s^{-1}
Emission current		
Extractor sensor	mA	1.6
Bayard sensor	mA	0.1 to 10; automatic control
Emission current shutdown at		$p > 1 \times 10^{-2}$ mbar, broken cathode, short-circuit, interruption of the electric circuit
Bake out power		
Extractor / Bayard-Alpert	W	20 / 40
Sensor power supply, potential for		anode Extractor / Bayard-Alpert: 220 V, cathode Extractor / Bayard-Alpert: 100 V/80 V, Reflector Extractor: 205 V
Sensor connections		Bayard-Alpert and Extractor - single operation is possible 2 x Bayard-Alpert or Extractor (redundant operation)
Measurement system detection		automatically
Measurement system switchover		automatically, pressure dependent, error dependent
Chart recorder outputs		logarithmic 0 to 10 V (1 V / dec.) or linear 0 to 10 Volt error indication $U > 10.5 \text{ V}$
Extractor / Bayard-Alpert ($R_a = 2,5 \text{ k}\Omega$)		
Interface (standard / optional)		RS 232 C / Profibus
Switching thresholds (single operation or interval)		2 with floating changeover contact
Mains connection	V AC / Hz	90 – 264 / 50/60
Storage temperature range	°C	-40 to +60
Nominal temperature range	°C	+5 to +50
Dimensions of the benchtop instrument, (W x H x D)	mm	213 x 128.5 x 250
Weight, approx.	kg (lbs)	3.0 (6.62)

Ordering Information

IONIVAC IM 540

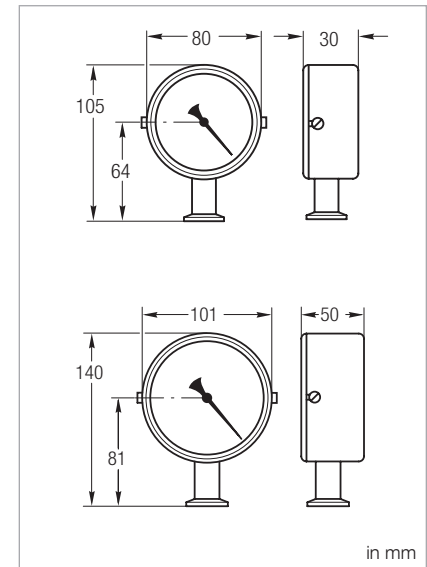
	Part No.
IONIVAC IM 540 with mains cord 2 m (EURO and US)	230 100
Options Profibus DP interface	230 101
Calibration	see chapter "Miscellaneous", para. "Leybold Calibration Service"
IONIVAC sensors IE 414, DN 40 CF Replacement cathode IE 414 IE 514, DN 40 CF Replacement cathode IE 514	158 66 158 63 158 67 158 61
Gauge head cables for IE 414/514 5 m 10 m 15 m 5 m, bakeable to 200 °C 10 m, bakeable to 200 °C	158 68 150 88 230 670 V01 158 44 230 671 V01
Extension cables for IE 414/514 10 m 20 m	245 002 200 02 937
THERMOVAC transmitter TTR	see chapter "Products", para. "Active Sensors"
Connection cable for THERMOVAC (Type A)	see chapter "Products", para. "Connection Cable for Active Sensors"
CERAVAC transmitter CTR	see chapter "Products", para. "Active Sensors"
Connection cable for CERAVAC (Type B)	see chapter "Products", para. "Connection Cable for Active Sensors"

Mechanical Gauges

Bourdon Vacuum Gauges



Rugged relative pressure vacuum gauges based on the Bourdon principle covering the pressure range from 1 to 1020 mbar (0.75 to 765 Torr).



Dimensional drawing for the BOURDONVAC A (top) and the BOURDONVAC C (bottom)

Advantages to the User

- Highly reliable, rugged, insensitive to vibrations
- Linear readout, independent of the type of gas
- Excellent media compatibility owing to the stainless steel movement (BOURDONVAC C)
- IP 54 protection (BOURDONVAC C)

Typical Applications

- Vacuum distillation
- Drying processes
- Vacuum conveying systems

Technical Data

BOURDONVAC A

BOURDONVAC C

Measurement range	mbar (Torr)	1 to 1020 (0.75 to 765)	
Measurement uncertainty	% FS	1	
Class 1 (EN 837)	% FS	1	
Overload range (abs. briefly)	bar	1.5	1.3
Storage temperature range	°C	-25 to +60	
Nominal temperature range	°C	+10 to +60	
Flange connection	DN	16 ISO-KF	
Length of scale	mm	207	188
Diameter	mm	80	101
Overall height	mm	105	140
Weight	kg (lbs)	0.25 (0.55)	0.5 (1.10)
Leak tightness	mbar x l/s	1 x 10 ⁻⁸	
Materials in contact with the medium		Nickel plated standard steel, bronze, soft solder	Stainless steel 1.4404

Ordering Information

BOURDONVAC A

BOURDONVAC C

	Part No.	Part No.
Bourdon vacuum gauge	160 40	161 20

Capsule Vacuum Gauges



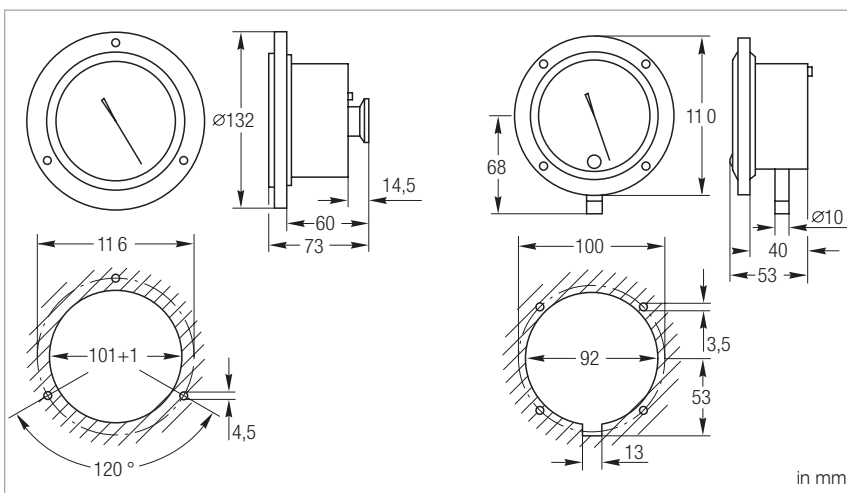
Rugged absolute pressure gauges for the pressure range from 1 to 1000 mbar (0.75 to 750 Torr).

Advantages to the User

- Rugged and insensitive to vibrations
- Models available for two measurement ranges (1 to 100 mbar (0.75 to 75 Torr) and 1 to 1000 mbar (0.75 to 750 Torr))
- Readout independent of the type of gas and changes in atmospheric pressure
- Linear pressure readout
- Installation direct via the connection flange or panel mounting
- Model with integrated isolation valve for use on packaging machines (Part No. 160 68)

Typical Applications

- Measurement of absolute pressures (for inert gases only)
- Vacuum conveying systems
- Operation monitoring
- Packaging



Dimensional drawings for the capsule vacuum gauges
Part Nos. 160 63/64 (left) and Part No. 160 68 (right)

Technical Data

Capsule Vacuum Gauge

Measurement range	mbar (Torr)	1 to 100 (0.75 to 75)	1 to 100 (0.75 to 75)	1 to 1000 (0.75 to 750)
Measurement uncertainty	% FS	1.0	2.5	1.6
Overload range (abs. briefly)	bar	1.5		
Storage temperature range	°C	-25 to +60		
Nominal temperature range	°C	+10 to +60		
Length of scale	mm	205	180	205
Dead volume, approx.	cm ³	235	167	235
Diameter	mm	132	110	132
Weight	kg (lbs)	0.7 (1.54)	0.6 (1.32)	0.7 (1.54)
Vacuum connection	DN	16 ISO-KF	10 mm dia. hose nozzle with integrated isolation valve	16 ISO-KF
Max. inclination when installed		45°		
Materials in contact with the medium		Brass, Standard steel nickel plated, Glass, NBR, Aluminum, Copper beryllium, Soft and hard solder, Resin		

Ordering Information

Capsule Vacuum Gauge

	Part No.	Part No.	Part No.
Capsule vacuum gauge	160 63	160 68	160 64

Diaphragm Vacuum Gauge DIAVAC DV 1000



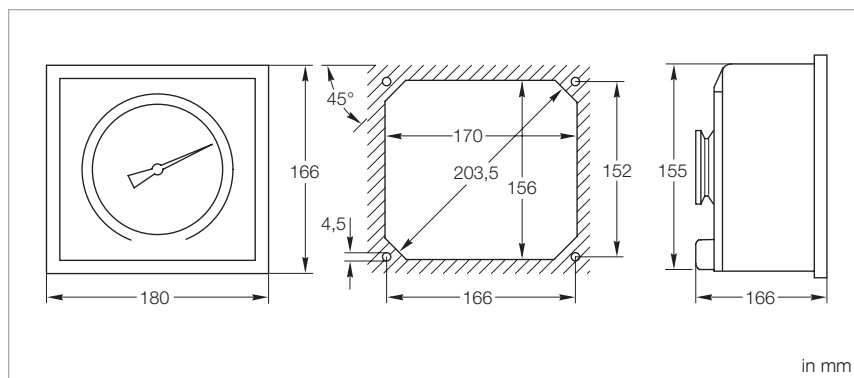
Rugged mechanical diaphragm vacuum gauge of high accuracy for the rough vacuum range from 1 to 1000 mbar (1 to 750 Torr).

Advantages to the User

- Wide measurement range from 1 to 1000 mbar (1 to 750 Torr) with high resolution in the range from 1 to 100 mbar (1 to 75 Torr)
- The scale of each gauge is individually calibrated
- Absolute pressure gauge
- Readout independent of the type of gas and changes in atmospheric pressure
- Stainless steel diaphragm for excellent compatibility with most media
- Laser welding technology for high precision diaphragm mount
- Rugged table-top housing, can be freely mounted above the flange connection; also for panel mounting
- Measurement chamber can be easily cleaned owing to the detachable measurement flange

Typical Applications

- Chemical processes
- Vacuum distillation
- Absolute pressure measurements for gas mixtures
- For use in explosion hazard rated areas
- Drying processes
- Lamp manufacture



Dimensional drawing and panel cut-out for the DIAVAC DV 1000

Technical Data

DIAVAC DV 1000

Measurement range	mbar (Torr)	1 to 1000 (1 to 750)
Measurement uncertainty		
1 – 10 mbar (1.0 - 7.5 Torr)		±1 mbar
10 – 600 mbar (7.5 - 450 Torr)		± 10% vom Messwert
Permissible overload (abs.)	bar	3
Storage temperature range	°C	-10 to +60
Nominal temperature range	°C	0 to +60
Length of scale	mm	270
Dead volume	cm ³	130
Dimension (W x H x D)	mm	180 x 166 x 100
Weight	kg (lbs)	2.7 (5.95)
Vacuum connection	DN	40 ISO-KF
Materials in contact with the medium		Stainless steel 1.4301, 1.4310 (diaphragm), FPM (FKM)

Ordering Information

DIAVAC DV 1000

	Part No.
DIAVAC DV 1000	
mbar display	160 67 ¹⁾
Torr display	896 06 ¹⁾
Factory calibration	154 22
Replacement sinter filter with centering ring, DN 40 ISO-KF	231 93 515
Replacement housing, complete	240 000

¹⁾ Complete with centering ring and sintered filter

Additional Sensors

Older Sensors / Replacement Sensors



Linear pressure sensor



Replacement sensor TTR 211



Replacement sensor TTR 216

Type

Corresponding Sensors/ Operating Units

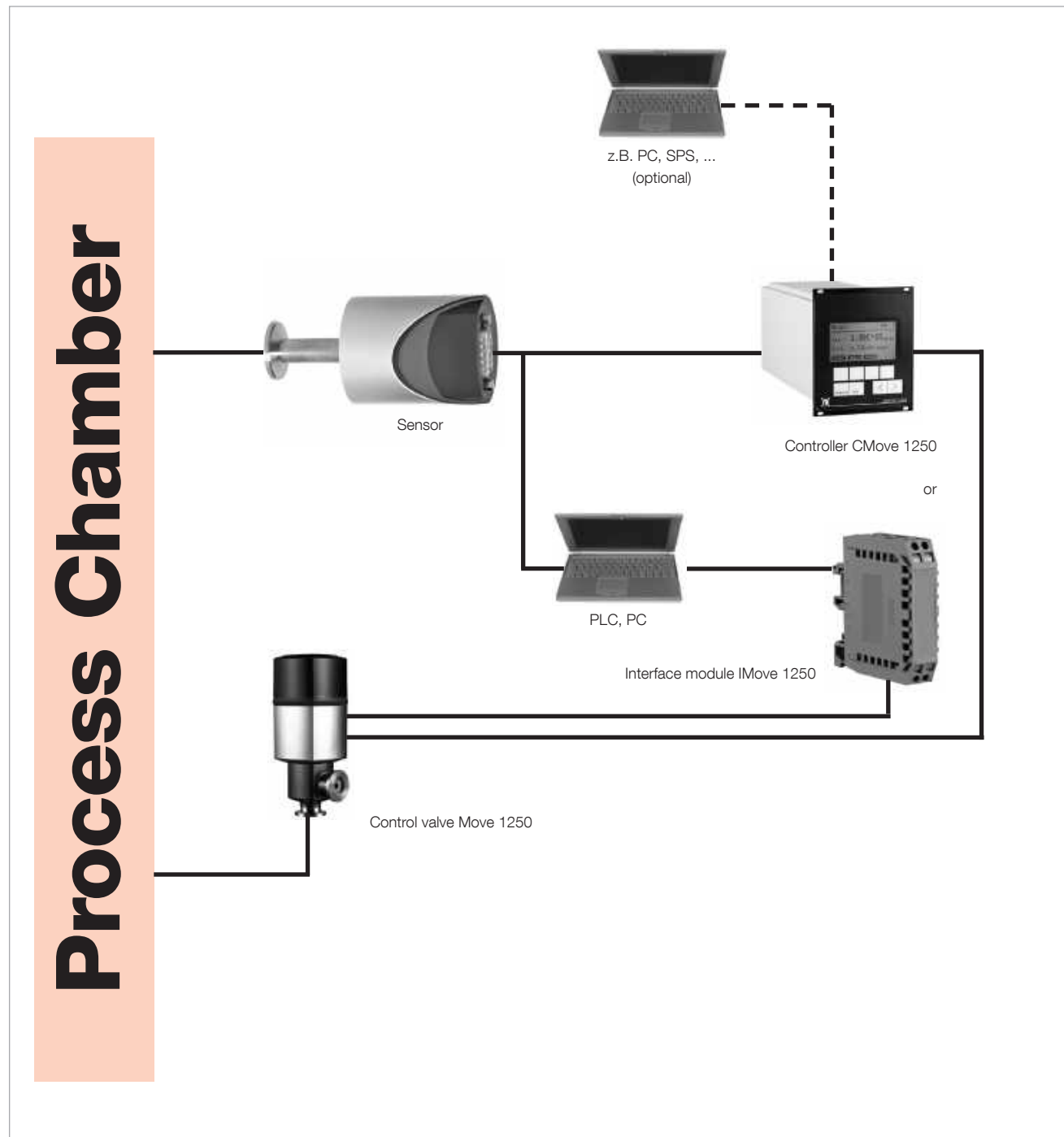
Ordering Information

		Part No.
Replacement sensor TTR 211	TTR 211 PB / D	E 157 75
Replacement sensor TTR 216	TTR 216 PB / D	E 157 77
Replacement sensor IE 100 DN 25 ISO-KF DN 40 CF	ITR 100 ITR 100	E 163 61 E 163 67
Replacement spare cathode IE 413	IM 510	158 63
Linear pressure sensor (Previous version)	DI 200 DI 201 DI 2000 DI 2000 Adaptor	158 12 158 14 158 13 245022V01

¹⁾ For all DI-Sensors

Pressure Switches and Control Instruments

Pressure Control System Move



Control Valve Move 1250



Control valve Move 1250

Control Valve Move 1250

Advantages to the User

- Extended control range from 1×10^{-6} to 1250 mbar x l/s
- High controllable gas throughput
- Corrosion resistant owing to FPM (FKM)/stainless steel
- In combination with CMove the valve closes automatically in the event of a power failure
- Valve driven either by the controller CMove 1250 or by a PC or a PLC through the IMove interface
- Electromotive pressure control with variable gas flow (upstream regulation) or with variable conductance (downstream regulation)

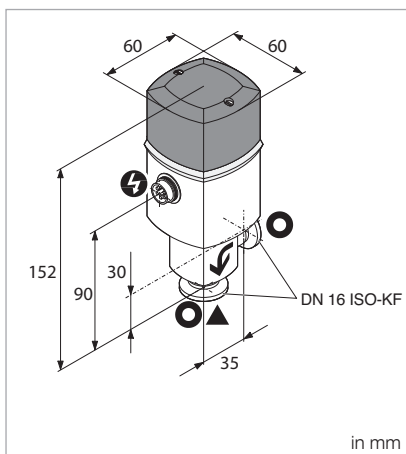
Technical Data

Control Valve

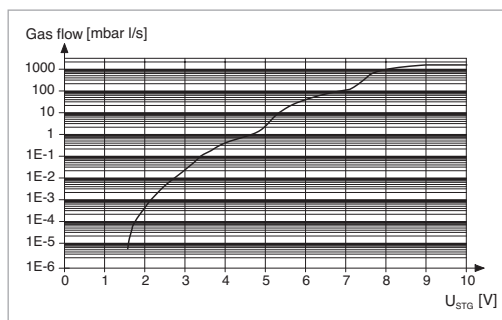
Move 1250

Vacuum connection		DN 16 ISO-KF
Mounting orientation		Any
Leak tightness	mbar x l/s	1×10^{-9}
Pressure range		1×10^{-8} mbar to 2.5 bar (absolute)
Gas flow ¹⁾		
with filter, on the inlet side	mbar x l/s	5×10^{-6} bis 1250 mbar x l/s
with filter, on the inlet and the vacuum side		5×10^{-6} to 1000
Power supply		
Operation voltage	V DC	24 ($\pm 10\%$)
Power consumption	VA	12
Current consumption	mA	500, 20 to 30 (closed circuit current)
Actuation	V DC	Step motor
Digital		CMove or IMove 1250
Analog		0 to 10
Type of protection	IP	40
Closing time / opening time	s	3 / 4
Ambient temperature	°C	+5 to +40
Bake out temperature		
Valve body	°C	80
Actuator	°C	60
Material		
Valve body		Stainless steel 1.4435
Valve needle, valve disc		Stainless steel 1.4301
Filter		Stainless steel 1.4404
Seals		FPM
Dosing sleeve		Fluorplastomer
Weight	kg (lbs)	0.5 (1.1)

¹⁾ For air at a differential pressure of $\Delta p = 1$ bar



Dimensional drawing for the Move 1250



Gas flow curve of the Move 1250

Ordering Information

Control Valve Move 1250

	Part No.
Control Valve Move 1250	230 219
Accessories Filter for the inlet or vacuum side consisting of filtering candle, O-ring and two securing rings	109 63
Connection cable CMove 1250 - Control valve Move 1250	
3 m	230 220
5 m	230 221
10 m	230 222
15 m	230 223
20 m	230 224
25 m	230 225

Controller CMove 1250



Controller CMove 1250

Technical Applications

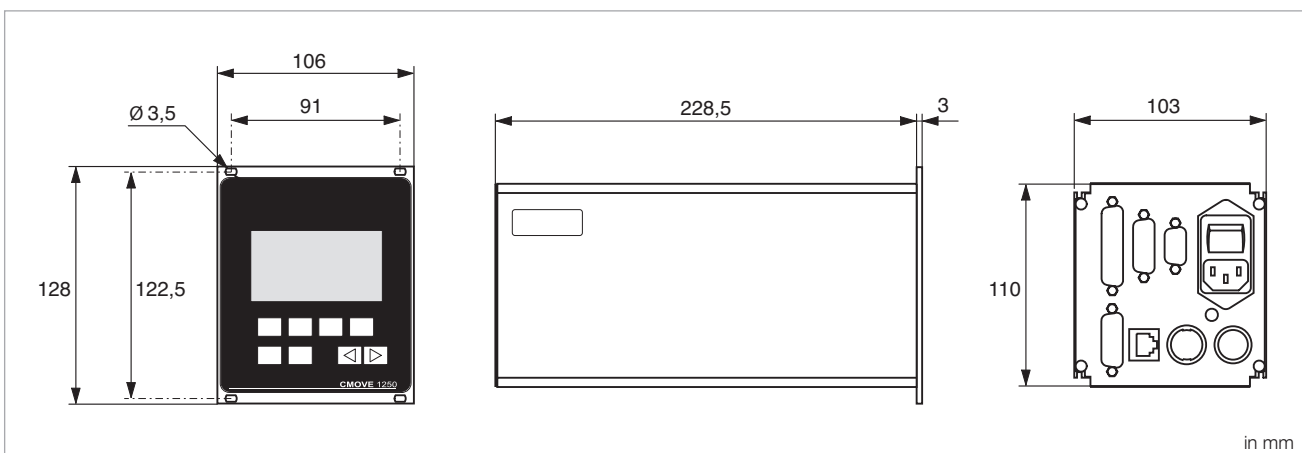
- Simple to operate
- Self-explanatory LCD display and function keys
- Analog/digital inputs/outputs and interfaces
- Digital input valve control, switch-over
- Pressure and gas flow adjustment
- Digital output valve control, error message
- Adjustable PID control algorithms
- 99 pre-programmed PI control algorithms for fast and simple operation
- For installation or tabletop use (1/4 19")

Typical Applications

The controller CMove in connection with the electric control valve Move 1250 or Move X is suited for applications in the areas like for example

- Semiconductor industry
- Analytical
- Coating
- Quality control
- Surface treatment

as well as in all applications where simple, fast and accurate pressure control is desired and necessary.



Dimensional drawing for the CMove 1250

Technical Data

Controller CMove 1250

Power supply		
Mains voltage, 50/60 Hz	V AC	90 – 250
Power consumption	VA	50
Control types		Auto = (PI) adjustable in 1 to 99 selectable steps PID = PID is user adjustable
Control accuracy ¹⁾		0,5% F.S. sensor
Display		LCD 64 x 128 Pixel
Display units (selectable)		
Pressure		mbar, Torr, Pa, mV
Flow		mbar l/s, Torr l/s, Pa l/s, mV
Measurement range		
Pressure control		
CERAVAC		
THERMOVAC		
PENNINGVAC (not for PTR 90)		
IONIVAC		
0 to 10 V linear	mV	0 to 10.000
Flow control		
with MOVE 1250		CLOSED, 5.0×10^{-6} to 1.25×10^{-3} mbar x l/s
with MOVE X		CLOSED, 1.0×10^{-5} to 1.0×10^{-2} mbar x l/s
with analog output AA 2	mV	0 to 10 000
Operating mode		Gas flow regulation (upstream regulation) Pressure regulation (downstream regulation)
Operating		Local operation or remote control
Digital input		Flow matching, opening/closing of external valves / operating mode flow/regulation / switching on of emission/degas
Digital output		Valve position indication; valve fault; sensor fault; status message for sensor and valve; pressure regulation upstream/downstream
Analog input		0 to 10 V DC setpoint pressure/flow
Analog output		0 to 10 V DC, Pressure sensor signal, valve signal, valve position MOVE 1250
Serial interface		RS 232 C, RS 485 C
Housing		1/4 19", for installation or tabletop use
Weight	kg (lbs)	1.65 (3.64)
Temperature		
Operation	°C	+5 to +50
Storage	°C	-40 to +60
Protection class	IP	30 (EN 60 529)

¹⁾ Valid for sensor setting 0 to +10 V linear and analog output A02

Ordering Information

Controller CMove 1250

	Part No.
Controller CMove 1250	230 200
Control valve Move 1250	230 219
Connection cable CMove 1250 – Control valve Move 1250	
3 m	230 220
5 m	230 221
10 m	230 222
15 m	230 223
20 m	230 224
25 m	230 225
Sensor cable TTR 90, TTR 100, TTR 101, TTR 211, TTR 216, PTR 225, PTR 237	
5 m	124 26
10 m	230 012
15 m	124 27
20 m	124 28
30 m	124 29
50 m	124 31
75 m	124 32
100 m	124 33
ITR 90, ITR 100, ITR 200	
5 m	124 55
10 m	230 022
15 m	124 56
20 m	124 57
30 m	124 58
CTR 90, CTR 91, CTR 100, CTR 101	
5 m	230 013
10 m	230 014
15 m	230 015
20 m	230 016
30 m	230 017
50 m	230 019
75 m	230 020
100 m	230 021

Interface Module IMove 1250 for Move 1250



Advantages to the User

- Status query and valve position

Typical Applications

The interface module IMove 1250 connects a RS 232C interface (for example from a computer or a PLC) to the digital interface of the Move 1250 control valve.

Technical Data

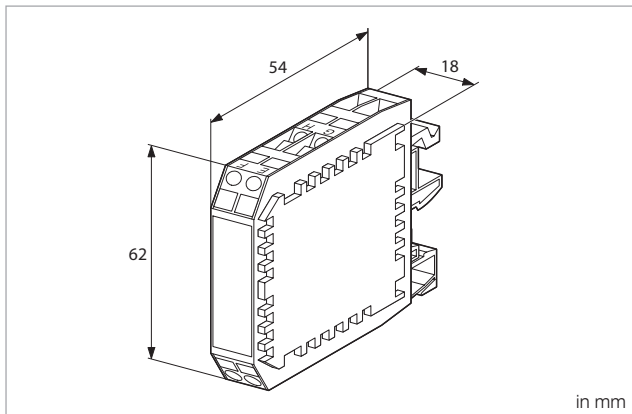
Interface-Modul IMove 1250

Temperature		
Operation	°C	+5 to +50
Storage	°C	-10 to +65
Protection class	IP	30
Operation voltage	V DC	24 ± 10%
Current consumption		
IMove 1250	mA	< 50 (own consumption)f)
Move 1250	mA	< 500
Provide upfront fusing		1 AT
Interface		RS 232 C
Mounting		
Support rails		EN 50022-35 (symmetrical) EN 50035-G32 (asymmetrical)
Weight	g	40

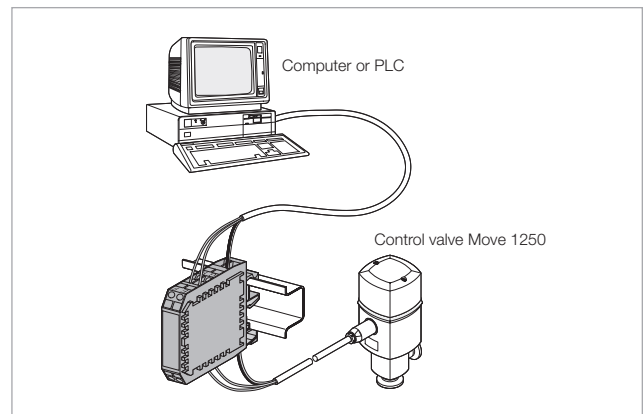
Ordering Information

Interface Module IMove 1250

	Part No.
Interface Module IMove 1250	230 201



Dimensional drawing for the IMove 1250



Connection of the IMove 1250

Low Pressure Safety Switch PS 113 A



Switch indicating whether or not the pressure has reached the level of the atmospheric pressure after venting. Preset diaphragm pressure switch set to a trigger of 6 mbar (4 Torr) below atmospheric pressure.

Advantages to the User

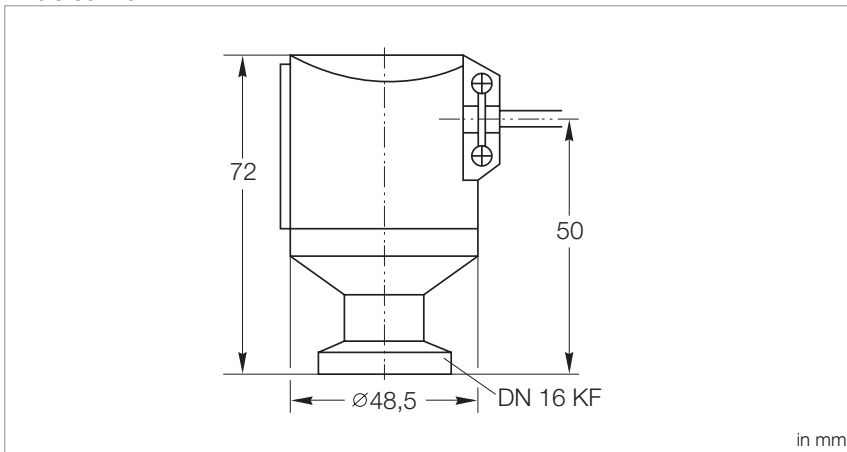
- Rugged design
- High switching capacity
- Corrosion protected
- Easy to use
- IP 44 protection
- Can be connected to a programmable control

Typical Applications

- Venting facilities
- Safety shutdown of vacuum systems
- Load locks
- Increased switching capacity when using the switching amplifier SV 110

Technical Note

Due to the diaphragm material used (EPDM) the PS 113 A is not suited for applications in which the process gas contains large quantities of helium. Owing to helium permeation, the leak rate of the diaphragm for helium amounts to values $\leq 1 \times 10^{-4}$ mbar x l/s.



Dimensional drawing for the low pressure safety switch PS 113 A

Technical Data

Low Pressure Safety Switch

Switching pressure	mbar (Torr)	Approx. 6 (4.5) below atmospheric pressure
Return switching pressure	mbar (Torr)	3 (2.3) below atmospheric pressure
Switching inaccuracy	mbar (Torr)	2 (1.5)
Max. permissible operating pressure (abs.)	mbar (Torr)	2000 (1500)
Storage temperature range	°C	-25 to +85
Nominal temperature range	°C	0 to +85
Switching contact		Changeover contacts, gold-plated, for prog. controls
Contact life		> 10 ⁵ switching cycles
Switching capacity		100 mA / 24 V AC 30 mA / 24 V DC
Electrical connection		6.3 mm flat plug
Vacuum connection	DN	16 ISO-KF
Helium permeation	mbar (Torr)	≤ 5 x 10 ⁻⁵
Dead volume	cm ³	2
Materials in contact with the medium		Stainless steel 1.4305, Stainless steel 1.4310, Stainless steel 1.4300 PTFE coated, EPDM
Weight	g	315
Protection class	IP	44

Ordering Information

Low Pressure Safety Switch

	Part No.
Low pressure safety switch PS 113 A, DN 16 ISO-KF; complete with 3 m long cable	230 011

Pressure Switch PS 115

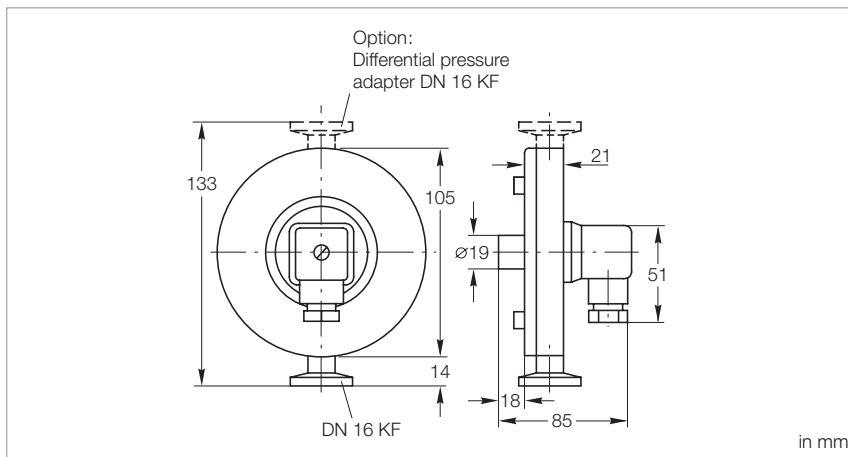


Rugged absolute pressure switch with electrical switching contact and an adjustable switching pressure between 0.5 and 2000 mbar (0.4 and 1500 Torr).

Through the differential pressure adapter (optional) the PS 115 pressure switch may be converted to operate as a differential pressure switch. The adapter consists of a DN 16 ISO-KF flange with screw-in thread and a sealing arrangement, and it is screwed into the PS 115 instead of the adjustment valve. The operating range extends to 2000 mbar (1500 Torr). Brief over-loading to 3000 mbar (2250 Torr) is permissible without impairing switching accuracy. In this operating range differential values of +5 to -20 mbar (+3.75 to -15 Torr) can be adjusted via the set screw.

Advantages to the User

- High switching accuracy (± 0.1 mbar)
- Stable long term operating characteristics
- Rugged, corrosion protected design
- Increased switching capacity (floating) when using the switching amplifier SV 110
- Switching contact (n.c.) in the reference chamber and thus protected against corrosion
- For operating pressures up to 3 bar
- For high ambient temperatures
- Upon request, the switching threshold may be set in the factory



Dimensional drawing for the pressure switch PS 115

Technical Data

Pressure SwitchPS 115

Switching range	mbar (Torr)	0.5 to 2000 (0.375 to 1500)
Overload limit	mbar (Torr)	3000 (2250)
Sensitivity	mbar (Torr)	0.1 (0.75)
Switching hysteresis	mbar (Torr)	0.5 (0.375)
Temperature coefficient	%/°K	0.4 of the switching value
Nominal temperature range		
briefly (max. 8 h)	°C	120
continuous	°C	0 to +90
Switching contact		Plug
Switching voltage	V	24
Switching current (max.)	mA	10
Contact resistance, max.	kΩ	1
Electrical connection		Plug (DIN 43 650)
Protection class	IP	65
Vacuum connection	DN	16 ISO-KF
Materials in contact with the medium		
Measurement chamber		Stainless steel 1.4301; 1.4401; 1.4310; 1.3541; FPM /FKM
Reference chamber		Stainless steel 1.4301; 1.4401; 1.3541; Glass; Gold
Volume of the measurement chamber approx.	cm ³	4
Volume of the reference chamber, approx.	cm ³	20
Weight	kg (lbs)	1.3 (2.87)

Ordering Information

Pressure SwitchPS 115

	Part No.
Pressure Switch PS 115, DN 16 ISO-KF	160 04
Pressure switch adjustment	160 05
For floating installations without SV 110, Clamping ring DN 16 ISO-KF, plastic Centering ring, DN 16 ISO-KF, plastic	200 28 306 200 28 307
Option Differential pressure adapter, DN 16 ISO-KF for connection to the PS 115	160 74
Spare parts kit PS 115	E 160 06
SV 110 switching amplifier	160 78

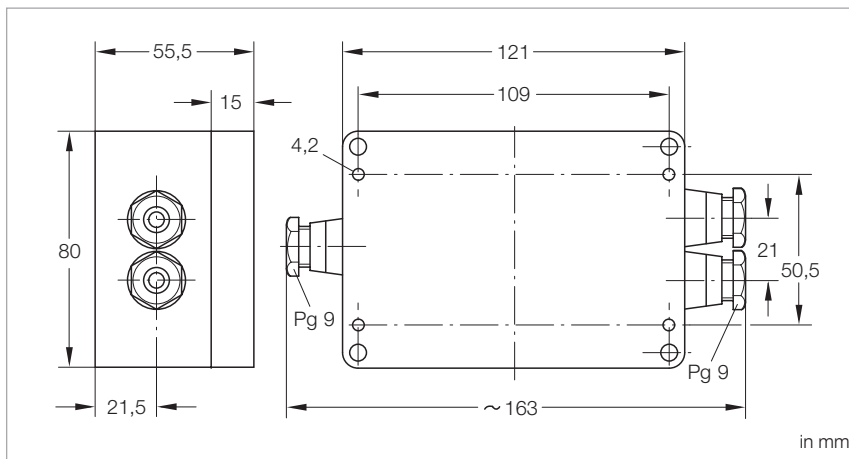
Switching Amplifier SV 110

The diaphragm contact of the pressure switches is connected on one side to ground and is rated to 24 V / 10 mA max. When wanting to switch higher voltages or currents, a switching amplifier will be needed. The switching amplifier is equipped with powerful floating changeover contacts. The output relay is energized as soon as the pressure drops below the switching threshold set up on the pressure switch.

The electrical connections are provided via screw terminals and are run out of the plastic enclosure through PG fittings.

Advantages to the User

- Increased ratings for the switch
- Changeover contact



Dimensional drawing for the switching amplifier SV 110

Technical Data

Switching Amplifier SV 110

Mains connection 50/60 Hz (selectable)		110/130/220/240 V
Power consumption	VA	3
Output relay		
Switching voltage / current	V / A	250 / 5
Switching power, max.	VA	500
Response time	ms	30
Release time	ms	7
Control circuit	V / mA	24 / 10
Ambient temperature, max.	°C	50
Weight, approx.	kg (lbs)	0.36 (0.79)

Ordering Information

Switching AmplifierSV 110

	Part No.
Switching amplifier SV 110	160 78

Diaphragm Pressure Regulators MR 16/MR 50



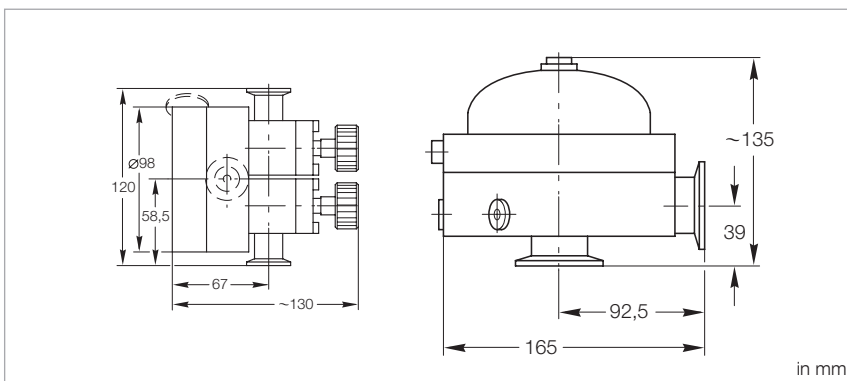
The MR 16/50 diaphragm regulators are absolute pressure regulators which automatically adapt the pumping speed of a vacuum pump depending on the amount of gas, without the need for an external power supply.

Advantages to the User

- Non-incremental, automatic pressure control
- Simple setting of the control pressures
- High control accuracy
- Corrosion protected stainless steel design
- Easy to disassemble for cleaning and maintenance
- Trouble-free operation in ex. areas
- Built-in isolation valves for the process connection and the vacuum pump (MR 16)

Typical Applications

- Distillation processes of all kinds
- Solvent recovery
- Drying processes
- Temperature control on bath cryostats
- Degassing of liquids and plastics



Dimensional drawing for the diaphragm regulator MR 16 (left) and MR 50 (right)

Technical Data

Diaphragm Pressure Regulator

MR 16

MR 50

Control range	mbar (Torr)	10 to 1000 (7.5 to 750)	
Control inaccuracy		± 2% of the pressure control (10 – 90% of flow)	
Throughput	m³/h	16	50
Nominal temperature range	°C	+5 to +100	
Storage temperature range	°C	-25 to +60	
Temperature coefficient	%/K	0.3	
Setting time	ms	5	
Permissible overload for brief periods	bar	3	
Diaphragm material		FPM (FKM)/EPDM	
Housing material		stainless steel 1.4571	
Installation orientation		Any	
Dimensions		see dimensional drawing	
Vacuum connection	2x DN	16 ISO-KF	40 ISO-KF
Measurement connection	3x thread R	1/8"	
Weight, approx.	kg (lbs)	2.7 (6.0)	8.0 (17.6)

Ordering Information

Diaphragm Pressure Regulator

MR 16

MR 50

	Part No.	Part No.
Diaphragm pressure regulator MR 16, DN 16 ISO-KF MR 50, DN 40 ISO-KF	160 25 -	- 160 27
Options Stainless steel measurement flange, DN 16 ISO-KF, for connection to a reference and/or process chamber or pumping stud KALREZ diaphragm	160 26 -	160 26 200 28 597
Spare Parts EPDM diaphragm and seal kit Viton diaphragm and seal kit Seal kit MR 50, incl. EPDM and Viton diaphragms Adjustment screw for the adjustable valve, complete with seal	EK 160 29 EK 160 31 - 240 001	- - EK 160 32 240 001

Products

Residual Gas Analyzers

LEYSPEC view and LEYSPEC ultra



The LEYSPEC product family offers simple and intuitive operation with an on-board control and display unit. Simple residual gas analysis is possible without even connecting the device to a computer.

Due to the intuitive interface, the Residual Gas Analyzer (RGA) is very easy to operate. At the push of a button, you can display the partial pressures of key gases and if your process involves an additional gas, you can assign it to the spare display channel. Due to the high bake-out temperatures achievable, the RGA is ideal for use in demanding high vacuum and ultra high vacuum applications.

The LEYSPEC RGA offers greatest sensitivity combined with an intuitive software that allows all basic and advanced test procedures.

Advantages to the User

- **Intuitive software**
The intelligent and intuitive LEYSPEC software completes the offering. The easy user interface allows a wide range of use cases, from simple operations to complex analysis. Creating recipes is as easy as it should be: Quick and convenient. During operation the total pressure is displayed and different views can be chosen to fit the view for the purpose of the analysis. Choose between the scan mode, trend mode or analog mode
- **Highest Sensitivity**
The LEYSPEC product family offers the highest sensitivity for the most accurate residual gas analysis. This allows detecting even the smallest traces of contaminants or process gases
- **Highest bake-out**
With its high bake out temperatures of up to 300°C, the LEYSPEC ultra is perfectly suited for sophisticated high and ultra high vacuum applications. The LEYSPEC ultra range offers highest bakeout temperature so even in harsh environments reliable gas analysis can be performed
- **Advanced feature**
Preinstalled software functions allow many additional functionalities and test procedures such as a helium leak test or setting of warnings and error levels for selectable gases. A programmable degas function is implemented for simple process degassing after start or exposure to atmosphere. The background suppression allows focussing on the important peaks
- **Different product types**
The new LEYSPEC range offers the perfect solution for any application in mass spectrometry. Focusing on residual gas analysis the product range offers solutions for 100, 200 or 300 amu – depending on the process requirements. All products come with the integrated display for easy and quick operations as well as the LEYSPEC software for sophisticated test procedures and residual gas analysis. Compact in size and mountable in any orientation, the LEYSPEC product range is perfectly suited for different built-in situations

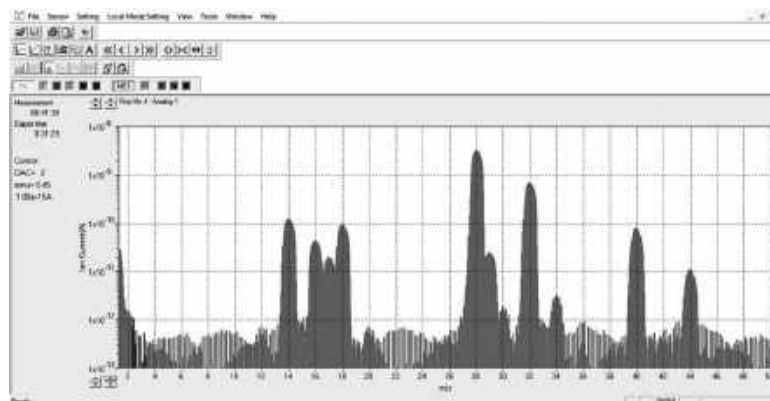
Typical Applications

LEYSPEC view

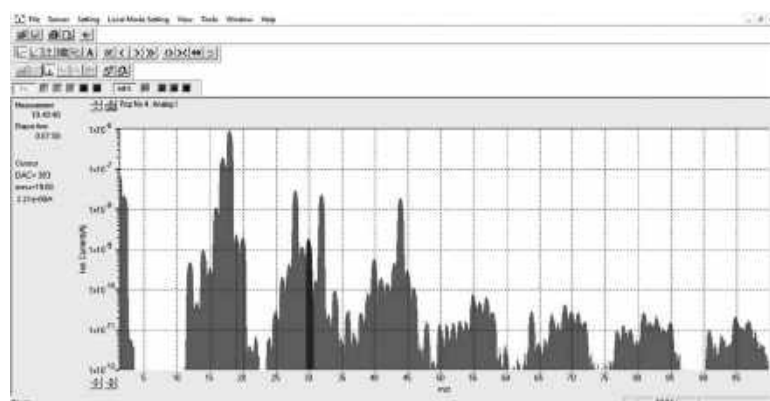
- Residual gas analysis in high vacuum pumping equipment
- Gas analysis in R&D, freeze drying, analytical systems and many more
- Analysis of organic materials
- Environmental tracking
- Gas impurity analysis

LEYSPEC ultra

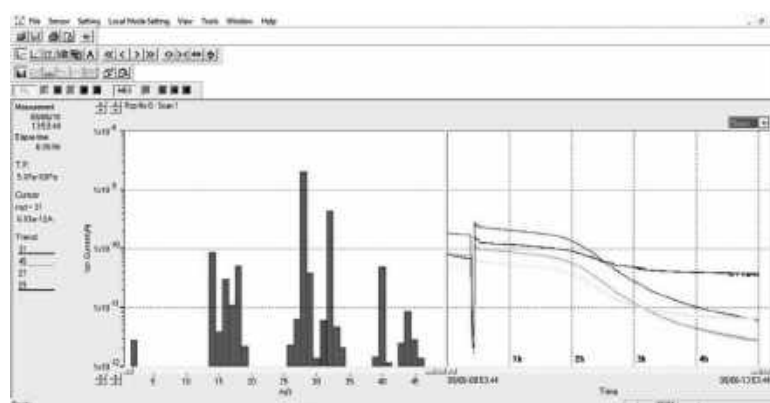
- Advanced range for all residual gas analysis
- For sophisticated residual gas analysis with higher sensitivity
- Reliable detection of very low partial pressures
- Suited for higher bake-out temperatures



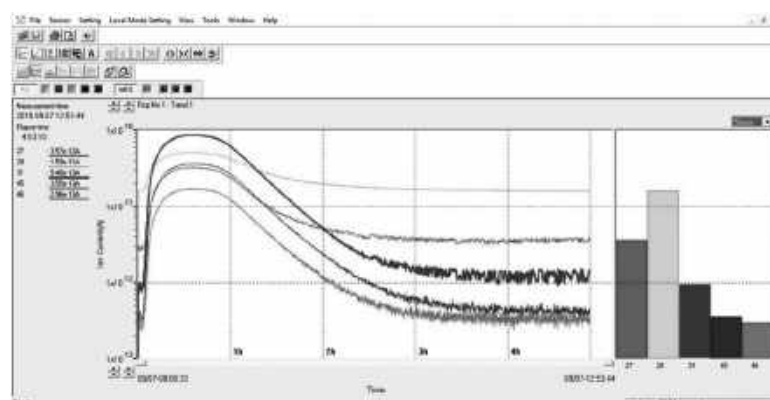
Analog mode



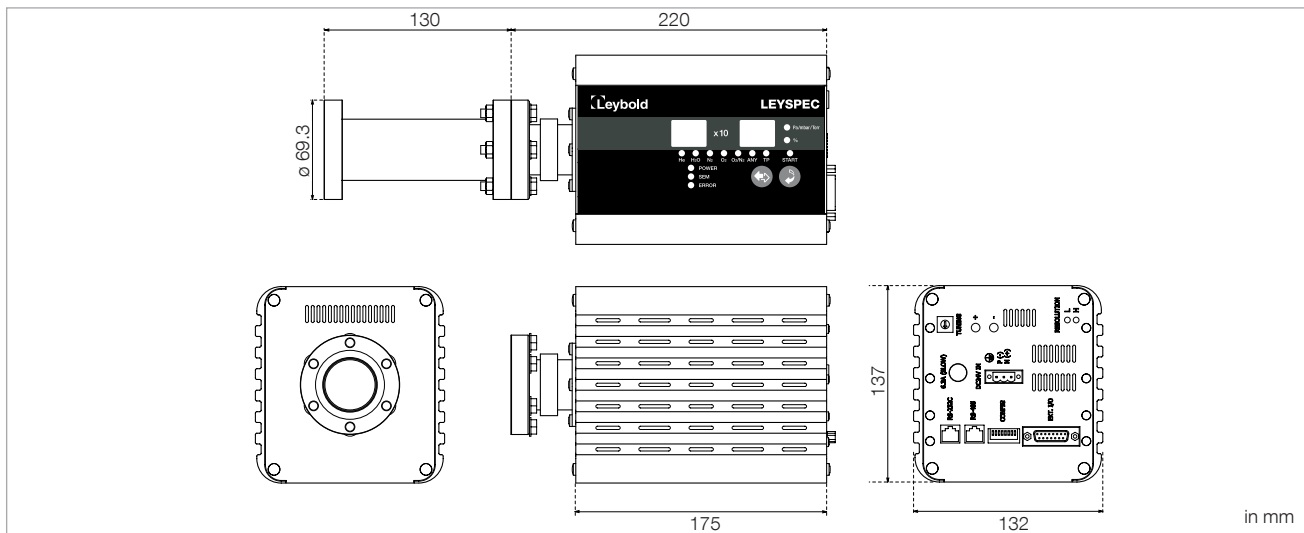
Analog mode hydrocarbons



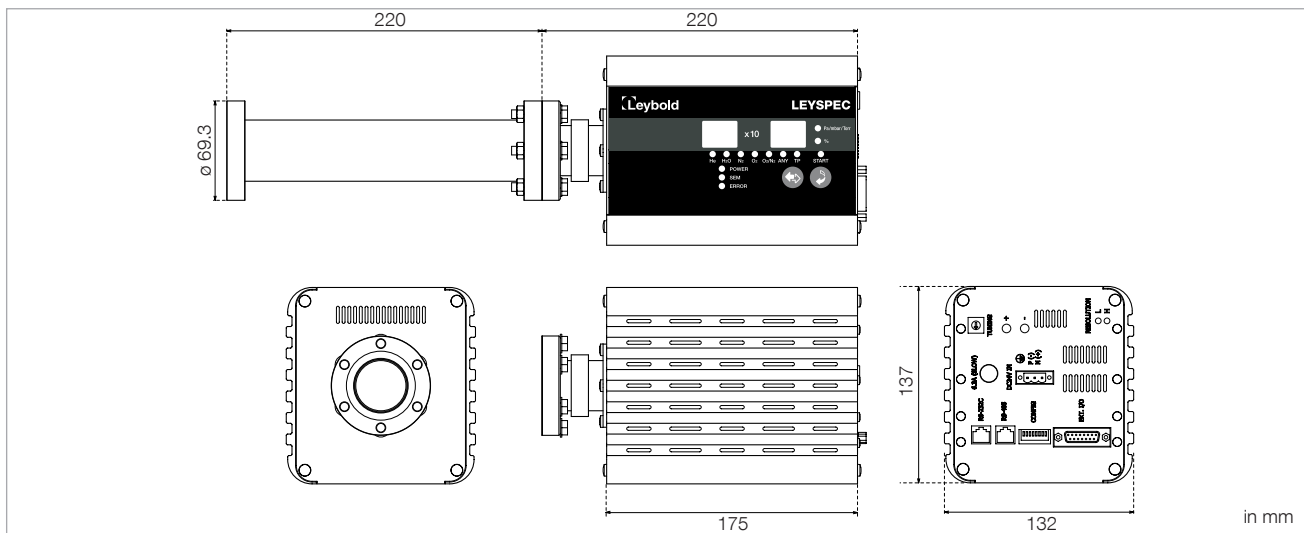
Scan and trend mode



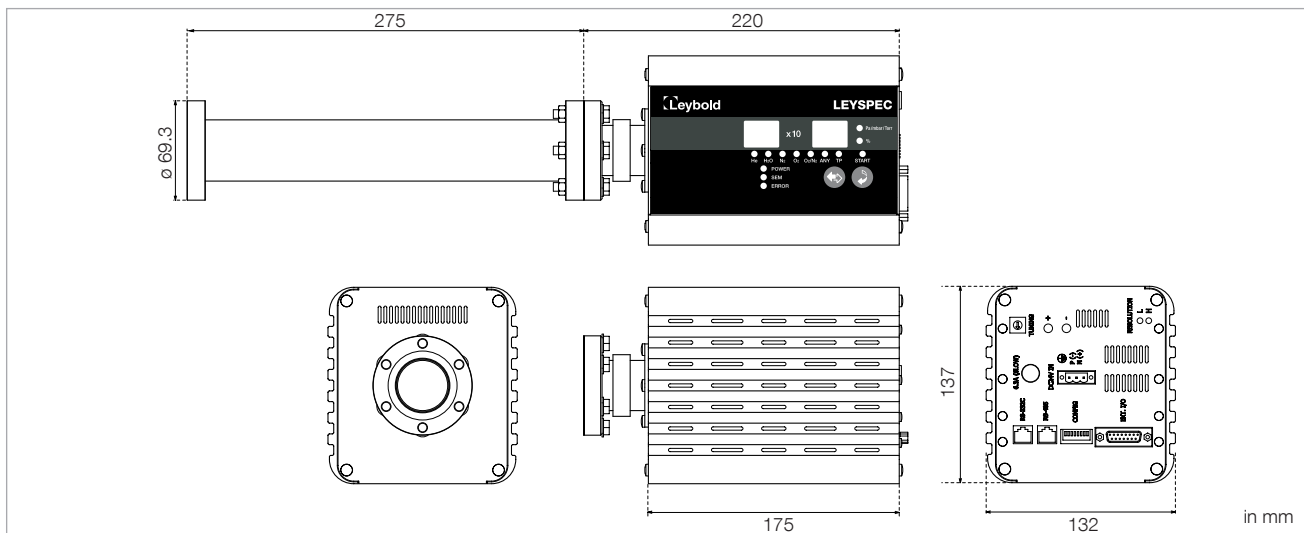
Trend mode



Dimensional drawing for LEYSPEC view 100 / 200



Dimensional drawing for LEYSPEC view 100S / 200S



Dimensional drawing for LEYSPEC ultra 200S / 300S

Technical Data

LEYSPEC

[view 100](#) [view 100S](#) [view 200](#) [view 200S](#) [ultra 200S](#) [ultra 300S](#)

Mass range	amu	1 - 100	1 - 100	1 - 200	1 - 100	1 - 100	1 - 300
Mass filter type		QMS					
Detector type		Faraday cup	EM / Faraday cup	Faraday cup	EM / Faraday cup	EM / Faraday cup	EM / Faraday cup
Sensitivity	A / mbar	1×10^{-5}	$400/1 \times 10^{-5}$	1×10^{-5}	$400/1 \times 10^{-5}$	$400/2.5 \times 10^{-4}$	$400/2.5 \times 10^{-4}$
Minimum detectable partial pressure	mbar	1×10^{-10}	$1 \times 10^{-14} / 1 \times 10^{-10}$	1×10^{-10}	$1 \times 10^{-14} / 1 \times 10^{-10}$	$1 \times 10^{-12} / 1 \times 10^{-11}$	$1 \times 10^{-12} / 1 \times 10^{-11}$
Maximum operating pressure	mbar	1×10^{-4}					
Filament material		Ir/Y203					
Operating temperature	°C	10 - 40					
Maximum sensing temperature	°C	120	120	120	120	250	250
Maximum bake out temperature (electronics removed)	°C	250	250	250	250	300	300
Connection flange		DN 40 CF					
Power input		DC 24 V \pm 10% 50 W					
Weight	kg	2.6	2.8	2.6	2.8	3.2	3.2
IP		30					
Serial communication		RS232C / RS485					
Software		LEYSPEC software					
Resolution		M / DeltaM = 1M(10%PH)					

Vacuum Measuring,
Controlling

Ordering Information

LEYSPEC

[view 100](#) [view 100S](#) [view 200](#) [view 200S](#) [ultra 200S](#) [ultra 300S](#)

	Part No.	Part No.	Part No.	Part No.	Part No.	Part No.
LEYSPEC	220010V01	220011V01	220012V01	220013V01	220020V01	220021V01

Leybold Calibration Service



Calibration of vacuum gauges in the pressure range from 10^{-8} to 1000 mbar (10^{-8} to 750 Torr) as DAkkS or factory calibration.

Advantages to the User

- Clear reference to the reference quantities
 - Reproducible measurements
 - Constantly high quality over time
 - Reliable checking of existing gauges
 - Unambiguous description of the process
- Since 1981 Leybold has been offering to all customers an impartial calibration service for gauges and sensors of any make. A DAkkS calibration certificate or a factory calibration certificate is issued for every calibration. Instruments with insufficient long-term stability or such instruments where the principle of measurement is not suited for calibration, can not be calibrated.
- ### Typical Applications
- Calibrated vacuum gauges are used under the following conditions:
- If the requirements concerning reproducibility and comparability of experiment runs are high
 - If an unambiguous reference is required for a large number of pressure gauges
 - If an unambiguous description for processes is required
 - If for experiments and processes unambiguous traceability of the measured pressures to basic quantities is demanded by the authorities
 - If testing to DIN/ISO 9000 is required in the following areas
 - Research
 - Thin-film engineering
 - Manufacture of systems
 - Military
 - Energy
 - Chemistry production
 - Production of pharmaceuticals and herbicides
 - Sputtering systems
 - Aircraft and space industry
 - Manufacture of lamp

DAkkS / Factory Calibration

It is the task of the Deutschen Akkreditierungsstelle (DAkkS) to ensure traceability of industrial measurements and testing to national standards.

The DAkkS is supported jointly by the Federal Institution for Physics and Technology (PTB), the industry, the Federal Minister for Economics and the Western European Metrology Club (WEMC).

The transfer standards in the DAkkS calibration facility used by Leybold are checked regularly (recalibrated) by the PTB.

Within the framework of the DAkkS, the calibration system at Leybold has been checked and approved by the PTB and the applied transfer standards have been calibrated by the PTB.

Factory calibrations were performed with standards which have not been calibrated directly at the PTB; instead the transfer standards of the in-house calibration service are used. Thus traceability to national standards is ensured in both cases.

Technical Data**DAkkS Calibration**

Calibration range	mbar (Torr)	to 10 ⁻³	to 10 ⁻⁵	to 10 ⁻⁸
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Ordering Information**DAkkS Calibration**

	Part No.	Part No.	Part No.
DAkkS Calibration	157 12	157 13	157 14

Technical Data**Factory Calibration**

Calibration range	mbar (Torr)	to 10 ⁻³	to 10 ⁻⁵	to 10 ⁻⁸
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Ordering Information**Factory Calibration**

	Part No.	Part No.	Part No.
Factory Calibration	154 22	154 23	154 24

For PENNINGVAC transmitters only Factory Calibration is available.

Calibration Systems are described in the Catalog Part "Vacuum Pump Systems".

Leak Detecting Instruments

PHOENIX Helium Leak Detectors

270.00.02

Excerpt from the Leybold Full Line Catalog (Edition 06/2018)
Catalog Part Leak Detecting Instruments

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Leak Detecting Instruments

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Applications for Leak Detecting Instruments

Test Instruments / Leak Detectors	PHOENIX Quadro	PHOENIX Quadro dry	PHOENIX Magno	PHOENIX Magno dry	PHOENIX Vario	PHOENIX Vario (oil sealed)
Applications						
Semiconductor production	■	■	■	■	■	
Vacuum coating	■	■	■	■		■
Research and development	■	■	■	■	■	■
Chemistry/pharmaceutical	■	■	■	■	■	■
Metallurgy/furnaces	■		■		■	■
Metallurgy/furnaces	■		■			■
Automotive industry	■		■			■
Laser engineering	■	■	■	■		
Particle accelerators		■		■	■	
Analytical engineering	■	■	■	■	■	■
Systems with cryopumps	■	■	■	■	■	■
Cooling and air conditioning		■		■	■	
Electrical engineering	■	■	■	■	■	■
Mechanical engineering	■		■			■
Power plants	■		■			■
Systems engineering	■	■	■	■	■	■
UHV applications	■	■	■	■	■	■

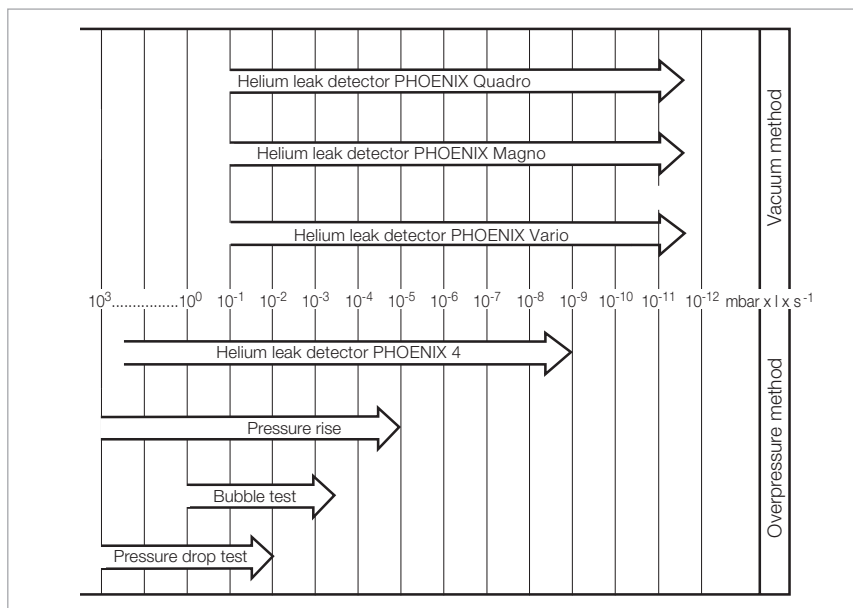
Leak Detection – Leak Testing

Whether a component or a system is leak-tight depends on the application it is to be used in and the leak rate that is acceptable. Absolutely leak-tight components and systems do not exist. A component is considered technically leak-tight if its leak rate remains below a value defined for this particular component. In order to provide a quantitative measure, the term “leak rate” with the symbol “ q_L ” was introduced. In vacuum technology mbar x l/s is used as the unit for leak rates.

A leak rate of 1 mbar x l/s exists in a closed vessel having a volume of 1 liter when the pressure increases by 1 mbar within one second, or in case of an overpressure it decreases by 1 mbar within one second.

$$q_L = \frac{V \times \Delta p}{\Delta t} \text{ (mbar x l/s)}$$

The wide range of leak rates from several 100 mbar x l/s to below 10^{-11} mbar x l/s as they occur in practice necessitates the use of different leak



Overview of the leak rate detection ranges

detection principles and hence leak detectors (see figure). Besides the determination of the total leak tightness, it is usually important to locate the leak, quickly and precisely, in order to seal it. Instruments for local

leak detection are called leak detectors. The leak detectors presented in this product section can be used for the localization of leaks, and in addition some are suitable for determining the total leak rate of test objects.

Leak Rate

	Pa x m³/s	atm x cm³/s ^{*)} mbar x l/s ^{*)}	atm x cm³/s ^{*)} cm³/s ^{*)}
Pa x cm³/s	1	10	9.87
1 mbar x l/s (He)	0.1	1	0.99
1 atm x cm³/s ^{*)} = cm³ (STP) /s	0.101	1.01	1
1 Torr x l/s ^{*)}	0.133	1.33	1.33
1 kg/h air	23.4	234	234
1 g/a C ₂ H ₂ F ₄ (R 134a)	$6,41 \times 10^{-7}$	$7,58 \times 10^{-6}$	$6,3 \times 10^{-6}$

Leak Rate

	atm x cm³/s ^{*)} Torr x l/s ^{*)}	kg/h Air	g/a C₂H₂F₄ (R 134a)
Pa x cm³/s	7.5	4.28×10^{-2}	2.28×10^6
1 mbar x l/s (He)	0.75	4.3×10^{-3}	2.28×10^5
1 atm x cm³/s ^{*)} = cm³ (STP) /s	0.76	4.3×10^{-3}	2.3×10^5
1 Torr x l/s ^{*)}	1	5.7×10^{-3}	3.0×10^5
1 kg/h air	175	1	–
1 g/a C ₂ H ₂ F ₄ (R 134a)	$4,8 \times 10^{-6}$	–	1

^{*)} According to international system of units only Pa x m³/s is permissible

Leak Detection Methods

There are two main groups of leak detection methods; for both there are special instruments available:

Vacuum Methods

The equipment to be tested is evacuated. The pressure ratio between inside and outside is 0:1.

Overpressure Methods

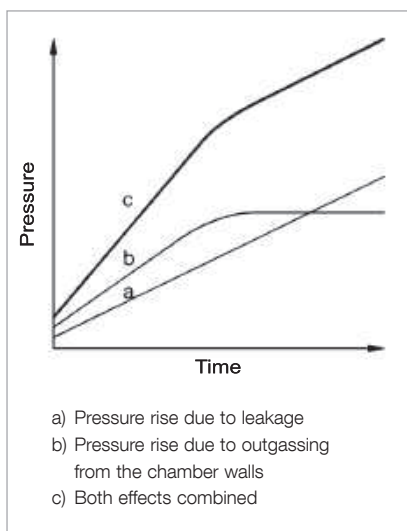
The equipment to be tested is pressurized with a search gas or a search gas mixture.

The pressure ratio between inside and outside is over 1:1.

Between the two methods there exist many variations depending on the particular application.

General Notes

1. The lowest leak rates can only be measured by employing the vacuum method, whereby the following applies: The lower the leak rate, the higher the requirements are concerning cleanliness and ultimate vacuum.
2. If possible the test objects should be tested under the same conditions that will be used in their final application, i.e. parts for vacuum operation should be tested according to the vacuum method and parts for overpressure operation should be tested using the overpressure method.



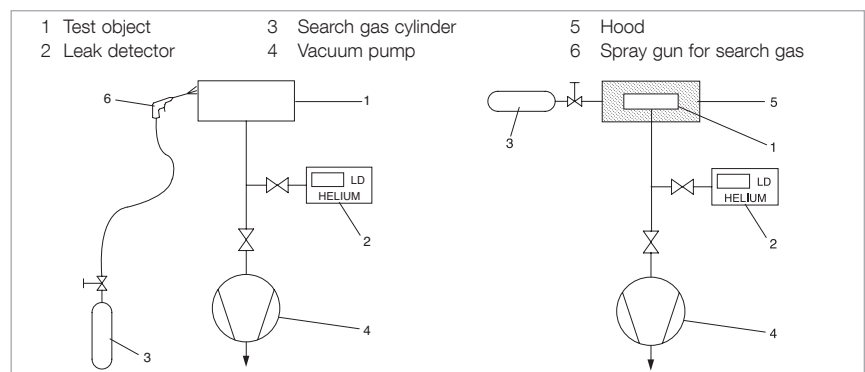
Pressure rise in a vacuum chamber after switching off the pump; double log. plot

Leak Testing Based on Vacuum Methods

(Vacuum inside the test object.)

Pressure Rise Method

With this method it is only possible to determine the total leak rate. The test object is evacuated with a vacuum pump or a vacuum pump system. A valve is used to isolate the test object from the vacuum pump. The pressure will then rise as a function of time. Curve **(a)** shows the theoretical pressure rise if there is only a leak. Curve **(b)** shows the pressure rise due to outgassing from the surfaces of the test object. This pressure rise tends to tail off in the direction of a saturation level. If in such a case the time allowed for monitoring the pressure rise is too short, a leak will be indicated which in reality does not exist. If one waits long enough for the pressure to rise, i.e. after the bend of curve **(b)** the outgassing process can then be disregarded, so that the leak rate can be determined from the known volume of the test object and the measured pressure rise over a fixed rise time (see equation on page before). Curve **(c)** shows the pressure rise as it occurs in practice, where out-gassing and leak rate add. The detectable leak rate depends on the volume of the test object, the obtained ultimate pressure and the out-gassing from the test object. In connection with very large test objects this method is time consuming if extremely low leak rates are to be determined in the fine and rough vacuum range.



Local leak detection – Evacuated test object (left) and Integral method – Evacuated test object (right)

Local Leak Detection

The test object is evacuated by a vacuum pump (auxiliary pump) until the pressure is low enough for the leak detector to operate. When using a helium leak detector, its own pump system will take care of further evacuation. Suspicious spots on the test object will then be sprayed with a fine jet of search gas. Search gas entering through leaks into the test object is pumped out by the vacuum pump and it is converted by the leak detector into an electrical signal which is then displayed. This permits rapid detection and determination of the size of even the smallest leaks.

Integral Method

Determination of the total leak rate of a test object. The testing arrangement is the same as for local leak detection, but in this case the test object is not sprayed with search gas on selected areas, but it is surrounded by a hood or a chamber which is filled with the search gas. Thus the entire outer surface of the test object comes into contact with the search gas. If the search gas enters the test object, the total leak rate is indicated independently of the number of existing leaks. With helium leak detectors it is possible to determine the helium content of the air. This is utilized in the detection of gross leaks.

Leak Testing Based on Overpressure Methods

(Overpressure within the test object.)

Pressure Drop Method

The test object is filled with a gas (for example air or nitrogen) until the testing pressure is reached. Precision vacuum gauges are used to detect a possible pressure drop during the testing period. This method is simple to implement, it is suitable for the determination of gross leaks and can be improved upon by using differential pressure gauges. By applying soap solutions or similar, leaks can be located.

Local Leak Detection with Leak Detectors – Sniffing

The test object is filled with the search gas or the search gas/air mixture to which the leak detector is sensitive. The leak detector is equipped with a sniffer probe, whereby there is a low pressure at the probe tip. If the sniffer tip passes suspicious points on the test object the search gas coming out of the leak is sucked in and transferred to the detection system of the leak detector. After conversion into electrical signals these are displayed optically and acoustically by the leak detector.

Integral Method – Hood Test

To determine the total leak rate of a test object subjected to a search gas overpressure, the test object is surrounded by a hood of a known volume. The search gas which escapes through the leaks collects in the hood.

After a fixed accumulation period a sniffer probe is used to measure the concentration of the search gas which has collected in the hood.

Before this the leak detector should be calibrated by a reference measurement using a known search gas concentration.

The leak rate can then be determined by the equation for q_L where V is the volume of the hood, Δp is the partial pressure difference of the search gas (concentration change) and t is the accumulation period.

Uncertainties in the determination of the volume, leaks in the hood and a wrong accumulation period make precise leak rate measurements based on this method very questionable.

Integral Method – Vacuum Hood Test

This test is a variation of the hood test described above, which has considerable advantages. A vacuum chamber which is evacuated by an auxiliary pump and which is connected to a leak detector is used as the hood. The search gas escaping through the leaks is converted by the detection system of the leak detector into electrical signals which are immediately displayed. After calibration of the leak detector with a calibrated leak it is possible to quantitatively determine the total leak rate.

This method permits the detection of very small leaks and is especially suited for automatic industrial leak detection.

Integral Method – Bombing-Test

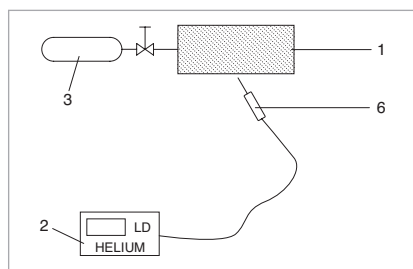
This method is used for testing hermetically sealed components such as transistors, IC-packages or dry reed relays. It is basically a variation of the vacuum hood test. Here the test objects are placed in a vessel which is pressurized with the search gas – preferably helium. At a fairly high search gas pressure and after a period of up to several hours it is tried to enrich the search gas inside leaky test objects. This is the actual so called “bombing” process.

After this, the test objects are transferred to a vacuum chamber and their total leak rate is determined in the same way as in the vacuum hood test. During evacuation of the vacuum chamber down to the required testing pressure, those test objects which have a gross leak already lost their accumulated search gas. These parts are not detected as leaking during the actual leak test. Therefore the test with the vacuum chamber is often preceded by a “bubble test”.

This method permits the detection of the lowest leak rates and is used mainly in automatic industrial leak testing especially when it is not possible to fill the parts with gas in any other way.

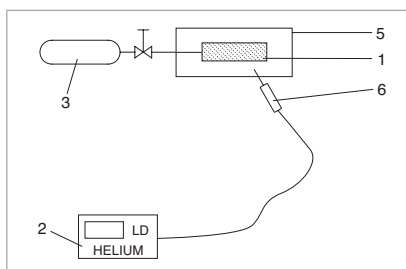
Key to the Figures

- | | |
|-----------------|-----------------------|
| 1 Test object | 3 Search gas cylinder |
| 2 Leak detector | 4 Vacuum pump |

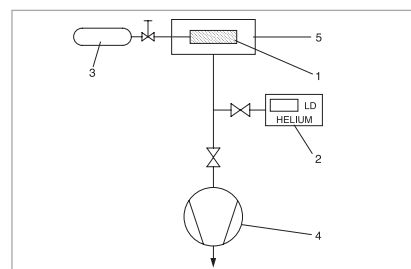


Local leak detection –
Search gas overpressure in the test object

- | |
|-----------------|
| 5 Hood |
| 6 Sniffer probe |



Integral method (search gas accumulation)
Search gas overpressure in the test object



Integral method –
Search gas overpressure in the test object

Operating Principles of the Helium Leak Detectors

Operating Principle

A helium leak detector performs the localization of leaks and the quantitative determination of the leak rate, i.e. the gas flow through the leak. Such a leak detector is therefore a helium flow meter.

In practice the leak detector performs this task by firstly evacuating the part which is to be tested, so that gas from the outside may enter through an existing leak due to the pressure difference present. If only helium is brought in front of the leak (for example by using a spray gun) this helium flows through the leak and is pumped out by the leak detector. The helium partial pressure present in the leak detector is measured by a sector mass spectrometer and is displayed as a leak rate. This is usually given in terms of volume flow of the helium (pV-flow).

Important Specifications

The two most important features of a leak detector are its measurement range (detection limits) and its response time.

The measurement range is limited by the lowest and the highest detectable leak rate. The lowest detectable leak rate is defined by the sum of drift and noise in the most sensitive measurement range. Usually the sum of noise amplitude and zero drift per minute is made to be equivalent to the lowest detectable leak rate. With leak detectors the amount of drift is so low, that the noise amplitude alone determines the detection limit.

The highest detectable leak rate depends strongly on the method employed. Especially the counterflow method and partial flow operation (see description below) perform with the measurement of very high leak rates even with a sensitive helium leak detector. In addition the multistage switchable high impedance input amplifiers of the leak detectors

also perform with the measurement of high leak rates.

In practical applications, especially in the localization of leaks the response time is of great significance. This is the time it takes from spraying the test object with helium until a measured value is displayed by the leak detector. The response time of the electronic signal conditioning circuitry is an important factor in the overall response time. In the case of leak detectors the response time of the electronic circuitry is well below 1 s.

The volume flow rate for helium at the point of the test object is of decisive significance to leak detection on components which are pumped down solely by the leak detector. This volume flow rate provided by the leak detector takes care of the helium entering through a leak and it ensures quick detection by the leak detector. On the other hand the volume of the test object delays the arrival of the helium signal. The response time can be calculated on the basis of the following simple equation:

$$\text{Response time for helium } t_A = 3 \frac{V}{S_{He}} \quad (\text{for 95\% of the final value})$$

with V = Volume of the test object
 S_{He} = Volume flow rate for helium at the point of the test object
 (or at the inlet of the leak detector, if it alone pumps down the test object).

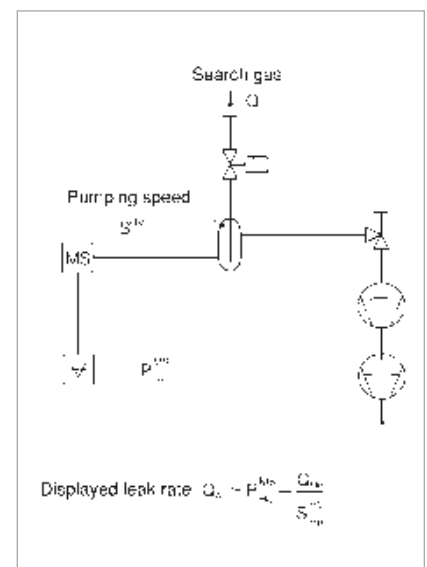
Main Flow Method

This operating principle of helium leak detectors is based on the main flow method and was long time the classic method of leak detectors. Here the entire helium flow passes through the high vacuum system of the leak detector, where the mass spectrometer measures the partial pressure of the helium. In this, the use of a liquid nitrogen cold trap is essential to remove water vapor or other condensable gases in the vacuum system which impair the operation. Moreover, the use of a cold trap performs the low operating pressures for the mass spectrometer to be reached (below 10^{-4} mbar) despite the directly connected (and possibly contaminated) test object.

The advantages of the main flow method are:

- Highest sensitivity, i.e. low detection limit
- Short response time due to a high volume flow rate at the inlet.

The disadvantage of the main flow method is that the gas flow is being led through the mass spectrometer thus particles like dust and dirt penetrate into the measuring system and may disturb the helium measurements.



Main flow method

Counterflow Method

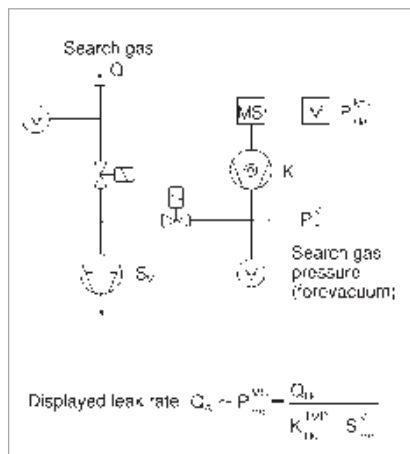
With this method the test object is not connected to the high vacuum. Instead it is connected to the forevacuum (between turbomolecular pump and backing pump), so that the entire gas flow (especially water vapor) does not contribute to the pressure increase in the mass spectrometer. Thus a cold trap is no longer required!

The helium which now enters the forevacuum can still be detected, as it is able to flow against the pumping direction of the turbomolecular pump into the mass spectrometer. This is due to the high particle velocity of the helium. The sensitivity of this counterflow arrangement is equal to that of the main flow principle, provided the right combination of volume flow rate of the backing pump and helium compression of the turbomolecular pump is used.

The advantages of the counterflow method are:

- No liquid nitrogen is required
- High permissible inlet pressures (i.e. pressure within the test object)

This makes the counterflow method especially suitable for mobile leak detection on systems. For leak detection on larger components where a short response time is essential (i.e. high volume flow rate) an additional turbomolecular pump stage is required at the inlet of the leak detector.



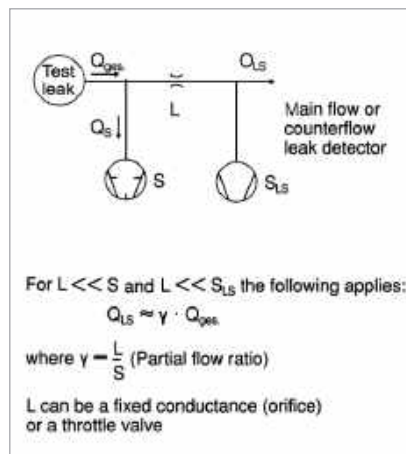
Counterflow method

Partial Flow Method

In order to expand the measurement range in the direction of higher leak rates and for operation at higher inlet pressures, helium leak detectors incorporate a partial flow or a gross leak system. This consists basically of a throttle and a rotary vane pump. At pressures above the normal inlet pressure (main flow: above 10^{-2} mbar, counterflow: above 10^{-1} mbar) or in the case of high helium leak rates, the inlet valve is closed and the main flow is allowed to enter the partial flow pump, whereas only a small part enters the leak detector via the partial flow throttle. Thus the total pressure and the helium pressure are dropped to values suitable for operation of the leak detector.

To obtain correct leak rate readings in the partial flow mode, the partial flow ratio, i.e. the ratio between the actually measured gas flow and the total gas flow must be known and stable.

In all leak detectors this is achieved by a partial flow throttle made of ruby with a precisely machined hole. This ensures that the quantitatively determined leak rates are always correct without calibration, even for gross leaks.



Partial flow method

Calibration of Helium Leak Detectors with Calibrated Leaks

In the process of leak detection one expects that a test object which does not have a leak produces a zero reading on the leak detector. In this any malfunctions are excluded. Thus calibrated leaks, i.e. artificial leaks which produce a known helium leak rate are essential for reliable results.

To obtain a quantitatively correct leak rate reading the sensitivity of the leak detector must also be adjusted. This requires the use of a calibrated leak.

Leybold offers calibrated helium leaks of various designs covering the range between 10^{-9} to 10^{-4} mbar x l/s as part of the standard range of products. All leak rates are traceable to the standards of the DAkkS Calibration Service controlled by the PTB (Federal Institution of Physics and Technology).

If requested each helium calibrated leak can be supplied with a calibration certificate issued by the DAkkS Calibration Service. The calibration itself is performed by the DAkkS Calibration Service for Vacuum which is run by Leybold on behalf of the PTB.

Products

Fourth PHOENIX Generation

The new PHOENIX 4 family sets new standards in helium leak detection.

The product portfolio provides the perfect device for a variety of applications. The PHOENIX Quadro – as a universal, portable helium leak detector – is the all-rounder in its class. For applications with larger test volumes, which require faster pump down or

repeated measuring cycles from atmosphere to test pressure, the PHOENIX Magno provides just the right high pumping speed. Full flexibility is achieved with the PHOENIX Vario, which knows to convince with its unique compactness and free selection of the backing pump that is to be connected.

All versions are suited for the use in vacuum as well as sniffer operation. The PHOENIX Quadro and PHOENIX Magno are available with oil-sealed or dry-running backing pump as well as in a variety of different voltage versions.



PHOENIX Quadro

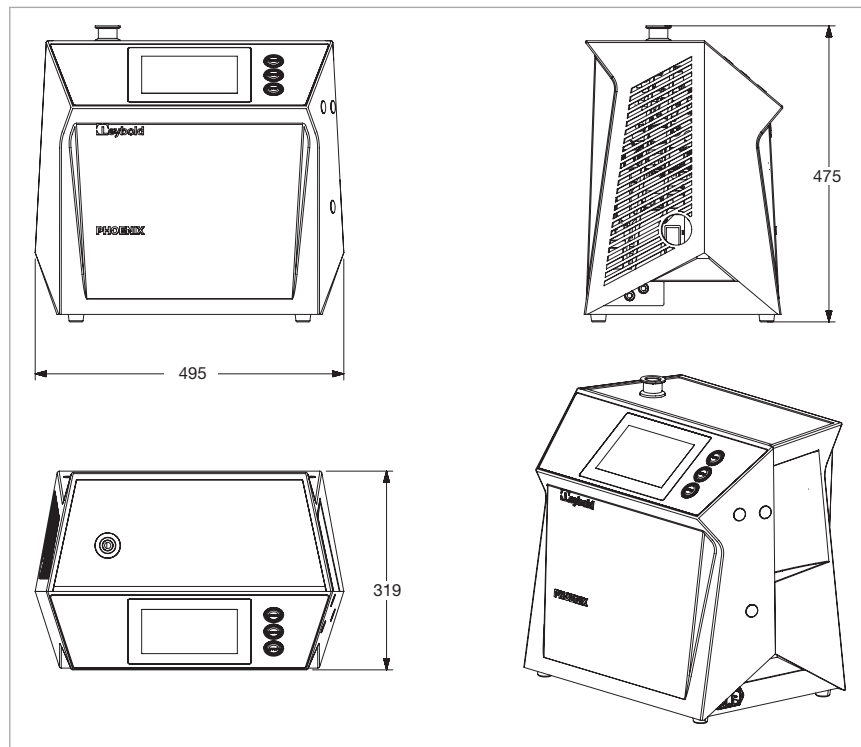


The PHOENIX Quadro is a portable helium leak detector, which can be used in many different applications. The accurate measuring system and the intuitive operation of the PHOENIX Quadro ensure simple and highly reliable leak detection. The PHOENIX Quadro dry has a dry-running backing pump and thus an oil-free pump system.

When it comes to applications that require oil-free pumping, the PHOENIX Quadro dry is therefore the ideal choice for reliable and efficient leak detection.

Advantages to the User

- Detects even the smallest leak quickly and reliably
- Very fast operational readiness
- Extremely short response times
- Rapid decontamination time in case of helium contamination
- Very high detection sensitivity
- Convenient remote control via smartphone or tablet PC without software installation
- Variety of interfaces for optimal device communication
- Innovative color touch display
- Long life span of the components
- Oil-free pumping system with the PHOENIX Quadro dry
- Internal data memory as well as simple data output via USB



Dimensional drawing PHOENIX Quadro (Dimensions in mm)

Technical Data

PHOENIX 4

		Quadro	Quadro dry
Minimum detectable helium leak rate			
Vacuum mode	mbar x l/s	$\leq 5 \times 10^{-12}$	
Sniffer mode	mbar x l/s	$< 1 \times 10^{-9} ^{1)}$	
Minimum detectable hydrogen leak rate			
Vacuum mode	mbar x l/s	$\leq 1 \times 10^{-8}$	
Sniffer mode	mbar x l/s	$< 1 \times 10^{-7}$	
Units of measurement (selectable)			
Pressure		mbar, Pa, atm, Torr	
Leak rate		mbar x l/s, Pa x m ³ /s, Torr x l/s, atm x cc/sec, sft ³ /yr	
Sniffer mode		ppm, g/a eq, oz/yr eq	
Leak rate measurement range	mbar x l/s	1×10^{-12} to 1×10^{-1}	
Measurement ranges		12 decades	
Max. inlet pressure	mbar (Torr)	15 (11.25)	
Pumping speed during the evacuation process			
50 Hz	m ³ /h (cfm)	2.5 (1.5)	3.4 (2.0)
60 Hz	m ³ /h (cfm)	3.0 (1.8)	3.8 (2.2)
Pumping speed (helium) at the inlet			
GROSS mode	l/s	0,4	0.04
FINE mode	l/s	1.2	1.2
ULTRA modes	l/s	> 3.1	> 3.1
Time constant of the leak rate signal (blanked off, 63% of final value)	s	< 1	
Run-up time (after starting)	s	≤ 110	
Mass spectrometer		180° magnetic sector field	
Ion source		2 filaments; iridium/yttria-oxide	
Detectable masses	amu	2, 3 and 4	
Inlet port	DN	25 ISO-KF	
Dimensions (W x H x D)	mm	495 x 475 x 318	
Weight	kg (lbs)	41 (90.39)	35 (77.16)
Available languages		English, German, Chinese, Japanese (Katakana), Korean Russian, French, Italian, Spanish and Polish	

Ordering Information

PHOENIX 4

	Quadro	Quadro dry
	Part No.	Part No.
PHOENIX Quadro EURO version 230 V, 50/60 Hz	250000V02	-
PHOENIX Quadro US version 115 V, 60 Hz	251000V02	-
PHOENIX Quadro Japan version 100 V, 60 Hz	251100V02	-
PHOENIX Quadro 100 – 240 V, 50/60 Hz	-	250001V02

¹⁾ Depending on the used sniffer line and site conditions. Leakage rate signal after zero: 1×10^{-8} mbar x l/s when using the sniffer line SL 300 or SL 301

For further accessories see para. "Accessories for PHOENIX Quadro, PHOENIX Magno and PHOENIX Vario"

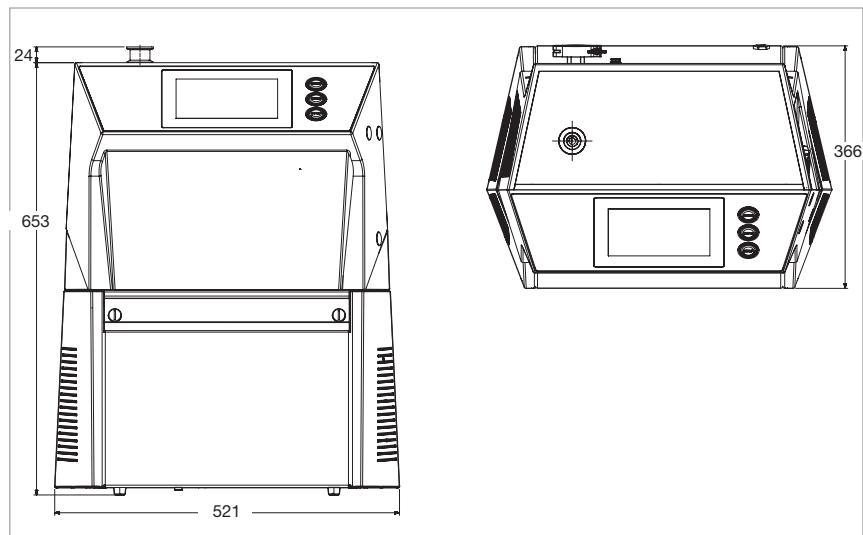
PHOENIX Magno



The PHOENIX Magno is the high-performance leak detector in the PHOENIX 4 Series. With added fore vacuum suction capacity, the PHOENIX Magno ensures very rapid evacuation times and is therefore particularly suited for larger test volumes. It has the same, highly-precise measuring system as the PHOENIX Quadro. The oil-tightened version together with the integrated SOGEVAC SV16D provides highest suction capacity. The dry version has an integrated SCROLLVAC SC5D for applications that require an oil-free pump system.

Advantages to the User

- Very high suction capacity for rapid measuring cycles
- Detects even the smallest leaks quickly and reliably
- Very fast operational readiness
- Extremely short response times
- Rapid decontamination time in case of helium contamination
- Very high detection sensitivity
- Convenient remote control via smartphone or tablet PC without software installation
- Variety of interfaces for optimal device communication
- Innovative color touch display
- Long life span of the components
- Oil-free pumping system with the PHOENIX Magno dry
- Internal data memory as well as simple data output via USB



Dimensional drawing PHOENIX Magno (Dimensions in mm)

Technical Data

PHOENIX 4

		Magno	Magno dry
Minimum detectable helium leak rate			
Vacuum mode	mbar x l/s	$\leq 5 \times 10^{-12}$	
Sniffer mode	mbar x l/s	$< 1 \times 10^{-9}$ ¹⁾	
Minimum detectable hydrogen leak rate			
Vacuum mode	mbar x l/s	$\leq 1 \times 10^{-8}$	
Sniffer mode	mbar x l/s	$< 1 \times 10^{-7}$	
Units of measurement (selectable)			
Pressure		mbar, Pa, atm, Torr	
Leak rate		mbar x l/s, Pa x m³/s, Torr x l/s, atm x cc/sec, sft³/yr	
Sniffer mode		ppm, g/a eq, oz/yr eq	
Leak rate measurement range	mbar x l/s	1×10^{-12} to 1×10^{-1}	
Measurement ranges		12 decades	
Max. inlet pressure	mbar (Torr)	15 (3.75)	
Pumping speed during the evacuation process			
50 Hz	m³/h (cfm)	15 (8.83)	5 (2.94)
60 Hz	m³/h (cfm)	17 (10.01)	6 (3.53)
Pumping speed (helium) at the inlet			
GROSS mode	l/s	2.6	1.2
FINE mode	l/s	1.2	1.2
ULTRA modes	l/s	> 3.1	> 3.1
Time constant of the leak rate signal (blanked off, 63% of final value)	s	< 1	
Run-up time (after starting)	s	110	
Mass spectrometer		180° magnetic sector field	
Ion source		2 filaments; iridium/yttria-oxide	
Detectable masses	amu	2, 3 and 4	
Inlet port	DN	25 ISO-KF	
Dimensions (W x H x D)	mm	521 x 679 x 371	
Weight	kg (lbs)	67 (147.71)	57 (125.66)
Available languages		English, German, Chinese, Japanese (Katakana), Korean Russian, French, Italian, Spanish and Polish	

Ordering Information

PHOENIX 4

	Magno	Magno dry
	Part No.	Part No.
PHOENIX Magno EURO version 200 – 230 V, 50/60 Hz	350000V02	350001V02
PHOENIX Magno Japan / US version 100 – 115 V, 50/60 Hz	352200V02	352201V02

¹⁾ Depending on the used sniffer line and site conditions. Leakage rate signal after zero: 1×10^{-8} mbar x l/s when using the sniffer line SL 300 or SL 301

For further accessories see para. "Accessories for PHOENIX Quadro, PHOENIX Magno and PHOENIX Vario"

PHOENIX Vario

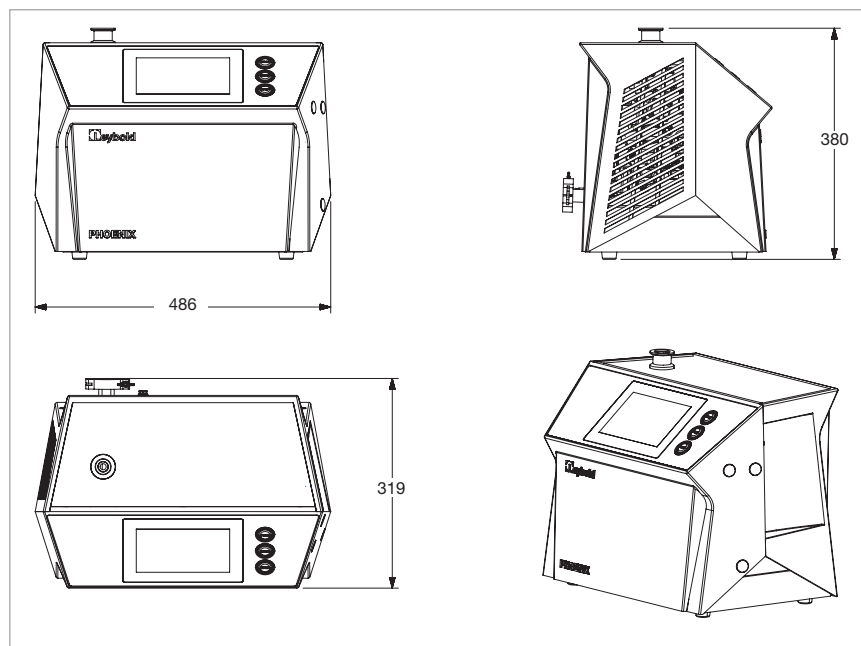


The PHOENIX Vario has no built-in backing pump, and therefore has the smallest installation space with maximum flexibility. The type and size of the backing pump can be chosen freely depending on applications and process requirements.

The PHOENIX Vario thus combines the excellent properties of the PHOENIX 4 series with the required pumping system. In that way both oil-sealed and dry backing pumps can be selected and the fore vacuum suction capacity can be adapted perfectly to the target application.

Advantages to the User

- Application-optimized pumping speed
- Extremely small installation space
- Very light weight
- Highly reliable measuring system
- Simple, intuitive handling
- Very high detection sensitivity
- Convenient remote control via smartphone or tablet PC without software installation
- Variety of interfaces for optimal device communication
- Innovative color touch display
- Extremely short response times
- Internal data memory as well as simple data output via USB



Dimensional drawing PHOENIX Vario (Dimensions in mm)

Technical Data

PHOENIX Vario

Minimum detectable helium leak rate		
Vacuum mode	mbar x l/s	$\leq 5 \times 10^{-12}$
Sniffer mode	mbar x l/s	$< 1 \times 10^{-9}$ ¹⁾
Minimum detectable hydrogen leak rate		
Vacuum mode	mbar x l/s	$\leq 1 \times 10^{-8}$
Sniffer mode	mbar x l/s	$< 1 \times 10^{-7}$
Max. inlet pressure	mbar (Torr)	15 (11.25)
with partial flow pump set	mbar (Torr)	1000 (750)
Pumping speed (helium) at the inlet		
ULTRA mode	l/s	> 3.1
Time constant of the leak rate signal (blanked off, 63% of final value)	s	< 1
Units of measurement (selectable)		
Pressure		mbar, Pa, atm, Torr
Leak rate		mbar x l/s, Pa x m ³ /s, Torr x l/s, atm x cc/sec, sft ³ /yr
Sniffer mode		ppm, g/a eq, oz/yr eq
Leak rate measurement range	mbar x l/s	1×10^{-12} to 1×10^{-1}
Run-up time (after starting)	min	≤ 2
Mass spectrometer		180° magnetic sector field
Ion source		2 filaments; iridium/yttria-oxide
Detectable masses	amu	2, 3 and 4
Test port		1 x DN 25 ISO-KF
Dimensions (W x H x D)	mm	486 x 380 x 313
Weight	kg (lbs)	25 (55.12)
Available languages		English, German, Chinese, Japanese (Katakana), Korean Russian, French, Italian, Spanish and Polish

¹⁾ Depending on the used sniffer line and site conditions. Leakage rate signal after zero: 1×10^{-8} mbar x l/s when using the sniffer line SL 300 or SL 301

For further accessories see para. "Accessories for PHOENIX Quadro, PHOENIX Magno and PHOENIX Vario"

Ordering Information

PHOENIX Vario

	Part No.
PHOENIX Vario	250002V02

Recommended backing pumps for PHOENIX Vario

The PHOENIX Vario can be operated with any backing pump, allowing full flexibility for the fore vacuum suction capacity.

Fore vacuum pumps that are electrically controllable, can be operated directly via the PHOENIX Vario.

A prerequisite for this is a minimum final vacuum pressure of 2 mbar and a maximum current of 12 A.

Fore vacuum pumps that are not electrically controllable, require a separate power supply.

Ordering Information

High Voltage 230 V, 50 Hz

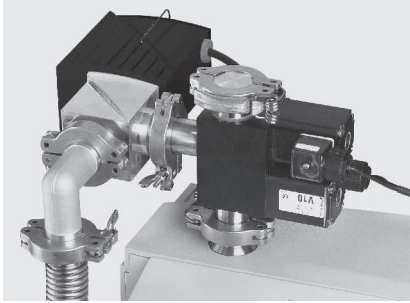
Low Voltage 100 V, 50/60 Hz

	Part No.	Part No.
Recommended backing pumps, electrically controlled		
TRIVAC D 4 B	112 45	140 081
TRIVAC D 8 B	112 55	140 082
TRIVAC D 16 B	112 65	-
TRIVAC D 25 B	112 75	-
SOGEVAC SV 16 D	960 186V	960 186V
SOGEVAC SV 28 BI	960 277	960 278
SOGEVAC SV 40 BI FC	960 364V	-
SCROLLVAC 7 plus	141007V10	141007V10
SCROLLVAC 10 plus	141010V10	141010V10
SCROLLVAC 15 plus	141015V10	141015V10
SCROLLVAC 18 plus	141018V10	141018V10
Recommended backing pumps, separate electrical supply		
ECODRY 40 plus	161040V01	-
ECODRY 65 plus	161065V01	-

For further accessories see para. "Accessories for PHOENIX Quadro, PHOENIX Magno and PHOENIX Vario"

Accessories

Accessories for PHOENIX Quadro, PHOENIX Magno und PHOENIX Vario



Partial flow system without pump

Partial Flow System

with following advantages:

- Faster response
- Start of measurement mode already at 1000 mbar inlet pressure.
- Faster venting of large test objects or leak detection of mass production.

Equipment:

Valve block (with inlet valve, venting valve, bypass or purging valve) plus right-angle bellows valve DN 25 ISO-KF made of stainless steel, solenoid drives, suited for remote control by the PHOENIX.

The partial flow systems are available without pumps.



Search gas spray gun

Search Gas Spray Gun

The search gas spray gun with PVC hose (5 m long) is used for well aimed spraying of search gas at places where a leak is suspected.

PHOENIX Transport Case

For impact protected transportation of the PHOENIX; complete with strong carrying handles and plastic castors. Separate case for accessories.

PHOENIX Wi-Fi Antenna

The PHOENIX Quadro series can be controlled conveniently via any mobile terminal such as tablet PC or smartphones, without the installation of a software or app. In order to be able to use the Wi-Fi function, a PHOENIX Wi-Fi antenna is available.



Interface module

PHOENIX interface modules for the use of other interfaces.

The modules can be mounted directly on the device or be placed in a control cabinet or similar by the customer via a cable connection.

The appropriate cables are available in various lengths.

The PHOENIX IO interface features the following:

- PLC IN
- PLC OUT
- ANALOG OUT
- RS232

The PHOENIX bus interface is available for:

- Profibus
- ProfiNet
- DeviceNet
- Ethernet I/P

PHOENIX Vario connector

A matching connector for the electrical connection between the leak detector and fore vacuum pump is available in order to control the vacuum pump directly via the PHOENIX Vario.

Ordering Information

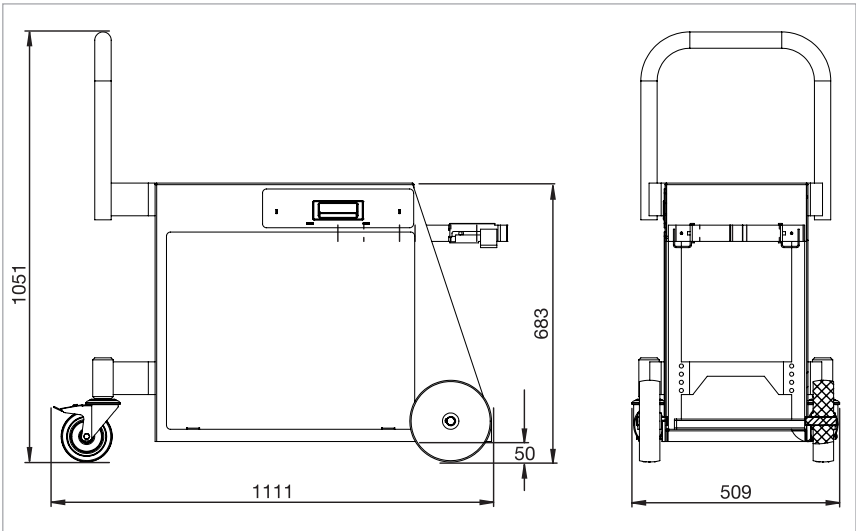
Accessories

	Part No.
Transport Case PHOENIX Quadro	252004V02
Transport Case PHOENIX Magno	352004V02
Transport Case PHOENIX Vario	252024V02
Partial flow system ¹⁾ 115 – 230 V, 50/60 Hz, without pump	140 20
AF 16-25 exhaust filter, for partial flow system	189 11
Search gas spray gun	165 55
PHOENIX WLAN Antenna (different versions)	upon request
PHOENIX IO Interface	252211V02
PHOENIX Bus Interface Profibus	252212V02
PHOENIX Bus Interface ProfiNet	252213V02
PHOENIX Bus Interface DeviceNet	252214V02
PHOENIX Bus Interface EtherNet/IP	252215V02
PHOENIX Vario connector plug	252300V02
Cable for PHOENIX Interfaces – 2 m	252290V02
Cable for PHOENIX Interfaces – 5 m	252291V02
Cable for PHOENIX Interfaces – 10 m	252292V02

¹⁾ 5 centering rings, 5 clamping rings and 1 vacuum hose 1 m with DN 25 ISO-KF are included

CART for PHOENIX Quadro and PHOENIX Vario

The CART for the PHOENIX 4 allows maximum mobility of the leak detector with all required accessories. The high-quality construction thus provides work surfaces for test leaks, as well as the flexible mounting possibility of helium bottles of various sizes. Furthermore, external fore vacuum pumps can also be mounted via a flexible rail construction in the lower level. Due to the innovative design, the helium supply is located on the side facing away from the inlet of the leak detector. Large stable rollers ensure easy transportation and mobility of the leak detector structure.



Dimensional drawing (Dimensions in mm)

Technical Data

CART

Dimensions (L x W x H)	mm	509 x 1051 x 1111
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Ordering Information

Cart

	Part No.
CART PHOENIX 4 for PHOENIX Quadro and PHOENIX Vario	252005V02

CART for PHOENIX Magno

For details please contact Leybold

Ordering Information

Cart

	Part No.
CART LC PHOENIX Magno	252008V02

RC 310 C / RC 310 WL

Remote Control Units for Leak Detectors



Wired remote control unit RC 310 C



Wireless remote control unit RC 310 WL

The RC 310 remote control unit with their industrial design RC 310 WL (wireless) and RC 310 C (cable) and integrated data memory offer utmost flexibility during the leak detection process.

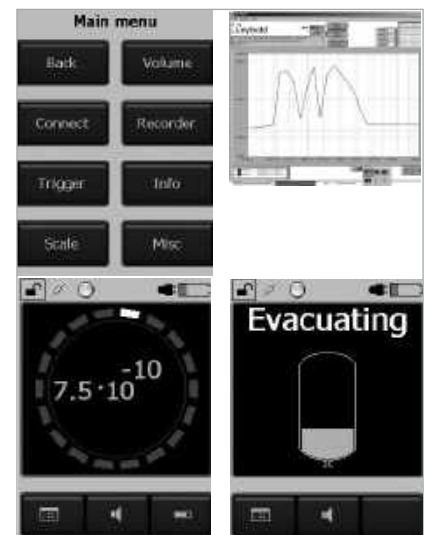
The RC 310 WL permits wireless remote monitoring up to a distance of 100 m. The RC 310 units support the current leak detectors of the PHOENIX 4 series as well as the L300i, UL 200 and L 200 models.

Advantages to the User

- Easy operation via Touch Screen Panel 3.5"
- Wireless transmission up to 100 m, wired transmission up to 34 m
- Data transfer to Windows is possible
- Data backup on internal 32 MB data logger or USB stick is possible
- Possible operating with or without cable
- Adjustable alarm trigger
- Magnetic holder on the rear of the instrument
- Rugged industrial design with an IP 42 rating
- Scroll function for measured data (optional)
- USB connection for data transfer and software updates
- Adjustable loudspeaker and headphone output
- Search function (paging) via audible signal
- Peak hold (maximum value indication)
- For simultaneous detection of up to 10 leak detectors

Typical Applications

- Mobile use with a portable leak detector due to wireless link
- Leak detection for analytics
 - Medicine technology
 - Solar systems
 - Research and development
 - Vacuum equipment
 - Accessories for the automotive industry
 - IT branch
 - Process industry



Different color displays on the remote control unit

Technical Data

RC 310

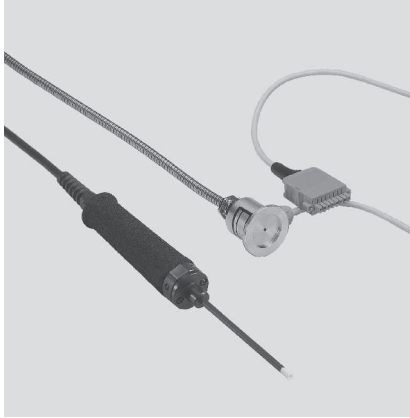
Display		TFT graphic touch panel 1/4 VGA / 3.5"; 240 x 320 px
Memory capacity		
Internal memory capacity	MB	64
of this available for recording data	MB	32
or memory stick		
Battery operating time (RC 310 WL only), (depending on charging condition)	hours	> 8
Wireless transmission range RC 310 WL	m	up to 100
HF output power (4 mW)	dBm	+6
Wireless transmission frequency RC 310 WL	GHz	2.4
Audio alarm at 1 m distance, max.	dB(A)	70
Headphone jack stereo 3.5 mm	Ohm	> 2 x 32
Permissible ambient temperature	°C	+5 to +40
Battery charger		
Mains voltages	V	100 – 240 (± 10%)
Frequencies	Hz	50/60
Connectable leak detectors		PHOENIX 4 series, L300i series, UL 200 series, L 200 series
Detection of leak detectors		up to 10
Available languages		English, German
Further languages		Chinese, Japanese (Katakana), Russian, French, Italian, Spanish and Polish
Protection class	IP	42
Charger protection class	IP	56
RC 310 WL radio perwiths		CE, FCC, IC, TELEC, MIC, MII
Dimensions (L x W x H)	mm	210 x 90 x 45
Weight		
RC 310 C, approx.	kg (lbs)	0.4 (0.88)
RC 310 WL, approx.	kg (lbs)	0.5 (1.1)

Ordering Information

RC 310

	Part No.
Remote control	
RC 310 C, wired with 4 m long connection cable	252 013 V01
RC 310 WL, wireless with battery charger (for integrated rechargeable battery) and wireless transwithter with connection cable (additional 4 m long connection cable)	252 014 V01
Accessories	
Wireless transwithter with connection cable (for operation of a further PHOENIX Quadro)	252 015 V01
Extension cable, 10 m (three extensions max. are possible)	140 22

Helium Sample Probes (Sniffers)



Helium sniffer line SL 300



Helium sniffer QUICK-TEST QT 100 with sniffer

Helium sniffers in connection with the leak detectors are used for leak testing test samples in which a helium over-pressure is present. Besides accurate pinpointing of leaks it is also possible to determine the leak rate of the escaping helium.



Helium sniffer line SL 301 in transport case

Advantages to the User

Helium Sniffer Line SL 300 and SL 301

- Sniffer line connects directly at the test connection
- **SL 300**
Comfortable helium sniffer with red and green status LED and ZERO push-button
- **SL 301**
Robust and easy helium sniffer in practical transport case
- Easy filter removable
- Very fast response
- Extremely low detection limit with $< 1 \times 10^{-7}$ mbar x l/s
- Rigid sniffer tip 120 mm
- Very rugged industrial design

Helium Sniffers QUICK-TEST QT 100

- Sniffer leak detection for greater distances between test object and leak detector
- Diaphragm pump for sucking the search gas
- Smallest detectable leak rate 1×10^{-6} mbar x l/s
- Short response and decay times
- High sniffer velocity
- Switching power supply, can be run off mains voltages from 100 to 230 V AC

Typical Applications

- Storage and transportation vessels for gases and liquids
- Gas supply systems
- Gas compressors
- Components for the cooling and air conditioning industries
- Heat pumps and components for thermal energy recovery units
- Chemical production plants
- Supply and phone lines laid in the ground
- Power station condensers and turbines
- Window and door seals of car bodies, refrigerators and alike
- Revision checks on leak testing systems
- Measurement of helium concentrations ranging from ppm to %
- All hollow objects exposed to overpressures

Technical Data**SL 300 / SL 301****QT 100**

Smallest detectable leak rate	mbar x l/s	< 10 ⁻⁷	10 ⁻⁶
Inlet pressure	mbar	< 0.13	–
Supply voltage		–	100 – 230 V, 50/60 Hz
Signal response time for SL 301 at a length of			
4 m	s	< 1	–
10 m	s	< 4	–
SL 300 at a length of			
4 m	s	< 1	–
20 m	s	–	< 6
50 m	s	–	20
Connection flange	DN	25 ISO-KF	
Weight	kg (lbs)	0.6 (1.3)	3.5 (7.7)

Ordering Information**SL 300 / SL 301**

	Part No.
Helium sniffer line with rigid sniffer tip 120 mm SL 300 red/green LED ZERO button 4 m long, straight handle	252 003
SL 301 4 m long, straight handle 10 m long, straight handle	252 025 V01 252 026 V01
Spare Parts for SL 301 Filter insert, 2 pieces Stainless steel tube with capillary tube	ESLMSA-92097 E-LST-30

Ordering Information**QT 100**

	Part No.
Helium sniffer QUICK-TEST QT 100	155 94
Sniffer line for the QT 100	
5 m	140 08
20 m	140 09
50 m	121 83

Calibrated Leaks for Vacuum and Sniffer Applications



Test leaks

Calibrated Leaks for Vacuum Applications

TL 4 and TL 6

Calibrated leaks without gas reservoir (capillary type of leak) for sensitivity and signal response time determinations during vacuum leak detection and for determination of sniffer sensitivity for overpressure leak detection. Nominal leak rate ranges 10^{-4} mbar x l/s for TL 4 and 10^{-6} mbar x l/s for TL 6. Suitable for helium. A purging valve with hose nozzle permits a rapid exchange of the gas in the dead volume.

TL 4-6

Helium calibrated leak (capillary leak) for gross leaks, adjustable in the range between 10^{-4} to 10^{-6} mbar x l/s, with exchangeable helium reservoir, pressure gauge and two manually operated valves. For calibration of leak rate readings and the alignment of helium mass spectrometers in the vacuum pressure range and for determining the sensitivity of sniffers in the overpressure range.

TL 4

Calibrated helium leak (capillary leak) with reservoir which may be refilled and with a leak rate in the range of 10^{-4} mbar x l/s. Special calibrated leak for use in a vacuum.

TL 7 (For installation within the PHOENIX 4)

Helium calibrated leak (capillary leak) with helium reservoir and electromagnetically operated valve. Leak rate range 10^{-7} mbar x l/s. The electromagnetically operated valve provided permits the opening and closing of the calibrated leak to be controlled by the leak detector's software.

TL 7

Calibrated helium leak (capillary leak) with helium reservoir, manual valve and He gas.

TL 8 and TL 9

Helium calibrated leak calibrated for a leak rate in the range of 10^{-8} mbar x l/s (helium leak rate) for TL 8 and 10^{-9} mbar x l/s for TL 9, with gas reservoir and diaphragm shutoff valve. For alignment of a helium mass spectrometer, for calibration of the leak rate display of helium leak detectors and for response time measurements in connection with larger volumes.

Note

All calibrated leaks with the exception of the TL 4 are not suited for use in a vacuum.

Calibrated leaks are required for the alignment of mass spectrometers, for the calibration of leak rates and for determining the response time of vacuum systems.

Advantages to the User

- Inspection certificate (included) in accordance with DIN EN 10204-3.1
- Highly accurate
- Very low temperature dependence
- Determination of the nominal leak rate by comparison with a calibrated leak having a PTB ¹⁾ certificate
- DAKKS ²⁾ certificate (optional), traceable to PTB
- Custom models for special applications

The nominal leak rate applies only if the calibrated leak has been connected to a vacuum system at a pressure of less than 1 mbar.

¹⁾ Federal Institution of Physics and Technology

²⁾ Deutsche Akkreditierungsstelle GmbH (German Calibration Service)

Calibrated Leaks for Sniffer Applications

These calibrated leaks have been set to a fixed value within the typical leak rate range (see Ordering Information). The exchangeable calibration gas reservoir is monitored through the built-in manometer.

Helium calibrated leaks

S-TL 4 to S-TL 6 with leak rates from 10^{-4} to 10^{-6} mbar x l/s.

Set of Calibrated Leaks for Power Plants

These three calibrated leaks of 1000, 100 and 10 mbar x l/s allow leak tests under partial flow conditions under the ambient conditions of power plants.

Technische Daten

Leak Rate Range

Leak Detection Method

Connection Flange

TL 4, without Helium gas reservoir	10^{-4} mbar x l/s	Vacuum and sniffer	DN 16 ISO-KF
TL 6, without Helium gas reservoir	10^{-6} mbar x l/s	Vacuum and sniffer	DN 16 ISO-KF
TL 4-6, with Helium gas reservoir	10^{-4} to 10^{-6} mbar x l/s	Vacuum and sniffer	DN 16 ISO-KF
TL 4, with Helium gas reservoir	10^{-4} mbar x l/s	Vacuum	Discharging opening
TL 7, with Helium gas reservoir	10^{-7} mbar x l/s	Vacuum (for installation within the PHOENIX)	Nozzle
TL 7, with manual valve and Helium gas reservoir	10^{-7} mbar x l/s	Vacuum	DN 10 ISO-KF
TL 8, with Helium gas reservoir	10^{-8} mbar x l/s	Vacuum	DN 10 ISO-KF
TL 9, with Helium gas reservoir	10^{-9} mbar x l/s	Vacuum	DN 10 ISO-KF
S-TL 4, with Helium gas reservoir	10^{-4} mbar x l/s	Sniffer	Nozzle
S-TL 5, with Helium gas reservoir	10^{-5} mbar x l/s	Sniffer	Nozzle
S-TL 6, with Helium gas reservoir	10^{-6} mbar x l/s	Sniffer	Nozzle

Ordering Information

Calibrated Leak

	Part No.
TL 4, without Helium gas reservoir ¹⁾	155 65
TL 6, without Helium gas reservoir ¹⁾	155 66
TL 4-6, with Helium gas reservoir ¹⁾	155 80
TL 7, with Helium gas reservoir ¹⁾ for installation within the PHOENIX 4 filling pressure 2,9 bar	140 23 V01
TL 7, with manual valve and Helium gas reservoir	142 10
TL 8, with Helium gas reservoir ¹⁾	165 57
TL 9, with Helium gas reservoir ¹⁾	144 08
S-TL 4, with Helium gas reservoir ¹⁾	122 37
S-TL 5, with Helium gas reservoir ¹⁾	122 38
S-TL 6, with Helium gas reservoir ¹⁾	122 39
Set of calibrated leaks for power plants 1000, 100, 10 mbar x l/s	115 16
Rubber bladder with hose clamp	890 11
Helium can; 1 l, 12 bar (for TL 4-6)	252 001
DAkkS calibration for TL 7/8/9	154 15
Factory calibration for He test leaks	154 16

¹⁾ With factory certificate

Screw-in Calibrated Leaks

The manufacturers of helium leak testing systems are in need of calibrated leaks of various sizes with individually adjusted leak rates for the purpose of setting up and calibrating their systems.

Depending on the type of application these calibrated leaks are either installed in the test sample as a master leak or used as a continually available facility in the test chamber itself.

Leybold is offering a complete family of calibrated leaks which are capable of meeting the requirements concerning type and required leak rate.



Calibrated leak with screw-in sleeve

Calibrated Leak with Screw-in Sleeve

Is used as a so-called master leak to check the entire helium leak testing system.

Generally two leaktight test samples are equipped with these calibrated leaks. These will ensure proper separation between "passed and rejected" parts.

They are fitted to the customer's test samples either by a welded joint or the screw-in sleeve is glued in place.

Typical Applications

- As a master calibrated leak built-in directly into the test sample
- Directly installed to the test chamber
- Use as a calibrated leak for sniffer applications



Calibrated leak with pin type casing

Calibrated Leak with Pin Type Casing

Serves as a calibrated leak for the entire helium leak testing system without being influenced by the presence of a test sample.

Here a dummy is placed in the test chamber. The connection to the test chamber is directly by a DN 10 ISO-KF fitting. The test gas connection is either by a VCO fitting or a hose nozzle for flexible connections.

Connections on the side of the customer's system are

- 16 ISO-KF running to the vacuum chamber
- Hose nozzle, 10 mm in diameter or VCO fitting, 10 mm in diameter

Advantages to the User

- Various types adapted to different customer requirements
- Simple to operate
- Easy to install



Calibrated leak with cylindrical casing

Calibrated Leak with Cylindrical Casing

Is used to check the sensitivity of a sniffing facility.

Before and after the actual test, the operator checks the sensitivity of his test facility within the scope of a plausibility check.

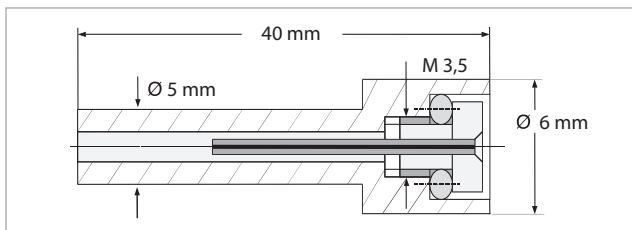
The connection on the side of the customer's system is provided via a VCO fitting for a diameter of 10 mm.

- Ideal installation dimensions
- As a rule, all calibrated leaks are supplied with a certificate (factory certificate) indicating the leak rate which has been set up

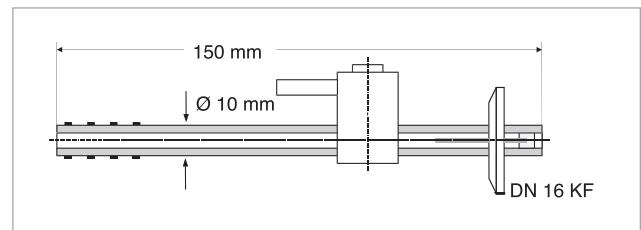
Customer-specific test leaks

The specified test leaks are customer-specific, which is why the specification of the leakage rate, the test pressure and the type of gas is necessary.

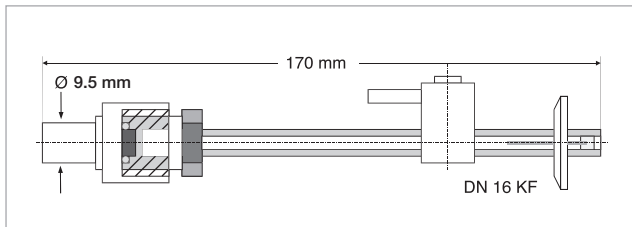
The specification is carried out via the test leakage form on the Leybold website → www.leyboldproducts.com/test-leak-form



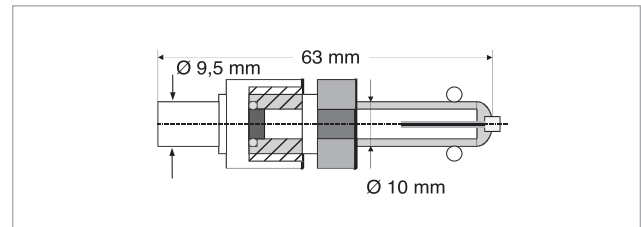
Calibrated leak with screw-in sleeve



Calibrated leak with pin type casing and hose nozzle



Calibrated leak with pin type casing and VCO fitting



Calibrated leak with cylindrical casing and VCO fitting

Ordering Information ¹⁾

Calibrated Leak

	Part No.
Calibrated leak with screw-in sleeve	143 00
with pin type casing and VCO fitting	143 04
with pin type casing and hose nozzle	143 08
with cylindrical casing and VCO fitting	143 12

¹⁾ When ordering please always specify the test leak via the testleak-form and indicate the generated code. Please request form if required.

Miscellaneous

Connection Flanges

Leak Detectors

Helium Sniffers

Calibrated Leaks

PHOENIX Quadro	–	DN 25 ISO-KF	SL 300	–	DN 25 ISO-KF	TL 4	–	DN 16 ISO-KF
PHOENIX Magno	–	DN 25 ISO-KF	QT	–	DN 25 ISO-KF	TL 6	–	DN 16 ISO-KF
PHOENIX Vario	–	DN 25 ISO-KF	ST 100	–	DN 25 ISO-KF	TL 4-6	–	DN 16 ISO-KF

If components of the same nominal width are connected, only one centering ring and one clamping ring will be required.

Connection Components

When wanting to connect accessories (helium sniffer and calibrated leaks) to a leak detector, the following reducers and components may be necessary:

Reduction

Reducers

Centering Rings Stainless steel/FPM

Clamping Rings Aluminium

	Part No.	Part No.	Part No.
DN 25 ISO-KF / 16 ISO-KF	183 86 (Aluminum) or 885 04 (Stainless steel)	DN 25 ISO-KF, 883 47 DN 16 ISO-KF, 883 46	DN 20 / 25 ISO-KF 183 42 DN 10 / 16 ISO-KF, 183 41
DN 40 ISO-KF / 25 ISO-KF	183 87 (Aluminum) or 885 05 (Stainless steel)	DN 40 ISO-KF, 883 48 DN 25 ISO-KF, 883 47	DN 32 / 40 ISO-KF, 183 43 DN 20 / 25 ISO-KF, 183 42
DN 40 ISO-KF / 16 ISO-KF	183 89 (Aluminum) or 885 07 (Stainless steel)	DN 40 ISO-KF, 883 48 DN 16 ISO-KF, 883 46	DN 32 / 40 ISO-KF, 183 43 DN 10 / 16 ISO-KF, 183 41
DN 63 ISO-K / 40 ISO-KF	269 40 (Aluminum) or 887 40 (Stainless steel)	DN 63 ISO-K, 887 03 DN 40 ISO-KF, 883 48	DN 63 / 250 ISO-K, ¹⁾ DN 32 / 40 ISO-KF, 183 43

¹⁾ See clamps for ISO-K flanges in the Product Part "Flanges and Fittings"

The following metal hoses are recommended to connect the leak detectors to systems:

Nominal Width

Length

Ordering Information

		Part No.
DN 16 ISO-KF	1.0 m	868 01
DN 16 ISO-KF	0.5 m	867 91
DN 25 ISO-KF	1.0 m	868 03
DN 25 ISO-KF	0.5 m	867 93
DN 40 ISO-KF	1.0 m	868 05
DN 40 ISO-KF	0.5 m	867 95

Further connecting components, like quick clamping rings and other components are described in Product Part "Flanges and Fittings"

Flanges and Fittings

ISO-KF, ISO-K, ISO-F, CF

280.00.02

Excerpt from the Leybold Full Line Catalog (Edition 01/2019)

Catalog Part Flanges and Fittings

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Flanges and Fittings

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For information on electrical, rotary/linear motion and liquid feedthroughs, please refer to Catalog Part "Feedthroughs".

General to Flanges and Fittings

Introduction

According to DIN 28 400, the term "Ultra-high Vacuum (UHV)" designates the pressure range below 10^{-7} mbar.

Several physical quantities, such as mean free path, monolayer time, flow density of the particles impinging on the walls, leak rate and the degassing rate are of significance in the characterization of this pressure range. For the definitions of these quantities refer to technical publications on this subject.

In order to attain or maintain pressures below 10^{-7} mbar, the following pre-conditions must be met:

- The vapor pressure of the pump fluid or lubricant should be in accordance with the desired ultimate pressure
- the leak and degassing rates of the entire apparatus including its installations must be extremely low.

Generally, both leak rate and backstreaming effects through the pump can be kept at sufficiently low levels by using suitable UHV sealing materials and pumps.

However, a sufficiently low outgassing rate can only be achieved by baking out the entire apparatus at temperatures of about 300 °C (572 °F) for a longer period of time. It is only under these conditions that the mono-layers of atoms or molecules, which attach quite firmly to the surfaces of the vacuum apparatus including its installations, are desorbed.

Consequently, components for UHV systems are generally made of stainless steel. Metal gaskets, ceramic feedthroughs and bakeable observation windows are used exclusively.

For applications in the extreme UHV range (XHV) the outgassing rate of the CF flanges and the UHV components can be reduced by about two orders of magnitude by a special degassing process.

The high standard of development and manufacture combined with the use of high quality materials guarantee that UHV components from Leybold Vacuum are able to meet even the most demanding requirements.

Advantages to the User

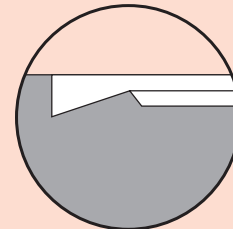
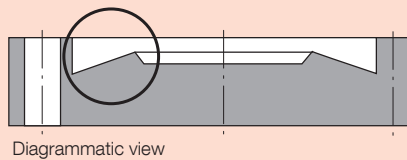
- Stabilized Leybold knife-edge
- High reliability
- Special knife edge profiles ensure the highest degree of leak tightness
- Flange connection can be baked out up to 450 °C (842 °F)
- Easy to assemble, helium-tight
- Symmetrical flange connection
- Equal sealing profiles
- Small outside diameter with respect to the nominal width
- Can be joined by welding or brazing using any desired process, also with other nickel chromium steel grades
- For use either with a flat gasket made of OFHC copper (oxygen-free) or FPM (FKM) O-ring
- Self-centering
- Fixed and rotary flanges in almost any size

These Arguments Prove Leybold's QUALITY

- Availability of all components at short notice
- Worldwide advice at any time to answer your questions relating to vacuum systems
- Utilization of most advanced manufacturing methods
- Environment-friendly cleaning baths with complete waste disposal and recycling facilities
- Environment-friendly and secure packaging
- Total Quality Management methods during all processing stages
- Controlled material quality
- Compatible to your existing flanges of the same system
- Highly leak-tight down to leak rates of 1×10^{-9} mbar x l/s; all components are subjected to a helium leak test
- Low outgassing rates of the materials through
- choice of the right material quality, especially for vacuum apparatus
- excellent cleaning methods
- Documentation available for all components

- The well-proven Leybold geometry for the cutting edges

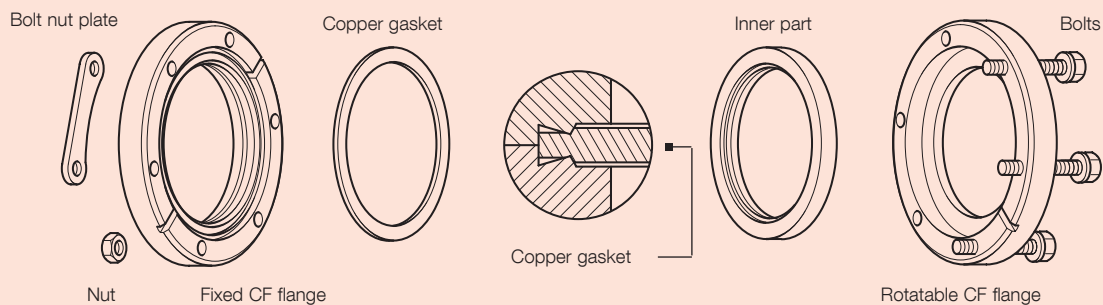
The stabilized Leybold profile for the cutting edges



- **Forged steel materials** of high tensile strength and density
- Material quality for standard applications **DIN 1.4301 corresponds to AISI 304**
- Tightly checked, **close dimensional tolerances** for the entire sealing geometry
- **Low degassing rates** of the tube material used

Advantages

Reliable sealing of UHV connections over hundreds of heating cycles



General

Vacuum systems (i.e. systems for pressures ranging from 2.5 bar to 10^{-9} mbar (1.9×10^{-3} Torr to 0.75×10^{-9} Torr)) are quickly and easily assembled owing to the modular construction principle which is based on interchangeable standard components by means of vacuum-tight, demountable flange connections. Individual components may be exchanged easily at any time. Depending on the intended use and size of the connection, flanges of different types have been developed. The ISO-KF flange connection was developed by Leybold many years ago and has been widely accepted by all users of vacuum equipment. This catalog part lists all flange connections and fittings including adaptors for ultra-high vacuum components.

Components marked with [< 1000 mbar (< 750 Torr)] are not allowed for use at pressures exceeding 1000 mbar abs.

The components and flange connections are intended for use in connection with vacuum systems. They have not been designed to support mechanical loads. All loads must be supported separately at the connection components.

When mounting turbo molecular vacuum pumps onto flanges the maximum crash momentum needs to be considered. Additional fixing of the pump might be necessary.

Flange Designations

The designations used by Leybold Vacuum for clamp flanges, fixed flanges (bolted) and collar flanges with retaining rings correspond both to the international standards ¹⁾ and to the usual nomenclature in vacuum technology.

Materials

Stainless Steel

German Material No.	AISI/SAE	DIN Designation
1.4301	304	X5 CrNi 18 10
1.4305	303	X10 CrNi S 18 9
1.4306	304 L	X2 CrNi 19 11
1.4310	301	X12 CrNi 17 7
1.4401	316	X5 CrNiMo 17 12 2
1.4404	316 L	X2 CrNiMo 17 12 2
1.4435	316 L	X2 CrNiMo 18 14 3
1.4541	321	X10 CrNiTi 18 9
1.4571	316 Ti	X6 CrNiMoTi 17 12 2
1.4552	–	X5 CrNiNb 18 9

Aluminium

German Material No.	AISI	DIN Designation
3.0255.10	AA 1050 1-0	Al 99.5 w
3.2162.05	380.0 (AA)	GD-AlSi8Cu3
3.2315.08	6082-F (AA)	AlMgSi1
3.2315.71	6082-T6	AlMgSi1
3.2315.72	6063 (AA)	AlMgSi1
3.2381.02	520.0 (AA)	GK AlSi 10 Mg
3.2381.62	520.0 (AA)	GK AlSi 10 Mgwa
3.2582.05	160 X	GD-AlSi 12

JIS	AISI	DIN Designation
ADC12	383	AlSi11Cu2(Fe)

¹⁾ The nominal width DN corresponds only approximately to the inner diameter, i.e. is not necessarily identical to the inner diameter. Differences in the actual inner diameter are quite normal in practice and do not contravene standards.

Steel

German Material No.	AISI	DIN Designation
1.0037	–	St 37-2
1.0308	–	St 35
1.0831	–	St 52
1.1141	–	CK 15
1.1181	–	CK 35

Gaskets

Code Designation	Chemical Designation	Typical Trade Name
CR	Chloroprene-caoutchouc	Neoprene
FPM (FKM)	Fluor-caoutchouc	Viton®
NBR	Acrylonitrile-butadienrubber	Perbunan®
PTFE	Polytetrafluor-ethylene	Teflon®
EPDM	Ethylene propylene dien rubber	–

Hoses and Tubes

Code Designation	Chemical Designation	Typical Trade Name
NR	Natural rubber	–
PVC	Polyvinylchloride	–

The Right Connection from Leybold

ISO-F

1. Flange
2. Vacuum sealing disk consisting of centering ring and O-ring gasket with outer support ring
3. ISO-K flange
4. Bolt with nut
5. Collar flange with retaining ring

ISO-KF

1. ISO-KF flanges
2. Centering ring with O-ring gasket
3. Clamping ring
4. Tee
5. Elbow
6. Tee
7. Clamp
8. Elbow
9. PVC coiled vacuum tubing
10. Cross
11. Blank flange
12. Small flange with hose nozzle

ISO-K

1. ISO-K flange
2. Centering ring with O-ring gasket and outer support ring
3. Clamp

CF

2. Reducer / ISO-K-CF
3. Adaptor CF-ISO-K/ISO-KF
4. Double cross
5. Adjustment piece
6. Elbow
7. Ceramic intermediate piece
8. Tee
9. UHV observation window
10. Blank flange

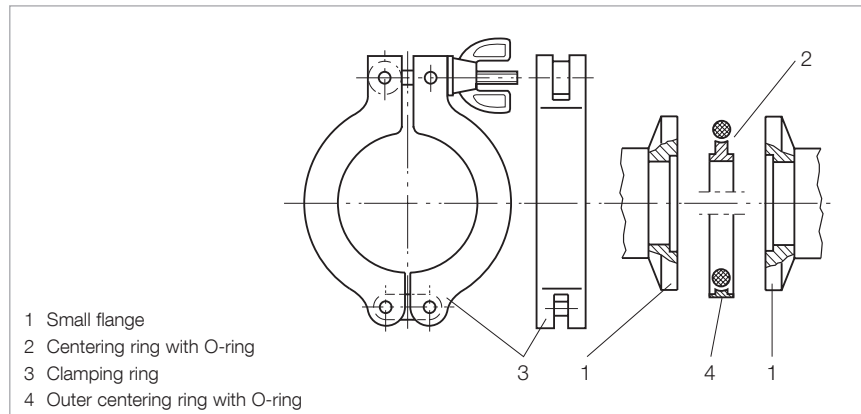
ISO-K clamp flange connection

1. ISO-K flange
2. Centering ring with O-ring gasket and outer support ring
3. Clamp
4. Tee
5. Cross with lateral DN 10/40 ISO-KF flanges
6. Elbow
7. Flexible vacuum tubing
8. Cross
9. Intermediate flange with gauge port
10. Clamp flange with tubulation
11. Blank flange
12. Flexible compensation element

Flange Connections

ISO-KF Connection

The ISO-KF connection (to DIN 28 403 and ISO 2861) permits rapid fitting and replacement of components in vacuum systems. It consists of two symmetrical ISO-KF flanges **(1)**, a centering ring with O-ring gasket **(2)** and a clamping ring **(3)**. High vacuum tight ISO-KF connections can be made without the use of tools simply by turning the wing nut of the clamping ring.

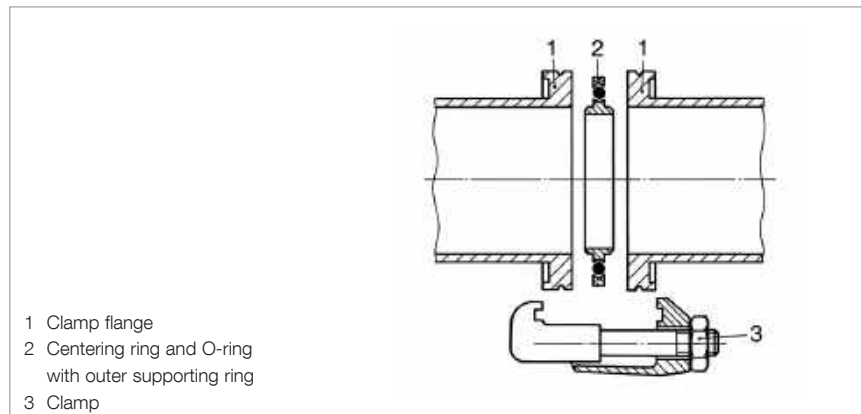


ISO-KF flange connection

ISO-K Clamp Flange Connection

The clamp flange connection (to DIN 28 404 and ISO 1609) allows components from DN 63 to DN 630 to be connected in any position regardless of the bolt hole arrangement on any fixed flanges.

It consists of two clamp flange components **(1)**, a centering ring **(2)** with an outer ring enclosing the O-ring gasket, and several clamps **(3)** which the connection is assembled and tightened with. Since the centering ring can be firmly inserted into the centering groove of the flange, even horizontal connections are quickly and easily fitted.



ISO-K clamp flange connection

ISO-F / DIN Fixed Bolted Flange Fittings

With the appropriate collar flanges, the clamp flange can be connected to various fixed bolted flange systems (ISO-F, DIN EN 1092-1, etc.) see figures in chapter "ISO-F and DIN EN 1092-1 Fixed Flange Fittings".

CF Flanges and Components

The CF flange connection consists of two geometrically identical flanges with a flat gasket made of OFHC copper, bolts and nuts and washers.

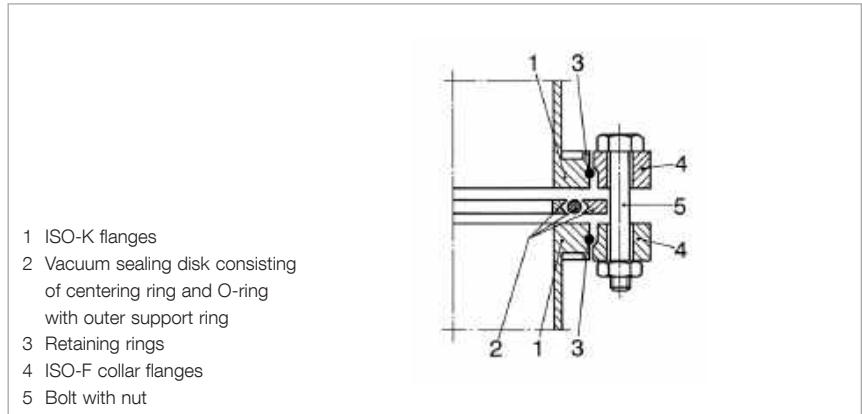
CF components are made of selected, corrosion resistant types of stainless steel.

All components are inside welded to prevent right from the beginning any cracks or pocket holes which might constitute a so-called virtual leak.

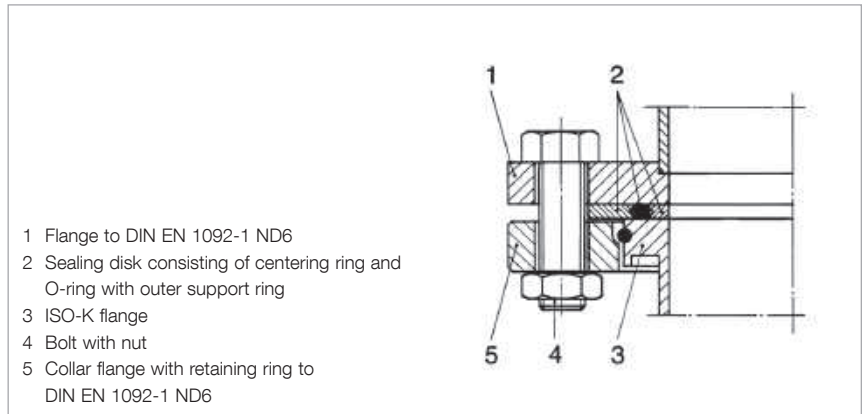
Bake Out Temperatures for the Gaskets

CR and FPM (FKM) gaskets can be inserted in all listed flange types, while aluminium gaskets may be used for higher vacuum requirements.

CR gaskets can be used in the temperature range from -40 °C to +100 °C [-40 °F to +212 °F] (max. bakeout temperature), FPM (FKM) gaskets from -15 °C to +150 °C [+5 °F to +302 °F] (max. bakeout temperature). Aluminium gaskets from -196 °C to +200 °C [-321 °F to +392 °F] (max. bakeout temperature gradient; ΔT max. 2.5 °/min).



Clamped flange connection with collar flanges



Connection between a DIN EN 1092-1 ND 6 flange and an ISO-K flange with DIN EN 1092-1 collar flange

ISO-KF Flange Fittings and Components

DN 16 ISO-KF to DN 50 ISO-KF Aluminium Design (to DIN 28 403) [Tubes similar DIN 28 403]

The small flange connection developed by Leybold has become the basis of the international standard for vacuum technology.

Advantages to the User (Aluminium and Stainless Steel)

- Quick, safe and reliable
- No tools are need to provide a vacuum-tight seal
- Suitable down to pressures of 10^{-7} mbar (0.75×10^{-7} Torr)
- Suitable up to pressures of 2.5 bar (36 psi) with inner centerring ring and clamping ring/quick clamping ring
- Suitable up to pressures of 5 bar (33 psi) with outside ring resp. ultra sealing ring and 3-part clamping ring
- Easy to disassemble and clean
- In the case of special requirements as to degassing for the purpose of reducing the outgassing rate and in case of special requirements as to corrosion resistance, we recommend the use of stainless steel components.

Additional Benefits of the Stainless Steel Types

- With metal seals suitable for pressures down to 10^{-9} mbar (0.75×10^{-9} Torr)
- Can be baked out up to 200 °C (392 °F) when using metal seals or UHV aluminium rings
- Can be degassed up to 150 °C (302 °F) with FPM (FKM) gaskets
- Corrosion resistant
- Low degassing rate

Flexible Compensation Elements

Vacuum systems and pump systems often require components which are capable of protecting sensitive instruments against impacts or excessive vibrations while linking tubes at the same time.

Advantages to the User

- Easy and quick to install
- Safe and reliable
- Tubes may be turned in any direction
- No centering and sealing ring required
- Capable of withstanding temperatures up to 80 °C (176 °F)
- Suitable for pressures down to 10^{-5} mbar (0.75×10^{-5} Torr)

Quick Clamping Ring

Advantages to the User

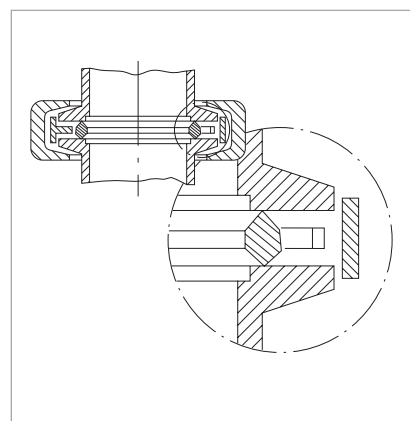
- Quick and effective fitting and disassembly
- Can be fitted with one hand
- Closing action via lever with clamping spring
- Corrosion resistant



Fitting a centering ring to an ISO-KF component



Quick clamping ring



Small flange connection with ultra sealing ring



Fitting an elbow



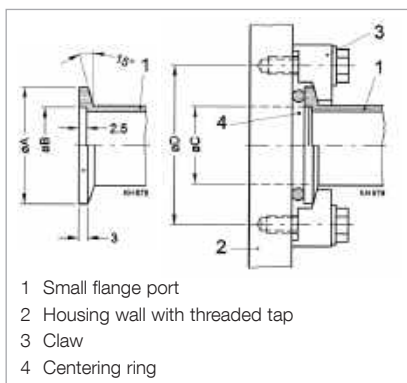
Clamping ring for ultra sealing disk



Small flange connection with clamping ring



Small flange components made of stainless steel

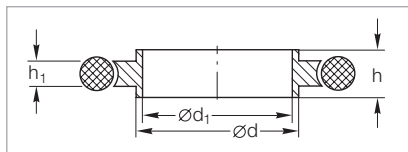


Small flange connection

Technical Data

Nominal diameter		A	B	C	D	Number of claws
DN 10 ISO-KF	mm	30	12,2	12,2	45	4
	in.	1.18	0.48	0.48	1.77	
DN 16 ISO-KF	mm	30	17,2	17,2	45	4
	in.	1.18	0.68	0.68	1.77	
DN 25 ISO-KF	mm	40	26,2	26,2	55	4
	in.	1.57	1.03	1.03	2.17	
DN 40 ISO-KF	mm	55	41,2	41,2	71	4
	in.	2.17	1.62	1.62	2.80	
DN 50 ISO-KF	mm	75	52,4	52,4	91	4
	in.	2.95	2.06	2.06	3.58	

Centering Rings (Al AW-6082-T6/Stainless Steel 1.4301) with O-Ring (CR / FPM (FKM))



Dimensional drawing for the centering rings with O-ring

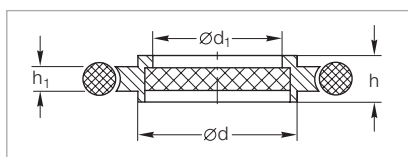
Technical Data

DN	ISO-KF	10	16	20	25	32	40	50
d	mm (in.)	12 (0.47)	17 (0.67)	22 (0.87)	26 (1.02)	34 (1.34)	41 (1.61)	52 (2.05)
d ₁	mm (in.)	10 (0.40)	16 (0.63)	20 (0.79)	25 (0.98)	32 (1.26)	40 (1.57)	50 (1.97)
h	mm (in.)	8 (0.31)	8 (0.31)	8 (0.31)	8 (0.31)	8 (0.31)	8 (0.31)	8 (0.31)
h ₁	mm (in.)	3.9 (0.15)	3.9 (0.15)	3.9 (0.15)	3.9 (0.15)	3.9 (0.15)	3.9 (0.15)	3.9 (0.15)

Ordering Information

Aluminim/CR	Part No.	183 21	183 26	183 22	183 27	183 23	183 28	183 25
Aluminim/FPM (FKM)	Part No.	182 01	182 06	182 02	182 07	182 03	182 08	182 05
Aluminim/FPM (FKM) (Set of 10 pcs)	Part No.	-	210841V01	210842V01	210843V01	210844V01	210845V01	210846V01
Stainless steel/FPM (FKM)	Part No.	883 21	883 46	883 22	883 47	883 23	883 48	883 25

Centering Rings (Stainless Steel) with Sintered Metal Filter (Stainless Steel 1.4404 and O-Ring (FPM (FKM)))



Dimensional drawing for the centering rings with sintered metal filter and O-ring

Sintered metal filter:

Air throughput at 20 °C (68 °F) and 200 mbar differential pressure approx. 1 m³ x h⁻¹ x cm², pore size: 20 µm

Technical Data

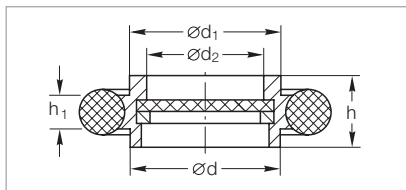
DN	ISO-KF	10	16	25	40	50
d	mm (in.)	12 (0.47)	17 (0.67)	26 (1.02)	41 (1.61)	52 (2.05)
d ₁	mm (in.)	8 (0.31)	14 (0.55)	23 (0.91)	38 (1.50)	48 (1.89)
h	mm (in.)	8 (0.31)	8 (0.31)	8 (0.31)	8 (0.31)	8 (0.31)
h ₁	mm (in.)	3.9 (0.15)	3.9 (0.15)	3.9 (0.15)	3.9 (0.15)	3.9 (0.15)

Ordering Information

Stainless steel	Part No.	883 50	883 51	883 52	883 53	883 54
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Important: In the table of Chapter "General" the German designation for the type of steel is also stated in accordance with AISI.

Centering Rings with Fine Filter (Stainless Steel 1.4305) with O-Ring (FPM (FKM))



Dimensional drawing for the centering rings with fine filter

Filter material:

Stainless steel mesh 1.4404,
size of pore: 4 μm

Separation grade:

1 μm particles to 98%
(Filter material not available separately)

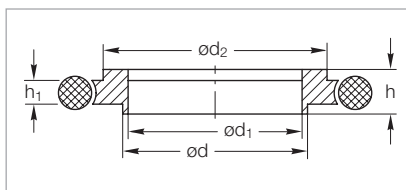
Technical Data

DN	ISO-KF	10	16	25	40	50
d	mm (in.)	12 (0.47)	17 (0.67)	26 (1.02)	41 (1.61)	52 (2.05)
d ₁	mm (in.)	12 (0.47)	17 (0.67)	26 (1.02)	41 (1.61)	52 (2.05)
d ₂	mm (in.)	9 (0.35)	13 (0.51)	22 (0.87)	35.5 (1.4)	46 (1.81)
h	mm (in.)	8 (0.31)	8 (0.31)	8 (0.31)	8 (0.31)	8 (0.31)
h ₁	mm (in.)	3.9 (0.15)	3.9 (0.15)	3.9 (0.15)	3.9 (0.15)	3.9 (0.15)

Ordering Information

Stainless steel	Part No.	883 95	883 96	883 97	883 98	883 99
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Centering Ring Adaptors (Al AW-6082-T6/Stainless Steel 1.4301) with O-ring (NBR / FPM (FKM))



Dimensional drawing for the centering ring adaptors with O-ring

Technical Data

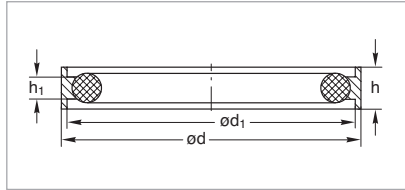
DN	ISO-KF	10/16	20/25	32/40
d	mm (in.)	12 (0.47)	22 (0.87)	34 (1.34)
d ₁	mm (in.)	10 (0.40)	20 (0.79)	32 (1.26)
d ₂	mm (in.)	17 (0.67)	26 (1.02)	41 (1.61)
h	mm (in.)	8 (0.31)	8 (0.31)	8 (0.31)
h ₁	mm (in.)	3.9 (0.15)	3.9 (0.15)	3.9 (0.15)

Ordering Information

Aluminium/FPM (FKM)	Part No.	182 56	182 57	182 58
Aluminium/FPM (FKM) (Set of 10 pcs)	Part No.	-	210848V01	-
Aluminium/NBR	Part No.	183 56	183 57	183 58
Stainless steel/FPM (FKM)	Part No.	883 56	883 57	883 58

Important: In the table of Chapter "General" the German designation for the type of steel is also stated in accordance with AISI.

Outer Centering Rings (Al AW-6082-T6) with O-Ring (CR / FPM (FKM))



Dimensional drawing for the outer centering rings with O-ring

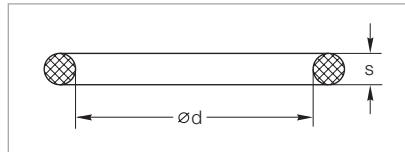
Technical Data

DN	ISO-KF	10/16	20/25	32/40	50
d	mm (in.)	32 (1.26)	42 (1.65)	57 (2.24)	77 (3.03)
d ₁	mm (in.)	30.2 (1.19)	40.2 (1.58)	55.2 (2.17)	75.2 (2.96)
h	mm (in.)	7 (0.28)	7 (0.28)	7 (0.28)	7 (0.28)
h ₁	mm (in.)	3.9 (0.15)	3.9 (0.15)	3.9 (0.15)	3.9 (0.15)

Ordering Information

Aluminium/CR	Part No.	183 50	183 51	183 52	183 59
Aluminium/FPM (FKM)	Part No.	183 53	183 54	183 55	183 60

Spare O-Ring Gaskets for ISO-KF Flange Connections



Dimensional drawing for the spare O-ring gaskets for ISO-KF flange connections

Technical Data

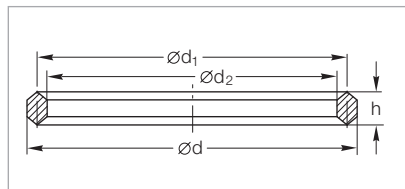
DN	ISO-KF	10	16 ¹⁾	20	25 ¹⁾	32	40 ¹⁾	50
d	mm (in.)	15 (0.59)	18 (0.71)	25 (0.98)	28 (1.10)	40 (1.57)	42 (1.65)	55 (2.17)
s	mm (in.)	5 (0.20)	5 (0.20)	5 (0.20)	5 (0.20)	5 (0.20)	5 (0.20)	5 (0.20)

Ordering Information

FPM (FKM) (Set of 10 pcs)	Part No.	ES210600	ES210605	ES210610	ES210615	ES210620	ES210625	ES210630
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¹⁾ Also for adaptor/centering rings

Ultra Sealing Rings (Aluminium 3.2315.71)



Dimensional drawing for the ultra sealing rings

Technical Data

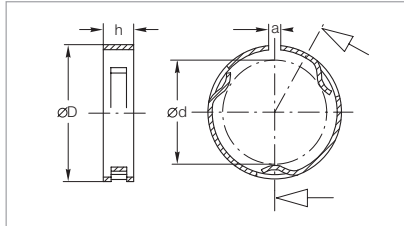
DN	ISO-KF	10/16	20/25	32/40	50
d	mm (in.)	25.6 (1.01)	35.6 (1.40)	50.6 (1.99)	65.6 (2.58)
d ₁	mm (in.)	22.6 (0.89)	32.6 (1.38)	47.6 (1.87)	62.6 (2.46)
d ₂	mm (in.)	19.6 (0.77)	29.6 (1.17)	44.6 (1.76)	59.6 (2.35)
h	mm (in.)	4.5 (0.18)	4.5 (0.18)	4.5 (0.18)	4.5 (0.18)

Ordering Information

Aluminium (set of 3 pieces)	Part No.	883 73	883 75	883 77	883 79
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Important: In the table of Chapter "General" the German designation for the type of steel is also stated in accordance with AISI.

Outer Support Rings (Stainless Steel 1.4310) for Ultra Sealing Rings



Dimensional drawing for the outer support rings

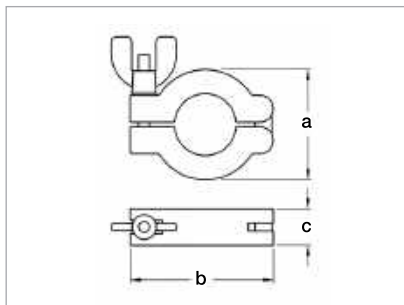
Technical Data

DN	ISO-KF	10/16	20/25	32/40	50
a	mm (in.)	3 (0.12)	3 (0.12)	3 (0.12)	3 (0.12)
D	mm (in.)	32 (1.26)	42 (1.65)	57 (2.24)	77 (3.03)
d	mm (in.)	25 (0.98)	35 (1.38)	50 (1.97)	65 (2.56)
h	mm (in.)	7 (0.28)	7 (0.28)	7 (0.28)	7 (0.28)

Ordering Information

Stainless steel	Part No.	883 74	883 76	883 78	883 69
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Clamping Rings (ADC 12)



Dimensional drawing for the clamping rings

Max. torque at the wing nut: 2 Nm

Technical Data

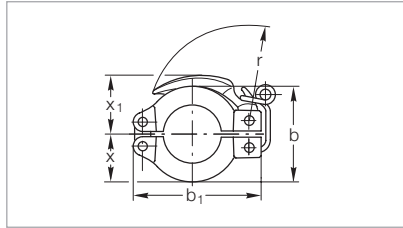
DN	ISO-KF	10/16	20/25	32/40	50
a	mm (in.)	45 (1.77)	55 (2.17)	70 (2.76)	92 (3.62)
b	mm (in.)	63 (2.48)	72 (2.83)	90 (3.54)	113 (4.45)
c	mm (in.)	16 (0.63)	16 (0.63)	16 (0.63)	20 (0.79)

Ordering Information

Aluminium	Part No.	183 41	183 42	183 43	183 45
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Important: In the table of Chapter "General" the German designation for the type of steel is also stated in accordance with AISI.

Quick Clamping Rings (Aluminium 3.2582.05)



Dimensional drawing for the quick clamping rings

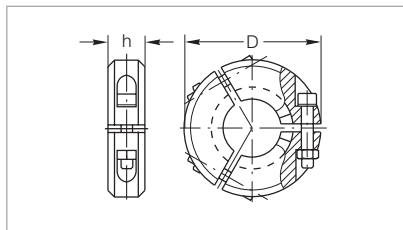
Technical Data

DN	ISO-KF	10/16	20/25	32/40
b	mm (in.)	45 (1.77)	55 (2.17)	70 (2.76)
b ₁	mm (in.)	61 (2.40)	72 (2.83)	90 (3.54)
r	mm (in.)	48 (1.89)	56 (2.20)	74 (2.91)
x	mm (in.)	22 (0.87)	27 (1.06)	35 (1.38)
x ₁	mm (in.)	30 (1.18)	34 (1.34)	44 (1.73)

Ordering Information

Aluminium	Part No.	183 46	183 47	183 48
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Clamping Collars (Aluminium 3.2162.05) for Ultra Sealing Rings



Dimensional drawing for the clamping collars for ultra sealing rings

Technical Data

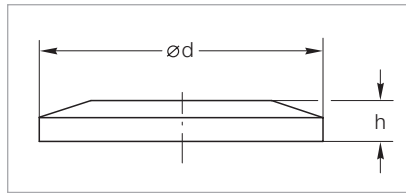
DN	ISO-KF	10/16	20/25	32/40	50
D	mm (in.)	52 (2.05)	75 (2.95)	90 (3.54)	115 (4.52)
h	mm (in.)	18 (0.71)	20 (0.79)	23 (0.90)	28 (1.10)
Hexagon socket screw to DIN 912 mm		M 4 x 30	M 6 x 30	M 8 x 35	M 8 x 50
	(in.)	(M 4 x 1.18)	(M 6 x 1.18)	(M 8 x 1.38)	(M 8 x 1.97)

Ordering Information

Aluminium	Part No.	882 75	882 77	882 78	882 79
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Important: In the table of Chapter "General" the German designation for the type of steel is also stated in accordance with AISI.

Blank Flanges (Al AW-6082-T6 / Stainless Steel 1.4301)



Dimensional drawing for the blank flanges

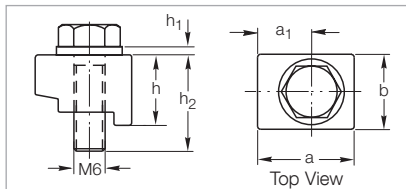
Technical Data

DN	ISO-KF	10	16	25	40	50
d	mm (in.)	30 (1.18)	30 (1.18)	40 (1.57)	55 (2.17)	75 (2.95)
h	mm (in.)	5 (0.20)	5 (0.20)	5 (0.20)	5 (0.20)	6 (0.24)

Ordering Information

Aluminium	Part No.	184 41	184 46	184 47	184 48	184 45
Stainless steel	Part No.	884 41	884 36	884 37	884 38	884 45

Claw, complete (Aluminium 3.2315.08)



Dimensional drawing for the claw, complete

Technical Data

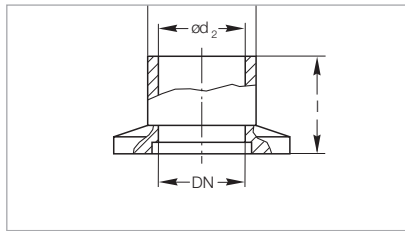
DN	ISO-KF	10 - 50
a	mm (in.)	19.5 (0.77)
a_1	mm (in.)	11.5 (0.45)
b	mm (in.)	14.0 (0.55)
h	mm (in.)	12.5 (0.49)
h_1	mm (in.)	1.6 (0.06)
h_2	mm (in.)	20.0 (0.79)

Ordering Information

Aluminium (Set of 4 pieces)	Part No.	885 00
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Important: In the table of Chapter "General" the German designation for the type of steel is also stated in accordance with AISI.

ISO-KF Flanges with Short Tubulation (Steel 1.0037 / Stainless Steel 1.4301)
Flange according DIN 28403; Tube diameter different



Dimensional drawing for the ISO-KF flanges with short tubulation

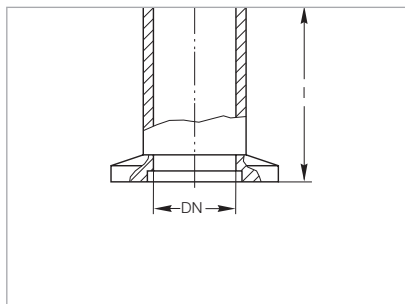
Technical Data

DN	ISO-KF	10	25	40	50
d_1 (Steel/Stainless steel)	mm (in.)	16/16 (0.63/0.63)	30/30 (1.18/1.18)	45/45 (1.77/1.77)	55/54 (2.17/2.13)
d_2 (Steel/Stainless steel)	mm (in.)	12/12 (0.47/0.47)	26/26 (1.02/1.02)	41/41 (1.61/1.61)	51/50 (2.01/1.97)
l	mm (in.)	20 (0.79)	20 (0.79)	20 (0.79)	20 (0.79)

Ordering Information

Steel	Part No.	182 31	182 33	182 34	182 35
Stainless steel	Part No.	866 31	866 33	866 34	866 35

ISO-KF Flanges with Long Tubulation (Steel 1.0037 / Stainless Steel 1.4301)
Flange according DIN 28403; Tube diameter different



Dimensional drawing for the ISO-KF flanges with long tubulation

Technical Data

DN	ISO-KF	10	25	40	50
d_1 (Steel/Stainless steel)	mm (in.)	16/16 (0.63/0.63)	30/30 (1.18/1.18)	45/45 (1.77/1.77)	55/54 (2.17/2.13)
d_2 (Steel/Stainless steel)	mm (in.)	12/12 (0.47/0.47)	26/26 (1.02/1.02)	41/41 (1.61/1.61)	51/50 (2.01/1.97)
l	mm (in.)	70 (2.76)	70 (2.76)	70 (2.76)	70 (2.76)

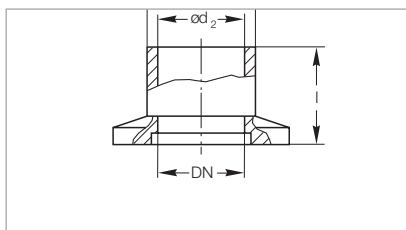
Ordering Information

Steel	Part No.	182 81	182 83	182 84	182 85
Stainless steel	Part No.	866 81	866 83	866 84	866 85

Important: In the table of Chapter "General" the German designation for the type of steel is also stated in accordance with AISI.

ISO-KF Flanges with Short Tubulation (Steel 1.0037 / Stainless Steel 1.4301)

Flange and tube according DIN 28403



Dimensional drawing for the ISO-KF flanges with short tubulation

Technical Data

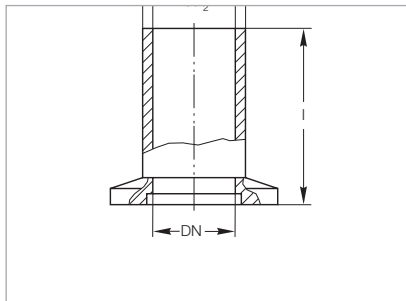
DN	ISO-KF	10	16	25	40	50
d_1	mm (in.)	14 (0.55)	20 (0.79)	28 (1.10)	44,5 (1.75)	57 (2.24)
d_2	mm (in.)	10 (0.39)	16 (0.63)	24 (0.94)	40,5 (1.59)	50,6 (1.99)
l	mm (in.)	20 (0.79)	20 (0.79)	20 (0.79)	20 (0.79)	20 (0.79)

Ordering Information

Steel	Part No.	182 31D	182 32	182 33D	182 34D	182 35D
Stainless steel	Part No.	866 31D	866 32	866 33D	866 34D	866 35D

ISO-KF Flanges with Long Tubulation (Steel 1.0037 / Stainless Steel 1.4301)

Flange and tube according DIN 28403



Dimensional drawing for the ISO-KF flanges with long tubulation

Technical Data

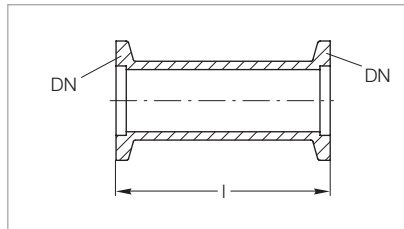
DN	ISO-KF	10	16	25	40	50
d_1	mm (in.)	14 (0.55)	20 (0.79)	28 (1.10)	44,5 (1.75)	57 (2.24)
d_2	mm (in.)	10 (0.39)	16 (0.63)	24 (0.94)	40,5 (1.59)	50,6 (1.99)
l	mm (in.)	70 (2.76)	70 (2.76)	70 (2.76)	70 (2.76)	70 (2.76)

Ordering Information

Steel	Part No.	182 81D	182 82	182 83D	182 84D	182 85D
Stainless steel	Part No.	866 81D	866 82	866 83D	866 84D	866 85D

Important: In the table of Chapter "General" the German designation for the type of steel is also stated in accordance with AISI.

Intermediate Pieces (Al AW-6082-T6 / Stainless Steel 1.4301)



Dimensional drawing for the intermediate pieces

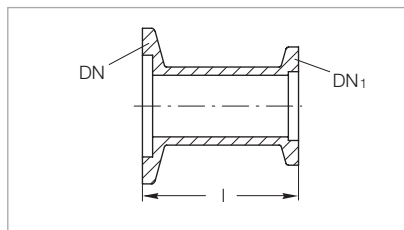
Technical Data

DN	ISO-KF	80 (3.15)	100 (3.94)	130 (5.12)
l	mm (in.)	80	100	130

Ordering Information

Aluminium	Part No.	184 80	184 81	184 82
Stainless steel	Part No.	884 17	884 18	884 19

Reducers (Al AW-6082-T6 / Stainless Steel 1.4301)



Dimensional drawing for the reducers

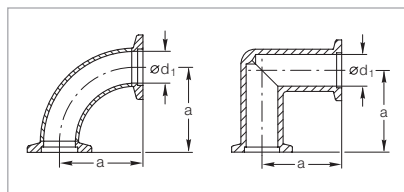
Technical Data

DN/DN ₁	ISO-KF	25/16	40/16	40/25	50/40
l	mm (in.)	40 (1.57)	40 (1.57)	40 (1.57)	40 (1.57)

Ordering Information

Aluminium	Part No.	183 86	183 89	183 87	183 88
Stainless steel	Part No.	885 04	885 07	885 05	885 06

Pipe Bend 90° (Stainless Steel 1.4301) / Mitred Elbow 90° (Aluminium 3.2315.08)



Dimensional drawings for the pipe bends 90° (stainless steel, left) and the mitred elbows 90° (aluminium, right)

Technical Data

DN	ISO-KF	16	16	25	25	40	40	50
a	mm (in.)	40 (1.57)	40 (1.57)	50 (1.97)	50 (1.97)	65 (2.56)	65 (2.56)	70 (2.76)
d ₁	mm (in.)	16 (0.63)	15 (0.59)	25 (0.98)	25 (0.98)	41 (1.62)	41 (1.62)	49 (1.93)
Conductance	l/s	6.5	–	18.9	–	56.5	–	–

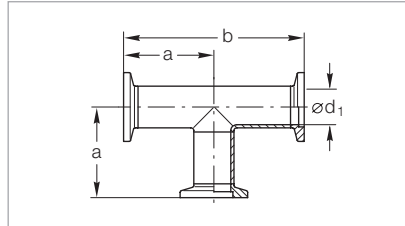
Ordering Information

Aluminium	Part No.	184 36	–	184 37	–	184 38	–	–
Stainless steel	Part No.	–	884 61	–	884 62	–	884 64	884 65

Not suited for the mounting of turbo molecular pumps

Important: In the table of Chapter "General" the German designation for the type of steel is also stated in accordance with AISI.

Tees (Aluminium 3.2315.08 / Stainless Steel 1.4301)



Dimensional drawing for the tees

Technical Data

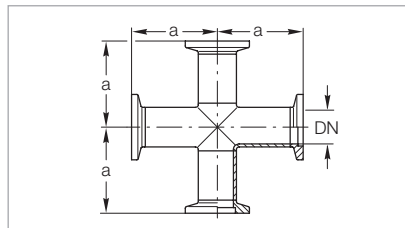
DN	ISO-KF	16	16	25	25	40	40	50
a	mm (in.)	40 (1.57)	40 (1.57)	50 (1.97)	50 (1.97)	65 (2.56)	65 (2.56)	70 (2.76)
b	mm (in.)	80 (3.15)	80 (3.15)	100 (3.94)	100 (3.94)	130 (5.12)	130 (5.12)	140 (5.51)
d ₁ (Aluminium)	mm (in.)	6 (0.63)	–	25 (0.98)	–	39 (1.54)	–	–
d ₁ (Stainless steel)	mm (in.)	–	16 (0.63)	–	25 (0.98)	–	41 (1.61)	53 (2.09)
Conductance	l/s	6,5	–	18,9	–	56,5	–	–

Ordering Information

Aluminium	Part No.	184 06	–	184 07	–	184 08	–	–
Stainless steel	Part No.	–	884 71	–	884 72	–	884 74	884 75

Not suited for the mounting of turbo molecular pumps

4-Way Crosses (Aluminium 3.2315.08 / Stainless Steel 1.4301)



Dimensional drawing for the 4-way crosses

Technical Data

DN	ISO-KF	16	16	25	25	40	40	50
a	mm (in.)	40 (1.57)	40 (1.57)	50 (1.97)	50 (1.97)	65 (2.56)	65 (2.56)	70 (2.76)
Conductance	l/s	6,5	–	18,9	–	56,5	–	–

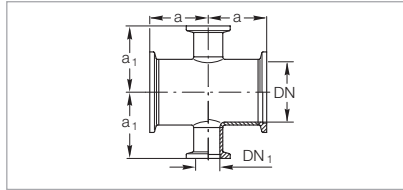
Ordering Information

Aluminium	Part No.	184 71	–	184 74	–	184 75	–	–
Stainless steel	Part No.	–	884 85	–	884 86	–	884 87	884 88

Not suited for the mounting of turbo molecular pumps

Important: In the table of Chapter "General" the German designation for the type of steel is also stated in accordance with AISI.

4-Way Reducer Crosses with lateral DN 16 Flanges (Aluminium 3.2315.08 / Stainless Steel 1.4301)



Dimensional drawing for the 4-way reducer crosses with lateral DN 16 flanges

Technical Data

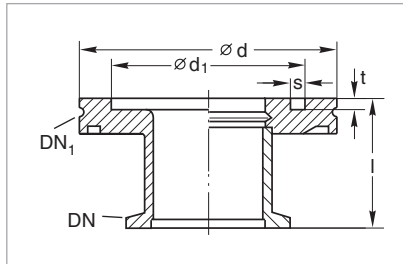
DN/DN ₁	ISO-KF	25/16	40/16	50/16
a	mm (in.)	35 (1.38)	40 (1.57)	50 (1.97)
a ₁	mm (in.)	35 (1.38)	45 (1.77)	50 (1.97)

Ordering Information

Aluminium	Part No.	184 57	184 58	–
Stainless steel	Part No.	884 96	884 97	884 98

Not suited for the mounting of turbo molecular pumps

Adaptors/Reducers ISO-KF – ISO-K



Dimensional drawing for the adaptor reducers ISO-KF – ISO-K;
left: aluminium; right: stainless steel

Technical Data

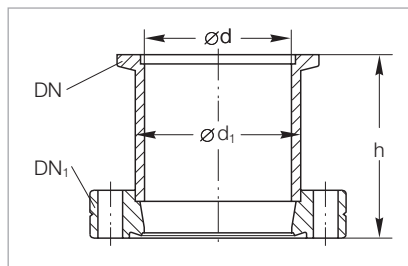
DN	ISO-KF	40	50	40
DN ₁	ISO-K	63	63	100
d	mm (in.)	95 (3.74)	95 (3.74)	130 (5.12)
d ₁	mm (in.)	70 (2.76)	70 (2.76)	102 (4.02)
l	mm (in.)	40 (1.57)	45 (1.77)	40 (1.57)
s	mm (in.)	5 (0.2)	5 (0.2)	5 (0.2)
t	mm (in.)	4.5 (0.18)	4.5 (0.18)	4.5 (0.18)
Weight	kg (lbs)	0.5 (1.10)	0.6 (1.32)	0.8 (1.77)

Ordering Information

Stainless steel 1.4305	Part No.	887 40	887 41	887 42
Aluminium 3.2315.71	Part No.	269 40	269 41	–

Important: In the table of Chapter “General” the German designation for the type of steel is also stated in accordance with AISI.

Adaptors ISO-KF – CF (Stainless Steel 1.4301)



Dimensional drawing for the adaptors CF – ISO-KF

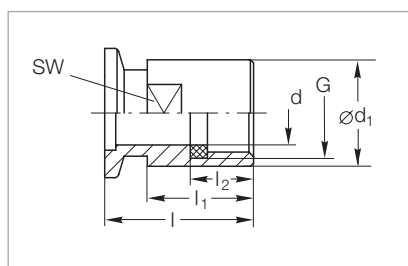
Technical Data

DN	ISO-KF	16	25	16	25	40	40
DN ₁	CF	16	16	40	40	40	63
d	mm (in.)	16	16	16	26	37	41
h	mm (in.)	35	35	30	30	50	35
d ₁ (tube)	mm (in.)	20	20	20	30	41	45

Ordering Information

Stainless steel 1.4301	Part No.	837 81	837 83	837 82	837 84	837 36	837 86
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Screw-on Flanges (Stainless Steel 1.4305 / FPM (FKM))



Dimensional drawing for the screw-on flanges

Technical Data

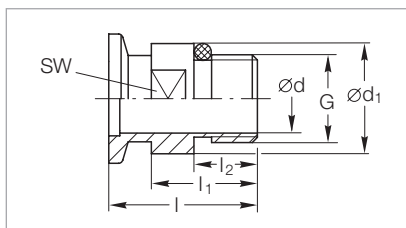
DN	ISO-KF	10	16	25	40
l	mm (in.)	35 (1.34)	35 (1.34)	45 (1.77)	50 (1.97)
l ₁	mm (in.)	25 (0.98)	25 (0.98)	35 (1.34)	40 (1.57)
l ₂	mm (in.)	15 (0.59)	15 (0.59)	25 (0.98)	30 (1.18)
d	mm (in.)	10 (0.39)	15 (0.59)	24 (0.94)	38 (1.50)
d ₁	mm (in.)	20 (0.79)	25 (0.98)	39 (1.54)	54 (2.13)
G (according to DIN ISO 228-1)		G 3/8	G 1/2	G 1	G 1 1/2
SW (width across flats)	mm (in.)	17 (0.67)	21 (0.83)	36 (1.42)	50 (1.97)

Ordering Information

Stainless steel	Part No.	884 25	884 26	884 27	884 28
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Important: In the table of Chapter "General" the German designation for the type of steel is also stated in accordance with AISI.

Screw-in Flanges (Stainless Steel 1.4301 / FPM (FKM))



Dimensional drawing for the screw-in flanges

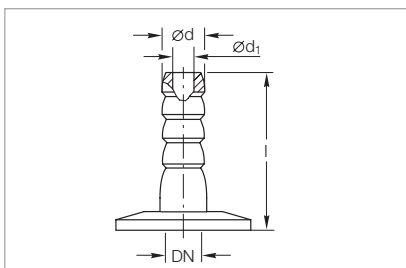
Technical Data

DN	ISO-KF	10	16	16	16	25	40
l	mm (in.)	35 (1.34)	26 (1.02)	35 (1.34)	42 (1.65)	45 (1.77)	50 (1.97)
l₁	mm (in.)	25 (0.98)	–	25 (0.98)	–	35 (1.34)	40 (1.57)
l₂	mm (in.)	15 (0.59)	8 (0.31)	15 (0.59)	11,5 (0.45)	25 (0.98)	30 (1.18)
d	mm (in.)	12 (0.47)	5 (0.20)	16 (0.63)	5 (0.20)	25 (0.98)	41 (1.61)
d₁	mm (in.)	22 (0.87)	16 (0.63)	26 (1.02)	–	39 (1.54)	54 (2.13)
M	mm (in.)	–	–	–	M 16 x 1,5 (M 16 x 0.06)	–	–
G (according to DIN ISO 228-1)		G 3/8	G 1/8	G 1/2		G 1	G 1 1/2
SW (width across flats)	mm (in.)	19 (0.75)	13 (0.51)	22 (0.87)	17 (0.67)	36 (1.42)	50 (1.97)

Ordering Information

Stainless steel 1.4301	Part No.	886 30	160 26	886 31	16840V01	886 32	886 33
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ISO-KF Flanges with Hose Nozzles (Al AW-6082-T6 and Stainless Steel 1.4305)



Dimensional drawing for the ISO-KF flanges with hose nozzle

Technical Data

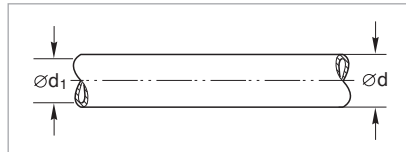
DN	ISO-KF	16	25	40
d	mm (in.)	12 (0.47)	12 (0.47)	12 (0.47)
d₁¹⁾	mm (in.)	7 (0.26)	7 (0.26)	7 (0.26)
d₁¹⁾	mm (in.)	40 (1.57)	40 (1.57)	40 (1.57)

Ordering Information

Aluminium	Part No.	182 90	182 91	182 92
Stainless steel	Part No.	885 14	885 08	885 09

¹⁾ Also recommended inside diameter for the hose

Rubber Vacuum Hoses (NR) for Hose Nozzles



Dimensional drawing for rubber vacuum hoses

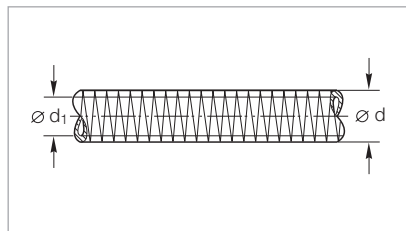
Technical Data

DN	ISO-KF	10	16	20
d	mm (in.)	17 (0.66)	25 (0.98)	32 (1.26)
d ₁	mm (in.)	7 (0.28)	10 (0.39)	16 (0.63)
Length	m (in.)	by the metre	by the metre	by the metre
Hardness – Shore A –		55 ±5	55 ±5	55 ±5
Temperature range	°C (°F)	-30 to +85 (-22 to +185)	-30 to +85 (-22 to +185)	-30 to +85 (-22 to +185)

Ordering Information

Rubber vacuum hose	Part No.	172 02	172 03	172 04
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PVC Coiled Vacuum Hoses without Flanges



Dimensional drawing for the PVC vacuum hoses

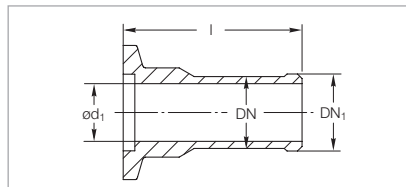
Technical Data

DN	ISO-KF	16	25	40
d	mm (in.)	23 (0.91)	33 (1.30)	53 (2.09)
d ₁	mm (in.)	16 (0.63)	25 (0.98)	40 (1.57)
Length	m (in.)	by the metre	by the metre	by the metre

Ordering Information

PVC coiled vacuum hose	Part No.	172 41	172 42	172 43
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ISO-KF Flanges with Hose Nozzle (Aluminium AW-6082-T6)



Dimensional drawing for the ISO-KF flanges with hose nozzle

Technical Data

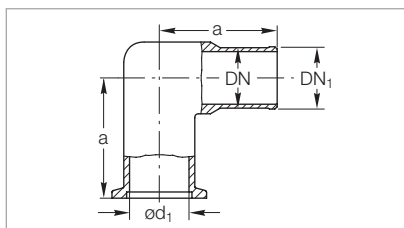
DN	ISO-KF	16	25	40
DN ₁ (tube)	mm (in.)	17 (0.67)	26 (1.02)	41 (1.61)
d ₁	mm (in.)	13 (0.51)	22 (0.87)	37 (1.46)
l	mm (in.)	40 (1.57)	40 (1.57)	40 (1.57)

Ordering Information

Aluminium	Part No.	182 45	182 46	182 47
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Important: In the table of Chapter "General" the German designation for the type of steel is also stated in accordance with AISI.

Elbows 90° with Hose Nozzle (Aluminium 3.2381.02)



Dimensional drawing for the elbows 90° with hose nozzle

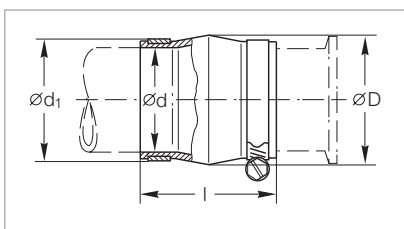
Technical Data

DN	ISO-KF	16	25	40
DN ₁ (Tube)	mm (in.)	17 (0.67)	26 (1.02)	41 (1.61)
a	mm (in.)	40 (1.57)	50 (1.97)	65 (2.56)
d ₁	mm (in.)	16 (0.63)	25 (0.98)	39 (1.54)

Ordering Information

Aluminium	Part No.	182 15	182 16	182 17
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CR Compensation Elements with Integrated Support Ring



Dimensional drawing for the compensation elements with integrated support ring

Technical Data

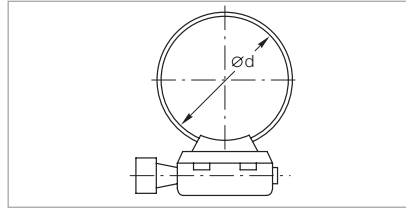
DN	ISO-KF	16	25	40
D	mm (in.)	44 (1.73)	50 (1.97)	68 (2.68)
d (Tube tolerance)	mm (in.)	16 (0.63)	25 (0.98)	40 (1.57)
d ₁	mm (in.)	24 (0.94)	33 (1.30)	48 (1.89)
l	mm (in.)	58 (2.28)	60 (2.36)	64 (2.52)
Leak rate	mbar x l x s ⁻¹	≤ 1 x 10 ⁻⁵	≤ 1 x 10 ⁻⁵	≤ 1 x 10 ⁻⁵

Ordering Information

Stainless steel/CR	Part No.	182 78 ¹⁾	182 79 ¹⁾	182 80 ¹⁾
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¹⁾ Is supplied complete with stainless steel hose clamps

Hose Clamps (Stainless Steel 1.4301)



Dimensional drawing for the hose clamps

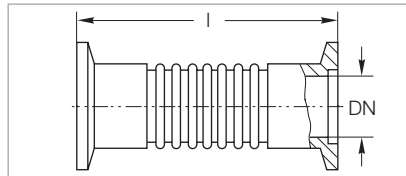
Technical Data

DN	ISO-KF	16	25	40
d (min. / max.)	mm	13 / 32 (0.51 / 1.26)	19 / 44 (0.75 / 1.73)	29 / 76 (1.14 / 2.99)

Ordering Information

Stainless steel	Part No.	866 21	866 22	866 23
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Bellows (Stainless Steel 1.4571) with Flanges (Stainless Steel 1.4301)



Dimensional drawing for the bellows with flanges

Technical Data

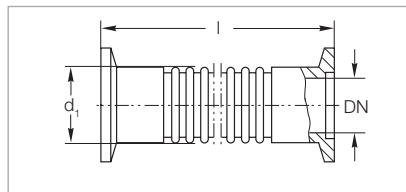
DN	ISO-KF	16	25	40	50
L	mm (in.)	70 (2.76)	80 (3.15)	100 (3.94)	100 (3.94)
Wall thickness	mm (in.)	0.13 (0.005)	0.13 (0.005)	0,15 (0.006)	0,2 (0.008)
Compression	mm (in.)	6.5 (0.26)	8 (0.31)	11 (0.43)	10 (0.39)
Tension	mm (in.)	4 (0.16)	5 (0.20)	7 (0.28)	6 (0.24)
max. angle	degrees ¹⁾	±21	±17	±15	±15
Lateral motion	mm (in.)	±4 (±0.16)	±3,5 (±0.14)	±7 (±0.28)	±8 (±0.31)

Ordering Information

Stainless steel	Part No.	872 41	872 43	872 45	872 46
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¹⁾ When utilizing the maximum bending angle, no extension along the axial axis will be possible!

Vacuum Hoses ¹⁾ with Flanges (Stainless Steel 1.4571)



Dimensional drawing for the vacuum hoses with flanges

Technical Data

DN	ISO-KF	16	25	40	50
d_1	mm (in.)	22.8 (0.90)	33 (1.30)	52 (2.05)	63 (2.48)
Max. bending radius (inside)					
with multiple bending	mm (in.)	68.5 (2.70)	103 (4.06)	129 (5.08)	198 (7.80)
with single bend	mm (in.)	50 (1.97)	63 (2.48)	100 (3.94)	130 (5.12)
Wall thickness	mm (in.)	0.2 (0.008)	0.2 (0.008)	0.2 (0.008)	0.3 (0.012)

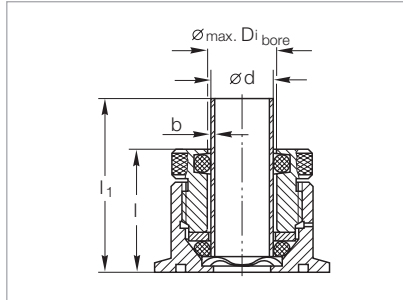
Ordering Information

L = 250 mm (9.84 in.)	Part No.	867 81	867 83	867 85	867 86
L = 500 mm (19.69 in.)	Part No.	867 91	867 93	867 95	867 96
L = 750 mm (29.53 in.)	Part No.	867 41	867 43	867 45	867 46
L = 1000 mm (39.37 in.)	Part No.	868 01	868 03	868 05	868 06

¹⁾ Flexible vacuum hoses must be linked to an external mechanical assembly

Important: In the table of Chapter "General" the German designation for the type of steel is also stated in accordance with AISI.

ISO-KF Flanges with Compression Fitting for Glass/Metal/Plastic Tubes (Aluminium 3.2315.71/FPM(FKM))



Dimensional drawing for the ISO-KF flanges with compression fitting

Only for pressure ≤ 1000 mbar (≤ 750 Torr)

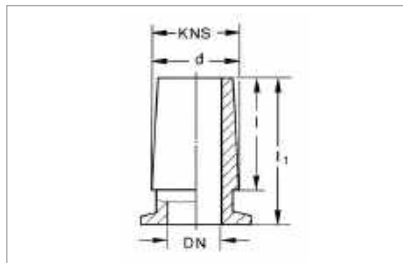
Technical Data

DN	ISO-KF	10	40
b	mm (in.)	1.5 (0.06)	1.5 (0.06)
d (glass)	mm (in.)	10 (0.39)	26 (1.02)
l	mm (in.)	30 (1.18)	45 (1.77)
l_1	mm (in.)	50 (1.97)	65 (2.56)
$D_{\text{i bore}}\text{-max.}$	± 0.2 mm (± 0.008 in.)	11 (0.43)	27 (1.06)

Ordering Information

Compression fitting	Part No.	184 61	184 66
Sealing set (FPM (FKM)) for high temperatures (150 °C (302 °F)) (set = 10 pcs)	Part No.	ES 105 94	ES 210 610

ISO-KF Flanges with Ground Cone (Stainless Steel 1.4301)



Dimensional drawing for the ISO-KF flanges with ground cone

Technical Data

DN	ISO-KF	16	25	40
KNS - d / l	mm (in.)	19 / 26 (0.75 / 1.02)	29 / 32 (1.14 / 1.26)	45 / 40 (1.77 / 1.57)
l_1	mm (in.)	40 (1.57)	45 (1.77)	55 (2.17)
Taper		1:10	1:10	1:10

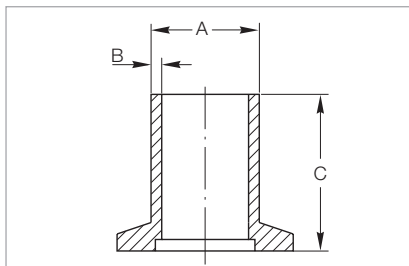
Ordering Information

Stainless steel	Part No.	184 87	184 85	184 86
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Important: In the table of Chapter "General" the German designation for the type of steel is also stated in accordance with AISI.

Only available for purchase in North and South America

ISO-KF Flanges with Long Weld Stub, Standard-Inch Diameters



Dimensional drawing for the ISO-KF flanges
with long weld stub

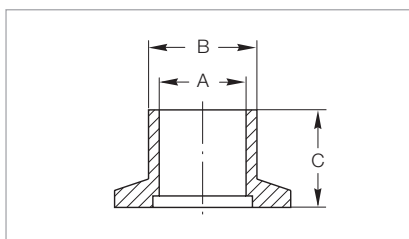
Technical Data

DN	ISO-KF	16	25	40
ø A	mm (in.)	19.0 (0.75)	25.4 (1.00)	38.1 (1.50)
B	mm (in.)	1.7 (0.07)	1.7 (0.07)	2.1 (0.08)
C	mm (in.)	40.0 (1.58)	40.0 (1.58)	40.0 (1.58)
Tube fitting O.D. size		3/4"	1"	1 1/2"

Ordering Information

Stainless steel	Part No.	899 621	899 622	899 624
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ISO-KF Flanges with Weld Stub, Metric Diameters



Dimensional drawing for the ISO-KF flanges
with weld stub

Technical Data

DN	ISO-KF	16	25	40	50
ø A	mm (in.)	16 (0.63)	25 (0.98)	40 (1.58)	50 (1.97)
B	mm (in.)	20 (0.79)	28 (1.10)	45 (1.77)	55 (2.17)
C	mm (in.)	16 (0.63)	19 (0.75)	25 (0.98)	25 (0.98)

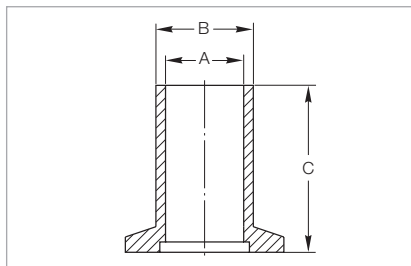
Ordering Information

Stainless steel	Part No.	884 21	884 22	884 23	883 85
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Important: In the table of Chapter "General" the German designation for the type of steel is also stated in accordance with AISI.

Only available for purchase in North and South America

ISO-KF Flanges with Weld Neck, Metric Diameters



Dimensional drawing for the ISO-KF flanges
with weld neck

Technical Data

DN	ISO-KF	16	25	40
ø A	mm (in.)	16 (0.63)	25 (0.98)	40 (1.58)
B	mm (in.)	20 (0.79)	28 (1.10)	45 (1.77)
C	mm (in.)	57 (2.25)	57 (2.25)	57 (2.25)

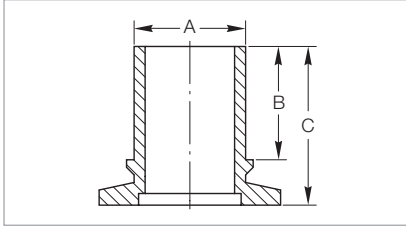
Ordering Information

Stainless steel	Part No.	884 31	884 32	884 33
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Important: In the table of Chapter “General” the German designation for the type of steel is also stated in accordance with AISI.

Only available for purchase in North and South America

ISO-KF Flanges for Tube Fittings, Male



Dimensional drawing for the ISO-KF flanges
for tube fittings, male

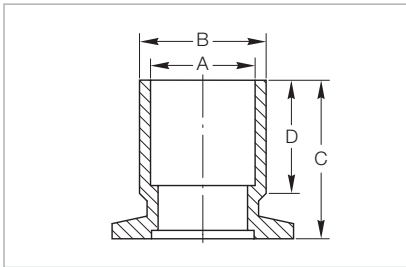
Technical Data

DN	ISO-KF	16	25	40
ø A	mm (in.)	19.0 (0.75)	29.0 (1.13)	41.0 (1.63)
B	mm (in.)	17.5 (0.69)	29.0 (1.13)	29.0 (1.13)
C	mm (in.)	29.0 (1.13)	35.0 (1.38)	46.0 (1.81)
Tube fitting I.D. size		3/4"	1 1/8"	1 5/8"

Ordering Information

Brass	Part No.	910280119	910280120	910280121
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ISO-KF Flanges for Tube Fittings, Female



Dimensional drawing for the ISO-KF flanges
for tube fittings, female

Technical Data

DN	ISO-KF	40	40
ø A	mm (in.)	54.0 (2.13)	41.0 (1.63)
ø B	mm (in.)	57.0 (2.24)	44.5 (1.75)
C	mm (in.)	35.0 (1.38)	35.0 (1.38)
D	mm (in.)	16.0 (0.63)	19.0 (0.75)
Tube fitting O.D. size		2 1/8"	1 5/8"

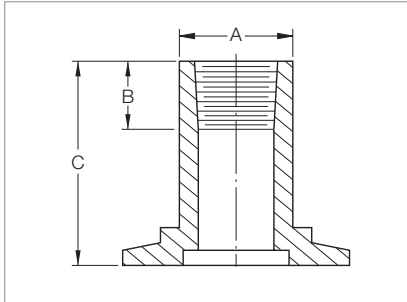
Ordering Information

Brass	Part No.	910280124	910280125
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Important: In the table of Chapter "General" the German designation for the type of steel is also stated in accordance with AISI.

Only available for purchase in North and South America

ISO-KF/NPT Female Adaptor



Dimensional drawing
for the ISO-KF/NPT female adaptors

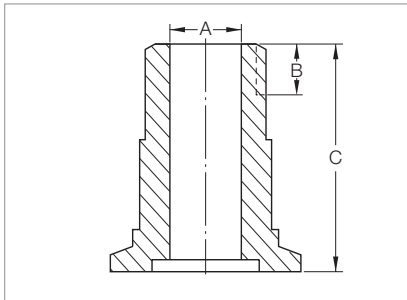
Technical Data

DN	ISO-KF	16	25	40	
ø A	mm (in.)	16 (0.62)	25 (1.00)	38 (1.50)	
B	mm (in.)	10 (0.39)	10 (0.39)	10 (0.39)	
C	mm (in.)	25.4 (1.00)	25.4 (1.00)	25.4 (1.00)	
Pipe size	NPT	1/8"	1/4"	1/8"	1/4"

Ordering Information

Stainless steel	Part No.	899 604	899 643	899 605	899 644	899 606	899 645
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ISO-KF/NPT Male Adaptor



Dimensional drawing
for the ISO-KF/NPT male adaptors

Technical Data

DN	ISO-KF	16	25	25
ø A	mm (in.)	9.5 (0.38)	16 (0.63)	23.8 (0.94)
B	mm (in.)	10 (0.4)	13.5 (0.53)	17 (0.68)
C	mm (in.)	38 (1.5)	46 (1.81)	63.5 (2.50)
Pipe size	NPT	1/4"	1/2"	1"

Ordering Information

Carbon steel	Part No.	899 601	899 602	899 626
Stainless steel	Part No.	992780678	-	-

Technical Data

DN	ISO-KF	40	40	40	40
ø A	mm (in.)	25.4 (1.00)	31.8 (1.25)	38.1 (1.50)	38.2 (1.50)
B	mm (in.)	17.0 (0.68)	18.0 (0.71)	18.4 (0.72)	19.2 (0.76)
C	mm (in.)	50.8 (2.00)	63.5 (2.50)	63.5 (2.50)	63.5 (2.50)
Pipe size	NPT	1"	1 1/4"	1 1/2"	2"

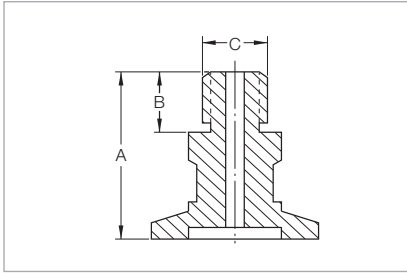
Ordering Information

Stainless steel	Part No.	899 603	899 627	899 628	899 629
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Important: In the table of Chapter "General" the German designation for the type of steel is also stated in accordance with AISI.

Only available for purchase in North and South America

ISO-KF/Metric Adaptor



Dimensional drawing for the ISO-KF/
metric adaptors

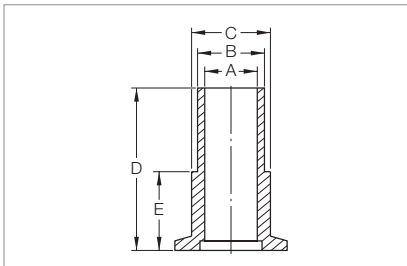
Technical Data

DN	ISO-KF	16
A	mm (in.)	50.8 (2.00)
B	mm (in.)	12.7 (0.50)
ø C / thread	mm (in.)	M 16 x 1.5 (M 16 x 0.06)

Ordering Information

Carbon steel	Part No.	99258004
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Hose Adaptor



Dimensional drawing for the hose adaptors

Technical Data

DN	ISO-KF	16	25	40
ø A	mm (in.)	16 (0.63)	21 (0.81)	32 (1.2)
ø B	mm (in.)	19.5 (0.77)	26 (1.02)	39 (1.54)
ø C	mm (in.)	20 (0.79)	28 (1.10)	45 (1.77)
D	mm (in.)	29 (1.13)	29 (1.13)	29 (1.13)
E	mm (in.)	13 (0.50)	13 (0.50)	13 (0.50)
Nominal I.D. hose		3/4"	1"	1 1/2"

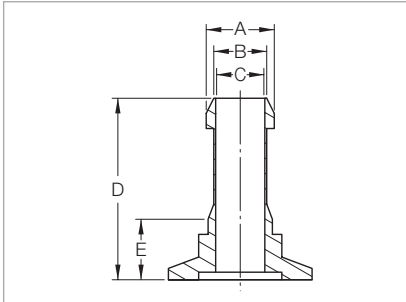
Ordering Information

Stainless steel	Part No.	992780668	992780670	992780672
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Important: In the table of Chapter "General" the German designation for the type of steel is also stated in accordance with AISI.

Only available for purchase in North and South America

ISO-KF Nipples, American Standard



Dimensional drawing for the ISO-KF nipples
american standard

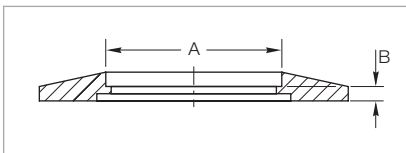
Technical Data

DN	ISO-KF	16	16	25
ø A	mm (in.)	9.5 (0.38)	16.1 (0.64)	16.1 (0.64)
ø B	mm (in.)	7.6 (0.30)	14.3 (0.56)	14.3 (0.56)
ø C	mm (in.)	5.6 (0.22)	11.9 (0.47)	11.9 (0.47)
D	mm (in.)	40 (1.58)	40 (1.58)	40 (1.58)
E	mm (in.)	12.7 (0.50)	12.7 (0.50)	12.7 (0.50)
Tube fitting O.D. size		1/4"	1/2"	1/2"

Ordering Information

Stainless steel	Part No.	899 674	899 675	899 676
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Flanges with Welded Socket



Dimensional drawing for the flanges
with welded sockets

Technical Data

DN	ISO-KF	40
ø A	mm (in.)	41.1 (1.62)
B	mm (in.)	3 (0.12)
Tube fitting O.D. size		1 1/2"

Ordering Information

Stainless steel	Part No.	899 634
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Important: In the table of Chapter "General" the German designation for the type of steel is also stated in accordance with AISI.

ISO-K

Clamp Flange Fittings and Components



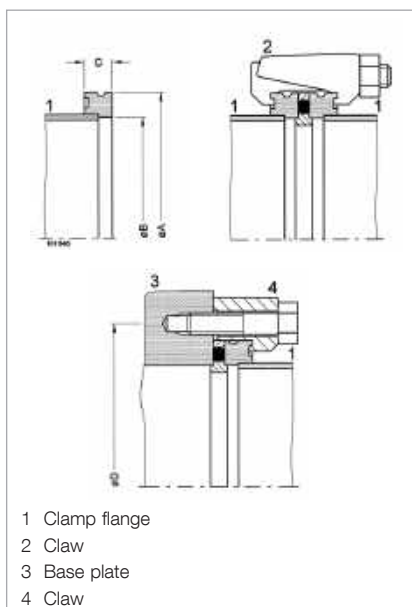
Attaching a clamp flange component and fitting of the clamp



Tightening the clamping bolt



ISO-K clamp flange connection



Flange Components DN 63 to DN 630 ISO-K (to DIN 28 404 in line with ISO 1609/3669)

The clamp flange connection was introduced to the vacuum industry by Leybold. Since the fitting of clamp flanges does not depend on any bolt holes in the flange, these components may be installed in any orientation.

Advantages to the User

- Quick to fit
- Safe and reliable
- Can be turned in any direction
- Easy to disassemble, thus easy to clean
- Suitable for pressures down to 10^{-7} mbar (0.75×10^{-7} Torr) when using O-rings and down to 10^{-9} mbar (0.75×10^{-9} Torr) when using metal gaskets
- Easily adaptable to other flange systems
- Mounted by means of clamps (ISO-K) or collar flange with retaining ring (ISO-F, DIN EN 1092-1)
- Clamp flange components are used with CR or FPM (FKM) gaskets or with ultra sealing disks made of aluminium
- Degassing temperatures

for CR, max. 100 °C (212 °F)
for FPM (FKM), max. 150 °C (302 °F)
for the ultra sealing disk, max. 200 °C (392 °F)

The pressure range for the application depends in each case on the sealing method which is used and is thus limited for ultra sealing disks to 10^{-9} mbar (0.75×10^{-9} Torr), for FPM (FKM) gaskets to 10^{-8} mbar (0.75×10^{-8} Torr) and for CR sealed components to 10^{-7} mbar (0.75×10^{-7} Torr).

Flexible Compensation Elements (CR)

Vacuum systems and pump systems often require components which are capable of protecting sensitive instruments against impacts or excessive vibrations while linking tubes at the same time.

Advantages to the User

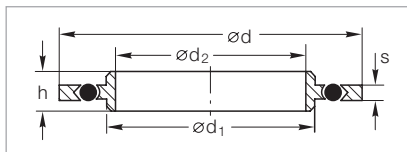
- Easy and quick to install
- Safe and reliable
- Tubes may be turned in any direction
- No centering ring and sealing ring is needed since the seal is provided by the smooth tube surface
- Capable of withstanding temperatures up to 100 °C (212 °F)
- Suitable for pressures down to 10^{-5} mbar (0.75×10^{-5} Torr)

Technical Data

Nominal diameter		A	B	C	Number of clamps	D	Screws for claws	Number of claws
DN 63 ISO-K	mm in.	95 3.74	70 2.76	12 0.47	4	110 4.33	M 8 x 35 M 8 x 1.38	4
DN 100 ISO-K	mm in.	130 5.12	102 4.02	12 0.47	4	145 5.71	M 8 x 35 M 8 x 1.38	8
DN 160 ISO-K	mm in.	180 7.09	153 6.02	12 0.47	4	200 7.87	M 10 x 35 M 10 x 1.38	8
DN 200 ISO-K	mm in.	240 9.45	213 8.39	12 0.47	6	260 10.24	M 10 x 35 M 10 x 1.38	12
DN 250 ISO-K	mm in.	290 11.42	261 10.28	12 0.47	6	310 12.20	M 10 x 35 M 10 x 1.38	12
DN 320 ISO-K	mm in.	370 14.57	318 12.52	17 0.67	8	395 15.55	M 12 x 50 M 12 x 1.97	12
DN 400 ISO-K	mm in.	450 17.72	400 15.75	17 0.67	8	480 18.90	M 12 x 50 M 12 x 1.97	16
DN 500 ISO-K	mm in.	550 21.65	501 19.72	17 0.67	12	580 22.83	M 12 x 50 M 12 x 1.97	16
DN 630 ISO-K	mm in.	690 27.17	651 25.63	22 0.87	12	720 28.35	M 12 x 55 M 12 x 2.17	20

Important: In the table of Chapter "General" the German designation for the type of steel is also stated in accordance with AISI.

Centering Rings (Aluminium AW-6082-T6 / Stainless Steel 1.4301) with O-Ring (CR/FPM (FKM))



Dimensional drawing for the centering rings with O-ring

Technical Data

DN	ISO-K	63	100	160	200	250
d	mm (in.)	96 (3.78)	128 (5.04)	179 (7.05)	239 (9.41)	287 (11.30)
d ₁	mm (in.)	70 (2.76)	102 (4.02)	153 (6.02)	213 (8.39)	261 (10.28)
d ₂	mm (in.)	67 (2.64)	99 (3.90)	150 (5.91)	210 (8.27)	258 (10.16)
h	mm (in.)	8 (0.31)	8 (0.31)	8 (0.31)	8 (0.31)	8 (0.31)
s	mm (in.)	3.9 (0.15)	3.9 (0.15)	3.9 (0.15)	3.9 (0.15)	3.9 (0.15)

Ordering Information

Aluminium/FPM (FKM)	Part No.	268 41	268 42	268 43	268 44	268 45
Aluminium/CR	Part No.	268 05	268 06	268 09	268 19	268 17
Stainless steel/FPM (FKM) ¹⁾	Part No.	887 03	887 04	887 07	887 02	887 08

Technical Data

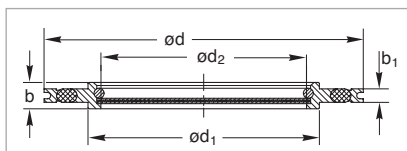
DN	ISO-K	320	400	500	630	800	1000
d	mm (in.)	358 (14.09)	440 (17.32)	541 (21.30)	691 (27.20)	840 (33.07)	1040 (40.94)
d ₁	mm (in.)	318 (12.52)	400 (15.75)	501 (19.72)	651 (25.63)	800 (31.50)	1000 (39.37)
d ₂	mm (in.)	313 (12.32)	395 (15.55)	496 (19.53)	646 (25.43)	795 (31.18)	995 (39.17)
h	mm (in.)	14 (0.55)	14 (0.55)	14 (0.55)	14 (0.55)	14 (0.55)	14 (0.55)
s	mm (in.)	5.6 (0.22)	5.6 (0.22)	5.6 (0.22)	5.6 (0.22)	5.6 (0.22)	5.6 (0.22)

Ordering Information

Aluminium/FPM (FKM)	Part No.	268 46	268 47	268 48	268 49	268 50	268 51
Aluminium/CR	Part No.	268 18	268 14	268 15	268 16	–	–

¹⁾ Inner ring: stainless steel, outer ring: aluminium

Centering Rings with Fine Filter (Stainless Steel 1.4301) and O-Ring (FPM (FKM))



Dimensional drawing for the centering rings with fine filter

Filter
material: Stainless steel 1.4404,
size of pores: 4 µm,
separation grade: 1 µm particles to 98%

Technical Data

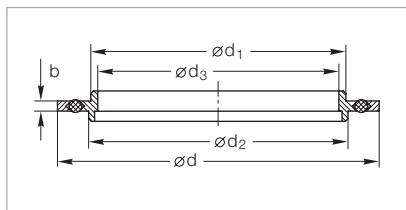
DN	ISO-K	63	100
b	mm (in.)	8 (0.31)	8 (0.31)
b ₁	mm (in.)	4 (0.16)	4 (0.16)
d	mm (in.)	96 (3.78)	128 (5.04)
d ₁	mm (in.)	70 (2.76)	102 (4.02)
d ₂	mm (in.)	62 (2.44)	94 (3.7)

Ordering Information

Stainless steel	Part No.	887 20	887 21
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Important: In the table of Chapter "General" the German designation for the type of steel is also stated in accordance with AISI.

Centering Ring Adaptors (Aluminium) with O-Ring (FPM (FKM)), ISO-K to LF Standard



Dimensional drawing for the centering ring adaptors with O-ring

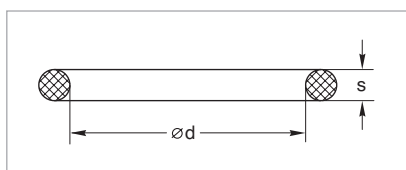
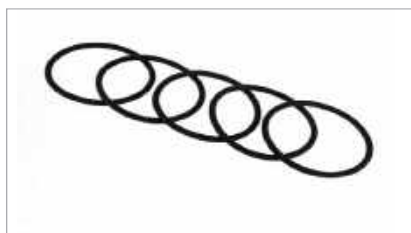
Technical Data

DN	ISO-K / LF	100 / 100	160 / 150	250 / 250
b	mm (in.)	4 (0.16)	4 (0.16)	4 (0.16)
d	mm (in.)	126 (4.96)	177 (6.97)	286 (11.26)
d ₁	mm (in.)	100 (3.94)	150 (5.91)	250 (9.84)
d ₂	mm (in.)	102 (4.02)	153 (6.02)	261 (10.28)
d ₃	mm (in.)	95 (3.74)	145 (5.71)	244 (9.61)

Ordering Information

Aluminium/FPM (FKM)	Part No.	105 25	105 35	105 45
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O-Ring Gaskets for Clamp Flange Fittings



Dimensional drawing for the spare O-ring for clamp flange fittings

Technical Data

DN	ISO-K	63	100	160	200	250	320
d	mm (in.)	75 (2.95)	107 (4.21)	158 (6.22)	208 (8.19)	253 (9.96)	329 (12.95)
s	mm (in.)	5 (0.20)	5 (0.20)	5 (0.20)	5 (0.20)	5 (0.20)	7 (0.28)
Quantity per set		5	5	5	5	5	1

Ordering Information

FPM (FKM)	Part No.	ES210635	ES210645	ES210650	ES210655	ES210660	E210665
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Technical Data

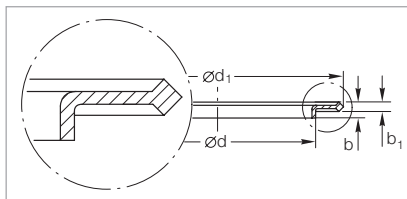
DN	ISO-K	400	500
d	mm (in.)	405 (15.94)	506 (19.92)
s	mm (in.)	7 (0.28)	7 (0.28)
Quantity per set		1	1

Ordering Information

(FKM)	Part No.	E210670	E210675
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Important: In the table of Chapter "General" the German designation for the type of steel is also stated in accordance with AISI.

Ultra Sealing Disks (Aluminium 3.2315.70) ¹⁾



Dimensional drawing for the ultra sealing disks

Technical Data

DN	ISO-K / ISO-F	63	100	160	250
b	mm (in.)	4.5 (0.18)	4.5 (0.18)	4.5 (0.18)	4.5 (0.18)
b ₁	mm (in.)	2.6 (0.10)	2.6 (0.10)	2.6 (0.10)	2.6 (0.10)
d	mm (in.)	69.8 (2.75)	101.8 (4.01)	152.8 (6.02)	260.8 (10.27)
d ₁	mm (in.)	85.6 (3.37)	116.6 (4.59)	166.6 (6.56)	276.6 (10.89)

Ordering Information

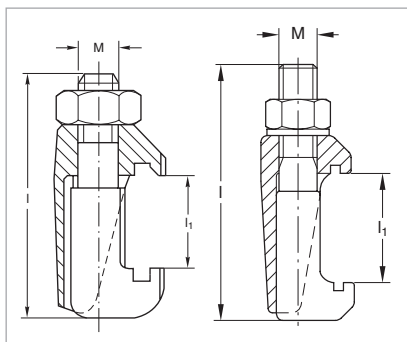
Aluminium	Part No.	886 24	886 25	886 26	886 27
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¹⁾ Only for collar ring connections

Clamps for ISO-K



Clamps for ISO-K, stainless steel



Dimensional drawing for the clamps,
right: Part No. 210 061

Exact numbers of clamps see first page of the chapter "ISO-K) Clamp Flange Fittings and Components"

Technical Data

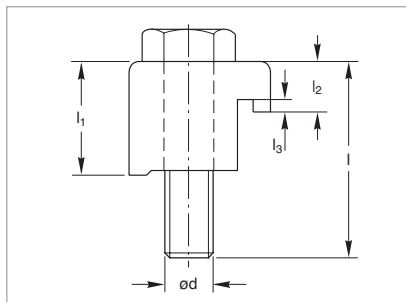
DN	ISO-K	63 / 250	63 / 250	320 / 500	630	320 / 630
Number of required clamps per connection		4 / 6	4 / 6	8 / 12	12	8 / 12
M	thread	M 10	M 10	M 12	M 12	M 12
I	mm (in.)	61.0 (2.40)	68.0 (2.68)	78.0 (3.07)	88.0 (3.46)	82.5 (3.25)
I ₁	mm (in.)	17 to 27 (0.67 to 1.06)	25 to 35 (0.98 to 1.38)	27 to 39 (1.06 to 1.54)	31 to 49 (1.22 to 1.93)	29 to 47 (1.14 to 1.85)

Ordering Information

1 set = 4 clamps						
Galvanized steel 1.1181	Part No.	267 01	267 02	267 10	267 11	-
Stainless steel 1.4401	Part No.	887 99	-	-	-	210 061

Important: In the table of Chapter "General" the German designation for the type of steel is also stated in accordance with AISI.

Claws (Galvanized Steel 1.1181) for ISO-K



Dimensional drawing for the claws for ISO-K

Exact numbers of clamps see first page of the chapter "(ISO-K) Clamp Flange Fittings and Components".

Note: These clamps are not suitable for the installation of turbomolecular pumps. Please use the fasteners specified in the operating instruction of the pump.

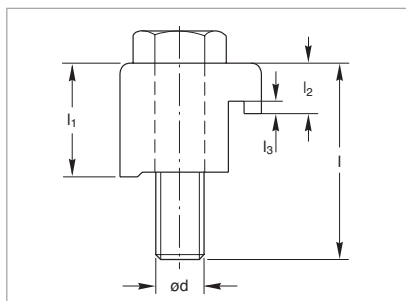
Technical Data

DN	ISO-K	63 / 100	160 / 250	320 / 500	630
Number of required claws per connection		4 / 8	8 / 12	12 / 16	20
d	thread	M 8	M 10	M 12	M 12
l	mm (in.)	35 (1.38)	35 (1.38)	50 (1.97)	55 (2.17)
l ₁	mm (in.)	22.5 (0.89)	23.0 (0.91)	36.5 (1.44)	41.5 (1.63)
l ₂	mm (in.)	8.6 (0.34)	9.1 (0.36)	15.9 (0.63)	16 (0.63)
l ₃	mm (in.)	2.5 (0.10)	2.5 (0.10)	2.5 (0.10)	2.5 (0.10)

Ordering Information

1 set = 4 claws	Part No.	268 25	268 26	268 27	268 28
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Claws for Sealing Groove in Base Plate (Galvanized Steel 1.1181) for ISO-K



Dimensional drawing for the claws for sealing groove

Exact numbers of clamps see first page of the chapter "(ISO-K) Clamp Flange Fittings and Components".

Note: These clamps are not suitable for the installation of turbomolecular pumps. Please use the fasteners specified in the operating instruction of the pump.

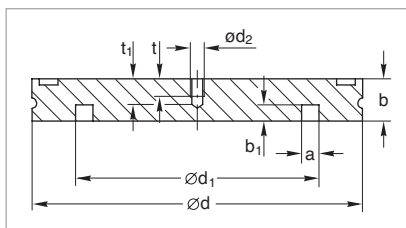
Technical Data

DN	ISO-K	63 / 100	160 / 250	320 / 500
d	thread	M 8	M 10	M 12
l	mm (in.)	30 (1.18)	35 (1.38)	45 (1.77)
l ₁	mm (in.)	18.6 (0.73)	19 (0.75)	31 (1.22)
l ₂	mm (in.)	8.6 (0.34)	9.0 (0.35)	16.0 (0.63)
l ₃	mm (in.)	2.5 (0.10)	2.5 (0.10)	2.5 (0.10)

Ordering Information

1 set = 4 claws	Part No.	268 76	268 77	268 78
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Blank Flanges (Stainless Steel 1.4301)



Dimensional drawing for the blank flanges

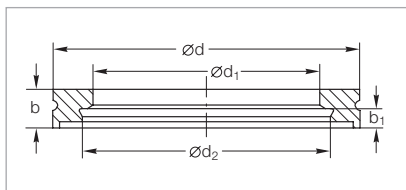
Technical Data

DN	ISO-K	63	100	160	200	250	320	400	500	630
a	mm	5	5	5	5	5	5	5	5	5
	in.	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20
b	mm	12	12	12	12	12	17	17	17	22
	in.	0.47	0.47	0.47	0.47	0.47	0.67	0.67	0.67	0.87
b ₁	mm	4,5	4,5	4,5	4,5	4,5	6,5	6,5	6,5	6,5
	in.	0.18	0.18	0.18	0.18	0.18	0.26	0.26	0.26	0.26
d	mm	95	130	180	240	290	370	450	550	690
	in.	3.74	5.12	7.09	9.45	11.42	14.57	17.72	21.65	27.17
d ₁	mm	70	102	153	213	261	318	400	501	651
	in.	2.76	4.02	6.02	8.39	10.28	12.52	15.75	19.72	25.63
d ₂	thread	–	–	–	–	–	–	–	M 8	M 8
t	mm	8	8	8	8	8	8	8	8	8
	in.	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.31
t ₁	mm	12	12	12	12	12	12	12	12	12
	in.	0.47	0.47	0.47	0.47	0.47	0.47	0.47	0.47	0.47

Ordering Information

Stainless steel	Part No.	88755	88756	88757	88754	88758	88759	88760	88761	88762
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Welding Flanges



Dimensional drawing for the welding flanges

Technical Data

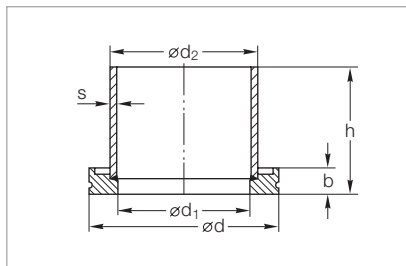
DN	ISO-K	63	100	160	200	250
b	mm (in.)	12 (0.47)	12 (0.47)	12 (0.47)	12 (0.47)	12 (0.47)
b ₁	mm (in.)	6 (0.24)	6 (0.24)	6 (0.24)	6 (0.24)	6 (0.24)
d	mm (in.)	95 (3.74)	130 (5.12)	180 (7.09)	240 (9.45)	290 (11.42)
d ₁	mm (in.)	70 (2.76)	102 (4.02)	153 (6.02)	213 (8.39)	261 (10.28)
d ₂	mm (in.)	76.6 (3.02)	108.7 (4.28)	159.8 (6.29)	219.8 (8.65)	267.8 (10.54)

Ordering Information

Steel 1.0831	Part No.	269 61	269 62	269 63	–	269 65
Stainless steel 1.4301	Part No.	886 61	886 62	886 63	886 64	886 65

Important: In the table of Chapter "General" the German designation for the type of steel is also stated in accordance with AISI.

Clamp Flanges with Tubulation (Steel 1.0831, 1.0308 / Stainless Steel 1.4301)



Dimensional drawing for the clamp flanges with tubulation

Technical Data

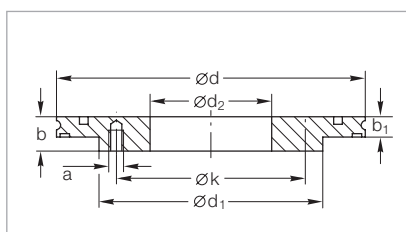
DN	ISO-K	63	100	160	200	250	320	400	500	630
d	mm	95	130	180	240	290	370	450	550	690
	in.	3.74	5.12	7.09	9.45	11.42	14.57	17.72	21.65	27.17
d ₁	mm	70	102	153	213	261	318	400	501	651
	in.	2.76	4.02	6.02	8.39	10.28	12.52	15.75	19.72	25.63
d ₂	mm	76,1	108	159	219,1	267	324	406	508	660
	in.	3.00	4.25	6.26	8.63	10.51	12.76	15.98	20.00	25.98
h	mm	100	100	100	100	100	100	100	100	100
	in.	3.94	3.94	3.94	3.94	3.94	3.94	3.94	3.94	3.94
s (steel)	mm	2,9	2,9	2,9	–	3	3	3	3	5
	in.	0.11	0.11	0.11	–	0.12	0.12	0.12	0.12	0.20
s (stainless steel)	mm	2,3	2,3	2,3	3	3	3	3	4	5
	in.	0.09	0.09	0.09	0.12	0.12	0.12	0.12	0.16	0.20
b	mm	12	12	12	12	12	17	17	17	22
	in.	0.47	0.47	0.47	0.47	0.47	0.67	0.67	0.67	0.87

Ordering Information

Steel 1.0831	Part No.	26904	26905	26906	–	26917	–	–	–	–
Stainless steel 1.4301	Part No.	88640	88641	88642	88643	88718	88719	88646	88647	88648

Not suited for the mounting of turbo molecular pumps

Reducing Flanges (Stainless Steel 1.4301)



Dimensional drawing for the reducing flanges

Technical Data

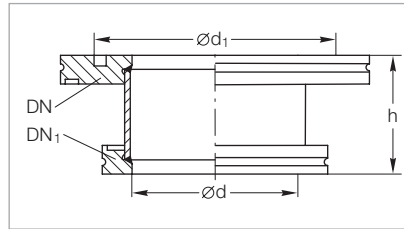
DN	ISO-K	160/63	160/100	200/100	200/160	250/160
a	thread	M 8	M 8	M 8	M 10	M 10
b	mm (in.)	22 (0.87)	25 (0.98)	20 (0.79)	25 (0.98)	22 (0.87)
b ₁	mm (in.)	12 (0.47)	12 (0.47)	12 (0.47)	12 (0.47)	12 (0.47)
d	mm (in.)	180 (7.09)	180 (7.09)	240 (9.49)	240 (9.49)	290 (11.42)
d ₁	mm (in.)	130 (5.12)	165 (6.50)	165 (6.50)	225 (8.86)	225 (8.86)
d ₂	mm (in.)	70 (2.76)	102 (4.02)	102 (4.02)	153 (6.02)	153 (6.02)
k	mm (in.)	110 (4.33)	145	145 (5.71)	200 (7.87)	200 (7.87)

Ordering Information

Stainless steel	Part No.	886 14	886 15	886 17	886 16	886 50
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Important: In the table of Chapter “General” the German designation for the type of steel is also stated in accordance with AISI.

Reducers (Stainless Steel)



Dimensional drawing for the reducers

Technical Data

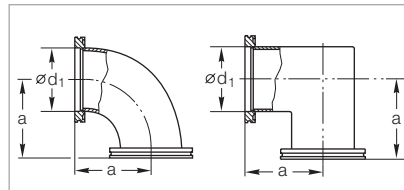
DN	ISO-K	100	250
DN ₁	ISO-K	63	200
d	mm (in.)	70 (2.76)	213 (8.39)
d ₁	mm (in.)	102 (4.02)	261 (10.28)
h	mm (in.)	50 (1.97)	50 (1.97)

Ordering Information

Stainless steel 1.4301	Part No.	887 89	887 93
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Not suited for the mounting of turbo molecular pumps

Pipe Bend (Stainless Steel 1.4301); from DN 160 ISO-K Mitred Elbow



Dimensional drawing for the pipe bends (left) and the mitred elbows (right)

Technical Data

DN	ISO-K	63	100	160	250
a	mm (in.)	88 (3.46)	108 (4.25)	138 (5.43)	208 (8.19)
d ₁	mm (in.)	70 (2.76)	102 (4.02)	153 (6.02)	261 (10.28)
Weight	kg (lbs.)	1.1 (2.43)	2.2 (4.8)	5.9 (13.02)	9.9 (21.85)
Conductance	l/s	208	470	1200	3700

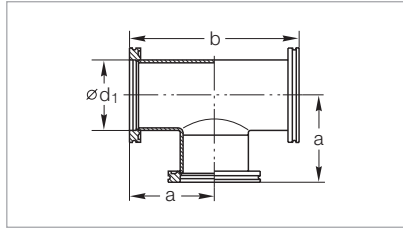
Ordering Information

Stainless steel	Part No.	887 25	887 26	887 27	887 28
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Not suited for the mounting of turbo molecular pumps

Important: In the table of Chapter "General" the German designation for the type of steel is also stated in accordance with AISI.

Tees (Stainless Steel 1.4301)



Dimensional drawing for the tees

Technical Data

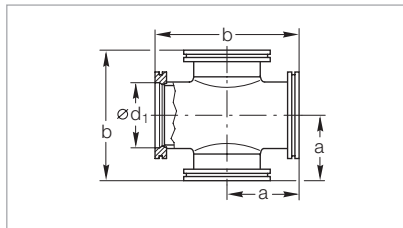
DN	ISO-K	63	100	160	250
a	mm (in.)	88 (3.46)	108 (4.25)	138 (5.43)	208 (8.19)
b	mm (in.)	176 (6.93)	216 (8.50)	276 (10.87)	416 (16.38)
d_1	mm (in.)	70 (2.76)	102 (4.02)	153 (6.02)	261 (10.28)
Weight	kg	1.6 (3.53)	3.2 (7.06)	7.6 (16.78)	8.1 (17.88)

Ordering Information

Stainless steel	Part No.	887 35	887 36	887 37	887 38
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Not suited for the mounting of turbo molecular pumps

4-Way Crosses (Stainless Steel 1.4301)



Dimensional drawing for the 4-way crosses

Technical Data

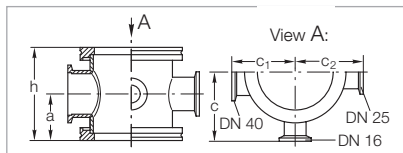
DN	ISO-K	63	100	160	250
a	mm (in.)	88 (3.46)	108 (4.25)	138 (5.43)	208 (8.19)
b	mm (in.)	176 (6.93)	216 (8.50)	276 (10.87)	416 (16.38)
d_1	mm (in.)	70 (2.76)	102 (4.02)	153 (6.02)	261 (10.28)

Ordering Information

Stainless steel	Part No.	887 45	887 46	887 47	887 48
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Not suited for the mounting of turbo molecular pumps

Branching Pieces with lateral DN 16/25/40 ISO-KF Flanges (Stainless Steel 1.4301)



Dimensional drawing for the branching pieces with lateral DN 16/25/40 flanges

Can not be used with collar flanges ISO-F and DIN EN 1092-1

Technical Data

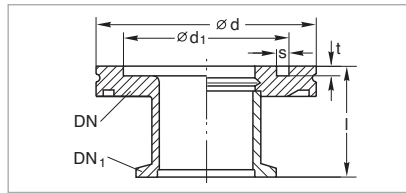
DN	ISO-K	63	100	160
a	mm (in.)	44 (1.73)	50 (1.97)	50 (1.97)
h	mm (in.)	88 (3.46)	100 (3.94)	100 (3.94)
c	mm (in.)	66 (2.60)	82 (3.23)	107 (4.21)
c_1	mm (in.)	59 (2.32)	77 (3.03)	105 (4.13)
c_2	mm (in.)	64 (2.52)	80 (3.15)	107 (4.21)

Ordering Information

Stainless steel	Part No.	886 71	886 72	886 73
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Important: In the table of Chapter "General" the German designation for the type of steel is also stated in accordance with AISI.

Adaptors-Reducers ISO-K – ISO-KF



Dimensional drawing for the adaptors-reducer
ISO-K – ISO-KF;
left: aluminium; right: stainless steel

Technical Data

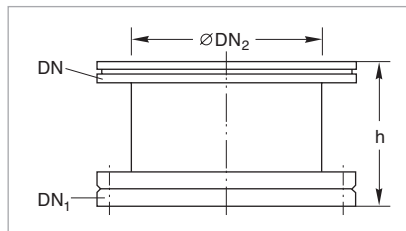
DN	ISO-K	63	63	100
DN ₁	ISO-KF	40	50	40
d	mm (in.)	95 (3.74)	95 (3.74)	130 (5.12)
d ₁	mm (in.)	70 (2.76)	70 (2.76)	102 (4.02)
l	mm (in.)	40 (1.57)	45 (1.77)	40 (1.57)
s	mm (in.)	5 (0.2)	5 (0.2)	5 (0.2)
t	mm (in.)	4.5 (0.16)	4.5 (0.16)	4.5 (0.16)
Weight	kg (lbs)	0.5 (1.1)	0.6 (1.32)	0.8 (1.77)

Ordering Information

Stainless steel 1.4301	Part No.	887 40	887 41	887 42
Aluminium 3.2315.71	Part No.	269 40	269 41	–

Not suited for the mounting of turbo molecular pumps

Adaptors ISO-K – CF



Dimensional drawing for the adaptors ISO-K – CF

Technical Data

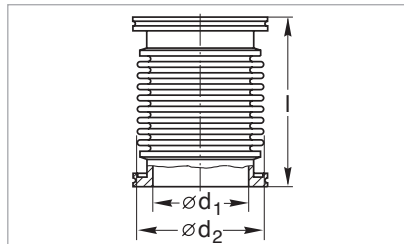
DN	ISO-K	63	100	160
DN ₁	CF	63	100	160
o. D.	inch	4 1/2	6	8
DN ₂	mm (in.)	66 (2.60)	104 (4.09)	153 (6.02)
h	mm (in.)	90 (3.54)	90 (3.54)	90 (3.54)

Ordering Information

Stainless steel 1.4301	Part No.	837 01	837 02	837 03
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Important: In the table of Chapter "General" the German designation for the type of steel is also stated in accordance with AISI.

Bellows (Stainless Steel 1.4571) with Flanges (Stainless Steel 1.4301)



Dimensional drawing for the bellows

Technical Data

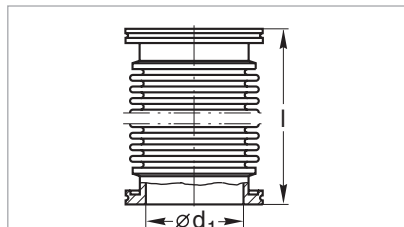
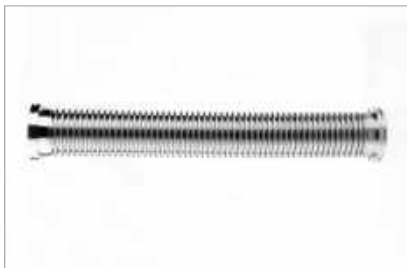
DN	ISO-K	63	100	160	250
d_1	mm (in.)	66 (2.60)	95 (3.74)	153 (6.02)	261 (10.78)
d_2	mm (in.)	83.7 (3.30)	120 (4.72)	186 (7.32)	305 (12.01)
l	mm (in.)	132 (5.20)	132 (5.20)	150 (5.91)	200 (7.87)
Weight	kg (lbs)	1.0 (2.21)	3.9 (8.61)	6.2 (13.69)	9.3 (20.53)
Compression	mm (in.)	20 (0.79)	28 (1.10)	22 (0.87)	30 (1.18)
Tension	mm (in.)	20 (0.79)	28 (1.10)	22 (0.87)	30 (1.18)
Max. bending angle	degrees ¹⁾	$\pm 30^\circ$	$\pm 30^\circ$	$\pm 14^\circ$	$\pm 13^\circ$
Lateral displacement	mm (in.)	7.5 (0.28)	9.0 (0.35)	3.5 (0.14)	4.5 (0.18)

Ordering Information

Stainless steel	Part No.	887 70	887 71	887 72	887 68
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¹⁾ When utilizing the maximum bend, no extension along the axial axis will be possible!

Flexible Vacuum Hoses (Stainless Steel 1.4571) with Flanges (Stainless Steel 1.4301)



Dimensional drawing for the flexible vacuum hoses

Technical Data

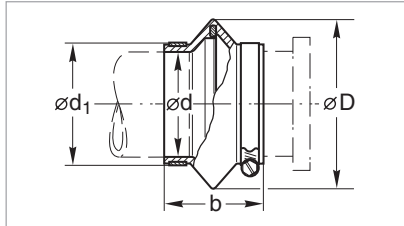
DN	ISO-K	63	63	63	63	100	100	100	100
d_1	mm	70	70	70	70	102	102	102	102
	in.	2.76	2.76	2.76	2.76	4.02	4.02	4.02	4.02
l	mm	250	500	750	1000	250	500	750	1000
	in.	9.84	19.69	29.53	39.37	9.84	19.69	29.53	39.37
Max. bending radius									
with multiple bending	mm	250	250	250	250	370	370	370	370
	in.	9.84	9.84	9.84	9.84	14.57	14.57	14.57	14.57
with single bend	mm	160	160	160	160	240	240	240	240
	in.	8.30	8.30	8.30	8.30	9.45	9.45	9.45	9.45

Ordering Information

Stainless steel	Part No.	868 37	867 97	868 34	868 07	868 38	867 98	868 35	868 08
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Important: In the table of Chapter "General" the German designation for the type of steel is also stated in accordance with AISI.

Flexible Compensation Elements (CR)



Dimensional drawing for the flexible compensation elements

Technical Data

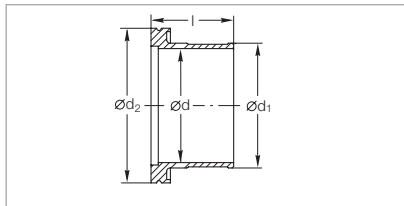
DN	ISO-K	63	100	160
D	mm (in.)	120 (4.72)	150 (5.91)	200 (7.87)
d	mm (in.)	75 (2.95)	106 (4.17)	155 (6.10)
d_1	mm (in.)	85 (3.35)	116 (4.57)	165 (6.50)
b	mm (in.)	70 (2.76)	72 (2.83)	72 (2.83)

Ordering Information

CR	Part No.	272 23 ¹⁾	272 24 ¹⁾	272 25 ¹⁾
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¹⁾ Is supplied complete with stainless steel hose clamps

Connections for Flexible Compensation Elements (Aluminium 3.2315.71)



Dimensional drawing for the connections for flexible compensation elements

Technical Data

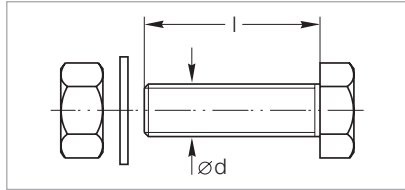
DN	ISO-K	63	100	160
d	mm (in.)	70 (2.76)	102 (4.02)	150 (5.91)
d_1	mm (in.)	76 (2.99)	107 (4.21)	156 (6.14)
d_2	mm (in.)	95 (3.74)	130 (5.12)	180 (7.09)
l	mm (in.)	51 (2.01)	56 (2.20)	56 (2.20)

Ordering Information

Aluminium	Part No.	272 35	272 36	272 37
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Important: In the table of Chapter "General" the German designation for the type of steel is also stated in accordance with AISI.

Bolts for Clamp Flange Fittings (Steel 8.8, zinc coated)



Dimensional drawing for the bolts
for clamp flange fittings

Technical Data

DN	ISO-F	63 – 100	160 – 250	320 – 500
Dimensions				
d	thread	M 8	M 10	M 12
l	mm (in.)	40 (1.57)	50 (1.97)	70 (2.76)
Quantity per set				
Bolts		8	12	16
Nuts		8	12	16
Washers		8	12	16

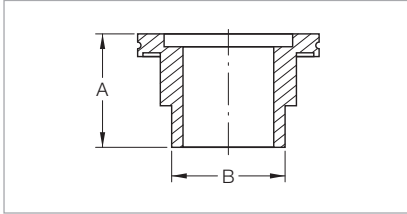
Ordering Information

Set	Part No.	887 81	887 82	887 83 (*)
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(*) Also suitable for DN 630 connections. 20 pieces needed for each connection.

Only available for purchase in North and South America

ISO-K to NPT Adaptor



Dimensional drawing for the ISO-K / NPT adaptor

Technical Data

DN		63 ISO-K / 2" NPT
A	mm (in.)	60.0 (2.36)
ø B	mm (in.)	51.0 (2" NPT)

Ordering Information

Stainless steel	Part No.	72103040
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ISO-F and DIN EN 1092-1 Fixed Flange Fittings, ND 6

Note: ND 6 states a dimension and not refer to an operating pressure of 6 bar!

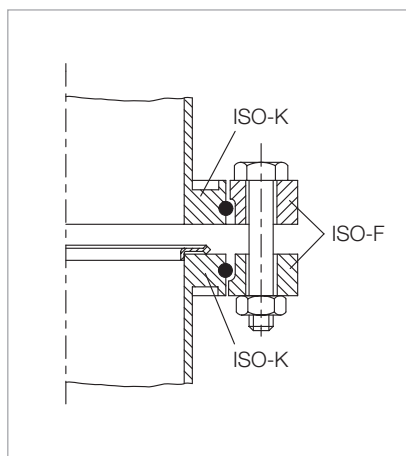


Mating clamp flanges with tubulation
using collar rings and sealing disk

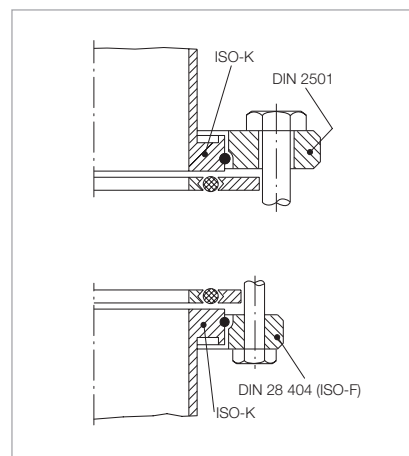
In addition to clamp flange connections, fixed welded flanges (ISO-F or to DIN EN 1092-1) are used in the area of vacuum engineering to interconnect valves, pumps and other components.

Advantages to the User

- A high vacuum seal is maintained also at large nominal width and high mechanical loads
- Evenly distributed sealing force through a large number of bolts
- Can be easily adapted to other flange systems
- Vacuum sealing disks consist of a CR O-ring seal with inner and outer aluminium ring
- Fixed flanges and collar flanges may also be constructed as all-metal seals by using ultra sealing disks



Mating clamp flanges using bolted collar rings and ultra sealing disk



Comparison: Clamp flange with collar flange to DIN EN 1092-1 and clamp flange with collar flange to DIN 28 404; ISO-F

Collar Flange

Steel

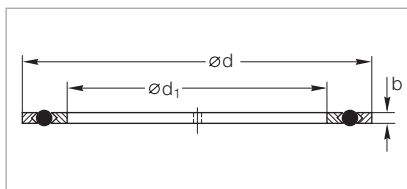
Stainless steel

Bolts and nuts	Galvanized 8.8 steel	1.4401
Retaining ring	Steel	1.4310

Important: In the table of Chapter "General" the German designation for the type of steel is also stated in accordance with AISI.

ISO-F Fixed Flange Fittings

Vacuum Sealing Disks for ISO-F Flanges (Aluminium/CR)



Dimensional drawing for vacuum sealing disks

Technical Data

DN	ISO-F	63	100	160	250	320
d	mm (in.)	98 (3.86)	132 (5.20)	185 (7.28)	295 (11.61)	375 (14.76)
d ₁	mm (in.)	73 (2.87)	107 (4.21)	160 (6.30)	270 (10.63)	330 (12.99)
b	mm (in.)	4 (0.16)	4 (0.16)	4 (0.16)	4 (0.16)	6 (0.24)

Ordering Information

Aluminium/CR	Part No.	171 09	171 10	171 11	171 12	171 19
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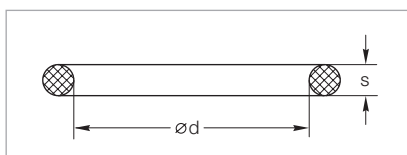
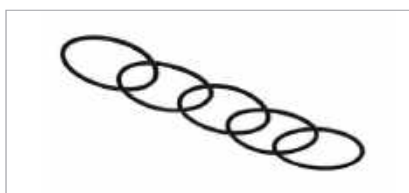
Technical Data

DN	ISO-F	400	500	630	800	1000
d	mm (in.)	460 (18.11)	560 (22.05)	701 (27.60)	870 (34.25)	1070 (42.13)
d ₁	mm (in.)	415 (16.34)	515 (20.28)	656 (25.83)	825 (32.48)	1025 (40.35)
b	mm (in.)	6 (0.24)	6 (0.24)	6 (0.24)	6 (0.24)	6 (0.24)

Ordering Information

Aluminium/CR	Part No.	171 14	171 15	171 16	171 17	171 18
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Spare O-Ring Gaskets for ISO-F Flange Connection



Dimensional drawing for O-rings

Technical Data

DN	ISO-F	63	100	160	250	320
d	mm (in.)	80 (3.15)	110 (4.33)	165 (6.50)	265 (10.43)	325 (12.75)
s	mm (in.)	5 (0.20)	5 (0.20)	5 (0.20)	5 (0.20)	8 (0.31)
Quantity per set		5	5	5	5	1

Ordering Information

CR	Part No.	ES210701	ES210711	ES210716	ES210721	E210726
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Technical Data

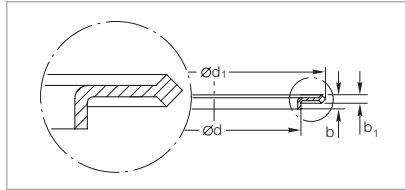
DN	ISO-F	400	630	800	1000
d	mm (in.)	412 (16.22)	640 (25.20)	820 (32.28)	1023 (40.28)
s	mm (in.)	8 (0.31)	8 (0.31)	8 (0.31)	8 (0.31)
Quantity per set		1	1	1	1

Ordering Information

CR	Part No.	E210731	E210741	E210746	E210751
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Important: In the table of Chapter "General" the German designation for the type of steel is also stated in accordance with AISI.

Ultra Sealing Disks (Aluminium 3.2315.71) for ISO-F Flanges



Dimensional drawing for O-rings

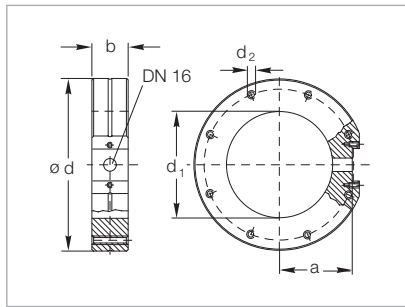
Technical Data

DN	ISO-K / ISO-F	63	100	160	250
b	mm (in.)	4.5 (0.18)	4.5 (0.18)	4.5 (0.18)	4.5 (0.18)
b ₁	mm (in.)	2.6 (0.10)	2.6 (0.10)	2.6 (0.10)	2.6 (0.10)
d	mm (in.)	69.8 (2.75)	101.8 (4.01)	152.8 (6.02)	260.8 (10.27)
d ₁	mm (in.)	85.6 (3.37)	116.6 (4.59)	166.6 (6.56)	276.6 (10.89)

Ordering Information

Aluminium	Part No.	886 24	886 25	886 26	886 27
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Measurement Flanges



Dimensional drawing for the measurement flanges

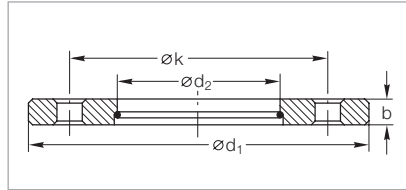
Technical Data

DN	ISO-F	63	100	160
a	mm (in.)	52.3 (2.06)	71.3 (2.81)	102.3 (4.03)
b	mm (in.)	30 (1.18)	30 (1.18)	30 (1.18)
d	mm (in.)	130 (5.12)	165 (6.50)	225 (8.86)
d ₁	mm (in.)	70 (2.76)	102 (4.02)	153 (6.02)
d ₂	thread	M 8	M 8	M 10
Number of threaded holes		4	8	8

Ordering Information

Stainless steel 1.4301	Part No.	286 60	286 61	286 62
Recommended centering ring (2x)	Part No.	887 03	887 04	887 07

ISO-F Collar Flanges with Retaining Ring for use with Clamp Flange Fittings (Steel 1.0037) and Stainless Steel



Dimensional drawing for collar flanges with retaining ring

Technical Data

DN	ISO-F	63	100	160	200	250
d_1	mm (in.)	130 (5.12)	165 (6.50)	225 (8.86)	285 (11.22)	335 (13.19)
d_2	mm (in.)	95.6 (3.76)	130.6 (5.14)	180.9 (7.12)	240.9 (9.48)	290.9 (11.45)
k	mm (in.)	110 (4.93)	145 (5.71)	200 (7.87)	260 (10.24)	310 (12.20)
b	mm (in.)	12 (0.47)	12 (0.47)	16 (0.63)	16 (0.63)	16 (0.63)
Number of holes		4	8	8	12	12

Ordering Information

Nickel-plated steel	Part No.	267 67	267 70	267 71	267 68	267 72
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Technical Data

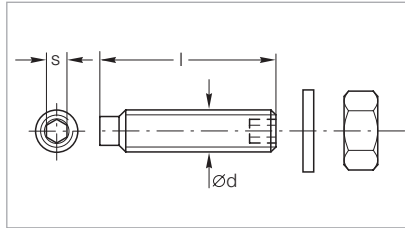
DN	ISO-F	320	400	500	630
d_1	mm (in.)	425 (16.73)	510 (20.08)	610 (24.02)	750 (29.53)
d_2	mm (in.)	370.8 (14.60)	451.0 (17.76)	551.0 (21.69)	691.0 (27.20)
k	mm (in.)	395 (15.51)	480 (18.90)	580 (22.83)	720 (28.35)
b	mm (in.)	20 (0.79)	20 (0.79)	20 (0.79)	24 (0.95)
Number of holes		12	16	16	20

Ordering Information

Nickel-plated steel	Part No.	267 76	267 74	267 75	267 77
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Important: In the table of Chapter "General" the German designation for the type of steel is also stated in accordance with AISI.

Bolts, Nuts and Washers for Joints with VAT Gate Valves



Dimensional drawing for the set screws, nuts and washers

Technical Data

DN	ISO-F	63 – 100	160 – 250
Dimensions			
d	thread	M 8	M 10
l	mm (in.)	45 (1.77)	55 (2.17)
s	mm (in.)	4 (0.16)	6 (0.24)
Quantity per set			
Bolts		16	12
Nuts		16	12
Washers		16	12

Ordering Information

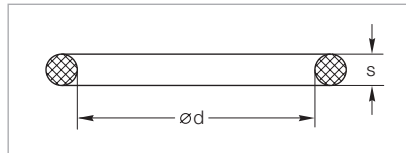
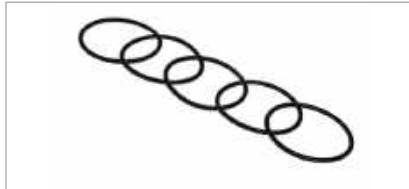
Set	Part No.	839 13	210 071
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DIN EN – Fixed Flange Fittings ND 6

Outside dimensions and hole pattern in accordance to DIN EN 1092-1;
inside contour similar with DIN 28404

Note: ND 6 states a dimension and does not refer to an operating pressure of 6 bar!

Spare O-Ring Gaskets for Vacuum Sealing Disks DIN EN 1092-1



Dimensional drawing for O-ring gaskets

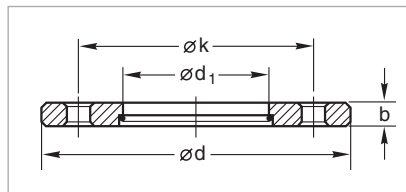
Technical Data

DN	ISO-F	63	100	160
d	mm (in.)	80 (3.15)	110 (4.23)	165 (6.50)
s	mm (in.)	5 (0.20)	5 (0.20)	5 (0.20)
Quantity per set		5	5	5

Ordering Information

CR	Part No.	ES210701	ES210711	ES210716
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Collar Flanges with Retaining Ring (Steel 1.4301)



Dimensional drawing for collar flanges with retaining ring

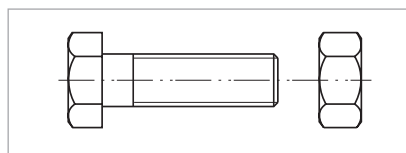
Technical Data

DN	ISO-F	63	100	160
d	mm (in.)	160 (6.30)	210 (8.27)	265 (10.43)
d_1	mm (in.)	95.6 (3.76)	130.6 (5.14)	180.9 (7.12)
k	mm (in.)	130 (5.12)	170 (6.69)	225 (8.86)
b	mm (in.)	12 (0.47)	15 (0.59)	15 (0.59)

Ordering Information

Stainless steel	Part No.	86747V01	86750V01	86751V01
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Bolts and Nuts for DIN Collar Flange



Dimensional drawing for bolts and nuts

Technical Data

DN	ISO-F	63	100	160	250
Dimensions					
d	thread	M 12	M 16	M 16	M 16
l	mm (in.)	40 (1.57)	50 (1.97)	50 (1.97)	50 (1.97)
Number of bolts/nuts required		4	8	8	12

Ordering Information

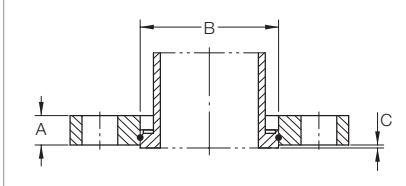
1 bolt (galvanized 8.8 steel)	Part No.	201 02 381	201 02 434	201 02 434	201 02 434
1 nut (galvanized 8.8 steel)	Part No.	211 01 115	211 01 117	211 01 117	211 01 117

Important: In the table of Chapter "General" the German designation for the type of steel is also stated in accordance with AISI.

Only available for purchase in North and South America

ANSI Fittings

Flanges, Rotatable Bolt Type



Dimensional drawing for the flanges,
rotatable type
(tube piece shown in phantom not included)

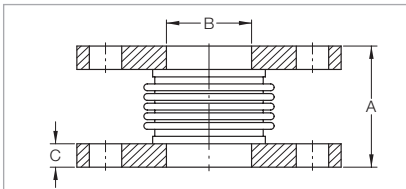
Technical Data

DN	ISO-K to ANSI	63 3"	100 4"	160 6"	250 10"
A	mm (in.)	13.0 (0.50)	13.0 (0.50)	16.0 (0.63)	22.0 (0.88)
ø B	mm (in.)	95.5 (3.76)	131.0 (5.14)	181.0 (7.12)	291.0 (11.45)
C	mm (in.)	1 (0.039)	1 (0.039)	1 (0.039)	1 (0.039)

Ordering Information

Stainless steel	Part No.	982780700	982780701	982780702	982780703
Spare retaining ring (Set of 10 pcs)	Part No.	ES23102401	ES23102402	ES23102412	

Bellows



Dimensional drawing for the bellows

Combined axial/lateral deflection cannot
exceed 100%.

Example: 75% axial rating – 25% lateral
rating

Technical Data

DN	ANSI	3"	4"	6"
A	mm (in.)	120 (4.72)	120 (4.72)	200 (7.87)
ø B	mm (in.)	78 (3.07)	102 (4.03)	154 (6.07)
C	mm (in.)	12.7 (0.50)	12.7 (0.50)	12.7 (0.50)
Rated deflection in axial	mm (in.)	15 (0.58)	18 (0.70)	29.5 (1.16)
Rated deflection in lateral	mm (in.)	5 (0.19)	6 (0.22)	8 (0.31)
Spring rate	lbf/in.	263	340	260
Compression / tension	mm (in.)	11.68 / 3.56 (0.460 / 0.140)	14.22 / 3.56 (0.560 / 0.140)	22.86 / 6.60 (0.900 / 0.260)

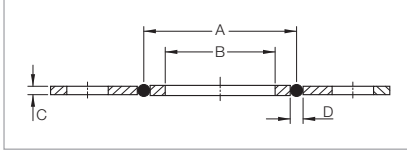
Ordering Information

Stainless steel bellows with carbon steel flanges	Part No.	991051013	991051014	991051016
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Important: In the table of Chapter "General" the German designation for the type of steel is also stated in accordance with AISI.

Only available for purchase in North and South America

Sealing Disk Assembly



Dimensional drawing for the sealing disk assembly

Technical Data

DN	ANSI	3"	4"	6"
A	mm (in.)	91 (3.60)	121 (4.75)	171 (6.72)
ø B	mm (in.)	78 (3.07)	102 (4.03)	154 (6.07)
C	mm (in.)	3.2 (0.13)	3.2 (0.13)	3.2 (0.13)
ø D	mm (in.)	4 (0.16)	4 (0.16)	4 (0.16)

Ordering Information

Aluminium	Part No. 910181605	910181606	910181607
Stainless steel	Part No. -	910181617	-

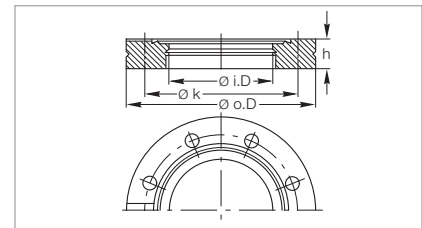
Important: In the table of Chapter "General" the German designation for the type of steel is also stated in accordance with AISI.

CF Flange Fittings and Components

CF Flanges



The CF flange connection consists of two identical flanges with a flat gasket made of **OFHC copper**, bolts, nuts and washers.



Dimensional drawing for CF flanges

Sealing Principle

When assembling the CF flange connection, the flat copper gasket fits with a slight clearance into the outer recess of the flanges and thus assures good centering of the flange connection. If the flange bolts are properly tightened according to the instructions, the knife edge of the flanges penetrates into the flat copper gasket, whereby the shear action of the outer face of the cutting edge – as seen from the flange axis – produces a yield pressure on the copper gasket, while the inner face of the edge produces a cutting action.

During this process the copper gasket adapts it-self optimally to the micro-structure of the outer knife edge. This explains the high sealing effect and the especially low leak rates of CF flange connections. A radial groove extending right up to the sealing ring is provided for leak testing of the flange connection. In order to ensure that the sealing knife edge is not damaged during frequent use of the flanges, the conventional geometry of such knife edges for CF flanges has been developed further. By using the Leybold developed obtuse angled knife edge

profile the strength of the sealing knife edges has been significantly stabilized. In addition to the actual knife edge, the flanges are provided with a concentric sealing surface for placement of a FPM (FKM) gasket or a supporting ring with FPM O-ring, which may be baked up to 150 °C (302 °F) (does not apply to observation windows).

This design has the advantage, that it is possible to equip the apparatus with elastomer gaskets prior to final assembly, so that the system can be tested under normal high vacuum conditions.

Technical Data

DN	CF	16	40	63	100	160	200	250
Outside diameter o. D.	mm (in.)	34 (1.33)	69.5 (2.75)	113.5 (4.50)	152 (6.00)	202.5 (8.00)	253 (10.00)	305 (12.00)
Inside diameter i. D.	mm (in.)	16 (0.63)	36.8 (1.375)	66 (2.50)	104 (4.00)	155 (6.00)	200 (8.00)	250 (10.00)
Bolt circle diameter k	mm (in.)	27 (1.06)	58.7 (2.31)	92.2 (3.63)	130.3 (5.13)	181 (7.13)	231.8 (9.13)	284 (11.18)
High h	mm (in.)	7.5 (0.30)	13 (0.51)	17.5 (0.69)	20 (0.79)	22 (0.87)	24.5 (0.97)	24.5 (0.97)
Number of holes		6	6	8	16	20	24	32
Hole diameter	mm (in.)	4.3 (0.17)	6.6 (0.26)	8.4 (0.33)	8.4 (0.33)	8.4 (0.33)	8.4 (0.33)	8.4 (0.33)

Conversion Factors

1. Magnetizing field H, unit:	A x m ⁻¹
Previously used unit: Oersted (Oe)	1 Oe = 79,577 (A x m ⁻¹)
2. Strength of the magnetic field B, unit:	Vs x m ² = Tesla (T)
Previously used unit: Gauß (G)	1 G = 10 ⁻⁴ Vs x m ² = 10 ⁻⁴ T

Important: In the table of Chapter "General" the German designation for the type of steel is also stated in accordance with AISI.

CF Components



CF components are manufactured according to the requirements outlined in the introductory chapter. They are made from selected and corrosion resistant types of stainless steel. Both design and production methods are such, that the components meet the requirements of UHV applications. All components are fusion welded from the inside to prevent fissures and pocket holes (virtual leaks which cannot be located by leak detection methods from the outside). If welding from the outside cannot be avoided due to design constraints, the welding seam penetrates to the inner side, the side of the vacuum.

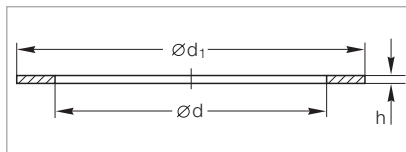
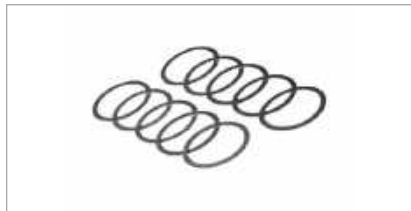
A carefully implemented cleaning process and suitable packaging for the components are essential prerequisites for obtaining pressures in the UHV range within reasonably short pump down times after assembly (providing the remainder of the apparatus is clean too).

For applications in the extreme UHV range (XHV) the outgassing rate of the CF flanges and the UHV components can be reduced by about two orders of magnitude by a special degassing process.

Advantages to the User

- Low degassing rates
- High degassing temperature
- Leak rates below 1×10^{-11} mbar x l/s
- Basic dimensions correspond to those of the components from other international manufacturers
- Bolts may be inserted from the side of the body

Copper Gaskets for CF Flanges (OFHC Copper – Oxygen-Free)



Dimensional drawing for the copper gaskets for CF flanges

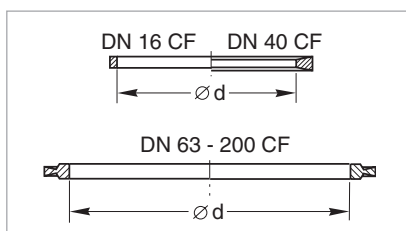
Technical Data

DN	CF	16	40	63	100	160	200	250
Outside diameter	in.	1.33	2.75	4.50	6.00	8.00	10.00	12.00
d	mm (in.)	16.2 (0.64)	39 (1.54)	63.6 (2.50)	101.8 (4.01)	152.6 (6.01)	203.4 (8.01)	254 (10.00)
d ₁	mm (in.)	21.3 (0.84)	48.1 (1.89)	82.4 (3.24)	120.5 (4.74)	171.3 (6.74)	222.1 (8.74)	272.7
Set of 5		–	–	–	–	–	–	x
Set of 10		x	x	x	x	x	x	–

Ordering Information

Quality: Standard	Part No.	ES83941	ES83943	ES83944	ES83945	ES83946	ES83947	ES83948
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FPM (FKM) Profiled Gasket without Support Ring



Dimensional drawing for the profiled gaskets without support ring

Technical Data

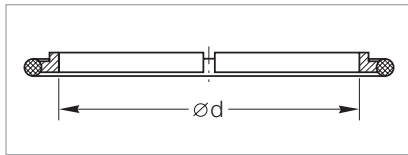
DN	CF	16	40	63	100	160	200
Outside diameter	in.	1.33	2.75	4.50	6.00	8.00	10.00
d	mm (in.)	16.0 (0.63)	42.0 (1.65)	69.7 (2.74)	107.8 (4.24)	156.0 (6.14)	206.0 (8.11)
Bakeout temperature	°C (°F)	160 (320)	160 (320)	160 (320)	160 (320)	160 (320)	160 (320)
Set of 2		–	–	x	x	x	x
Set of 5		x	x	–	–	–	–

Ordering Information

	Part No.	ES83921	ES83923	ES83934	ES83935	ES83936	ES83937
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Important: In the table of Chapter “General” the German designation for the type of steel is also stated in accordance with AISI.

FPM (FKM) O-ring with Support Ring



Dimensional drawing for the FPM (FKM) O-rings with support ring

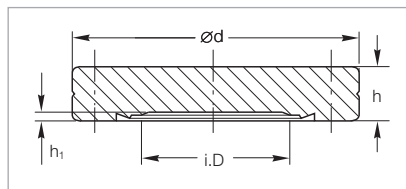
Technical Data

DN	CF	250
Outside diameter	in.	12
d	mm (in.)	248.3 (9.78)
Bakeout temperature	°C (°F)	160 (320)

Ordering Information

FPM O-ring with support ring	Part No.	839 03
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CF Blank Flanges, Fixed



Dimensional drawing for the CF blank flanges, fixed

For missing dimensions see "Technical Data" at the beginning of the Chapter "CF Flanges"

Technical Data

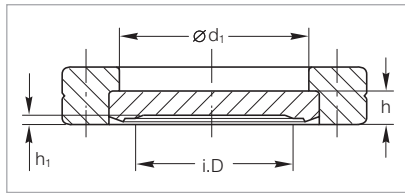
DN	CF	16	40	63	100	160	200	250
Outside diameter	in.	1.33	2.75	4.50	6.00	8.00	10.00	12.00
Inside diameter	mm (in.)	14 (0.55)	38 (1.50)	66 (2.60)	104 (4.09)	155 (6.10)	205 (8.07)	256 (10.08)
d	mm (in.)	34 (1.34)	69.5 (2.74)	113.5 (4.47)	152 (5.98)	202.5 (7.97)	253 (9.96)	305 (12.01)
h	mm (in.)	7.5 (0.30)	13 (0.51)	17.5 (0.69)	20 (0.79)	22 (0.87)	24.5 (0.97)	24.5 (0.97)
h ₁	mm (in.)	1.4 (0.06)	1.4 (0.06)	1.4 (0.06)	1.4 (0.06)	1.4 (0.06)	1.4 (0.06)	1.4 (0.06)

Ordering Information

Stainless steel DIN 1.4301	Part No.	835 01	835 03	835 04	835 05	835 06	835 07	835 09
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Important: In the table of Chapter "General" the German designation for the type of steel is also stated in accordance with AISI.

CF Blank Flanges, Rotatable



Dimensional drawing for the CF blank flanges, rotatable

For missing dimensions see "Technical Data" at the beginning of the Chapter "CF Flanges"

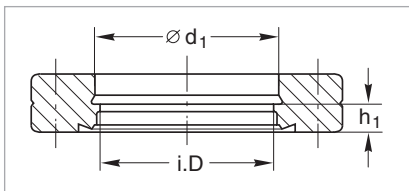
Technical Data

DN	CF	16	40	63	100	160	200	250
Outside diameter	in.	1.33	2.75	4.50	6.00	8.00	10.00	12.00
Inside diameter	mm (in.)	14 (0.55)	38 (1.50)	66 (2.60)	104 (4.09)	155 (6.10)	205 (8.07)	256 (10.08)
d_1	mm (in.)	18.6 (0.73)	41 (1.61)	71 (2.80)	109 (4.29)	160 (6.30)	206 (8.11)	257 (10.12)
h	mm (in.)	5.8 (0.23)	7.6 (0.30)	12.6 (0.50)	14.3 (0.56)	15.8 (0.62)	17.1 (0.67)	18 (0.71)
h_1	mm (in.)	1.4 (0.06)	1.4 (0.06)	1.4 (0.06)	1.4 (0.06)	1.4 (0.06)	1.4 (0.06)	1.4 (0.06)

Ordering Information

Stainless steel DIN 1.4301	Part No.	835 21	835 23	835 24	835 25	835 26	835 27	835 29
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CF Bore Flanges, Fixed



Dimensional drawing for the CF bore flanges, fixed

For missing dimensions see "Technical Data" at the beginning of the Chapter "CF Flanges"

Technical Data

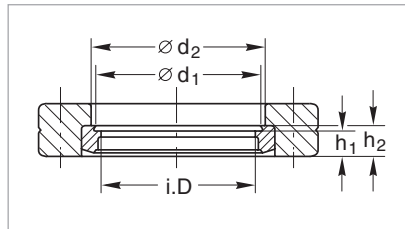
DN	CF	16	40	63	100	160	200	250
Outside diameter	in.	1.33	2.75	4.50	6.00	8.00	10.00	12.00
Inside diameter	mm (in.)	16 (0.63)	36.8 (1.45)	66 (2.60)	104 (4.09)	155 (6.10)	200 (7.87)	250 (9.84)
d_1	mm (in.)	18.3 (0.72)	40.3 (1.59)	70.3 (2.77)	108.5 (4.27)	159.5 (6.28)	205.5 (8.09)	256.5 (10.10)
h_1	mm (in.)	4.2 (0.17)	5.5 (0.22)	9.5 (0.37)	11.0 (0.43)	12.0 (0.47)	12.5 (0.49)	12.5 (0.49)

Ordering Information

Stainless steel DIN 1.4301	Part No.	835 41	835 37	835 38	835 39	835 40	835 47	835 49
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Important: In the table of Chapter "General" the German designation for the type of steel is also stated in accordance with AISI.

CF Bore Flanges, Rotatable



Dimensional drawing for the CF bore flanges, rotatable

For missing dimensions see "Technical Data" at the beginning of the Chapter "CF Flanges"

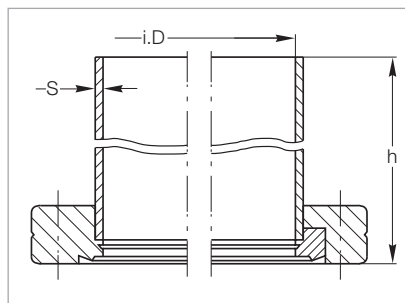
Technical Data

DN	CF	16	40	63	100	160	200	250
Outside diameter	in.	1.33	2.75	4.50	6.00	8.00	10.00	12.00
Inside diameter	mm (in.)	16 (0.63)	36.8 (1.45)	66 (2.60)	104 (4.09)	155 (6.10)	200 (7.87)	250 (9.84)
d_1	mm (in.)	18.3 (0.72)	40.3 (1.59)	70.3 (2.77)	108.5 (4.27)	159.5 (6.28)	205.5 (8.09)	256.5 (10.10)
d_2	mm (in.)	18.6 (0.73)	41 (1.61)	71 (2.80)	109 (4.29)	160 (6.30)	206 (8.11)	257 (10.12)
h	mm (in.)	4.2 (0.17)	5.5 (0.22)	9.5 (0.37)	11.0 (0.43)	12.0 (0.47)	12.5 (0.49)	12.5 (0.49)
h_1	mm (in.)	5.8 (0.23)	7.6 (0.30)	12.6 (0.50)	14.3 (0.56)	15.8 (0.62)	17.1 (0.67)	18.0 (0.71)

Ordering Information

Stainless steel DIN 1.4301	Part No.	835 61	835 58	835 59	835 60	835 69	835 67	835 78
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CF Flanges with Tube End



Dimensional drawing for the CF flanges with tube end; left fixed, right rotatable

For missing dimensions see "Technical Data" at the beginning of the Chapter "CF Flanges"

Technical Data

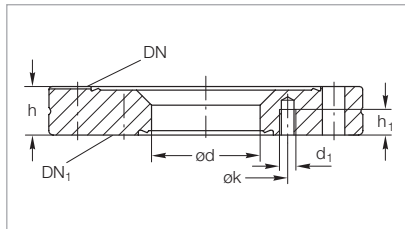
DN	CF	16	40	63	100	160
Outside diameter	in.	1.33	2.75	4.50	6.00	8.00
Inside diameter	mm (in.)	16 (0.63)	36.8 (1.45)	66 (2.60)	104 (4.09)	155 (6.10)
s	mm (in.)	1 (0.04)	1.6 (0.06)	2 (0.08)	2 (0.08)	2 (0.08)
h	mm (in.)	38 (1.50)	63 (2.48)	105 (4.13)	135 (5.32)	167 (6.58)

Ordering Information

Stainless steel DIN 1.4301						
Tube end						
fixed	Part No.	835 51	835 31	835 32	835 33	835 34
rotatable	Part No.	835 71	835 82	835 74	835 75	835 76

Important: In the table of Chapter "General" the German designation for the type of steel is also stated in accordance with AISI.

CF Reducing Flanges



Dimensional drawing for the CF reducing flanges, fixed

For missing dimensions see "Technical Data" at the beginning of the Chapter "CF Flanges"

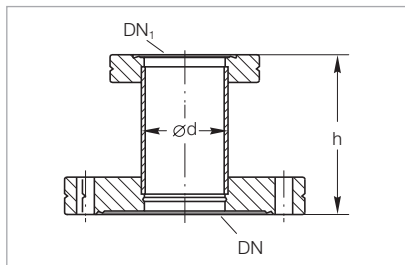
Technical Data

DN	CF	40	63	100	100	160	160
Outside diameter	in.	2.75	4.50	6.00	6.00	8.00	8.00
DN ₁	CF	16	40	40	63	40	100
k	mm (in.)	27 (1.06)	58.7 (2.31)	58.7 (2.31)	92.2 (3.63)	58.7 (2.31)	130 (5.12)
h	mm (in.)	13 (0.51)	17.5 (0.69)	20 (0.79)	20 (0.79)	22 (0.87)	22 (0.87)
h ₁	mm (in.)	5.5 (0.22)	9 (0.35)	9 (0.35)	11 (0.43)	9 (0.35)	11 (0.43)
d	mm (in.)	16 (0.63)	39 (1.54)	39 (1.54)	66 (2.60)	39 (1.54)	104 (4.09)
d ₁	mm (in.)	M 4 (M 4)	M 6 (M 6)	M 6 (M 6)	M 8 (M 8)	M 6 (M 6)	M 8 (M 8)

Ordering Information

Stainless steel DIN 1.4301	Part No.	836 85	836 86	836 87	836 89	836 90	836 91
Matching stud bolts	Part No.	839 10	839 11	839 11	839 13	839 11	839 13

CF Reducing Pieces



Dimensional drawing for the CF reducing pieces

For missing dimensions see "Technical Data" at the beginning of the Chapter "CF Flanges"

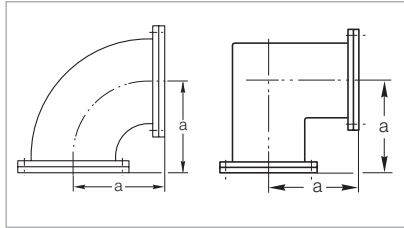
Technical Data

DN	CF	40	63	100	100	160
Outside diameter	in.	2.75	4.50	6.00	6.00	8.00
DN ₁	CF	16	40	40	63	100
h	mm	45 (1.77)	75 (2.95)	75 (2.95)	95 (3.74)	105 (4.13)
d (tube)	mm	18 (0.71)	40 (1.57)	40 (1.57)	70 (2.76)	108 (4.25)

Ordering Information

Stainless steel DIN 1.4301	Part No.	837 10	837 15	837 16	837 19	837 22
----------------------------	----------	--------	--------	--------	--------	--------

Pipe Bend 90°; from DN 160 CF Mitred Elbow



Dimensional drawing for the pipe bends 90° (left) and the mitred elbows (right)

For missing dimensions see "Technical Data" at the beginning of the Chapter "CF Flanges"

Technical Data

DN	CF	16	40	63	100	160
Outside diameter	in.	1.33	2.75	4.50	6.00	8.00
a	mm (in.)	38 (1.50)	63 (2.48)	105 (4.13)	135 (5.32)	167 (6.58)

Ordering Information

Stainless steel DIN 1.4301

Elbow 90°

with a rotatable flange

Part No.

836 04

836 05

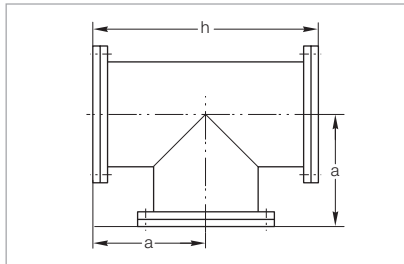
836 06

836 07

836 08

Not suited for the mounting of turbo molecular pumps

Tees



Dimensional drawing for the tees

For missing dimensions see "Technical Data" at the beginning of the Chapter "CF Flanges"

Technical Data

DN	CF	16	40	63	100	160
Outside diameter	in.	1.33	2.75	4.50	6.00	8.00
a	mm (in.)	38 (1.50)	63 (2.48)	105 (4.13)	135 (5.32)	167 (6.58)
h	mm (in.)	76 (2.99)	126 (4.96)	210 (8.27)	270 (10.63)	334 (13.15)

Ordering Information

Stainless steel DIN 1.4301

Tee with a rotatable flange

on each axis

Part No.

836 14

836 15

836 16

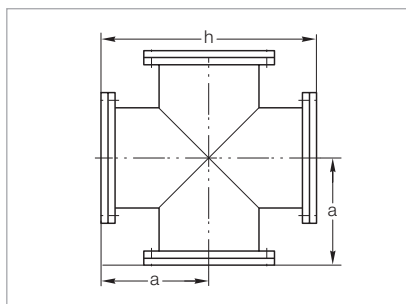
836 17

836 18

Not suited for the mounting of turbo molecular pumps

Important: In the table of Chapter "General" the German designation for the type of steel is also stated in accordance with AISI.

Crosses



Dimensional drawing for the crosses

For missing dimensions see "Technical Data" at the beginning of the Chapter "CF Flanges"

Technical Data

DN	CF	16	40	63	100	160
Outside diameter	in.	1.33	2.75	4.50	6.00	8.00
a	mm (in.)	38 (1.50)	63 (2.48)	105 (4.13)	135 (5.32)	167 (6.58)
h	mm (in.)	76 (2.99)	126 (4.96)	210 (8.27)	270 (10.63)	334 (13.15)

Ordering Information

Stainless steel DIN 1.4301

Cross with a rotatable flange

on each axis

Part No.

836 34

836 35

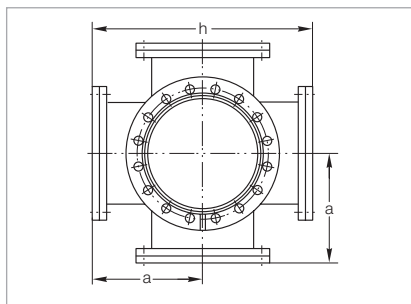
836 36

836 37

836 38

Not suited for the mounting of turbo molecular pumps

Double Crosses



Dimensional drawing for the double crosses

For missing dimensions see "Technical Data" at the beginning of the Chapter "CF Flanges"

Technical Data

DN	CF	40	63	100	160
Outside diameter	in.	2.75	4.50	6.00	8.00
a	mm (in.)	63 (2.48)	105 (4.13)	135 (5.32)	167 (6.58)
h	mm (in.)	126 (4.96)	210 (8.27)	270 (10.63)	334 (13.15)

Ordering Information

Stainless steel DIN 1.4301

Dopuble Cross with a rotatable flange

on each axis

Part No.

836 45

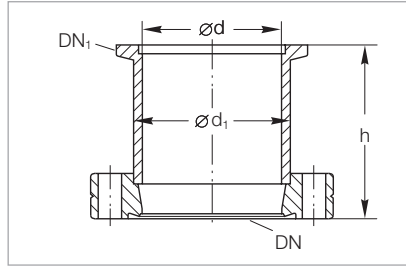
836 46

836 47

836 48

Not suited for the mounting of turbo molecular pumps

CF/ISO-KF Adaptors



Dimensional drawing for the CF/ISO-KF adaptors

For missing dimensions see "Technical Data" at the beginning of the Chapter "CF Flanges"

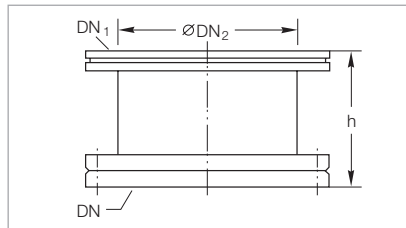
Technical Data

DN	CF	16	16	40	40	40	63
Outside diameter	in.	1.33	1.33	2.75	2.75	2.75	4.50
DN ₁	ISO-KF	16	25	16	25	40	40
d	mm (in.)	16 (0.63)	16 (0.63)	16.0 (0.63)	26.0 (1.02)	37.0 (1.36)	41.0 (1.61)
h	mm (in.)	35 (1.38)	35 (1.38)	30 (1.18)	30 (1.18)	50 (1.97)	35 (1.38)
d ₁ (tube)	mm (in.)	20 (0.79)	20 (0.79)	20 (0.79)	30 (1.18)	41 (1.61)	45 (1.77)

Ordering Information

Stainless steel DIN 1.4301	Part No.	837 81	837 83	837 82	837 84	837 36	837 86
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CF/ISO-K Adaptors



Dimensional drawing for the CF/ISO-K adaptors

For missing dimensions see "Technical Data" at the beginning of the Chapter "CF Flanges"

Technical Data

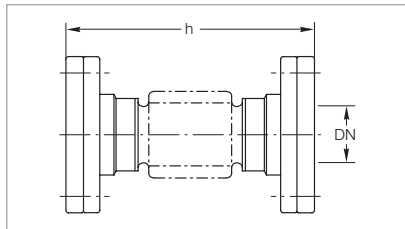
DN	CF	63	100	160
Outside diameter	in.	4.50	6.00	8.00
DN ₁	ISO-K	63	100	160
DN ₂	mm (in.)	66 (2.60)	104 (4.09)	153 (6.02)

Ordering Information

Stainless steel DIN 1.4301	Part No.	837 01	837 02	837 03
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Important: In the table of Chapter "General" the German designation for the type of steel is also stated in accordance with AISI.

Flexible Connecting Components (CF Bellows)



Dimensional drawing for the CF bellows

For missing dimensions see "Technical Data" at the beginning of the Chapter "CF Flanges"

Technical Data

DN	CF	16	40	63	100
Outside diameter	in.	1.33	2.75	4.50	6.00
h	mm (in.)	76 ±1,5 (2.99 ±0.06)	126 ±2 (4.96 ±0.08)	139 ±2 (5.47 ±0.08)	142 ±2 (5.59 ±0.08)

Ordering Information

Stainless steel

CF bellows

with one rotatable flange

Part No.

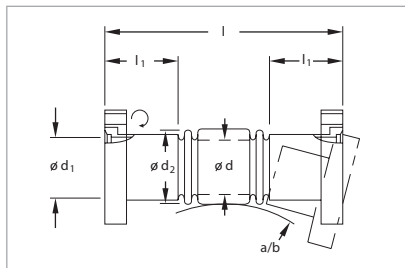
880 01

880 02

880 03

880 04

Flexible Connecting Components (CF Corrugated Hoses)



Dimensional drawing for the CF corrugated hoses

For missing dimensions see "Technical Data" at the beginning of the Chapter "CF Flanges"

Technical Data

DN	CF	16	40	16	40	16	16
Outside diameter	in.	1.33	2.75	1.33	2.75	1.33	1.33
l	mm	250 (9.84)	250 (9.84)	500 (19.69)	500 (19.69)	750 (29.53)	1000 (39.37)
l ₁	mm	23 (0.91)	23 (0.91)	23 (0.91)	23 (0.91)	23 (0.91)	23 (0.91)
d	mm	15 (0.59)	15 (0.59)	15 (0.59)	15 (0.59)	15 (0.59)	15 (0.59)
d ₁	mm	16 (0.63)	16 (0.63)	16 (0.63)	16 (0.63)	16 (0.63)	16 (0.63)
d ₂	mm	22.5 (0.89)	22.5 (0.89)	22.5 (0.89)	22.5 (0.89)	22.5 (0.89)	22.5 (0.89)
a	mm	70 (2.76)	70 (2.76)	70 (2.76)	70 (2.76)	70 (2.76)	70 (2.76)
b	mm	50 (1.97)	50 (1.97)	50 (1.97)	50 (1.97)	50 (1.97)	50 (1.97)

Ordering Information

Stainless steel

CF corrugated hose

with one rotatable flange

Part No.

885 56

85 57

885 68

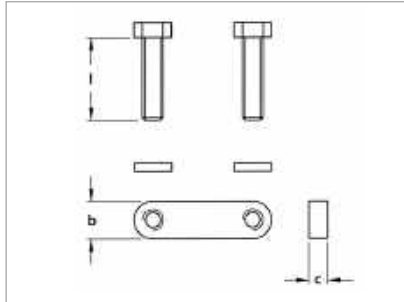
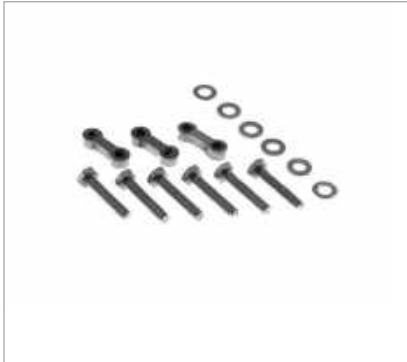
885 69

885 65

885 73

Important: In the table of Chapter "General" the German designation for the type of steel is also stated in accordance with AISI.

Bolts with Bolt Nut Plate and Washers



Dimensional drawing for the bolts with bolt nut plate and washers

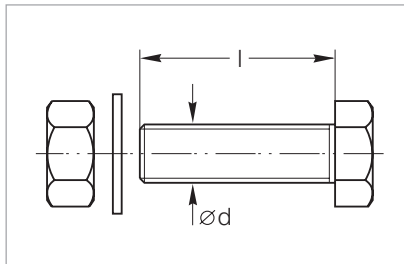
Technical Data

DN	CF	16	40	63	100	160
Outside diameter	in.	1.33	2.75	4.5	6	8
Dimensions (d x l)	mm (in.)	M 4 x 20 (M 4 x 0.79)	M 6 x 35 (M 6 x 1.38)	M 8 x 45 (M 8 x 1.77)	M 8 x 50 (M 8 x 1.97)	M 8 x 55 (M 8 x 2.17)
l	mm (in.)	20 (0.79)	35 (1.38)	45 (1.77)	50 (1.97)	55 (2.15)
b	mm (in.)	7 (0.28)	10 (0.39)	12 (0.47)	12 (0.47)	12 (0.47)
c	mm (in.)	4 (0.16)	5 (0.20)	8 (0.32)	8 (0.32)	8 (0.32)
Sealing torque	Nm (lbf-in)	4 (35.40)	10 (88.51)	20 (177.02)	20 (177.02)	20 (177.02)
Quantity per set						
Bolts		6	6	8	16	20
Bolt nut plate		3	3	4	8	10
Washers		6	6	8	16	20

Ordering Information

Set	Part No.	838 87	838 88	838 89	83890	838 91
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Hexagon Bolts, Set for CF Flanges



Dimensional drawing for the hexagon bolts for CF flanges

Technical Data

DN	CF	16	40	63	100	160	200	250
Outside diameter	in.	1.33	2.75	4.5	6	8	10	12
Dimensions (d x l)	mm (in.)	M 4 x 20 (M 4 x 0.79)	M 6 x 35 (M 6 x 1.38)	M 8 x 45 (M 8 x 1.77)	M 8 x 50 (M 8 x 1.97)	M 8 x 55 (M 8 x 2.17)	M 8 x 60 (M 8 x 2.36)	M 8 x 60 (M 8 x 2.36)
Sealing torque	Nm (lbf-in)	4 (35.40)	10 (88.51)	20 (177.02)	20 (177.02)	20 (177.02)	20 (177.02)	20 (177.02)
Quantity per set								
Bolts		25	25	25	25	25	25	25
Bolt nut plate		25	25	25	25	25	25	25
Washers		25	25	25	25	25	25	25

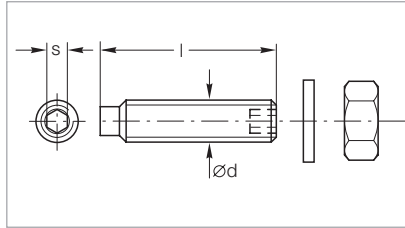
Ordering Information

Set	Part No.	839 00	839 01	838 81	839 04	839 05	839 07	839 07 ¹⁾
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¹⁾ 2 sets are required

Important: In the table of Chapter "General" the German designation for the type of steel is also stated in accordance with AISI.

Set Screws, Nuts and Washers for CF Flanges



Dimensional drawing for the set screws, nuts and washers for CF flanges

Technical Data

DN	CF	16	40	63 - 100
Dimensions (d x l)	mm (in.)	M 4 x 20 (M 4 x 0.79)	M 6 x 35 (M 6 x 1.38)	M 8 x 45 (M 8 x 1.77)
s	mm (in.)	2.0 (0.08)	3.0 (0.12)	4.0 (0.16)
Sealing torque	Nm (lbf-in)	4 (35.40)	10 (88.51)	20 (177.02)
Quantity per set				
Bolts		6	6	16
Nuts		6	6	16
Washers		6	6	16

Ordering Information

Set	Part No.	839 10	839 11	839 13
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Observation Windows for Vacuum Systems

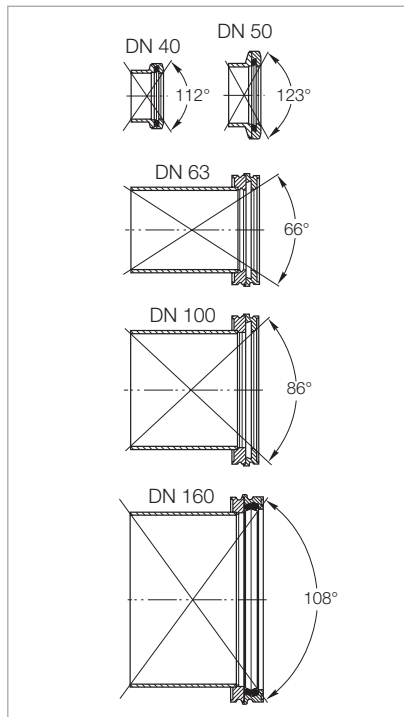


Observation of the phenomena in the vacuum chamber is very important for many vacuum processes. Measurements and monitoring can often be accomplished only by means of external instruments used under normal atmospheric pressure conditions.

This calls for highly transparent, rugged observation windows featuring a wide angle view.

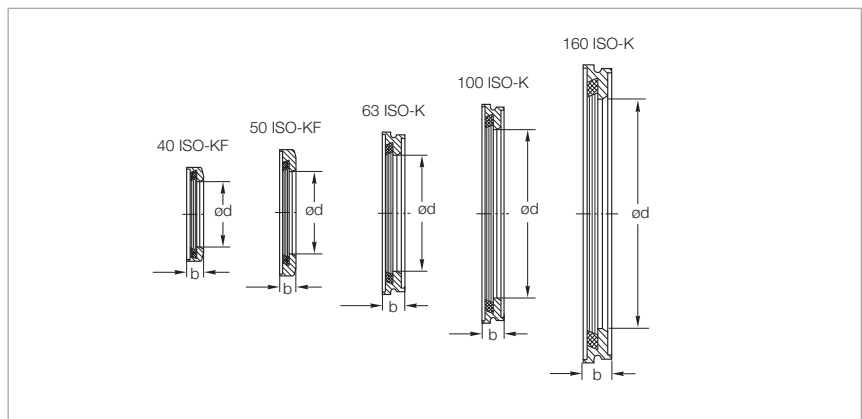
Advantages to the User

- Flat design
- Easy to fit and remove
- Easy to clean
- Wide viewing angle
- Can be baked out up to 150 °C (302 °F)
- May be combined with ISO-KF and ISO-K components
- No special mounting components are required
- The FPM (FKM) O-ring seals against the atmosphere (integrated centering ring)
- Each observation window is subjected to a leak test (thereby ensuring safe operation!)

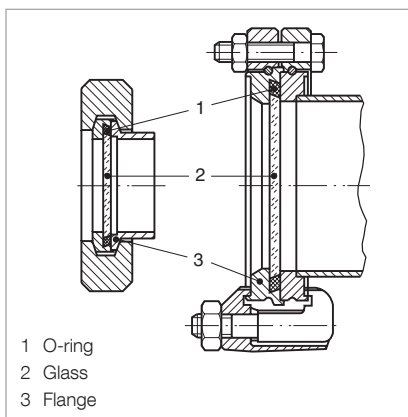


Viewing angle into vacuum chamber through observation window DN 40 ISO-KF – DN 160 ISO-K (mounting on matching flanges with tubulation)

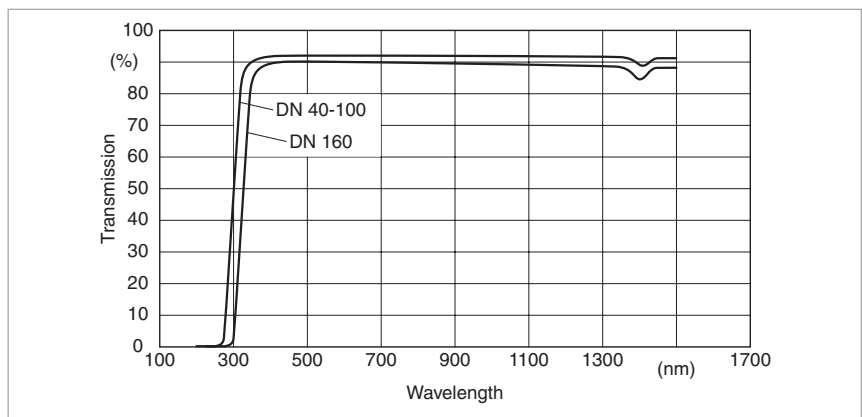
ISO-KF/ISO-K Observation Windows



Window dimensions for the observation windows



ISO-KF and ISO-K observation windows, fully installed



Transmittance as a function of the wavelength for Leybold viewports DN 40 ISO-KF to DN 160 ISO-K for different window thicknesses

Technical Data

Schaugläser

DN		40 ISO-KF	50 ISO-KF	63 ISO-K	100 ISO-K	160 ISO-K
Thickness of the glass	mm (in.)	4 (0.16)	4 (0.16)	4 (0.16)	5 (0.20)	9 (0.35)
Diameter of the glass	mm (in.)	44 (1.73)	54 (2.13)	75 (2.95)	109 (4.29)	160 (6.30)
b	mm (in.)	10 (0.39)	10 (0.39)	13.5 (0.53)	13 (0.51)	17 (0.67)
d	mm (in.)	40 (1.57)	50 (1.97)	70 (2.76)	102 (4.02)	153 (6.02)
Viewing angle	°	112	123	66	86	108

The glass used is a borosilicate glass (BOROFLOAT® 33) with a refractive index of $n = 1.472$

Dielectric number (at 25 °C (77 °F))

4.8 at 1 MHz

Flange material

Stainless steel 1.4301

Glass material

Borosilicate

O-ring material

FPM (FKM)

Leak rate

$< 10^{-8}$ mbar x l/s

Ordering Information

Schaugläser

Set	Part No.	Part No.	Part No.	Part No.	Part No.
DN	40 ISO-KF	50 ISO-KF	63 ISO-K	100 ISO-K	160 ISO-K
Observation Windows	210 131	210 132	210 133	210 134	210 135

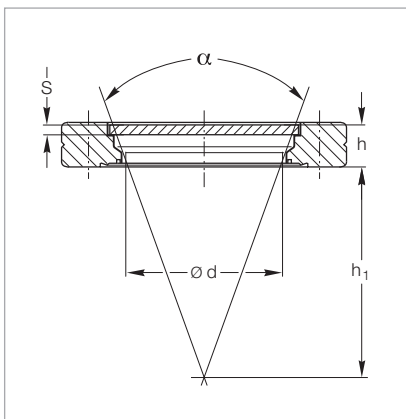
CF Observation Windows



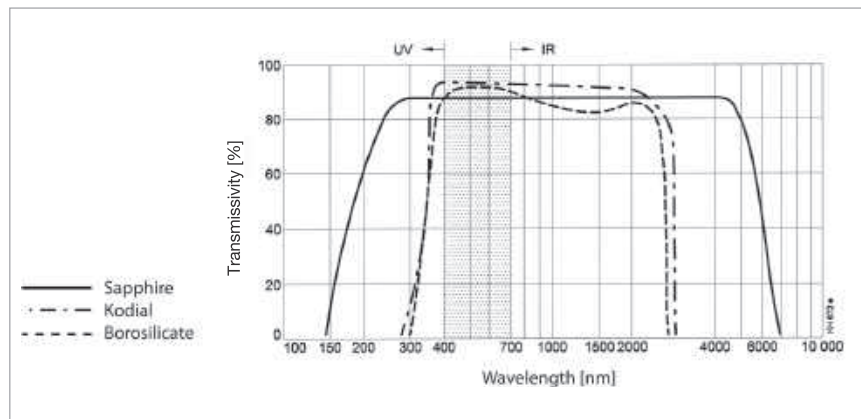
Standard glass is normally only used for visual observations, for photography of experiment details and, among other things, for pyrometer measurements.

Advantages to the User

- Optically plane-parallel glass surface up to just before the edge
- Flange with a wide viewing angle



Dimensional drawing for CF observation windows



Optical transmissivity for the CF observation windows

Technical Data

DN	CF	40	63	100	160
Thickness of the glass (s)	mm (in.)	3 (0.12)	3.5 (0.14)	6 (0.24)	8 (0.32)
Diameter of viewing area (d)	mm (in.)	38 (1.50)	65 (2.56)	90 (3.54)	135 (5.32)
Viewing angle (α)	°	38	57	71	92
Spacing of the glass (h), approx.	mm (in.)	11 (0.43)	16.4 (0.65)	8 (0.32)	10 (0.39)
Viewing distance (h ₁)	mm (in.)		50 (1.97)		
Wavelength range	mm (in.)		400 to 3000		
Material			Vacon (compensation ring)		
Mean transmission ratio	%		93 in the visible range		
Type of glass			Kodial		
Max. heating rate	min		5		
Max. bakeout temperature	°C (°F)		400 (752)		

Ordering Information

CF observation window	Part No.	210 112	210 114	210 115	210 116
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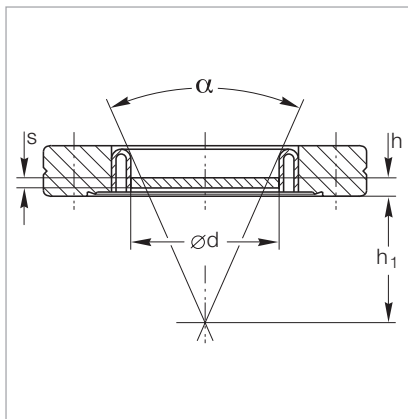
CF Sapphire Observation Windows



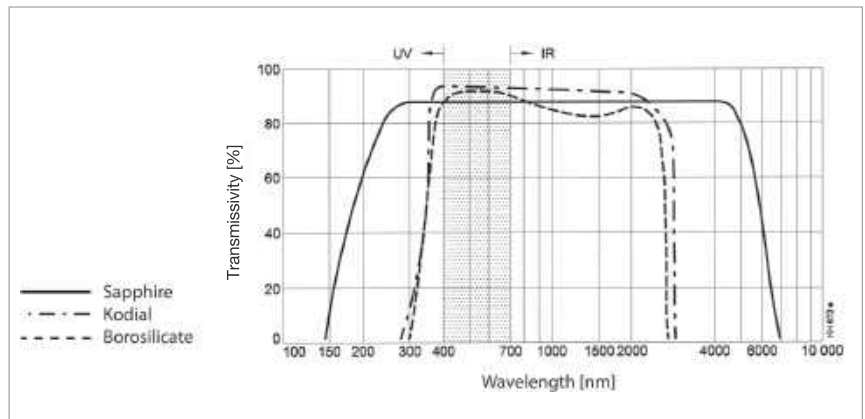
Sapphire exhibits a transmissivity range of 250 nm to 5500 nm. The infrared limit is shifted far in to the infrared range. For this reason, glass of this type is used in connection with sun simulation tests, Laser experiments, high-temperature plasma measurements and spectroscopic measurements, for example.

Advantages to the User

- Optically plane-parallel glass surface up to just before the edge



Dimensional drawing for the CF sapphire observation windows



Optical transmissivity for the CF Sapphire observation windows

Technical Data

DN	CF	40
Thickness of the glass (s)	mm (in.)	3 (0.12)
Diameter of viewing area (d)	mm (in.)	23 (0.91)
Viewing angle (α)	°	23
Spacing of the glass (h), approx.	mm (in.)	10 (0.39)
Viewing distance (h ₁)	mm (in.)	50 (1.97)
Wavelength range	mm (in.)	250 to 5500
Mean transmission ratio	%	> 80
Type of glass		Sapphire
Max. heating rate	min	5
Max. bakeout temperature	°C (°F)	400 (752)

Ordering Information

CF sapphire observation windows	Part No.	210 122
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Feedthroughs

ISO-KF, ISO-K, CF

290.00.02

Excerpt from the Leybold Full Line Catalog 2018
Catalog Part Feedthroughs

Feedthroughs

Products

Feedthroughs	4
Current Feedthroughs	4
High Current Feedthroughs	8
Rotary Feedthroughs	10
Liquid Feedthroughs	11
Rotary / Linear Motion Feedthroughs	12
CF Feedthroughs	14
Linear Motion Mechanical Feedthroughs	14
Current Feedthroughs	16
Accessories for Feedthroughs	18
Connectors, vacuum side	18
Connectors, atmospheric side	19

Feedthroughs

Current Feedthroughs

General

Current feedthroughs for vacuum applications, as well as their corresponding connectors, comply with the German VDE Regulations 0100, 0660 and 0110 Section 1. The latter refers to air gaps and leakage paths.

- All current feedthroughs are tested according to VDE Regulations

Important

The special regional safety regulations must be observed! These may differ from the regulations which apply in Germany! The voltages stated on the following pages apply to atmospheric pressure and the right connector from Leybold. The voltage specifications apply also to that part of the feedthrough which is exposed to the vacuum, provided the pressure in these areas is less than 10^{-1} mbar (0.75×10^{-1} Torr).

At pressures over 10^{-1} mbar (0.75×10^{-1} Torr) voltage breakdowns may occur depending on the distance between the electrodes, the type of rarefied gas, the type of contamination, the distribution of the electric field, etc.

Operators are advised to check each application individually or to get in touch with Leybold for advice.

In applications where VDE regulations need not be applied, higher operating voltages are permissible. Please contact us for further information regarding your particular application.

The test and operating voltages refer to a vacuum pressure of $< 1 \times 10^{-4}$ mbar ($< 0.75 \times 10^{-4}$ mbar) and when using the connectors recommended by Leybold. Electrical power may only be applied via the external plugs.

Abbreviations used in connection with feedthroughs:

F Feedthrough

E	Current
L	Liquid
N	Normal
P	Precision
F	Frequency
HC	Current
HV	Voltage
L	Linear
R	Rotary

Current Feedthroughs

Technical Data

FE 16 / 9S

FE 16 / 9

Vacuum connection	DN	16 ISO-KF	
Number of feedthroughs		9	
Voltage per pole ¹⁾	V	50	
Current per pole ¹⁾	A	2	
Connection			
Vacuum side		solder connection	connector
Air side		connector	connector
Diameter of connecting wire	mm (in.)	0.8 (0.03) / 1.2 (0.05)	–
Tightness	mbar x l/s	1 x 10 ⁻⁹	
Pressure (absolute)		1 x 10 ⁻⁸ mbar to 2.5 bar (0.75 x 10 ⁻⁸ Torr to 1875 Torr)	
Bakeout temperature (feedthrough, connector)	°C (°F)	130 (266)	
Housing		Stainless steel	
Insulator		PEEK / Araldit	
Seal		FPM (FKM)	
Contact (feedthrough, connector)		gold-plated brass	

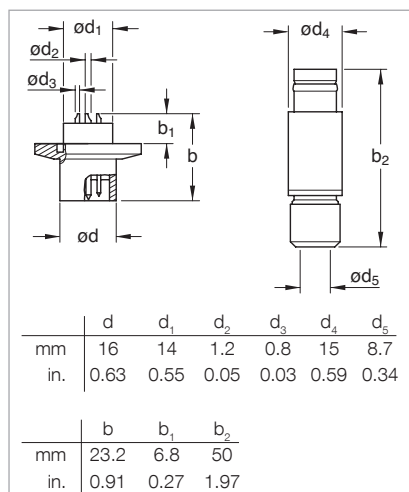
Ordering Information

FE 16 / 9S

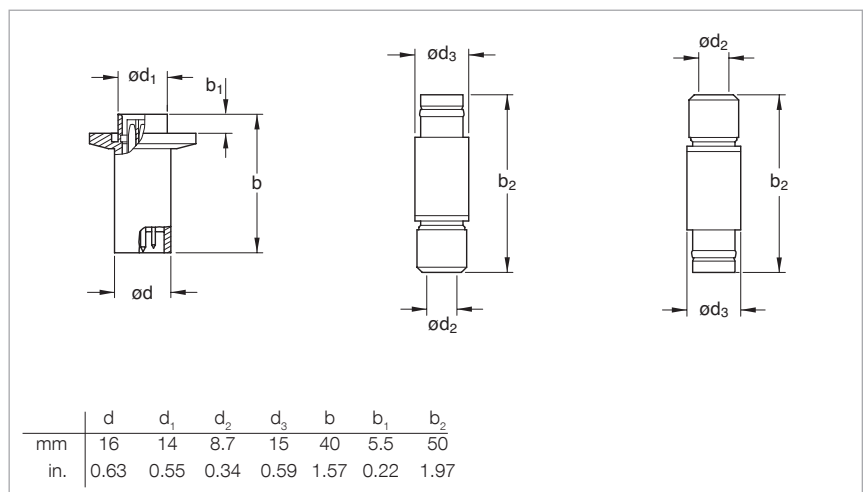
FE 16 / 9

	Part No.	Part No.
Current feedthroughs	210 302	210 304
Connector: vacuum side	–	210 305
Connector: air side	210 303	210 303

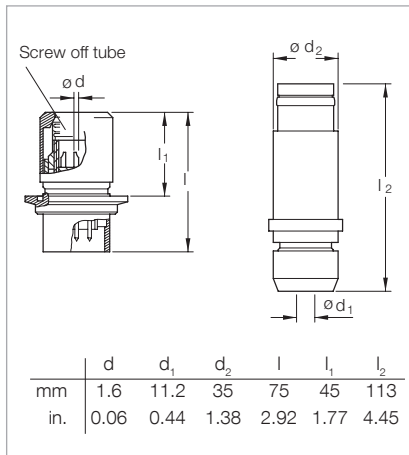
¹⁾ Local regulations concerning use must be followed



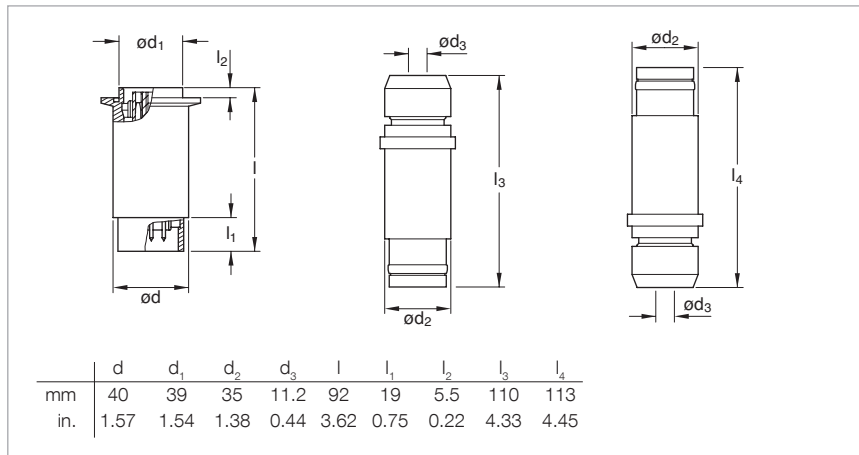
Dimensional drawing for the feedthrough FE 16/9S (left) and the connector for air side (right)



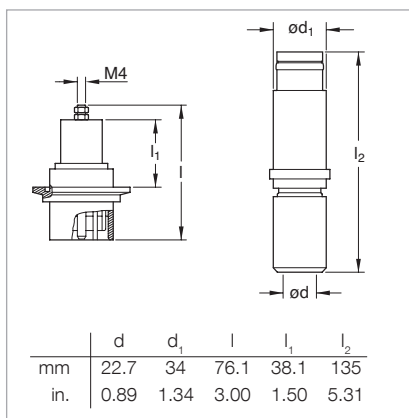
Dimensional drawing for the feedthrough FE 16/9 (left), the connector for vacuum side (middle) and the connector for air side (right)



Dimensional drawing for the feedthrough FE 40/7S (left) and the connector for air side (right)



Dimensional drawing for the feedthrough FE 40/7 (left), the connector for vacuum side (middle) and the connector for air side (right)



Dimensional drawing for the feedthrough FEHV 40/1 (left) and the connector for air side (right)



Technical Data**FE 40 / 7S****FE 40 / 7****FEHV 40 / 1**

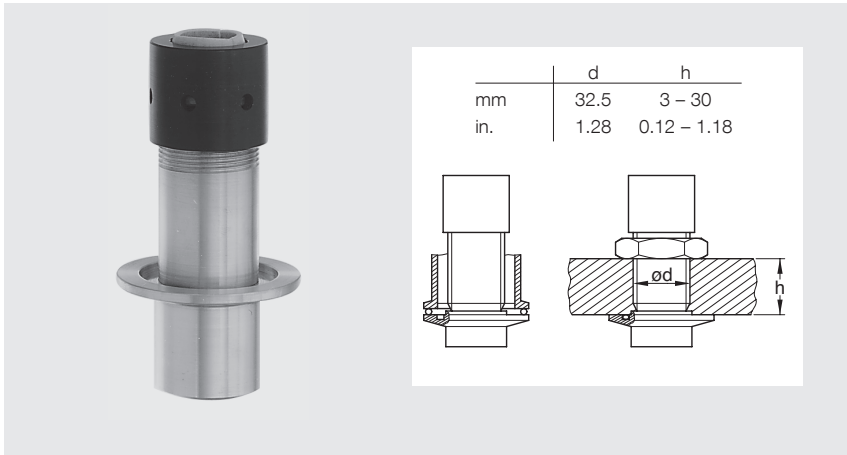
Vacuum connection	DN	40 ISO-KF		
Number of feedthroughs		7	7	1
Voltage per pole ¹⁾	V	380	380	6000
Current per pole ¹⁾	A	16	16	25
Connection				
Vacuum side		solder connection	connector	screw coupling
Air side		connector	connector	connector
Diameter of connecting wire	mm (in.)	1.8	–	–
Test voltage	kV / Hz	–	–	15 / 50
Tightness	mbar x l/s	1 x 10 ⁻⁹		
Pressure (absolute)		1 x 10 ⁻⁸ mbar x l/s to 2.5 bar		
Bakeout temperature (feedthrough, connector)	°C (°F)	130 (266)		
Housing		chrom-plated steel		
Insulator		PTFE / Araldit	PTFE / Araldit	PTFE
Seal		FPM (FKM)		
Contact (feedthrough, connector)		gold-plated stainless steel	gold-plated stainless steel	nickel-plated brass

Ordering Information**FE 40 / 7S****FE 40 / 7****FEHV 40 / 1**

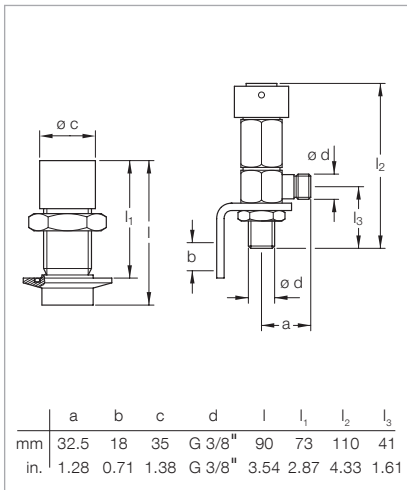
	Part No.	Part No.	
Current feedthroughs	210 325	210 326	210 350
Connector: vacuum side	–	210 328	–
Connector: air side	210 327	210 327	210 351

¹⁾ Local regulations concerning use must be followed

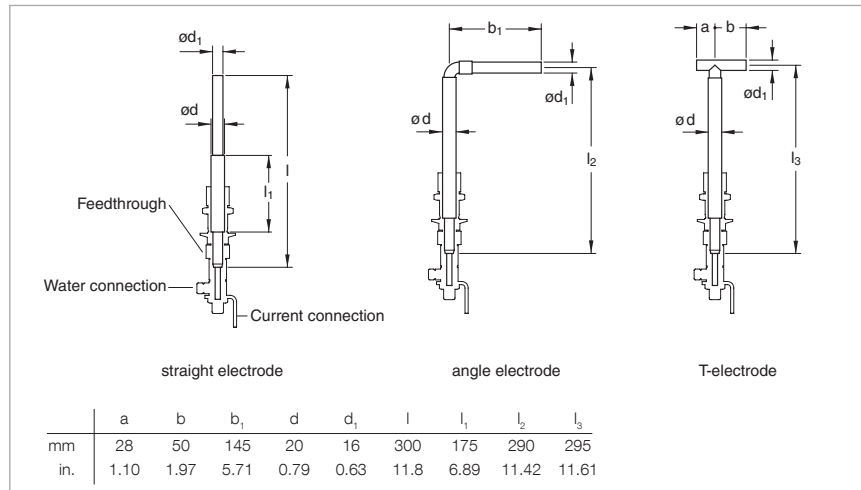
High Current Feedthroughs



- Selection of electrodes
- Slide into mounted feedthrough
- Current connection with water cooling



Dimensional drawing for the feedthrough FEHC 40/1 (left) and current connection with water cooling (right)



Dimensional drawings for the copper electrodes for the feedthrough FEHC 40/1

Technical Data**FEHC 40/1**

Vacuum connection	DN	40 ISO-KF
Number of feedthroughs		1
Voltage	V	50
Current	A	250
with water cooling	A	1500
Tightness	mbar x l/s	1×10^{-9}
Pressure (absolute)		1×10^{-8} mbar to 2.5 bar (max. 10 bar with external centering ring)
Bakeout temperature	°C (°F)	110 (230)
Housing		aluminum
Insulator		thermoplast and thermoset
Seal		FPM (FKM)

Ordering Information**FEHC 40/1**

	Part No.
High current feedthroughs	210 352
Current connection with water cooling ¹⁾	210 356
Straight electrode	210 353
Angle electrode	210 354
T-electrode	210 355

¹⁾ Not insulated

Rotary Feedthroughs

- ISO-KF / ISO-K
- For transmitting high torque
- With FPM (FKM) shaft seal and ball bearings

Technical Data

FR 25/50 N

FR 63/100 N

Vacuum connection	DN	25 ISO-KF	63 ISO-K
Feedthrough / Seal		FPM (FKM)	
Shaft Connection	mm (in.)	dia. 8 (0.31)	dia. 20 (0.79)
Transferable torque	Nm	6	100
Rotational speed ¹⁾	1/min	1000	500
Shaft load			
Radial	N	150	500
Axial	N	50	100
Service life (revolutions)		20 000 000	10 000 000
Tightness, static	mbar x l/s	1 x 10 ⁻⁹	
Pressure (absolute)		1 x 10 ⁻⁹ mbar to 1 bar	
Operating temperature, max.	°C (°F)	50 (122)	
Bakeout temperature	°C (°F)	110 (230)	
Materials exposed to process media		Stainless steel, aluminum, FPM (FKM)	
Weight	kg (lbs)	0.2 (0.44)	2 (4.42)

Ordering Information

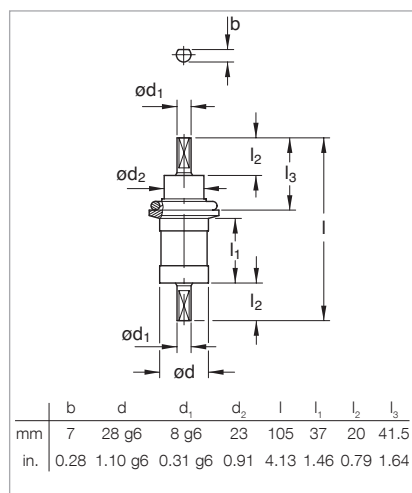
FR 25/50 N

FR 63/100 N

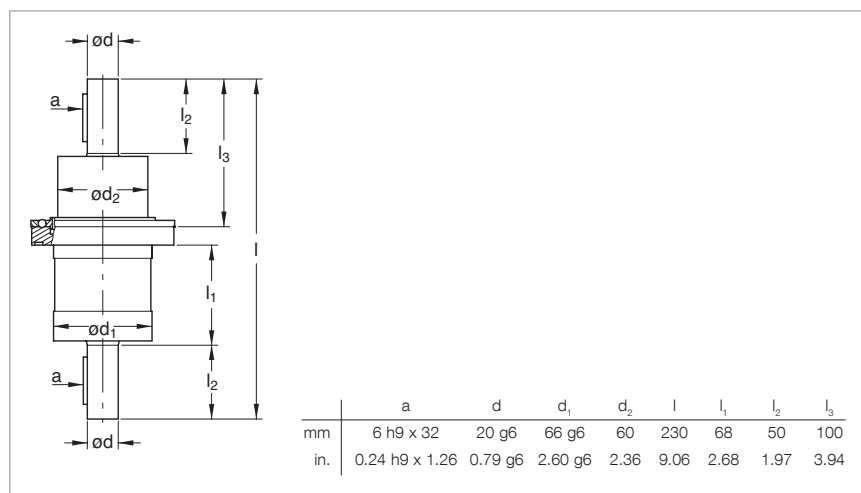
	Part No.	Part No.
Rotary feedthrough	210 151	210 153 ²

¹⁾ When a reduced service life is acceptable, the rotational speed can be increased by up to a factor of two

²⁾ Centering ring, CR/aluminum Part No. 268 05, FPM (FKM)/stainless steel Part No. 887 03



Dimensional drawing
for the feedthrough FR 25/50 N



Dimensional drawing for the feedthrough FR 63/100 N

Liquid Feedthroughs

- For H₂O and LN₂
- Thermally insulated
- Especially suited for very hot and very cold applications

Technical Data

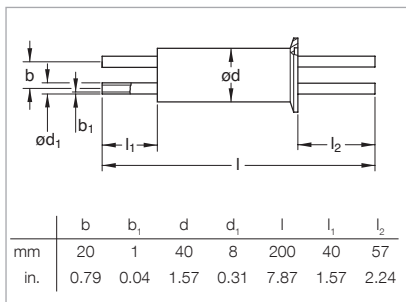
FL 40K/2

Vacuum connection	DN	40 ISO-KF
Feedthrough / seal		welded
Connection	mm (in.)	dia. 8 x 1 (0.31 x 0.04)
Number of tubes		2
Tightness	mbar x l/s	1 x 10 ⁻⁹
Pressure (absolute)		1 x 10 ⁻⁹ mbar to 2.5 bar (max. 10 bar with external centering ring)
Temperature range	°C (°F)	-200 to +150 (-328 to +302)
Material		Stainless steel
Weight	kg (lbs)	0.3 (0.66)

Ordering Information

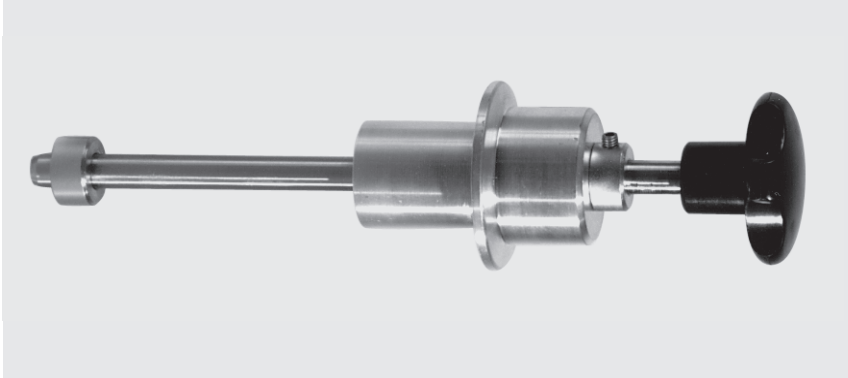
FL 40K/2

	Part No.
Liquid feedthrough	210 275

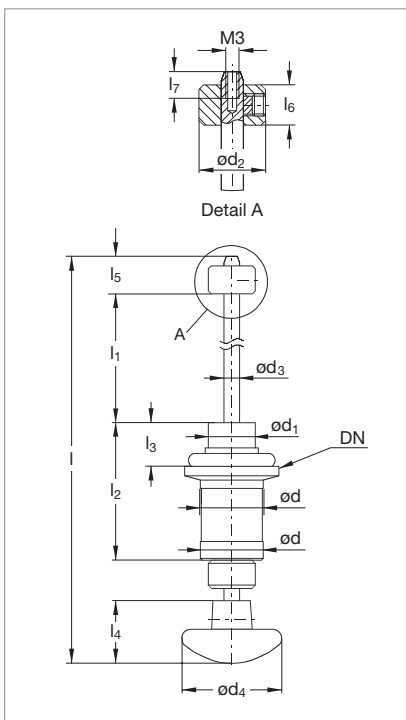


Dimensional drawing for the liquid feedthrough
FL 40K/2

Rotary / Linear Motion Feedthroughs



- Two FPM (FKM) shaft seals
- Direct push/pull and rotary actuation
- With locking ring



Dimensional drawing for the feedthroughs FNRL

Dimension Table

Feedthroughs		DN	d	d ₁	d ₂	d ₃	
FNRL 16/50	mm in.	16	20g6 0.79g6	15 0.59	15 0.59	5 ^{+0.03} _{0.05} 0.20	
FNRL 25/100	mm in.	25	25g6 0.98g6	23 0.91	22 0.87	8 ^{+0.06} _{0.08} 0.31	
			d ₄	l	l ₁ max.	l ₂	l ₃
FNRL 16/50	mm in.	32 1.26	134 5.28	50 1.97	44 1.73	14 0.55	
FNRL 25/100	mm in.	50 1.97	210 8.27	100 3.94	58 2.28	24 0.94	
			l ₄	l ₅	l ₆	l ₇	
FNRL 16/50	mm in.	20 0.79	10.5 0.41	8 0.31	6 0.24		
FNRL 25/100	mm in.	32 1.26	11 0.43	9 0.35	8 0.31		

Technical Data**FNRL 16/50****FNRL 25/100**

Vacuum connection	DN	16 ISO-KF	25 ISO-KF
Feedthrough / seal		FPM (FKM)	
Shaft Connection	mm (in.)	M 3 x 6 / dia. 5 (M 3 x 0.24 / dia. 0.20)	M 4 x 8 / dia. 8 (M 4 x 0.31 / dia. 0.31)
Stroke	mm (in.)	50.0 (1.97)	100.0 (3.94)
Shaft load			
Radial, at max. displacement	N	10	15
Torsion	Nm	2	8
Tightness, static	mbar x l/s	1 x 10 ⁻⁹	
Operating pressure range (absolute)		1 x 10 ⁻⁹ mbar to 1 bar	
Operating temperature, max.	°C (°F)	50 (122)	
Bakeout temperature	°C (°F)	110 (230)	
Materials exposed to process media		Stainless steel, aluminum, FPM (FKM)	
Weight	kg (lbs)	0.1 (0.22)	0.2 (0.44)

Ordering Information**FNRL 16/50****FNRL 25/100**

	Part No.	Part No.
Rotary / linear feedthrough	210 200	210 201

CF Feedthroughs

CF feedthroughs are available in a variety of field-proven designs, specifically:

- Linear motion mechanical feedthroughs
- Rotary motion mechanical feedthroughs

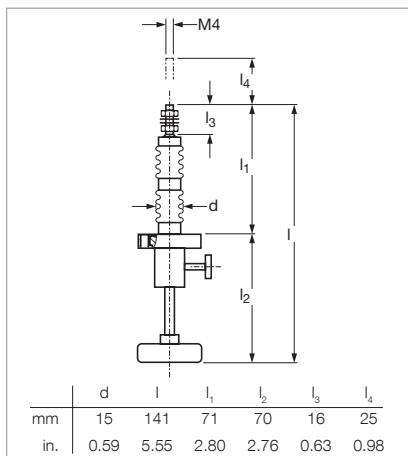
A stainless steel bellows is used to seal off the CF linear and rotary feedthroughs against the atmosphere.

All feedthroughs can be installed in the vacuum systems in any orientation.

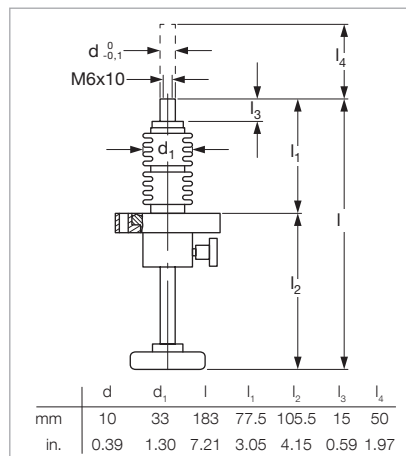
Abbreviations used in connection with feedthroughs:

- F Feedthrough
 E Electric
 L Liquid
 N Normal
 P Precision
 F Frequency
 HC Current
 HV Voltage
 L Linear
 R Rotary

Linear Motion Mechanical Feedthroughs



Dimensional drawing for the FNL 16/25 linear motion feedthrough



Dimensional drawing for the FNL 40/50 linear motion feedthrough

Technical Data

FNL 16/25

FNL 40/50

Nominal width	DN	16 CF-R	40 CF-R
Shaft connection	mm (in.)	M 4 x 16 (M 4 x 0.63)	M 6 x 10, Ø 10 (M 6 x 0.39, Ø 0.39)
Feedthrough / seal		bellow	
Actuator		manually	
stroke	mm (in.)	25.0 (0.98)	50.0 (1.97)
Scale division	mm (in.)	5.0 (0.20)	10.0 (0.39)
Shaft load			
Radial at max. displacement	N	20	100
Axial, against vacuum	N	85	140
Axial, against atmosphere	N	100	200
Torsion	Nm (lbf-in)	0.2 (1.77)	0.5 (4.43)
Tightness	mbar x l/s	5 x 10 ⁻¹¹	
Pressure (absolute)		1 x 10 ⁻¹⁰ mbar to 2 bar	
Bakeout temperature	°C (°F)	300 (572)	
Materials exposed to process media		Stainless steel	
Weight	kg (lbs)	0.15 (0.33)	0.75 (1.66)

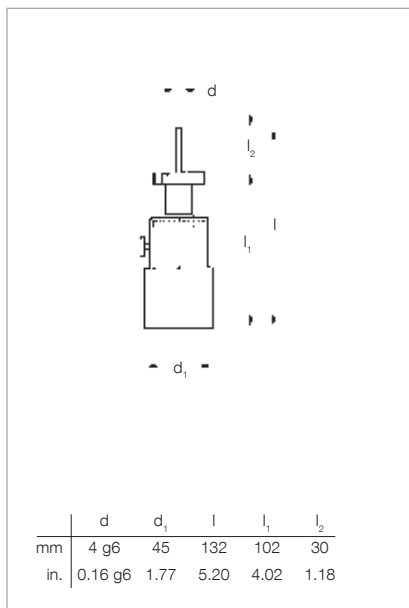
Ordering Information

FNL 16/25

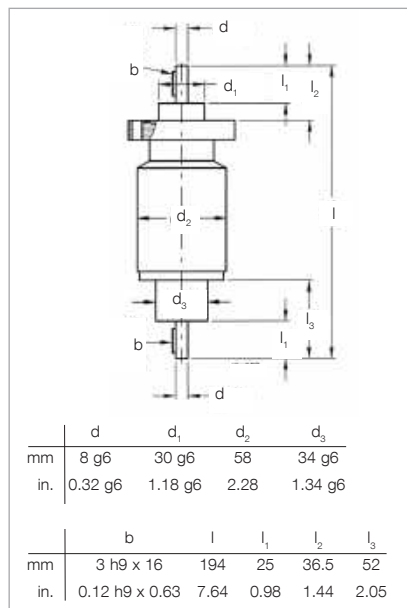
FNL 40/50

	Part No.	Part No.
Linear motion feedthrough	210 250	210 251

Linear Motion Mechanical Feedthroughs



Dimensional drawing for the FPR 16/5 N rotary feedthrough



Dimensional drawing for the FNR 40/20 N rotary feedthrough

The rotation of the drive knob is translated via a gearless drive system to the shaft on the vacuum side. This shaft runs on ball bearings which do not require any maintenance during the entire service life.

Technical Data

FPR 16/5 N

FNR 40/20 N

Nominal width	DN	16 CF-F	40 CF-F
Shaft connection	mm (in.)	dia. 4 (0.16)	dia. 8 (0.32)
Feedthrough / seal		bellow	
Transferable torque			
Dynamic	Nm (lbf-in)	0.4 (3.54)	4.0 (35.40)
Dynamic, at 300 °C (572 °F)	Nm (lbf-in)	0.2 (1.77)	2.0 (17.70)
Static	Nm (lbf-in)	0.2 (1.77)	3.0 (26.55)
Rotational speed	rpm	200	1000
at max. torque	rpm	–	500
Scale division	mm	10°	–
Shaft load			
Radial	N	10	60
Axial	N	5	20
Tightness	mbar x l/s	5 x 10 ⁻¹¹	
Pressure (absolute)		1 · x 10 ⁻¹⁰ mbar to 2 bar	
Bakeout temperature	°C (°F)	300 (572)	
Materials exposed to process media		Stainless steel	
Weight	kg (lbs)	0.3 (0.66)	1.5 (3.31)

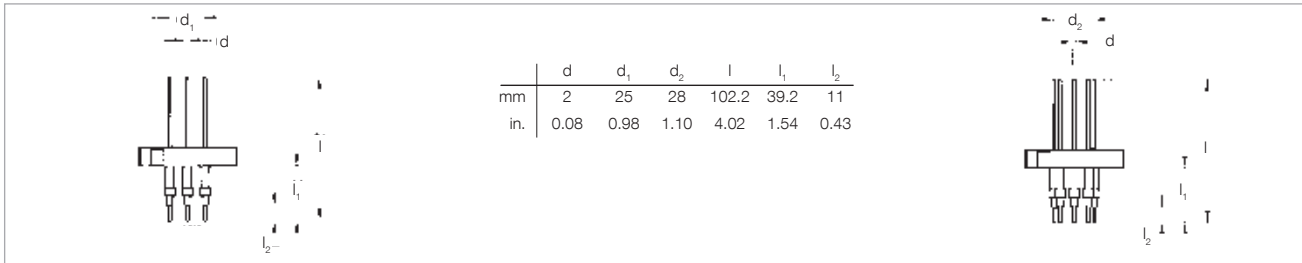
Ordering Information

FPR 16/5 N

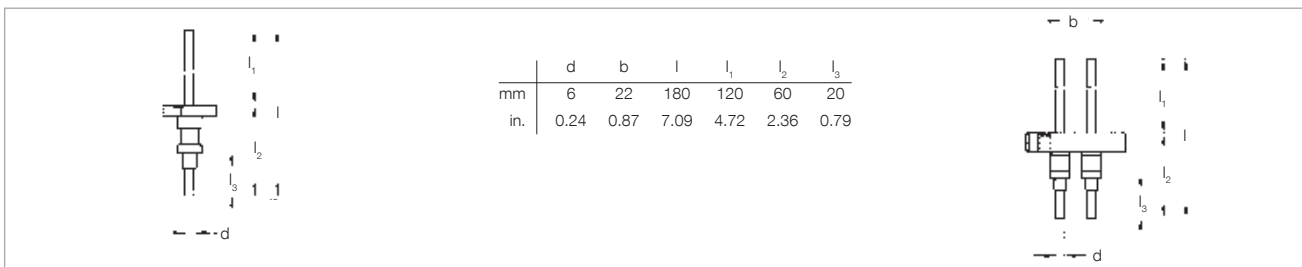
FNR 40/20 N

	Part No.	Part No.
Rotary feedthrough	210 154	210 155

Current Feedthroughs



Dimensional drawing for the current feedthrough FE 40/4 (left) and FE 40/9 (right)



Dimensional drawing for the current feedthrough FEHC 16/1 (left) and FEHC 40/2 (right)

Technical Data

FE 40/4

FE 40/9

FEHC 16/1

FEHC 40/2

Nominal width	DN	CF 40-F	CF 40-F	CF 16-F	CF 40-F
Number of feedthroughs		4	9	1	2
Number of connection pieces					
vacuum side (set)		5	2 x 5	2	2
atmospheric side (set)		5	2 x 5	2	2
Voltage per pole ¹⁾	kV	1	1	4	4
Current per pole ¹⁾	A	8	8	150	150
Bakeout temperature ΔT	°C (°F)	400 (752)			
Temperature rise at max. current ΔT	°C/min	40	40	50	50
Tightness	mbar x l/s	5 x 10 ⁻¹¹			
Pressure (absolute)		1 x 10 ⁻¹⁰ mbar to 2 bar			
Flange		Stainless steel			
Conductor		Stainless steel	Stainless steel	Copper	Copper
Insulator		Al ₂ O ₃			
Weight	kg (lbs)	0.3 (0.66)	0.4 (0.88)	0.15 (0.33)	0.45 (0.91)

Ordering Information

FE 40/4

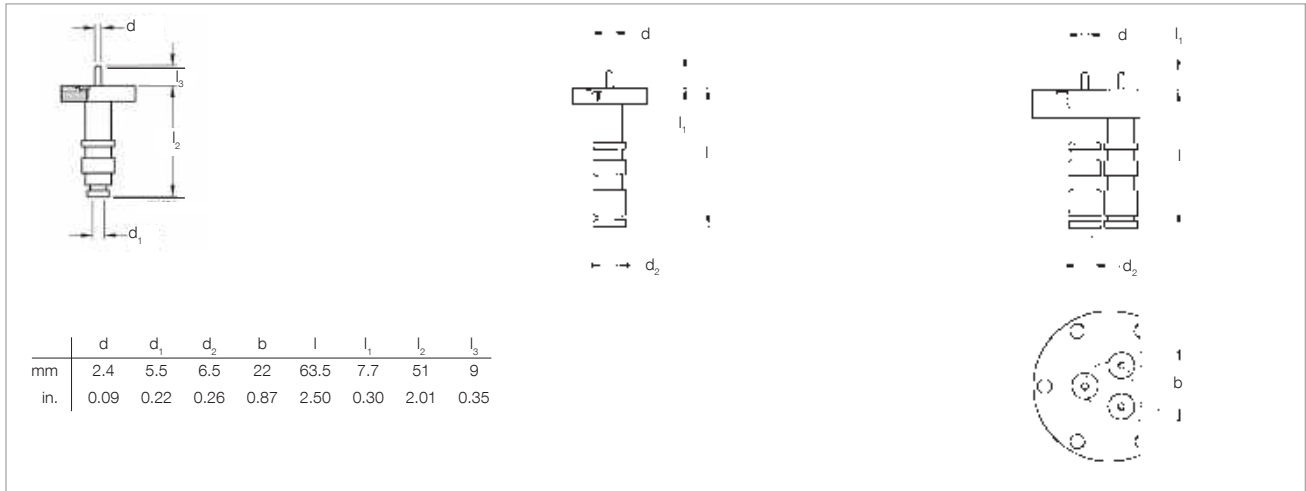
FE 40/9

FEHC 16/1

FEHC 40/2

	Part No.	Part No.	Part No.	Part No.
Current feedthrough	210 310	210 313	210 335	210 342
Connection piece, vacuum side (set)	210 312	2x 210 312	210 337	210 337
Connector, atmospheric side (set)	210 311	2x 210 311	210 336	210 336

¹⁾ Local safety regulations must be met



Dimensional drawing for the current feedthrough FEF 16/1 (left), FEHV 16/1 (middle) and FEHV 40/3 (right)

Technical Data

FEF 16/1

FEHV 16/1

FEHV 40/3

Nominal width	DN	CF 16-F	CF 16-F	CF 40-F
Number of feedthroughs		1	1	3
Voltage				
AC, 50 Hz	kV	0.35	3.5	3.5
DC	kV	0.5	5.0	5.0
Current	A	3		
Frequency	MHz	150	–	–
Impedance	Ω	50 - 60	–	–
Insulation resistance at 20 °C (68 °F)	Ω	10 ⁺¹⁰		
Bakeout temperature				
with connector	°C (°F)	50 (122)		
without connector	°C (°F)	400 (572) ¹⁾		
Tightness	mbar x l/s	1 x 10 ⁻¹⁰		
Pressure (absolute) ²⁾		1 x 10 ⁻¹⁰ mbar to 2,5 bar		
Housing, flange, conductor		Stainless steel		
Feedthrough, seal		Al ₂ O ₃		
Weight	kg (lbs)	0.14 (0.31)	0.14 (0.31)	0.5 (1.10)

Ordering Information

FEF 16/1

FEHV 16/1

FEHV 40/3

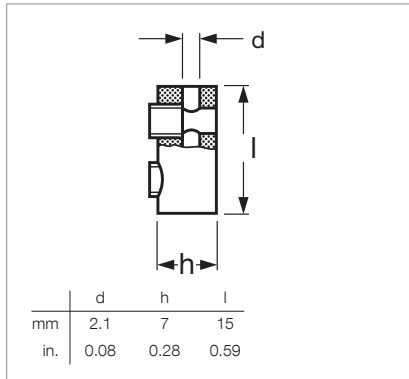
	Part No.	Part No.	Part No.
Current feedthrough	210 404	210 402	210 403
Outside plug (included in delivery)	BNC UG 88/U	MHV UG 932/U	MHV UG 932/U
Cable	RG 58/U	RG 59/U	RG 59/U

¹⁾ With elastomer seal up to 150 °C (302 °F)

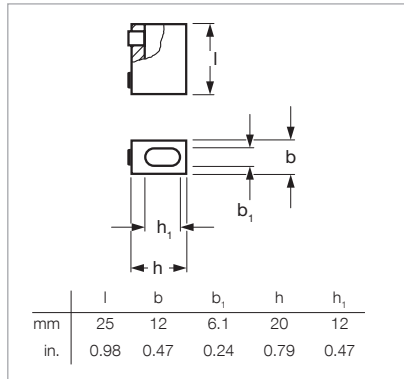
²⁾ Pressure at 400 °C (572 °F) reduced to 2 bar

Accessories for Feedthroughs

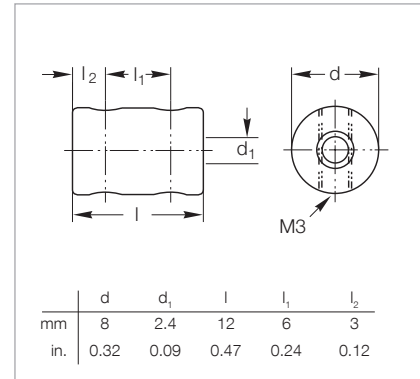
Connectors, vacuum side



Dimensional drawing for the connector used on FE 40/4 / FE 40/9



Dimensional drawing for the connector used on FE 16/1, FEHC 40/2 and FEHC 16/1



Dimensional drawing for the connector used on FEHV 16/1, FEHV 40/3 and FEF 16/1

Technical Data

Connector for feedthrough		FE 40/4 / FE 40/9	FEHC 40/2 / FEHC 16/1	FEHV 16/1 / FEHV 40/3 FEF 16/1
Current max.	A	12	90	3
Bakeout temperature	°C (°F)	400 (752)	400 (752)	350 (662)
Material		Stainless steel	Stainless steel	Copper

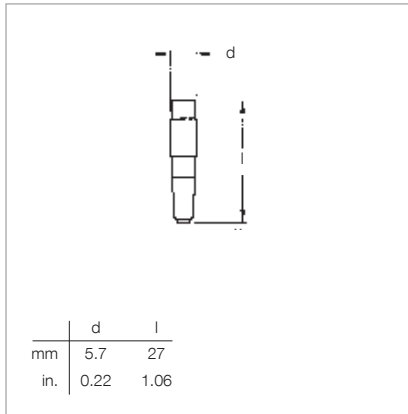
Connectors Vacuum Side

Ordering Information

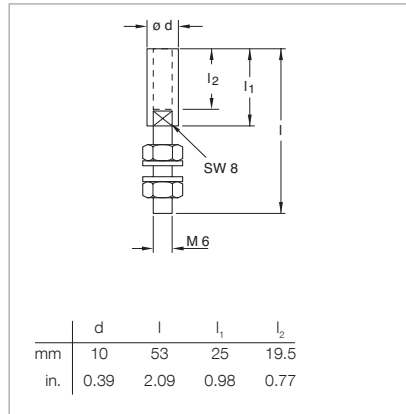
Connectors Vacuum Side

	Part No.	Part No.	
Connector: vacuum side	-	-	846 47
Connector: vacuum side (Set of 5)	210 312	-	-
Connector: vacuum side (Set of 5)	-	210 337	-

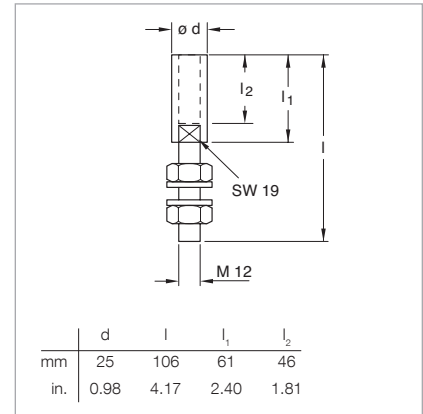
Connectors, atmospheric side



Dimensional drawing for the outside plug used on FE 40 /4 and FE 40/9



Dimensional drawing for the outside plug used on FE 16/1, FEHC 40/2 and FEHC 16/1



Dimensional drawing for the outside plug used on FEHC 40/1

Technical Data

Connectors Atmospheric Side

Connector for feedthrough		FE 40/4 / FE 40/9	FEHC 40/2 / FEHC 16/1	FEHC 40/1
Current max.	A	12	90	250
Not insulated, for use up to	V	50		
Bakeout temperature	°C (°F)	50 (122)	150 (302)	150 (302)
Material		gold-plated brass	silver-plated brass	silver-plated brass

Ordering Information

Connectors Atmospheric Side

	Part No.	Part No.	
Connector, atmospheric side	-	-	210 339
Connector, atmospheric side (Set of 5)	210 3112	-	-
Connector, atmospheric side (Set of 2)	-	210 336	-

Valves

Valves

Right-Angle and Straight-Through Valves

Special Valves

Gate Valves

UHV Valves

300.00.02

Excerpt from the Leybold Full Line Catalog (Edition 01/2019)

Catalog Part Valves

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Gate Valves with ISO-KF / CF / ISO-F Flange

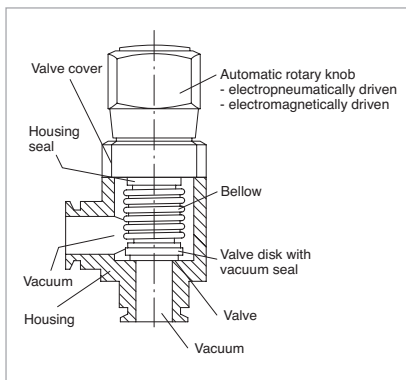
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The Leybold Valve Program

The long-standing experience of Leybold in the area of vacuum engineering is reflected in the selection and the design of the valves and vacuum protection components for a wide variety of applications.

The range of products is such that a reliable solution can be offered for every vacuum engineering application. Many years of service and the reliability of the valves is ensured by design. Leybold valves are well-proven in many widely varying areas of research and industry.

The Design of a Vacuum Valve Scope of the Range of Valves



The range of Leybold valves comprises:

- Small valves **micro**
- Right-angle and straight-through valves with a nominal width of DN 16 to DN 40 with ISO-KF flanges
- Right-angle valves with a nominal width of DN 63 to DN 250 with ISO-K flanges
- Gate valves with a nominal width of DN 16 to DN 250 with various flanges
- Ball valves
- Special valves

It is the aim of Leybold to meet, through the offered range of isolation components and valves, the customers requirements regarding the design of such components. For this reason all valves are available with different driving systems.

With the exception of the special valves you may select between an electro-pneumatic drive or an electro-magnetic drive system.

Right-angle valves DN 16 ISO-KF to DN 40 ISO-KF as well as DN 63 ISO-K to DN 160 ISO-K are either available with an Aluminum or stainless steel body (the latter up to DN 100 ISO-K only).

The special characteristics of the application in each case result in special requirements concerning features of the valves, for example:

- Coating
 - Short switching cycles (e.g. 1.5 s)
 - Very high number of opening and switching cycles (e.g. over 10 million cycles)
- Analytical engineering
 - High conductance (similar to the corresponding flange components, like bends, for example)
 - High integral leak tightness for the valves (leak rates below 10^{-9} mbar l/s)
- Lamps and tubes manufacture
 - Temperature resistant
 - Permissible ambient temperatures, 50 °C max.
- Accelerator technology
 - Materials capable of resisting radiation, high temperatures and corrosion at the same time
- Metallurgy and furnace manufacture
 - Rugged and insensitive to contamination
- Chemistry
 - Choice of materials in contact with the medium for the valve body

All applications have the following requirements in common:

- Quiet opening action with very little vibration
- Compact design, low weight
- Highly visible, unambiguous position indicator
- For use within the pressure range from 10^{-8} to 2500 mbar, if not stated otherwise
- Fully operational within the entire specified pressure range

Leybold valves meet these requirements, unless otherwise stated by the technical data.

Quality Assurance

The various markets, like Analytical or Coating, for example are very demanding regarding certain important features for the valves which are to be used in the new generation of instruments currently under development. Demanded are, among other things, high reliability during the entire service life, high integral leak tightness, a high number of opening/closing cycles as well as a fast response.

The valves from Leybold meet all these demanding requirements!

For further information on flange connections and flange components please refer to Catalog Parts "Flanges and Fittings" and "Feedthroughs".

Flange Designations

The flange designations used in this Catalog Part are in line with the international standards and the nomenclature used in practice:

Flange Type	Standard	Designation with standardized nominal width ¹⁾ (DN)
Small flanges	ISO 2861/1 DIN 28 403	"ISO-KF" e.g. DN 40 ISO-KF
Clamp flanges	ISO 1609 DIN 28 404	"ISO-K" e.g. DN 100 ISO-K
Fixed flanges/ collar flanges with retaining ring	ISO 1609 DIN 28 404	"ISO-F" "F" for fixed flange e.g. DN 250 ISO-F

In the case of gate valves equipped with CF flanges the following must be noted:

The designation DN 35 CF for UHV flanges has been changed to DN 40 CF with the sealing parameters remaining unchanged; the same applies to DN 150 CF which has changed to DN 160 CF.

Advantages to the User

- Compact design
- Integral leak rate less than 10^{-8} mbar l/s
- FPM (FKM) sealed
- For pressures up to 2000 mbar
- Seal in both directions ²⁾
- Principal dimensions comparable to Leybold flange components of the same nominal width
- Reliable operation ensured regardless of the valve's orientation
- Optical valve position indicator as standard (not for valves of the "micro" range)
- Electrical valve position indicator as standard (not for valves of the "micro" range)
- Operation of electromagnetic ISO-KF valves off supply voltages ranging from 100 to 230 V AC
- The inside of the housing in contact

with the medium is sealed off against the atmosphere by a bellows type seal which is free of lubricants.

All further technical data as well possible deviations from the general specifications stated here can be found along with the descriptions for the individual valve types.

For various applications and special design requirements Leybold offers a range of special valves:

- SECUVAC vacuum safety valves (DN 16 ISO-KF to DN 100 ISO-K)
- Venting valves / power failure venting valves
- Vacuum locks / sealing valves
- Variable leak valves
- Ball valves (straight-through valve)

Accessories

All connecting components like centering rings, clamps or clamping rings needed to connect the valves must be ordered separately (see Catalog Parts "Flanges and Fittings" and "Feedthroughs").

Materials

The valve bodies and the inside parts are made of selected, vacuum compatible materials, like wrought aluminum or cast stainless steel.

The raw components are subjected to a 100% test before they are further processed.

The materials which are used are described in the tables at the end of the chapter "General".

Gaskets

Shown in the table at the end of the chapter "General" are the types of gasket used in the valves together with their brief or chemical designations and their thermal ratings.

Other Materials

Plastic:	Polyamide 6 (PA 6)
Grey cast iron:	GG 20 (0.6020)
Brass:	Ms 58
Brass	
(nickel-plated):	CuZn39Pb3
Nimonic	
Bronze	
Spring steel	

¹⁾ The standardized nominal width (DN) corresponds approximately to the inside diameter, but need not necessarily be identical to the inside diameter.

²⁾ High vacuum systems are very demanding as to the leak tightness of the vacuum components used. For this reason each individual Leybold valve is subjected to a helium leak test before delivery. The valves are only considered as leak tight, if a leak rate of less than 10^{-9} mbar x l/s can be measured for the body and the valve seat.

In the case of our high vacuum valves with ISO-KF and ISO-K flanges a leak rate of less than 10^{-9} mbar x l/s is maintained also during actuation.

This means that in the case of a gas flow of the mentioned order of magnitude the pressure would increase only by 3 mbar in a vessel of 1 liter and in 100 years.

Materials

Aluminum Alloys

Material No.		Brief Designation
DIN	AA	DIN
3.0615	–	AlMgSiPbF28
3.2153	–	G AlSi7Cu3
3.2315	6081	AlMgSi1F28
3.2341	–	G AlSi5Mg wa
3.2371	–	G AlSi7Mg06
3.2373	–	G AlSi9Mg
3.2381	–	G AlSi10Mg wa
3.3527	–	AlMg2Mn0,8F20

Stainless Steels

Material No.		Brief Designation
DIN	AISI	DIN
1.4034	420	X 46 Cr 13
1.4301	304	X5 CrNi 18 10
1.4305	303	X10 CrNi 51 89
1.4306	304 L	X2 CrNi 18 10
1.4308	–	G-X6 CrNi 18 1
1.4310	301	X12 CrNi 17 7
1.4404	316 L	X2 CrNiMo 17 13 3
1.4435	316 L	X2 CrNiMo 18 14 3
1.4541	321	X10 CrNiTi 18 10
1.4571	316 Ti	X6 CrNiMoTi 17 12 2

Standard Steels

Material No.	Brief Designation
DIN	DIN
1.0388	St4/St14
1.0425	H II

Materials used for the Gaskets

Brief Designation	Chemical Designation	Typical Trade Name	Degassing Temperature
FPM (FKM)	Fluor caoutchouc	Viton	up to 150 °C
NBR	Acrylonitrile-butadiene rubber	Perbunan	up to 80 °C
PTFE	Polytetrafluor ethylene	Teflon	up to 250 °C
EPDM	Ethylene-propylenedien caoutchouc	–	up to 150 °C

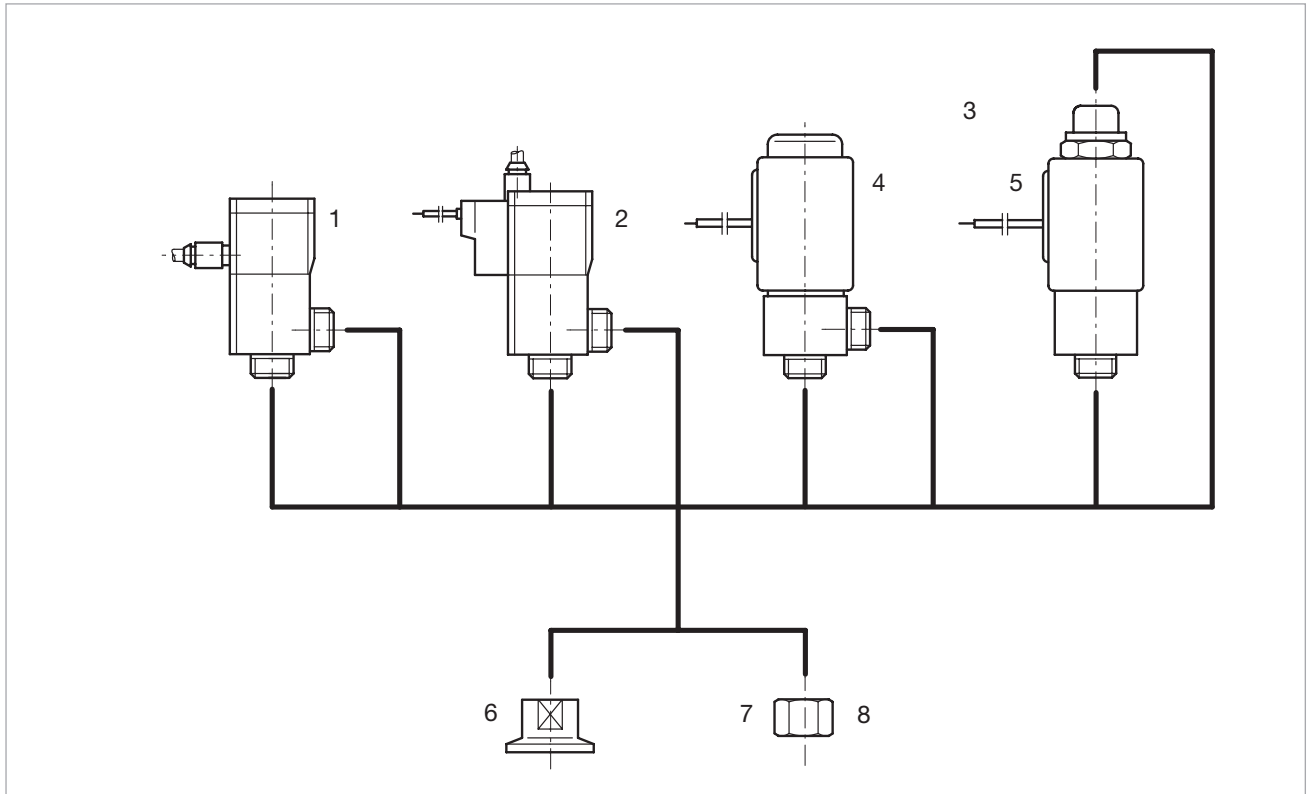
Abbreviations used in the valve designations

Brief Designation	Valve Type
EMD	Solenoid straight-through valve
EME	Solenoid right-angle valve
EPD	Electropneumatic straight-through valve
EPE	Electropneumatic right-angle valve
MAN	Manual operation
PD	Pneumatic straight-through valve
PE	Pneumatic right-angle valve

Products

Small Valves of the “micro” Range

Overview



Leybold small valves **micro** are available with any of three drive systems, two types of body and three adaptors.

Types of drive

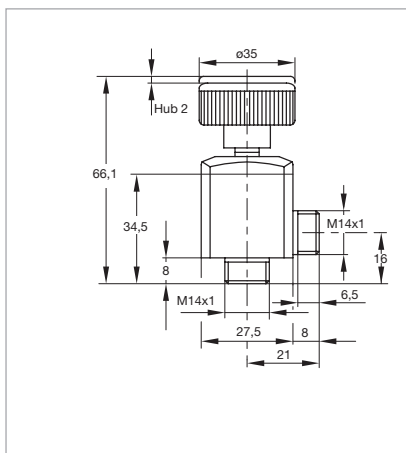
- Pneumatic (1)
- Electropneumatic (2)
- Electromagnetic (3)

Types of valve body

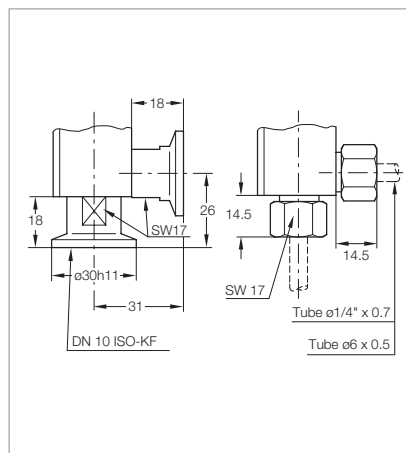
- Right-angle valve (4)
- Straight-through valve (5)

as well as adaptor

- DN 10 ISO-KF flange (6)
- 1/4" tube (7)
- 6 mm tube (8)



Dimensional drawing for the **micro MAN**



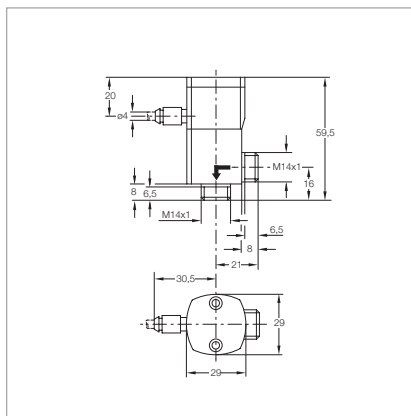
Connection dimensions for small valves **micro**

Technical Information

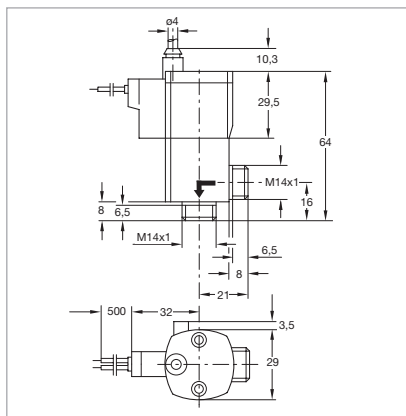
micro valves are supplied without adaptor.

The adaptors must be ordered additionally.

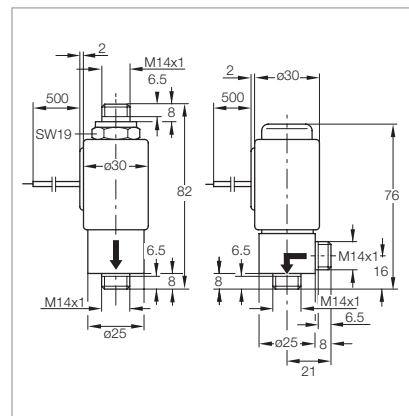
Right-Angle and Straight-Through Valves, Bellows-Sealed, Various Drives



Dimensional drawing for the pneumatically actuated small valves **micro**



Dimensional drawing for the electropneumatically actuated small valves **micro**



Dimensional drawing for the electromagnetic actuated small valves **micro**

Advantages to the User

- Small size
- High conductance in the molecular flow range
- Long service life of over 2 million switching cycles
- High switching frequency
- Protection class IP 50

Typical Applications

- Gas handling systems in production machines
- Latest generation analytical equipment

Technical Data

Small Valves "micro"

		Elektropneumatic	Pneumatic	Electromagnetic
Nominal width	mm	5	5	5
Integral leak rate	mbar x l/s	10^{-9}	10^{-9}	10^{-9}
Switching cycles		5 millions	5 millions	5 millions
Max. pressure differential	bar abs.	3	3	1
Closure time	ms	35	35	7
Opening time	ms	35	35	30
Max. switching frequency	min ⁻¹	150	150	300
Conductance, molecular	l/s	0.4	0.4	0.3
Supply voltage	V DC	24 (with pilot valve)	–	24
Max. power consumption	W	1	–	10
Material				
Valve body		stainless steel (1.4301)	stainless steel (1.4301)	stainless steel (1.4301)
Inside section		stainless steel (1.4301)	stainless steel (1.4301)	stainless steel (1.4301)
Seals		O-rings of FPM (FKM)	O-rings of FPM (FKM)	O-rings of FPM (FKM)
Drive		aluminum anodized	aluminum anodized	stainless steel 1.4105

Ordering Information**Small Valves “micro”**

	Part No.
Right-Angle Valves, normally closed	
Electropneumatic (with pilot valve)	284 41
Pneumatic (without pilot valve), with flanges DN 10 ISO-KF	284 47
Electromagnetic, 24 V DC	284 44
Straight-Through Valves, normally closed	
Electromagnetic, 24 V DC	284 45
Adaptor (1 piece)	
Flange DN 10 ISO-KF	284 50
Tube 1/4"	284 51
Tube 6 mm	284 52

Valves with ISO-KF Flanges

Overview



Leybold ISO-KF valves are available with any of four drive systems and four types of body having a nominal width of DN 16, 25, 40 and 50 ISO-KF.

Abbreviations used in connection with bellows sealed valves:

B Bellows sealed

A Angle (valve)

I Inline (valve)

V Valve

M Rotary knob

P Pneumatically actuated
(without pilot valve)

EP Electropneumatically actuated
(with pilot valve)

EM Electromagnetically actuated

AL Aluminum body

SS Stainless steel body

BAV ... EP AL ...

Types of drive

- Rotary knob **1**
with bellows seal
- Pneumatic **2**
with bellows seal
- Electropneumatic **3**
with bellows seal
- Electromagnetic **4**

Types of valve body

- Right-angle valve,
aluminum body **5**
- Right-angle valve,
stainless steel body **6**
- Straight-through valve,
aluminum body **7**
- Straight-through valve,
stainless steel body **8**

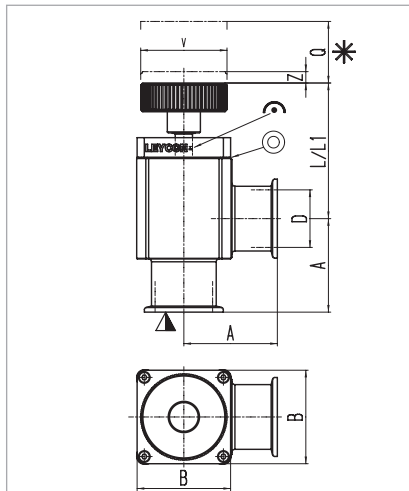
Materials Used

	Aluminum version	Stainless steel version
Housing	Aluminum (AlMgSi) EN-AW 6060 ¹⁾	Stainless steel (AISI 304)
Inner section ¹⁾	Aluminum (AlMgSi)	Stainless steel (AISI 304)
Drive unit ²⁾	Aluminum	Aluminum
Valve disk	AISI 316L	AISI 316L
Bellows	AISI 316	AISI 316
Head and disk O-ring	Viton	Viton
Rotary knob	Plastic	Plastic
Position indicating cover ²⁾	Plastic	Plastic
Housing cover ¹⁾	Plastic	Plastic

¹⁾ For the solenoid version only

²⁾ For pneumatic and electropneumatic version only

Right-Angle Valves, Bellows-Sealed, Manually Operated



Dimensional drawing for the manually operated, bellows-sealed, right-angle valves

Dimension Table

DN	ISO-KF	16	25	40	50
A	mm	40	50	65	70
B	mm	40	48	65	77
D	mm	16	25	40	50
L ¹⁾	mm	64.9	60.9	94.3	101.1
L1 ²⁾	mm	67.4	64.3	97.3	104.1
Q	mm	46	44	73.5	85.5
V	mm	40	40	60	60
Z ³⁾	mm	3.6	4.7	7.9	9.3

¹⁾ Aluminum version

²⁾ Stainless steel version

³⁾ Disk stroke is greater due to the transmission

Advantages to the User

Valves with Rotary Knob

- Allow also for reduced venting of systems
- Suited as a manually operated variable leak valve to roughly control gas flows
- Leak tight in both directions up to a pressure of 2.0 bar and easy to open
- Installation in any orientation

Connection Icons

- ▼ Side of the valve seat
- * Required clearance
- ⤵ Mechanical position indicator
- ⊙ Leak detection bore

Technical Data

DN 16 ISO-KF

DN 25 ISO-KF

DN 40 ISO-KF

DN 50 ISO-KF

		Aluminum	Stainl. Steel	Aluminum	Stainl. Steel	Aluminum	Stainl. Steel	Aluminum	Stainl. Steel
Service life	Cycles	30,000							
Conductance at molecular flow	l/s	5	5	14	14	45	45	50	50
Leak rate	mbar x l/s	1 x 10 ⁻⁹							
Operating pressure range	mbar	10 ⁻⁸ – 5000							
Differential pressure, closing and opening direction	bar	5 / 2							
Ambient / operating temperature, max.	°C	80							
Seal		FPM (FKM)							
Weight	kg	0.3	0.3	0.4	0.5	1.0	1.1	1.4	1.5

Ordering Information

DN 16 ISO-KF

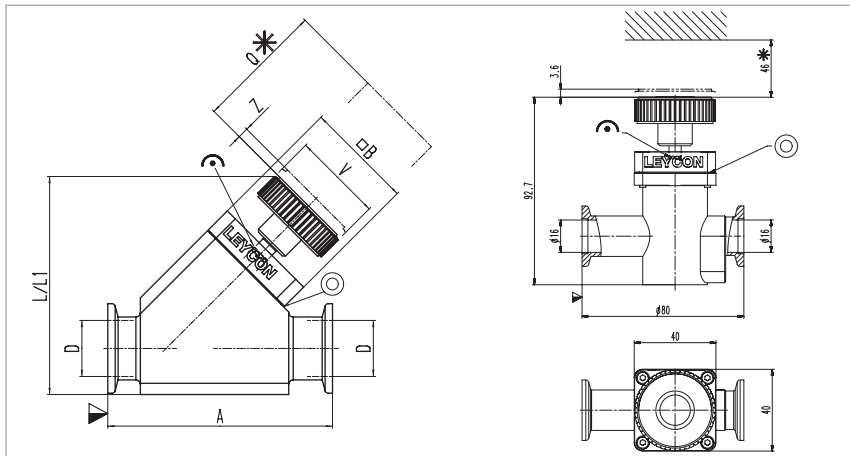
DN 25 ISO-KF

DN 40 ISO-KF

DN 50 ISO-KF

	Aluminum	Stainl. Steel	Aluminum	Stainl. Steel	Aluminum	Stainl. Steel	Aluminum	Stainl. Steel
	Part No.	Part No.	Part No.	Part No.	Part No.	Part No.	Part No.	Part No.
Right-angle valve, rotary knob								
BAV ... M AL	215 375	–	215 376	–	215 377	–	215 378	–
BAV ... M AL EPDM	215 384							
	V001	–	–	–	–	–	–	–
BAV ... M SS	–	215 383	–	215 385	–	215 386	–	215 387
Spare parts								
Bellows feedthrough	E 242 292		E 233 014		E 229 542		E 244 980	
Knob	E 245 912				E 245 913			
Seal kit consisting of disk seal (O-ring) and head seal (O-ring)	EK 242 324		EK 241 077		EK 241 079		EK 245 556	

Straight-Through Valves, Bellows-Sealed, Manually Operated



Dimensional drawing for the manually operated, bellows-sealed straight-through valves; right DN 16 ISO-KF

Dimension Table

DN	ISO-KF	16	25	40	50
A	mm	80	100	130	178
B	mm	40	48	65	77
D	mm	16	25	40	50
L ¹⁾	mm	90.6	97	143.5	167.2
L1 ²⁾	mm	92.8	105.8	152.5	172.1
Q	mm	46	44	73.5	85.5
V	mm	40	40	60	60
Z ³⁾	mm	3.6	4.7	7.9	9.3

¹⁾ Aluminum version

²⁾ Stainless steel version

³⁾ Disk stroke is greater due to the transmission

Advantages to the User

Valves with Rotary Knob

- Allow also for reduced venting of systems
- Suited as a manually operated variable leak valve to roughly control gas flows
- Leak tight in both directions up to a pressure of 2.0 bar and easy to open
- Installation in any orientation

Connection Icons

▼ Side of the valve seat

* Required clearance

☉ Mechanical position indicator

⊙ Leak detection bore

Technical Data

DN 16 ISO-KF

DN 25 ISO-KF

DN 40 ISO-KF

DN 50 ISO-KF

		Aluminum	Stainl. Steel	Aluminum	Stainl. Steel	Aluminum	Stainl. Steel	Aluminum
Service life	Cycles	30,000						
Conductance at molecular flow	l/s	5	5	14	14	45	45	50
Leak rate	mbar x l/s	1 x 10 ⁻⁹						
Operating pressure range	mbar	10 ⁻⁸ – 5000						
Differential pressure, closing and opening direction	bar	5 / 2						
Ambient / operating temperature, max.	°C	80						
Seal		FPM (FKM)						
Weight	kg	0.4	0.8	0.5	0.5	1.3	1.2	2.2

Ordering Information

DN 16 ISO-KF

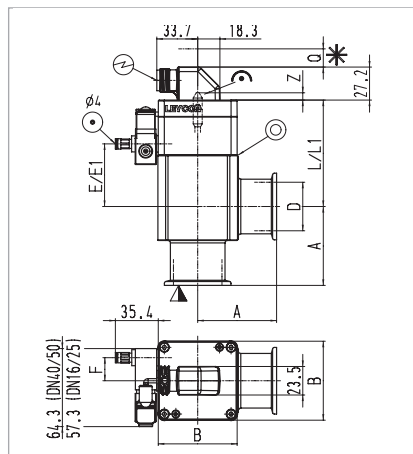
DN 25 ISO-KF

DN 40 ISO-KF

DN 50 ISO-KF

	Aluminum	Stainl. Steel	Aluminum	Stainl. Steel	Aluminum	Stainl. Steel	Stainl. Steel
	Part No.	Part No.	Part No.	Part No.	Part No.	Part No.	Part No.
Straight-through valve, rotary knob							
BAV ... M AL	215 313	-	215 388	-	215 389	-	215 390
BAV ... M SS	-	215 379	-	215 374	-	215 381	-
Spare parts							
Bellows feedthrough	E 242 292		E 233 014		E 229 542		E 244 980
Knob	E 245 912				E 245 913		
Seal kit consisting of disk seal (O-ring) and head seal (O-ring)	EK 242 324		EK 241 077		EK 241 079		EK 245 556

Right-Angle Valves, Bellows-Sealed, (Electro)pneumatically Operated



Dimensional drawing right-angle valves,
with fitted pilot valve

Dimension Table

DN	ISO-KF	16	25	40	50
A	mm	40	50	65	70
B	mm	40	48	65	77
D	mm	16	25	40	50
L ¹⁾	mm	65.2	60.6	87.7	96
L1 ²⁾	mm	67.7	64	90.7	99
Q	mm	46	44	73.5	85.5
F	mm	9	13	19	20
Z	mm	2	4	9.5	10
E ¹⁾	mm	35.6	30.6	51.6	58.4
E1 ²⁾	mm	38.1	34	54.6	61.4

¹⁾ Aluminum version

²⁾ Stainless steel version

Connection Icons

- ▼ Side of the valve seat
- * Required clearance
- ☺ Mechanical position indicator
- ⊕ Leak detection bore
- ⊙ Electrical connection
- ⊙ Compressed air connection

Advantages to the User

- Quiet opening and closing action with very little vibration
- Short opening and closing times
- Optical valve position indicator as standard
- Very low leak rate and insensitive to particles owing to bellows seal. Always closed in case the compressed air supply fails
- Electric position indicator is standard
- With and without pilot valve as standard
- Standard electrical and compressed air connections
- Protection class IP 50
- The valves are closed by the restoring force of a spring
- Installation in any orientation and no restrictions as to the direction of flow

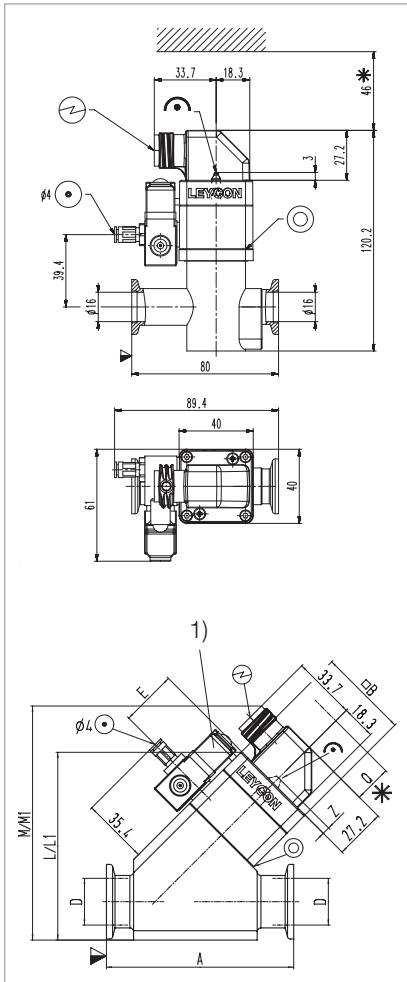
Technical Data

		DN 16 ISO-KF		DN 25 ISO-KF		DN 40 ISO-KF		DN 50 ISO-KF	
		Aluminum	Stainl. Steel	Aluminum	Stainl. Steel	Aluminum	Stainl. Steel	Aluminum	Stainl. Steel
Service life	cycles	10 millions							
Conductance at molecular flow	l/s	5	5	14	14	45	45	80	80
Leak rate	mbar x l/s	1 x 10 ⁻⁹							
Operating pressure range	mbar	10 ⁻⁸ – 5000							
Differential pressure, closing and opening direction	bar	5 / 2							
Ambient / operating temperature, max.	°C	80							
Seal		FPM							
Closing time / opening time	ms	100 / 100	100 / 100	210 / 120	210 / 120	550 / 250	550 / 250	650 / 400	650 / 400
Switching frequency	1/min	100							
Position indicator, switching capacity									
Voltage	V AC / V DC	≤ 50							
Current	mA	5 – 100							
Power	W	≤ 1,0							
Control valve	V DC / W	24 / 2.5							
Compressed air, overpressure	bar	4 to 8							
Air cylinder, volume	l	0.004	0.004	0.011	0.011	0.035	0.035	0.047	0.047
Compressed air connection	mm	4 and 6							
Weight, with pilot valve	kg	0.3	0.3	0.4	0.5	1.0	1.1	1.4	1.5

Ordering Information

		DN 16 ISO-KF		DN 25 ISO-KF		DN 40 ISO-KF		DN 50 ISO-KF	
		Aluminum	Stainl. Steel	Aluminum	Stainl. Steel	Aluminum	Stainl. Steel	Aluminum	Stainl. Steel
		Part No.	Part No.	Part No.	Part No.	Part No.	Part No.	Part No.	Part No.
Right-angle valves, bellows sealed									
BAV ... P AL		215 315	–	215 316	–	215 317	–	215 318	–
BAV ... P SS		–	215 335	–	215 336	–	215 337	–	215 338
BAV ... EP AL 24 V AC		215 319	–	215 320	–	215 321	–	215 322	–
BAV ... EP SS 24 V AC		–	215 339	–	215 340	–	215 341	–	215 342
BAV ... EP AL 24 V DC		215 323	–	215 324	–	215 325	–	215 326	–
BAV ... EP AL 24 V DC, normally open		215 395 V01	–	215 394 V01	–	215 130	–	–	–
BAV ... EP SS 24 V DC		–	215 347	–	215 348	–	215 349	–	215 350
BAV ... EP AL 115 V AC		215 327	–	215 328	–	215 329	–	215 330	–
BAV ... EP SS 115 V AC		–	215 351	–	215 352	–	215 353	–	215 354
BAV ... EP AL 230 V AC		215 331	–	215 332	–	215 333	–	215 334	–
BAV ... EP SS 230 V AC		–	215 343	–	215 344	–	215 345	–	215 346
Spare parts									
Bellows feedthrough		E 242 292		E 233 014		E 229 542		E 244 980	
Seal kit consisting of disk seal (O-ring) and head seal (O-ring)		EK 242 324		EK 241 077		EK 241 079		EK 245 556	
Mating plug (included with the valve)		599998003							

Straight-Through Valves, Bellows-Sealed, (Electro)pneumatically Operated



Dimensional drawing
for the straight-through valves
with fitted pilot valve (EP)
without pilot valve (P)
(on top DN 16 ISO-KF, stainless steel)
1) pilot valve

Dimension Table

DN	ISO-KF	16	25	40	50
A	mm	80	100	130	178
B	mm	40	48	65	77
D	mm	16	25	40	50
L	mm	91.5	100.3	140.9	170.1
Q	mm	46	44	73.5	85.5
E	mm	29.6	30	36.1	37.6
Z	mm	2	4	9.5	10
M	mm	120	125	160	185

Connection Icons

- ▼ Side of the valve seat
- * Required clearance
- ☾ Mechanical position indicator
- ⌚ Leak detection bore
- ⊙ Electrical connection
- ⊙ Compressed air connection

Advantages to the User

- Quiet opening and closing action with very little vibration
- Short opening and closing times
- Optical valve position indicator as standard
- Very low leak rate and insensitive to particles owing to bellows seal – thus always closed in case the compressed air supply fails
- Electric position indicator is standard
- With and without pilot valve as standard
- Protection class IP 50
- Standard electrical and compressed air connections
- The valves are closed by the restoring force of a spring

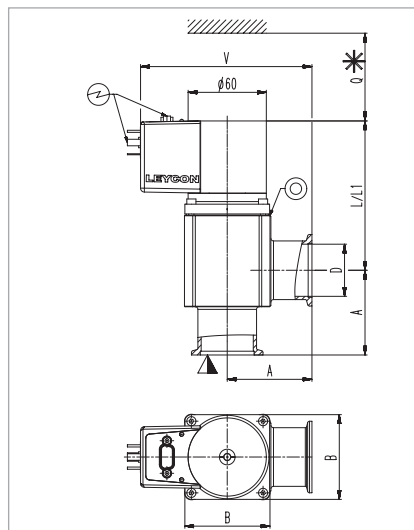
Technical Data

		DN 16 ISO-KF		DN 25 ISO-KF		DN 40 ISO-KF		DN 50 ISO-KF
		Aluminum	Stainl. Steel	Aluminum	Stainl. Steel	Aluminum	Stainl. Steel	Aluminum
Service life	cycles	10 millions						
Conductance at molecular flow	l/s	5	5	14	14	45	45	80
Leak rate	mbar x l/s	1 x 10 ⁻⁹						
Operating pressure range	mbar	10 ⁻⁸ – 5000						
Differential pressure, closing and opening direction	bar	5 / 2						
Ambient / Operating temperature, max.	°C	80						
Seal		FPM (FKM)						
Closing time / opening time	ms	100 / 100	100 / 100	210 / 120	210 / 120	550 / 250	550 / 250	650 / 400
Switching frequency	1/min	100						
Position indicator, switching capacity								
Voltage	V AC / V DC	≤ 50						
Current	mA	5 – 100						
Power	W	≤ 1,0						
Pilot valve	V DC / W	24 / 2.5						
Compressed air, overpressure	bar	4 to 8						
Air cylinder, volume	l	0.004	0.004	0.011	0.011	0.035	0.035	0.047
Compressed air connection	mm	4 and 6						
Weight, with pilot valve	kg	0.3	0.8	0.5	0.5	1.3	1.2	2.2

Ordering Information

Ordering Information	DN 16 ISO-KF		DN 25 ISO-KF		DN 40 ISO-KF		DN 50 ISO-KF
	Aluminum	Stainl. Steel	Aluminum	Stainl. Steel	Aluminum	Stainl. Steel	Aluminum
	Part No.	Part No.	Part No.	Part No.	Part No.	Part No.	Part No.
Straight-through valve, bellows sealed							
BIV ... P SS	–	215 355	–	215 356	–	215 357	–
BIV ... EP SS 24 V AC	–	215 359	–	215 360	–	215 361	–
BIV ... EP AL 24 V DC	215 314	–	215 391	–	215 392	–	215 393
BIV ... EP SS 24 V DC	–	215 367	–	215 368	–	215 369	–
BIV ... EP SS 115 V AC	–	215 371	–	215 372	–	215 373	–
BIV ... EP SS 230 V AC	–	215 363	–	215 364	–	215 365	–
Spare parts							
Bellows feedthrough	E 242 292		E 233 014		E 229 542		E 244 980
Seal kit consisting of	EK 242 324		EK 241 077		EK 241 079		EK 245 556
Disk seal (O-ring) and Head seal (O-ring)							
Mating plug (included with the valve)	599998003						

Right-Angle Valves, Electromagnetically Operated







Dimensional drawing for the electromagnetically operated right-angle valves

Dimension Table

DN	ISO-KF	16	25	40
A	mm	40	50	65
B	mm	40	48	65
D	mm	16	25	40
L	mm	100	93	114
L1	mm	102.5	103.4	117
Q	mm	46	44	73.5
V	mm	106.5	116.5	131.5

Connection Icons

-  Side of the valve seat
-  Required clearance
-  Leak detection bore
-  Electrical connection

Electromagnetic valves are particularly well suited for vacuum systems in which the valves need to be remotely controlled and where compressed air is not readily available.

Advantages to the User

- Selectable operating mode:
 - Remote control via programmable control or personal computer
 - direct operation by switching the supply voltage on and off
- Well visible, unambiguous optical position indicator: open (green LED) and closed (orange LED)
- Integrated electrically floating position indicator (opto-coupler for 48 V DC)
- Optical error indicator (LEDs flash)
- Protection class IP 40
- Spring action closure, thus closed when the power fails
- Low operating temperature
- Installation in any orientation and no restrictions as to the direction of flow

Technical Data

DN 16 ISO-KF

DN 25 ISO-KF

DN 40 ISO-KF

Service life	cycles	200,000		
Conductance at molecular flow	l/s	5	14	45
Leak rate	mbar x l/s	1 x 10 ⁻⁹		
Operating pressure range	mbar	10 ⁻⁸ to 2 bar		
Differential pressure, closing and opening direction	bar	≤ 2		
Ambient / Operating temperature, max.	°C	0 to +50		
Closing time / opening time	s	0.2		
Switching frequency	1/min	15		
at ambient temperature	°C	20		
Rating, max.	V AC/DC	48		
Rating for the valve position indicator, max.	mA	500		
Power consumption, max.				
Actuation	W	700 (~100 ms)		
Hold	W	10		
Supply voltage, max.	V AC	100 – 115 / 200 – 240		
Frequency	Hz	50/60 Hz		
Protection class	IP	40		
Weight	kg	1.3	1.5	1.8

Ordering Information

DN 16 ISO-KF

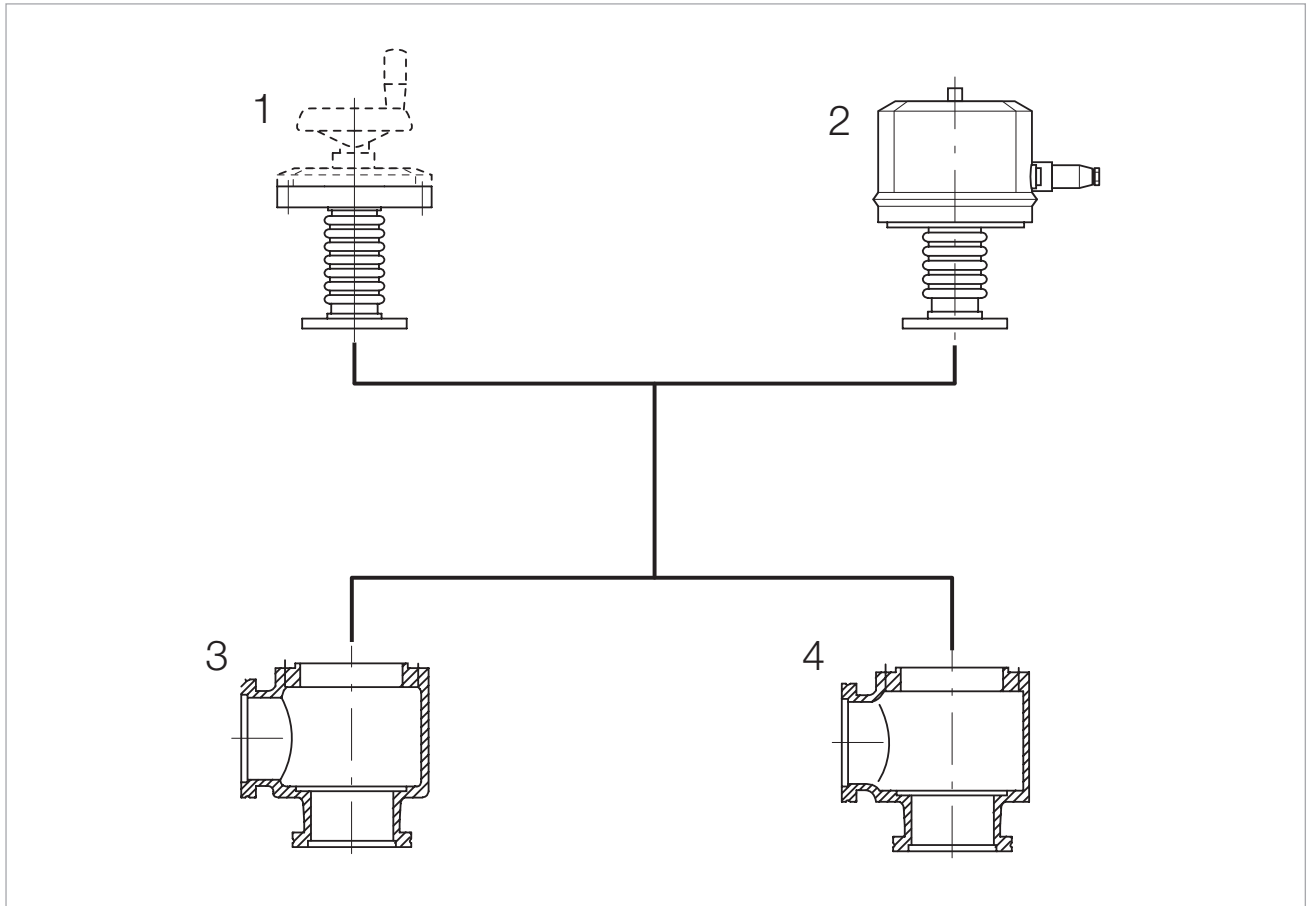
DN 25 ISO-KF

DN 40 ISO-KF

	Part No.	Part No.	Part No.
Right-angle valve, bellows-sealed, electromagnetic actuator, microprocessor controlled			
BAV ... EM AL			
100-120 V, 50/60 Hz	215 004 V02	215 064 V02	215 124 V02
200-240 V, 50/60 Hz	215 004 V01	215 064 V01	215 124 V01
BAV ... EM SS			
100-120 V, 50/60 Hz	215 006 V02	215 079 V02	215 134 V02
200-240 V, 50/60 Hz	215 006 V01	215 079 V01	215 134 V01
Spare parts			
Seal kit	EK 396 788	EK 388 499	EK 388 450

Right-Angle Valves with ISO-K Flanges

Overview



Leybold valves with ISO-K flanges are available with any of two drives and either of two bodies.

Types of drive

- Handwheel **(1)**
- Electropneumatic drive **(2)**

Body types

- Right-angle valve with aluminum body **(3)**
- Right-angle valve with stainless steel body **(4)**

Advantages to the User

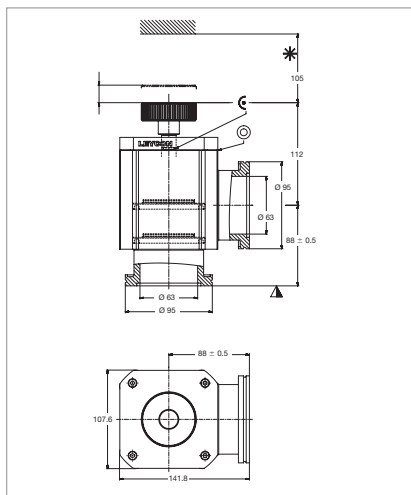
- Full exchangeability of the subassemblies
- Two types of drive
- Two body options
- Standard nominal widths to DIN 28 404 and ISO 1609
- Simplified stocking of spare parts

Connection Pictograms

- ⊕ Position indicator connection
- Ⓜ Compressed air connection
- ⚡ Power connection
- ⌚ Position indicator

Nominal widths DN 63 ISO-K and DN 100 ISO-K are available in aluminum and stainless steel, DN 160 ISO-K in aluminum only. Nominal width DN 100 ISO-K only with pneumatic or electropneumatic drive.

Right-Angle Valves, Bellows-Sealed, Manually Operated



Dimensional drawing for the right-angle valves, bellows-sealed, manually operated, dimensions in mm

The universal valves are particularly well suited for systems where remote control is not mandatory. Moreover, the valves may be used for maintenance purposes in connection with backing pumps or condensate separators.

Advantages to the User

- Removable handle
- Modular design
- Rugged and compact
- Easy to clean
- Gentle venting of systems
- Seal in both directions up to a pressure difference of 1.5 bar
- Easy manual operation, for an effortless vacuum-tight seal
- May also be used as a variable leak valve to roughly control gas flows
- Installation in any orientation and no restrictions as to the direction of flow

Technical Data

DN 63 ISO-KF

Service life	cycles	3 millions
Conductance at molecular flow	l/s	160
Leak rate	mbar x l/s	1×10^{-9}
Operating pressure range	mbar	1×10^{-8} to 5000 (abs.)
Differential pressure, closing and opening direction	bar	$< 5 / < 2$
Opening against differential pressure	bar	< 1 in both directions
Ambient / Operating temperature, max.	°C	80
Seal		FPM (Viton)
Weight		
Aluminum body	kg	2.9
Stainless steel body	kg	2.8
Material		
Valve body		aluminum (AlMgSi) or stainless steel AISI 304 (1.4301, 1.4305)
Disk		stainless steel AISI 316L (1.4404, 1.4435)
Bellows		stainless steel AISI 316L (1.4404, 1.4435), 316 Ti (1.4571)

Ordering Information

DN 63 ISO-KF

	Part No.
Right-angle valve, bellows-sealed, manually operated	
Aluminum body	107 80 V01
Stainless steel body	107 83 V01

Right-Angle Valves, Bellows-Sealed, Manually Operated

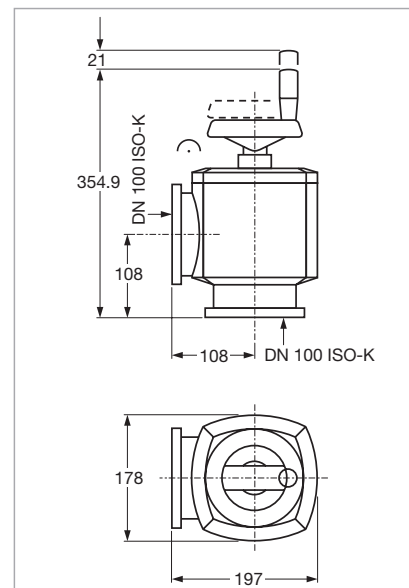


These universal valves are ideal especially for smaller systems, where remote control is not essential.

They may be also installed in larger systems, where backing pumps or condensate separators or similar units are to be cut off at longer intervals for maintenance purposes by maintenance personnel.

Advantages to the User

- Gentle venting of systems
- Seal in both directions up to a pressure difference of 1.5 bar
- Easy manual operation, for an effortless vacuum-tight seal
- May also be used as a variable leak valve to roughly control gas flows
- Installation in any orientation and no restrictions as to the direction of flow



Dimensional drawing (all dimensions in mm)

Technical Data

DN 100 ISO-KF

Service life	cycles	10,000
Conductance at molecular flow	l/s	440
Leak rate	mbar x l/s	1×10^{-9}
Operating pressure range	mbar	1×10^{-8} to 2000
Differential pressure, closing and opening direction	bar	opening direction $\leq 1,2$ closing direction ≤ 2
Opening against differential pressure at the valve disk	bar	< 1
Ambient / Operating temperature, max.	°C	80
Seal		FPM (Viton)
Weight		
Aluminum body	kg	6.0
Stainless steel body	kg	6.5
Material		
Valve body		aluminum EN AL 42000 or stainless steel (1.4404)
Drive		aluminum
Disk		stainless steel (1.4404)
Bellows		stainless steel (1.4571)
Handwheel		plastic

Ordering Information

DN 100 ISO-KF

	Part No.
Right-angle valve, bellows-sealed, manually operated	
Aluminum body	107 81 V01
Stainless steel body	107 84 V01

Right-Angle Valves, Bellows-Sealed, Electropneumatically Operated

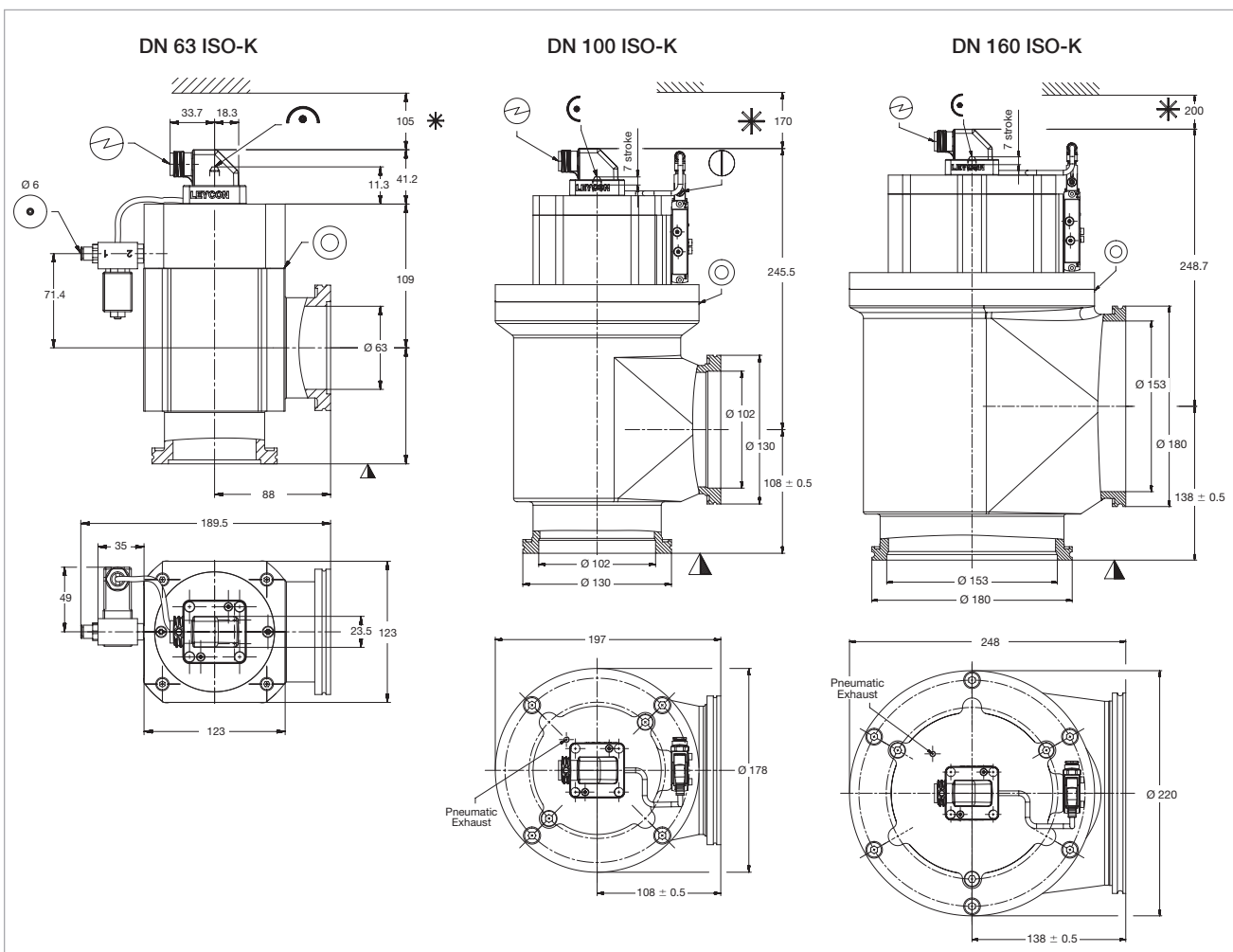


Electropneumatically actuated right-angle valves, bellows sealed, stainless steel, DN 100 ISO-K (left), aluminum DN 160 ISO-K (right)

Electropneumatically actuated right-angle valves are used in automated vacuum systems which need to be controlled electrically.

Advantages to the User

- Pneumatic or electropneumatic opening
- Short opening and closing times
- Optical position indicator
- Electric position indicator
- With and without pilot valve IP 54
- Protection class IP 50
- The valves are closed by the restoring force of a spring
- Installation in any orientation and no restrictions as to the direction of flow



Dimensional drawing (all dimensions in mm)

Technical Data

DN 63 ISO-K

DN 100 ISO-K

DN 160 ISO-K

Service life	cycles	1 million		
Conductance at molecular flow	l/s	160	440	1000
Leak rate	mbar x l/s	1 x 10 ⁻⁹		
Operating pressure range	mbar	1 x 10 ⁻⁸ to 5000 (abs.)	1 x 10 ⁻⁸ to 2000 (abs.)	1 x 10 ⁻⁸ to 2000 (abs.)
Differential pressure, closing and opening direction	bar	≤ 4 / ≤ 1,2	≤ 2 / ≤ 1,2	≤ 2 / ≤ 1,2
Opening against differential pressure at the valve disk	bar	≤ 1		
Ambient / operating temperature, max.	°C	80		
Seal		FKM (Viton)		
Closing time / opening time	s	≤ 1	≤ 1	≤ 1,5
Switching frequency	1/min	≤ 30	≤ 30	≤ 20
Position indicator, rating	V AC/DC mA	≤ 50 5 to 100		
Compressed air, overpressure	bar	4 to 8	4,5 to 7	4,5 to 7
Druckluftvolumen	cm³	112	330	650
Compressed air connection	mm	6		
Weight				
Aluminum housing	kg	3.9	9	14
Stainless steel housing	kg	3.7	9	–

Ordering Information

DN 63 ISO-K

DN 100 ISO-K

DN 160 ISO-K

	Part No.	Part No.	Part No.
Right-angle valve, bellows-sealed, electropneumatic drive without Pilot valve			
Aluminum housing	107 90 V01	107 91 V01	107 92 V01
Stainless steel body	107 93 V01	107 94 V01	–
Valve with Pilot valve 24 V DC			
Aluminum housing	108 00 V01	108 01 V01	108 02 V01
Stainless steel body	108 10 V01	108 11 V01	–
Valve with Pilot valve 24 V AC			
Aluminum housing	108 03 V01	108 04 V01	108 05 V01
Stainless steel body	108 13 V01	–	–
Valve with Pilot valve 100 – 115 V AC			
Aluminum housing	108 20 V01	108 21 V01	108 22 V01
Stainless steel body	–	–	–
Valve with Pilot valve 200 – 240 V AC			
Aluminum housing	108 25 V01	108 26 V01	108 27 V01
Stainless steel body	108 35 V01	108 36 V01	–
Mating plug (included with the valve)	599998003		

Special Valves with ISO-KF/ISO-K/CF Flange

Overview



Leybold offers a range of special valves for a variety of different applications and to meet special design requirements of customers.

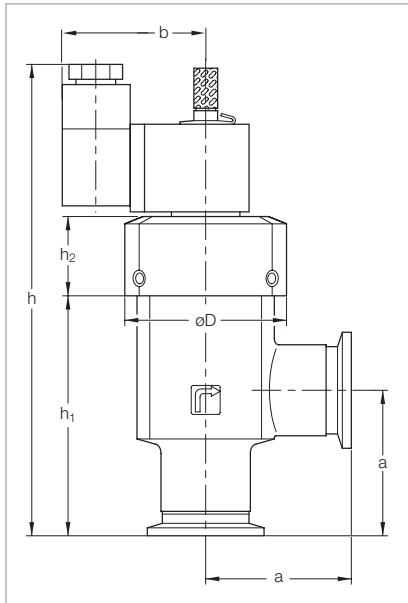
Among these are:

- SECUVAC vacuum safety valves (DN 16 ISO-KF to DN 100 ISO-K) **1**
- Venting Valves **2**

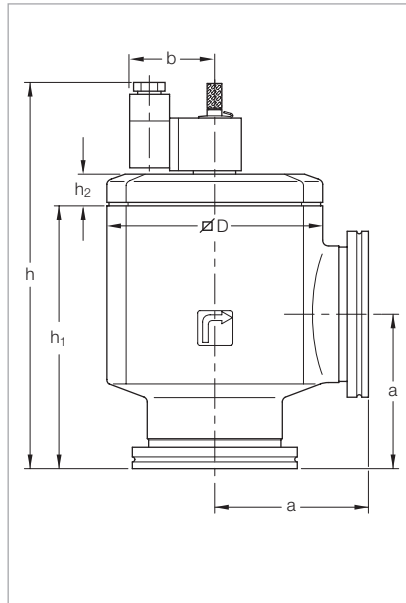
- Power failure venting valves **3**
- Vacuum Locks **4**
- Sealing Valves **4**
- Variable leak valves **5**
- Ball Valves **6**

These valves ideally supplement our range of ISO-KF and ISO-K valves.

SECUVAC Vacuum Safety Valves



Dimensional drawing for the SECUVAC valves with ISO-KF small flanges



Dimensional drawing for the SECUVAC valves with ISO-K clamp flanges

These solenoid right-angle valves were specially developed for use with rotary vacuum pumps which are not equipped with a built-in anti-suckback valve. The SECUVAC safety valve protects the vacuum system against unplanned venting via the backing pump in case of a power failure and it ensures that the vacuum system remains sealed until the backing pump, after it has restarted, has evacuated the connecting lines.

**Dimension Table
Special Valves (ISO-KF)**

DN	ISO-KF	16	25	40
a	mm	40	50	65
b	mm	49	49	49
D	mm	44	56	82
h	mm	138.6	161.8	177.8
h ₁	mm	62.3	82.5	101.7
h ₂	mm	24	27	24,3

**Dimension Table
Special Valves (ISO-K)**

DN	ISO-K	63	100
a	mm	88	108
b	mm	49	49
D	mm	124	164
h	mm	220.5	263.5
h ₁	mm	150	175
h ₂	mm	18.2	36.2

Advantages to the User

Two valve functions in one:

- Fast-closing high vacuum isolation valve for separating the vacuum chamber or a vapor jet pump (a diffusion pump, for example) from the backing pump
- Venting valve for venting of the valve's chamber and thus the pump (backing pump)
- Immediate closing action upon power failure
- Opening action only after the in-take line has been evacuated
- Delayed isolation of the vacuum chamber and venting the vacuum pump (negligible "gulp")

Typical Applications

- Safety isolation valve between backing pump and vacuum chamber or vapor jet pumps (protection of the vacuum chamber against venting in the event of a power failure)

Technical Data**SECUVAC Valve**

		DN 16 ISO-KF	DN 25 ISO-KF	DN 40 ISO-KF
Conductance at molecular flow	l/s	3.8	11	30.5
Current consumption DC	W	2,5		
Actuation / holding AC	VA	5 / 3.7		
Leak tightness, body	mbar x l/s	$< 1 \times 10^{-9}$		
Leak tightness, valve disk	mbar x l/s	$< 1 \times 10^{-5}$		
Installation orientation		any		
Operating pressure range	mbar	1×10^{-8} to 1000		
Differential pressure for opening	mbar	150		
for closing	mbar	150		
Opening time	s	< 15		
Closing time / reaction time	ms	< 100 / < 50		
Ambient temperature	°C	+5 to +50		
Protection	IP	65		
Weight	kg	0.3	0.5	0.9
Material				
Body		aluminum		
Seal		FPM (FKM)		

Technical Data**SECUVAC Valve**

		DN 63 ISO-K	DN 100 ISO-K
Conductance at molecular flow	l/s	126	300
Current consumption DC	W	2.5	
Actuation / holding AC	VA	5 / 3.7	
Leak tightness, body	mbar x l/s	$< 1 \times 10^{-9}$	
Leak tightness, valve disk	mbar x l/s	$< 1 \times 10^{-5}$	
Installation orientation		any	
Operating pressure range	mbar	$1 \cdot \times 10^{-8}$ to 1000	
Differential pressure for opening	mbar	150	
for closing	mbar	150	
Opening time	s	< 30	
Closing time / reaction time	ms	< 100 / < 50	
Ambient temperature	°C	+5 to +50	
Protection	IP	65	
Weight	kg	2.4	5.1
Material			
Body		aluminum	
Seal		FPM (FKM)	

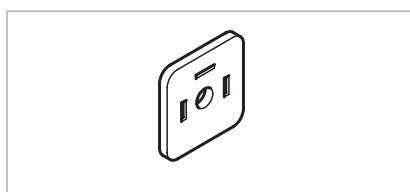
Ordering Information

		SECUVAC Valve		
		DN 16 ISO-KF	DN 25 ISO-KF	DN 40 ISO-KF
	Part No.	Part No.	Part No.	Part No.
SECUVAC valve				
24 V DC	215 015	215 065	215 135	
100 – 115 V AC	215 016	215 066	215 136	
200 – 230 V AC	215 017	215 067	215 137	
Spare parts				
Seal kit	E 105 02	E 105 04	E 105 05	
Solenoid coils for SECUVAC valves and power failure venting valves				
24 V DC		E 215 242		
100 – 115 V AC / 50/60 Hz		E 215 241		
200 – 230 V AC / 50/60 Hz		E 215 240		
Filter for SECUVAC valves and power failure venting valves (set of 5 pcs.)		215 701		

Ordering Information

		SECUVAC Valve	
		DN 63 ISO-K	DN 100 ISO-K
	Part No.	Part No.	Part No.
SECUVAC valve			
24 V DC	215 205	215 225	
100 – 115 V AC	215 206	–	
200 – 230 V AC	215 207	215 227	
Spare parts			
SSeal kit	E 105 07	E 105 08	
Solenoid coils for SECUVAC valves and power failure venting valves			
24 V DC		E 215 242	
100 – 115 V AC / 50/60 Hz		E 215 241	
200 – 230 V AC / 50/60 Hz		E 215 240	
Filter for SECUVAC valves and power failure venting valves (set of 5 pcs.)		215 701	

Interference Suppression Kit – Illuminated

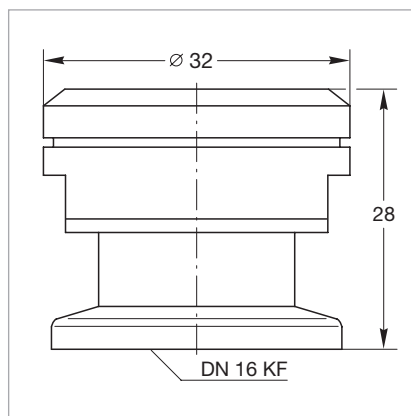


As an option for the solenoid coil, an interference suppression kit is offered which reliably prevents any interferences from affecting other equipment operating in the vicinity.

Ordering Information

	Part No.
Interference suppression kit	
24 V DC	104 96

Pressure Relief Valve



Dimensional drawing for the pressure relief valve

Typical Applications

- Protecting sealed vacuum systems like cryopumps, cryostats, lifting devices, for example against internal overpressures
- Mandatory for systems which are separated when cold, as a means of protection against overpressures

Technical Data

Pressure Relief Valve

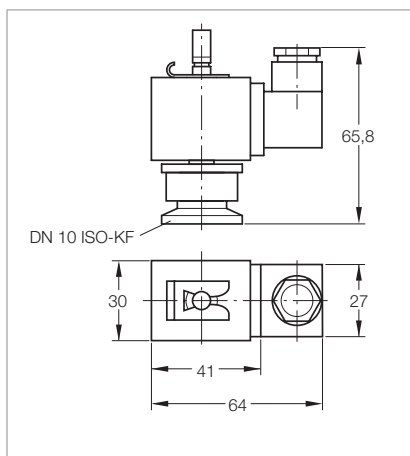
Responding pressure	mbar	1150 ±40
Flow at 140 mbar	l x h ⁻¹	500
Valve disk		Spring loaded, with O-ring seal
Leak rate in the closed state	mbar x l/s (Torr x l/s)	< 1 x 10 ⁻⁸ (< 0.75 x 10 ⁻⁸)
Connection	DN	16 ISO-KF
Diameter	mm	32
Overall height	mm	28
Weight	kg	0.3

Ordering Information

Pressure Relief Valve

	Part No.
Pressure Relief Valve on DN 16 ISO-KF flange	890 39

Power Failure Venting Valves, Electromagnetically Actuated



Dimensional drawing for the power failure venting valve

Power failure venting valves are open when de-energized and are used to automatically vent pumps, systems or vacuum vessels in the event of a power failure.

Permissible pressure difference
< 2.5 bar (0 bar on the vacuum side).

Advantages to the User

- Can be installed in any orientation
- Protection against being contaminated by filtering of the inflowing air
- Easy to install
- Simple filter exchange

Technical Data

Leak tightness	mbar x l/s	< 1 x 10 ⁻⁷
Venting time for a 50 l vessel	s	270
Opening time / closing time ¹⁾	ms	30 / 30
Protection class to DIN 40 050	IP	65
Permissible ambient temperature	°C	50
Weight	kg	0.1
Dimensions (W x H x D)	mm	64 x 66 x 30
Material		
Body		aluminum
Seal		NBR
Armature		brass
Filter		bronze

Power Failure Venting Valves electromagnetically actuated

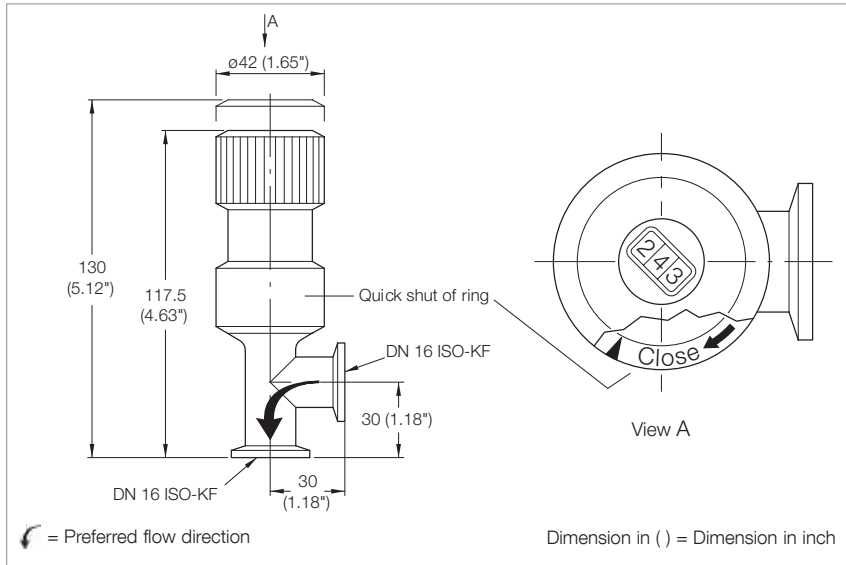
Ordering Information

Power Failure Venting Valves electromagnetically actuated

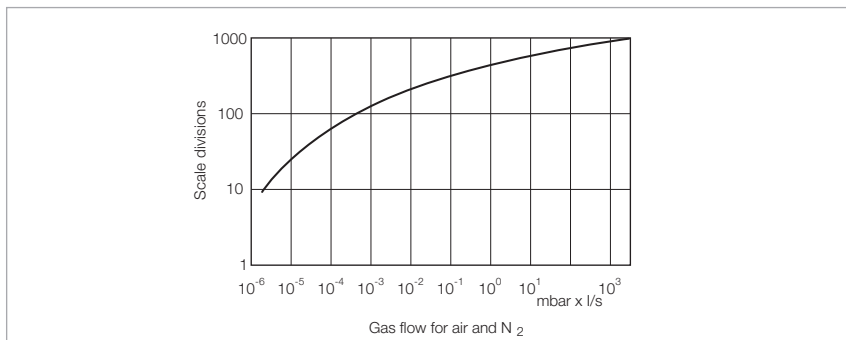
	Part No.
Power failure venting valve DN 10 ISO-KF, electromagnetically actuated, with inlet filter	
230 V / 50/60 Hz	174 26
24 V DC	174 46
Centering ring DN 10 ISO-KF with sinter filter	883 50
Spare solenoid valves	see SECUVAC Valves
Filter for SECUVAC valves and power failure venting valves (set of 5 pcs.)	215 701

¹⁾ At a differential pressure $V_p = 0$ bar

Variable Leak Valve with Isolation Valve



Dimensional drawing for the variable leak valve with isolation valve



Variable leak characteristic for the variable leak valve with isolation valve

Variable leak valves with a isolation valve permit an interruption of the gas supply without changing the gas admission rate setting.

Applications

- Gas admission rates of 1000 to 5×10^{-6} mbar x l/s allow variable leak valves to be used in almost all applications
- Through the digital display, the opening point may be accurately set at any time or a certain gas flow may be defined
- Blocking valve

Technical Data

Variable Leak Valve with Isolation Valve

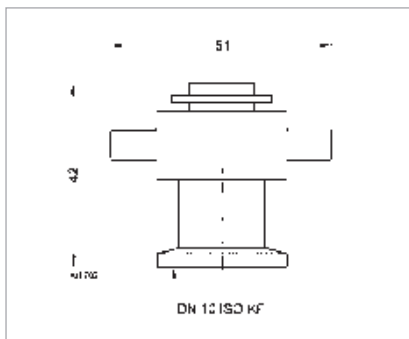
Gas flow controllable	mbar x l/s	$5 \times 10^{-6} - 1000$
Tightness	mbar x l/s	1×10^{-9}
Differential pressure	bar	2.5
Dead volume	cm ³	0.032
Operating temperature	°C	80
Bakeout temperature, flanges	°C	150
Material (housing, needle, filter)		stainless steel
Material (needle sleeve)		fluorplastomer
Seal		FPM (FKM)
Weight	kg	0.4

Ordering Information

Variable Leak Valve with Isolation Valve

	Part No.
Variable leak valve with isolation valve, DN 16 ISO-KF	215 010

Venting Valves, Manually Operated



Dimensional drawing for the venting valve,
manually operated

Venting valves are used to vent small vacuum systems.

Advantages to the User

- Simple opening and closing of the valve by loosening or tightening the screw cap

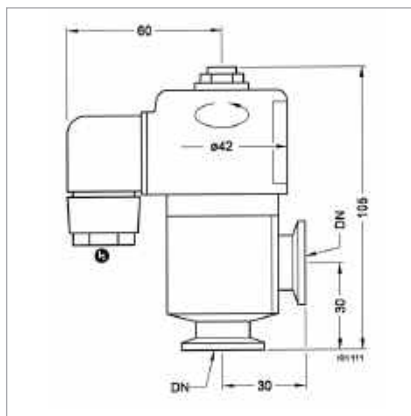
Technical Data

		Venting Valve manually operated
Tightness	mbar x l/s	$< 1 \times 10^{-9}$
Weight	kg	0.15
Dimensions (W x H x D)	mm	51 x 42 x 30
Material		
Body		aluminum (3.0615), stainless steel (1.4301)
Inside section		aluminum (3.0615), stainless steel (1.4301)
Seal		FPM (FKM)
Screw cap		brass (nickel-plated)

Ordering Information

	Part No.
Venting valve DN 10 ISO-KF, manually operated (screw cap)	
Aluminum	173 24
Stainless steel	173 37

Venting Valves, Electromagnetically Actuated



Dimensional drawing for the venting valve,
electromagnetically actuated

Venting valves are used to vent small vacuum systems and are closed when no power is applied.

Advantages to the User

- Open when power is applied, closed with no power
- Seals on one side against atmospheric pressure
- Protected against dirt by a filter

Technical Data

Venting Valve electromagnetically actuated

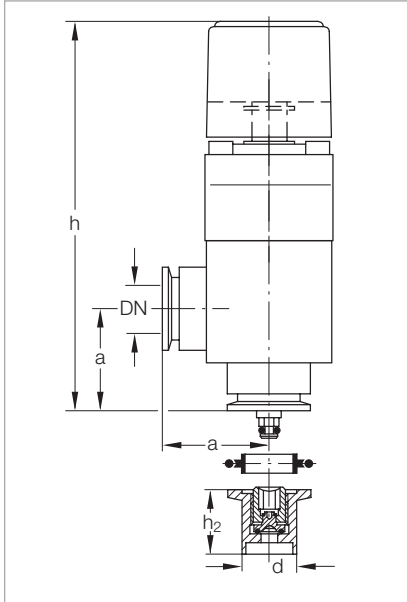
Leak rate	mbar x l/s	$< 1 \times 10^{-9}$
Venting time for a 100 l chamber	s	23
Mains connection	V / Hz	230 / 50/60
	V / Hz	115 / 50/60
	V DC	24
Power consumption, actuation / holding	V	35 / 15
Differential pressure in closing / opening direction	bar	5 / 1
Can be opened to a pressure difference of	bar	2
Service life	cycles	1.5 mio.
Switching frequency	1/min	50
Opening / closing time	ms	60 / 45
Conductance for molecular flow	l/s	1
Weight	kg	0.46
Dimensions (W x H x D)	mm	105 x 120 x 42
Material		
Valve body		aluminum
Seal		FPM (FKM)

Ordering Information

Venting Valve electromagnetically actuated

	Part No.
Venting valve DN 10 ISO-KF, electromagnetically actuated	
24 V DC	215 021
115 V AC	215 023
230 V AC	215 024
Centering ring with sintered metal filter, DN 10 ISO-KF	883 50

Vacuum Locks and Sealing Valves



Dimensional drawing for the sealing valves

Dimension Table

DN	ISO-KF	16	25	40
a	mm	40	50	65
d	mm	16	25	38
h	mm	124	160	190
h ₂	mm	30	30	40

A screw-in sealing element with a hex. socket into which the spindle of the gas lock is inserted for actuation has been integrated within the tubulation.

After having filled in the gas or evacuated the chamber, the gas lock is detached from the small flange and may thus be reused for an unlimited number of times on other sealing valves.

Advantages to the User

- Simple to use, handy knob
- Compact, low weight
- Also well-suited for operating older types of sealing valves from Leybold
- Long travel and high conductance, thus short pumpdown times
- Spindle can be arrested in its end position
- Double O-ring seal offering a very low leak rate ($< 1 \times 10^{-7}$ mbar x l/s) and a long service life

- May be used in the entire rough and medium vacuum range
- Long service life
- Secured against inadvertent opening
- Temperature resistant

Vacuum lock	60 °C
Blocking valve	100 °C
- May be protected by a standard blank flange against becoming dirty

Typical Applications

- Sealing of evacuated or gas-filled chambers
- Post-evacuation of vessels
- Topping up and exchanging the gas filling in vessels
- Sealing valves with stainless steel ISO-KF connection and stainless steel tubulation for welding to the chamber

Technical Data

Vacuum Lock / Sealing Valve

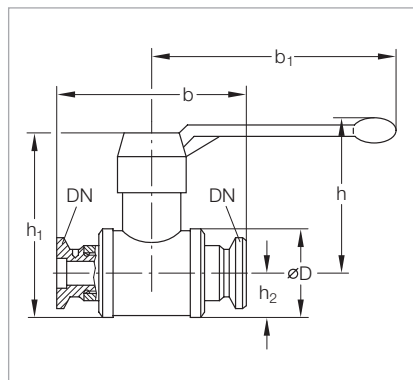
		DN 16 ISO-KF	DN 25 ISO-KF	DN 40 ISO-KF
Leak rate				
Sealing valve	mbar x l/s	1 x 10 ⁻⁷		
Vacuum lock	mbar x l/s	1 x 10 ⁻⁹		
Travel for the vacuum lock	mm	56	76	108
Free passage in the sealing valve	mm	3	8	18
Absolute pressure	bar	2.5		
Weight				
Vacuum lock	kg	0.35	1.0	1.8
Sealing valve	kg	0.04	0.1	0.12
Material				
Vacuum lock		aluminum		
Seal		FPM (FKM)		

Ordering Information

Vacuum Lock / Sealing Valve

		DN 16 ISO-KF	DN 25 ISO-KF	DN 40 ISO-KF
		Part No.	Part No.	Part No.
Vacuum lock, aluminum body		283 25	283 26	283 27
Sealing valve with tubulation, stainless steel body		283 21	283 22	283 23
Clamping ring		183 41	183 42	183 43
Centering ring		883 46	883 47	883 48
Repair kit				
Vacuum lock		EK 215 055	EK 215 056	EK 215 057

Ball Valves



Dimensional drawing for the ball valves

Dimension Table

DN	ISO-KF	10	16	25	40
b	mm	75	100	130	160
b ₁	mm	80	80	110	138
h	mm	55	55	62	90
h ₁	mm	55	58	80	110
h ₂	mm	15	15	20	27.5
D	mm	26	30	42	60

Ball valves are rugged and cost-effective straight-through valves of small size, which are opened or closed simply by operating a lever. The valve position (OPEN/CLOSED) can be determined from the lever's position. The lever may be detached.

Ball valves are provided with lubricated gaskets and when open they permit an unobstructed passage.

Advantages to the User

- Leak tight on both sides against the atmosphere; can be opened against atmospheric pressure

Technical Data

Ball Valve

DN 10 ISO-KF DN 16 ISO-KF DN 25 ISO-KF DN 40 ISO-KF

Leak rate	mbar x l/s	< 1 x 10 ⁻⁶			
Conductance at molecular flow	l/s	1,5	3	9	30
Pressure absolute, min. / max.	mbar / bar	10 ⁻⁵ / 5			
Weight	kg	0.35	0.4	0.75	2.6
Material					
Body		brass (nickel-plated)			
Seal		PTFE			
Ball		brass (hardchromium-plated)			
ISO-KF flanges		aluminum (3.0615)			

Ordering Information

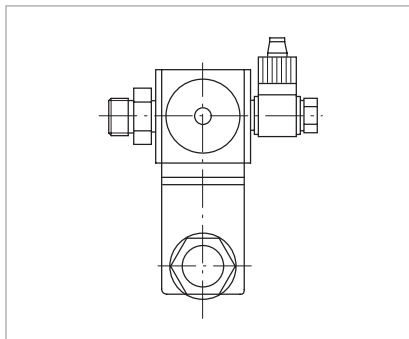
Ball Valve

DN 10 ISO-KF DN 16 ISO-KF DN 25 ISO-KF DN 40 ISO-KF

	Part No.	Part No.	Part No.	Part No.
Ball valve				
Brass body (nickel-plated)	174 94	174 95	174 96	174 97

Accessories for the Electropneumatically Operated Valves

Pilot Valves



Pilot valve

A range of pilot valves is available for actuation of the electropneumatic ISO-KF valves, which cover all commonly used control voltages.

Advantages to the User

- Easy to fit to the pneumatic cylinder, adaptor is included with the DOT valve

Supplied Equipment

- Hose connection and gasket for connection to the compressed air supply

Ordering Information

ISO-KF Pilot Valves for DOT Valves (incl. Solenoid Coil)

	Part No.
110 – 120 V AC / 50/60 Hz (normally closed)	E 280 72
24 V DC (normally closed)	E 280 74

Interference Suppression Kit – Illuminated

As an option for the solenoid coil and the pilot valves an interference suppression kit is offered so as to reliably prevent any pick-up of interference by sensitive equipment in the vicinity of the solenoid coils.

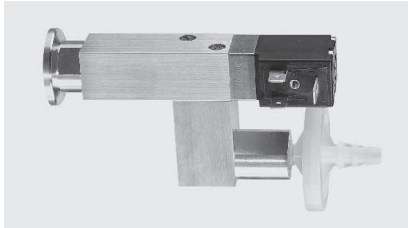
Ordering Information

Interference Suppression Kit for different voltages

	Part No.
Interference Suppression Kit 110 V AC	upon request

Special Valves for Turbomolecular Pumps

Solenoid Venting Valve



Technical Data

Drive voltage	V DC	24
Power consumption	W	4
Connecting flange	DN	16 ISO-KF
Weight, approx.	kg (lbs)	0.3 (0.66)

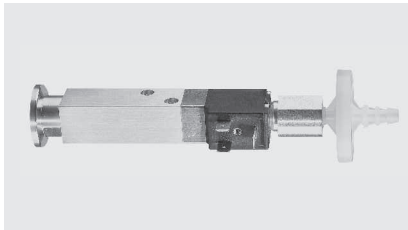
Venting Valve

Ordering Information

Venting Valve

	Part No.
Solenoid venting valve, normally closed	800120V0011

Power Failure Venting Valve



Technical Data

Drive voltage	V DC	24
Power consumption	W	4
Connecting flange	DN	16 ISO-KF
Weight, approx.	kg (lbs)	0.3 (0.66)

Power Failure Venting Valve

Ordering Information

Power Failure Venting Valve

	Part No.
Power failure venting valve, normally open	800120V0021

Purge Gas and Venting Valve



Technical Data

Connecting flange	DN	10 ISO-KF
Weight, approx.	kg (lbs)	0.7

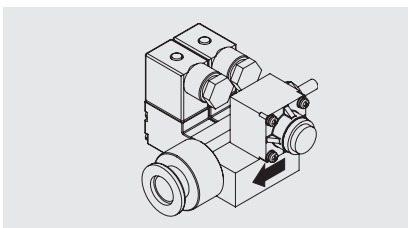
Purge Gas and Venting Valve

Ordering Information

Purge Gas and Venting Valve

	Part No.
Purge gas and venting valve, 230 V	
0.2 mbar x l/s (12 sccm)	855 19
0.4 mbar x l/s (24 sccm)	855 29

Purge Gas and Venting Valve



Technical Data

Connecting flange		
Inlet		1/4" tube
Outlet		pump specific or DN 16 ISO-KF
Sperrgas-Druck, abs.	bar	1.5 to 6.0
Weight, approx.	kg (lbs)	0.5 (1.1)

Purge Gas and Venting Valve

Ordering Information

Purge Gas and Venting Valve

	Part No.
Purge gas and venting valve	
24 V DC; 0.6 mbar x l/s	121 33

Further 0.6 mbar x l/s valves upon request

Purge Gas and Venting Valve for ClassicLine and SL Pumps



Technical Data

Connecting flange		
Pump side	DN	10 KF
Gas connection	G	1/4"
Seal gas pressure, abs.	bar	1
Weight, approx.	kg (lbs)	0.3 (0.66)

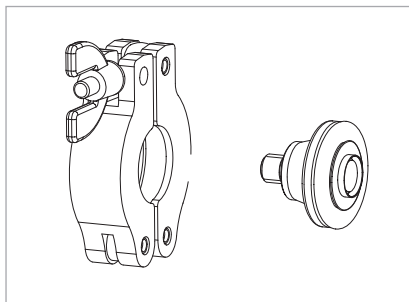
Purge Gas and Venting Valve

Ordering Information

	Part No.
Purge gas and venting valve at 1 bar	
0.2 mbar x l/s (12 sccm), 110 – 115 V DC	800152V0041
0.2 mbar x l/s (12 sccm), 230 V DC	800152V0019
0.4 mbar x l/s (24 sccm), 24 V DC	800152V0013
0.4 mbar x l/s (24 sccm), 110 – 115 V DC	800152V0042
0.4 mbar x l/s (24 sccm), 230 V DC	800152V0014
0.6 mbar x l/s (36 sccm), 24 V DC	800152V0012
0.6 mbar x l/s (36 sccm), 110 – 115 V DC	800152V0043
0.6 mbar x l/s (36 sccm), 230 V DC	800152V0040

Purge Gas and Venting Valve

Adaptor Set for Seal Gas and Venting Valve for the SL pumps



Technical Data

Pump flange adaptor M8/DN 10 ISO-KF including adaptor centering ring DN 10/DN 16 ISO-KF with sinter filter insert and clamping ring	
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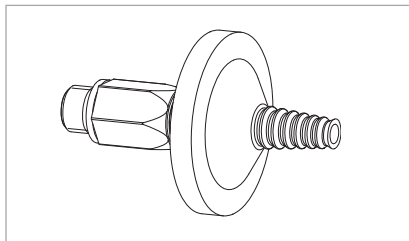
Adaptor Set

Ordering Information

	Part No.
Adaptor set for purge gas and venting valve	800110V0011

Adaptor Set

Gas Filter to G 1/4" for Purge Gas and Venting Valve



Technical Data

Gas filter including fitting G 1/4" and 2 gaskets	
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Gas Filter

Ordering Information

	Part No.
Gas filter to G 1/4" for seal gas and venting valve	800110V0012
Replacement filter for gas filter to G 1/4" for seal gas and venting valve	E 200 18 515

Gas Filter

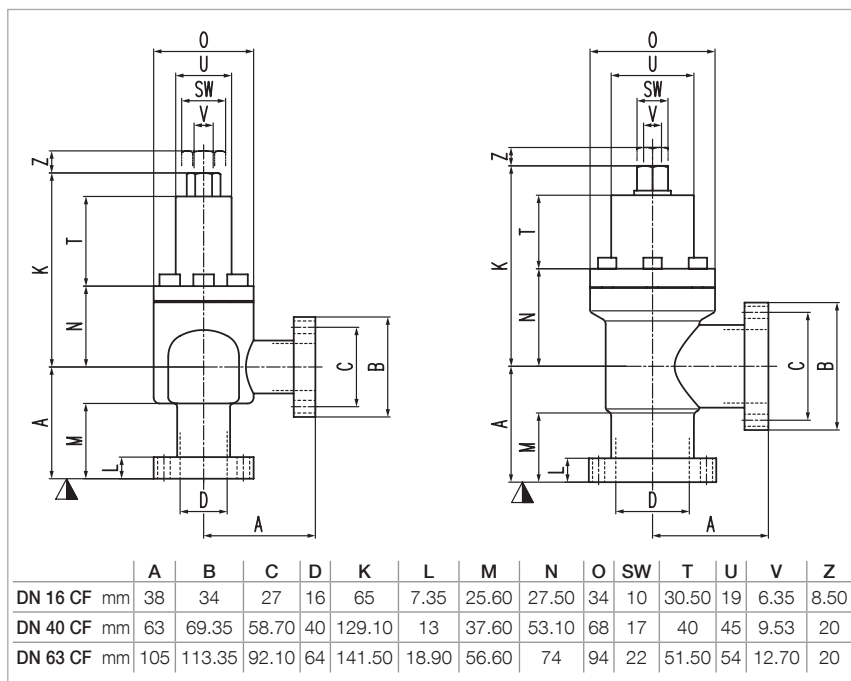
UHV All-Metal Right-Angle Valves

Our UHV all metal angle valves are the reliable solution for all applications in ultra-high vacuum. The innovative design and rotatable CF flanges allow a convenient handling and an easy installation.

The reliability of the valve is achieved by the use of optimal sealing materials. The silver-coated sealing with its very long service life is maintenance-free at more than 1000 cycles. A mechanical stop prevents the valve from too much torque that might cause damages to the sealing. Also the mechanical stop indicates when the valve is fully closed. For operating the valve a plastic hand wheel and a metal T-handle are available. The advantage of the T-handle is that it suited for heating processes and does not need to be removed.

Advantages to the User

- Very reliable sealing
- Maintenance-free for over 1000 cycles
- Very easy to use, mechanical stop prevents from over torque
- T-handle available for bake out processes
- Coated spindle, no lubrication necessary
- Very high lifetime due to the coated metal sealing



Dimensional drawing DN 16 CF (left), DN 40 / 63 CF (right)

Technical Data

UHV-All-Metal Right-Angle Valves with Rotatable Flanges on Both Sides

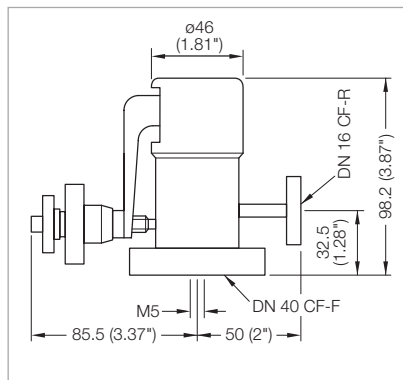
DN	CF	16	40	63
Connection flange				
rotatable	DN	16 CF-R	40 CF-R	63 CF-R
Leak rate:		<1 x 10 ⁻¹⁰		
body, valve seat	mbar x l/s			
Differential pressure		2		
on the plate in either				
direction	bar	1		
Differential pressure				
at opening	bar	closing to a mechanical stop		
Closing force				
Turns per stroke		6	11	9
Valve position indication		visual (mechanical)		
Service life	cycles	1000		
Conductance for		5		
molecular flow	l/s			
Pressure, absolute		1 x 10 ⁻¹¹		
min.	mbar			
max.	bar	2		
Mounting orientation		any		
Bake out temperature	°C	≤ 300		
Max. heating and		≤ 60		
cooling rate	°C/h			
Bellows	Material	Stainless steel 1.4404		
Valve disk	Material	Stainless steel 1.4404, 1.4435		
Valve disk seal	Material	Metal		
Weight	kg	0.4	1.9	5.9

Ordering information

UHV-All-Metal Right-Angle Valves with Rotatable Flanges on Both Sides

	Part No.	Part No.	Part No.
UHV all-metal right-angle valves	28980V01	28981V01	28982V01
T-bar, metal	289811V01	289812V01	289813V01
Handwheel, plastic	289801V01	289802V01	-

UHV All-Metal Variable Leak Valves



Dimensional drawing for the all-metal variable leak valves

Technical Data

UHV All-Metal Variable Leak Valves

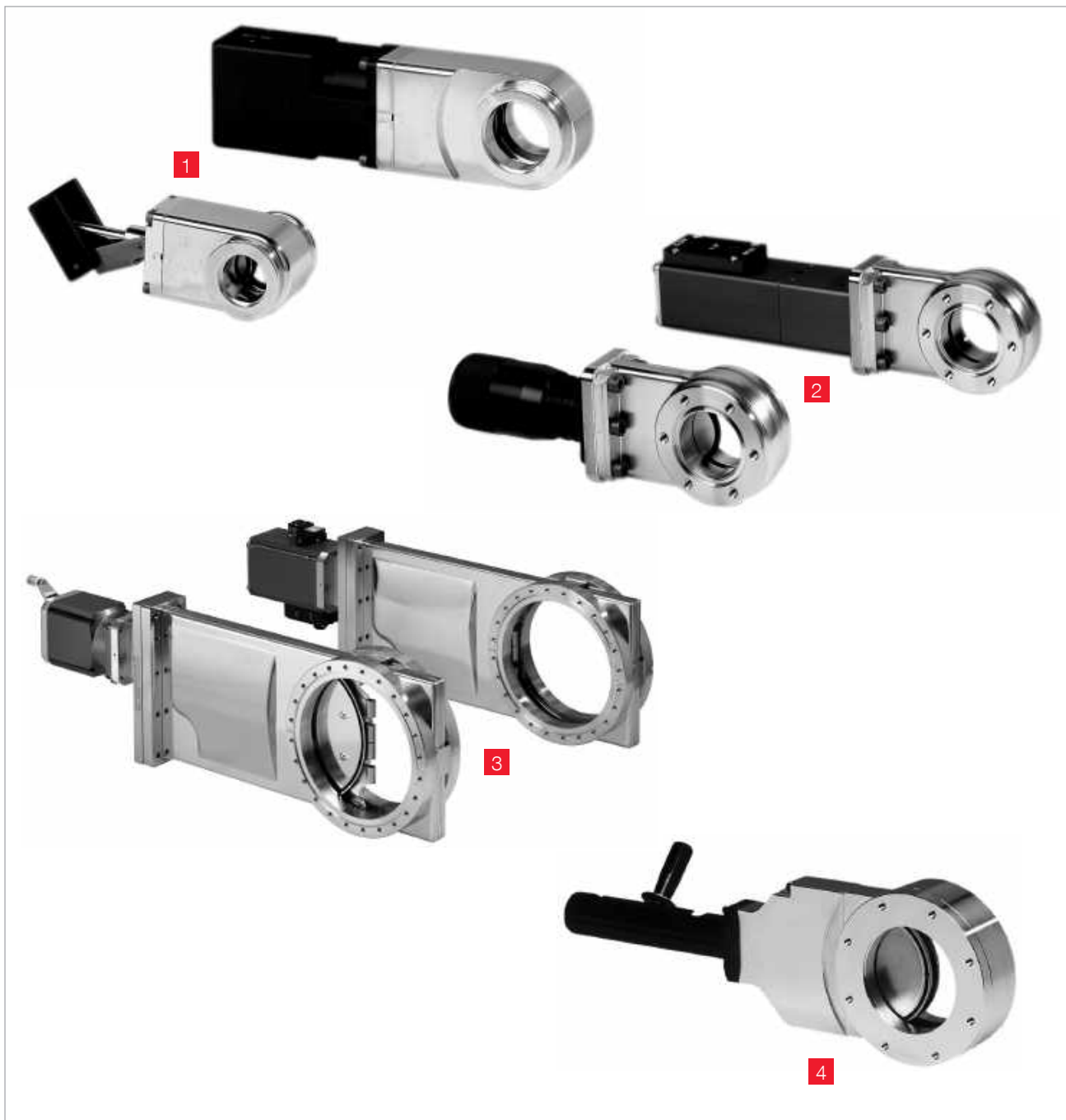
Connection flanges		
Input	DN	16 CF-R
Output	DN	40 CF-F
Gas flow, min. for		
Pure gas	mbar x l/s	10^{-10}
Air	mbar x l/s	10^{-9}
Gas flow		
max.	mbar x l/s	600
adjustable, max.	mbar x l/s	100
Tightness	mbar x l/s	1×10^{-11}
Pressure absolute		
min.	mbar	1×10^{-10}
max.	bar	30
Conductance for molecular flow	l/s	0.7
Operating temperature	°C	200
Bakeout temperature	°C	350
Valve seat	Material	Copper alloy
Valve plate	Material	Sapphire
Housing	Material	Stainless steel
Weight	kg	1.4

Ordering Information

UHV All-Metal Variable Leak Valves

	Part No.
UHV all-metal variable leak valve	289 90
Spare valve plate	E 289 87
Spare valve seat	E 289 88
Tool kit for valve seat	E 290 97

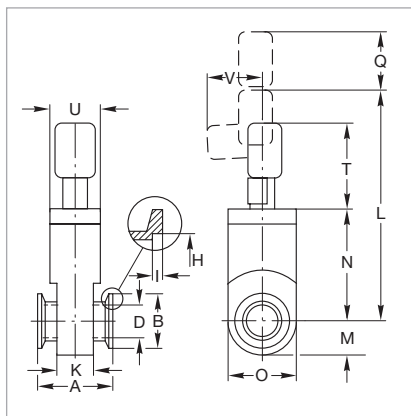
Gate Valves with ISO-KF / CF / ISO-F Flanges Overview



- 1** Miniature UHV gate valves,
ISO-KF flange
- 2** Miniature UHV gate valves,
CF flange
- 3** UHV gate valves
- 4** HV gate valves

For the precise installation dimensions, please refer to the product's Operating Instructions.

Miniature Gate Valves, ISO-KF, Manually Operated (Articulated Lever)



Dimensional drawing for the miniature UHV gate valves, articulated lever, ISO-KF flange

Dimension Table

DN	ISO-KF	16	25	40
A	mm	40	50	51
B	mm	30	40	55
D	mm	15	24	39
H	mm	17.2	26.2	41.2
I	mm	3	3	3
K	mm	25	32	31
L	mm	100	139	208
M	mm	15	22	32,5
N	mm	39	59	93
O	mm	30	44	65
Q	mm	25	35	55
T	mm	37	50	85
U	mm	25	32	40
V	mm	30	30	50

Advantages to the User

- Cost-effective gate valve for industrial applications with elastomer-sealed push gate feedthrough
- Aluminum body
- Slim and light-weight
- Low play in the locked state and low wear

Technical Data

Miniature Gate Valve

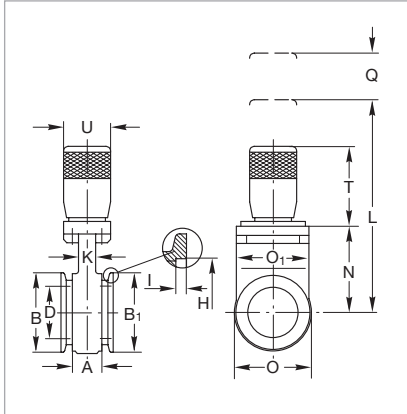
		DN 16 ISO-KF	DN 25 ISO-KF	DN 40 ISO-KF
Tightness	Body	$< 1 \times 10^{-9}$		
	Valve seat			
Pressure range, abs.		1×10^{-7} mbar to 2 bar		
High vacuum conductance	l/s	10	34	140
Differential pressure at the valve gate	bar	≤ 2 in both directions		
Max. differential pressure during opening	mbar	≤ 30		
Service life until first maintenance	cycles	50,000		
Degassing temperature for the valve	°C	100 / 100		
	manual open / closed	80		
Installation orientation		any		
Weight	kg	0.4	0.4	0.7
Material				
Valve body		AlMgSi1 (3.2315)		
Valve gate		AlSi 301 (1.4310)		
Seal (head, gate)		Viton/Viton		

Ordering Information

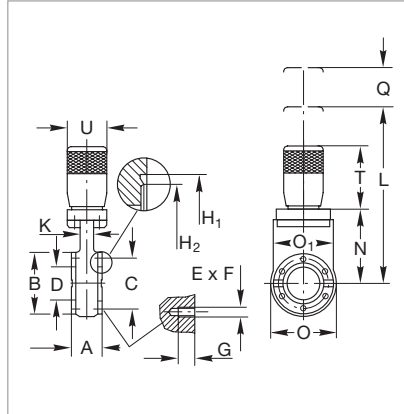
Miniature Gate Valve

	DN 16 ISO-KF	DN 25 ISO-KF	DN 40 ISO-KF
	Part No.	Part No.	Part No.
Miniature gate valve, manually operated, articulated lever	286 06	286 08	286 09

Miniature UHV Gate Valves, ISO-KF and CF, Manually Operated (Handwheel)



Dimensional drawing for the miniature UHV gate valves, manually operated (handwheel), DN 40 ISO-KF



Dimensional drawing for the miniature UHV gate valves, manually operated (handwheel), DN 40 CF

Advantages to the User

- Bellows-sealed feedthrough
- Valve technology with only one moving part
- Equipped with a mechanical position indicator
- Low particle generating and vibration free actuation
- Compact design

Dimension Table

DN		40 ISO-KF	40 CF
A	mm	50	35
B	mm	72	72
B ₁	mm	55	–
C	mm	–	58,7
D	mm	40	40
E x F		–	6 x M 6
G	mm	–	7
H	mm	41.2	–
H ₁	mm	–	48.3
H ₂	mm	–	42
I	mm	3	–
K	mm	16	16
L	mm	198	198
N	mm	82	82
O	mm	76	76
O ₁	mm	70	70
Q	mm	55	55
T	mm	73	73
U	mm	45	45

Technical Data

Miniature UHV Gate Valve

DN 40 ISO-KF

DN 40 CF

Tightness			
Body	mbar x l/s	< 5 x 10 ⁻¹⁰	
Valve seat	mbar x l/s	< 1 x 10 ⁻⁹	
Pressure range, abs.		1 x 10 ⁻¹⁰ mbar to 2 bar	
High vacuum conductance	l/s	160	220
Differential pressure at the valve gate	bar	≤ 2 in both directions	
Max. differential pressure during opening	mbar	≤ 30	
Service life until first maintenance	cycles	50,000	
Degassing temperature			
valve open / closed	°C	250 / 200	
manually operated	°C	250	
Installation orientation		any	
Weight	kg	1.5	
Material			
Valve body		AISI 304 (1.4301)	
Valve gate		AISI 304 (1.4301)	
Bellows		AISI 316 L (1.4435)	
Seal (head, gate)		Viton/Viton	

Ordering Information

Miniature UHV Gate Valve

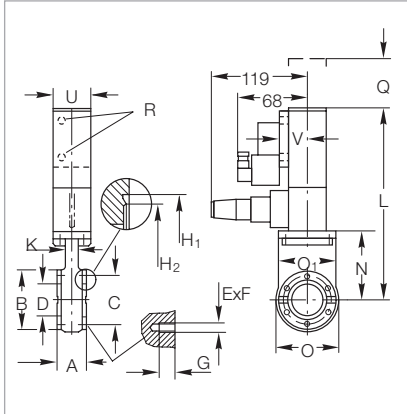
DN 40 ISO-KF

DN 40 CF

	Part No.	Part No.
Miniature gate valve, manually operated, handwheel	286 15	286 84
6 set screws with nuts and washers ¹⁾	–	839 11

¹⁾ For dimensions E x F see table "Connections for CF"

Miniature UHV Gate Valves, ISO-KF / CF, Electropneumatically Operated



Dimensional drawing for the miniature UHV gate valves; electropneumatically operated, CF flange

Dimension Table

DN		40 ISO-KF	40 CF
A	mm	51	35
B	mm	55	72
C	mm	–	58.7
D	mm	40	40
E x F		–	6 x M 6
G	mm	–	7
H	mm	41.2	–
H ₁	mm	–	48.3
H ₂	mm	–	42
I	mm	3	–
K	mm	31	16
L	mm	196	230
M	mm	32.5	–
N	mm	88	82
O	mm	65	76
O ₁	mm	–	70
Q	mm	55	55
T	mm	–	73
U	mm	40	45
V	mm	65	32.5
W	mm	61	–
W ₁	mm	50	–

Advantages to the User

- Double-acting electropneumatic actuator (with position indicator and pilot valve); bellows-sealed feedthrough
- Valve technology with only one moving part
- Equipped with a mechanical position indicator
- Actuation free of particles and vibrations
- Short closing time, very long service life
- Compact design

Technical Data

Miniature UHV Gate Valve

DN 40 ISO-KF (Stainless Steel)

DN 40 CF (Stainless Steel)

Tightness			
Body	mbar x l/s	< 5 x 10 ⁻¹⁰	
Valve seat	mbar x l/s	< 1 x 10 ⁻⁹	
Pressure range, abs.		1 x 10 ⁻¹⁰ mbar to 2 bar	
High vacuum conductance	l/s	160	220
Differential pressure at the valve gate	bar	≤ 2 in both directions	
Max. differential pressure during opening	mbar	≤ 30	
at reduced service live	bar	1	
Service life until first maintenance	cycles	50,000	
Degassing temperature			
Valve open / closed	°C	≤ 250 / 200	
pneumatic actuation	°C	≤ 200	
position indicator / pilot valve	°C	80 / 50	
Warming-up and cooling down speed	°C x h ⁻¹	50	
Compressed air, min. / max.	bar	4.5 / 7.0	
Closing time / opening time	s	0.7	
Pilot valve			
supply voltage / power consumption		24 V DC / 6 W or 230 V AC, 50/60 Hz / 2 W	
Switching capacity of the position indicator at 80 °C	A	5 at 250 V AC; 3 at 50 V DC	
Installation orientation		any	
Weight	kg	1.8	
Material			
Valve body		AISI 304 (1.4301)	
Valve gate		AISI 304 (1.4301)	
Bellows		AISI 316 L (1.4435)	
Seal (head, gate)		Metal/Viton	

Ordering Information

Miniature UHV Gate Valve

DN 40 ISO-KF (Stainless Steel)

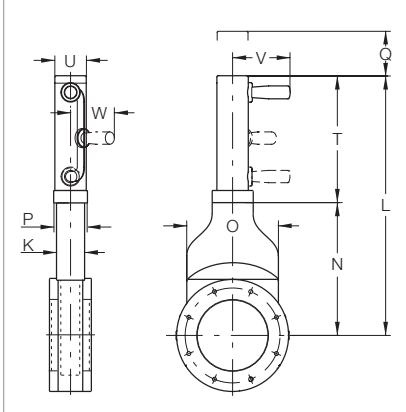
DN 40 CF (Stainless Steel)

	Part No.	Part No.
Miniature gate valve, electropneumatically operated		
24 V DC / 6 W	286 36	286 99
230 V AC, 50/60 Hz / 2 W	286 35	286 94
6 set screws with nuts and washers ¹⁾	–	839 11

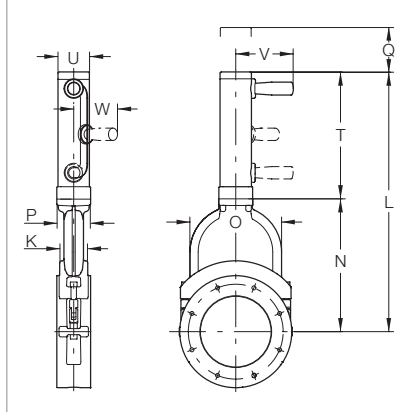
¹⁾ For dimensions E x F see table "Connections for CF"

HV Gate Valves, ISO-F

Manually Operated



Dimensional drawing for the HV gate valves; manually operated, DN 63 ISO-F and DN 100 ISO-F



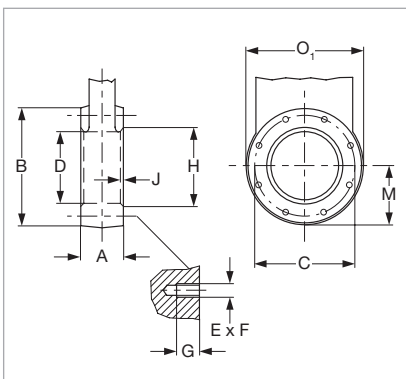
Dimensional drawing for the HV gate valves; manually operated, DN 160 ISO-F

Advantages to the User

- Cost-effective gate valve for industrial applications with elastomer-sealed push gate feedthrough
- Aluminum body
- Slim and light-weight
- Low play in the locked state and low wear

Dimension Table

DN	ISO-F	63	100	160
K	mm	36	36	58
L	mm	329.5	41	547
N	mm	155.5	203.5	280
O	mm	100	140	192
P	mm	48	48	70
Q	mm	25	25	60
T	mm	174	209.5	267
U	mm	43	43	65
V	mm	94	94	122
W	mm	75	75	95



Connection dimensions for ISO-F flanges (HV gate valves)

Connections for ISO-F

DN	ISO-F	63	100	160
A	mm	60	60	70
B	mm	130	165	235
C	mm	110	145	200
D	mm	65	100	150
E x F		4 x M8	8 x M8	8 x M10
G	mm	12	12	16
H	mm	70	102	153
J	mm	3	3	5
M	mm	65.5	83	117.5
O ₁	mm	131	166	237

Technical Data

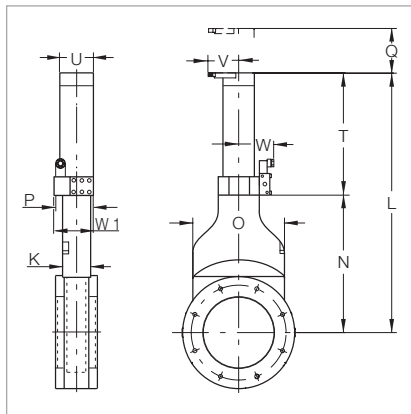
		HV Gate Valve		
		DN 63 ISO-F	DN 100 ISO-F	DN 160 ISO-F
Tightness				
Body	mbar x l/s	$< 1 \times 10^{-9}$		
Valve seat	mbar x l/s	$< 1 \times 10^{-9}$		
Pressure range, abs.		1×10^{-7} mbar to 1.6 bar		
High vacuum conductance	l/s	550	2000	6000
Differential pressure at the valve gate	bar	1.6 in both directions		
Max. differential pressure during opening	mbar	≤ 30		
Service life until first maintenance	cycles	200,000	200,000	100,000
Degassing temperature				
valve	°C	120		
manually operated	°C	80		
Installation orientation		any		
Weight	kg	3	4.5	9
Material				
Valve body		AlMg4.5Mn		
Valve gate		AISI 304 (1.4301)		
Mechanism		AISI 301 (1.4310), AISI 304(1.4301), AISI 420 (1.4034)		
Seal (head, gate)		Viton		

Ordering Information

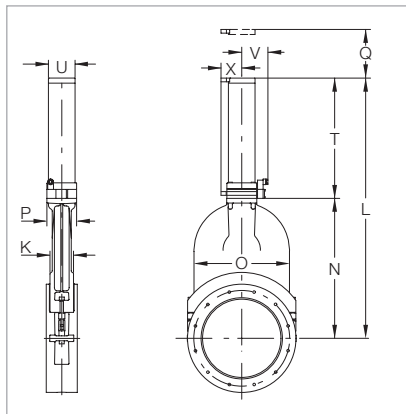
		HV Gate Valve		
		DN 63 ISO-F	DN 100 ISO-F	DN 160 ISO-F
		Part No.	Part No.	Part No.
HV gate valve, manually operated		286 25	286 26	215 633
Set screws with nuts and washers ¹⁾		839 13	839 13	210 071
(Package each containing)	pieces	16	16	12

¹⁾ For dimensions E x F see table "Connections for ISO-F"

HV Gate Valves, ISO-F, Electropneumatically Operated



Dimensional drawing for the gate valves;
DN 63 ISO-F and DN 100 ISO-F



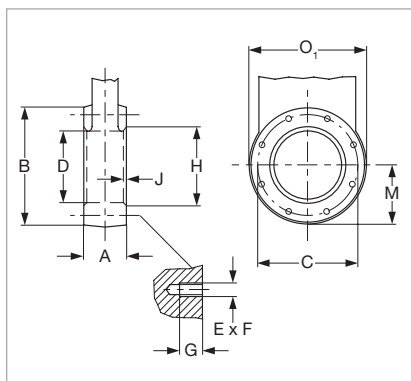
Dimensional drawing for the gate valves;
DN 160 ISO-F to DN 250 ISO-F

Advantages to the User

- Cost-effective gate valve for industrial applications with elastomer-sealed push gate feedthrough
- Aluminum body
- Slim and light-weight
- Low play in the locked state and low wear
- Double-acting
- With position indicator

Dimension Table

DN	ISO-F	63	100	160	200	250
K	mm	36	36	58	66	76
L	mm	341.5	424	547	688	843
N	mm	155.5	203.5	280	363.5	453
O	mm	100	140	192	240	308
P	mm	58	58	70	80	96
Q	mm	25	25	60	80	100
T	mm	186	221.5	267	324.5	390
U	mm	55	55	65	75	86
V	mm	56	56	71.5	76.5	84.5
W	mm	72	72	–	–	–
W ₁	mm	65.5	65.5	–	–	–
X	mm	59	59	57	62	67



Connection dimensions for ISO-F flanges
(HV Gate Valves)

Connections for ISO-F

DN	ISO-F	63	100	160	200	250
A	mm	60	60	70	80	100
B	mm	130	165	235	288	350
C	mm	110	145	200	260	310
D	mm	65	100	150	200	261
E x F		4 x M8	8 x M8	8 x M10	12 x M10	12 x M10
G	mm	12	12	16	16	16
H	mm	70	102	153	213	–
J	mm	3	3	5	5	–
M	mm	65.5	83	117.5	144	175
O ₁	mm	131	166	237	290	352

Technical Data

HV Gate Valve

DN 63 ISO-F DN 100 ISO-F DN 160 ISO-F DN 200 ISO-F DN 250 ISO-F

Tightness						
Body	mbar x l/s	$< 1 \times 10^{-9}$				
Valve seat	mbar x l/s	$< 1 \times 10^{-9}$				
Pressure range, abs.		1 x 10 ⁻⁷ mbar to 1.6 bar	1 x 10 ⁻⁷ mbar to 1.6 bar	1 x 10 ⁻⁷ mbar to 1.6 bar	1 x 10 ⁻⁷ mbar to 1.6 bar	1 x 10 ⁻⁷ mbar to 1.2 bar
High vacuum conductance	l/s	550	2000	6000	12000	22000
Max. Differential pressure at the valve gate	mbar	≤ 1600 in both directions	≤ 1600 in both directions	≤ 1600 in both directions	≤ 1600 in both directions	≤ 1200 in both directions
Max. differential pressure during opening	mbar	≤ 30				
Compressed air, min. / max.	bar	4 / 7				
Closing time / opening time	s	1.5	2	2	3	5
Service life until first maintenance	cycles	200,000	200,000	100,000	100,000	100,000
Degassing temperature						
valve	°C	120				
pneumatic drive	°C	80				
position indicator	°C	80				
pilot valve	°C	50				
Switching capacity for the position indicator	A	5 at 230 V AC; 3 at 50 V DC				
Installation orientation		any				
Weight	kg	3	4.5	9	18	25
Material						
Valve body		AlMg4.5Mn	AlMg4.5Mn	G-AlSi7Mg	G-AlSi7Mg	G-AlSi7Mg
Valve gate		AISI 304 (1.4301)	AISI 304 (1.4301)	AlMgSi1,	AlMgSi1,	AlMgSi1,
Mechanism		AISI 301 (1.4310), AISI 304 (1.4301), AISI 420 (1.4034)	AISI 301 (1.4310), AISI 304 (1.4301), AISI 420 (1.4034)	AISI 301 (1.4310), AISI 304 (1.4301), AISI 420 (1.4034)	AISI 301 (1.4310), AISI 304 (1.4301), AISI 420 (1.4034)	AISI 301 (1.4310), AISI 304 (1.4301), AISI 420 (1.4034)
Seal (head, gate)		Viton/Viton	Viton/Viton	Viton/Viton	Viton/Viton	Viton/Viton

Ordering Information

HV Gate Valve

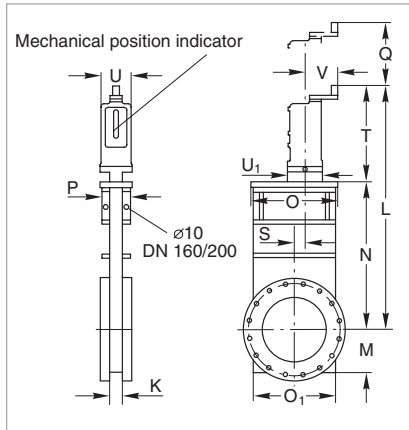
DN 63 ISO-F DN 100 ISO-F DN 160 ISO-F DN 200 ISO-F DN 250 ISO-F

	Part No.	Part No.	Part No.	Part No.	Part No.
HV gate valve, electropneumatically operated					
24 V DC / 2.5 W	286 55	286 56	-	-	-
24 V DC / 6 W	-	-	215 643	215 644	215 645
230 V AC, 50 Hz / 7.1 W	286 45	286 46	215 653	215 654	215 655
Set screws with nuts and washers ¹⁾ (Package each containing)	839 13	839 13	210 071	210 071	210 071
pieces	16	16	12	12	12

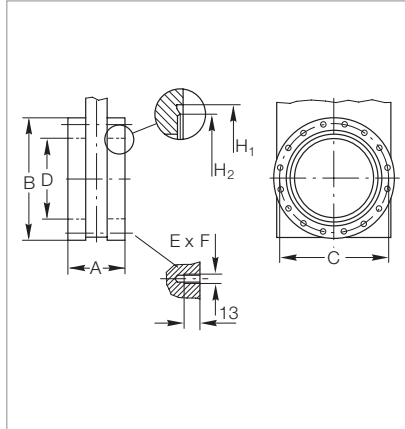
¹⁾ For dimensions E x F see table "Connections for ISO-F"

UHV Gate Valves, CF

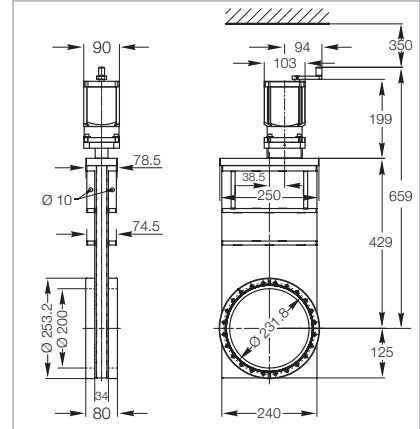
Manually Operated



Dimensional drawing for the UHV gate valves
DN 63 CF to DN 160 CF



Connection dimensions for CF flanges



Dimensional drawing for the UHV gate valve
DN 200 CF

Dimension Table

DN	CF	63	100	160
K	mm	27	27	27
L	mm	408	462	552
M	mm	57	73	99
N	mm	192	247	336
O	mm	115	145	200
O ₁	mm	112	142	192
P	mm	70	70	70
Q	mm	180	220	290
S	mm	11	9	25
T	mm	184	184	184
U	mm	70	70	70
U ₁	mm	83	83	83
V	mm	77	77	77

Connections for CF

DN	CF	63	100	160
A	mm	70	70	70
B ₂	mm	113.5	151.6	202.4
C	mm	92.1	130.2	181
D	mm	70	100	150
E x F	mm	8 x M8	16 x M8	20 x M8
H ₁	mm	82.5	120.65	171.45
H ₂	mm	77.4	115.5	166

Advantages to the User

- Valve and wheel can be degassed at temperatures up to 250 °C (up to 200 °C when closed)
- Stainless steel body (non-rusting)
- Bellows-sealed feedthrough
- Low play in the locked state and low wear
- Compact
- Mechanically locked in the closed state
- Mechanical position indicator

Technical Data

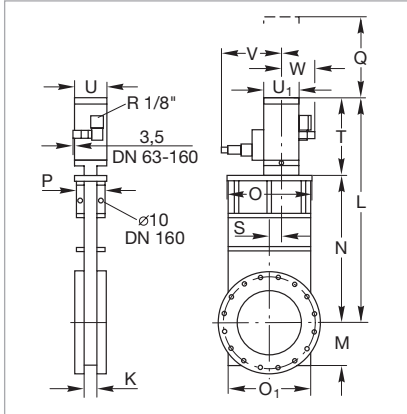
		UHV Gate Valve			
		DN 63 CF	DN 100 CF	DN 160 CF	DN 200 CF
Tightness					
Body	mbar x l/s	< 5 x 10 ⁻⁹			
Valve seat	mbar x l/s	< 1 x 10 ⁻⁹			
Pressure range, abs.		1 x 10 ⁻¹⁰ mbar to 1.6 bar			
High vacuum conductance	l/s	600	1700	6000	12000
Differential pressure at the valve gate	bar	≤ 1.6 in both directions			
Max. differential pressure during opening	mbar	≤ 30			
Number of spindle turns for full travel		10	13	17	17
Service life until first maintenance	cycles	50,000			
Degassing temperature					
valve open / closed	°C	250 / 200			
manually operated	°C	250			
Warming-up / cooling down speed	°C x h ⁻¹	50			
Installation orientation		any			
Weight	kg	9	12	18	28
Material					
Body		AISI 304 (1.4301)			
Bellows		AISI 316 L (1.4435)			
Mechanism		AISI 304 (1.4301), AISI 316 L (1.4404), AISI 301 (1.4310), AISI 420 (1.4034)			
Seal (head, gate)		Metal/Viton			

Ordering Information

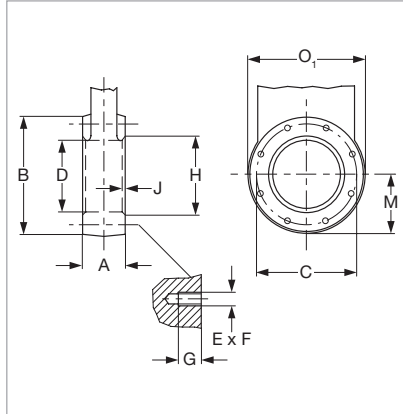
		UHV Gate Valve			
		DN 63 CF	DN 100 CF	DN 160 CF	DN 200 CF
		Part No.	Part No.	Part No.	Part No.
UHV gate valve, manually operated		286 85	286 86	286 87	286 88
16 set screws with nuts and washers ¹⁾		839 13	839 13	2 x 839 13	2 x 839 13

¹⁾ For dimensions E x F see table "Connections for ISO-F"

UHV Gate Valves, ISO-F, Electropneumatically Operated



Dimensional drawing for the UHV gate valves
ISO-F



Connection dimensions for ISO-F flanges
(UHV gate valves)

Advantages to the User

- Valve and pneumatic drive can be degassed at temperatures up to 250 °C and 200 °C respectively
- Stainless steel body (non-rusting)
- Double-acting electropneumatic actuator (with position indicator and pilot valve)
- Bellows-sealed feedthrough
- Low play in the locked state and low wear
- Compact
- Mechanically locked in the closed state

Dimension Table

DN	ISO-F	100	160	250
K	mm	27	27	41
L	mm	418	523	800
M	mm	73	99	161
N	mm	247	336	560
O	mm	145	200	345
O ₁	mm	142	192	322
P	mm	70	70	80
Q	mm	220	290	450
S	mm	9	25	65
T	mm	171	187	240
U	mm	70	70	90
U ₁	mm	83	83	103
V	mm	145	145	155
W	mm	77	77	87

Connections for ISO-F

DN	ISO-F	100	160	250
A	mm	70	70	100
B	mm	165	225	350
C	mm	145	200	310
D	mm	100	150	261
E x F		8 x M8	8 x M10	12 x M10
G	mm	13	13	15
H	mm	102	153	–
J	mm	3	5	–

Technical Data

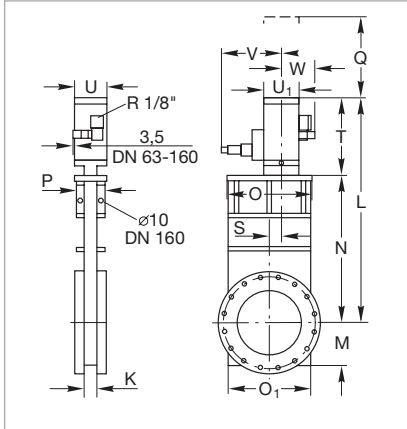
		UHV Gate Valve		
		DN 100 ISO-F	DN 160 ISO-F	DN 250 ISO-F
Tightness				
Body	mbar x l/s	$< 5 \times 10^{-10}$		
Valve seat	mbar x l/s	$< 1 \times 10^{-9}$		
Pressure range, abs.		1×10^{-10} mbar to 1 bar		
High vacuum conductance	l/s	1700	6000	26000
Differential pressure at the valve gate	bar	1 in both directions		
Max. differential pressure during opening	mbar	30		
Compressed air, min. / max.	bar	4 / 7	4 / 7	5 / 7
Closing time / opening time	s	1.2	1.5	4
Compressed air cylinder, volume	l	0.11	0.14	0.35
Service life until first maintenance	cycles	50,000		
Degassing temperature				
valve open / closed	°C	250 / 200		
pneumatic drive	°C	200		
position indicator	°C	80		
pilot valve	°C	50		
Warming-up / cooling down speed	°C x h ⁻¹	50		
Pilot valve				
supply voltage / power consumption		24 V DC / 6 W or 230 V AC, 50 Hz / 7.1 W	24 V DC / 6 W or 230 V AC, 50 Hz / 7.1 W	24 V DC / 6 W
Switching capacity of the position indicator at 80 °C	A	5 at 250 V AC; 3 at 50 V DC		
Installation orientation		any		
Weight	kg	12	18	42
Material				
Body		AISI 304 (1.4301)		
Bellows		AISI 316 L (1.4435)		
Mechanism		AISI 304 (1.4301), AISI 316 L (1.4404), AISI 301 (1.4310), AISI 420 (1.4034)		
Seal (head, gate)		Metal/Viton		

Ordering Information

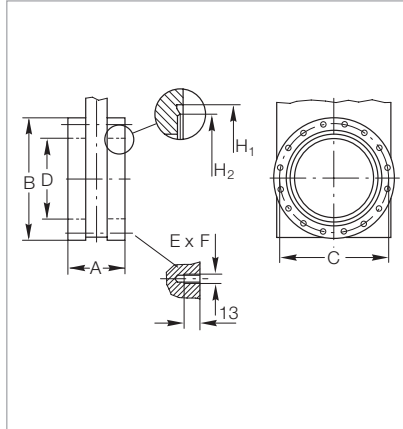
		UHV Gate Valve		
		DN 100 ISO-F	DN 160 ISO-F	DN 250 ISO-F
		Part No.	Part No.	Part No.
UHV gate valve, electropneumatically operated				
24 V DC / 6 W		286 73	286 74	286 81
230 V AC, 50 Hz / 7.1 W		286 76	286 77	–
Set screws with nuts and washers ¹⁾ (Package each containing)	pieces	839 13 16	210 071 12	210 071 12

¹⁾ For dimensions E x F see table "Connections for ISO-F"

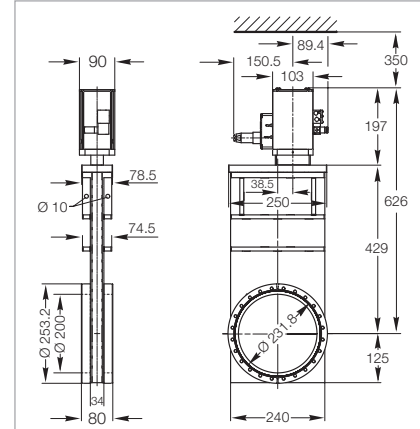
UHV Gate Valves, CF, Electropneumatically Operated



Dimensional drawing for the UHV gate valves
DN 63 CF to DN 160 CF
electropneumatically operated



Connection dimension for
CF flanges DN 63 CF to DN 160 CF



Dimensional drawing for the UHV gate valve
DN 200 CF electropneumatically operated

Dimension Table

DN	CF	63	100	160	200
K	mm	27	27	27	35
L	mm	346	418	523	630
M	mm	57	73	99	125
N	mm	192	247	336	430
O	mm	115	145	200	250
O ₁	mm	112	142	192	240
P	mm	70	70	70	80
Q	mm	180	220	290	350
S	mm	11	9	25	38,5
T	mm	154	171	187	200
U	mm	70	70	70	90
U ₁	mm	83	83	83	103
V	mm	145	145	145	155
W	mm	77	77	77	87

Connections for CF

DN	CF	63	100	160	200
A	mm	70	70	70	80
B ₂	mm	113.5	151.6	202.4	253.2
C	mm	92.1	130.2	181	231.8
D	mm	70	100	150	200
E x F		8 x M8	16 x M8	20 x M8	24 x M8
H ₁	mm	82.5	120.65	171.45	222.3
H ₂	mm	77.4	115.5	166	217

Advantages to the User

- Double-acting electropneumatic actuator (with position indicator and pilot valve)
- Bellows-sealed feedthrough
- Valve and pneumatic drive can be degassed at temperatures up to 250 °C and 200 °C respectively
- Stainless steel body (non-rusting)
- Low play in the locked state and low wear
- Compact
- Mechanically locked in the closed state

Technical Data

		UHV Gate Valve			
		DN 63 CF	DN 100 CF	DN 160 CF	DN 200 CF
Tightness					
Body	mbar x l/s	< 5 x 10 ⁻¹⁰			
Valve seat	mbar x l/s	< 1 x 10 ⁻⁹			
Pressure range, abs.		1 x 10 ⁻¹⁰ mbar to 1 bar			
High vacuum conductance	l/s	600	1700	6000	12000
Differential pressure at the valve gate	bar	1 in both directions			
Max. differential pressure during opening	mbar	30			
Druckluft, min. / max.	bar	4 / 7	4 / 7	4 / 7	5 / 7
Closing time / opening time	s	1	1.2	1.5	4
Compressed air cylinder, volume	l	0.08	0.11	0.14	0.35
Service life until first maintenance	cycles	50,000			
Degassing temperature					
Valve open / closed	°C	250 / 200			
Pneumatik-Antrieb	°C	200			
position indicator	°C	80			
pilot valve	°C	50			
Warming-up / cooling down speed	°C x h ⁻¹	50			
Pilot valve					
supply voltage / power consumption		24 V DC / 6 W or 230 V AC, 50 Hz / 7.1 W			
Switching capacity of the position indicator at 80 °C	A	5 at 250 V AC; 3 at 50 V DC			
Installation orientation		any			
Weight	kg	9	12	18	28
Material					
Body		AISI 304 (1.4301)			
Bellows		AISI 316 L (1.4435)			
Mechanism		AISI 304 (1.4301), AISI 316 L (1.4404), AISI 301 (1.4310), AISI 420 (1.4034)			
Seal (head, gate)		Metal/Viton			

Ordering Information

		UHV Gate Valve			
		DN 63 CF	DN 100 CF	DN 160 CF	DN 200 CF
		Part No.	Part No.	Part No.	Part No.
UHV gate valve, electropneumatically operated					
24 V DC / 6 W		286 89	286 90	286 91	286 92
230 V AC, 50 Hz / 7.1 W		286 95	286 96	286 97	-
16 set screws with nuts and washers ¹⁾		839 13	839 13	2 x 839 13	2 x 839 13

¹⁾ For dimensions E x F see table "Connections for CF"

Ultra High Vacuum Pumps

TiTan™

Ion Pumps

BOOSTIVAC™

Titanium Sublimation Pumping (TSP)

Non-evaporable Getter (NEG)

DIGITEL™

Ion Pump Controllers

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Ultra High Vacuum Pumps

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TiTan™ Ion Pumps



Ion pumps are used in a wide variety of high and ultra-high vacuum (UHV) environments. They can reach the lowest possible vacuum for an economical cost. In addition, ion pumps have some technical advantages over other technologies:

Advantage for the User

- Vibration free operation
- Low operational cost
- Bakeable
- Low maintenance
- Pressure indication
- Permanent gas capture
- Radiation tolerance
- Long operational life
- Non-contaminating technology

Characteristics

Lifetime

All Gamma Vacuum ion pumps are designed to operate for 45,000 – 50,000 hours at 1×10^{-6} mbar. Lifetime increases linearly with decreased pressure. At 1×10^{-9} , for example, an ion pump can last for many years.

Ultimate Pressure

Ion pumps are capable of reaching pressures below 1×10^{-10} mbar. Ultimate pressure of an ion pump is dictated by overall system conditions and materials.

Vacuum Processing

Ion pumps are shipped under vacuum at pressures less than 1×10^{-10} mbar. Certificates of conformance are provided and record all leak check points and pump characteristic values. RGA scans can be provided upon request.

Port Configurations

Each ion pump can be configured with a variety of pumping port options. Additional ports are available in most designs on the top, bottom, or side and can accommodate TSP or non-evaporable getter (NEG) modules.

Feedthroughs

Gamma Vacuum has standardized on the commercially available 10kV SHV feedthrough since 1996. For legacy purposes, alternate feedthroughs are available.

Heaters

Integrated heaters can be added to ion pumps for economical and efficient baking.

Cables

In addition to incorporating the SAFECONN interlock system, high voltage cables are made of flexible silicone materials that are bakeable and have high radiation tolerance.

Ion Pump Applications

Ion Pump Size Pumping Speed (l/s)				
	2-3	3-20	20-75	100+
Application				
Industry and Medical Processes				
Radar	■			
Traveling Wave Tubes (TWT)	■			
Klystrons	■			
X-Ray Tube Evacuation	■	■		
X-Ray Sources	■	■		
Treatment & Diagnostics		■	■	
Semiconductor				
Critical Dimension SEM (CD SEM)		■	■	
Lithography			■	■
Instrumentation				
Electron Microscopes (SEM/TEM)		■	■	
Focused Ion Beam (FIB)		■	■	
Scanning Probe Microscope (SPM)		■	■	■
Surface Analysis (AES, XPS, SIMS, EDX)			■	■
Mass Spectrometry (MS)			■	■
Molecular Beam Epitaxy (MBE)			■	■
High Energy Physics				
Accelerators			■	■
Boosters			■	■
Storage Rings			■	■
Front Ends			■	■
Beam Lines			■	■
End Stations			■	■
Free Electron Lasers (FEL)			■	■
Laser Interferometers			■	■

Small Ion Pumps (MINI – 75S)



Small ion pumps come in a wide variety of sizes and configurations. Gamma Vacuum maintains stock of the most common configurations for same-day shipping. These pumps have the added advantage that they can be mounted in any orientation without additional support.

Low Profile Ion Pumps (100L – 1200LX)



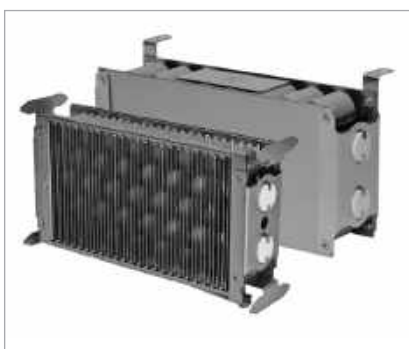
Low Profile ion pumps are under 12 in. (300 mm) high for standard configurations. The closed magnetic loop of these pumps reduces the stray magnetic field created by the pump making these pumps ideal for any type of charged particle application.

Tall Profile Ion Pumps (150TV – 600TV)



Tall Profile ion pumps are designed for mounting in narrow locations and matching competitive dimensions. These pumps are built to order and designed to fit into locations where a Low Profile ion pump might not fit.

TiTan Ion Pump Elements



TiTan™ ion pump elements are “tuned” for specific pumping applications. Surfaces are chemically processed to remove potential surface contaminants and provide maximum adhesion for extended lifetime. Ceramics are optimally shielded to reduce exposure to sputtered material.

- TiTan™ CV (Conventional)
 - two titanium cathodes for high pumping speed of reactive gases.
- TiTan™ DI (Differential)
 - a titanium and tantalum cathode for maintained pumping speeds of reactive gases and long term stability of noble gases.
- TiTan™ TR
 - classic triode element for higher pressure operation

Technical Data and Ordering Information

	Pumping Speed l/s	Inlet Flange	Dimensions L x W x H mm (inch)	Weight kg (lbs)	Part No.
Small Ion Pumps					
MINI	0.2	DN 16 CF	38 x 51 x 38 (1.5 x 2.0 x 1.5)	0.35 (0.8)	on request
3S	2 – 3	DN 16 CF	45 x 108 x 41 (1.8 x 4.3 x 1.6)	0.45 (1.0)	on request
10S	8 – 10	DN 40 CF	113 x 214 x 152 (4.4 x 8.4 x 6.0)	6 (13)	on request
25S	15 – 20	DN 40 CF DN 63 CF	25 x 130 x 202 (4.9 x 5.1 x 8.0)	9 (20)	on request
45S	30 – 40	DN 40 CF DN 63 CF	251 x 130 x 202 (9.9 x 5.1 x 8.0)	16 (34)	on request
75S	40 – 75	DN 40 CF DN 63 CF DN 100 CF	242 x 130 x 277 (9.5 x 5.1 x 10.9)	22 (48)	on request
Low Profile Ion Pumps					
100L	80 – 100	DN 100 CF DN 160 CF	328 x 294 x 294 (12.9 x 11.6 x 11.6)	29 (62)	on request
200L	160 – 200	DN 100 CF DN 160 CF	413 x 233 x 325 (16.3 x 9.2 x 12.8)	50 (112)	on request
300L	240 – 300	DN 160 CF	413 x 337 x 325 (16.3 x 13.3 x 12.8)	66 (145)	on request
400L	320 – 400	DN 160 CF	413 x 413 x 325 (16.3 x 16.3 x 12.8)	67 (148)	on request
400LX	320 – 400	DN 160 CF	490 x 408 x 508 (19.3 x 16.1 x 20.0)	95 (210)	on request
600L	480 – 600	DN 160 CF DN 200 CF	513 x 513 x 325 (20.2 x 20.2 x 12.8)	103 (226)	on request
600LX	480 – 600	DN 160 CF DN 200 CF	413 x 336 x 537 (16.3 x 13.2 x 21.1)	122 (270)	on request
800LX	640 – 800	DN 160 CF DN 200 CF	413 x 413 x 537 (16.3 x 16.3 x 21.1)	127 (280)	on request
1200LX	960 – 1200	DN 160 CF DN 200 CF	513 x 513 x 650 (20.2 x 20.2 x 25.6)	206 (452)	on request
Tall Profile Ion Pumps					
150TV	120 – 150	DN 100 CF	247 x 231 x 338 (9.7 x 9.1 x 13.3)	32 (70)	on request
300TV	240 – 300	DN 160 CF	450 x 231 x 345 (17.7 x 9.1 x 13.6)	65 (143)	on request
600TV	480 – 600	DN 160 CF	450 x 305 x 525 (17.7 x 12.0 x 20.7)	109 (243)	on request

BOOSTIVAC™ Titanium Sublimation Pumping (TSP) Non-evaporable Getter (NEG)



Titanium Sublimation Pumps (TSPs) are often used in combination with ion pumps or independently to remove reactive gases from the vacuum environment. Combined with an ion pump, the TSP allows for low ultimate pressures in a shorter amount of time. All TSP components are bakeable to 400°C.

Advantage for the User

Ease of Use

The TSP and MPC controllers are each fully controlled with an intuitive touch panel LCD.

Filaments

Each titanium-molybdenum filament contains 1.5 grams of usable titanium and averages 20 hours of operation.

Connectivity

TSP/NEG cables have MS style connectors that are bakeable and radiation resistant.

Safety

High currents travel over distances up to 15 meters through bakeable and radiation-resistant insulated and strain relief cabling.

DIGITEL™ Flexibility

The DIGITEL™ line is flexible enough to control a wide variety of ion pump and TSP configurations. The QPCe and MPC can operate up to four ion pumps simultaneously or independent operation of one or two ion pumps respectively. The MPCe and QPCe are capable of controlling one or two TSP or NEG cartridges independently from the remote TSP or NEG controller or the MPCe's optional internal TSP (iTSP) or NEG (iNEG).

TSP Filament Cartridge



The filament cartridge is mounted on a 2- 3/4" CFF (NW 35). The feedthrough supports three titanium-molybdenum filaments and a return path for ground isolation. Each filament contains 1.5 grams of usable titanium and averages 20 hours of operation.

Liquid Cryoshroud



The liquid cryoshroud consists of a double walled, type 304L stainless steel cylinder with two liquid nitrogen feedthroughs with flare type fittings. It provides 1578 cm² (245 in.²) of liquid nitrogen cooled surface area that provides pumping speeds up to 12,000 l/s for hydrogen (see table). The shroud is mounted on an 8 in. CFF (DN 160) or 10 in. CFF (DN 200)

Ambient Sputter Shield



The ambient sputter shield economically maximizes surface area when cooling is not practical or possible. It provides 827cm² (128 in.²) of ambient temperature surface area that provides pumping speeds up to 2,200 l/s for hydrogen (see table). The shield is mounted on an 8 in. CFF (DN 160) or a 6 in. CFF (DN 100).

Digitel™ TSP / NEG Controller



A TSP or NEG can be fully operated from the LCD touchscreen of the QPC or MPC. They can be fired manually or automatically based on the pressure of either ion pump the controller is monitoring. Timed modes also let the user have full control over exact parameters of operation. A single remote controller can operate up to eight TSP filaments or two NEG pumps.

Technical Data

Controller

		DIGITEL TSP/NEG	Remote TSP/NEG
Input power			
Voltage	V	90 – 130 or 200 – 240	
Frequency	Hz	48 – 62	
Output power			
Open circuit voltage	VAC	19 / 32	19 / 32
Current (maximum)	A	55 / –	55 / –
Watts (maximum)	W	850 / 220	850 / 220
Resolution	A	0.1	0.1
High current connections		MS style / XLR style ¹⁾	MS style / XLR style ¹⁾
Display			
Type		1/4 VGA touchscreen LCD	touchscreen LCD via MPC/QPC
Readouts		Current, on-time, and programmable options	Current, on-time, and programmable options via MPC/QPC
Analog outputs		linear configurable	
Voltage		linear or logarithmic, configurable	
Current / pressure			
Communications		Local/Remote/Full Ethernet Serial: 232, 422, 485	Local/Remote/Full via MPC/QPC Ethernet via MPC/QPC Serial: 232, 422, 485 via MPC/QPC
Conformity to norms		EN 55011 Class A, IEC 801-2 EN 801-3, IEC 801-4, EN 61010-1	
Weight	kg lbs	16.8 37	13.1 29
Size		3U high. 1/2 rack wide 438 mm (17.2 in.) deep	293 x 219 x 130 mm (min.) (12 x 9 x 5 in) 293 x 219 x 150 mm (max.) (12 x 9 x 6 in)
Additional features		TSP Enable	TSP Enable via MPC/QPC

¹⁾ N410 has MS style

Typical TSP Pumping Speeds

		Liquid Cryoshroud	Ambient Sputter Shield	
		(8 in.)	(8 in.)	(6 in.)
Area	cm ² (in. ²)	709 / 1578 110 / 245*	827 128	621 96
Temperature	°C	20 / -195	20	
H ₂				
Rate	l/s / cm ²	2.6 / 17	2.6	2.6
Speed	l/s	1,843 / 12,053	2,150	1,614
CO				
Rate	l/s / cm ²	8.2 / 11	8.2	8.2
Speed	l/s	5,814 / 7,799	6,780	5,092
H ₂ O				
Rate	l/s / cm ²	7.3 / 14.6	7.3	7.3
Speed	l/s	5,176 / 23,039	6,037	4,533

*Applies to H₂O speed only

Ordering Information

Part No.
Regarding ordering information please contact your nearest Leybold representative.

DIGITEL™ Ion Pump Controllers



The DIGITEL family of Ion Pump Controllers offers the right balance of performance, power and protection.

Advantage for the User

Ease of Use

Each DIGITEL™ has a highly visible display. The SPCe has an easy-to-read LCD that displays pressure, current and voltage. The QPC and MPCe are each fully controlled with an intuitive touch panel LCD. Digital resolution down to 1nA is possible depending on pump size and current requirements.

Communications

Serial communications (RS232, RS422, and RS485) are standard on all DIGITEL™ products. Ethernet protocol for advanced facility and instrumentation communications is available on all units.

Connectivity

Each DIGITEL™ has programmable analog and interlock capabilities. This allows for optimal flexibility when integrating with standard or legacy setpoint and analog monitoring systems.

Operator Safety

The integrated SAFECONN high voltage interlock system eliminates electrical shocks and false positive pressure readings. The controller automatically shuts off high voltage when the cable is disconnected from the ion pump or controller end. The system is isolated and guarantees ground, high voltage, and safety connectivity that prevents accidental arcing.

DIGITEL™ Flexibility

The DIGITEL™ line is flexible enough to control a wide variety of ion pump and TSP/NEG configurations. The QPC and MPCe can operate up to four ion pumps simultaneously or independent operation of one or two ion pumps, respectively. The MPCe is capable of controlling one or two TSP/NEG cartridges independently.

DIGITAL™ SPCe – Small Pump Controller



The SPCe is a versatile way to fully operate ion pumps 0.2 – 75 l/s with up to 40 mA (50 watts) of power. An LCD pressure/current/voltage display along with standard serial communications makes the SPCe able to accommodate the needs of basic and advanced users. Nano amp resolution provides gauging capabilities using the appropriate ion pump set-up.

DIGITAL™ QPCe – Quad Pump Controller



Ion pumps 100 l/s and larger required higher currents for starting and higher pressure operation. The QPCe supplies up to four ion pumps with 125 mA (125 watts) each. The easy-to-read color touchscreen display simultaneously displays pressure, current, and voltage. Standard serial and standard Ethernet communications along with legacy set-point and analog outputs allow for easy system integration. The QPCe fits into any rack at just 3U high and 1/2 rack wide.

DIGITAL™ MPCe – Multiple Pump Controller



Ion Pump Control

The MPCe allows for high current control of one or optionally two ion pumps independently or up to four in parallel with 500 mA (1000 watts). At 3U high and a full rack in width, the MPCe is ideal for operating a wide variety of ion pump configurations on any system.

TSP/NEG Control

A TSP or NEG can be fully operated from the LCD touchscreen of the QPCe or MPCe. They can be fired manually or automatically based on the pressure of either ion pump the controller is monitoring. Timed modes also let the user have full control over exact parameters of operation. A single remote controller can operate up to eight TSP filaments or two NEG pumps.

Ion Pump Compatibility

Ion Pump Size				
	SPCe	QPC	MPCe	TSP
Small Ion Pumps				
MINI	■			
3S	■			
5S		■		
10S	■	■		
25S	■	■		
45S	■	■		
75S	■	■		
Low Profile Ion Pumps				
100L		■	■	■
200L		■	■	■
300L		■	■	■
400L			■	■
400LX			■	■
600L			■	■
600LX			■	■
800LX			■	■
1200LX			■	■
Tall Profile Ion Pumps				
150TV		■	■	■
300TV		■	■	■
600TV			■	■

Technical Data

Controller

		SPCe	QPCe	MPCe
Input power				
Voltage	V	90 – 240 or 24 VDC	100 – 240	90 – 230 or 200 – 240
Frequency	Hz	48 – 62	50 – 60	48 – 62
Output power				
Independent outputs	V	1	1 – 4	1 or 2
Open circuit voltage	VDC	±3000 – 7000 programmable	±3000 – 7000 programmable	±5600 or 7000
Current (maximum)	mA	40	125	500
Watts (maximum)	W	50	125	1000
Resolution	nA	1	1	100
High voltage connections		One 10kV SHV or Fischer	1-4, 10kV SHV or Fischer	1-4, 10kV SHV or Fischer
Display				
Type		LCD	Wide VGA Touchscreen Color LCD	1/4 VGA Touchscreen LCD
Readouts		Pressure, current, voltage, and programmable options	Pressure, current, voltage, and programmable options	Pressure, current, voltage, and programmable options
Setpoints		One relay, one TTL	Four relay, four TTL	Four relay, four TTL
Analog outputs		linear configurable linear or logarithmic, configurable		
Voltage				
Current / pressure				
Communications		Local/Remote/Full Ethernet (optional) Serial: 232, 422, 485	Local/Remote/Full Ethernet (standard) Serial: 232, 422, 485	Local/Remote/Full Ethernet (optional) Serial: 232, 422, 485
Conformity to norms		EN 55011 Class A, IEC 801-2 EN 801-3, IEC 801-4, EN 61010-1		
Weight	kg lbs	1.5 3.3	9.5 21	16.8 / 25.4 (min./max.) 37 / 56 (min./max.)
Size		2U high, 1/4 rack wide 313 mm (12.3 in.) deep	3U high, 1/2 rack wide 438 mm (17.2 in.) deep	3U high, full rack wide 438 mm (17.2 in.) deep
Additional features		SAFECONN AUTOSTART/AUTORUN High Voltage Enable Fowler-Nordheim Calibration High-Pot Capability	SAFECONN AUTOSTART/AUTORUN High Voltage Enable Remote TSP/NEG Control	SAFECONN AUTOSTART/AUTORUN High Voltage Enable Remote TSP/NEG Control

Ordering Information

Part No.

Regarding ordering information please contact your nearest Leybold representative.

Oils / Greases / Lubricants

LEYBONOL

Vacuum Pump Oils

Special Oils

Diffusion Pump Oils

Greases

320.00.02

Excerpt from the Leybold Vacuum Full Line Catalog (Edition 02/2019)

Catalog Part Oils / Greases / Lubricants

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Oils / Greases / Lubricants

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Our Formula for your success:
Your Vacuum pump
+ Your Application
+ LEYBONOL

= High Performance

Excellent Vacuum Performance

LEYBONOL has been specially developed to achieve the best possible ultimate pressure capable for your pump. It also provides a low vapor pressure over the entire vacuum range. LEYBONOL keeps your production running!

Long Lifetime

Vacuum suitable additives protect your pump and extend its life expectancy. LEYBONOL allows long oil change intervals helping to substantially reduce your maintenance costs.



Superior Lubrication

LEYBONOL reduces wear and tear caused by friction. Its superior lubrication properties reduce overall power consumption while also allowing for easy start ups.



Extensive Quality Controls

LEYBONOL oils are subjected to frequent on-going and rigorous testing to ensure that each batch is consistent and will provide the same outstanding vacuum performance.

Highest Industry Standards

LEYBONOL meets the highest industry standards such as

- RoHS - Conformity
- Freedom of VOC (Volatile Organic Compounds)
- BAM Registration (for some LEYBONOL products)
(BAM = Bundesanstalt für Materialforschung und -prüfung)
- NSF H1 (NSF International / Nonfood Compounds Registration Program)
(some products from the LEYBONOL line are NSF registered)

LEYBONOL® is a registered trademark of Leybold GmbH

LEYBONOL® Lubricant Classifications

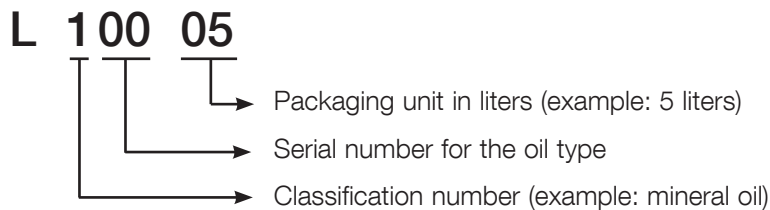
LVO 1XX	=	Mineral oil
LVO 2XX	=	Ester oil
LVO 3XX	=	PAO oil (Polyalphaolefins)
LVO 4XX	=	PFPE oil (Perfluoropolyether)
LVO 5XX	=	Diffusion pump oil
LVO 7XX	=	Special lubricants
LVO 8XX	=	Greases
LVO 9XX	=	Services / analyses

Self-explanatory part numbers

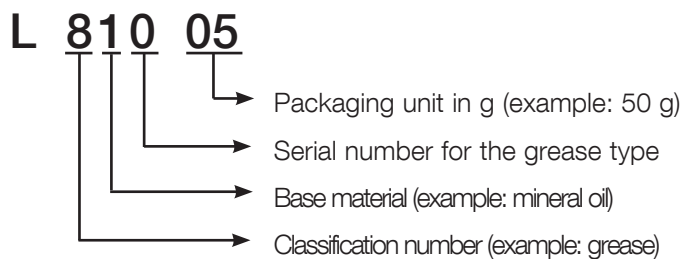
Example for LVO 100

L 100 01	=	1 liter
L 100 05	=	5 liters
L 100 20	=	20 liters
L 100 99	=	208 liters (drum)

Example 1: mineral oil, No. 00, 5 liters



Example 2: grease, based on mineral oil, No. 0, 50 g



LEYBONOL® is a registered trademark of Leybold GmbH

Vacuum Pump Oils

LEYBONOL lubricating oils for vacuum pumps need to fulfil demanding requirements. Their vapor pressure must be low at high temperatures and the water content and water uptake must be minimal. Their viscosity characteristics need to be flat; lubricating properties need to be excellent and they need to be resistant against thermal decomposition and increased mechanical stress.

All the LEYBONOL oils listed in the following have been subjected in our factory laboratories to very comprehensive tests closely resembling the conditions encountered in practice by the respective pump series.

Under vacuum engineering conditions lubricating oils may react very differently compared to what is being expected of them.

In order to ensure the best possible performance of the vacuum pumps, the use of LEYBONOL vacuum pump oils qualified by Leybold is recommended.

When using third party oils, the oil change intervals and the performance of the vacuum pump may be reduced. Also unwanted deposits may occur which may cause severe damage to the vacuum pump.

Our oils are subjected to an involved qualification process with respect to their technical suitability in our vacuum pumps.

Our warranty commitment is dependent on the usage of lubricating oils which are specifically qualified by us.

No liability will be assumed for any kind of damage caused through the usage of types of oil which have not been qualified or which are unsuitable.

In order to adapt the pumps to the different applications of our customers, different types of oil are used in our vacuum pump series.

Please note that owing to differing properties not all types of oil may be used in all our vacuum pump series. If you can not find the combination of pump and oil you require by way of a Part No., please ask us for a quotation.

Oil Types

Mineral Oils (LEYBONOL LVO 1XX)

Mineral oils are products distilled and refined from crude oil. These do not consist of precisely defined constituents but rather consist of a complex mixture. The way in which the mineral oil is pre-treated and its composition is decisive as to the applications it will be suited for. Depending on the distribution of the hydrocarbons and the dominance of certain properties, mineral oils are grouped according to paraffin-base, naphthenic and aromatic. For the purpose of attaining especially low ultimate pressures, mineral oils must be selected on the basis of a core fraction.

The thermal and chemical resistance of mineral oils has been found to be adequate in the majority of applications. They offer a high degree of compatibility with elastomers and resistance to hydrolysis.

Mineral oils also include the group of hydrocracked oils. These are frequently also termed semi-synthetic oils. Hydrocracked oils are produced under a very high hydrogen pressure at high temperature and are substantially free of aromatic compounds and olefins.

Hydrocracking oils exhibit a higher thermal stability compared to conventional mineral oils. In most cases the intervals between the oil changes can be extended.

Synthetic Oils

Synthetic oils are produced through chemical reactions. The group of synthetic oils includes liquids differing widely as to their chemical structure and composition. Correspondingly, their physical and chemical properties differ considerably. Synthetic oils are used in those cases where special properties of the oil are required which can not be fulfilled by mineral oils.

Synthetic oils are among others:

Ester Oils (LEYBONOL LVO 2XX)

Ester oils are organic compounds which excel especially through their high thermal resistance to cracking compared to mineral oils. Chemical resistance is generally quite good, but will depend on the type of ester oil. Elastomer compatibility and resistance against hydrolysis are not so good compared to mineral oils.

They should not be used when pumping acids, halogens or alkaline media like ammonia in connection with humidity.

Polyalphaolefins (PAO) (LEYBONOL LVO 3XX)

Polyalphaolefin oils are synthetic hydrocarbons which are paraffin like, but have a uniform structure. Thermal and chemical resistance is better compared to mineral oils.

Owing to their good flowing properties when cold they can be used at low temperatures.

Elastomer compatibility and resistance against hydrolysis are comparable to mineral oils.

Perfluoropolyether (PFPE) (LEYBONOL LVO 4XX)

These are oils which are only composed of carbon (C), fluorine (F) and oxygen (O) atoms. The existing

C-O and C-F bonds are highly stable. For this reason PFPE oils are practically inert against all chemical and oxidizing influences.

Perfluoropolyethers will not polymerise under the influence of high energy radiation.

Perfluoropolyethers are used when pumping strongly oxidative substances like oxygen, ozone or nitric oxides as well as highly reactive substances like halogens and hydrogen halides. Regarding Lewis acids (for example, boron trifluoride BF_3 , aluminium trichloride AlCl_3) they are not completely inert. Here reactions may take place at temperatures over approximately 150 °C (302 °F).

Perfluoropolyethers are thermally highly stable. PFPE is not flammable. Thermal decomposition may only take place at temperatures of over 290 °C (554 °F).

Caution: perfluoropolyethers will – when decomposed – release toxic and corrosive gases: hydrogen fluoride HF, carbonyl difluoride COF_2 among others. For this reason open fires must be avoided in the workspace where PFPE is being used. Do not smoke in the workspace where PFPE is being used.

Only suitably prepared pumps must be used in connection with perfluoropolyethers, since it is essential that these be free of hydrocarbons.

Changing from one basic type of oil to PFPE must be left exclusively to authorised Service Centers. The pumps will have to be fully disassembled and carefully cleaned. Gaskets and filters will have to be exchanged and suitable greases will have to be used.

Other Types of Synthetic Oil

Further types of synthetic oil like polyglycols, phosphate esters or silicone oils are not recommended by us for our forevacuum pumps. These types of oil exhibit specific properties which may have a negative effect when used in forevacuum pumps.

Safety data sheets are available to professional users from:
e-mail “documentation.vacuum@leybold.com” or Internet “www.leybold.com”.

Diffusion Pump Oils

Pump fluids for oil diffusion pumps must exhibit a low vapor pressure at room temperature and must be able to resist thermal decomposition and oxidation to a large extent. Surface tension of the pump fluids must be high to reduce creep of oil films. They must be chemically inert, exhibit a high flash point and evaporation heat must be low. Moreover, the pump fluids should permit high pumping speeds over a wide range of pressures and be cost effective.

One type of pump fluid alone cannot meet these comprehensive requirements.

It is therefore required to select a pump fluid according to the operating pressure and the requirements of the application in each case.

Mineral oils (LEYBONOL LVO 500 and LVO 510)

Mineral oils for diffusion pumps are closely tolerated fractions of a high quality base product distilled with particular care.

These pump fluids are especially suited for work in a high vacuum.

Silicone oil (LEYBONOL LVO 520)

Silicone oils are composed of precisely defined chemical compounds and are highly resistant. Owing to their extremely low vapor pressure, silicone oils are particularly well suited as a working fluid. Even after numerous air inrushes, silicone oils suffer neither ageing nor mass spectrometrically apparent alterations.

Strong mineral acids, alkalis and strong oxidants are capable of decomposing silicone oils.

(LEYBONOL LVO 540) is a hydrocarbon compound

LVO 540 has been developed for utilisation in oil vapour jet pumps.

It is thermally and chemically highly resistant and excels through a high degree of oxidation resistance.

It delivers the essential high pumping speed of the vapour jet pumps in the medium vacuum range.

Safety data sheets are available to professional users from:

e-mail "documentation.vacuum@leybold.com" or Internet "www.leybold.com".

Special Lubricants

(LEYBONOL LVO 7XX)

All special lubricants are summarised under the name of LEYBONOL LVO 7xx which are used in connection with special applications.

For example, LEYBONOL LVO 700 is a H1 registered, extremely stable special lubricant for vacuum pumps. This special lubricant has been devel-

oped for special applications where reactions with chemically active substances cannot be avoided.

Greases

(LEYBONOL LVO 8XX)

Greases are solid to semi-solid substances which consist of the principal components base oil and thickener.

The base oil provides most of the lubrication and will in most cases define the service temperature. The thickener binds the oil and can increase the lubricity or the thermal stability of the grease.

Added to these two constituencies are additives which may improve the per-

formance of the grease in specific areas depending on the specific application.

As base oils, frequently mineral oils, synthetic oils on the basis of ester oils, PAOs, silicone oils or also PFPE (perfluoropolyethers) are used.

Thickeners are roughly categorised in soap thickeners like lithium, for example and non-soap thickeners like polyurea or PTFE.

Greases will reduce friction and wear, ensure moveability of components, will seal off against contaminants or are used as anti-rust and anticorrosion agents.

Through the selection of corresponding base oil types, thickeners and additives, greases can be optimised for different applications.

Safety data sheets are available to professional users from:
e-mail "documentation.vacuum@leybold.com" or Internet "www.leybold.com".

General Information and Recommendations for Oils

Lubricant Functions

The term “Lubricant” actually describes only one of the five important functions of the oil:

Lubrication

Oil is used as a **lubricant** helping to reduce friction and provide a protective film against mechanical wear. For example, the vanes of a vacuum pump are forced by the centrifugal force against the pump ring at a force of several Newtons. The oil protects the vanes against friction since they slide along on the oil film. When viewing a running pump from the inside using stroboscopic light it is apparent how an oil wave builds up in front of the vanes, pressing the vanes away from the pump ring. The vanes never touch the pump ring or the bearing covers allowing the pump to operate for 10,000s of hours.

Cooling

The oil conducts the heat produced by friction and gas compression away so that the pump will always be operated at its optimum operating temperature. The oil here functions as a coolant.

Means of transport (dispersing properties of oils)

As a **means of transport** the oil absorbs process substances or other particles keeping them suspended (dispersed). In this way pump sections are protected against suffering damage. Sludge deposits and oil thickening shall be avoided.

Corrosion Protection

The oil shall protect the inner pump surfaces against corrosion. Corrosion can occur when the pump is used to pump water vapor or other chemical vapours which condense. The oil wets and protects the inner pump surfaces helping to keep condensate away from these. The oil acts as a **corrosion inhibitor**.

Applies only to a lesser extent to PFPE (LVO 4XX).

Sealing

As a **sealing agent** oil improves the attainable ultimate pressure and the attainable pumping speed. This is the principal function of vacuum pump oil. Oil sealed pumps are capable of attaining a much improved ultimate pressure compared to oil-free rotary vane pumps of similar construction.

In oil sealed pumps an oil film is created on the guiding components as well as on the tips and sides of the vanes.

The oil seals the intermediate spaces around the edges and tips of the vanes thereby preventing gas molecules from flowing back through leaks.

This improves the attainable ultimate pressure and the attainable pumping speed within all pressure ranges.

Oil Lifetime

Oil lifetime is dependent on a number of parameters.

An important influencing factor is that of the temperature. Mineral oils are commonly specified for a maximum temperature limit of 80 °C (176 °F). Above this temperature, to put it simply, it can be said that a temperature increase by 10 °C (50 °F) will cut oil lifetime in half. This results in thickening of the oil.

Synthetic oils may depending on the type be operated constantly at 100 to 160 °C (320 °F). PFPE oils can be operated constantly at a temperature of 250 °C (482 °F) max., however, lower maximum temperatures need to be taken into account depending on the process medium.

PFPE oils are not subject to any typical oil ageing since they are almost inert (for this see also the chapter "Vacuum Pump Oils", paragraph Perfluoropolyethers PFPE).

When operating a pump under conditions which are too cold, then water vapor or other vapours may condense. The condensed liquid may then cause a loss of the lubricating properties or cause corrosion within the pump.

The following parameters among others have a direct influence on the oil temperature:

- Ambient temperature
- Operating pressure
- Operating frequency 50 or 60 Hz
- Temperature of the pumped gases
- Gas ballast type and flow
- Water or air cooling
- Cooling water temperature and condition of the cooling water circuit
- Oil volume

A further important factor regarding oil lifetime is the avoidance of influences which have a modifying effect on the oil like the ingress of reactive or aggressive substances, water vapor, dust or contaminants in general.

For dispersion of process media and cleaning of the oil by oil filters, we offer a number of different standard approaches.

Please contact us.

Our experts shall be pleased to assist you in the selection process for suitable accessories (for this refer also to paragraph "Oil Cleaning").

Oil Check

The condition of the oil can be determined by way of an oil analysis.

Assessing the colour of the oil alone does not indicate the condition of the lubricant in a conclusive way. Colour changes and a turbid appearance of the oil can be indicative of contamination with foreign substances or oxidation. A turbid appearance may be indicative of water, for example. Depending on the type of oil a dark discolouration of the oil can occur already after a few operating hours, but without any negative effects on the application as in the case of LVO 210, for example.

For this reason only a comparison between the fresh oil and the used oil through an analysis will help (see chapter "Services"). For the purpose of detecting a necessary oil change, viscosity and the neutralisation number (TAN - total acid number) are analysed in comparison with fresh oil.

Changes in viscosity exceeding 20% necessitate an oil change. If the neutralisation number (TAN) in the case of mineral oils and PAOs increases to a level of 2 mg KOH/g then an oil change should be done. Above this value ageing of a mineral oil or PAO will increase exponentially.

In the case of ester oils, a higher neutralisation number can be accepted since here oil ageing will not be exponential. However, this requires that trend analyses confirm a low increase and that the other oil data be inconspicuous.

Oil Cleaning

Leybold offers a number of different standard oil filter devices.

These include:

- Mechanical oil filters for depositing dust, crystalline decomposition products and sludge
- Chemical oil filters for separating substances dissolved in the oil by way of adsorption to activated aluminium oxide
- Various separators for the intake side for avoiding the ingress of process media into the pump

Please contact us.

Our experts shall be pleased to assist you in the selection process for suitable accessories.

Details on the respective pump accessories and additional information can also be found in the corresponding Catalog Part.

Oxygen Applications

In applications in which pure oxygen or oxygen concentrations exceeding that in the atmosphere (over 21% by volume) occur, suitable operating means must be used.

Oxygen reacts with hydrocarbons. In connection with mineral oil based lubricants and most synthetic oils there exists an ignition risk. Oxygen can cause a self-ignition of oils and greases.

Even a slight oxygen enrichment may have the following effects:

- Increase in the rate of combustion
- Combustion temperature increase
- Decreased ignition temperature

For this reason any oxygen concentration above that of the atmosphere needs to be considered as hazardous.

In such cases a perfluoropolyether (PFPE) will be suitable as the operating agent.

Leybold has in its product range special vacuum pumps specified for PFPE operation which are free of hydrocarbons.

Information for Smooth Operation

- Reactive or aggressive substances in the pumped flow can inadmissibly stress the operating oil or modify it and may even be incompatible with the materials of the pump
- Even small quantities of dust or particles can result in failures
- Pumping of liquids is not permissible
- Corrosion, deposits and severe oil cracking can cause a pump failure
- Avoid standstill corrosion of the pumps for all processes which involve condensable vapours
- Small quantities of water may be ejected safely by operating the pumps with their gas ballast
- Avoidance of oil modifying influences or increased number of oil change intervals adapted to the specific application
- Selection of the optimum lubricant type and optimum viscosity
- Regular checks on the oil condition and the filters
- Pump maintenance in regular intervals
- Keep thermal stresses low
- Oil cleaning by oil filters and separation of process media

Moreover, all safety regulations regarding explosion protection need to be observed.

Storage of LEYBONOL Oils and Greases

Important recommendations for **proper** storing all LEYBONOL lubricants are:

- Storage temperature +10 to +30 °C (+50 to +86 °F)
- The containers should be protected against direct sunlight
- Drums should be stored horizontally
- Storage in enclosed indoor rooms
- The storage rooms should be clean and dry

LEYBONOL Oils

When stored properly in sealed original containers, the following durability periods apply:

The product LEYBONOL LVO 240 exhibits a durability of two years.

For the PFPE products LEYBONOL LVO 4XX a durability of 20 years applies.

For the other LEYBONOL oils durability is at least 3 years.

LEYBONOL Greases

Durability of the LEYBONOL greases differs widely depending on their type. For this reason no general statement can be made.

Upon request we shall be pleased to send to you precise durability information on the individual LEYBONOL lubricants.

Restrictions

For sealed original containers: if the product is not stored properly, durability is reduced.

After the containers have been opened: Adequate precautions against the ingress of dust, dirt, water etc. need to be introduced and the contents must be used up speedily. After having opened the containers once, durability of the product is reduced.

Products

LEYBONOL Mineral Oils

Application Data

LVO 100

LVO 120

LVO 130

Type of oil	Mineral oil, free of additives	Mineral oil with additives	Mineral oil with additives
Properties	Low vapor pressure,, low inclination to foaming, very good water separation	Extended oil change intervals, low inclination to foaming, very good water separation	Extended oil change intervals, low inclination to foaming, very good water separation
Application examples	Standard oil for low ultimate pressures. Pumping of air, chemically inert gases and water vapor	Standard oil for small SOGEVAC pumps ²⁾ Pumping of air, chemically inert gases and water vapor	Standard oil for large SOGEVAC pumps ²⁾ Pumping of air, chemically inert gases and water vapor
Elastomer compatibility FKM (FPM, Viton) NBR (Perbunan) ¹⁾ EPDM	Suited Conditionally suited Unsuitable	Suited Conditionally suited Unsuitable	Suited Conditionally suited Unsuitable
Used in the pumps of series	TRIVAC, E + DK, RUVAC	SOGEVAC A-series (≤ SV 65) and B-series (≤ SV 25, ≤ SV 120 BI (FC))	SOGEVAC A-series (≥ SV 100) and B-series (≥ SV 40 B)

Technical Data

LVO 100

LVO 120

LVO 130

ISO viscosity grade	ISO VG 100	ISO VG 32	ISO VG 68
Viscosity			
at 40 °C (104 °F)	95	32	68
at 100 °C (212 °F)	10.5	5.5	9
Flash point	°C (°F)	244 (471)	248 (478)
	> 255 (> 491)		
Density at 15 °C (59 °F)	kg/m³	875	885
	880		
Pour point	°C (°F)	-27 (-17)	-21 (-6)
	< -9 (< +16)		

Ordering Information

LVO 100

LVO 120

LVO 130

	Part No.	Part No.	Part No.
0.5 liters	-	L 120 00	-
1 liters	L 100 01	L 120 01	L 130 01
2 liters	-	L 120 02	L 130 02
5 liters	L 100 05	L 120 05	L 130 05
20 liters	L 100 20	L 120 20	L 130 20
208 liters	L 100 99	-	L 130 99

Please note that the technical data stated are typical characteristics only. Slight variations from batch to batch must be expected.
The technical data stated here do not entail any warranted characteristics

¹⁾ Resistance is dependent on the level of the acrylonitrile content in the NBR

¹⁾ LVO 120 is suited for the SOGEVAC SV 25 B and smaller pumps where the lower viscosity assists the starting process.
LVO 130 is suited for the SOGEVAC SV 40 B and larger pumps where the higher viscosity assists attaining of lower pressures.
However, all SOGEVAC pumps can be operated with both types of oil and moreover, LVO 120 and LVO 130 can be mixed with each other.

Application Data**LVO 140****LVO 150****LVO 170**

Type of oil	Mineral oil with additives	Mineral oil with additives	Mineral oil with detergent additives
Properties	Suitable for use in the food & packaging industry	Suitable for use in the food & packaging industry	High detergency, high thermal stability, low inclination of foaming
Application examples	Recommended for applications in the food industry	Recommended for applications in the food industry	Heat treatment, low pressure carburizing process and other processes creating tar or soot
Elastomer compatibility FKM (FPM, Viton) NBR (Perbunan) ¹⁾ EPDM	Suited Conditionally suited Unsuitable	Suited Conditionally suited Unsuitable	Suited Conditionally suited Unsuitable
Used in the pumps of series	SOGEVAC A-series (≤ SV 65) and B-series (≤ SV 25 B)	SOGEVAC A-series (≥ SV 100) and B-series (≥ SV 40 B)	SOGEVAC A-series (≥ SV 100) and B-series (≥ SV 40 B)

Technical Data**LVO 140****LVO 150****LVO 170**

ISO viscosity grade	ISO VG 32	ISO VG 68	ISO VG 100
Viscosity at 40 °C (104 °F) mm ² /s at 100 °C (212 °F) mm ² /s	30 5	63 8	95.6 11
Flash point °C (°F)	225 (437)	253 (487)	> 110 (230)
Density at 15 °C (59 °F) kg/m ³	860	870	0.889
Pour point °C (°F)	-18 (-0.4)	-18 (-0.4)	-24 (-11.2)

Ordering Information**LVO 140****LVO 150****LVO 170**

	Part No.	Part No.	Part No.
1 liter	L 140 01	L 150 01	-
20 liters	-	L 150 20	L 170 20

Please note that the technical data stated are typical characteristics only. Slight variations from batch to batch must be expected.
The technical data stated here do not entail any warranted characteristics

¹⁾ Resistance is dependent on the level of the acrylonitrile content in the NBR

LEYBONOL Ester Oils

Application Data

LVO 200

LVO 210

Type of oil	Synthetic oil (ester oil with additives)	Synthetic oil (ester oil with additives)
Properties	Very high thermal, oxidative and chemical stability, good deterging/dispersion characteristics, excellent wear protection	Very high thermal, oxidative and chemical stability, good deterging/dispersion characteristics, excellent wear protection
Application examples	Application at increased temperatures Starting of the pump between 0 and +12 °C (32 and 64 °F) Pumping of air, inert gases, carbon dioxide (dry), carbon monoxide, organic solvent vapours, resin vapours	Application at increased temperatures Pumping of air, inert gases, carbon dioxide (dry), carbon monoxide, organic solvent vapours, resin vapours
Remarks	Not for pumping of inorganic acids, free halogens or alkaline media	Not for pumping of inorganic acids, free halogens or alkaline media
Elastomer compatibility FKM (FPM, Viton) NBR (Perbunan) ¹⁾ EPDM	Suited Conditionally suited Unsuitable	Suited Conditionally suited Unsuitable
Used in the pumps of series	SOGEVAC A-series (≤ SV 65 A) and BI-series (≤ SV 120 BI (FC))	TRIVAC B, SP-Line, E + DK, RUVAC, DRYVAC SOGEVAC (≥ SV 100, ≥ SV 40 B) SV 40 Cat. 1 (i)/2 (o) IIB + H2 and SV 40 B to 630 B Cat. 2 (i)/2 (o) and 3 (i)/3 (o)

Technical Data

LVO 200

LVO 210

ISO Viscosity grade		ISO VG 32	ISO VG 100
Viscosity			
at 40 °C	mm ² /s	28	97
at 100 °C	mm ² /s	5.5	9
Flash point ^{tt}	°C (°F)	258 (496)	250 (482)
Density at 15 °C	kg/m ³	918	960
Pour point	°C (°F)	< -45 (< -49)	-33 (-27)

Ordering Information

LVO 200

LVO 210

	Part No.	Part No.
1 liter	L 200 01	L 210 01
2 liters	L 200 02	L 210 02
5 liters	L 200 05	L 210 05
20 liters	L 200 20	L 210 20
208 liters	-	L 210 99

Please note that the technical data stated are typical characteristics only. Slight variations from batch to batch must be expected.
The technical data stated here do not entail any warranted characteristics

¹⁾ Resistance is dependent on the level of the acrylonitrile content in the NBR

Application Data**LVO 220****LVO 240**

Type of oil	Synthetic oil (ester oil with additives)	Synthetic oil (special ester oil)
Properties	Very high thermal, oxidative and chemical stability, good deterging and dispersion characteristics, excellent wear protection	Excellent solubility for polymers
Application examples	Application in RUVAC WSLF for operation with gas lasers	Pumping of process media which have a tendency to polymerise (styrene and butadiene)
Remarks		Do not use any chemical oil filters Strictly avoid any mixing with any other type of oil Not for pumping inorganic acids
Elastomer compatibility FKM (FPM, Viton) NBR (Perbunan) ¹⁾ EPDM	Suited Conditionally suited Unsuitable	Suited Unsuitable Unsuitable
Used in the pumps of series	RUVAC (WSLF)	TRIVAC B

Technical Data**LVO 220****LVO 240**

ISO Viscosity grade		ISO VG 100	Not classified
Viscosity			
at 40 °C	mm ² /s	94	38
at 100 °C	mm ² /s	13	5
Flash point ^{tt}	°C (°F)	265 (509)	225 (437)
Density at 15 °C	kg/m ³	915	1055 ²⁾
Pour point	°C (°F)	-35 (-31)	-32 (-26)

Ordering Information**LVO 220****LVO 240**

	Part No.	Part No.
1 Liter	L 220 01	-
20 liters	-	L 240 20
208 liters	-	L 240 99

Please note that the technical data stated are typical characteristics only. Slight variations from batch to batch must be expected.
The technical data stated here do not entail any warranted characteristics

¹⁾ Resistance is dependent on the level of the acrylonitrile content in the NBR

²⁾ At 20 °C (68 °F)

Application Data**LVO 250****LVO 260**

Type of oil	Synthetic oil (ester oil with additives)	Synthetic oil (special ester oil)
Properties	High thermal and oxidative stability	Very high thermal and oxidative stability
Application examples	Bearing lubricant for turboradial blowers	Bearing lubricant for turboradial blowers
Elastomer compatibility FKM (FPM, Viton) NBR (Perbunan) ¹⁾ EPDM	Suited Conditionally suited Unsuitable	Suited Conditionally suited Unsuitable
Used in the pumps of series	TURBOSTREAM	TURBOSTREAM

Technical Data**LVO 250****LVO 260**

ISO Viscosity grade		Not classified	Not classified
Viscosity			
at 40 °C	mm ² /s	13	24
at 100 °C	mm ² /s	3.5	5
Flash point	°C (°F)	> 185 (> 365)	245 (473)
Density at 15 °C	kg/m ³	925	980 ²⁾
Pour point	°C (°F)	< -57 (< -71)	-60 (-76)

Ordering Information**LVO 250****LVO 260**

	Part No.	Part No.
0.3 liters	L 250 00	L 260 00
300 ml Set (for TURBOSTREAM D 2500)	896 101	-
600 ml Set (for TURBOSTREAM D 2500 / S 3500)	-	896 112

Please note that the technical data stated are typical characteristics only. Slight variations from batch to batch must be expected.
The technical data stated here do not entail any warranted characteristics

¹⁾ Resistance is dependent on the level of the acrylonitrile content in the NBR

²⁾ At 20 °C (68 °F)

LEYBONOL PAO Oils

Application Data

LVO 300

LVO 310

LVO 320

Type of oil	Synthetic oil (PAO with additives)	Synthetic oil (PAO with additives)	Synthetic oil (PAO with additives)
Properties	High thermal and oxidative stability H1 registration by NSF. Constituents approved by the FDA under CFR 178-3570. In acc. with USDA - H1	High thermal and oxidative stability	High thermal and oxidative stability
Application examples	Recommended for applications in the food industry Backing pumps for mass spectrometers Cleaning systems	Cold starting at low temperatures is possible Pumping of air, chemically inert gases, water vapor and small quantities of refrigerant R 717 (ammonia)	Pumping of air, chemically inert gases and water vapor
Elastomer compatibility FKM (FPM, Viton) NBR (Perbunan) ¹⁾ EPDM	Suited Conditionally suited Unsuitable	Suited Conditionally suited Unsuitable	Suited- Conditionally suited Unsuitable-
Used in the pumps of series	TRIVAC, only D 25 B SOGEVAC A-series (≥ SV 100) und B-series (≥ SV 40 B)	TRIVAC, up to D 16 B	VACUBE

Technical Data

LVO 300

LVO 310

LVO 320

ISO viscosity grade		ISO VG 100	ISO VG 32	ISO VG 46
Viscosity				
at 40 °C (104 °F)	mm²/s	99	29	45.4
at 100 °C (212 °F)	mm²/s	13.5	5.5	7.2
Flash point	°C (°F)	270 (518)	230 (446)	252 (485.6)
Density at 15 °C (59 °F)	kg/m³	840	820	828
Pour point	°C (°F)	-54 (-65)	< -54 (< -65)	-51 (-59.8)

Ordering Information

LVO 300

LVO 310

LVO 320

	Part No.	Part No.	Part No.
0.5 liters	L 300 00	-	-
1 liter	L 300 01	L 310 01	-
20 liters	L 300 20	-	L 320 20

Please note that the technical data stated are typical characteristics only. Slight variations from batch to batch must be expected.
The technical data stated here do not entail any warranted characteristics

¹⁾ Resistance is dependent on the level of the acrylonitrile content in the NBR

LEYBONOL PFPE Oils

Application Data

LVO 400

LVO 410

Type of oil	Synthetic oil (perfluoropolyether PFPE, free of additives)	Synthetic oil (perfluoropolyether PFPE, free of additives)
Properties	Chemically inert Highest thermal stability	Chemically inert Highest thermal stability
Application examples	Pumping of strong oxidants like oxygen, ozone or nitrous oxides, as well as reactive substances like halogens, hydrogen halides and conditionally Lewis acids	Pumping of strong oxidants like oxygen, ozone or nitrous oxides, as well as reactive substances like halogens, hydrogen halides and conditionally Lewis acids
Remarks	Use only in pumps modified for PFPE Mixing with any type of other oil must be strictly avoided Avoid pumping of water vapor, in particular in connection with corrosive media (see above) The use of a chemical oil filter CF/CFS is strongly recommended When used in RUVAC: For use with PFPE we exclusively recommend pump types with a canned motor	Use only in pumps modified for PFPE Mixing with any type of other oil must be strictly avoided Avoid pumping of water vapor, in particular in connection with corrosive media (see above) The use of a chemical oil filter CF/CFS is strongly recommended When used in RUVAC: For use with PFPE we exclusively recommend pump types with a canned motor
Elastomer compatibility FKM (FPM, Viton) NBR (Perbunan) ¹⁾ EPDM	Suited Suited Suited	Suited Suited Suited
Used in the pumps of series	TRIVAC BCS, SOGEVAC, E + DK, RUVAC	RUVAC, E + DK, DRYVAC ECODRY Plus, LEYVAC

Technical Data

LVO 400

LVO 410

ISO Viscosity grade		Not classified	Not classified
Viscosity			
at 40 °C	mm ² /s	49	89
at 100 °C	mm ² /s	7	11
Flash point	°C (°F)	– ²⁾	– ²⁾
Density at 15 °C	kg/m ³	1890	1900
Pour point	°C (°F)	-45 (-49)	-35 (-31)

Ordering Information

LVO 400

LVO 410

	Part No.	Part No.
0.60 liters	–	L 410 00
0.75 liters	L 400 00	–
1 liter	L 400 01	L 410 01

Please note that the technical data stated are typical characteristics only. Slight variations from batch to batch must be expected.

The technical data stated here do not entail any warranted characteristics

¹⁾ Resistance is dependent on the level of the acrylonitrile content in the NBR

²⁾ **Caution:** in the case of thermal decomposition > 290 °C (> 554 °F) toxic and corrosive gases are released. When handling PFPE keep away from open fires. Do not smoke in the work area

Application Data

LVO 420

Type of oil	Synthetic oil (perfluoropolyether PFPE, free of additives)
Properties	Chemically inert Highest thermal stability
Application examples	Pumping of strong oxidants like oxygen, ozone or nitrous oxides, as well as reactive substances like halogens, hydrogen halides and conditionally Lewis acids
Remarks	Use only in pumps modified for PFPE Mixing with any type of other oil must be strictly avoided Avoid pumping of water vapor, in particular in connection with corrosive media (see above) The use of a chemical oil filter CF/CFS is strongly recommended
Elastomer compatibility FKM (FPM, Viton) NBR (Perbunan) ¹⁾ EPDM	Suited Suited Suited
Used in the pumps of series	SOGEVAC BI-series with 1 ph motors ≤ SV 40 BI

Technical Data

LVO 400

ISO Viscosity grade	Not classified
Viscosity	
at 40 °C	mm ² /s 25
at 100 °C	mm ² /s 4.5
Flash point	°C (°F) – ²⁾
Density at 15 °C	kg/m ³ 1880
Pour point	°C (°F) -50 (-58)

Ordering Information

LVO 400

	Part No.
1 liter	L 420 01
2 liters	L 420 02

Please note that the technical data stated are typical characteristics only. Slight variations from batch to batch must be expected.
The technical data stated here do not entail any warranted characteristics

¹⁾ Resistance is dependent on the level of the acrylonitrile content in the NBR

²⁾ **Caution:** in the case of thermal decomposition > 290 °C (> 554 °F) toxic and corrosive gases are released. When handling PFPE keep away from open fires.
Do not smoke in the work area

LEYBONOL Diffusion Pump Oils

Application Data

LVO 500

LVO 510

LVO 520

LVO 540

(DIFFELEN normal)

Type of oil	White oil, free of additives	Mineral oil, free of additives	Silicone oil (tetramethyl- tetraphenyltrisiloxane)	Pump fluid based on hydrocarbons
Properties	Good thermal stability	High thermal stability	Very high thermal stability and highly resistant against oxidation and decomposition	High thermal stability and excellent resistance against oxidation and decomposition
Application examples	LVO 500 is the most frequently used pump fluid for applications in a high vacuum. The attainable ultimate total pressure is below 10 ⁻⁷ mbar	For applications in a high vacuum	For high vacuum and ultra-high vacuum applications	For oil vapor jet pumps
Elastomer compatibility FKM (FPM, Viton) NBR (Perbunan) ¹⁾ EPDM	Suited Conditionally suited Unsuitable	Suited Conditionally suited Unsuitable	Suited Suited Suited	Suited Suited Unsuitable
Used in the pumps of series	DIP, LEYBOJET 630	DIP, LEYBOJET 630	DIP, LEYBOJET 630	OB

Technical Data

LVO 500

LVO 510

LVO 520

LVO 540

(DIFFELEN normal)

Vapor pressure at 20 °C (68 °F) mbar	4 x 10 ⁻⁹	1 x 10 ⁻⁷	7 x 10 ⁻⁹ ²⁾	6 x 10 ⁻⁶
Viscosity at 40 °C (104 °F) mm ² /s	100	60	21	22
Flash point °C	> 250 (> 482)	> 230 (> 446)	221 (430)	196 (385)
Density at 20 °C (68 °F) kg/m ³	868	850	1070 ²⁾	885

Ordering Information

LVO 500

LVO 510

LVO 520

LVO 540

(DIFFELEN normal)

	Part No.	Part No.	Part No.	Part No.
1 liter	L 500 01	L 510 01	L 520 01	-
5 liters	L 500 05	L 510 05	L 520 05	-
20 liters	L 500 20	-	-	L 540 20
200 liters	-	-	-	L 540 99

Please note that the technical data stated are typical characteristics only. Slight variations from batch to batch must be expected.
The technical data stated here do not entail any warranted characteristics.

¹⁾ Resistance is dependent on the level of the acrylonitrile content in the NBR

²⁾ At 25 °C (77 °F)

LEYBONOL Special Lubricants

Application Data

LVO 700

DOT 4

Type of oil	Synthetic cyclic hydrocarbon	Brake fluid
Properties	H1 registration by NSF. Very high thermal stability and highly resistant against oxidation and decomposition. Very long lifetime.	High-quality brake fluid based on glycol ethers. Corresponds to FMVSS DOT 4
Application examples	Chemically inert to gases of acidic nature. For long service intervals	Only for filling of brake fluid circuits in the automotive industry.
Remarks	–	Use only in pumps modified specifically for DOT 4. Mixing with any other type of oil must be strictly avoided
Elastomer compatibility FKM (FPM, Viton) NBR (Perbunan) ¹⁾ EPDM ²⁾	Suited Conditionally suited Unsuitable	Unsuitable Unsuitable Conditionally suited
Used in the pumps of series	SOGEVAC BI-series ≤ SV 120 BI (FC)	TRIVAC, SOGEVAC

Technical Data

LVO 700

DOT 4

ISO viscosity grade	32	Not classified ¹⁾
Viscosity at 40 °C (104 °F) mm ² /s at 100 °C (212 °F) mm ² /s	31 5	Not applicable > 1.5
Flash point °C (°F)	> 210 (> 410)	> 120 (248)
Density at 15 °C kg/m ³	904	1070
Pour point °C (°F)	< -42 (< -44)	< -50 (< -58)

Ordering Information

LVO 700

DOT 4

	Part No.	Part No.
1 liter	L 700 01	200 10 037

Please note that the technical data stated are typical characteristics only. Slight variations from batch to batch must be expected.
The technical data stated here do not entail any warranted characteristics

¹⁾ Resistance is dependent on the level of the acrylonitrile content in the NBR

²⁾ Not all EPDM materials are suited for contact with DOT 4

LEYBONOL Greases

Application Data

LVO 810 (LITHELEN)

LVO 870 (GLEITLEN)

Base oil type	Mineral oil	Special vaseline types
Thickener	Lithium soap	Natural rubber
Properties	Wide application range (0 to +150 °C / 32 to 302 °F), atmospheric pressure to 10 ⁻⁸ mbar	Usable down to 10 ⁻² mbar
Application examples	Lubrication of ground joints, taps and O-rings at low pressures and high operating temperatures	Lubrication of stirrer shafts (KPG-stirrer)
Remarks	Owing high vacuum processing, LVO 810 does not contain any shares exhibiting higher vapor pressures ¹⁾	–
Elastomer compatibility FKM (FPM, Viton) NBR (Perbunan) ²⁾ EPDM	Suited Conditionally suited Unsuitable	Suited Conditionally suited Unsuitable

Technical Data

LVO 810 (LITHELEN)

LVO 870 (GLEITLEN)

Vapor pressure at 20 °C (68 °F)	mbar	10 ⁻¹⁰	10 ⁻⁴
Dropping point	°C (°F)	> 210 (> 441)	> 50 (> 122)
Max. operating temperature	°C (°F)	150 (302)	30 (86)

Ordering Information

LVO 810 (LITHELEN)

LVO 870 (GLEITLEN)

	Part No.	Part No.
Tube 50 g	L 810 05	–
Tin 50 g	–	L 870 05
Bucket 2 kg	L 810 99	L 870 99

Please note that the technical data stated are typical characteristics only. Slight variations from batch to batch must be expected.
The technical data stated here do not entail any warranted characteristics

¹⁾ The product contains silicon dioxide

²⁾ Resistance is dependent on the level of the acrylonitrile content in the NBR

Application Data**LVO 871****LVO 872**

Base oil type	Special vaseline types	Special vaseline types
Thickener	Natural rubber	Natural rubber
Properties	Usable down to 10 ⁻² mbar	Usable down to 10 ⁻² mbar
Application examples	Lubrication of ground joints	Lubrication of taps
Elastomer compatibility FKM (FPM, Viton) NBR (Perbunan) ¹⁾ EPDM	Suited Conditionally suited Unsuitable	Suited Conditionally suited Unsuitable

Technical Data**LVO 871****LVO 872**

Vapor pressure at 20 °C (68 °F)	mbar	10 ⁻⁴	10 ⁻⁴
Dropping point	°C (°F)	> 56 (> 133)	> 56 (> 133)
Max. operating temperature	°C (°F)	30 (86)	30 (86)

Ordering Information**LVO 871****LVO 872**

	Part No.	Part No.
Tin 50 g	L 871 05	L 872 05

Please note that the technical data stated are typical characteristics only. Slight variations from batch to batch must be expected.
The technical data stated here do not entail any warranted characteristics

¹⁾ Resistance is dependent on the level of the acrylonitrile content in the NBR

Application Data**High Vacuum Grease**

Base oil type	Silicone oil
Thickener	Inorganic
Properties	Low vapor pressure, high water and chemicals resistance
Application examples	Lubrication of ground joints, taps and O-rings at low pressures and high operating temperatures
Remarks	Wide operating range (-40 to +200 °C / -40 to +392 °F) atmospheric pressure down to 10 ⁻⁶ mbar ²⁾
Elastomer compatibility	
FKM (FPM, Viton)	Suited
NBR (Perbunan) ¹⁾	Suited
EPDM	Suited

Technical Data**High Vacuum Grease**

Vapor pressure at 20 °C (68 °F)	mbar	10 ⁻⁷
Dropping point	°C (°F)	None ³⁾
Max. operating temperature	°C (°F)	200 (392)

Ordering Information**High Vacuum Grease**

	Part No.
Tube 50 g	E 210 502

Please note that the technical data stated are typical characteristics only. Slight variations from batch to batch must be expected.
The technical data stated here do not entail any warranted characteristics

¹⁾ Resistance is dependent on the level of the acrylonitrile content in the NBR

²⁾ This product is unsuitable if also hot-cathode ionization vacuum gauges e.g. IONIVAC ITR 90/200 are installed in the process

³⁾ Above 200 °C (392 °F) polymerisation of the silicone greases discharges gas

Miscellaneous

Services

We are offering a number of different services under the product designation LEYBONOL LVO 9XX.

These include oil analysis sets and application assessments.

Oil Analyses for Your Safety

An analysis of vacuum oils provides information on influences from the side of the process and can be an important component for quality assurance and process optimisation.

The mandatory reference analysis with a fresh oil sample completes the evaluation.

With the utilisation of LEYBONOL, no additional costs are incurred for this.

Please note that the oil samples must not be contaminated with explosive, microbiological or radioactive substances. When requiring the analysis of lubricants which are contaminated with toxic or corrosive media, you must first

discuss this with our partner OELCHECK.

Oil Analysis Standard, Set 2

You receive from us one Analysis Set 2. You fill this set according to the instructions (minimum oil quantity is 60 ml) and send the oil sample and the consignment note directly to our partner OELCHECK. You will then receive the results directly from OELCHECK.

Application Data

LVO 900 Set 2 Oil Analysis Standard

Performance scope	Measurement of viscosity TAN (ageing) Wearing metals and additives in ppm Water in % Simple infrared measurement
Remark	Not applicable to PFPE oils

Ordering Information

LVO 900 Set 2 Oil Analysis Standard

	Part No.
Oil Analysis Standard, Set 2	L 900 01

Enhanced Oil Analysis, Set 5

You receive from us Analysis Set 5. You fill this according to the instructions (minimum oil quantity is 70 ml) and send the oil sample and the consignment note directly to our partner OELCHECK.

You will then receive the results directly from OELCHECK.

Especially recommended for trend analyses. Please order the corresponding number of sets.

Application Data

LVO 900 Set 5 Enhanced Oil Analysis

Performance scope	Measurement of viscosity TAN (ageing) Wearing metals and additives in ppm Water in % Simple infrared measurement Optical particle analysis and particle count
Remark	Not applicable to PFPE oils

Ordering Information

LVO 900 Set 5 Enhanced Oil Analysis

	Part No.
Enhanced Oil Analysis, Set 5	L 900 02

Application Assessment

Application Assessment, Standard

You send to us the results of the analysis by our partner OELCHECK and complete the information on the laboratory order supplement. We will then compare this information with the information contained in our application database. Thereafter you will receive a condition report and recommendations on how to handle and optimally use this type of oil in the desired process.

Ordering Information

LVO 900

Application Assessment, Standard

	Part No.
Application Assessment, Standard	ASL 900 03

Trend Analysis

You fill in the laboratory order supplement once and order three analysis, Part No. L 900 01 or L 900 02. You then take the oil samples in cycles according to the recommendation from Leybold yourself. After completion of the analysis series you send all analysis results to us. We will then compare these results with the information in our application database. Thereafter you will receive a condition report and recommendations on how to handle and optimally use this type of oil in the desired process.

Ordering Information

LVO 900

Trend Analysis

	Part No.
Trend Analysis	ASL 900 04

Forms are available on www.leybonol.com.

All recommendations on oil performance are based upon the information provided by the customer. Standard Leybold terms and conditions for services apply.

Glossary

Additives

Additives are oil soluble substances which can be added in low concentrations to the lubricants so as to improve certain properties. Frequently additives serve the purpose of improving, respectively avoiding oxidation, wear, corrosion, fluidity and foaming. Not all additives are suited for vacuum applications. Some additives exhibit a high vapor pressure thereby having a negative influence on the attainable ultimate pressure.

BAM

Some products from the LEYBONOL line have been registered at the Bundesanstalt für Materialforschung und -prüfung. (I.e. the Federal Institute for Materials Research and Testing in Germany.)

CFR (Code of Federal Regulations) in the USA.

Colour

For this refer to "Visual appearance".

Density

The density of a substance is defined as the ratio between its mass and its volume at a certain temperature. It depends on the chemical composition of a product.
International unit of measurement: kg/m³

Dropping point

The dropping point designates the temperature at which a lubricating grease begins to flow.

Elastomers

Elastomers are cross-linked polymers capable of reversibly absorbing significant deformations. Elastomers are used as the sealing material for shaft sealing rings or O-rings, for example.

The following belong among others to the group of elastomers:

EPDM

Ethylene propylene diene monomer rubber EPDM

Usable up to 150 °C (302 °F), partly suited for glycol ether based brake fluids, not suited for mineral oils and ester oils.

FKM

Fluor rubber FKM (trade name VITON®, for example)

Usable up to 200 °C (392 °F), suited for mineral oils and ester oils, not suited for glycol ether based brake fluids.

NBR

Acrylonitrile-butadiene rubber NBR (trade name PERBUNAN®, for example)

Usable up to 100 °C (212 °F), only NBR with a high share of acrylonitrile is suited for mineral oils and ester oils, not suited for glycol ether based brake fluids.

FDA (Food and Drug Administration)

Food and Drug Administration in the USA responsible for the approval of substances on the US American market.

Flash point

Flash point is the lowest temperature at which a liquid which is to be tested develops vapours in an open, respectively sealed crucible to such an extent that this vapor/air mixture above the liquid level can be briefly ignited by an external ignition.

Foaming

It is normal for oils in vacuum pumps to foam slightly upon the ingress of air through the gas ballast, for example. Under normal conditions this will not have any effect on the pump's performance.

Infrared measurement (IR)

Through the natural vibrations of the atoms of certain groups of organic molecules, the energy of the emitted infrared light is absorbed to different extents.

Based on an infrared spectrum it is possible to assess the following criteria among others:

- Detection of the type of oil (mineral oil, ester oil, PFPE, for example) by comparison against reference spectra
- Detection of contaminants in comparison with the fresh oil spectrum

ISO viscosity grade

Classification of liquid industrial lubricants in 20 viscosity grades based on the kinematic viscosity at 40 °C (104 °F) in the range of 2 mm²/s to 3200 mm²/s.

Abbreviation: ISO VG

See Table 1.

Neutralisation number

The neutralisation number indicates the quantity of potassium hydroxide (KOH) required to neutralise the free acid constituents contained in 1 g of a lubricant. Through the neutralisation number it is possible to determine the relative changes for used lubricants suffering from oxidative ageing. The increase in the neutralisation number in combination with the viscosity change are needed to assess the oil quality.
See also "TAN".

NSF (National Sanitation Foundation/ Nonfood Compounds Registration Program)

Nonfood components registration program for all substances used in the food industry like lubricants, for example.

Odour

Lubricants when new exhibit a mild odour. Mineral oils will usually develop a more intensive odour compared to synthetic oils. Contamination with foreign substances or lubricant reactions can cause a significant odour change.

Oil ageing

Common lubricants cannot be used for an unlimited time.

Lubricants worsen during use, i.e. they age. This ageing is caused, among other things, by temperature, oxidation, chemical and physical reactions with process media. This can result in the formation of sludge, resins or acids (for this see also Chapter "General information and Recommendations for Oils", paragraph "Oil check").

Pour point

The pour point is the lowest temperature at which oil is still capable of flowing.

RoHS (Restriction of (the use of certain) hazardous substances)

Directive on the Restriction of the use of certain Hazardous Substances in electrical and electronic equipment.

TAN

The designation TAN (Total Acid Number) is frequently used instead of the designation neutralisation number. For details see "Neutralisation number".

Thickener

A thickener binds the oil in the lubricating grease and may increase lubricity or thermal stability of the grease. Thickeners are roughly categorised in soap thickeners like lithium and non-soap thickeners like polyurea or PTFE.

USDA

United States Department of Agriculture (in charge of food safety among other things).

Vapor pressure

The vapor pressure is the ambient pressure below which a liquid begins to change into the gaseous state with the temperature being constant.

Viscosity

Viscosity is a measure of the amount of inner friction within a fluid. The development of hydrodynamically supporting films of oil, optimum oil conveying, sealing and lubricating and also the supply of heat require optimum viscosities. These need to be within certain ranges depending on the specific purpose of the application.

Viscosity is much temperature dependent.

At increasing temperatures viscosity reduces, i.e. the lubricant substance is less viscous.

When the oil is too thick at operating temperature it will no longer flow through the oil lines resulting in inadequate lubrication thereby causing damage. The result is a rapid increase in wear and an impaired ultimate pressure.

During operation the viscosity may change owing to:

- Lubricant ageing
- Ingress of foreign substances
- Reaction of the lubricant substance with the process media

a) Dynamic viscosity

The Newtonian definition of viscosity relates to the true viscosity. It is also termed dynamic viscosity.

International unit of measurement: mPas

This value corresponds to the former unit of measurement: cP

b) Kinematic viscosity

The ratio between dynamic viscosity and density is defined as kinematic viscosity. Generally kinematic viscosity is measured at 40 °C (104 °F) and 100 °C (212 °F).

International unit of measurement: mm²/s.

This value corresponds to the former unit of measurement: cSt.

Visual appearance

The visual appearance of the lubricant should be clear and clean. The colour of the new lubricant substances will normally range from colourless to amber. Changes in colour and turbidity can be indicative of a contamination with foreign substances or oxidation. Turbidity, for example, may indicate the presence of water. However, the colour alone is not conclusive as to the condition of the lubricant.

VOC

Volatile Organic Compound.

Water

A high water content can impair the lubricity of the lubricant being used and may have a negative influence on the attainable ultimate pressure. Should the oil/water emulsion remain in the pump then this can lead to corrosion.

Wearing metals

Wearing materials like iron, aluminum copper can be detected by measurements. Wearing metals present in the oil allow conclusions as to abrasive or corrosive wear.

LEYBONOL Oil Analysis

Laboratory Order Supplement

Please cross as appropriate

- ☐ Application assessment: Standard
- ☐ Application assessment: Trend analysis
- ☐ Condition assessment
- ☐ Matching the oil selection to the application
- ☐ Optimisation of oil change intervals
- ☐ Review of accessories, effectiveness of filtering devices, for example (for trend analysis/Set 5)

Customer

Company *

Name *

Street address/number *

Postal code/city *

Phone *

E-mail *

Oil sample

Oil designation *

Oil manufacturer or supplier *

Used in pump type/size *

Total oil sample operating hours *

Total pump operating hours

Oil change interval

Oil temperature

Pump accessories *

Application *

Process media *

**Reason/problem/aim
of the investigation ***

Please fill in all fields marked with an *.

Please note that in the instance of missing information, in particular in the case of a missing description of the problem, an optimal assessment will not be possible.

Please return the filled-in laboratory order supplement to:

analysis.leybonol@leybold.com

Forms are available from our homepage www.leybonol.com.

We provide our service on the basis of the information submitted by you. Our general sales terms for services apply.

Leybold GmbH
Bonner Strasse 498
D-50968 Cologne
Tel.: +49-(0)221-347 0
Fax: +49-(0)221-347 1250



www.leybold.com

Table 1

ISO viscosity grade	Centre point for the kinematic viscosity (mm²/s at 40 °C (104 °F))	Limit values for the viscosity grades (mm²/s at 40 °C (104 °F)) min. / max.
ISO VG 2	2.2	1.98 / 2.42
ISO VG 3	3.2	2.88 / 3.52
ISO VG 5	4.6	4.14 / 5.06
ISO VG 7	6.8	6.12 / 7.48
ISO VG 10	10	9.00 / 11.0
ISO VG 15	15	13.5 / 16.5
ISO VG 22	22	19.8 / 24.2
ISO VG 32	32	28.8 / 35.2
ISO VG 46	46	41.4 / 50.6
ISO VG 68	68	61.2 / 74.8
ISO VG 100	100	90.0 / 110
ISO VG 150	150	135 / 165
ISO VG 220	220	198 / 242
ISO VG 320	320	288 / 352
ISO VG 460	460	414 / 506

In acc. with DIN ISO 3448, as of February 2010

Services

Advanced Vacuum Services

Advanced Vacuum Services

Easy, competent, reliable

The optimization of productivity, system availability and overall costs is a challenge you constantly have to deal with to be competitive and successful.

Therefore, service has a central role as a part of the supply chain.

Leybold is available worldwide for you as a reliable and competent partner with its service network.

We accompany your vacuum systems over the entire life cycle with an innovative and comprehensive range of services.

We consider ourselves as part of your value chain. For this reason, we are lined up to respond flexibly to market changes. And we continue to constantly develop ourselves further in order to be jointly successful with you.

Our Service Portfolio



At your disposal all over the world

How to reach us



We are available 24/7 to help you :
+49 221 347 1000

Our staff with its extensive vacuum expertise will define the details of the service requirements together with you:

- Workshop repair

When returning your vacuum component please make sure to always include a completed and signed Declaration of Contamination.

Using our online return form is an easy option to fill in the Declaration of Contamination and print the accompanying shipping documents for your equipment shipment.

https://returns2.leybold.com/en_GB/

- On-site service

After arranging a service appointment our service engineer will visit your site to conduct the required maintenance.

Headquarter Germany

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www.leybold.com

Genuine Spare and Wear Parts



Your pump is delivering top performance day in and day out. Full functionality demands precise matching and accurate coordination between each individual component.

For this reason, demand the genuine spare and wear parts so that you can be sure to attain optimum performance and top quality.

Through our original spare parts we are offering more than only a supply of repair components:

Long life time:

All materials and also the components for maintenance, repair and refurbishing are subject to the highest quality requirements. Doing so we ensure a long, trouble free operation of your vacuum equipment.

Appropriate service kits:

We offer functional spare part kits for custom maintenance and repair work, so that you have all required materials directly at hand and perform this work as simply as possible (for example, a maintenance kit for filter change).

Availability:

With our global service and sales network we ensure the highest possible level of availability of our original parts for our worldwide customers.

On-site Service, Service Points and Service Technology Centers



Leybold maintains throughout the world Service Technology Centers and Service points also in your area.

Our service engineers undergo regular training and are kept abreast of all application specific special features. To ensure a rapid solution in case of problems our technicians carry with them all necessary tools and materials plus the needed genuine Leybold parts.

In our Service Technology Centers we offer vacuum service following global Leybold standards to ensure the highest quality levels. Our technicians are specialists in maintenance, overhaul and repair of your vacuum equipment.

We use worldwide applicable repair standards as well as special tools developed for your vacuum equipment. Moreover, the global Service Technology Centers are also linked to our production and development sites to ensure state of the art vacuum knowledge.

Are you running your vacuum equipment in processes using toxic or acid substances? Our Service Technology Centers have the best equipment available for proper decontamination of your equipment.

You will find an overview of our worldwide locations, as well as up-to-date contact data on our homepage:

www.leybold.com/en/services/

TELEFAX Inquiry

To

Leybold

Telefax +49 (0)221 347-12 50

e-mail:

sales.vacuum@leybold.com

Name:

.....

Company:

.....

Position:

.....

Street:

.....

Code/City:

.....

Phone:

.....

Fax:

.....

e-mail:

.....

For online enquiries please visit our
Online Catalog on the Internet:
www.leybold.com

Please send me an offer for the following products

Part No.	Quantity	Brief Designation

Place / date

Signature

Company stamp



ATEX TELEFAX Inquiry



Necessary information for flame proof vacuum pumps to EC ATEX-directive

Thank you for your interest in our vacuum pumps certified to the ATEX-directive. In order to select a vacuum pump best suited for your application and for legal reasons Leybold needs the following information.

Please answer the questions with care and completely. Please fill in the required information or mark the answers as appropriate. Send the questionnaire by fax or E-Mail to your contact person in Leybold or to your local sales representative. In case of uncertainties or questions please use the following contact data:

Phone: +49 (0)221 347 1112

Fax: +49 (0)221 347 1245

E-Mail: sales.vacuum@leybold.com

Information on the required pump

Please select the required pump type and the needed pumping speed first:

- | | | |
|--|-------|-------------------|
| <input type="checkbox"/> TRIVAC - two stage rotary vane pump | _____ | m ³ /h |
| <input type="checkbox"/> SOGEVAC - single stage rotary vane pump | _____ | m ³ /h |
| <input type="checkbox"/> SCREWLINE - dry compressing screw type pump | _____ | m ³ /h |
| <input type="checkbox"/> RUVAC - roots pump | _____ | m ³ /h |

Information on operating conditions

For this information please refer to your explosion protection document. According to the ATEX-directive 137 (99/92/EC) the user of a plant is obliged to create such a document. In this the zoning has to be specified. Please consider that zoning has to be made separately for the outer environment (installation location) (o) and also for the inside (i) of your plant.

The pump will be installed in an outer environment (o) which is for gases specified as

- | | | | |
|---|---------------------------------|---------------------------------|---------------------------------|
| <input type="checkbox"/> non potentially explosive atmosphere | | | |
| <input type="checkbox"/> potentially explosive atmosphere of | <input type="checkbox"/> zone 0 | <input type="checkbox"/> zone 1 | <input type="checkbox"/> zone 2 |
| <input type="checkbox"/> In addition a certification for dust in zone 2 (cat. 22) is required | | | |

Inside the pump (i) the gas atmosphere is specified as

- | | | | |
|---|---------------------------------|---------------------------------|---------------------------------|
| <input type="checkbox"/> non potentially explosive atmosphere | | | |
| <input type="checkbox"/> potentially explosive atmosphere of | <input type="checkbox"/> zone 0 | <input type="checkbox"/> zone 1 | <input type="checkbox"/> zone 2 |
| <input type="checkbox"/> In addition a certification for dust in zone 2 (cat. 22) is required | | | |

please turn over ...



ATEX TELEFAX Inquiry



Information on pumped products and pump environment

For this information please refer also the Material Safety Data Sheets of the relevant substances. The temperature class means the auto-ignition temperature of the relevant product. For mixtures of products please mark for outside (o) and inside (i) the highest gas class and the lowest auto-ignition temperature.

The pump will be installed in an outer environment (o) with the following gas and temperature classes:

Gas class:	<input type="checkbox"/> IIA	Temperature class:	<input type="checkbox"/> T1 to max. 450 °C
	<input type="checkbox"/> IIB1		<input type="checkbox"/> T2 to max. 300 °C
	<input type="checkbox"/> IIB2		<input type="checkbox"/> T3 to max. 200 °C
	<input type="checkbox"/> IIB3		<input type="checkbox"/> T4 to max. 135 °C
	<input type="checkbox"/> IIB		<input type="checkbox"/> T5 to max. 100 °C
	<input type="checkbox"/> IIC		<input type="checkbox"/> T6 to max. 85 °C

With the pump the following gases (i) will be pumped.
(Name and/or chemical formula - also CAS-No., if available):

The products have a maximum classification of:

Gas class:	<input type="checkbox"/> IIA	Temperature class:	<input type="checkbox"/> T1 to max. 450 °C
	<input type="checkbox"/> IIB1		<input type="checkbox"/> T2 to max. 300 °C
	<input type="checkbox"/> IIB2		<input type="checkbox"/> T3 to max. 200 °C
	<input type="checkbox"/> IIB3		<input type="checkbox"/> T4 to max. 135 °C
	<input type="checkbox"/> IIB		<input type="checkbox"/> T5 to max. 100 °C
	<input type="checkbox"/> IIC		<input type="checkbox"/> T6 to max. 85 °C

Please check if the material of construction of the pump is compatible with the pumped products. This is very important for aggressive, corrosive, toxic or radioactive media. It is also important for the outer environment of the pump. Please refer for material of construction in contact with pumped products to the actual Leybold catalog, pump data sheets and information in the quotation.

Sender: _____

Date: _____

Name: _____

Phone: _____

Company: _____

Fax: _____

Dep.: _____

E-Mail: _____

ZIP/City: _____

Street: _____

City, sign, company stamp

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