

Vacuum Solutions

Application Support

Service



LEYBOLD VACUUM

101.01.02

LEYBOLD VACUUM

PRODUCTS AND
REFERENCE BOOK

2003 04



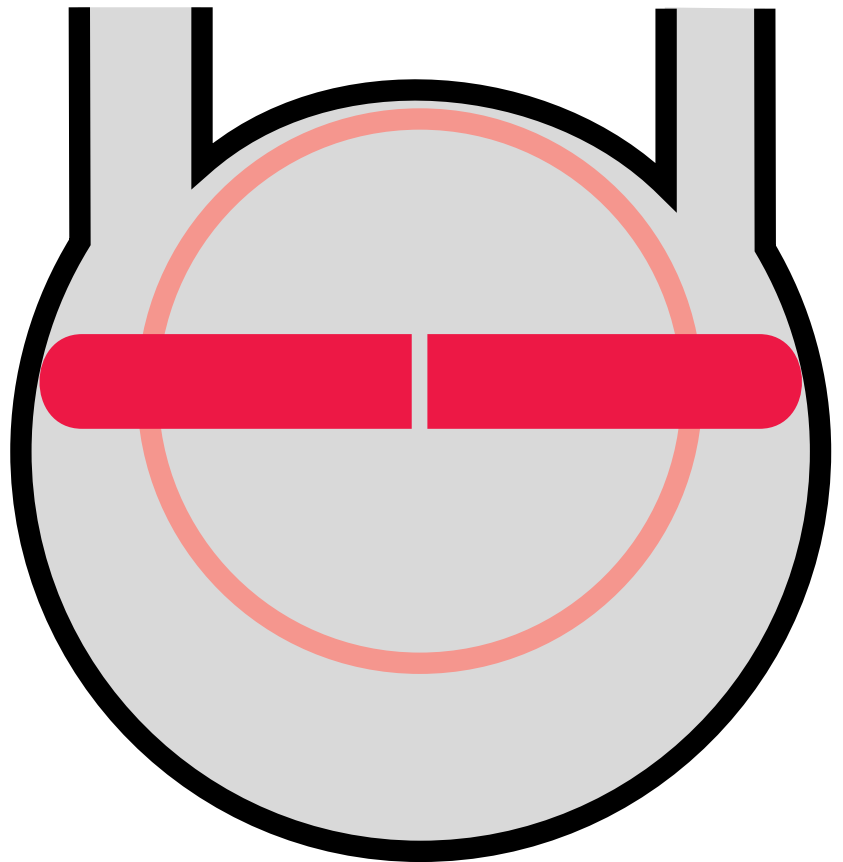
TRIVAC

Rotary Vane Vacuum Pumps, Oil-Sealed,
1.5 to 65 m³ x h⁻¹, (0.7 to 38.3 cfm)

S 1.5, Single-Stage

TRIVAC E, Two-Stage

TRIVAC B, Two-Stage





S 1.5



TRIVAC E



TRIVAC B



TRIVAC BCS

General

Applications and Accessories C01.03

Pumps

Small Compact Pump S 1.5 C01.04

TRIVAC E, Two-Stage Rotary Vane Vacuum Pumps C01.06

TRIVAC D 2.5 E C01.08

TRIVAC B, Two-Stage Rotary Vane Vacuum Pumps C01.10

TRIVAC D 4 B and D 8 B C01.12

TRIVAC D 16 B and D 25 B C01.16

TRIVAC D 40 B and D 65 B C01.20

TRIVAC D 16 B-DOT C01.22

TRIVAC D 16 B-Ex (Explosion Blast Wave Resistant) C01.24

TRIVAC BCS, Two-Stage Rotary Vane Vacuum Pumps C01.26

TRIVAC D 16 BCS to D 65 BCS C01.28

TRIVAC D 16 BCS-PFPE to D 65 BCS-PFPE C01.32

Motor Dependant Data for the TRIVAC B, BCS and BCS-PFPE C01.36

Accessories for TRIVAC E and B

Exhaust Filters AF 8 to AF 25 C01.40

Condensate Traps AK 8 to AK 25 C01.40

Exhaust Filter Drain Tap, Oil Drain Tap, Oil Drain Kit C01.42

Oil Suction Facility Controlled by Solenoid Valve AR-V C01.43

Manually Operated Oil Suction Facility AR-M C01.43

Dust Separators AS 8-16 and AS 30-60 C01.44

Molecular Filters MF 8-16 and MF 30-60 C01.44

Fine Vacuum Adsorption Traps FA 2-4 to FA 30-60 C01.45

Dust Filters FS 2-4 to FS 30-60 C01.46

Cold Trap TK 4-8 C01.47

RST Refillable Traps C01.48

SE Smoke Eliminator C01.49

Compact Oil Mist Exhaust Filter C01.50

Accessories for TRIVAC B

Condensate Traps AK 4-8, AK 16-25, AK 40-65 C01.52

Exhaust Filters AK 4-8, AK 16-25, AK 40-65 C01.53

Exhaust Filters with Lubricant Return ARP 4-8, AR 4-8, AR 16-25, AR 40-65 C01.54

Exhaust Filters with Lubricant Return ARS 16-25 and ARS 40-65 C01.55

Mechanical Oil Filters OF 4-25 and OF 40-65 C01.56

Chemical Oil Filters CF 4-25 and CF 40-65 C01.56

Chemical Oil Filters with Safety Isolation Valve CFS 16-25 and CFS 40-65 C01.57

Inert Gas System, IGS 16-25 and IGS 40-65 C01.58

Limit Switch System LSS 16-25 and LSS 40-65 C01.59

Electrical Indicator System EIS 16-25 and EIS 40-65 C01.60

Roots Pump Adaptor C01.61

Oil Filtering System OF1000 C01.62

General Accessories

Flange Components, Valves C01.64

Oil C01.65

Miscellaneous

60 Hz Curves C01.70

Applications and Accessories

Pumps	Pumps															
	S 1.5	TRIVAC D 2.5 E	TRIVAC D 4 B	TRIVAC D 8 B	TRIVAC D 16 B	TRIVAC D 23 B	TRIVAC D 40 B	TRIVAC D 65 B	TRIVAC D 16 B-DOT	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
Applications																
Production of semiconductors											♦	♦	♦	♦	♦	♦
Vacuum coating			♦	♦	♦	♦										
Research and development	♦	♦	♦	♦	♦	♦										
Chemistry/pharmaceuticals		♦	♦	♦	♦	♦	♦				♦	♦	♦			
Metallurgy/furnaces						♦	♦									
Lamps and tubes manufacture		♦	♦	♦	♦		♦	♦								
Car 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		♦	♦	♦	♦	♦	♦	♦								
Accessories	Page															
AK condensate trap	C01.40/52	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦
AF exhaust filters	C01.40/53		♦	♦	♦	♦	♦	♦	♦	♦		♦	♦	♦		
Exhaust filter drain tap	C01.42		♦													
Oil drain tap	C01.42	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦
Oil drain kit	C01.42	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦
AR-V oil suction facility *)	C01.43		♦													
AR-M oil suction facility *)	C01.43		♦													
AS dust separators	C01.44		♦		♦	♦	♦	♦	♦			♦	♦	♦	♦	♦
MF molecular filters	C01.44		♦	♦	♦	♦	♦	♦	♦			♦	♦	♦	♦	♦
FA fine vacuum adsorption traps	C01.45	♦	♦	♦	♦	♦	♦	♦	♦			♦	♦	♦	♦	♦
FS dust filters	C01.46	♦	♦	♦	♦	♦	♦	♦	♦			♦	♦	♦	♦	♦
TK cold trap	C01.47		♦	♦	♦											
AR exhaust filters with lubricant return	C01.54			♦	♦	♦	♦	♦	♦			♦	♦	♦		
ARS exhaust filters with lubricant return	C01.55											♦	♦	♦	♦	♦
OF mechanical oil filters	C01.56			♦	♦	♦	♦	♦	♦							
CF chemical oil filters	C01.56			♦	♦	♦	♦	♦	♦			♦	♦	♦	♦	♦
CFS chemical oil filters with safety blocking valve	C01.57											♦	♦	♦	♦	♦
IGS inert gas system	C01.58											♦	♦	♦	♦	♦
LSS limit switch system	C01.59											♦	♦	♦	♦	♦
EIS electrical indicator system	C01.60											♦	♦	♦	♦	♦
RIS remote indicator system (remote monitoring)	C01.61											♦	♦	♦	♦	♦
Roots pump adaptors	C01.62							♦	♦				♦	♦		♦
Valves, flange components	C01.64	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦
Vacuum pump oils	C01.65	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦

*) For pumps with gas ballast only

S 1.5 Small Compact Pump



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

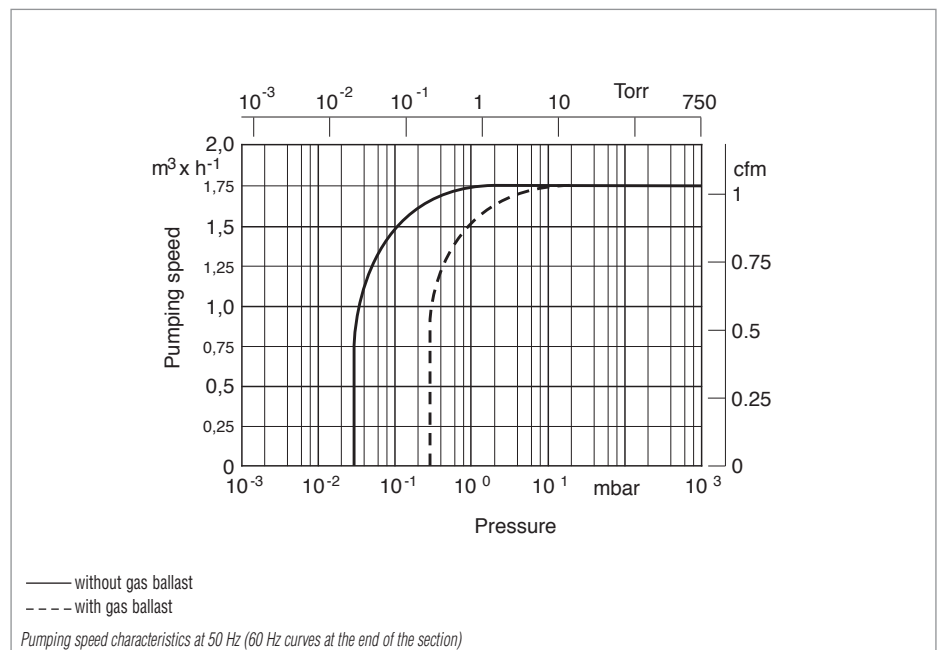
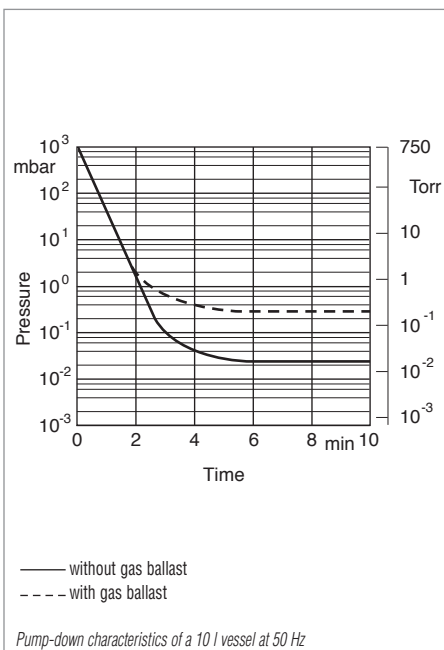
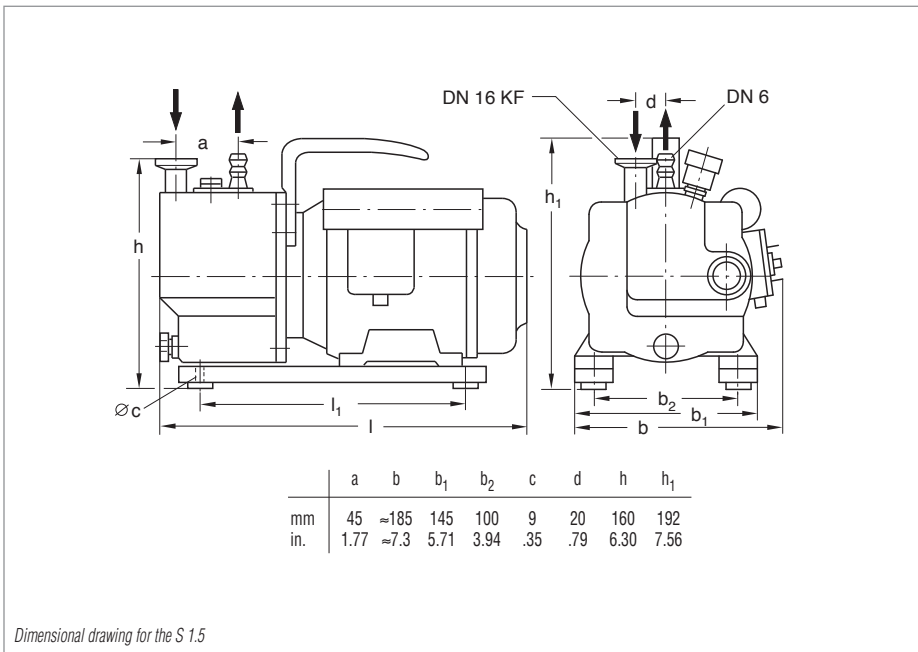
- ◆ Very small and light-weight
- ◆ Low ultimate pressure
- ◆ High water vapor tolerance
- ◆ Low noise operation
- ◆ Simple to connect
- ◆ Easy to maintain and use

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



Technical Data		S 1.5	
		50 Hz	60 Hz
Nominal pumping speed ¹⁾	m ³ x h ⁻¹ (cfm)	1.9 (1.1)	2.3 (1.3)
Pumping speed ¹⁾	m ³ x h ⁻¹ (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)	
Ultimate total pressure with gas ballast ¹⁾	mbar (Torr)	5 x 10 ⁻¹ (3.8 x 10 ⁻¹)	
Water vapor tolerance ¹⁾	mbar (Torr)	> 15 (> 11.3)	
Water vapor capacity	g/h (lbs/hr)	19 (42)	
Oil filling, min./max.	l (qt)	0.11/0.14	
Admissible ambient temperature	°C (°F)	40 (104)	
Motor rating	W (hp)	80 (.11)	
Nominal speed	rpm	1500	1800
Type of protection	IP	54	
Weight	kg (lbs)	10 (22.1)	
Connections,			
Intake	DN	16 KF	
Exhaust	DN	6	

Ordering Information		S 1.5
S 1.5 with AC motor, 230 V (208-252 V ±5%), 50/60 Hz, with 2 m long mains cord and EURO plug		Part No. 101 01
AK 8 condensate trap		Part No. 190 60
Oil drain tap (M 16 x 1.5)		Part No. 190 90
Connection components		
Elbow (1x) DN 16 KF		Part No. 184 36
Centering ring with O-ring (2x) DN 16 KF		Part No. 183 26
Clamping ring (2x) DN 16 KF		Part No. 183 41

¹⁾ To DIN 28 400 and following numbers

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.

New customers' requirements as well as increased environmental requirements gave rise to the further development of the successful range of TRIVAC B pumps.

The result is the new 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.

The new TRIVAC E pump includes also a set of accessories which also fits to the TRIVAC D 4 - 16 B.

Advantages to the User

- ◆ Highly reliable
- ◆ Small and compact
- ◆ Quiet operation
- ◆ Environmentally compatible (low oil consumption, EMI compatible; IP 54 protection)
- ◆ Process quality (little backstreaming of oil)
- ◆ Motors for all standard supply voltages and frequencies
- ◆ Safe and intelligent vacuum protection (hermetically sealed)
- ◆ Free of yellow metals
- ◆ Compliance with international standards (CE, UL and CSA)
- ◆ 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

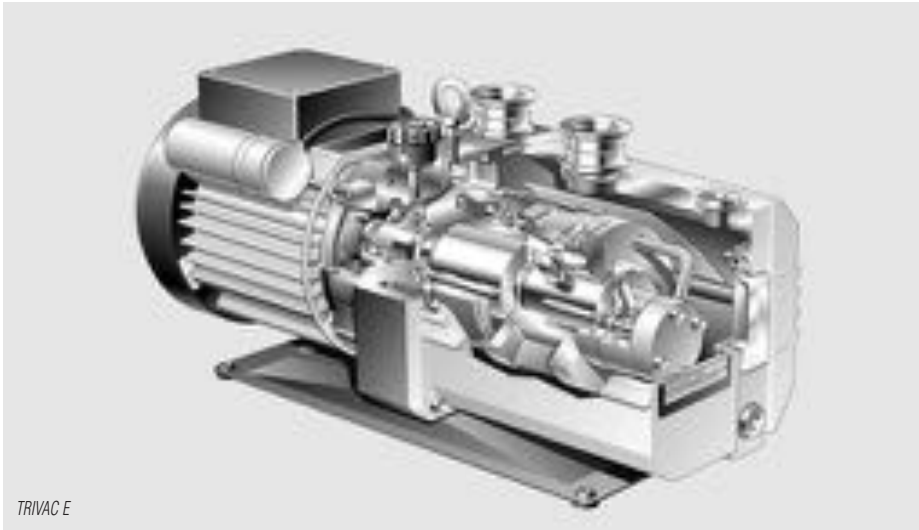
Typical Applications

- ◆ Mass spectrometers
- ◆ Electron beam microscopes
- ◆ Sterilizers
- ◆ Freeze-drying systems
- ◆ Chemical and research labs
- ◆ TV tube
- ◆ General vacuum engineering
- ◆ Backing pump for high vacuum pump systems

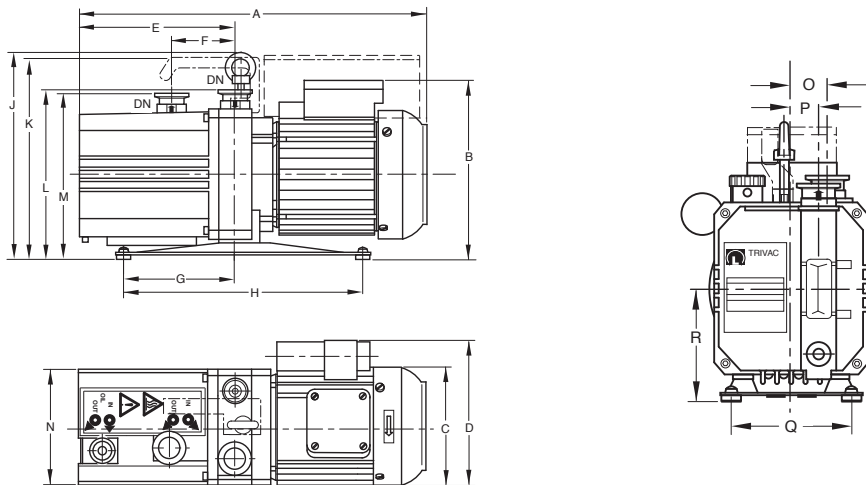
Supplied Equipment

- ◆ Dirt trap
- ◆ Oil filling included separately (standard N 62; special oil HE-200 in the U:S:)
- ◆ Gas ballast device
- ◆ Main cord with the specific plug for Euro, USA and Japan motors
- ◆ Optional: Main cord with country specific plug for the world motor
- ◆ With handle

ALL PUMPS ARE SUBJECTED TO A VACUUM TEST BEFORE DELIVERY!



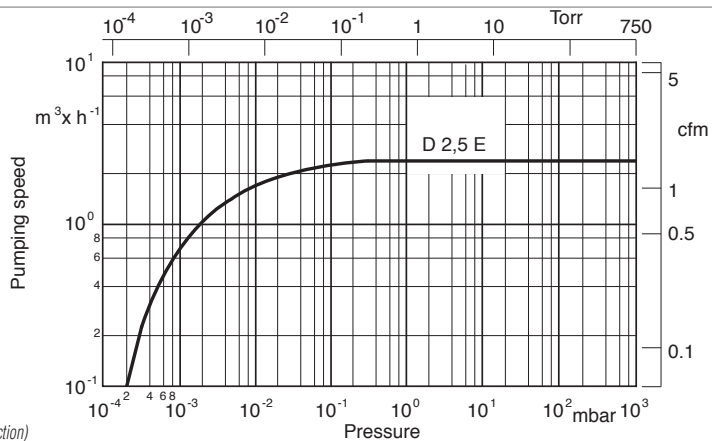
TRIVAC E



	A		B		C		D				E	F	G	H	J	K	L	M	N	O	P	Q	R	DN
	EURO JAP, USA	World 1~	EURO JAP, USA	World 1~	EURO JAP, USA	World 1~	EURO	JAP	USA	World 1~														
mm	388.5	393.5	210.5	227.5	127	127	148.5	153.5	153.5	*	162.5	75.5	119.5	225	231.5	225	182	177	113	27	15	83	84.5	16 KF
in.	15.3	15.7	8.29	8.96	5	5	5.85	6.04	6.04		6.40	2.97	4.70	8.86	9.90	8.86	7.16	6.97	4.45	1.06	.59	3.27	3.33	16 KF

Dimensional drawing for the TRIVAC D 2.5 E

* Condensers in the connection box



Pumping speed of the TRIVAC D 2.5 E at 50 Hz (60 Hz curves at the end of the section)

Technical Data		D 2.5 E	
		50 Hz	60 Hz
Nominal pumping speed ¹⁾	m ³ x h ⁻¹ (cfm)	3.2 (1.9)	3.6 (2.1)
Pumping speed ¹⁾	m ³ x h ⁻¹ (cfm)	2.7 (1.6)	3.3 (1.9)
Ultimate partial pressure without gas ballast	mbar (Torr)	≤ 5 x 10 ⁻⁴ (≤ 3.8 x 10 ⁻⁴)	
Ultimate total pressure without gas ballast ²⁾	mbar (Torr)	≤ 2 x 10 ⁻³ (≤ 1.5 x 10 ⁻³)	
Ultimate total pressure with gas ballast Step 2 ²⁾	mbar (Torr)	≤ 3 x 10 ⁻² (≤ 2.3 x 10 ⁻²)	
Water vapor tolerance			
Step 1	mbar (Torr)	10 (7.5)	
Step 2	mbar (Torr)	20 (15)	
Step 3	mbar (Torr)	30 (22.5)	
Water vapor capacity			
Step 1	gm/h	20	
Step 2	gm/h	40	
Step 3	gm/h	60	
Oil filling, max./min.	l (qt)	0.7/0.4 (0.7/0.4)	
Noise level	dB(A)	≤ 47	
Admissible ambient temperature	°C (°F)	10 to 50 (50 - 122) (EURO motor) / 10 to 40 (50 - 104) (USA/Japan motor)	
Motor rating 50/60 Hz	W (HP)	250 (0.34)	300 (0.41)
Nominal speed 50/60 Hz	rpm	1400	1600
Type of protection	IP	54	
Weight (with oil filling)	kg (lbs)	15.3 (33.7)	
Dimensions (W x H x D)	mm (in.)	127 x 225 x 383 (5 x 8.86 x 15)	
Connections (Intake and Exhaust)	DN	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
Japan	1 ~	100	50/60	+/- 5 %	250/300 (0.34/0.41)	5.5/4.0	IP 54	1400/1600
USA	1 ~	110-120	60	+/- 5 %	300 (0.41)	3.3	IP 54	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	D 2.5 E
TRIVAC E with 1.8 m long mains cord EURO-Version, 1-ph., 220-240 V, 50 Hz; 230 V, 60 Hz Earthed plug UK plug CH plug US version, 1-ph., 110-120 V, 60 Hz, NEMA plug Japan version, 1-ph., 100 V, 50/60 Hz, NEMA plug Single phase world motor (without mains cord) Further variants upon request	Part No. 140 000 Part No. 140 004 Part No. 140 005 Part No. 140 002 Part No. 140 003 Part No. 140 001
Accessories	
Connection cable for single phase world motor 230 V earthed plug 230 V UK plug 230 V CH plug 230 V NEMA plug (200-240 V) 115 V NEMA plug (100-120 V)	Part No. 200 81 091 Part No. 200 81 097 Part No. 200 81 099 Part No. 200 81 141 Part No. 200 81 090
Exhaust filter AF 8	Part No. 190 50
Replacement filter elements for AF 8 (pack of 5) FE 8	Part No. 190 80
Exhaust filter drain tap (G 1/4")	Part No. 190 95
Manual oil return AR-M via gas ballast inlet (kit for AF 8-16)	Part No. 190 93
Oil suction AR-V controlled by a solenoid valve via the gas ballast inlet (kit for AF 8-16)	Part No. 190 92
Condensate trap AK 8	Part No. 190 60
Oil drain tap (M 16 x 1.5)	Part No. 190 90
Oil drain kit (M 16 x 1.5)	Part No. 190 94
Connection components Elbow (1x) DN 16 KF Centering ring with O-ring (2x) DN 16 KF Clamping ring (2x) DN 16 KF	Part No. 184 36 Part No. 183 26 Part No. 183 41
Spare parts	
Maintenance kit 1 (oil separation, oil box seal)	Part No. 200 40 022
Repair set 1 (valves, oil separation, oil box seal)	Part No. 200 40 024
Complete set (oil separation, sealing, wearing parts)	Part No. E 100 000 347
For further accessories see Section "Accessories for TRIVAC E and B"	

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



The TRIVAC B is the logical step ahead within the well-proven TRIVAC concept. Here the performance and the characteristics of the pumps have been adapted without compromise to market requirements. 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 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.

All pumps from the D 4 B to the D 25 B model are equipped either with single-phase AC or three-phase AC motors. D 40 - 65 B models are equipped with three-phase motors. Moreover, all pumps of the B series are available also without the motor.

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

- ◆ 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 (He₃ capable)

Typical Applications

See section "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 main cord and main plug, ready for immediate operation.

Standard TRIVAC B pumps come with a filling of N 62 special oil (HE-200 in the U.S.), others with special oil fillings can be specified.

ALL PUMPS ARE SUBJECTED TO A VACUUM TEST BEFORE DELIVERY!

Custom Models

- ◆ 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)
- ◆ He₃-tight (for cryostats)
- ◆ Special motors

TRIVAC D 16 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.

As to the D 8 B-DOT, D 25 B-DOT and D 40 B-DOT please ask us for a quotation.

Advantages to the User

- ◆ Matching exhaust filters with EPDM gaskets (AF-DOT)
- ◆ Except for the seals and the operating agent 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

- ◆ Oil fill screws have been screwed out and are included separately (European pumps only)
- ◆ Pump is supplied in an air-tight bag containing silica gel (European pumps only)
- ◆ The remaining quantity of brake fluid (0.7 l) is supplied separately in a bottle

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



Today the manufacturers of modern air-conditioning and refrigerating equipment must be capable of reliably complying with the relevant standards.

For the new flammable refrigerants propane and isobutane (R 290 and R 600a) and their mixtures, any risk of personal injury in the event of an explosion must be avoided. This is to comply with the European safety regulations for compressors and vacuum pumps EN 1012 in force since January 1, 1995.

Due to the pressure burst resistant design, such a hazard to persons or equipment can be excluded in the case of explosions.

Flame arresters on the intake and the exhaust sides prevent the propagation of an explosion to upstream or downstream parts of the system.

Advantages to the User

- ◆ Pressure burst resistant (12 bar abs. (160 psi, gauge) test pressure)

Typical Applications

- ◆ Application in the refrigerating and air-conditioning and cooling industry, for pumping of R 290 and R 600 a **only**.

ATEX products upon request!

Supplied Equipment

- ◆ Including pressure burst resistant exhaust filter AF 16-25
- ◆ Without flame arresters

Technical Note

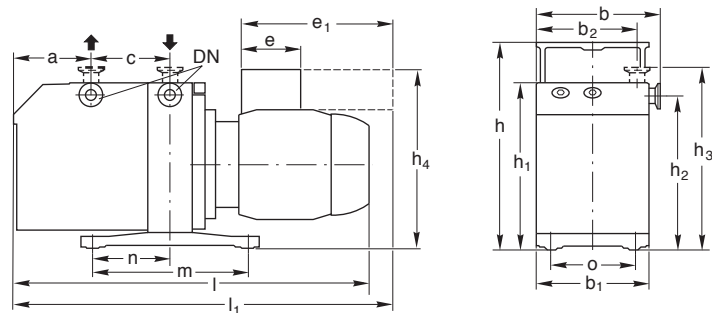
For approval regarding other flammable substances please ask for a quotation.

All TRIVAC B pumps are available with explosion protected motors.

TRIVAC D 4 B and D 8 B



TRIVAC D 8 B

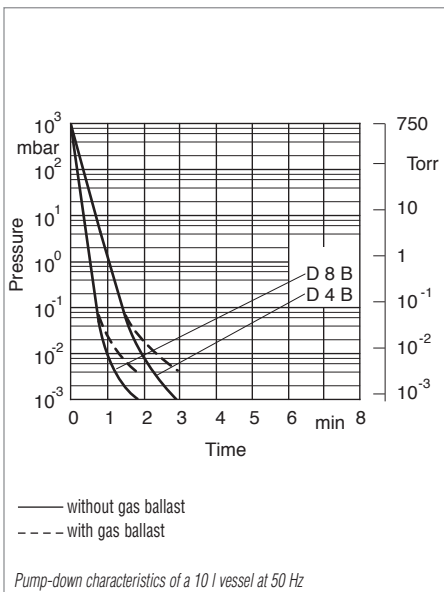


* Depending on the motor

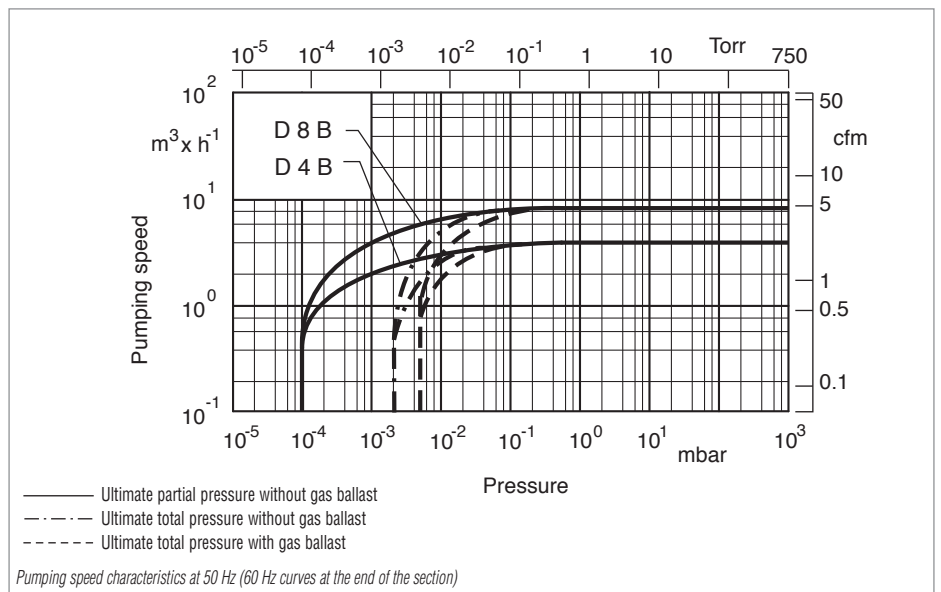
USA pumps max. length
 D 4 B 485 mm (19.1")
 D 8 B 555 mm (21.9")

Type	DN	a	b	b ₁	b ₂	c	e	e ₁	h	h ₁	h ₂	h ₃	h ₄	l	l ₁	m	n	o	
D 4 B (Part No. 113 04, 113 08, 113 09)	16 KF	mm	75	162	147	132	100	-	170	265	215	200	230	259	-	455	198	99	108
	in.		2.95	6.38	5.79	5.23	3.94	-	6.69	10.43	8.46	7.87	9.06	10.20	-	17.91	7.80	3.90	4.25
D 4 B (Part No. 113 03, 112 45)	16 KF	mm	75	162	147	132	100	102	-	265	215	200	230	234	437	-	198	99	108
	in.		2.95	6.38	5.79	5.23	3.94	4.02	-	10.43	8.46	7.87	9.06	9.21	17.21	-	7.80	3.90	4.25
D 4 B (Part No. 112 46)	16 KF	mm	75	162	147	132	100	89	-	265	215	200	230	223	438	-	198	99	108
	in.		2.95	6.38	5.79	5.23	3.94	3.5	-	10.43	8.46	7.87	9.06	8.78	17.24	-	7.80	3.90	4.25
D 8 B (Part No. 113 14, 113 18, 113 21)	16 KF	mm	100	162	147	132	100	-	170	265	215	200	230	259	-	480	198	99	108
	in.		3.94	6.38	5.79	5.23	3.94	-	6.69	10.43	8.46	7.87	9.06	10.20	-	18.90	7.80	3.90	4.25
D 8 B (Part No. 113 13, 113 55)	16 KF	mm	100	162	147	132	100	102	-	265	215	200	230	234	462	-	198	99	108
	in.		3.94	6.38	5.79	5.23	3.94	4.02	-	10.43	8.46	7.87	9.06	9.21	18.19	-	7.80	3.90	4.25
D 8 B (Part No. 113 56)	16 KF	mm	100	162	147	132	100	89	-	265	215	200	230	223	463	-	198	99	108
	in.		3.94	6.38	5.79	5.23	3.94	3.5	-	10.43	8.46	7.87	9.06	8.78	18.23	-	7.80	3.90	4.25

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 section)

Technical Data		TRIVAC D 4 B		TRIVAC D 8 B	
		50 Hz	60 Hz	50 Hz	60 Hz
Nominal pumping speed ¹⁾	m ³ x h ⁻¹ (cfm)	4.8 (2.8)	5.8 (3.4)	9.7 (5.7)	11.6 (6.9)
Pumping speed ¹⁾	m ³ x h ⁻¹ (cfm)	4.2 (2.5)	5 (3)	8.5 (5)	10.2 (6)
Ultimate partial pressure without gas ballast ¹⁾	mbar (Torr)	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)			
Ultimate total pressure with gas ballast ¹⁾	mbar (Torr)	< 5 x 10 ⁻³ (< 3.8 x 10 ⁻³)			
Water vapor tolerance ¹⁾	mbar (Torr)	30 (22.5)		25 (18.8)	
Water vapor capacity	gm/h	93		157	
Oil filling, min./max.	l (qt)	0.3 / 0.8 (.3 / .85)		0.3 / 0.9 (.3 / .95)	
Noise level ²⁾ to DIN 45 635, without/with gas ballast	dB(A)	50 / 52			
Admissible ambient temperature	°C (°F)	12 - 40 (54 - 104)			
Motor rating ²⁾	W (HP)	370 (.50)			
Nominal speed	rpm	1500	1800	1500	1800
Type of protection ³⁾	IP	54			
Weight ²⁾	kg (lbs)	18.7 (41.2)		21.2 (46.7)	
Connections, Intake and Exhaust	DN	16 KF			

¹⁾ To DIN 28 400 and following numbers

²⁾ Weight, motor rating and noise levels for the pumps with 230 V, 50 Hz AC motor only.

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

³⁾ Global versions only. North and South American versions are TEFC

Version for the North and South American Continents

Ordering Information	TRIVAC D 4 B two-stage	TRIVAC D 8 B two-stage
TRIVAC B, with 1-phase motor 115 V, 60/50 Hz, NEMA plug 208-230 V, 60/50 Hz, NEMA plug with 3-phase motor 208-230/460 V, 60 Hz / 200-220/380 V, 50 Hz	Part No. 912 45-1 Part No. 912 45-2 Part No. 912 46-2	Part No. 912 55-1 Part No. 912 55-2 Part No. 912 56-2

Global Version

Ordering Information	TRIVAC D 4 B two-stage	TRIVAC D 8 B two-stage
TRIVAC B, with 1-phase motor 230 V, 50 Hz 230 V, 50/60 Hz 115 V, 60 Hz 100 V, 50 Hz / 110 V, 60 Hz 100 V, 50 Hz / 110 V, 60 Hz with 3-phase motor 230/400 V, 50 Hz / 250/440 V, 60 Hz 230/400 V, 50 Hz, Exe II T3	Part No. 112 45 Part No. 113 09 Part No. 113 03 Part No. 113 04 Part No. 113 08 (SHC 224) Part No. 112 46 Part No. 113 06	Part No. 112 55 Part No. 113 21 Part No. 113 13 Part No. 113 14 Part No. 113 18 (SHC 224) Part No. 112 56 Part No. 113 16

Accessories

FS 2-4 dust filter	Part No. 186 05
FA 2-4 fine vacuum adsorption trap	Part No. 187 05
Adsorption trap with aluminium oxide Activated aluminium oxide, 1.3 kg (2 l approx.)	Part No. 854 14 Part No. 854 10
TK 4-8 cold trap	Part No. 188 20
AF 4-8 exhaust filter	Part No. 189 06
AR 4-8 exhaust filter with lubricant return	Part No. 189 20
AK 4-8 condensate trap	Part No. 188 06
OF 4-25 mechanical oil filter	Part No. 101 91
CF 4-25 chemical oil filter	Part No. 101 96
Connector for gas ballast inlet M 16 x 1.5 – DN 16 KF	Part No. 168 40
Oil drain tap M 16 x 1.5	Part No. 190 90

Spare parts

Inside section	Part No. E 200 10 989	Part No. E 200 10 991
Seal kit	Part No. 197 20	

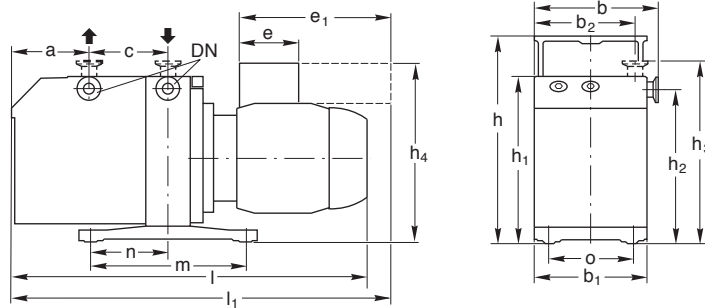
Notes

C01

TRIVAC D 16 B and D 25 B



TRIVAC D 25 B



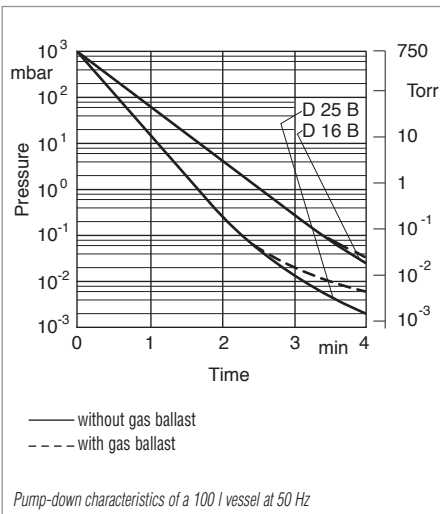
* Depending on the motor

USA pumps max. length
 D 16 B 560 mm (22.1")
 D 25 B 660 mm (26")

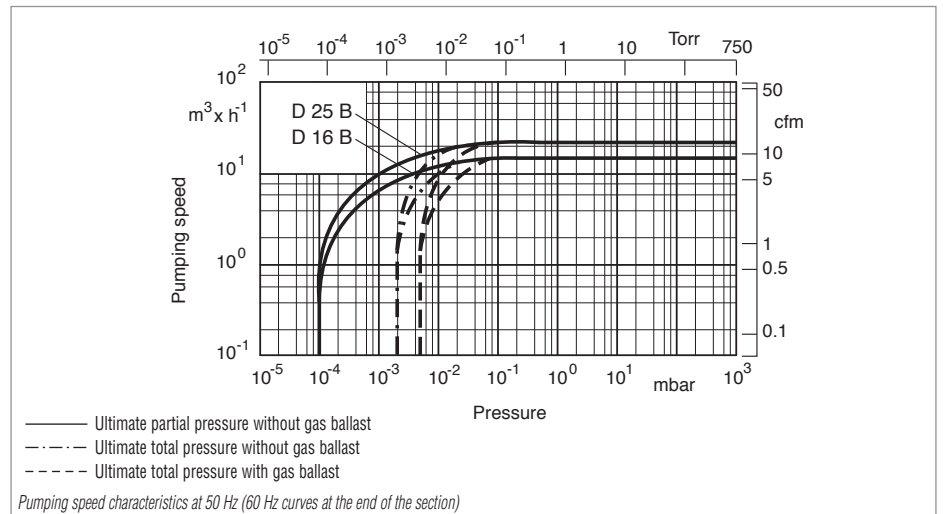
Type	DN	a	b	b ₁	b ₂	c	e	e ₁	h	h ₁	h ₂	h ₃	h ₄	l	l ₁	m	n	o
D 16 B (Part No. 113 25, 113 29)	25 KF mm	82	190	177	150	135	-	266	298	250	226	263	271	-	566	280	140	132
	in.	3.23	7.48	6.97	5.91	5.32	-	10.47	11.73	9.84	8.90	10.35	10.67	-	22.28	11.02	5.51	5.20
D 16 B (Part No. 112 65)	25 KF mm	82	190	175	150	135	-	170	298	250	226	263	274	-	507	280	140	132
	in.	3.23	7.48	6.89	5.91	5.32	-	6.69	11.73	9.84	8.90	10.35	10.79	-	19.96	11.02	5.51	5.20
D 16 B (Part No. 112 66, 113 33)	25 KF mm	82	190	175	150	135	89	-	298	250	226	263	236	490	-	280	140	132
	in.	3.23	7.48	6.89	5.91	5.32	3.50	-	11.73	9.84	8.90	10.35	9.29	19.29	-	11.02	5.51	5.20
D 16 B (Part No. 113 27)	25 KF mm	82	190	175	150	135	u. r.	u. r.	u. r.	u. r.	u. r.	u. r.	u. r.	u. r.	u. r.	u. r.	u. r.	u. r.
	in.	3.23	7.48	6.89	5.91	5.32	u. r.	u. r.	u. r.	u. r.	u. r.	u. r.	u. r.	u. r.	u. r.	u. r.	u. r.	u. r.
D 16 B (Part No. 113 34)	25 KF mm	82	190	175	150	135	111	-	298	250	226	263	262	507	-	280	140	132
	in.	3.23	7.48	6.89	5.91	5.32	4.37	-	11.73	9.84	8.90	10.35	10.32	19.96	-	11.02	5.51	5.20
D 25 B (Part No. 113 36, 113 39, 112 75)	25 KF mm	142	190	177	150	135	-	266	298	250	226	263	271	-	626	280	140	132
	in.	5.59	7.48	6.97	5.91	5.32	-	10.47	11.73	9.84	8.90	10.35	10.67	-	24.65	11.02	5.51	5.20
D 25 B (Part No. 112 76)	25 KF mm	142	190	177	150	135	111	-	298	250	226	263	262	566	-	280	140	132
	in.	5.59	7.48	6.97	5.91	5.32	4.37	-	11.73	9.84	8.90	10.35	10.32	22.28	-	11.02	5.51	5.20
D 25 B (Part No. 112 37)	25 KF mm	142	190	177	150	135	u. r.	u. r.	u. r.	u. r.	u. r.	u. r.	u. r.	u. r.	u. r.	u. r.	u. r.	u. r.
	in.	5.59	7.48	6.97	5.91	5.32	u. r.	u. r.	u. r.	u. r.	u. r.	u. r.	u. r.	u. r.	u. r.	u. r.	u. r.	u. r.

Dimensional drawing for the TRIVAC D 16 and D 25 B

u. r. = upon request



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 section)

Technical Data		TRIVAC D 16 B		TRIVAC D 25 B	
		50 Hz	60 Hz	50 Hz	60 Hz
Nominal pumping speed ¹⁾	m ³ x h ⁻¹ (cfm)	18.9 (11.1)	22.7 (13.4)	29.5 (17.4)	35.4 (20.9)
Pumping speed ¹⁾	m ³ x h ⁻¹ (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)			
Ultimate total pressure without gas ballast ¹⁾	mbar (Torr)	< 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)			
Water vapor tolerance ¹⁾	mbar (Torr)	25 (18.8)			
Water vapor capacity	gm/h	305		476	
Oil filling, min./max.	l (qt)	0.5 / 1.0 (0.5 / 1.1)		0.6 / 1.4 (0.6 / 1.5)	
Noise level ²⁾ to DIN 45 635, without/with gas ballast	dB(A)	52 / 54			
Admissible ambient temperature	°C (°F)	12 - 40 (54 - 104)			
Motor rating ²⁾	W (HP)	750 (1)			
Nominal speed	rpm	1500	1800	1500	1800
Type of protection ³⁾	IP	54			
Weight ²⁾	kg (lbs)	26 (57.3)		32 (70.6)	
Connections, Intake and Exhaust	DN	25 KF			

¹⁾ To DIN 28 400 and following numbers

²⁾ Weight, motor rating and noise levels for the pumps with AC motor, 50 Hz, only.
Any data that deviate from the above for pumps with other motors, and other motor-dependent data are given in section "Products", paragraph "Motor Dependent Data for the TRIVAC B, BCS and BCS-PFPE"

³⁾ Global versions only. North and South American versions are TEFC

Version for the North and South American Continents

Ordering Information	TRIVAC D 16 B two-stage	TRIVAC D 25 B two-stage
TRIVAC B, with 1-phase motor 115 V, 60/50 Hz, NEMA plug 208-230 V, 60/50 Hz, NEMA plug with 3-phase motor 208-230/460 V, 60 Hz / 200-220/380 V, 50 Hz	Part No. 912 65-1 Part No. 912 65-2 Part No. 912 66-2	- Part No. 912 75-2 Part No. 912 76-2

Global Version

Ordering Information	TRIVAC D 16 B two-stage	TRIVAC D 25 B two-stage
TRIVAC B, with 1-phase motor 230 V, 50 Hz 230 V, 50/60 Hz 100 V, 50 Hz / 110 V, 60 Hz 100 V, 50 Hz / 110 V, 60 Hz 115 V, 60 Hz 115 V, 60/50 Hz, NEMA plug 208-230 V, 60/50 Hz, NEMA plug with 3-phase motor 230/400 V, 50 Hz / 250/440 V, 60 Hz 230/400 V, 50 Hz / 250/440 V, 60 Hz 230/400 V, 50 Hz, Exe II T3 200/346 V, 50 Hz / 208/360 V, 60 Hz 208-230/460 V, 60 Hz / 200-220/380 V, 50 Hz	Part No. 112 65 Part No. 113 25 - Part No. 113 29 (SHC 224) - Part No. 912 65-1 Part No. 912 65-2 Part No. 112 66 Part No. 113 33 (RCF - E68N) Part No. 113 27 Part No. 113 34 (RCF - E68N) Part No. 912 66-2	Part No. 112 75 Part No. 113 35 Part No. 113 36 Part No. 113 39 (SHC 224) Part No. 113 48 - Part No. 912 75-2 Part No. 112 76 - Part No. 113 37 - Part No. 912 76-2

Accessories

FS 8-16 dust filter	Part No. 186 10
AS 8-16 dust separator	Part No. 186 11
MF 8-16 molecular filter	Part No. 186 12
FA 8-16 fine vacuum adsorption trap	Part No. 187 10
Adsorption trap with aluminium oxide Activated aluminium oxide, 1.3 kg (2 l approx.)	Part No. 854 15 Part No. 854 10
AF 16-25 exhaust filter	Part No. 189 11
AR 16-25 exhaust filter with lubricant return	Part No. 189 21
AK 16-25 condensate trap	Part No. 188 11
OF 4-25 mechanical oil filter	Part No. 101 91
CF 4-25 chemical oil filter	Part No. 101 96
Connector for gas ballast inlet M 16 x 1.5 – DN 16 KF	Part No. 168 40
Oil drain tap	Part No. 190 90

Spare parts

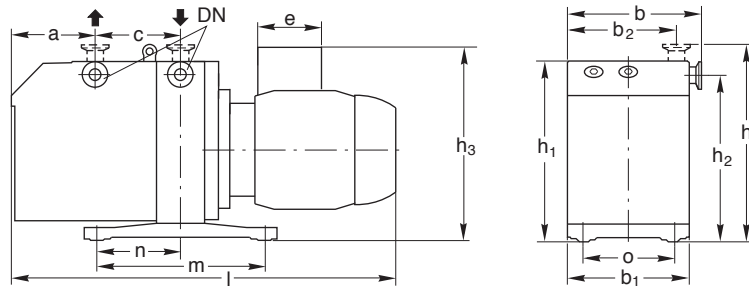
Inside section	Part No. E 200 10 956	Part No. E 200 10 960
Seal kit	Part No. 197 21	

Notes

TRIVAC D 40 B and D 65 B



TRIVAC D 65 B



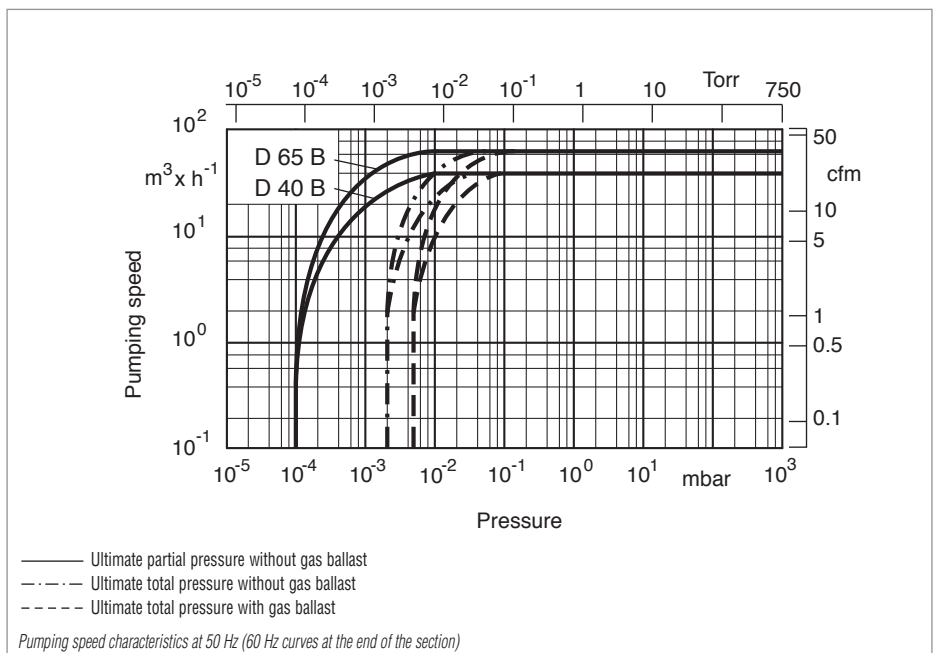
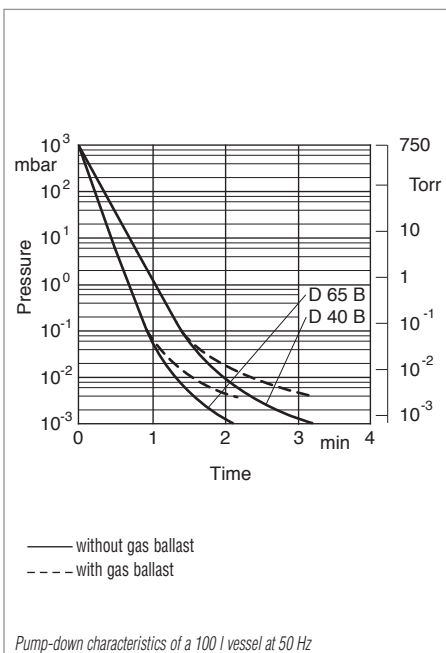
* Depending on the motor

USA pumps max. length
D 40 B 760 mm (30")
D 65 B 840 mm (33.1")

Type	DN	a	b	b ₁	b ₂	c	e	h	h ₁	h ₂	h ₃	l	m	n	o	
D 40 B (Part No. 112 86)	40 KF	mm	135	264	234	206	166	111	355	336	308	302	676	382	191	190
		in.	5.32	10.39	9.21	8.11	6.54	4.37	13.98	13.23	12.13	11.89	26.61	15.04	7.52	7.48
D 40 B (Part No. 113 45)	40 KF	mm	135	264	234	206	166	u. r.	u. r.	u. r.	u. r.	u. r.	u. r.	382	191	190
		in.	5.32	10.39	9.21	8.11	6.54	u. r.	u. r.	u. r.	u. r.	u. r.	u. r.	15.04	7.52	7.48
D 40 B (Part No. 113 47)	40 KF	mm	135	264	234	206	166	111	355	336	308	302	667	382	191	190
		in.	5.32	10.39	9.21	8.11	6.54	4.37	13.98	13.23	12.13	11.89	26.26	15.04	7.52	7.48
D 65 B (Part No. 112 96, 113 57)	40 KF	mm	213	264	234	206	166	111	355	336	308	302	750	382	191	190
		in.	8.39	10.39	9.21	8.11	6.54	4.37	13.98	13.23	12.13	11.89	29.53	15.04	7.52	7.48
D 65 B (Part No. 113 55)	40 KF	mm	213	264	234	206	166	u. r.	u. r.	u. r.	u. r.	u. r.	u. r.	382	191	190
		in.	8.39	10.39	9.21	8.11	6.54	u. r.	u. r.	u. r.	u. r.	u. r.	u. r.	15.04	7.52	7.48

Dimensional drawing for the TRIVAC D 40 and D 65 B

u. r. = upon request



Technical Data		TRIVAC D 40 B		TRIVAC D 65 B	
		50 Hz	60 Hz	50 Hz	60 Hz
Nominal pumping speed ¹⁾	m ³ x h ⁻¹ (cfm)	46 (27)	55 (32.5)	75 (44)	90 (53)
Pumping speed ¹⁾	m ³ x h ⁻¹ (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)			
Ultimate total pressure without gas ballast ¹⁾	mbar (Torr)	< 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)			
Water vapor tolerance ¹⁾	mbar (Torr)	40 (30)			
Water vapor capacity	gm/h	1184		1925	
Oil filling, min./max.	l (qt)	1.7 / 2.6 (1.8 / 2.7)		2.0 / 3.3 (2.1 / 3.5)	
Noise level ²⁾ to DIN 45 635, without/with gas ballast	dB(A)	57/59			
Admissible ambient temperature	°C (°F)	12 - 40 (54 - 104)			
Motor rating ²⁾	W (HP)	2200 (3)			
Nominal speed	rpm	1500	1800	1500	1800
Type of protection ³⁾	IP	54			
Weight ²⁾	kg (lbs)	68 (150)		80 (177)	
Connections, Intake and Exhaust	DN	40 KF			

Version for the North and South American Continents

Ordering Information	TRIVAC D 40 B two-stage	TRIVAC D 65 B two-stage
TRIVAC B, with 3-phase motor 208-230/460 V, 60 Hz / 200-220/380 V, 50 Hz	Part No. 912 86-2	Part No. 912 96-2

Global Version

Ordering Information	TRIVAC D 40 B two-stage	TRIVAC D 65 B two-stage
TRIVAC B, with 3-phase motor 230/400 V, 50 Hz / 250/440 V, 60 Hz 230/400 V, 50 Hz, Exe II T3 200/346 V, 50 Hz / 208/360 V, 60 Hz	Part No. 112 86 Part No. 113 45 Part No. 113 47	Part No. 112 96 Part No. 113 55 Part No. 113 57

Accessories	
Roots pump adaptor	Part No. 168 30
FS 30-60 dust filter	Part No. 18615
AS 30-60 dust separator	Part No. 186 16
MF 30-60 molecular filter	Part No. 186 17
FA 30-60 fine vacuum adsorption trap	Part No. 187 15
Adsorption trap with aluminium oxide Activated aluminium oxide, 1.3 kg (2 l approx.)	Part No. 854 16 Part No. 854 10
AF 40-65 exhaust filter	Part No. 189 16
AR 40-65 exhaust filter with lubricant return	Part No. 189 22
AK 40-65 condensate trap	Part No. 188 16
OF 40-65 mechanical oil filter	Part No. 101 92
CF 40-65 chemical oil filter	Part No. 101 97
Connector for gas ballast inlet M 16 x 1.5 – DN 16 KF	Part No. 168 40
Oil drain tap	Part No. 190 90
Spare parts	
Inside section	Part No. E 200 10 933 Part No. E 200 10 944
Seal kit	Part No. 197 22

¹⁾ To DIN 28 400 and following numbers

²⁾ Weight, motor rating and noise levels for the pumps with 3-phase motor, 50 Hz, only.

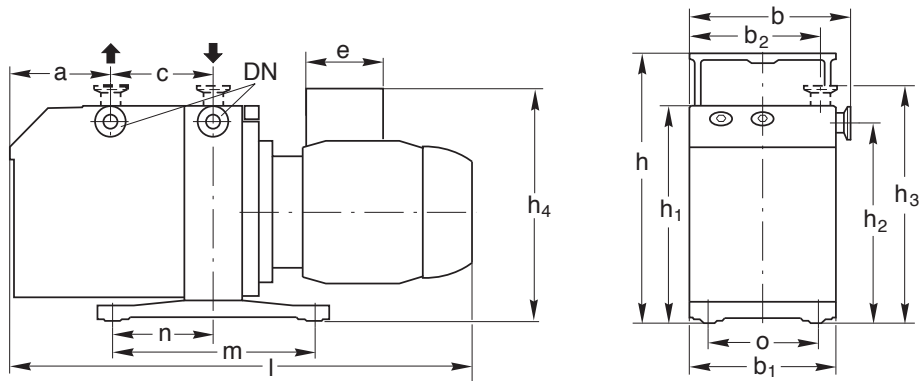
Any data that deviate from the above for pumps with other motors, and other motor-dependent data are given in section "Products", paragraph "Motor Dependent Data for the TRIVAC B, BCS and BCS-PFPE"

³⁾ Global versions only. North and South American versions are TEFC

TRIVAC D 16 B-DOT

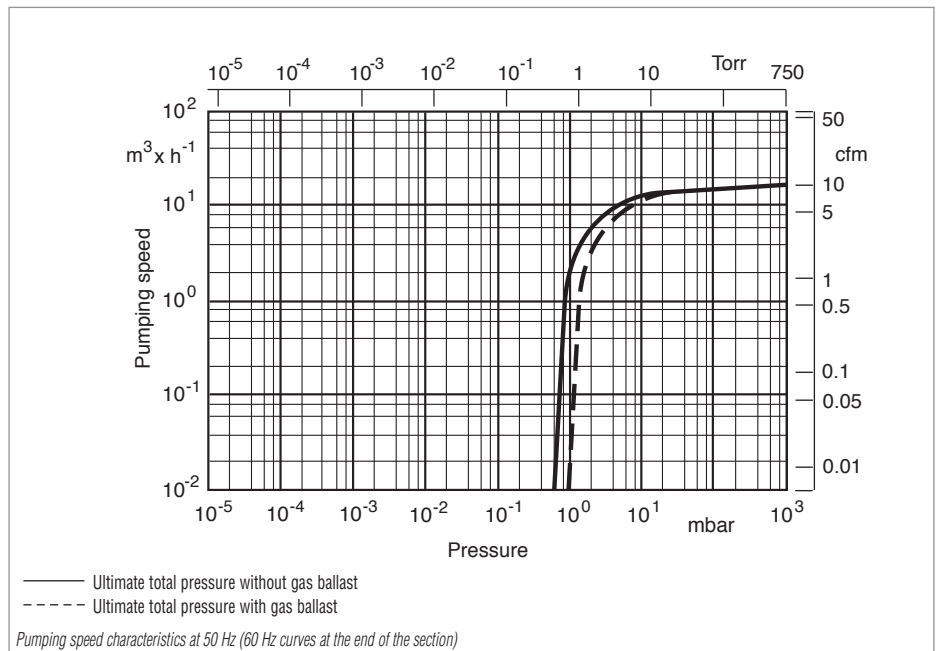
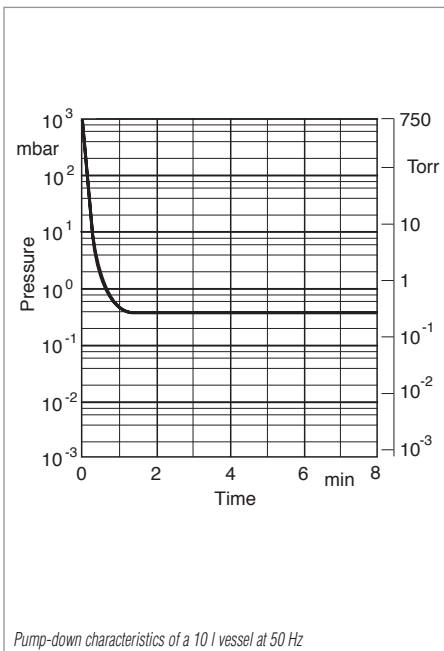


TRIVAC D 16 B-DOT



Type	DN	a	b	b ₁	b ₂	c	h	h ₁	h ₂	h ₃	l	m	n	o	
D 16 B-DOT (Part No. 114 06/10)	25 KF	mm	82	190	175	150	135	298	250	226	265	482	280	140	132
		in.	3.23	7.48	6.89	5.91	5.31	11.7	9.84	8.90	10.4	19	11	5.51	5.20

Dimensional drawing for the TRIVAC D 16 B-DOT



Technical Data		TRIVAC D 16 B-DOT	
		50 Hz	60 Hz
Nominal pumping speed ¹⁾	m ³ x h ⁻¹ (cfm)	18.9 (11.1)	22.7 (13.4)
Pumping speed ¹⁾	m ³ x h ⁻¹ (cfm)	16.5 (9.7)	19.8 (11.7)
Ultimate partial pressure without gas ball. ¹⁾	mbar (Torr)	-	
Ultimate total pressure without gas ballast ¹⁾	mbar (Torr)	< 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)	
Water vapor tolerance ¹⁾	mbar (Torr)	25 (18.75)	
Water vapor capacity	gm/h	259	
Brake fluid filling, min./max.	l (qt)	0.45 / 1.0 (0.5 / 1.1)	
Noise level to DIN 45 635, without/with gas ballast	dB(A)	52 / 52	
Admissible ambient temperature	°C (°F)	12 - 40 (54 - 104)	
Motor rating	W (HP)	550 (0.75)	
Nominal speed	rpm	1500	1800
Type of protection ²⁾	IP	54	
Weight	kg (lbs)	26 (57.3)	
Connections, Intake and Exhaust	DN	25 KF	

Ordering Information	TRIVAC D 16 B-DOT	
	Global version	North and South America version
TRIVAC B-DOT, with 3-phase motor 230/400 V, 50 Hz; 250/440 V, 60 Hz 230/400 V, 50 Hz; 250/440 V, 60 Hz with 1-phase motor 115 V, 60 Hz with 3-phase motor 208-230/460 V, 60 Hz 208-220/380 V, 50 Hz	Part No. 114 06 Part No. 114 10 (with float switch)	Part No. 914 62 Part No. 914 63
AF 16-25 DOT exhaust filter	Part No. 124 16	
Seal kit	Part No. 200 39 059	

¹⁾ To DIN 28 400 and following numbers

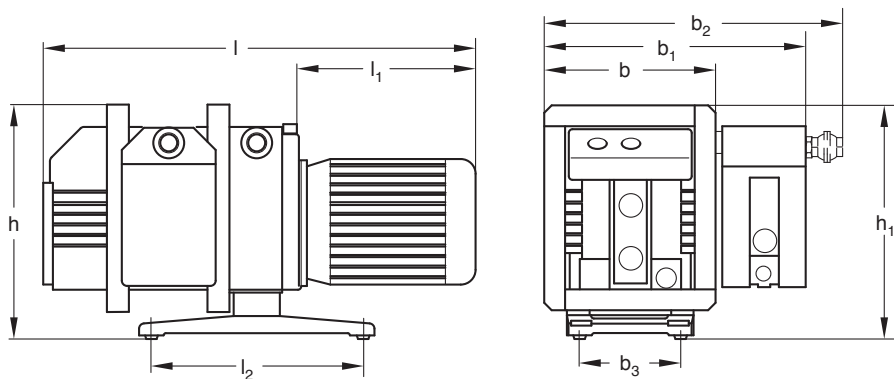
²⁾ Global versions only. North and South American versions are TEFC

As to the D 8 B-DOT, D 25 B-DOT and D 40 B-DOT please ask us for a quotation.

TRIVAC D 16 B-Ex (Explosion Blast Wave Resistant)

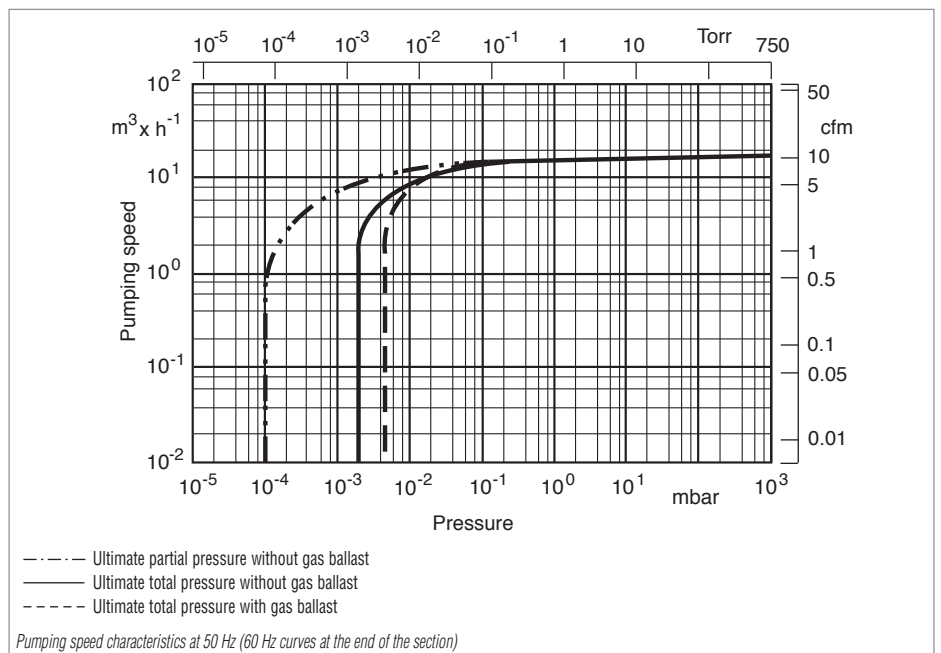
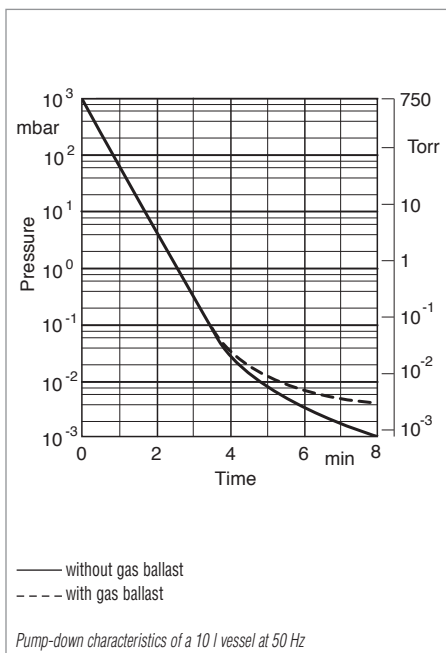


TRIVAC D 16 B-Ex



Type		b	b ₁	b ₂	b ₃	h	h ₁	l	l ₁	l ₂
D 16 B-Ex	mm	230	362	405	132	310	250	578	232	280
	in.	9.06	14.3	15.9	5.20	12.2	9.84	22.8	9.13	11

Dimensional drawing for the TRIVAC 16 B-Ex (explosion blast wave resistant)



TRIVAC D 16 B-Ex (Explosion Blast Wave Resistant) Two-Stage

Technical Data		
Nominal pumping speed ¹⁾	m ³ x h ⁻¹ (cfm)	18.9 (11.1)
Pumping speed ¹⁾	m ³ x h ⁻¹ (cfm)	16.5 (9.7)
Ultimate partial pressure without gas ballast ¹⁾	mbar (Torr)	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)
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 (18.75)
Water vapor capacity	gm/h	305
Oil filling, min./max.	l (qt)	0.45 / 1.0 (0.5 / 1.1)(N 62)
Noise level to DIN 45 635, without/with gas ballast	dB(A)	52 / 54
Admissible ambient temperature	°C (°F)	12 - 40 (54 - 104)
Motor rating	W (HP)	750 (1)
Nominal speed	rpm	1500
Type of protection	IP	54
Weight with flame arresters	kg (lbs)	50 (110.3)
Connections intake side	Inside thread	G 3/4"
pressure side	Inside thread	G 1"

Ordering Information

TRIVAC D 16 B-Ex (Explosion Blast Wave Resistant) Two-Stage

TRIVAC D 16 B-Ex (according to 94/9 EC) ²⁾

TRIVAC D 16 B-Ex (for propane and butane only) ³⁾

with explosion protected 3-phase motor
(Exe II T 3) 230/400 V, 50 Hz,
includes AF 16-25 exhaust filter,
specially modified for burst resistant

Upon request

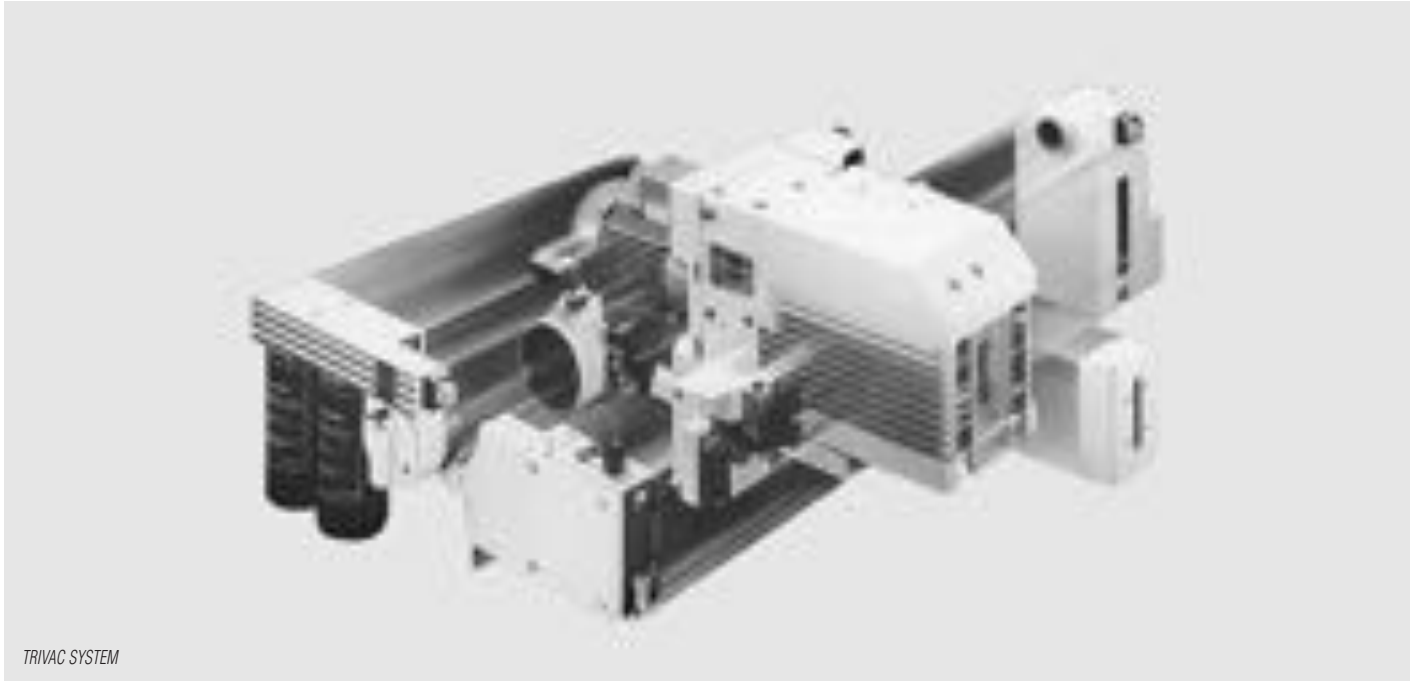
Part No. 113 30

¹⁾ To DIN 28 400 and following numbers

²⁾ Available in June 2003

³⁾ The pump is checked at pressures up to 12 bar absolute (160 psi, gauge)

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 TRIVAC BCS are available with a three-phase motor (The North and South American TRIVAC D 16/25 BCS are also available with single-phase motors). 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 cryo pumps

Supplied Equipment

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

BCS pumps are supplied with a filling of mineral oil N 62, HE-200 oil or perfluoropolyether (PFPE) synthetic oil.

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 and
- ◆ EIS, electrical indicator system

make up the TRIVAC SYSTEM.

TRIVAC BCS-PFPE

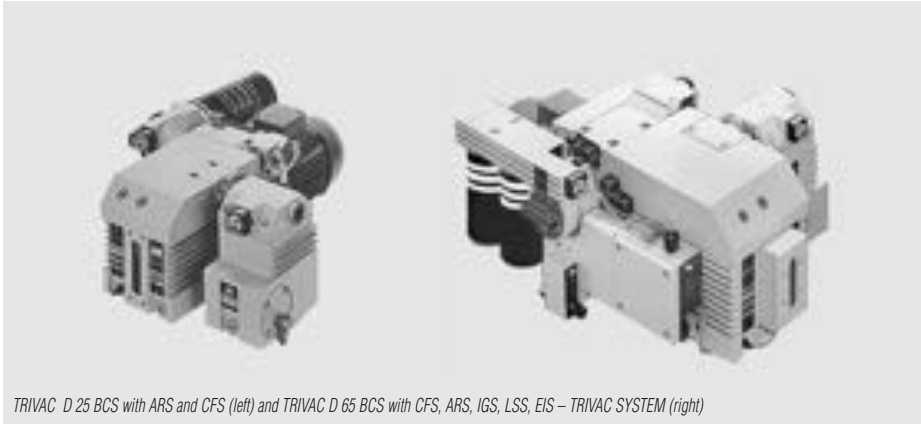
In many applications the use of synthetic lubricants like perfluoropolyether (PFPE) offers for superior characteristics compared to mineral oils.

Advantages of perfluoropolyether (PFPE) NC 1/14 and HE-1600:

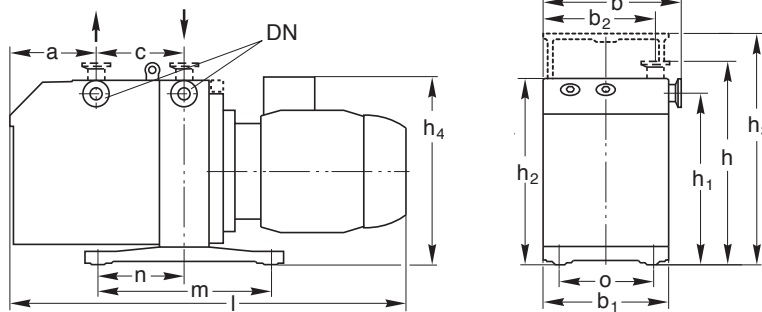
- ◆ Practically inert against all chemical and oxidizing influences.
- ◆ No polymerization under the influence of high energy radiation.
- ◆ PFPE is non-flammable. Leybold NC1/14 has the approval of BAM (Federal Institute for Materials Research and Testing) for pumping of pure oxygen.
- ◆ In part significantly 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 PFPE and are supplied without the oil filling. We recommend using our operating fluid PFPE NC 1/14 or HE-1600 and always to install a chemical oil filter CF/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)

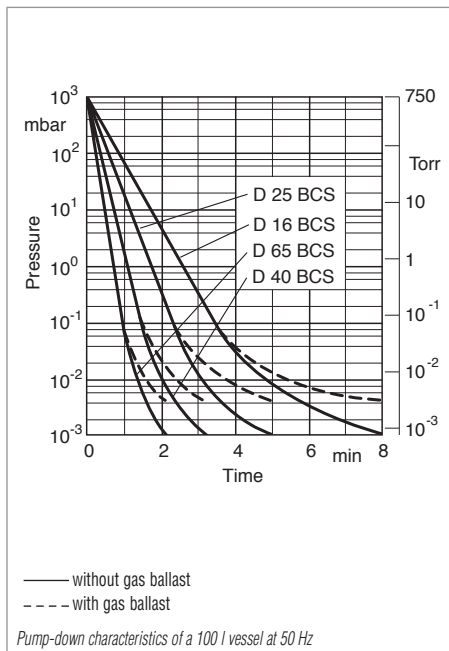


* Depending on the motor

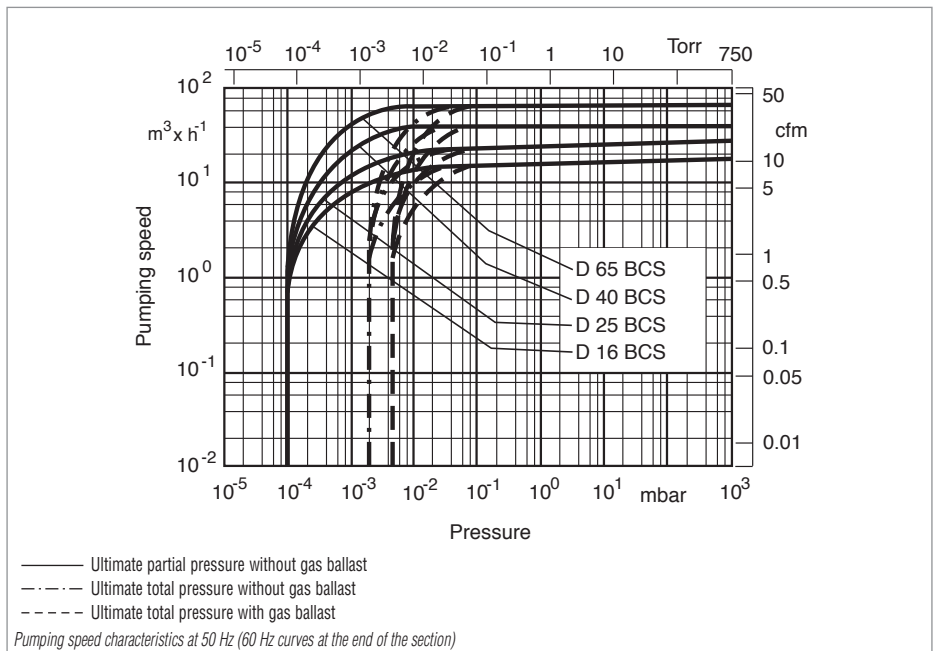
USA pumps max. length
 D 16 BCS 560 mm (22.1")
 D 25 BCS 660 mm (26")
 D 40 BCS 760 mm (30")
 D 65 BCS 840 mm (33.1")

Type	DN	a	b	b ₁	b ₂	c	e	h	h ₁	h ₂	h ₃	h ₄	l	m	n	o
D 16 BCS (Part No. 113 68)	40 KF	mm 82	190	175	150	135	89	263	226	250	298	236	490	280	140	132
		in. 3.23	7.48	6.89	5.91	5.32	3.50	10.35	8.90	9.84	11.73	9.29	19.29	11.02	5.51	5.20
D 25 BCS (Part No. 113 78)	40 KF	mm 143	190	175	150	135	111	236	226	250	298	262	566	280	140	132
		in. 5.63	7.48	6.89	5.91	5.32	4.37	9.29	8.90	9.84	11.73	10.32	22.28	11.02	5.51	5.20
D 40 BCS (Part No. 113 88)	40 KF	mm 135	264	234	206	166	111	355	308	336	-	302	676	382	191	190
		in. 5.32	10.39	9.21	8.11	6.54	4.37	13.98	12.13	13.23	-	11.89	26.61	15.04	7.52	7.48
D 65 BCS (Part No. 118 98)	40 KF	mm 213	264	234	206	166	111	355	308	336	-	302	747	382	191	190
		in. 8.39	10.39	9.21	8.11	6.54	4.37	13.98	12.13	13.23	-	11.89	29.41	15.04	7.52	7.48

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 section)

Technical Data		TRIVAC D 16 BCS	TRIVAC D 25 BCS	TRIVAC D 40 BCS	TRIVAC D 65 BCS
Nominal pumping speed 50/60 Hz ¹⁾	m ³ x h ⁻¹ (cfm)	18.9 (11.1) / 22.7 (13.4)	29.5 (17.4) / 35.4 (20.9)	46 (27) / 55 (32.5)	75 (44) / 90 (53)
Pumping speed 50/60 Hz ¹⁾	m ³ x h ⁻¹ (cfm)	16.5 (9.7) / 19.8 (11.7)	25.7 (15.1) / 30.8 (18.2)	40 (24) / 48 (28)	65 (38) / 78 (46)
Ultimate partial pressure without gas ballast ¹⁾	mbar (Torr)	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)			
Ultimate total pressure with gas ballast ¹⁾	mbar (Torr)	< 5 · 10 ⁻³ (< 3.8 x 10 ⁻³)			
Water vapor tolerance ¹⁾	mbar (Torr)	25 (18.8)	25 (18.8)	40 (30)	40 (30)
Water vapor capacity	gm/h	305	476	1184	1925
Oil filling, min./max.	l (qt)	0.45 / 1.0 (0.5/1.1)	0.6 / 1.4 (0.6/1.5)	1.7 / 2.6 (1.8/2.7)	2.0 / 3.3 (2.1/3.5)
Noise level ²⁾ to DIN 45 635, without/with gas ballast	dB(A)	52 / 54	52 / 54	57 / 59	57 / 59
Admissible ambient temperature	°C (°F)	12 - 40 (54 - 104)			
Motor rating ²⁾	W (HP)	750 (1)	750 (1)	1500 (2)	2200 (3)
Nominal speed 50/60 Hz	rpm	1500 / 1800			
Type of protection ³⁾	IP	54			
Weight ²⁾	kg (lbs)	26 (57.3)	32 (70.6)	68 (150)	80 (176.4)
Connections, Intake and Exhaust	DN	25 KF	25 KF	40 KF	40 KF

¹⁾ To DIN 28 400 and following numbers

²⁾ Weight, motor rating and noise levels for the pumps with 3-phase motor, 50 Hz, only.

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

³⁾ Global versions only. North and South American versions are TEFC

Version for the North and South American Continents

Ordering Information	TRIVAC D 16 BCS two-stage	TRIVAC D 25 BCS two-stage	TRIVAC D 40 BCS two-stage	TRIVAC D 65 BCS two-stage
TRIVAC BCS, with 1-phase motor 115 V, 60/50 Hz, NEMA plug 200-230 V, 60 Hz, NEMA plug	Part No. 913 68-1	-	-	-
with 3-phase motor 208-230/460 V, 60 Hz / 200-220/380 V, 50 Hz	Part No. 913 68-2	Part No. 913 78-2	Part No. 913 88-2	Part No. 913 98-2

Global Version

Ordering Information	TRIVAC D 16 BCS two-stage	TRIVAC D 25 BCS two-stage	TRIVAC D 40 BCS two-stage	TRIVAC D 65 BCS two-stage
TRIVAC BCS with 3-phase motor 230/400 V, 50 Hz / 250/440 V, 60 Hz	Part No. 113 68	Part No. 113 78	Part No. 113 88	Part No. 113 98
Accessories				
Roots pump adaptor	-	-	Part No. 168 30	Part No. 168 30
Exhaust filter with lubricant return ARS 16-25 ARS 40-65	Part No. 189 56 -	Part No. 189 56 -	- Part No. 189 57	- Part No. 189 57
Condensate separator AK 16-25 AK 40-65	Part No. 188 11 -	Part No. 188 11 -	- Part No. 188 16	- Part No. 188 16
Chemical filter with safety blocking valve CFS 16-25 CFS 40-65	Part No. 101 76 -	Part No. 101 76 -	- Part No. 101 77	- Part No. 101 77
Inert gas system IGS 16-25 IGS 40-65	Part No. 161 76 -	Part No. 161 76 -	- Part No. 161 77	- Part No. 161 77
Limit switch system LSS 16-25 LSS 40-65	Part No. 161 06 -	Part No. 161 06 -	- Part No. 161 07	- Part No. 161 07
Electrical indicator system EIS 16-25 EIS 40-65	Part No. 160 96 -	Part No. 160 96 -	- Part No. 160 97	- Part No. 160 97
RIS remote indicator system, remote monitoring	Part No. 188 96			
MBS moisture barrier system	Part No. 189 67			
Spare parts				
Inside section	Part No. 200 39 762	Part No. 200 39 764	Part No. 200 39 758	Part No. 200 39 760
Seal kit	Part No. 197 31	Part No. 197 31	Part No. 197 32	Part No. 197 32

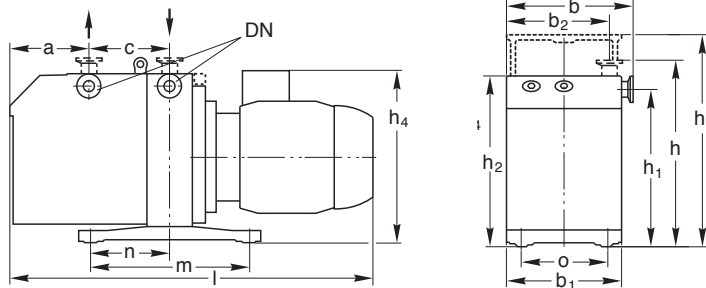
Notes

C01

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)

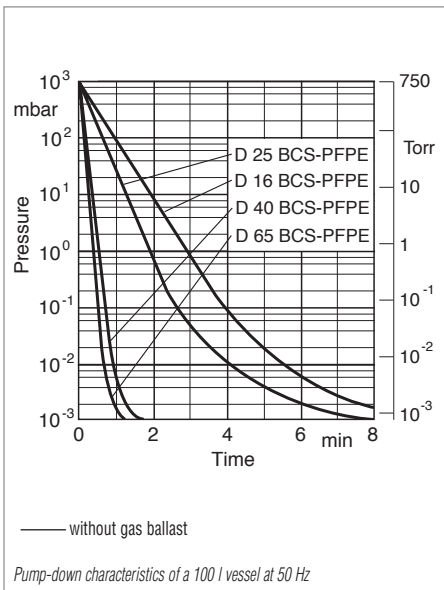


* Depending on the motor

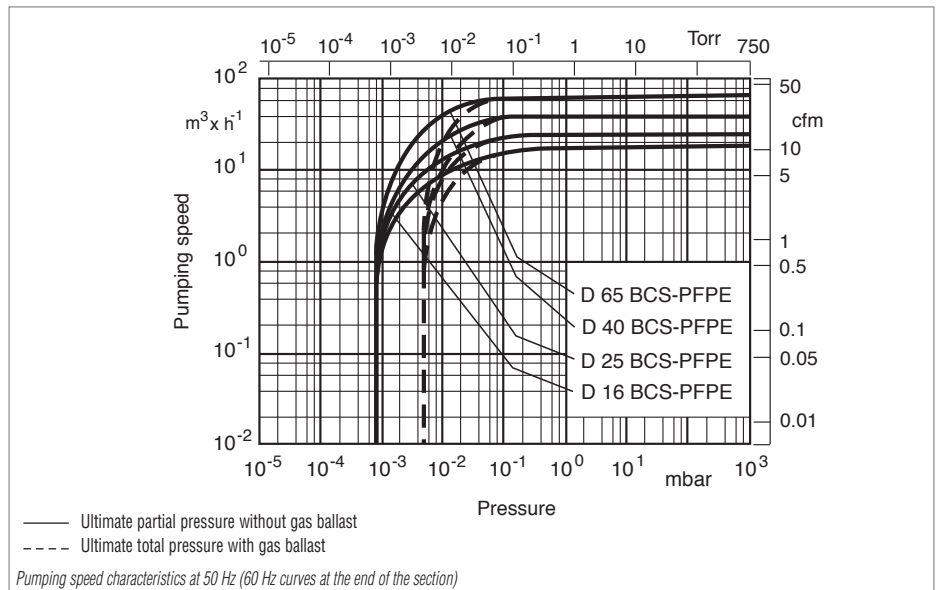
- USA pumps max. length
- D 16 BCS-PFPE 560 mm (22.1")
- D 25 BCS-PFPE 660 mm (26")
- D 40 BCS-PFPE 760 mm (30")
- D 65 BCS-PFPE 840 mm (33.1")

Type	DN	a	b	b ₁	b ₂	c	e	h	h ₁	h ₂	h ₃	h ₄	l	m	n	o
D 16 BCS-PFPE (Part No. 113 69, 154 50)	25 KF	mm 82	190	175	150	135	111	263	226	250	298	262	507	280	140	132
		in. 3.23	7.48	6.89	5.91	5.32	4.37	10.35	8.90	9.84	11.73	10.32	19.96	11.02	5.51	5.20
D 25 BCS-PFPE (Part No. 113 79, 154 51)	25 KF	mm 142	190	175	150	135	111	263	226	250	298	262	566	280	140	132
		in. 5.59	7.48	6.89	5.91	5.32	4.37	10.35	8.90	9.84	11.73	10.32	22.28	11.02	5.51	5.20
D 40 BCS-PFPE (Part No. 113 89)	40 KF	mm 135	264	234	206	166	111	355	308	336	-	302	670	382	191	190
		in. 5.32	10.39	9.21	8.11	6.54	4.37	13.98	12.13	13.23	-	11.90	26.38	15.04	7.52	7.48
D 40 BCS-PFPE (Part No. 154 52)	40 KF	mm 135	264	234	206	166	111	355	308	336	-	302	714	382	191	190
		in. 5.32	10.39	9.21	8.11	6.54	4.37	13.98	12.13	13.23	-	11.90	28.11	15.04	7.52	7.48
D 65 BCS-PFPE (Part No. 113 99)	40 KF	mm 213	264	234	206	166	111	355	308	336	-	302	750	382	191	190
		in. 8.39	10.39	9.21	8.11	6.54	4.37	13.98	12.13	13.23	-	11.90	29.53	15.04	7.52	7.48
D 65 BCS-PFPE (Part No. 54 54)	40 KF	mm 213	264	234	206	166	111	355	308	336	-	302	796	382	191	190
		in. 8.39	10.39	9.21	8.11	6.54	4.37	13.98	12.13	13.23	-	11.90	31.34	15.04	7.52	7.48

Dimensional drawing for the TRIVAC D 16 to D 65 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 section)

Technical Data		TRIVAC D 16 BCS-PFPE	TRIVAC D 25 BCS-PFPE	TRIVAC D 40 BCS-PFPE	TRIVAC D 65 BCS-PFPE
Nominal pumping speed 50/60 Hz ¹⁾	m ³ x h ⁻¹ (cfm)	18.9 (11.1) / 22.7 (13.4)	29.5 (17.4) / 35.4 (20.9)	46 (27) / 55 (32.5)	75 (44) / 90 (53)
Pumping speed 50/60 Hz ¹⁾	m ³ x h ⁻¹ (cfm)	16.5 (9.7) / 19.8 (11.7)	25.7 (15.1) / 30.8 (18.2)	40 (24) / 48 (28)	65 (38) / 78 (46)
Ultimate partial pressure without gas ballast ¹⁾	mbar (Torr)	< 8 · 10 ⁻⁴ (< 6 x 10 ⁻⁴)			
Ultimate total pressure without gas ballast ¹⁾	mbar (Torr)	< 2 · 10 ⁻³ (< 1.5 x 10 ⁻³)			
Ultimate total pressure with gas ballast ¹⁾	mbar (Torr)	< 5 · 10 ⁻³ (< 3.8 x 10 ⁻³)			
Ultimate total pressure with reduced gas ballast, 200 l x h ⁻¹ ¹⁾	mbar (Torr)	< 2 · 10 ⁻³ (< 1.5 x 10 ⁻³)	< 2 · 10 ⁻³ (< 1.5 x 10 ⁻³)	–	–
Lubricant filling					
min./max.	l (qt)	0.45 / 1.0 (0.5 / 1.1)	0.6 / 1.4 (0.6 / 1.5)	1.5 / 2.5 (1.6 / 2.6)	2.0 / 3.5 (2.1 / 3.7)
upon delivery	l (qt)	0.2 (0.2)	0.4 (0.4)	0.6 (0.6)	0.75 (0.8)
Noise level ²⁾ to DIN 45 635, without/with gas ballast	dB(A)	52 / 54	52 / 54	57 / 59	57 / 59
Admissible ambient temperature	°C (°F)	12 ³⁾ - 40 (54 - 104)	12 - 40 (54 - 104)	12 - 40 (54 - 104)	12 - 40 (54 - 104)
Motor rating ²⁾	W (HP)	550 (0.75)	750 (1)	2200 (3)	2200 (3)
Nominal speed 50/60 Hz	rpm	1500 / 1800			
Type of protection ⁴⁾	IP	54			
Weight ²⁾	kg (lbs)	27 (59.5)	33 (72.8)	71 (156.6)	83 (183)
Connections, Intake and Exhaust	DN	25 KF	25 KF	40 KF	40 KF

¹⁾ To DIN 28 400 and following numbers

²⁾ Weight, motor rating and noise levels for the pumps with 3-phase motor, 50 Hz, only.

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

³⁾ Cold start temperature to DIN

⁴⁾ Global versions only. North and South American versions are TEFC

Version for the North and South American Continents

Ordering Information	TRIVAC D 16 BCS-PFPE two-stage	TRIVAC D 25 BCS-PFPE two-stage	TRIVAC D 40 BCS-PFPE two-stage	TRIVAC D 65 BCS-PFPE two-stage
TRIVAC BCS, with 1-phase motor 115 V, 60/50 Hz, NEMA plug 200-230 V, 60 Hz, NEMA plug with 3-phase motor 208-230/460 V, 60 Hz / 200-220/380 V, 50 Hz	Part No. 913 69-1 -	- Part No. 913 79-2	- -	- -
	Part No. 913 69-2	Part No. 913 79-3	Part No. 913 89-2	Part No. 913 99-2

Global Version

Ordering Information	TRIVAC D 16 BCS-PFPE two-stage	TRIVAC D 25 BCS-PFPE two-stage	TRIVAC D 40 BCS-PFPE two-stage	TRIVAC D 65 BCS-PFPE two-stage
TRIVAC BCS-PFPE, with 3-phase motor 230/400 V, 50 Hz / 250/440 V, 60 Hz 200/400 V, 50 Hz / 220/440 V, 60 Hz	Part No. 113 69 Part No. 154 50	Part No. 113 79 Part No. 154 51	Part No. 113 89 Part No. 154 52	Part No. 113 99 Part No. 154 54
Accessories				
Roots pump adaptor	-	-	Part No. 168 30	Part No. 168 30
Exhaust filter with lubricant return ARS 16-25 ARS 40-65	Part No. 189 56 -	Part No. 189 56 -	- Part No. 189 57	- Part No. 189 57
Condensate trap AK 16-25 AK 40-65	Part No. 188 11 -	Part No. 188 11 -	- Part No. 188 16	- Part No. 188 16
Chemical filter with safety isolation valve CFS 16-25 CFS 40-65	Part No. 101 76 -	Part No. 101 76 -	- Part No. 101 77	- Part No. 101 77
Inert gas system IGS 16-25 IGS 40-65	Part No. 161 76 -	Part No. 161 76 -	- Part No. 161 77	- Part No. 161 77
Limit switch system LSS 16-25 LSS 40-65	Part No. 161 06 -	Part No. 161 06 -	- Part No. 161 07	- Part No. 161 07
Electrical indicator system EIS 16-25 EIS 40-65	Part No. 160 96 -	Part No. 160 96 -	- Part No. 160 97	- Part No. 160 97
RIS remote indicator system, remote monitoring	Part No. 188 96			
MBS moisture barrier system	Part No. 189 67			
Spare parts				
Inside section	Part No. 200 39 763	Part No. 200 39 765	Part No. 200 39 154	Part No. 200 39 156
Seal kit	Part No. 197 41	Part No. 197 41	Part No. 197 42	Part No. 197 42

Notes

C01

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

TRIVAC D 4 + 8 B

Part No.	Part No.
D 4 B	D 8 B
113 04 / 113 08 (SHC 224)	113 14 / 113 18 (SHC 224)
113 03	113 13
112 45	112 55
113 09	113 21
112 46	112 56
113 06	113 16
912 45-1	-
912 45-2	-
912 46-2	-
-	912 55-1
-	912 55-2
-	912 56-2

TRIVAC D 16 + 25 B (BCS (-PFPE))

Part No.	Part No.
D 16 B D 16 BCS D 16 BCS-PFPE	D 25 B D 25 BCS D 25 BCS-PFPE
113 29 (SHC 224)	113 36 / 113 39 (SHC 224)
-	-
-	113 48
-	-
113 25	112 75
-	-
112 65	-
-	-
112 66 / 113 33 (RCF - E68N)	-
113 68	-
-	-
-	112 76
113 69	113 78
113 27 / 113 30 (Ex)	113 79
-	113 37
-	-
113 34 (RCF - E68N)	-
-	-
114 06 DOT / 114 10 DOT LSS	-
-	-
-	-
154 50	154 51
912 65-1	-
913 68-1	-
913 69-1	-
912 65-2	-
-	-
-	-
912 66-2	-
913 68-2	-
913 69-2	-
-	912 75-2
-	913 78-2
-	913 79-2
-	912 76-2
-	913 78-3
-	913 79-3

Ref. No. 1- or 3-ph	Motor voltage (V)	Frequency (Hz) ± 5%	Voltage range (V)	Power		Nominal current (A) ¹⁾	Size	Region
				kW	HP			
200 10 404 1 ~	100 110	50 60	95-105 95-115	0.37	0.5 6.1	8.7	80	Japan
200 10 403 1 ~	115	60	109-121	0.37	0.5	5.6	70	USA
380 66 008 1 ~	230	50	218-242	0.37	0.5	2.9	70	Euro
200 39 867 1 ~	230	50 60	208-252 208-252	0.37	0.5	2.9	70	Wide range
380 66 006 3 ~	230/400 250/440	50 60	218-242/380-420 240-277/415-480	0.37	0.5	1.95/1.12 1.73/1.0	70	Euro (USA)
200 10 406 3 ~ EXE II CT3	230/400	50	218-242/380-420	0.37	0.5	1.92/1.11	70	Euro
722 60 095 1 ~	115 110	60 50	103-126 99-121	0.25	0.33	7 8.8	NEMA 56 C	USA
722 60 096 1 ~	200-230 200-220	60 50	180-253 180-220	0.25	0.33	3.2-3.5 3.6-4.4	NEMA 56 C	USA
722 60 067 3 ~	200-230/460 200/380	60 50	180-253/414-506 180-220/342-418	0.25	0.33	1.5-1.6/0.8 1.6/0.8	NEMA 56 C	USA
722 60 117 1 ~	115 115	60 50	103-126 103-126	0.55	0.75	9.4 13	NEMA 56 C	USA
722 60 005 1 ~	208-230 208-230	60 50	187-253 187-253	0.55	0.75	4.8-4.7 5.5-6.5	NEMA 56 C	USA
722 60 135 3 ~	208-230/460 208-220/380	60 50	187-253/414-506 187-242/342-418	0.75	1	3.4-3.4/1.7 3.1-/1.7	NEMA 56 C	USA
200 10 679 1 ~	115	60	109-121	0.75	1	12.5	90	USA
200 10 408 1 ~	100 110	50 60	95-105 95-115	0.75	1	14.5 14.5	90	Japan
380 66 004 1 ~	230	50	208-252	0.75	1	6.3	90	Euro
380 66 003 1 ~	230	50	218-242	0.55	0.75	5.0	80	Euro
380 66 001 3 ~	230/400 250/440	50 60	218-242/380-420 240-277/415-480	0.55	0.75	2.85/1.65 2.5/1.45	70	Euro (USA)
380 66 002 3 ~	230/400 250/440	50 60	218-242/380-420 240-277/415-480	0.75	1	3.55/2.05 3.25/1.85	80	Euro (USA)
200 10 409 3 ~ Exe II CT3	230/400	50	218-242/380-420	0.75	1	3.4/1.97	80	Euro
200 10 410 3 ~	200/346 208/360	50 60	190-210/330-365 190-230/330-400	0.75	1	4.3/2.5 4.3/2.5	80	Japan, South and Central America USA
200 10 299 3 ~	230/400 250/440	50 60	218-242/380-420 240-265/415-460	0.55	0.75	3.2/1.85 2.8/1.6	70	Euro
100 000 807 3 ~	200/400 220/440	50 60	190-220/380-440 190-240/380-480	0.75	1	4.3/2.15 4.0/2.0	80	Wide range
722 60 117 1 ~	115 115	60 50	103-126 103-126	0.55	0.75	9.4 13	NEMA 56 C	USA
722 60 005 1 ~	208-230 208-230	60 50	187-253 187-253	0.55	0.75	4.8-4.7 5.5-6.5	NEMA 56 C	USA
722 60 135 3 ~	208-230/460 208-220/380	60 50	187-253/414-506 187-242/342-418	0.75	1	3.4-3.4/1.7 3.1/1.7	NEMA 56 C	USA
722 60 022 1 ~	200-230	60	180-253	1.1	1.5	9.6-9.2	NEMA 56 C	USA
722 60 071 3 ~	200-230/460 200/380	60 50	180-253/414-506 180-220/342-418	1.1	1.5	9.0-8.0 9.6-9.2	NEMA 56 C	USA

TRIVAC D 4 + 8 B

TRIVAC D 16 + 25 B (BCS(-PFPE))

1) Will be changed for engineering reasons in 2003

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

TRIVAC D 40 + 65 B (BCS (-PFPE))	Part No.		Part No.	
	D 40 B D 40 BCS D 40 BCS-PFPE		D 65 B D 65 BCS D 65 BCS-PFPE	
		112 86 113 88 113 89		112 96 113 98 113 99
	113 45 -		113 55 -	
	113 47 -		113 57 -	
	- -		- -	
	154 52		154 54	
	912 86-2 913 88-2 913 89-2		912 96-2 913 98-2 913 99-2	

	D 4/8 B	D 16/25	D 40	D 65 B	S 1.5	Type of protection:	IP 54
Shaft dimensions ϕ d / l	14 / 30	19 / 40	24 / 50	28 / 60	11 / 23	Type of motor:	B 14
Size of flange A/B	140 / 95	160 / 110	160 / 110	160 / 110	120 / 100	Rotational speed 50/60 Hz:	1500 / 1800

Ref. No. 1- or 3-ph	Motor voltage (V)	Frequency (Hz) ± 5%	Voltage range (V)	Power		Nominal current (A) ¹⁾	Size	Region
				kW	HP			
380 66 012 3 ~	230/400 250/440	50 60	218-242/380-420 240-277/414-480	2.2	3	8.65/5.0 7.8/4.5	90	Euro (USA)
200 10 411 3 ~ Exe II CT3	230/400	50	218-242/380-420	2.2	3	9.4/5.4	100	Euro
200 10 412 3 ~	200/346 208/360	50 60	190-210/330-365 190-230/330-400	2.2	3	10.1/5.85 10.1/5.85	90	Japan, South and Central America USA
200 15 402 3 ~	200/400 220/440	50 60	190-220/380-440 190-240/380-480	2.2	3	11.8/5.9 10/5	100	Wide range
722 60 011 3 ~	200-230/460 200-220/380-415	60 50	180-253/414-506 180-242/342-418	3	4	9.0-8.4/4.2 9.4-9.6/4.6-4.7	NEMA 182 TC	USA

TRIVAC D 40 + 65 B
(BCS (-PFPE))

C01

¹⁾ Will be changed for engineering reasons in 2003

Exhaust Filters AF 8, AF 25 / Condensate Traps AK 8, 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.

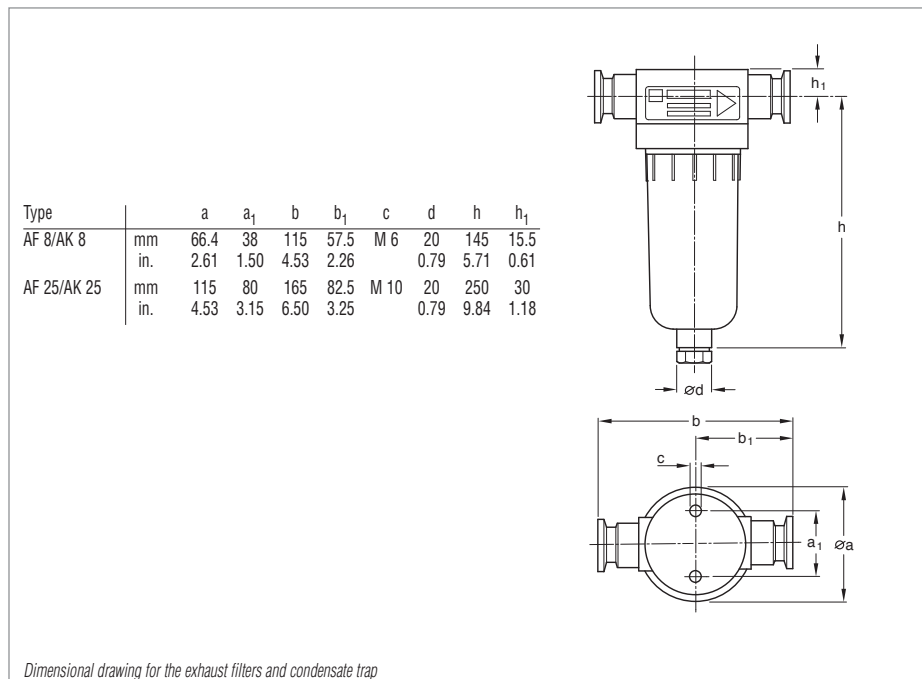
Advantages to the User

- ◆ 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 exhaust filters and condensate trap

Technical Data		AF 8	AK 8	AF 25	AK 25
Connection to pump (necessary accessories: 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 25 B	D 16 B D 25 B
Connection flanges	DN	16 KF	16 KF	25 KF	25 KF
Max. filling level (for vertical installation)	ml (qt)	60 (0.06)	60 (0.06)	285 (0.3)	285 (0.3)
Permissible leak rate	mbar x l x s ⁻¹	≤ 1 · 10 ⁻⁵			
Max. continuous temperature	°C (°F)	90 (194)			
Material		PA 6			
Ordering Information		AF 8	AK 8	AF 25	AK 25
Exhaust filter		Part No. 190 50	–	Part No. 190 53	–
Exhaust filter drain tap		Part No. 190 95			
Condensate trap		–	Part No. 190 60	–	Part No. 190 63
Replacement filter element (pack of 5)					
FE 8		Part No. 190 80	–	–	–
FE 25		–	–	Part No. 190 83	–
Elbow (1x)		Part No. 184 36	Part No. 184 36	Part No. 184 37	Part No. 184 37
Centering ring with O-ring (2x)					
aluminium / NBR		Part No. 183 26	Part No. 183 26	Part No. 183 27	Part No. 183 47
stainless steel / FPM		Part No. 883 46	Part No. 883 46	Part No. 883 47	Part No. 883 47
Clamping ring (2x)		Part No. 183 41	Part No. 183 41	Part No. 183 42	Part No. 183 42

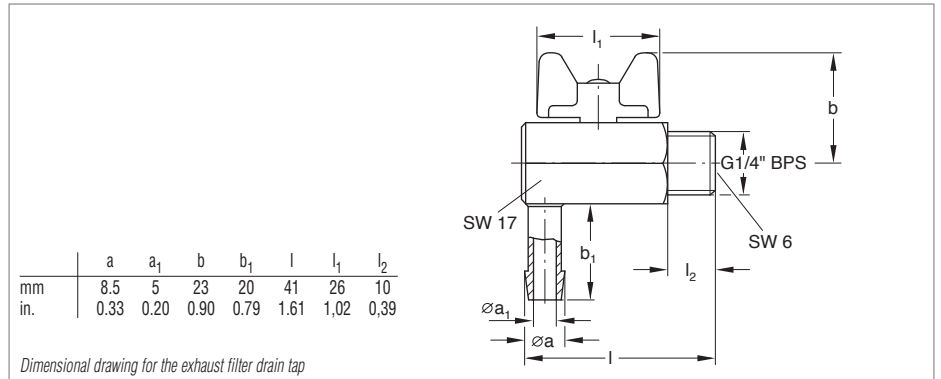
Exhaust Filter Drain Tap



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.

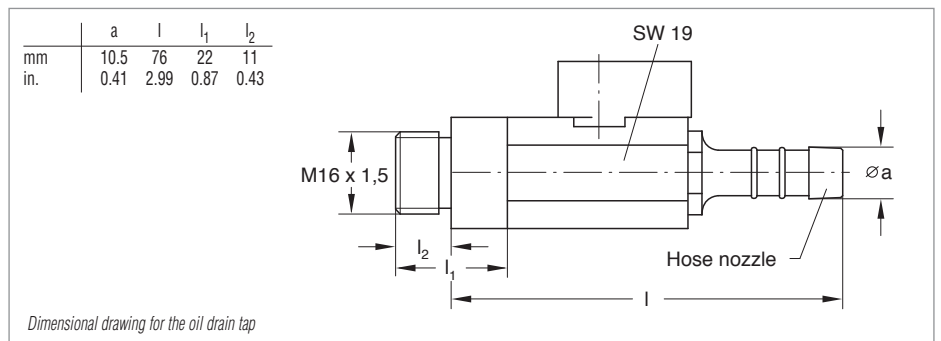


Technical Data		Exhaust Filter Drain Tap
Leak rate	mbar x l x s ⁻¹	≤ 10 ⁻⁵
Ordering Information		Exhaust Filter Drain Tap
Exhaust filter drain tap		Part No. 190 95

Oil Drain Tap

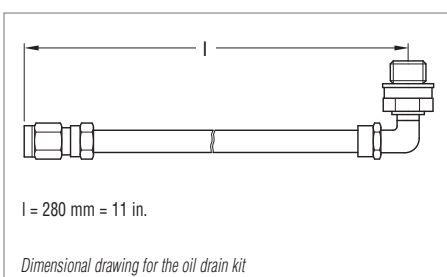


This oil drain tap may be screwed into the oil drain when wanting to change the oil in the rotary vane pumps. It is also suited for the condensate separators and exhaust filters of the TRIVAC B series.



Technical Data		Oil Drain Tap
Leak rate	mbar x l x s ⁻¹	≤ 10 ⁻⁵
Ordering Information		Oil Drain Tap
Oil drain tap		Part No. 190 90

Oil Drain Kit



Technical Data		Oil Drain Kit
Length	mm (in.)	280 (11)
Leak rate	mbar x l x s ⁻¹	≤ 10 ⁻⁵
Ordering Information		Oil Drain Kit
Oil drain kit		Part No. 190 94

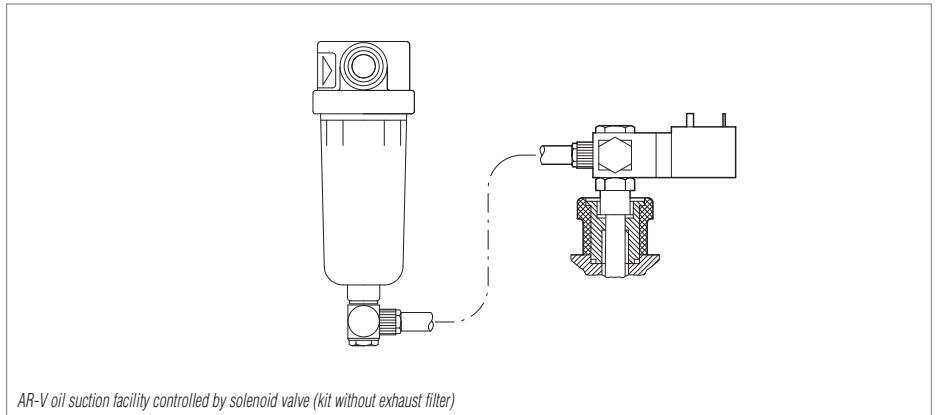
AR-V Oil Suction Facility Controlled by Solenoid Valve

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.

Technical Note

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



Technical Data		AR-V Oil Suction Facility Controlled by Solenoid Valve
Leak rate	mbar x l x s ⁻¹	≤ 10 ⁻⁵
Ordering Information		AR-V Oil Suction Facility Controlled by Solenoid Valve
AR-V oil suction facility controlled by solenoid valve 24 V DC, 4 W, normally closed		Part No. 190 92

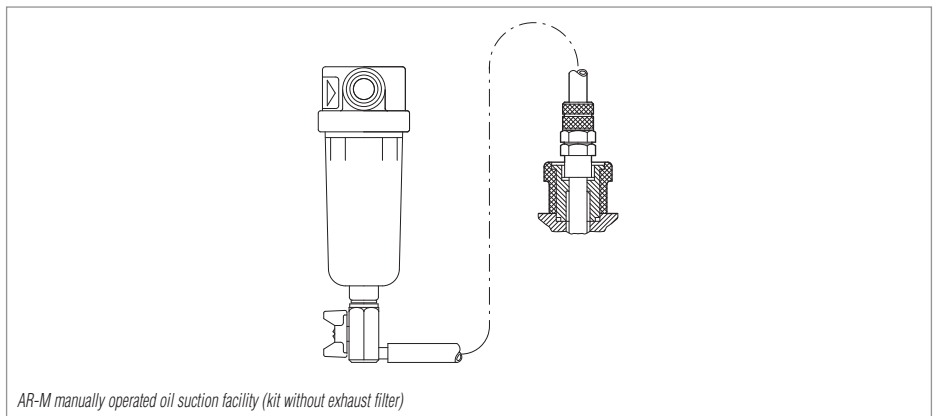
AR-M Manually Operated Oil Suction Facility

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.

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		AR-M Manually Operated Oil Suction Facility
Leak rate	mbar x l x s ⁻¹	≤ 10 ⁻⁵
Ordering Information		AR-M Manually Operated Oil Suction Facility
AR-M manually operated oil suction facility		Part No. 190 93

C01

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



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)

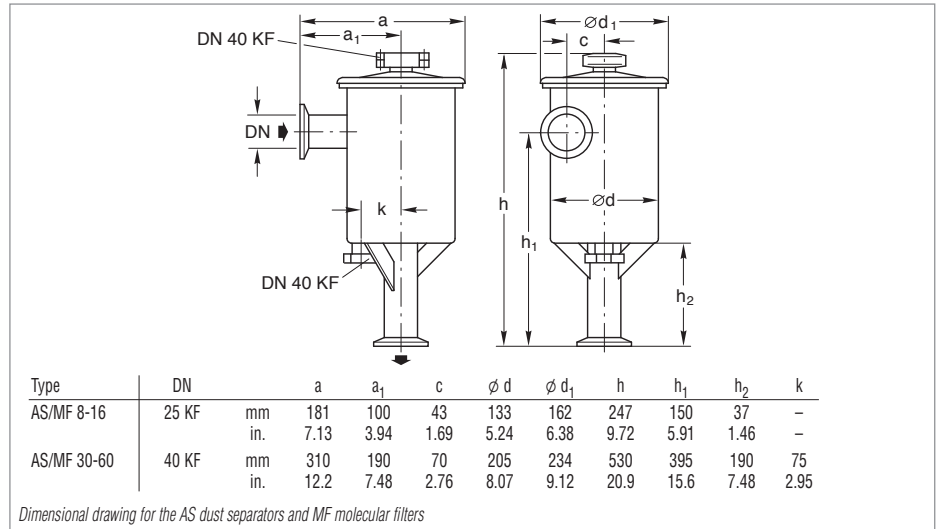
Typical Application

- ◆ 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 (0.6)		2.0 (2.1)		–		–	
Capacity for resin vapors or similar	kg (lbs)	–		–		0.15 (0.3)		0.35 (0.8)	
Impact ring filling	l (qt)	0.5 (0.5)		3.5 (3.7)		–		–	
Active charcoal filling	kg (lbs)	–		–		0.6 (1.3)		1.4 (3.1)	
Weight	kg (lbs)	4.5 (9.9)		18.4 (40.6)		4.5 (9.9)		18.4 (40.6)	
Ordering Information		AS 8-16		AS 30-60		MF 8-16		MF 30-60	
Dust separator		Part No. 186 11		Part No. 186 16		–		–	
Molecular filter		–		–		Part No. 186 12		Part No. 186 17	
Replacement filter insert		–		Part No. 178 43		–		–	
Replacement active charcoal insert		–		–		Part No. 178 07		Part No. 178 08	
Active charcoal, undried, 5 kg (11 lbs)		–		–		Part No. 178 10		Part No. 178 10	

Fine Vacuum Adsorption Traps FA 2-4, FA 8-16, FA 30-60



Fine vacuum adsorption traps are vacuum-tight vessels which offer a high adsorption capacity especially for water vapor.

Advantages to the User

- ◆ Total pressures of 1.5×10^{-5} mbar (1.125×10^{-5} Torr) can be attained with a two-stage rotary vane vacuum pump
- ◆ Zeolite filling can be easily regenerated (baked at 300 °C (572 °F))
- ◆ High conductance

Typical Application

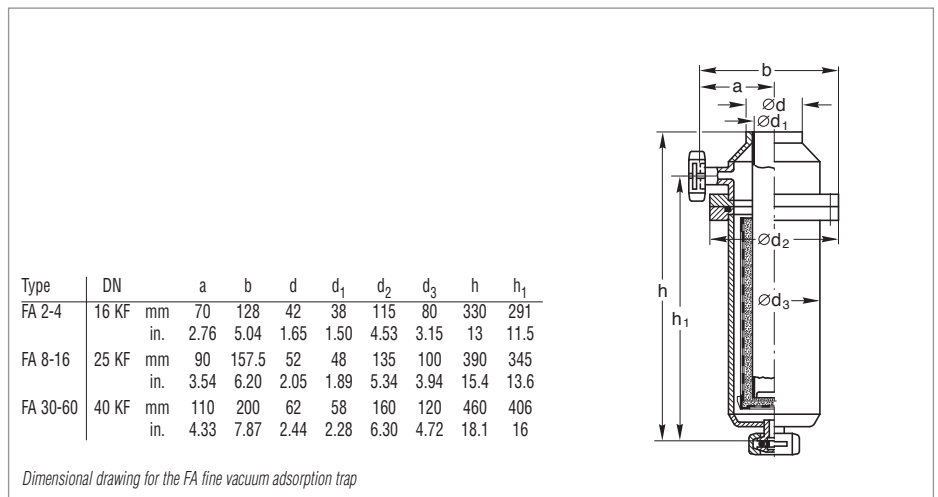
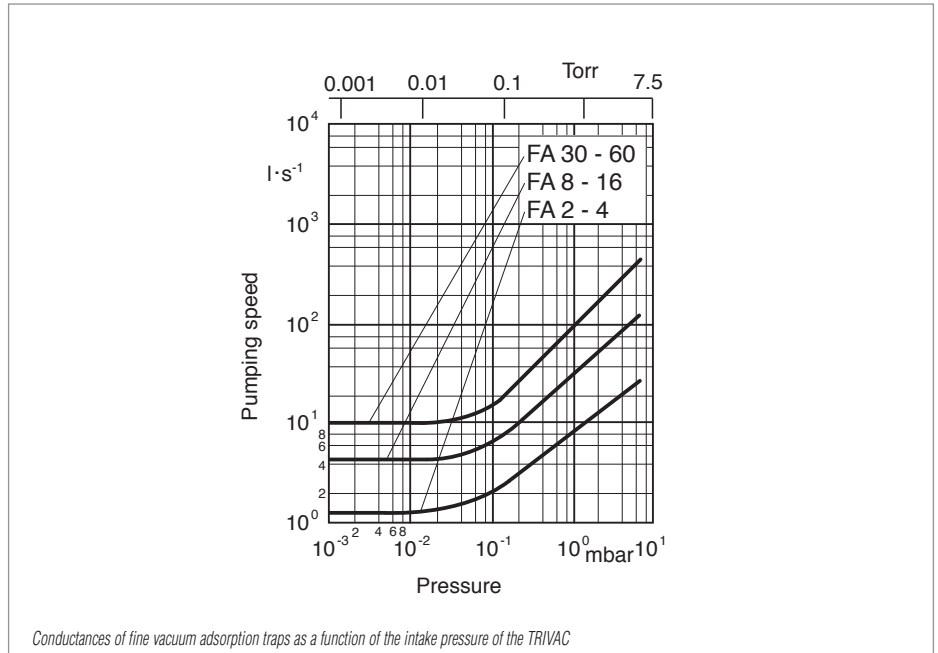
- ◆ Producing a vacuum which is free of water vapor

Technical Information

Liquid nitrogen in the adsorption trap will increase its adsorption capacity.

The conductance of the adsorption trap is higher than the pumping speed of the corresponding pump. See figure where the average pressure ahead and after the fine vacuum adsorption trap is plotted on the horizontal axis.

The adsorption traps may be installed in the intake line.



Type	DN	a	b	d	d ₁	d ₂	d ₃	h	h ₁
FA 2-4	16 KF	mm 70	128	42	38	115	80	330	291
		in. 2.76	5.04	1.65	1.50	4.53	3.15	13	11.5
FA 8-16	25 KF	mm 90	157.5	52	48	135	100	390	345
		in. 3.54	6.20	2.05	1.89	5.34	3.94	15.4	13.6
FA 30-60	40 KF	mm 110	200	62	58	160	120	460	406
		in. 4.33	7.87	2.44	2.28	6.30	4.72	18.1	16

Technical Data		FA 2-4	FA 8-16	FA 30-60
Connection to pump	TRIVAC	D 2.5 E D 4/8 B	D 16/25 B/BCS	D 40/65 B/BCS
Zeolite filling, approx.	kg (lbs)	0.3 (0.7)	0.7 (1.5)	1.25 (2.8)
Conductance below 10 ⁻² mbar (0.075 Torr)	l x s ⁻¹	1	4	9
Power rating of the heating rod at a main voltage of 220 V	W	200	200	300
Ordering Information		FA 2-4	FA 8-16	FA 30-60
Fine vacuum adsorption trap filled with zeolite, without heating rod	Part No.	187 05	187 10	187 15
Heating rod for adsorption trap	Part No.	854 21	854 21	854 23
Molecular sieve zeolite 13 X, 1 kg (2.2 lbs)	Part No.	854 20	854 20	852 20

Dust Filters FS 2-4, FS 8-16, FS 30-60



The dust filters protect the pumps against the intake of dust.

Advantages to the User

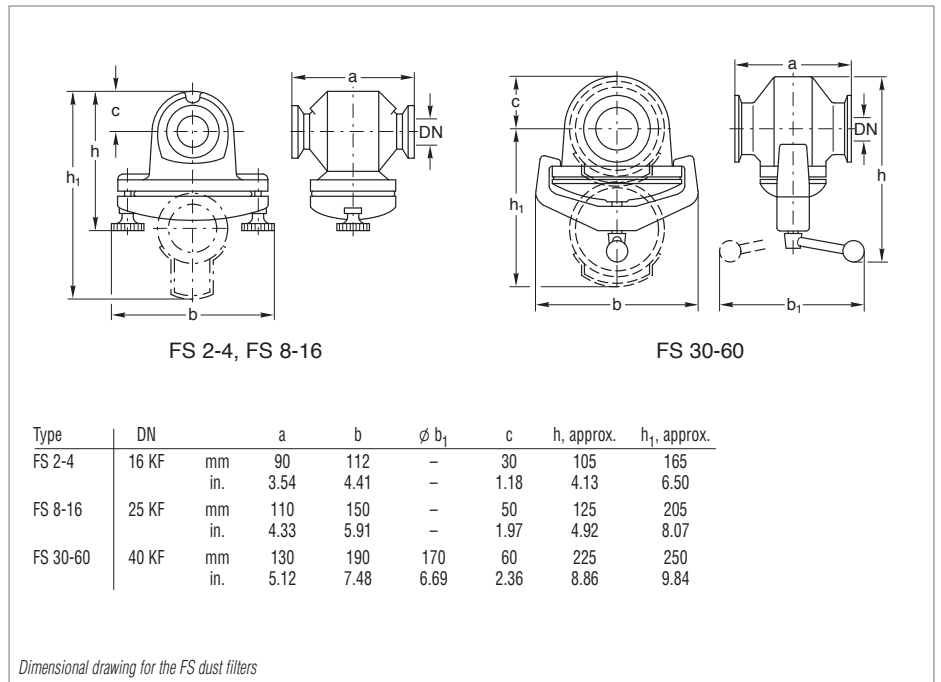
- ◆ Easy to disassemble
- ◆ Vacuum-tight cast iron casing
- ◆ Replacement filters may be easily exchanged
- ◆ Separates dusts from a grain size of 1 µm

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.

Since the dust filters have only a small dust collecting chamber, we recommend – in the case of larger dust quantities – the two-stage dust separators from the AS range.

The dust filters should be installed in a horizontal flow so that the filter insert may be removed by pulling it down and out.



Technical Data		FS 2-4		FS 8-16		FS 30-60		
Connection to pump	TRIVAC	D 2.5 E	S 8 B	D 16 B	D 25 B	D 40 B	D 65 B	
		D 4 B	D 8 B					
Throttling of the pumping speed								
	at 1 mbar (0.75 Torr), approx.	%	6	10	12	18	12	25
	at 10 mbar (7.5 Torr), approx.	%	4	7	6	9	3	8
Weight	kg (lbs)	1.0 (2.2)		1.6 (3.5)		7.5 (16.5)		
Ordering Information		FS 2-4		FS 8-16		FS 30-60		
Dust filter		Part No. 186 05		Part No. 186 10		Part No. 186 15		
Replacement filter insert		Part No. 178 32		Part No. 178 33		Part No. 178 35		
Replacement wadding cartridges (1 set = 10 pieces)		Part No. 200 39 050		Part No. 200 39 051		Part No. 971 98 251		

TK 4-8 Cold Trap



TK 4-8 cold trap

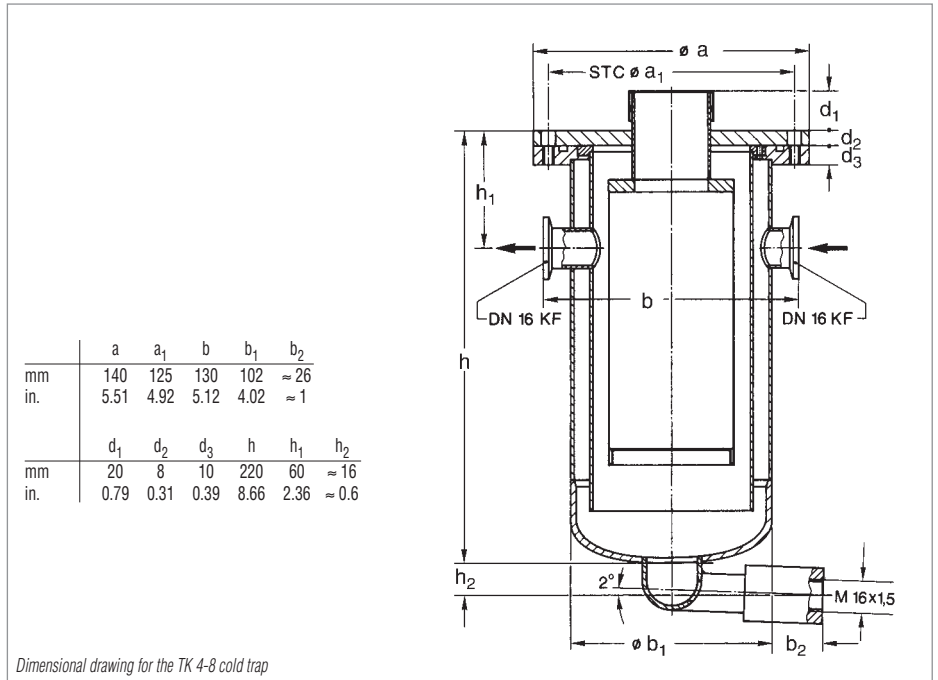
The cold trap protects the pump against damaging vapors.

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 (LN₂) or a mixture of acetone and carbon dioxide 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 (0.4)
Connections	DN	16 KF
Weight	kg (lbs)	4 (8.8)
Ordering Information		TK 4-8
Cold trap		Part No. 188 20
Drain tap for the intake side, vacuum-tight		Part No. 190 90
Elbow (1x)		Part No. 184 36
Centering ring		
aluminum/NBR (2x)		Part No. 183 26
stainless steel/FPM (2x)		Part No. 183 46
Clamping ring (2x)		Part No. 183 41

Version for the North and South American Continents

RST Refillable Traps



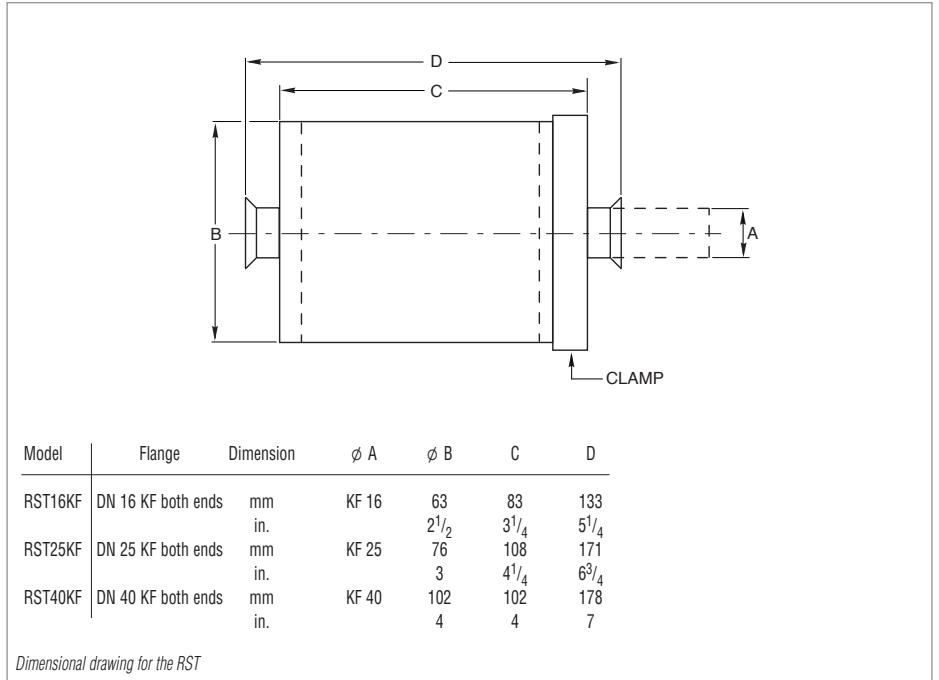
The RST traps are made from 304 stainless steel, and when specified with stainless steel filtration media, are fully suited for corrosive applications. The media is inserted directly into the trap. This ensures direct contact with the trap walls. There is no oil path between the trap wall and the retainer gasket to reduce trap effectiveness.

Advantages to the User

- ◆ Refillable
- ◆ Two Filtration Media
- ◆ Easy to Clean
- ◆ Easy to Recharge
- ◆ KF Flanges

Applications

Foreline traps are utilized whenever long-term effects of mechanical pump oil back migration into the pumped chamber or higher vacuum (oil diffusion) pump may be undesirable. Copper wool for standard applications and stainless steel wool for corrosive applications are available.



Technical Data		RST16KF	RST25KF	RST40KF
Connection to pump	TRIVAC	D 4/8 B/BCS	D 16/25 B/BCS	D 40/65 B/BCS
Ordering Information		RST16KF	RST25KF	RST40KF
RST16KF, 1.9 lb (0.9 kg)		Part No. 99 171 135	-	-
RST25KF, 2.6 lb (1.2 kg)		-	Part No. 99 171 136	-
RST40KF, 4.1 lb (1.9 kg)		-	-	Part No. 99 171 137
Filtering media				
Stainless steel		Part No. 99 171 141	Part No. 99 171 141	Part No. 99 171 141
RF Copper		Part No. 99 171 145	Part No. 99 171 146	Part No. 99 171 147
BUNA-N Gasket		Part No. 725 80 005	Part No. 725 80 006	Part No. 725 80 007

Version for the North and South American Continents

SE Smoke Eliminator



The Leybold SE Smoke Eliminator can be utilized on all TRIVAC B Rotary Vane 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 B 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.

Model	Flange	Dimension	A	B	C
SE 2-4	DN 16 KF	mm	64	76	70
		in.	2½	3	2¾
SE 8-16	DN 25 KF	mm	127	152	51
		in.	5	6	2
SE 30-60	DN 40 KF	mm	267	121	57
		in.	10½	4¾	2¼

Dimensional drawing for the SE

Technical Data		SE 2-4	SE 8-18	SE 30-60
Connection to pump	TRIVAC	D 4/8 B	D 16/25 B	D 40/65 B
Ordering Information		SE 2-4	SE 8-18	SE 30-60
Smoke Eliminator		Part No. 99 171 125	Part No. 99 171 126	Part No. 99 171 127
Replacement Element				
RE 2-4		Part No. 99 171 128	—	—
RE 8-16		—	Part No. 99 171 129	—
RE 30-60		—	—	Part No. 99 171 130

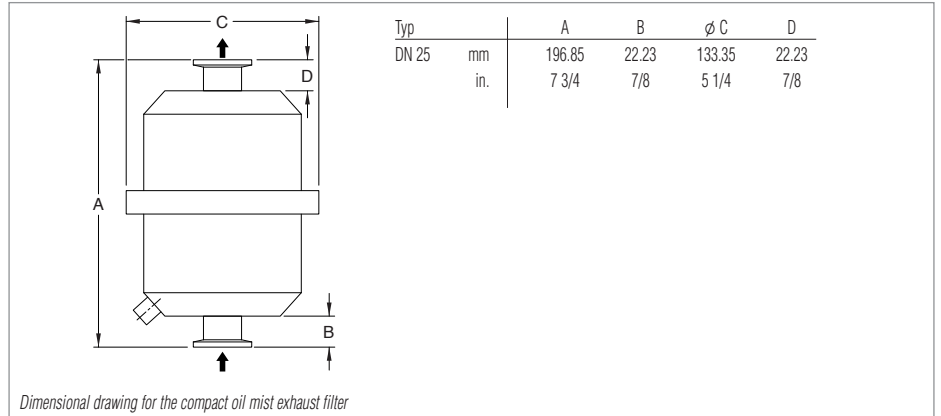
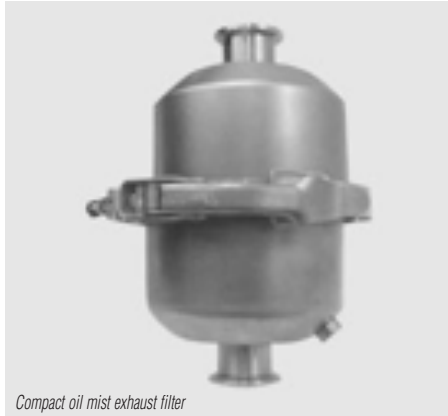
By utilizing a coalescing exhaust filter for these applications, the fluid and exhaust gases are separated, and in the case of the SE Smoke Eliminator, the coalesced fluid is allowed to drain back into the pump fluid reservoir. Annoying oil fog to the atmosphere is thus eliminated.

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 instead of the SE Smoke Eliminator. The AF is an in-line type coalescing filter and much more suitable for these applications.

Version for the North and South American Continents

Compact Oil Mist Exhaust Filters



Applications and Equipment

- ◆ Rotary vane pumps
- ◆ Vacuum furnaces, ovens and degassing
- ◆ Refrigeration and air condition
- ◆ Vacuum freeze drying
- ◆ Vacuum metallizing
- ◆ Vacuum coating
- ◆ Laboratory furnaces, test stands
- ◆ Autoclaving, sterilization
- ◆ Leak detection

Features and Specifications

- ◆ Minimum 99.97 % D.O.P. on 3 micron particles
- ◆ Captures oil fog, mist or smoke from exhaust of oil lubricated vacuum pumps
- ◆ Compact, low profile design
- ◆ Stainless steel housing and internals
- ◆ Pleated filter element provides increased surface area for low back pressure
- ◆ Back pressure valve designed to release element at 7.35 PSI (0.5 bar) differential for pump safety
- ◆ 1/8" NPT oil drain
- ◆ Easy release V-band clamp
- ◆ Seamless drawn housings - no welds to rust or vibrate apart
- ◆ Easy field maintenance
- ◆ Operating temperature: 40 °F (4 °C) to 220 °F (104 °C)

Technical Data		Compact Oil Mist Exhaust Filter	
Connection to pump		TRIVAC D16/25B	
ISO inlet and outlet		DN 25	
Nominal vacuum pump rating	scfm (m ³ /hr)	20 (34)	
Element rating	scfm (m ³ /hr)	20 (34)	
Weight, approx.	kg (lbs)	1 (2.2)	
Ordering Information		Compact Oil Mist Exhaust Filter	
Compact oil mist exhaust filter		Part No. 721-87-113	
Replacement filter insert filter		Part No. 721-87-099	

Notes

C01

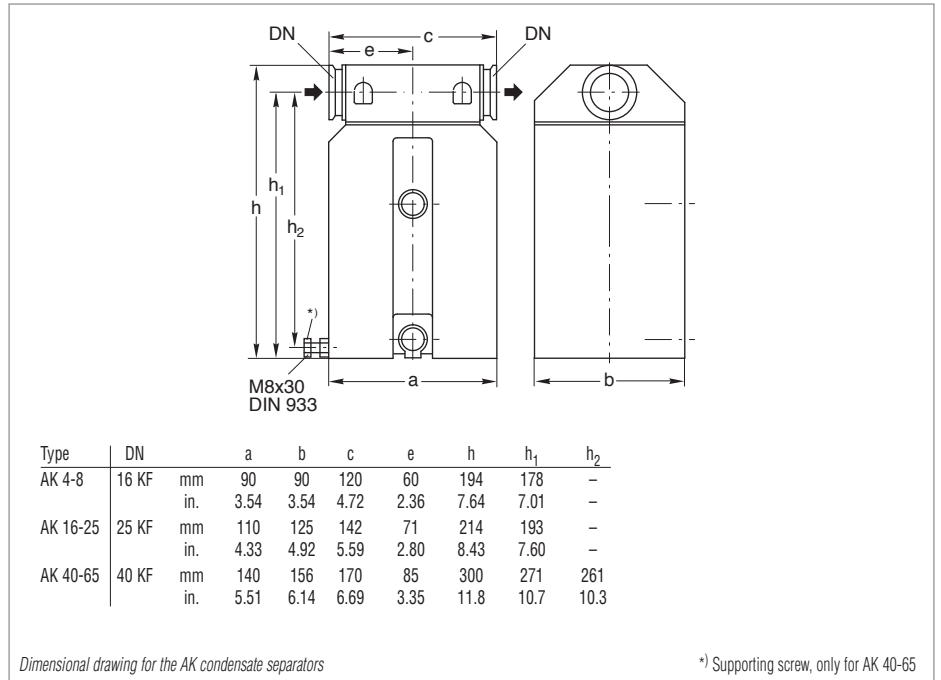
Condensate Separators AK 4-8, AK 16-25, AK 40-65



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
- ◆ Simple to clean
- ◆ Easy to use
- ◆ Drained via drain screw or drain tap



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 B D 8 B	D 16 B/BCS (-PFPE) D 25 B/BCS (-PFPE)	D 40 B/BCS (-PFPE) D 65 B/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
Condensate separator		Part No. 188 06	Part No. 188 11	Part No. 188 16
Drain tap for the intake side, vacuum-tight			Part No. 190 90	
Oil drain tap (exhaust side)			Part No. 190 90	
Adaptor DN 16 KF – hose nozzle DN 7		Part No. 182 90	–	–
For further accessories see Section “Accessories for TRIVAC E and B”				

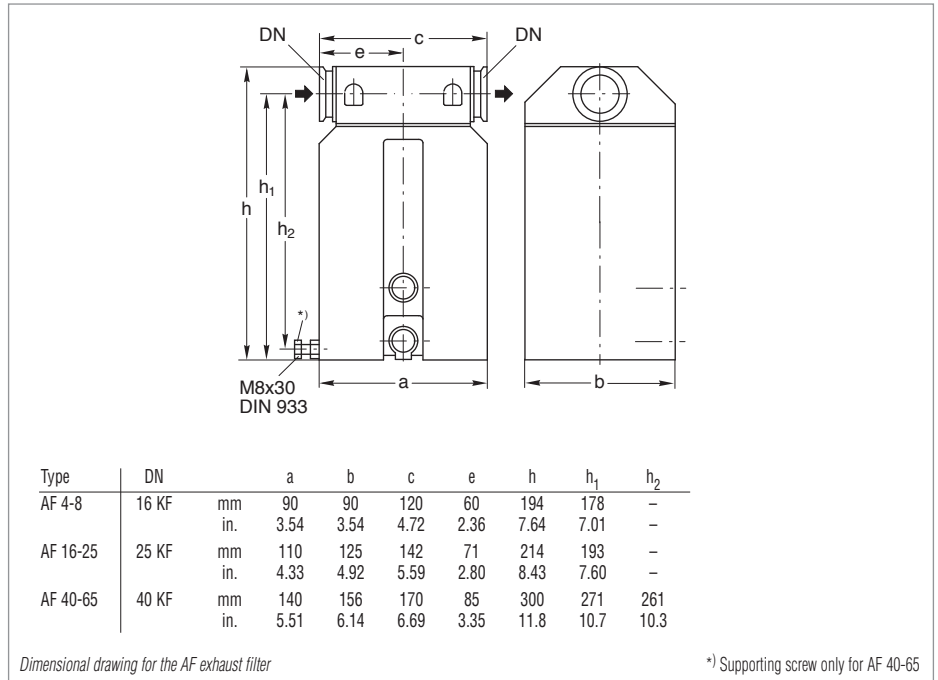
Exhaust Filters AF 4-8, AF 16-25, AF 40-65



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
- ◆ All seals made of FPM
- ◆ Easy to clean and use
- ◆ Retains dirt and cracked products



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
Connection to pump	TRIVAC	D 4/8 B	D 16/25 B/BCS	D 40/65 B/BCS
Max. capacity for condensate, approx.	l (qt)	0.4 (0.4)	0.5 (0.5)	1.0 (1)
Weight	kg (lbs)	1.9 (4.1)	3.2 (7.1)	6.5 (14.3)

Ordering Information		AF 4-8	AF 16-25	AF 40-65
Exhaust filter		Part No. 189 06	Part No. 189 11	Part No. 189 16
Replacement filter element				
FE 4-8		Part No. 189 71	–	–
FE 16-25		–	Part No. 189 72	–
FE 40-65		–	–	Part No. 189 73
Oil drain tap		Part No. 190 90	Part No. 190 90	Part No. 190 90
For further accessories see Section "Accessories for TRIVAC E and B"				

Technical Data		AF 16-25 DOT		
Connection to pump	TRIVAC	–	D 16 B-DOT	–

Ordering Information		AF 16-25 DOT		
Exhaust filter		–	Part No. 124 16	–
Replacement filter element, FE 16-25 DOT		–	Part No. 200 10 304	–
For further accessories see Section "Accessories for TRIVAC E and B"				

Exhaust Filters with Lubricant Return ARP 4-8, AR 4-8, AR 16-25, AR 40-65



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

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
- ◆ The top head may be easily rotated (either parallel or perpendicular to bottom body) [Only AR 4-8 to AR 16-25]

Typical Application

- ◆ Extending the maintenance intervals

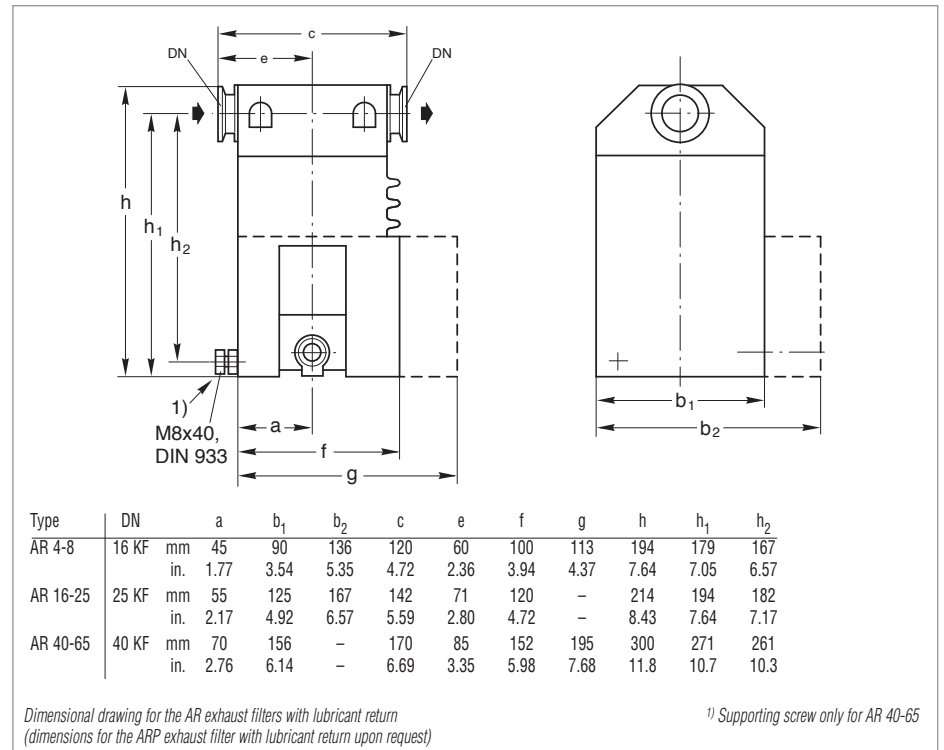
Supplied Equipment

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

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.



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 N 62	–	430 (0.45)	510 (0.54)	760 (0.80)
	remaining amount of oil N 62	–	350 (0.37)	430 (0.45)	700 (0.74)
	Weight	kg (lbs)	1.7 (3.8)	3.1 (6.8)	4.7 (10.4)
Ordering Information		ARP 4-8	AR 4-8	AR 16-25	AR 40-65
Exhaust filter with oil return		Part No. 140 065	Part No. 189 20	Part No. 189 21	Part No. 189 22
Replacement filter element	FE 8	Part No. 190 80	–	–	–
	FE 4-8	–	Part No. 189 71	–	–
	FE 16-25	–	–	Part No. 189 72	–
	FE 40-65	–	–	–	Part No. 189 73

Exhaust Filters with Lubricant Return ARS 16-25, 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
- ◆ May also be used on the TRIVAC B

Typical Application

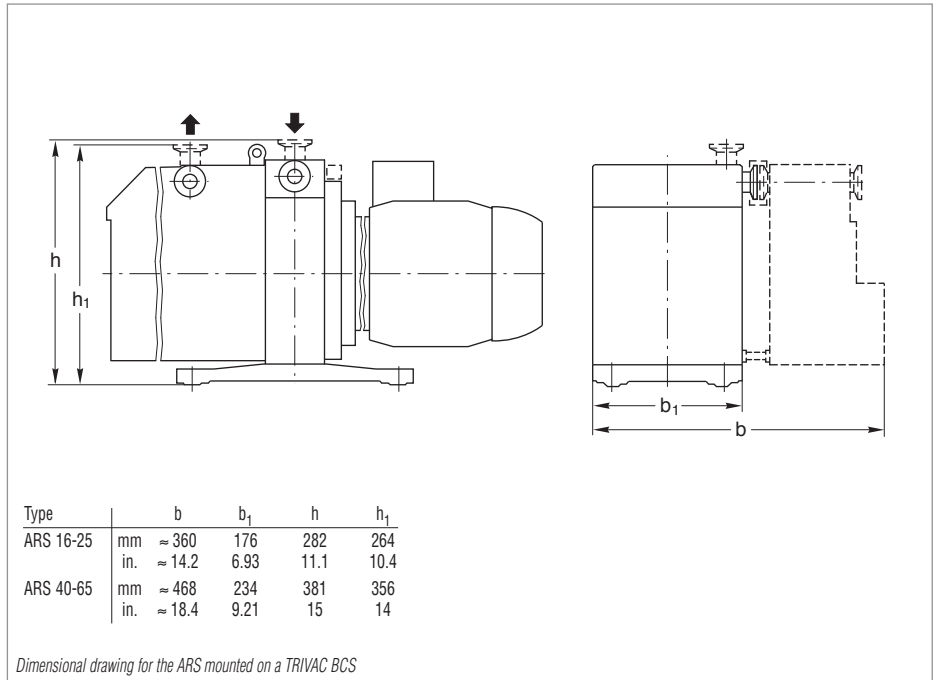
- ◆ Filtering the exhaust air of entrained lubricant particles

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 cleaned in the factory to such an extent, that it may be operated either with mineral oil (e.g. N 62 or HE-200) or perfluoropolyther (PFPE e.g. NC 1/14 or HE-1600).



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.

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/BCS (-PFPE)
Connection flanges	DN	25 KF	40 KF
Amount of oil required for opening the float-controlled valve			
N 62 /HE-200	cm ³ (qt)	510 (0.54)	760 (0.80)
PFPE	cm ³ (qt)	340 (0.36)	420 (0.44)
Remaining amount of oil			
N 62 /HE-200	cm ³ (qt)	430 (0.45)	700 (0.74)
PFPE	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 (18.7)
Ordering Information		ARS 16-25	ARS 40-65
Exhaust filter with lubricant return		Part No. 189 56	Part No. 189 57
Replacement filter element			
FE 16-25		Part No. 189 72	-
FE 40-65		-	Part No. 189 73

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

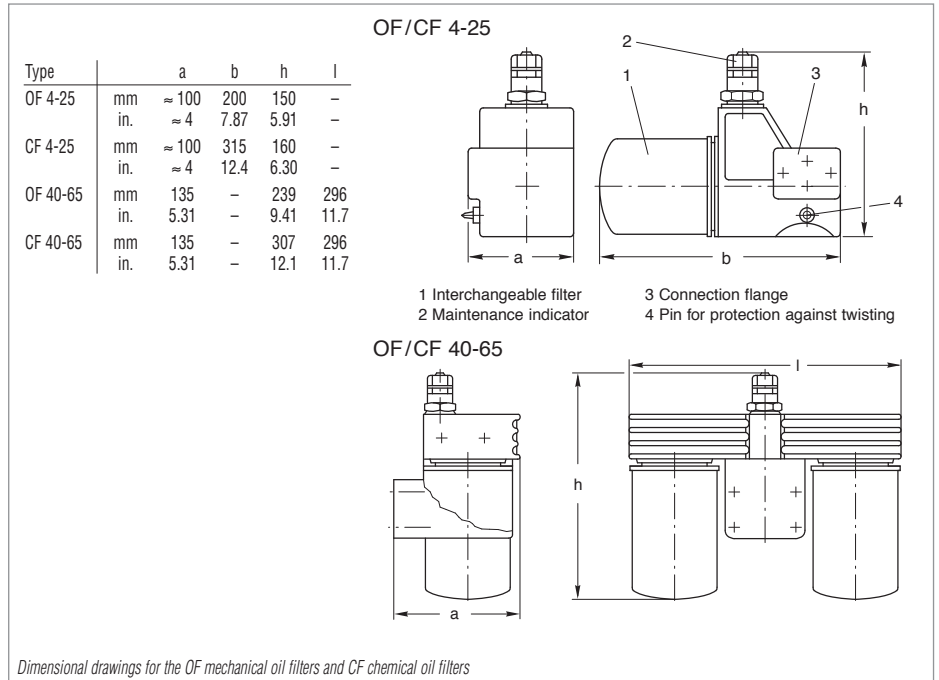


Since there is a pressure-lubrication system with an oil pump in every TRIVAC B, it is possible to connect main flow oil filters.

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

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 40/65 B		
Nominal throughput	$l \times h^{-1}$	900		2000		
Separation, mechanical oil filter	μm	5 to 10		5 to 10		
	chemical oil filter	μm	to 3		to 3	
Permissible operating pressure	bar (psig)	2.5 (21.7)		2.5 (21.7)		
Opening pressure, non-return valve	bar (psid)	0.12 (1.7)		0.12 (1.7)		
	bypass valve	bar (psid)	2.5 ± 0.3 (21.7 ± 4.3)		2.5 ± 0.3 (21.7 ± 4.3)	
Topping up amount during	first time installation	l (qt)	1 (1)		2.5 (2.6)	
	filter exchange	l (qt)	1 (1)		2 (2.1)	
Weight, ready for operation, dry	kg (lbs)	4.0 (8.8)		10 (22.1)		
Ordering Information		OF 4-25	CF 4-25	OF 40-65	CF 40-65	
Mechanical oil filter		Part No. 101 91	-	Part No. 101 92	-	
Chemical oil filter		-	Part No. 101 96	-	Part No. 101 97	
WF 4-25 interchangeable filter, paper, 0.5 l (0.5 qt)		Part No. 189 91	-	-	-	
WF 40-65 interchangeable filter, paper 0.75 l (0.8 qt)		-	-	Part No. 189 92 (2x)	-	
WF Alu 4-65 interchangeable filter, paper and Al ₂ O ₃ , 1 l (1 qt)		-	Part No. 189 96	-	Part No. 189 96 (2x)	

Chemical Filters with Safety Isolation Valve CFS 16-25, 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

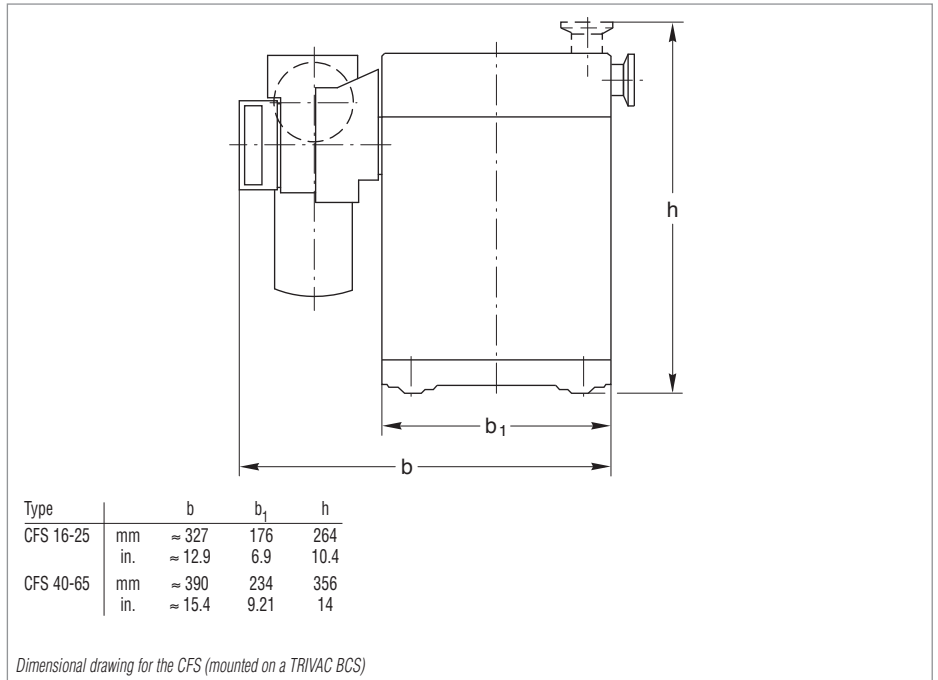
Technical Information

The CFS is cleaned in the factory to such an extent, that it may be operated either with mineral oil (e.g. N 62 or HE-200) or perfluoropolyther (PFPE e.g. NC 1/14 or HE-1600).

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 BCS (-PFPE)	D 40/65 BCS (-PFPE)
Nominal throughput	l x h ⁻¹	900	2000
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)	
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
Chemical filter with safety isolation valve	Part No. 101 76	Part No. 101 77
WF Alu-Part combination filter, paper and Al ₂ O ₃ , 1.6 l (1.7 qt)	Part No. 189 99	Part No. 189 99 (2x)
WF particle filter, paper, 1.6 l (1.7 qt)	Part No. 200 09 804	Part No. 200 09 804 (2x)
WFG particle filter, paper with support mesh, 1 l (1 qt)	Part No. 189 90	Part No. 189 90 (2x)

Inert Gas System IGS 16-25, IGS 40-65



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 x h⁻¹
- ◆ 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

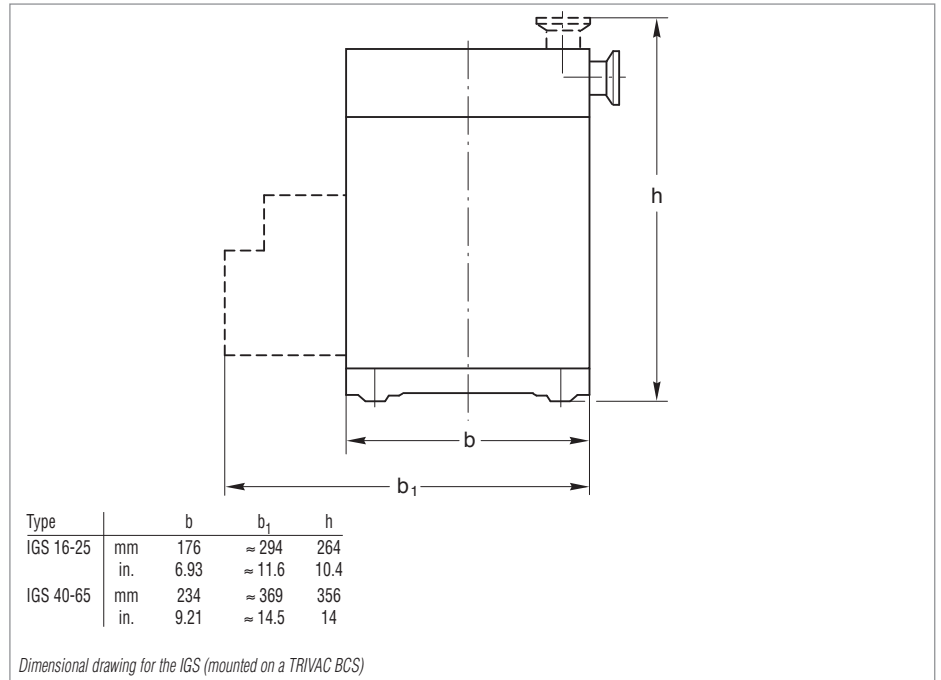
- ◆ Reduction of the contamination levels in the lubricant
- ◆ Reduction in the dwell time of volatile substances within the pump

Technical Information

The amount of inert gas ballast is restricted by a nozzle to 200 l x h⁻¹. Larger quantities are used for purging.

Supplied Equipment

Solenoid valves with connection cables and plugs for connection to the electric indicator system EIS, the required connecting pieces, mounting screws and cover panel.



Technical Data		IGS 16-25	IGS 40-65
Connection to pump	TRIVAC	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)	l x h ⁻¹	200	
Max. amount of admitted gas at a reservoir pressure of 6.0 bar (72.5 psig)	l x h ⁻¹	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. 161 77

Limit Switch System LSS 16-25, LSS 40-65



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

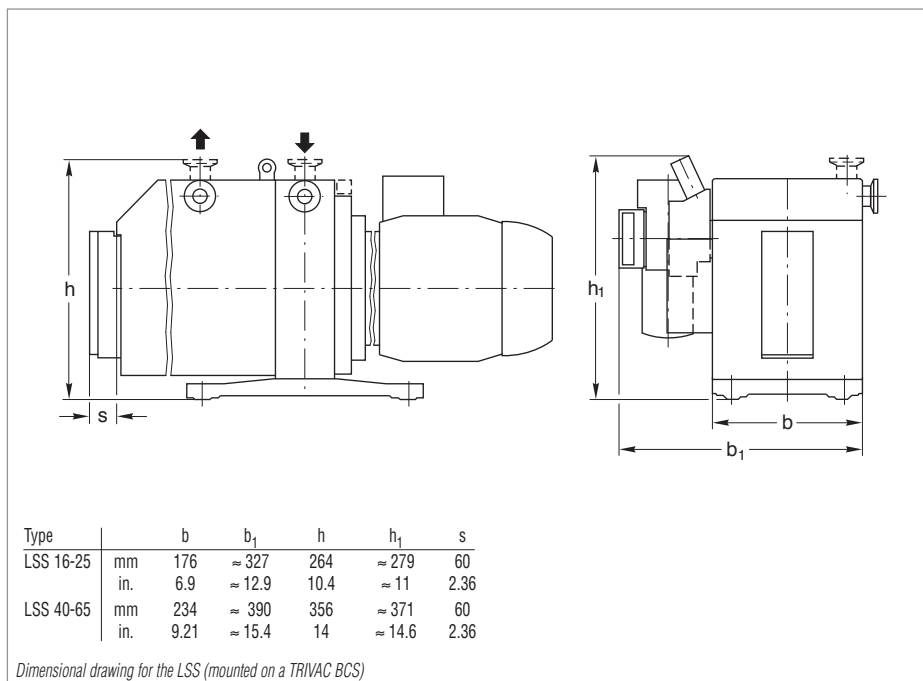
- ◆ Errors are indicated well in advance so that it will in most cases be possible to complete the process for the running batch
- ◆ The switching action is independent of the optical displays (for optimum reliability)
- ◆ The temperature switch is already present in the TRIVAC BCS

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	10/0.4	
Type of protection	IP	54	
Weight, approx.	kg (lbs)	2.5 (5.5)	
Ordering Information		LSS 16-25	LSS 40-65
Limit switch system		Part No. 161 06	Part No. 161 07

Electrical Indicator System EIS 16-25, EIS 40-65



This accessory electrically links all switches from the limit switch system and the electrical indicator system so that the position of each switch is indicated optically by LEDs.

The EIS is part of the TRIVAC SYSTEM.

Advantages to the User

- ◆ Connects directly to the LSS
- ◆ LEDs arranged conveniently on the side of the BCS which carries the controls
- ◆ Socket and plug for supplying and controlling the connected valves, no soldering is required
- ◆ Socket for remote signal transmission
- ◆ For direct, compact installation to the IGS
- ◆ IP 54 protection
- ◆ Each pair of LEDs (red or green) is clearly marked

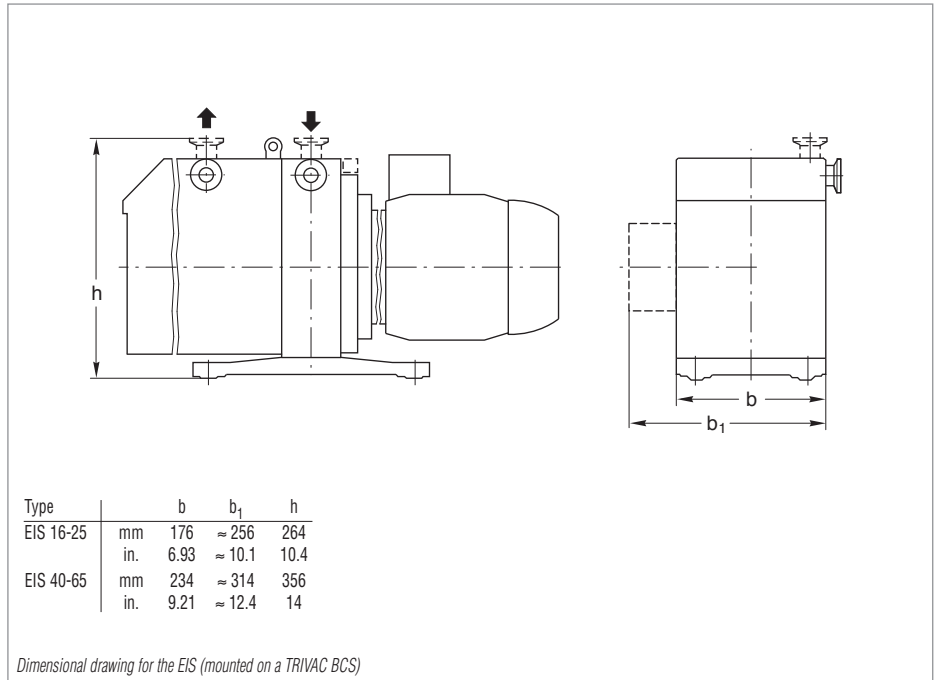
Supplied Equipment

Housing, complete with all sockets for the components of the system.

Socket and plug for 24 V DC supply.

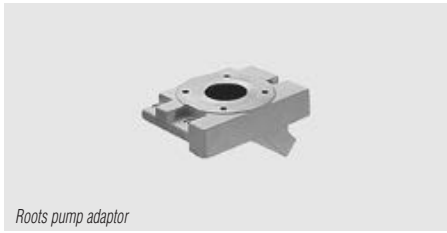
Socket for operating the solenoid valves of the IGS and remote data transmission.

Cover panel and all required mounting screws.



Technical Data		EIS 16-25	EIS 40-65
Connection to pump	TRIVAC	D 16/25 BCS (-PFPE)	D 40/65 BCS (-PFPE)
Input voltage	V DC	24	
Output voltage	V DC	24	
Maximum current	A	3	
Type of protection	IP	54	
Weight			
without cover panel	kg (lbs)	2.5 (5.5)	
with cover panel	kg (lbs)	4.0 (8.8)	
Ordering Information		EIS 16-25	EIS 40-65
Electrical indicator system		Part No. 160 96	Part No. 160 97
Connection plug for transmission of the "green" signals		Part No. 200 80 078	

Roots Pump Adaptor



Roots pump adaptor

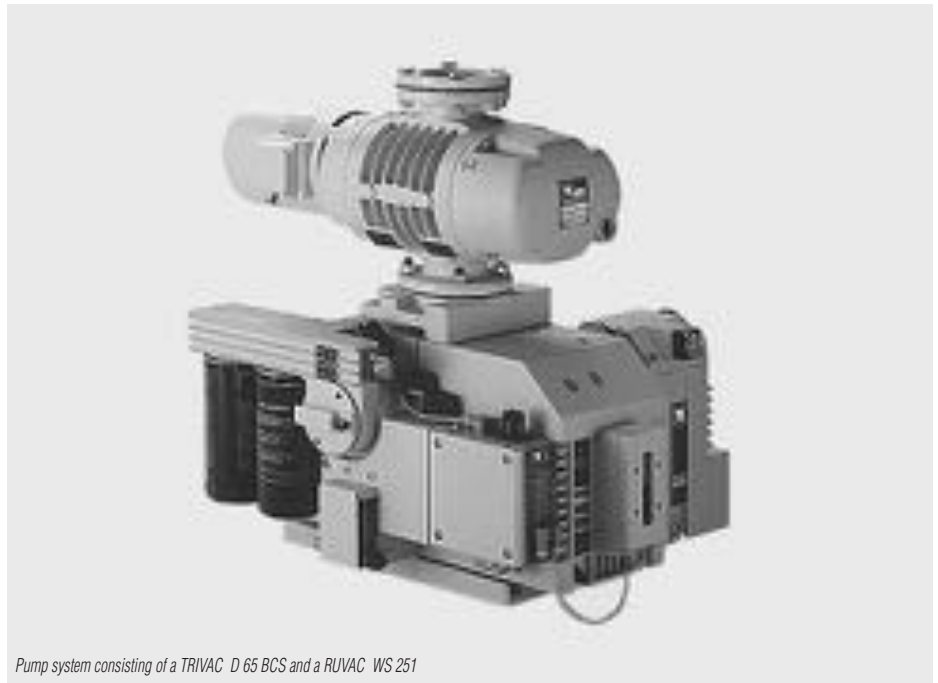
The Roots pump adaptor allows the direct installation of a Roots pump on a TRIVAC D 40/65 B/BCS.

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



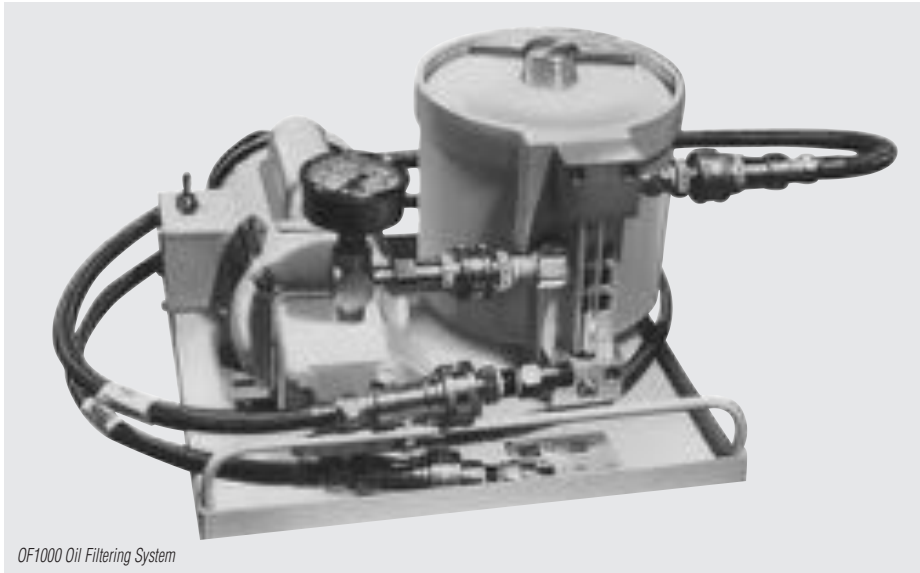
Pump system consisting of a TRIVAC D 65 BCS and a RUVAC WS 251

C01

Technical Data		Roots Pump Adaptor
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)
Ordering Information		Roots Pump Adaptor
Roots pump adaptor		Part No. 168 30

Version for the North and South American Continents

OF1000 Oil Filtering System



OF1000 Oil Filtering System

OF 1000 Oil Filtering Systems are designed to remove acids and particulates from the lubricating fluid used in Leybold mechanical vacuum pumps. The systems are located externally from the vacuum pump, and utilize their own integral gear pump in conjunction with a bypass to continuously recycle fluid through a filtering medium; the medium is housed in an element/canister assembly which additionally serves to absorb heat, and thus reduce the operating temperature of the vacuum pump.

OF1000 Systems are available in both single- and dual-canister designs. Both types are highly compact and reliable, and can be supplied in models for standard or chemically severe applications.

Single-canister OF1000 models are distinguished by their smaller footprint while dual-canister configurations afford the advantages of multi-media filtration and increased oil capacity. Dual-canister models are designed for series flow through two side-by-side mounted canisters, and thus can be used to filter oil through two different media on the same pass or for double filtration through elements containing the same medium. The models also enable the vacuum pump to operate at somewhat lower temperatures, while providing it with a larger supply of clean, filtered oil.

All OF1000 models are supplied with a choice of four filtering elements. The Fullers Earth element provides high capacity for standard acids and can be used to trap particulates down to 10 micron in size. Hydrophilic, activated alumina and fiberglass particulate elements are also available. The hydrophilic element is particularly effective for hydrolyzed acids, and can also be used to trap particles as small as 1 micron. The activated alumina element provides 10 micron particulate retention and is extremely effective for Lewis acids and polar compounds. The fiberglass element is suitable for particulate removal down to 10 micron.

The element/canister assembly of OF1000 systems is easy to install, extremely easy to remove and replace. The recessed lid and oil level of the assembly safeguards against the possibility of spillage. Dripless quick disconnects are also provided for easy canister removal and safer disposal of the filtering element and oil.

OF1000 Systems also come equipped with flexible Teflon hoses designed to resist dielectric breakdown. The systems thus ward against the possibility of oil leaks due to pinholing or static burning of the hose.

Advantages to the User

- ◆ Choice of Single- and Dual-Canister Models for Standard or Chemically Severe Applications
- ◆ Compact Design
- ◆ Reliable Operation
- ◆ Choice of Four Filtering Elements
- ◆ Dripless Quick Disconnects for Easy Removal and Replacement of Filter Elements
- ◆ Recessed Lid and Oil Level – No Oil Spillage
- ◆ Conductive Teflon Hoses for Static Charge Dissipation – No Oil Leakage Due to Static Burning
- ◆ Integral Gear Pump with Built-In Bypass
- ◆ Fluid Sight Glass and Flow Monitor
- ◆ Pressure Gauge
- ◆ Small Precharge Fluid Volume
- ◆ Single Phase 50/60 Hz Motors Standard

Applications

Standard series models are widely used in silicon production processes, including LPCVD, low-pressure epitaxy, ion implantation, reactive ion etching and several plasma processes. Such processes employ a variety of gases which can react with pump fluid, resulting in the formation of sludge, particulates and acids. The standard OF1000 model has proven effective at extending maintenance intervals in such applications.

Similarly, chemically resistant OF1000C models have proven successful in aluminum etching and other processes where boron trichloride and other highly toxic gases are employed. The canister, gear pump, fittings and quick disconnects of the corrosive-service model have been specially treated with a fluorocarbon material that substantially increases the life of these components.

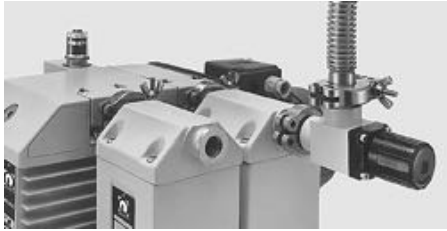
Version for the North and South American Continents



Technical Data		Single-Canister Systems	Dual-Canister Systems
Gear Pump Motor		1/6 HP, 115/208/220V, single phase, 50/60Hz, wired for 115V, with on/off switch ¹⁾	
Gear Pump		0.7 gpm @ 1800 RPM	
Pressure Gauge		0 to 100 psig (0 to 70 kPa)	
Pump Fluid Capacity		15 lb perfluorinated polyether or 3.75 qt hydrocarbon oil	29 lb perfluorinated polyether or 7.25 qt hydrocarbon oil
Flexible Hoses		3/8 in. I.D. teflon/carbon black with stainless steel braid – 4 ft lengths ²⁾	
Dimensions	in. (mm)	16 x 14 x 11 (406 x 356 x 279)	23 x 14 x 11 (585 x 356 x 279)
Flow Arrangement		–	series ³⁾
Weight (Dry)	lb	45	60
Ordering Information		Single-Canister Systems	Dual-Canister Systems
Oil Filtering System			
OF1000 Less Filtering Element and Oil		Part No. 898 550	Part No. 898 552
OF1000 Prepared for PFPE, Less Filtering Element and Oil		Part No. 898 551	Part No. 898 553
OF1000C Chemically Severe Service. Prepared for PFPE Fluid		Part No. 898 561	Part No. 898 554
Accessories			
Spare Filter Canister Assembly With Quick Disconnect Prepared for PFPE, With Quick Disconnect Chemically Severe Service		Part No. 898 555 Part No. 898 556 Part No. 898 566	Part No. 898 557 (front), Part No. 898 555 (rear) Part No. 898 558 (front), Part No. 898 556 (rear) Part No. 898 559 (front), Part No. 898 566 (rear)
Filtering Elements			
Aluminum Oxide — High Capacity for Reagent Grade HCl; Removes Lewis Acids and PolarCompounds; 10 Micron Particulate Retention		Part No. 898 504	Part No. 898 504
Fullers Earth — Acid and Particulate Filter with Capacity of 34 ml Reagent Grade HCl; 10 Micron Particulate Retention		Part No. 898 505	Part No. 898 505
Hydrophilic — Water and HCl Acid Absorbing Capabilities; 1 Micron Particulate Retention		Part No. 898 506	Part No. 898 506
Particulate — Fiberglass Element with 10 Micron Particulate Retention		Part No. 898 507	Part No. 898 507

1) Hazardous duty models and special voltages also available
 2) Optional 6, 10 and 15 feet hoses available
 3) Optional parallel flow arrangement also available

Flange Components, Valves



Our range of flange components and valves is described in detail in Product Sections C13 and C14.

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

Isolation Valve

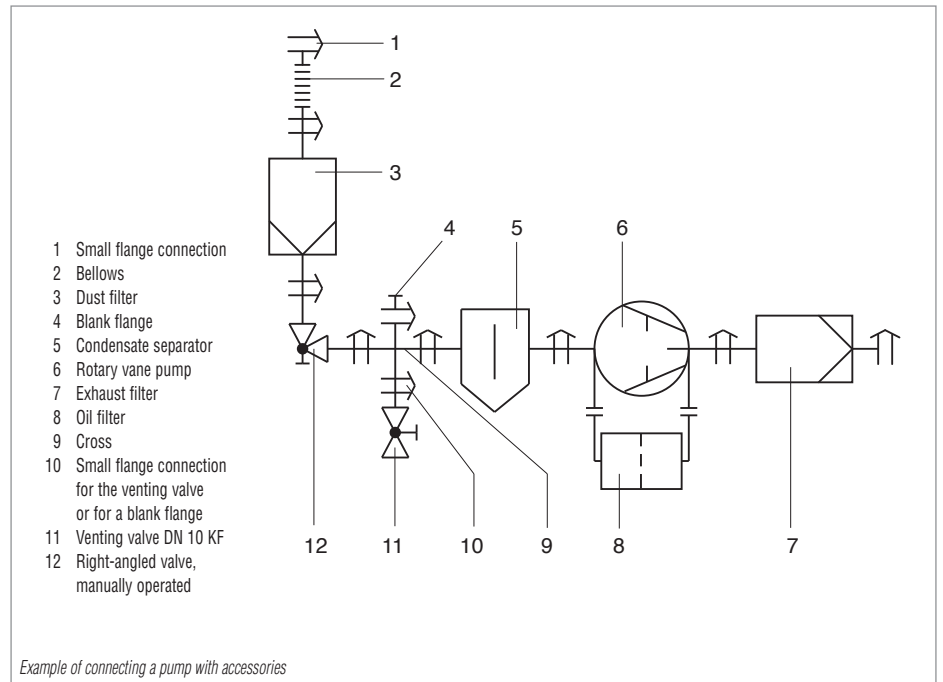
- ◆ The pump is allowed to warm up with the intake line isolated
- ◆ The pump may continue to operate in the energy-saving and environmentally compatible ultimate pressure mode when the vacuum chamber is vented briefly
- ◆ The pump may be left on after completion of the process so as to regenerate the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



Example of connecting a pump with accessories

Ordering Information	DN 16 KF	DN 25 KF	DN 40 KF
Small flange connection			
Clamping ring	Part No. 183 41	Part No. 143 42	Part No. 183 43
Centering ring, aluminum/CR	Part No. 183 26	Part No. 183 27	Part No. 183 28
Centering ring, stainless steel/FPM	Part No. 883 46	Part No. 883 47	Part No. 883 48
Bellows	Part No. 872 41	Part No. 872 43	Part No. 872 45
Right-angled valve, manually operated			
Aluminum casing	Part No. 287 11	Part No. 287 12	Part No. 287 13
Stainless steel casing	Part No. 288 11	Part No. 288 12	Part No. 288 13
Blank flange for (reducing) cross			
Aluminium	Part No. 184 46	Part No. 184 41	Part No. 184 41
Stainless steel	Part No. 884 36	Part No. 884 41	Part No. 884 41
Reducing cross (to DN 10 KF)			
Aluminum	-	Part No. 184 17	Part No. 184 19
Stainless steel	-	Part No. 884 92	Part No. 884 94
Cross DN 16 KF			
Aluminum	Part No. 184 71	-	-
Stainless steel	Part No. 884 85	-	-
Small flange connection for venting valve or blank flange			
Clamping ring	Part No. 183 41	Part No. 183 41	Part No. 183 41
(Adaptor) centering ring, aluminum/NBR	Part No. 183 56	Part No. 183 21	Part No. 183 21
(Adaptor) centering ring, stainless steel/FPM	Part No. 883 56	Part No. 883 21	Part No. 883 21
Venting valve DN 10 KF			
Aluminum	Part No. 173 24	Part No. 173 24	Part No. 173 24
Stainless steel	Part No. 173 37	Part No. 173 37	Part No. 173 37

Vacuum Pump Oils

Lubricating oils for rotary 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 must resist cracking upon being mechanically stressed.

All the vacuum pump 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 pumps from the TRIVAC series.

We therefore recommend the exclusive use of vacuum pump oils fully qualified by Leybold so as to ensure optimum performance of the Leybold vacuum pumps and also to ensure optimum oil change intervals.

Under vacuum conditions lubricating oils, especially those with additives may behave quite differently than expected. Additives may adversely affect the attainable ultimate pressure and may react with the media being pumped.

When using not suitably qualified third party oils, the oil change intervals and the performance of the vacuum pump may be reduced. Also unwanted deposits may occur which may even cause severe damage to the vacuum pump.

In order to adapt the pumps to the different applications of our customers, different types of oil are used in the TRIVAC pumps.

In order to adapt the pumps to the different applications of our customers, different types of oil are used in the TRIVAC pumps.

Please note that owing to differing properties not all types of oil may be used in all pumps of the TRIVAC series. If you can not find the combination of pump and oil you require please ask us for a quotation.

Lubricant Types

Mineral Oils

Mineral oils are products distilled and refined from crude oil. These do not consist of precisely defined compounds 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.

Synthetic Oils

Synthetic oils are produced by a chemical reaction. 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.

The oils given in the following belong to the group of synthetic oils:

Polyalphaolefin (PAO) Oils

Polyalphaolefin oils are synthetic hydrocarbons which are paraffin like, but have a uniform structure. Thermal and chemical resistance is better compared to mineral oils. Elastomer compatibility and resistance against hydrolysis are comparable to mineral oils.

Ester oils

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.

Perfluorinated polyether (PFPE)

These are oils which are only composed of carbon (C), fluorine (F) and oxygen atoms (O). The existing C-O and C-F bonds are highly stable. For this reason PFPE oils are practically inert against all chemical and oxidising influences.

Perfluorinated polyethers will not polymerise under the influence of high energy radiation.

PFPE is non-flammable. Leybold NC1/14 has the approval of BAM (Federal Institute for Materials Research and Testing) for pumping of pure oxygen.

Perfluorinated polyethers are used when pumping strongly reactive substances like oxygen (O₂), fluorine F₂ and uranium hexafluoride UF₆. Regarding Lewis acids (for example, boron trifluoride BF₃, aluminum trichloride AlCl₃) they are not completely inert. Here reactions may take place at temperatures over 100 °C (212 °F).

Perfluorinated polyethers are thermally highly stable. Thermal decomposition may only take place at temperatures of over 290 °C (554 °F).

Caution: Perfluorinated polyethers will – when decomposed – release toxic and corrosive gases: hydrogen fluoride HF, carbonyl difluoride COF₂. 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 perfluorinated polyethers, since it is essential that the pump 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.

For all lubricants from our line of products you may obtain Safety Data Sheets from the Dept. Technical Support in Cologne.

Oil recommendations for various areas of application

Application Data	Special Oil N62	White Oil NC2	PROTELEN	SHC 224
Type of oil	Paraffin-base mineral oil, core fraction, free of additives	Medicinal, high purity white oil, paraffin-base, core fraction, free of additives, sulphur and aromatic compounds	Mixed base mineral oil	Polyalphaolefin PAO
Examples of areas of application and process media	Standard oil for Leybold Germany For pumping air, chemically inert permanent gases (noble gases, for example), water vapor, solvent vapors in the case of laboratory pumps operated with cold traps	For pumping small quantities of chemically reactive substances like halogens (for example, bromine Br ₂ , iodine I ₂), halogen acids (for example, hydrogen chloride HCl, hydrogen bromide HBr), halogenated hydrocarbons (for example, bromomethane CH ₃ Br, trichloromethane CHCl ₃), Lewis acids (for example, aluminum chloride AlCl ₃ , titanium tetrachloride TiCl ₄), acetic acid CH ₃ COOH	For pumping corrosive contaminants in the gas, acid vapors (for example, sulfuric acid H ₂ SO ₄), organic acid chlorides (for example acetyl chloride CH ₃ COCl).	Cold starting at low temperatures is possible. Pumping of chemically inert permanent gases (for example, noble gases) water vapor in small quantities, refrigerants R 717 (ammonia NH ₃)
Remarks	The ultimate pressures stated in our catalogs are based on operation of the pump with N62 (except for the DOT and PFPE pumps) Service life may be extended through the use of an oil filter	When pumping the aforementioned process media, humidity must be avoided Service life may be extended through the use of an oil filter	When pumping the aforementioned process media, humidity must be avoided Do not use chemical oil filters Avoid corrosion at standstill	Service life may be extended through the use of an oil filter
Elastomer compatibility				
FPM (Viton)	Suited	Suited	Suited	Suited
NBR (Perbunan) ¹⁾	Conditionally suited	Conditionally suited	Conditionally suited	Conditionally suited
EPDM	Not suited	Not suited	Not suited	Not suited

Technical Data	Special Oil N62	White Oil NC2	PROTELEN	SHC 224
Viscosity				
at 40 °C (104 °F) mm ² /s (= cSt)	90	90	140	29
at 100 °C (212 °F) mm ² /s (= cSt)	10	10	11	5.6
Flash point °C (°F)	> 255 (491)	> 260 (500)	250 (482)	230 (446)
Vapor pressure				
at 20 °C (68 °F) mbar (Torr)	< 1 x 10 ⁻⁵ (< 8 x 10 ⁻⁶)	< 1 x 10 ⁻⁵ (< 8 x 10 ⁻⁶)	4 x 10 ⁻⁴ (3 x 10 ⁻⁴) ³⁾	1 x 10 ⁻⁵ (0,75 x 10 ⁻⁵)
at 100 °C (212 °F) mbar (Torr)	< 3 x 10 ⁻³ (< 2 x 10 ⁻³)	< 1 x 10 ⁻³ (< 8 x 10 ⁻⁴)	1 x 10 ⁻² (8 x 10 ⁻³)	8 x 10 ⁻³ (6 x 10 ⁻³)
Density at 15 °C (59 °F) g/ml	0.88 ²⁾	0.87 ²⁾	0.90	0.83
Pour point °C (°F)	< -9 (16)	< -15 (5)	-30 (- 22)	< - 55 (- 67)
Middle molecular weight g/mol	550	530	450	476

Ordering Information	Special oil N62	White Oil NC2	PROTELEN	SHC 224
1 litre (1.06 qt)	Part No. 177 01	–	–	Part No. 200 28 181
5 litres (5.29 qt)	Part No. 177 02	Part No. 177 29	Part No. 177 07	–
20 litres (21.14 qt)	Part No. 177 03	Part No. 177 27	Part No. 177 08	–
180 kg (397.35 lbs)	Part No. 177 05	–	Part No. 177 10	–

Please note that the technical data stated are only typical data. Slight variations from batch to batch must be expected.

The technical data stated here can not be taken as assured properties

¹⁾ Resistance to decomposing is very much dependent on the share of acrylonitrile in the NBR

²⁾ at 20 °C (68 °F)

³⁾ at 60 °C (140 °F)

Application Data	ANDEROL® 555	ANDEROL® RCF-E68N	NC 10
Type of oil	Diester oil	Polycarboxylic acid ester	Alkyl sulphonic acid ester
Examples of areas of application and process media	Used at elevated temperatures, pumping of air, chemically inert permanent gases (noble gases, for example), carbon dioxide CO ₂ , carbon monoxide CO, aliphatic compounds (for example methane CH ₄ , propane C ₃ H ₈ , ethylene C ₂ H ₄), organic solvent vapors	Cooling and air-conditioning applications. For refrigerants (for example halocarbon, R134a), HCFC (for example, R123), HFC (for example, R218), CFC (for example, R12) and HC (for example, R600a)	When pumping process media which tend to polymerise (for example, styrene C ₈ H ₈ , butadiene C ₄ H ₆).
Remarks	Do not pump any inorganic acids (HCL, HF, for example), no free halogens (CL ₂ , F ₂ , for example) or alkaline media (NH ₃ , for example)	Use only correspondingly modified pumps Mixing with other types of oil must be absolutely avoided Do not pump any inorganic acids (for example HCl, HF)	Do not use a chemical oil filter Mixing with other types of oil must be absolutely avoided Do not pump any inorganic acids (for example HCl, HF)
Elastomer compatibility FPM (Viton) NBR (Perbunan) ¹⁾ EPDM	Suited Conditionally suited Not suited	Suited Conditionally suited Not suited	Suited Not suited Not suited

Technical Data	ANDEROL® 555	ANDEROL® RCF-E68N	NC 10
Viscosity at 40 °C (104 °F) mm ² /s (= cSt) at 100 °C (212 °F) mm ² /s (= cSt)	94 9	68 10	38 4
Flash point °C (°F)	250 (482)	260 (500)	225 (437)
Vapor pressure at 20 °C (68 °F) mbar (Torr) at 100 °C (212 °F) mbar (Torr)	7 x 10 ⁻⁵ (5 x 10 ⁻⁵) 1.5 x 10 ⁻³ (1 x 10 ⁻³)	No known No known	1 x 10 ⁻⁴ (8 x 10 ⁻⁵) No known
Density at 15 °C (59 °F) g/ml	0.96	1.00	1.05 ²⁾
Pour point °C (°F)	-42 (-44)	-54 (-65)	-30 (-22)
Middle molecular weight g/mol	530	Not applicable	Not applicable

Ordering Information	ANDEROL® 555	ANDEROL® RCF-E68N	NC 10
1 litre (1.06 qt)	Part No. 200 10 272	Part No. 200 02 754	–
5 litres (5.29 qt)	Part No. 200 10 891	–	–
20 litres (21.14 qt)	Part No. 200 00 193	–	Part No. 177 25

Please note that the technical data stated are only typical data. Slight variations from batch to batch must be expected.

The technical data stated here can not be taken as assured properties

²⁾ at 20 °C (68 °F)

¹⁾ Resistance to decomposing is very much dependent on the share of acrylonitrile in the NBR

ANDEROL® is a trademark of ANDEROL BV

Application Data	DOT 4	NC 1/14
Type of oil	Brake fluid	Perfluorinated polyether PFPE
Examples of areas of application and process media	Filling of brake fluid circuits in the car industry	For pumping strong oxidants like oxygen, O ₂ , ozone O ₃ , nitrogen oxides NO _x and sulphur oxides (SO ₂ , SO ₃) as well as reactive substances like halogens (for example fluorine F ₂ , chlorine Cl ₂), hydrogen halides (for example hydrogen chloride HCl, hydrogen bromide HBr), uranium hexafluoride UF ₆ , and conditionally Lewis acids (for example, boron trichloride BCl ₃)
Remarks	Use only in pumps modified for DOT 4 Mixing with other types of oil must be absolutely avoided	Use only in pumps modified for PFPE Mixing with other types of oil must be absolutely avoided Avoid pumping water vapour, especially with corrosive media (see above) The use of a chemical oil filter CF / CFS is strongly recommended
Elastomer compatibility FPM (Viton) NBR (Perbunan) ¹⁾ EPDM	Not suited Not suited Suited	Suited Suited Suited

Technical Data	DOT 4	NC 1/14
Viscosity at 40 °C (104 °F) mm ² /s (= cSt) at 100 °C (212 °F) mm ² /s (= cSt)	No known > 2	47 5
Flash point °C (°F)	> 120 (248)	- 2)
Vapor pressure at 20 °C (68 °F) mbar (Torr) at 100 °C (212 °F) mbar (Torr)	1.3 (0.98) No known	3 x 10 ⁻⁷ (2.25 x 10 ⁻⁷) 6 x 10 ⁻⁴ (4.5 x 10 ⁻⁴)
Density at 15 °C (59 °F) g/ml	1.05	1.89 ³⁾
Pour point °C (°F)	Not applicable	- 40 (- 40)
	Not applicable	2500

Ordering Information	DOT 4	NC 1/14
1 litre (1.06 qt)	Part No. 200 10 037	Part No. 177 38

Please note that the technical data stated are only typical data. Slight variations from batch to batch must be expected.

The technical data stated here can not be taken as assured properties

¹⁾ Resistance to decomposing is very much dependent on the share of acrylonitrile in the NBR

²⁾ **Caution:** Perfluorinated polyether compounds will, when being decomposed at temperatures over 290 °C (554 °F), release toxic and corrosive gases.

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

³⁾ at 20 °C (68 °F)

Version for the North and South American Continents

Application Data	HE-200	HE-1600
Type of oil	Paraffin-base mineral oil, core fraction, free of additives	Perfluorinated polyether PFPE
Examples of areas of application and process media	Standard oil for Leybold USA For pumping air, chemically inert permanent gases (noble gases, for example), water vapor, solvent vapors in the case of laboratory pumps operated with cold traps	For pumping strong oxidants like oxygen, O ₂ , ozone O ₃ , nitrogen oxides NO _x and sulphur oxides (SO ₂ , SO ₃) as well as reactive substances like halogens (for example fluorine F ₂ , chlorine Cl ₂), hydrogen halides (for example hydrogen chloride HCl, hydrogen bromide HBr), uranium hexafluoride UF ₆ , and conditionally Lewis acids (for example, boron trichloride BCl ₃)
Remarks	The ultimate pressures stated in our catalogs are based on operation of the pump with HE-200 (except for the DOT and PFPE pumps) Service life may be extended through the use of an oil filter	Use only correspondingly modified pumps Mixing with other types of oil must be absolutely avoided The uptake of water vapor must be avoided The use of an oil filter is strongly recommended
Elastomer compatibility		
FPM (Viton)	Suited	Suited
NBR (Perbunan) ¹⁾	Conditionally suited	Suited
EPDM	Not suited	Suited

Technical Data	HE-200	HE-1600
Viscosity		
at 40 °C (104 °F) mm ² /s (= cSt)	58	140 ²⁾
at 100 °C (212 °F) mm ² /s (= cSt)	9.1	7
Flash point °C (°F)	224 (435)	– ³⁾
Vapor pressure		
at 25 °C (77 °F) mbar (Torr)	4.7 x 10 ⁻⁶ (3.5 x 10 ⁻⁶)	7 x 10 ⁻⁷ (5 x 10 ⁻⁷) ²⁾
at 100 °C (212 °F) mbar (Torr)	3.9 x 10 ⁻⁴ (2.9 x 10 ⁻⁴)	3 x 10 ⁻⁴ (2 x 10 ⁻⁴)
Density at 20 °C (68 °F) g/ml	0.88	1.86
Pour point °C (°F)	- 10 (14)	- 40 (- 40)
Molecular weight	480	3000

Ordering Information	HE-200	HE-1600
1 qt (1 l)	Part No. 98 198 006	–
1 gal (3.8 l)	Part No. 98 198 007	–
5 gal (18.9 l)	Part No. 98 198 008	–
55 gal (208 l)	Part No. 98 198 010	–
Bottle 2 lb (0.91 kg)	–	Part No. 898 564-1
Bottle 4 lb (1.81 kg)	–	Part No. 898 564-2
Bottle 16 lb (7.25 kg)	–	Part No. 898 564-4

Please note that the technical data stated are only typical data. Slight variations from batch to batch must be expected.

The technical data stated here can not be taken as assured properties

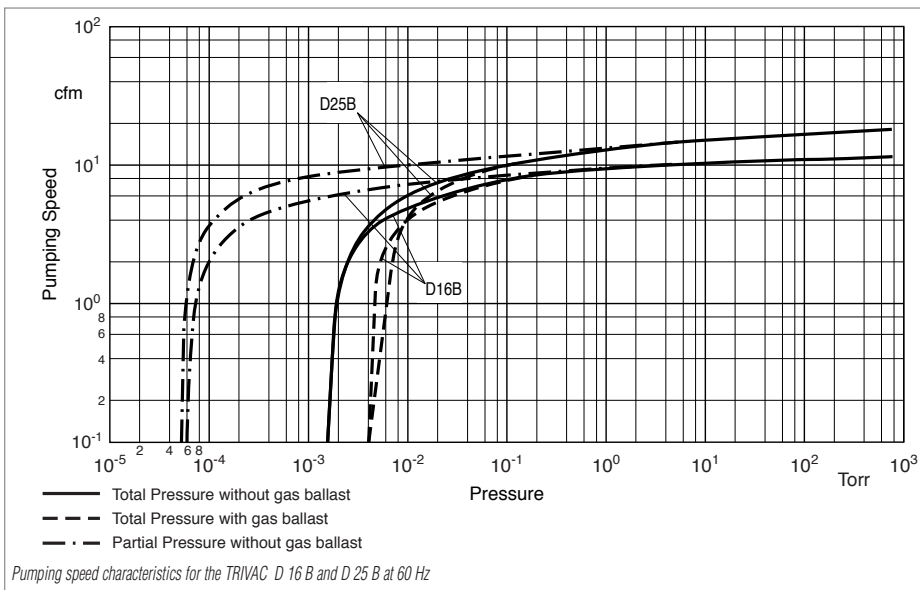
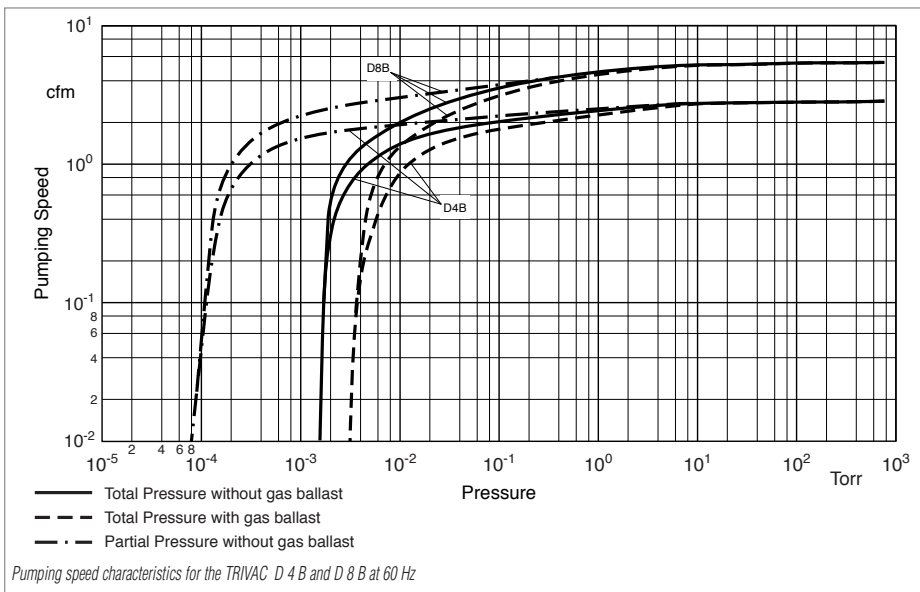
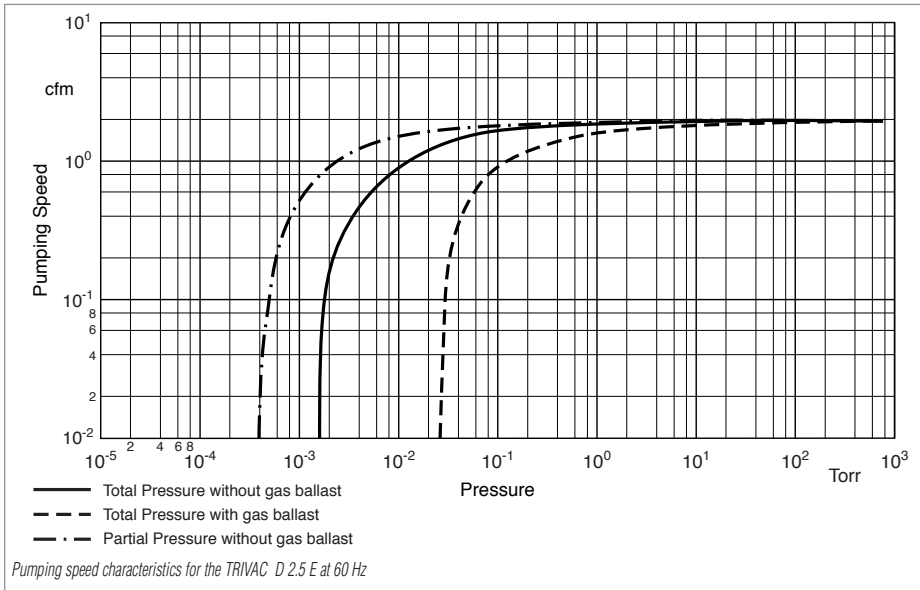
¹⁾ Resistance to decomposing is very much dependent on the share of acrylonitrile in the NBR

²⁾ at 20 °C (68 °F)

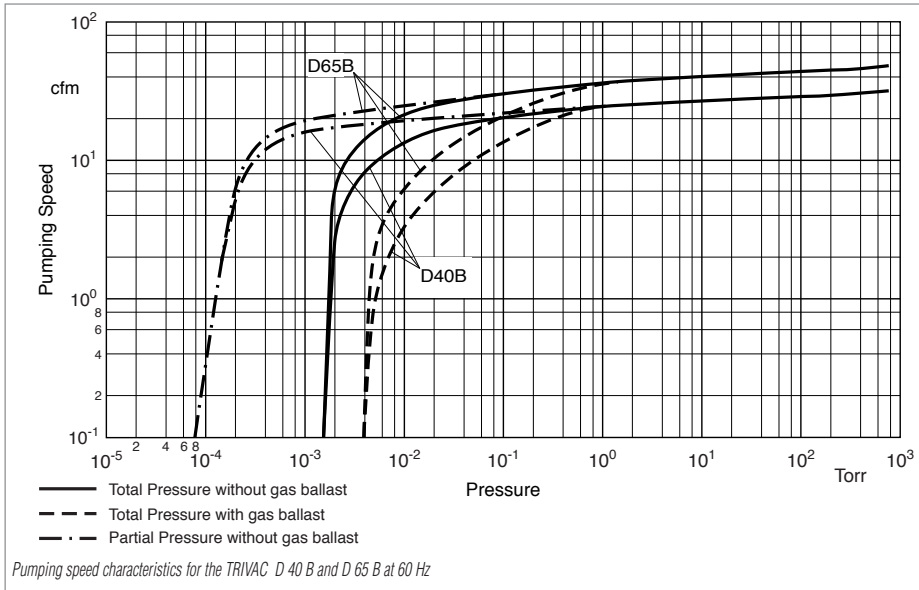
³⁾ **Caution:** Perfluorinated polyether compounds will, when being decomposed at temperatures over 290 °C (554 °F), release toxic and corrosive gases.

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

Version for the North and South American Continents



Version for the North and South American Continents



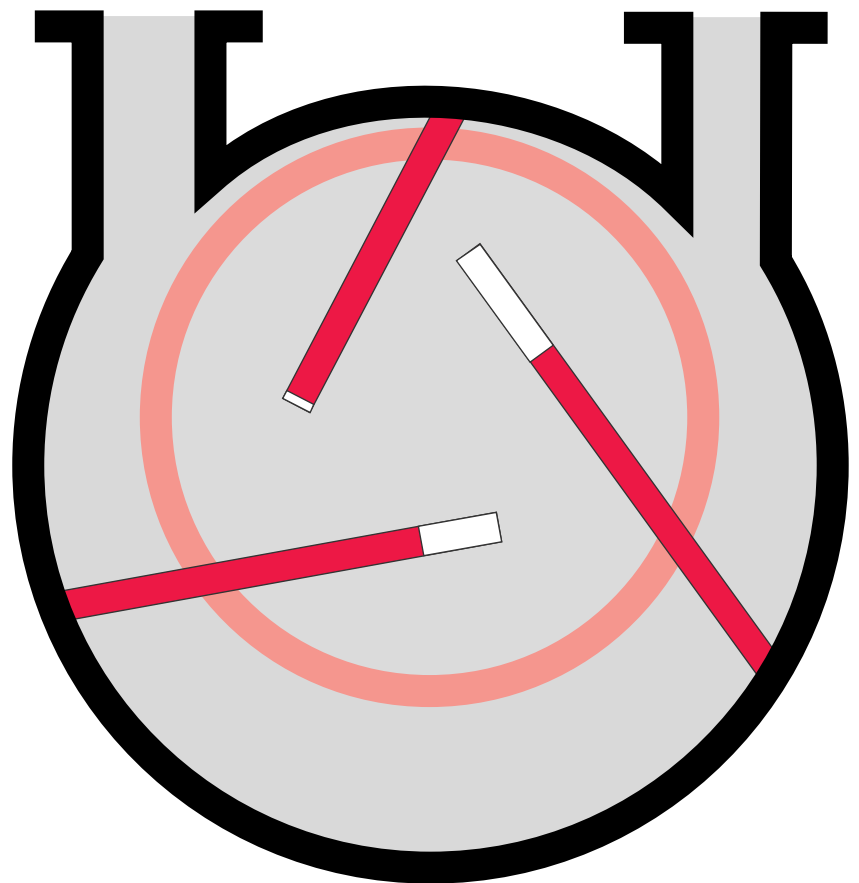
C01

CO2

SOGEVAC

Rotary Vane Vacuum Pumps

single-stage, oil-sealed,
10 - 1200 m³ x h⁻¹ (5.9 - 707 cfm)



General

Product Range, Features and Design	C02.03
--	---------------

Products

Rotary Vane Vacuum Pumps	
SOGEVAC SV 10 B/SV 16 B.	C02.04
SOGEVAC SV 25 B.	C02.06
SOGEVAC SV 40 B/SV 65 B.	C02.08
SOGEVAC SV 100 B.	C02.12
SOGEVAC SV 16/SV 25.	C02.16
SOGEVAC SV 40/SV 65/SV 100.	C02.18
SOGEVAC SV 200/SV 300.	C02.22
SOGEVAC SV 500.	C02.26
SOGEVAC SV 630/SV 630 F/SV 750.	C02.28
SOGEVAC SV 1200.	C02.32

Accessories

Dust Filters (Suction Side)	C02.34
SL Condensate Traps	C02.36
SEP Separators and SEPC Condensers.	C02.37
Special Oil Sight Glass.	C02.38
Gas Ballast Valve	C02.38
Thermal Switch	C02.38
Ball Valves and Valves	C02.39
Oil Filtering System OF3000.	C02.40
Other Accessories	C02.41
Mounting Accessories	C02.42
Exhaust Filter Gauge	C02.42
Bourdon Vacuum Gauges.	C02.43
Connection Fittings	
for SOGEVAC SV 16, SV 25 and SV 10 B, SV 16 B, SV 25 B.	C02.44
for SOGEVAC SV 40, SV 65, SV 100 and SV 40 B, SV 65 B, SV 100 B.	C02.45
for SOGEVAC SV 200, SV 300.	C02.46
for SOGEVAC SV 500, SV 630, SV 630 F, SV 750.	C02.47
for SOGEVAC SV 1200.	C02.48

Miscellaneous

Central Vacuum Systems	C02.49
Vacuum Pump Oils	C02.55
60 Hz Curves.	C02.59

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 pumps or high vacuum pumps. By design, rotary vane pumps run quietly and do not produce much noise.

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 16 to 1200 m³ x h⁻¹ (9.4 to 707 cfm)) allows every customer to select the right pump for his particular needs.

With the new range of compact pumps from 10 to 100 m³ x h⁻¹ 1 these characteristics are even more pronounced.

Application Examples

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

Advantages to the User

- ◆ Operation from atmospheric pressure to ultimate pressure
- ◆ High pumping speed also at low pressures
- ◆ Low noise level
- ◆ Low vibrations
- ◆ Integrated exhaust filter, up to 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 or SV 100 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

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 before it is injected. The lubricant system is rated for continuous operation at high intake pressures 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.

This demister system, optimized to suit all operating conditions of the vacuum pump ensures oil-mist free exhaust gas (degree of separation over 99.9%) even at high intake pressures and when pumping vapors.

LEYBOLD rotary vane 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.

Except for the SV 10 B to SV 65 B, 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

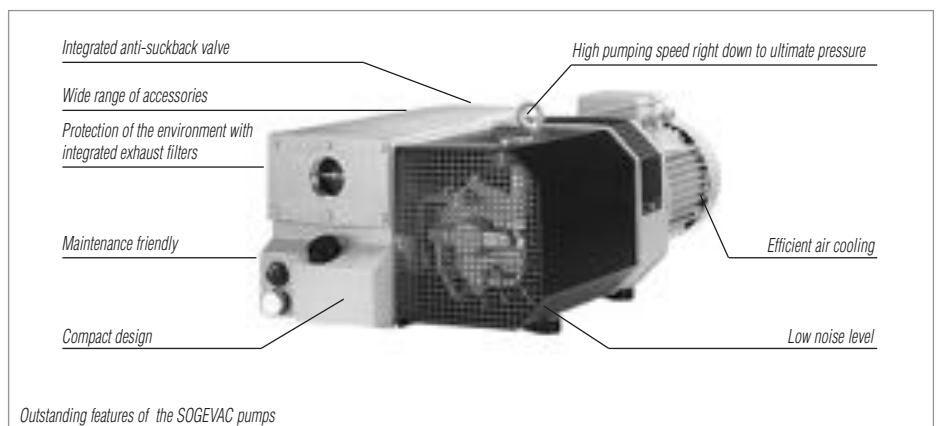
A valve is built into the intake of the SOGEVAC pumps. This "anti-suckback valve" is protected by a metal wire-mesh filter. During standstill of the pump (for example due to shutting down or a power failure) this valve closes the intake. This prevents the pressure from rising in the connected chamber 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 gas over the entire range of operating pressures – from atmospheric pressure to ultimate pressure.

Supplied Equipment

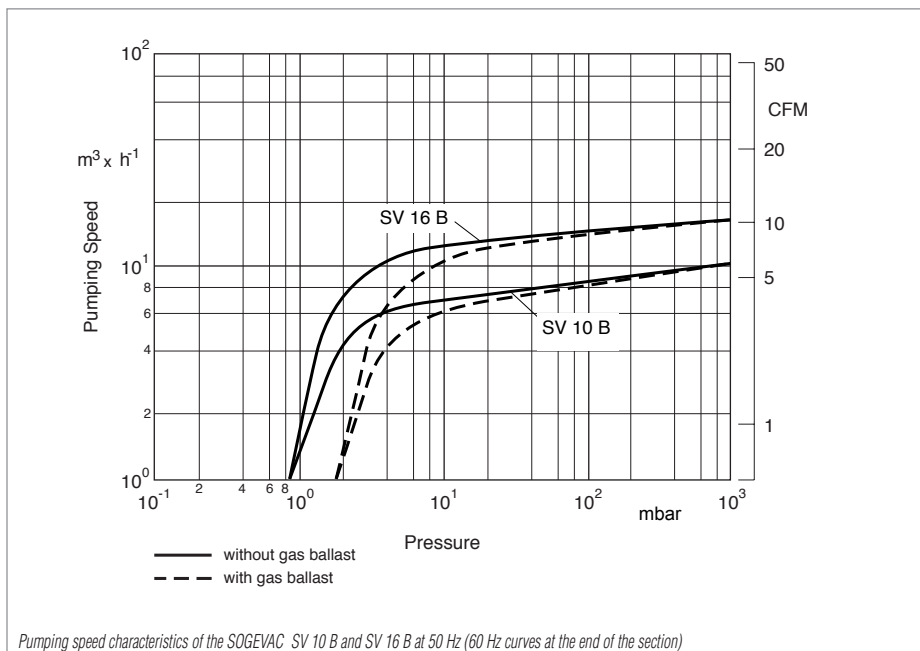
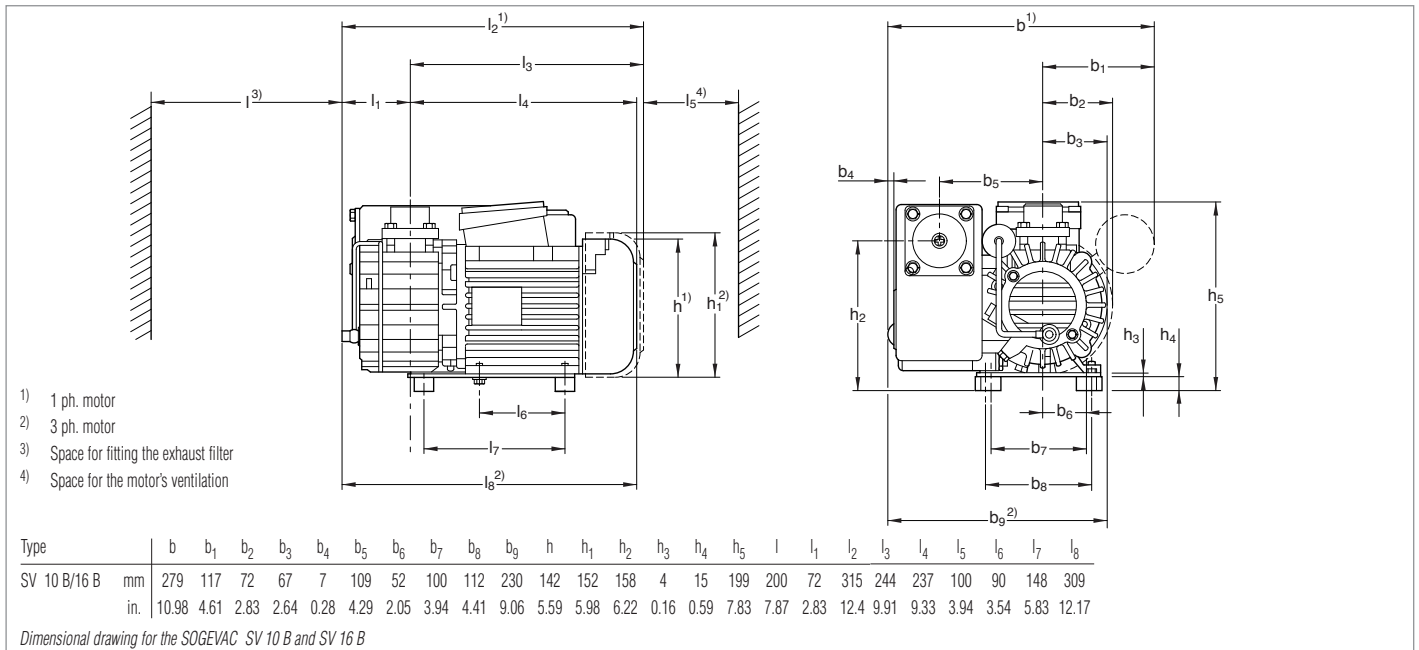
All pumps are delivered with the required quantity of oil: SV 10 B to SV 65 (B) in a separate canister, whereas the SV 100 (B) to SV 1200 already contain the oil and are thus ready for operation.



SOGEVAC SV 10 B/SV 16 B



SOGEVAC SV 16 B



Technical Data		SOGEVAC SV 10 B		SOGEVAC SV 16 B	
		50 Hz	60 Hz	50 Hz	60 Hz
Nominal speed ¹⁾	m ³ x h ⁻¹ (cfm)	11 (6.5)	13 (7.7)	16 (9.4)	19 (11.2)
Pumping speed ¹⁾	m ³ x h ⁻¹ (cfm)	9.5 (5.6)	11.5 (6.8)	15 (8.8)	17 (10)
Ultimate partial pressure without gas ballast ¹⁾	mbar (Torr)	≤ 1 (≤ 0.75)		≤ 1 (≤ 0.75)	
Ultimate total pressure with gas ballast ¹⁾	mbar (Torr)	≤ 2 (≤ 1.5)		≤ 2 (≤ 1.5)	
Water vapor tolerance ¹⁾	mbar (Torr)	10 (7.5)	15 (11.3)	10 (7.5)	15 (11.3)
Water vapor capacity	kg x h ⁻¹ (qt/hr)	20 (21)	30 (32)	30 (32)	50 (53)
Oil capacity	l (qt)	0.5 (0.53)		0.5 (0.53)	
Noise level ²⁾	dB(A)	62 (1φ) - 60 (3φ)	66 (1φ) - 64 (3φ)	62 (1φ) - 60 (3φ)	66 (1φ) - 64 (3φ)
Admissible ambient temperature	°C (°F)	12 to 40 (54 to 104)		12 to 40 (54 to 104)	
Motor power	kW (hp)	0.55 (1)	0.75 (1.5)	0.55 (1)	0.75 (1.5)
Nominal speed	min ⁻¹ (rpm)	3000 (3000)		3000 (3000)	
Type of protection	IP	55-F		55-F	
Weight (with oil filling)	kg (lbs)	20 (41.15)		20.5 (45.25)	
Dimensions (W x H x D)	mm (in.)	315 x 281 x 199 (12.4 x 11.06 x 7.83)		315 x 281 x 199 (12.4 x 11.06 x 7.83)	
Connections					
intake (Inside thread)	G	3/4" + 1/2"	3/4" + 1/2"	3/4" + 1/2"	3/4" + 1/2"
Ordering Information		SOGEVAC SV 10 B		SOGEVAC SV 16 B	
		50 Hz	60 Hz	50 Hz	60 Hz
SOGEVAC SV 10 B/SV 16 B ¹⁾ with three-phase motor, with gasballast 230/400 V, 50 Hz und 230/460 V, 60 Hz (CEI) 200 V, 50/60 Hz		Part No. 960 100 Part No. 960 115		Part No. 960 160 Part No. 960 175	
with single-phase motor, with gasballast 230 V, 50/60 Hz (CEI) 115 V, 60 Hz 100 V, 50/60 Hz		Part No. 960 105 Part No. 960 110 Part No. 960 114		Part No. 960 165 Part No. 960 170 Part No. 960 174	
Other voltages/frequencies ⁴⁾ Filling with special oil		upon request upon request		upon request upon request	
Accessories		upon request			
Spare parts		upon request			

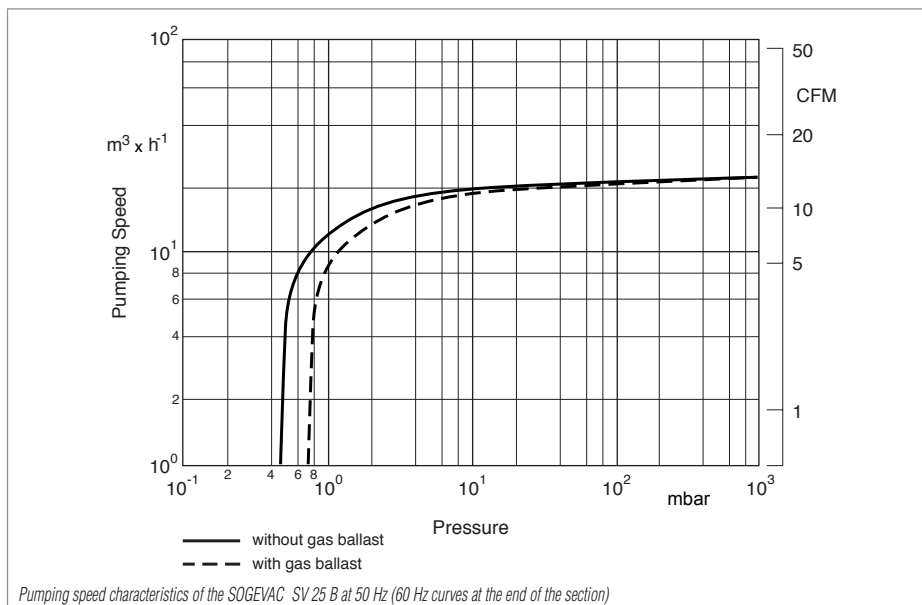
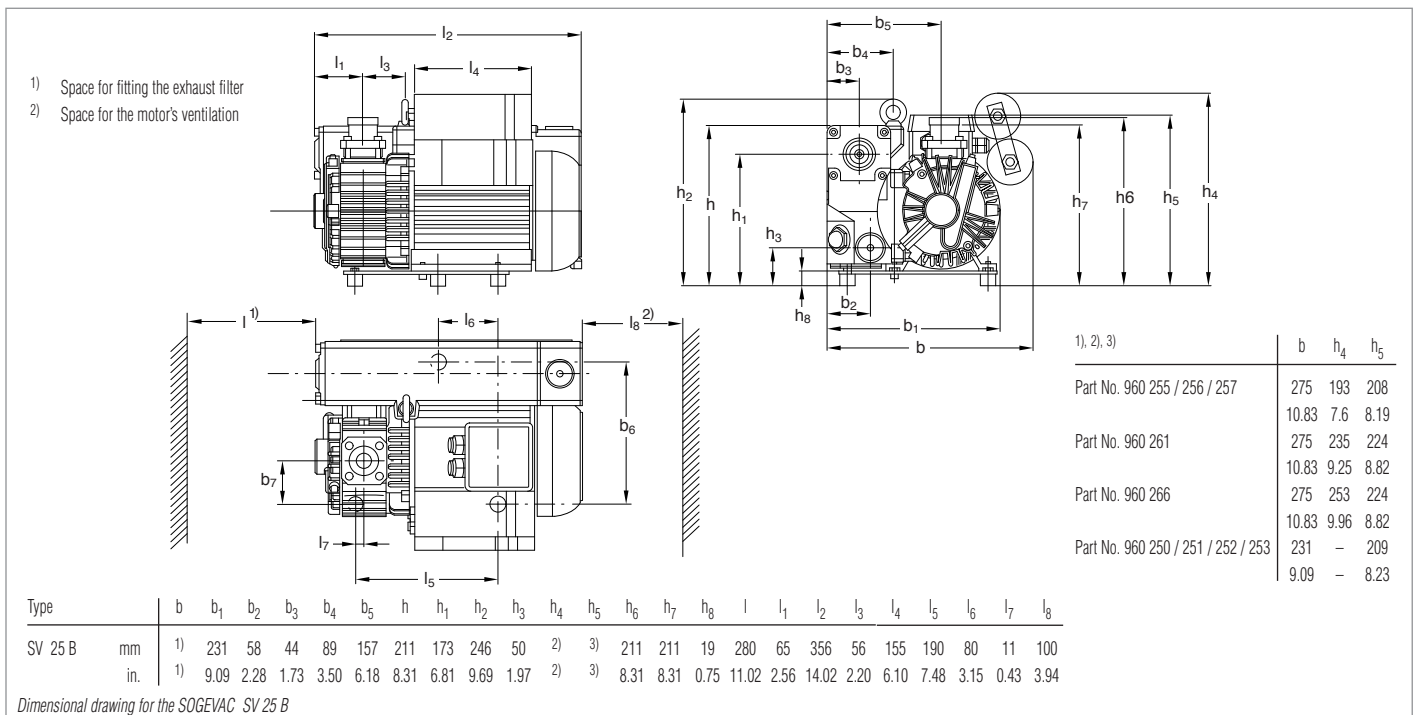
¹⁾ To DIN 28 400 and following numbers
²⁾ Operated at the ultimate pressure without gas ballast, free-field measurement at a distance of 1 m
³⁾ Please indicate when ordering a pump

Technical description see Section "General"

SOGEVAC SV 25 B



SOGEVAC SV 25 B



Technical Data		SOGEVAC SV 25 B	
		50 Hz	60 Hz
Nominal speed ¹⁾	m ³ x h ⁻¹ (cfm)	26 (15.3)	31 (18.3)
Pumping speed ¹⁾	m ³ x h ⁻¹ (cfm)	22.5 (13.3)	25 (14.7)
Ultimate partial 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 (7.5)	
Water vapor capacity	kg x h ⁻¹ (qt/hr)	85 (90)	100 (???)
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)	
Type of protection	IP	55-F	
Weight (with oil filling)	kg (lbs)	26 (57.4)	27 (59.6)
Dimensions (W x H x D)	mm (in.)	356 x 275 x 246 (14.02 x 10.83 x 9.69)	
Connections			
intake	G	3/4" + 1/2"	
exhaust	G	3/4"	

Ordering Information		SOGEVAC SV 25 B	
		50 Hz	60 Hz
SOGEVAC SV 25 B ¹⁾			
with three-phase motor, without gasballast			
200-230/400 V, 50 Hz (CEI)		Part No. 960 250	
200-230/400-460 V, 60 Hz (CEI)		-	
200-230/400 V, 50 Hz, NPT flanges (CEI)		Part No. 960 252	
200-230/400-460 V, 60 Hz, NPT flanges (CEI)		-	
with three-phase motor, with gasballast			
200-230/400 V, 50 Hz (CEI)		Part No. 960 251	
200-230/400-460 V, 60 Hz (CEI)		-	
200-230/400 V, 50 Hz, NPT flanges (CEI)		Part No. 960 253	
200-230/400-460 V, 60 Hz, NPT flanges (CEI)		-	
with single-phase motor, without gasballast			
230 V, 50/60 Hz (CEI)		Part No. 960 255	
230 V, 50/60 Hz, NPT flanges (CEI)		-	
115 V, 60 Hz		-	
100 V, 50/60 Hz		-	
with single-phase motor, with gasballast			
230 V, 50/60 Hz (CEI)		Part No. 960 256	
230 V, 50/60 Hz, NPT flanges (CEI)		Part No. 960 257	
115 V, 60 Hz		Part No. 960 261	
100 V, 50/60 Hz		Part No. 960 266	
Other voltages/frequencies ⁴⁾		upon request	
Filling with special oil		upon request	
Accessories		upon request	
Spare parts		upon request	

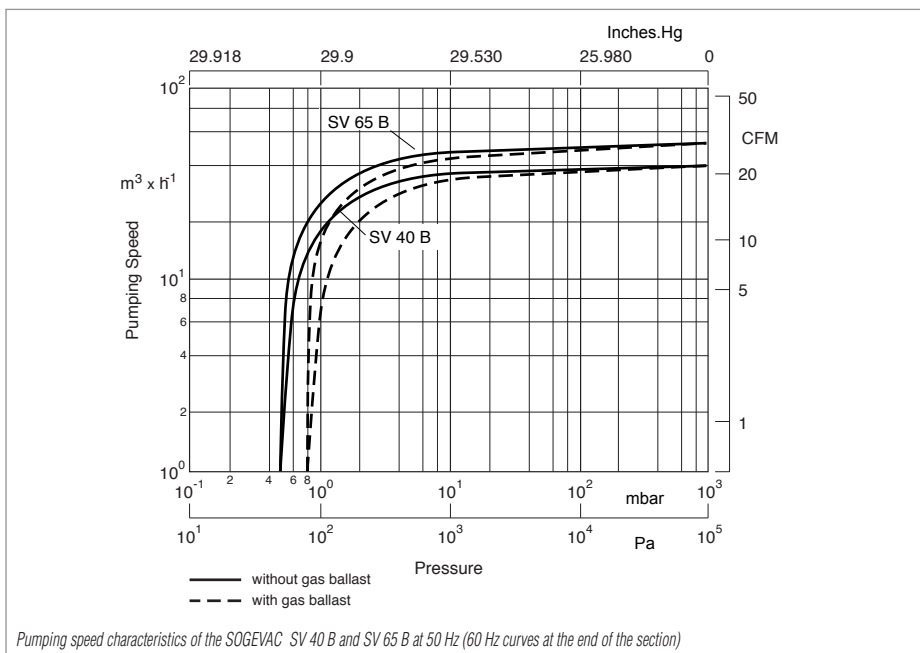
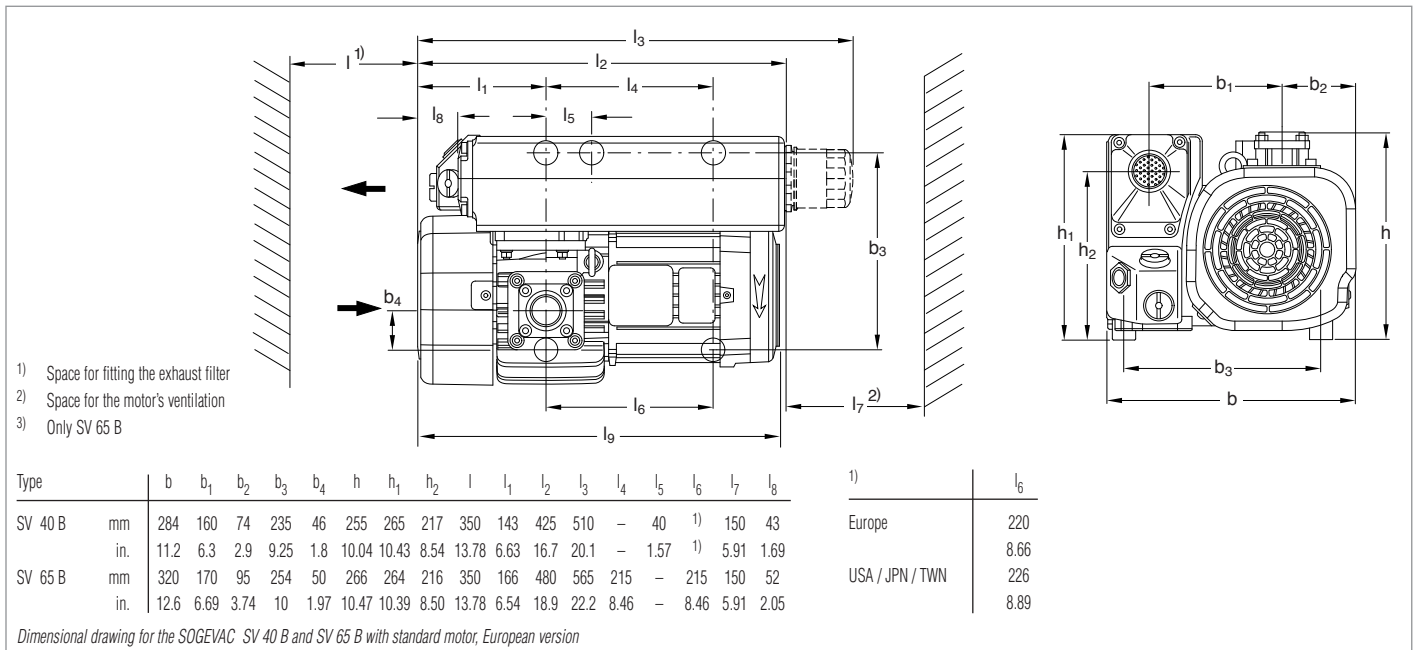
- ¹⁾ To DIN 28 400 and following numbers
- ²⁾ Operated at the ultimate pressure without gas ballast, free-field measurement at a distance of 1 m
- ³⁾ European and Japanese pumps have BSP, North and South American versions have NPT
- ⁴⁾ Please indicate when ordering a pump

Technical description see Section "General"

SOGEVAC SV 40 B/SV 65 B



SOGEVAC SV 65 B



Technical Data		SOGEVAC SV 40 B		SOGEVAC SV 65 B	
		50 Hz	60 Hz	50 Hz	60 Hz
Nominal speed ¹⁾	m ³ x h ⁻¹ (cfm)	44 (25.9)	53 (31.2)	59 (34.8)	71 (41.8)
Pumping speed ¹⁾	m ³ x h ⁻¹ (cfm)	38.5 (22.7)	47 (27.7)	54 (31.8)	64 (37.7)
Ultimate partial pressure without gas ballast ¹⁾	mbar (Torr)	≤ 0.5 (≤ 0.4)		≤ 0.5 (≤ 0.4)	
Ultimate total pressure	with standard gasballast ¹⁾	≤ 1.5 (≤ 1.1)		≤ 1.5 (≤ 1.1)	
	with small gasballast ²⁾	≤ 0.8 (≤ 0.6)		≤ 0.8 (≤ 0.6)	
Water vapor tolerance	with standard gasballast ¹⁾	30 (22.5)		30 (22.5)	
	with small gasballast	10 (7.5)		10 (7.5)	
Water vapor capacity, max.	with standard gasballast	0.76 (0.80)	0.90 (0.95)	1.0 (1.1)	1.25 (1.32)
	with small gasballast	0.28 (0.30)	0.34 (0.36)	0.36 (0.38)	0.42 (0.44)
Oil capacity	l (qt)	1.0 (1.05)		2.0 (2.1)	
Mean noise level ³⁾	dB(A)	60	63	60	64
Admissible ambient temperature	°C (°F)	12 to 40 (54 to 104)		12 to 40 (54 to 104)	
Motor power	kW (hp)	1.1 (1.5)	1.5 (2.0)	1.5 (2.0)	1.8 (2.5)
Nominal speed	min ⁻¹ (rpm)	1500 (v)	1800 (1800)	1500 (1500)	1800 (1800)
Type of protection	IP	55-F		55-F	
Weight (with oil filling)	kg (lbs)	43 (94.9)	45 (99.3)	49 (108.2)	52 (114.8)
Dimensions (W x H x D)	Eur	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)	
	USA / JPN / TWN	455 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)	
Connections	intake	1 1/4"	1 1/4"	1 1/4"	1 1/4"
	exhaust	1 1/4"	1 1/4"	1 1/4"	1 1/4"

¹⁾ To DIN 28 400 and following numbers

²⁾ Ordering Information see Section "Accessories"

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

⁴⁾ IEC-Motor (Europa) 50/60 Hz in IP 55, NEMA-Motor in TEFC

⁵⁾ European and Japanese pumps have BSP, North and South American versions have NPT

Technical description see Section "General"

Ordering Information	SOGEVAC SV 40 B		SOGEVAC SV 65 B	
	50 Hz	60 Hz	50 Hz	60 Hz
SOGEVAC SV 40 B/SV 65 B ¹⁾ with three-phase motor, without gasballast, without oilfilter 230/400 V, 50 Hz and 460 V, 60 Hz (CEI) 230/460 V, 60 Hz and 400 V, 50 Hz (CEI) 230/400 V, 50/60 Hz (CEI) 200 V, 50/60 Hz	Part No. 960 300 – – –		Part No. 960 400 – – –	
with three-phase motor, without gasballast, with oilfilter 230/400 V, 50 Hz and 460 V, 60 Hz (CEI) 230/460 V, 60 Hz and 400 V, 50 Hz (CEI) 230/400 V, 50/60 Hz (CEI) 200 V, 50/60 Hz	Part No. 960 302 – – –		Part No. 960 402 – – –	
with three-phase motor, with small gasballast, without oilfilter 230/400 V, 50 Hz and 460 V, 60 Hz (CEI) 230/460 V, 60 Hz and 400 V, 50 Hz (CEI) 230/400 V, 50/60 Hz (CEI) 200 V, 50/60 Hz	Part No. 960 301 Part No. 960 311 Part No. 960 321 Part No. 960 316		Part No. 960 401 Part No. 960 411 Part No. 960 421 Part No. 960 416	
with three-phase motor, with small gasballast, with oilfilter 230/400 V, 50 Hz and 460 V, 60 Hz (CEI) 230/460 V, 60 Hz and 400 V, 50 Hz (CEI) 230/400 V, 50/60 Hz (CEI) 200 V, 50/60 Hz	Part No. 960 303 Part No. 960 313 Part No. 960 323 Part No. 960 316		Part No. 960 403 Part No. 960 413 Part No. 960 423 Part No. 960 418	
with three-phase motor, with standard gasballast, without oilfilter 230/400 V, 50 Hz and 460 V, 60 Hz (CEI) 230/460 V, 60 Hz and 400 V, 50 Hz (CEI) 230/400 V, 50/60 Hz (CEI) 200 V, 50/60 Hz	Part No. 960 305 Part No. 960 312 Part No. 960 322 Part No. 960 317		Part No. 960 405 Part No. 960 412 Part No. 960 422 Part No. 960 417	
with three-phase motor, with standard gasballast, with oilfilter 230/400 V, 50 Hz and 460 V, 60 Hz (CEI) 230/460 V, 60 Hz and 400 V, 50 Hz (CEI) 230/400 V, 50/60 Hz (CEI) 200 V, 50/60 Hz	Part No. 960 307 Part No. 960 314 Part No. 960 324 Part No. 960 319		Part No. 960 407 Part No. 960 414 Part No. 960 424 Part No. 960 419	
Other voltages/frequencies ²⁾ Filling with special oil ²⁾	upon request upon request		upon request upon request	
Accessories	upon request		upon request	
Spare parts	upon request		upon request	

¹⁾ European and Japanese pumps have BSP, North and South American versions have NPT

²⁾ Please indicate when ordering a pump

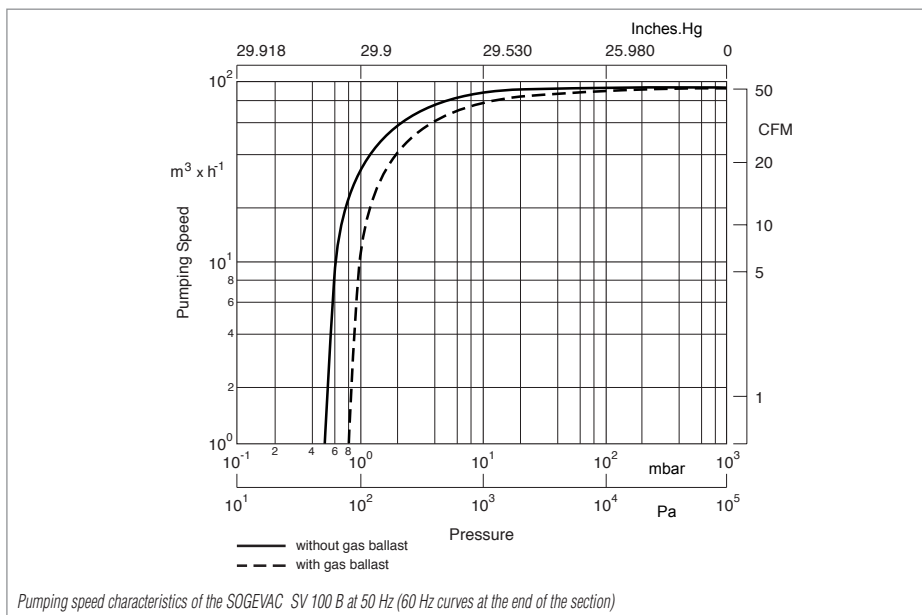
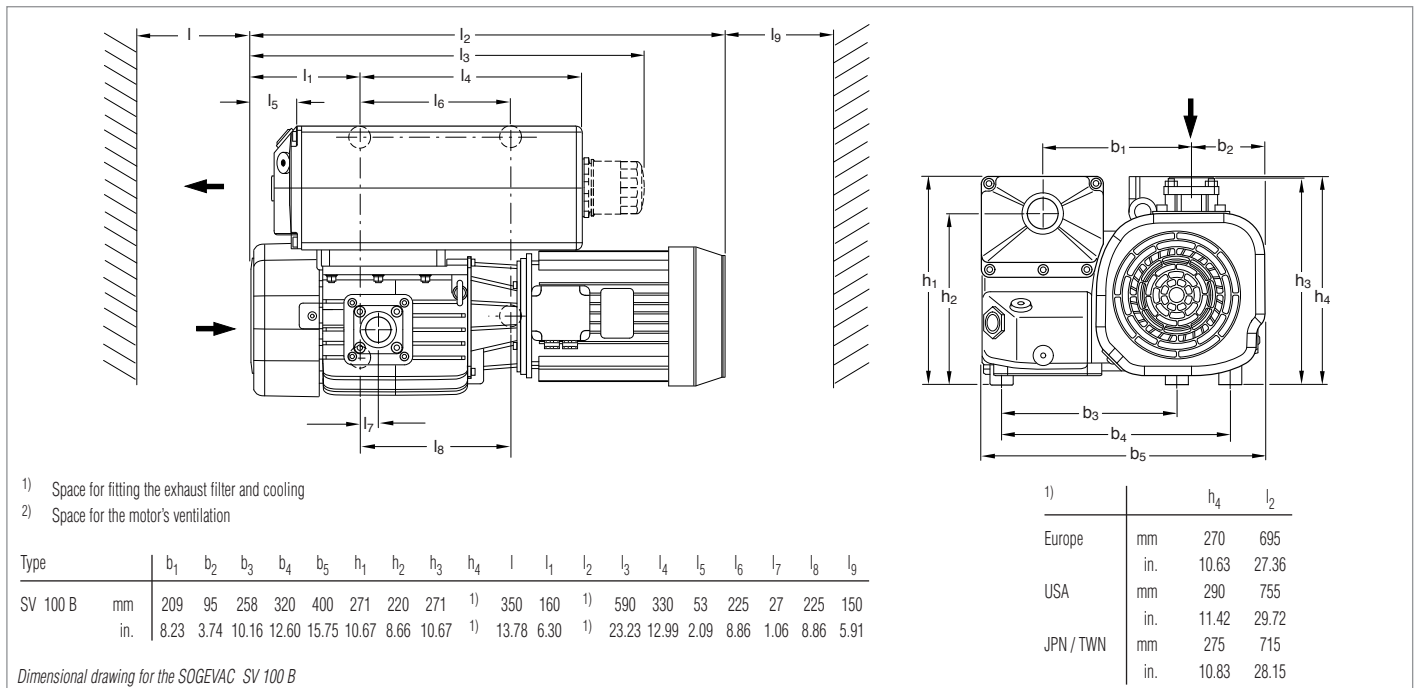
Notes

C02

SOGEVAC SV 100 B



SOGEVAC SV 100 B



Technical Data		SOGEVAC SV 100 B	
		50 Hz	60 Hz
Nominal speed ¹⁾	m ³ x h ⁻¹ (cfm)	97.5 (57.4)	117 (68.9)
Pumping speed ¹⁾	m ³ x h ⁻¹ (cfm)	87.5 (51.5)	105 (61.8)
Ultimate partial pressure without gas ballast ¹⁾ mbar (Torr)		≤ 0.5 (≤ 0.38)	
Ultimate total pressure			
with standard gasballast ¹⁾	mbar (Torr)	≤ 1.5 (≤ 1)	
with small gasballast ²⁾	mbar (Torr)	≤ 0.8 (≤ 0.6)	
Water vapor tolerance			
with standard gasballast ¹⁾	mbar (Torr)	30 (22.5)	
with small gasballast	mbar (Torr)	15 (11.3)	
Water vapor capacity, max.			
with standard gasballast	kg x h ⁻¹ (qt/hr)	1.60 (1.69)	1.70 (1.80)
with small gasballast	kg x h ⁻¹ (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 (3.0)	3.0 (4.0)
Nominal speed	min ⁻¹ (rpm)	1500 (1500)	1800 (1800)
Type of protection	IP	55-F	
Weight (with oil filling)	kg (lbs)	75 (165.6)	88 (194.3)
Dimensions (W x H x D)			
Eur	mm (in.)	695 x 400 x 270 (27.4 x 15.7 x 10.6)	
USA	mm (in.)	755 x 400 x 290 (29.7 x 15.7 x 11.4)	
JPN / TWN	mm (in.)	715 x 400 x 275 (28.1 x 15.7 x 10.8)	
Connections			
intake	G	1 1/4"	1 1/4"
exhaust	G	1 1/4"	1 1/4"

¹⁾ To DIN 28 400 and following numbers

²⁾ Ordering Information see Section "Accessories"

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

⁴⁾ IEC-Motor (Europa) 50/60 Hz in IP 55, NEMA-Motor in TEFC

⁵⁾ European and Japanese pumps have BSP, North and South American versions have NPT

Technical description see Section "General"

Ordering Information	SOGEVAC SV 100 B	
	50 Hz	60 Hz
SOGEVAC SV 100 B ¹⁾		
with three-phase motor, without gasballast, without oilfilter		
230/400 V, 50 Hz and 460 V, 60 Hz (CEI)		Part No. 960 500
230/460 V, 60 Hz and 400 V, 50 Hz (NEMA)		-
230/400 V, 50/60 Hz (CEI)		-
200 V, 50/60 Hz (JIS)		-
with three-phase motor, without gasballast, with oilfilter		
230/400 V, 50 Hz and 460 V, 60 Hz (CEI)		Part No. 960 502
230/460 V, 60 Hz and 400 V, 50 Hz (NEMA)		-
230/400 V, 50/60 Hz (CEI)		-
200 V, 50/60 Hz (JIS)		-
with three-phase motor, with small gasballast, without oilfilter		
230/400 V, 50 Hz and 460 V, 60 Hz (CEI)		Part No. 960 501
230/460 V, 60 Hz and 400 V, 50 Hz (NEMA)		Part No. 960 511
230/400 V, 50/60 Hz (CEI)		Part No. 960 521
200 V, 50/60 Hz (JIS)		Part No. 960 516
with three-phase motor, with small gasballast, with oilfilter		
230/400 V, 50 Hz and 460 V, 60 Hz (CEI)		Part No. 960 503
230/460 V, 60 Hz and 400 V, 50 Hz (NEMA)		Part No. 960 513
230/400 V, 50/60 Hz (CEI)		Part No. 960 523
200 V, 50/60 Hz (JIS)		Part No. 960 516
with three-phase motor, with standard gasballast, without oilfilter		
230/400 V, 50 Hz and 460 V, 60 Hz (CEI)		Part No. 960 505
230/460 V, 60 Hz and 400 V, 50 Hz (NEMA)		Part No. 960 512
230/400 V, 50/60 Hz (CEI)		Part No. 960 522
200 V, 50/60 Hz (JIS)		Part No. 960 517
with three-phase motor, with standard gasballast, with oilfilter		
230/400 V, 50 Hz and 460 V, 60 Hz (CEI)		Part No. 960 507
230/460 V, 60 Hz and 400 V, 50 Hz (NEMA)		Part No. 960 514
230/400 V, 50/60 Hz (CEI)		Part No. 960 524
200 V, 50/60 Hz (JIS)		Part No. 960 519
Other voltages/frequencies ²⁾		upon request
Filling with special oil ²⁾		upon request
Accessories		upon request
Spare parts		upon request

¹⁾ European and Japanese pumps have BSP, North and South American versions have NPT

²⁾ Please indicate when ordering a pump

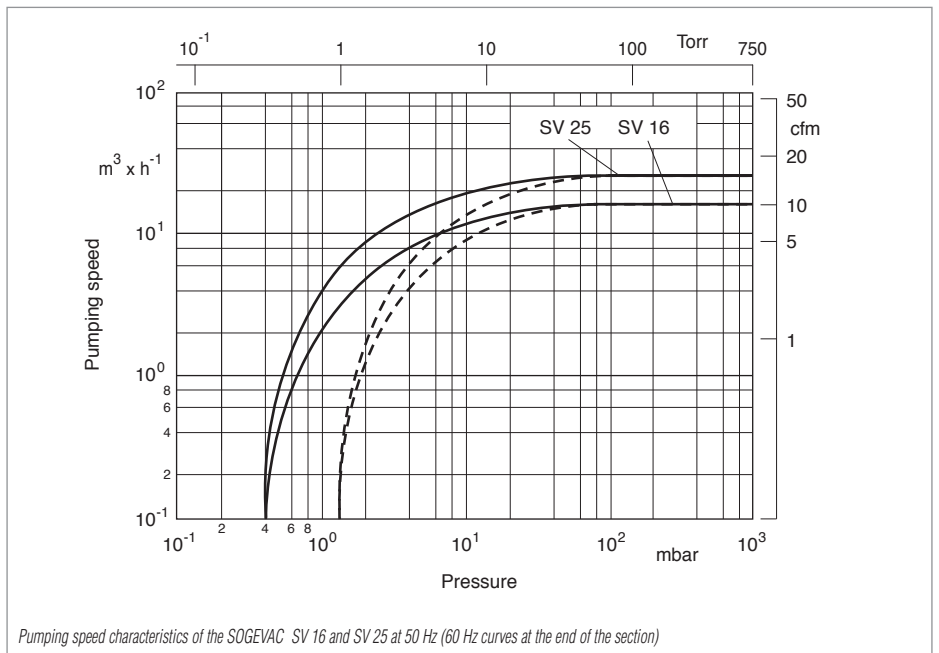
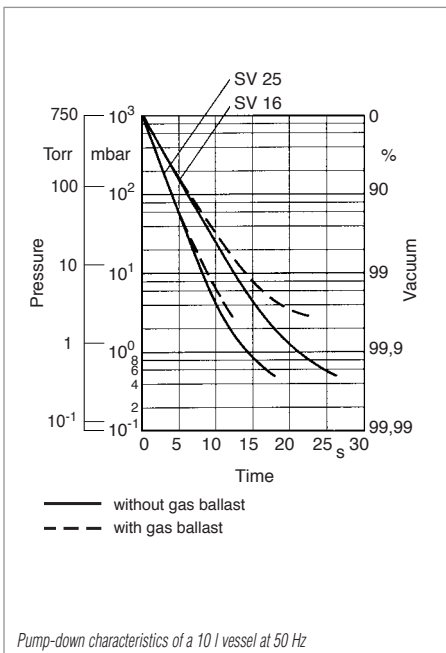
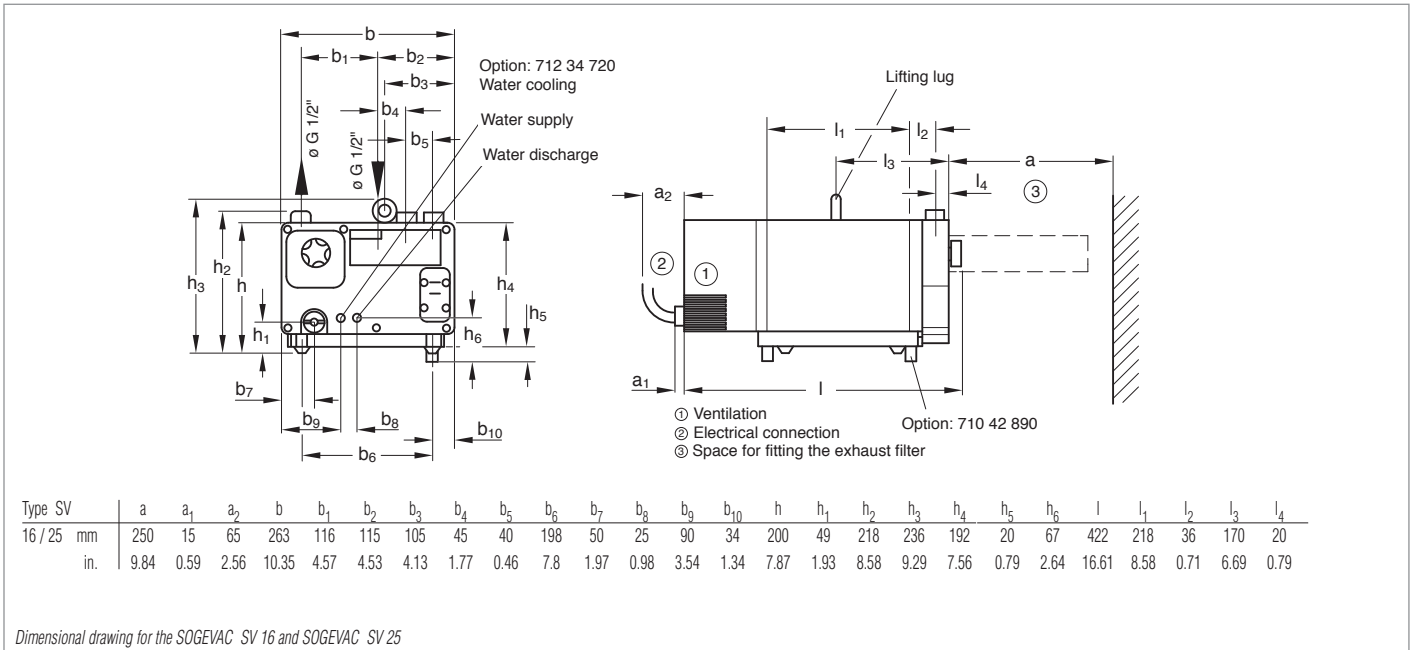
Notes

C02

SOGEVAC SV 16/SV 25



SOGEVAC SV 25



Technical Data		SOGEVAC SV 16		SOGEVAC SV 25	
		50 Hz	60 Hz	50 Hz	60 Hz
Nominal speed ¹⁾	m ³ x h ⁻¹ (cfm)	16 (9.4)	19 (11)	25 (14.7)	29 (17)
Pumping speed ¹⁾	m ³ x h ⁻¹ (cfm)	14.5 (8.5)	17 (10)	22.5 (13.3)	25.5 (15)
Ultimate partial pressure without gas ballast ¹⁾	mbar (Torr)	≤ 0.5 (≤ 0.4)			
Ultimate total pressure with gas ballast ¹⁾	mbar (Torr)	≤ 1.5 (≤ 1.1)			
Water vapor tolerance ¹⁾	mbar (Torr)	40 (30)			
Water vapor capacity	kg x h ⁻¹ (qt/hr)	0.3 (0.32)		0.45 (0.47)	
Oil capacity	l (qt)	1.8 (2)			
Noise level ²⁾	dB(A)	56			
Admissible ambient temperature	°C (°F)	12 to 40 (54 to 104)			
Motor power	kW (hp)	0.55 (1)		0.75 (1.5)	
Nominal speed	min ⁻¹ (rpm)	1500 (1500)			
Type of protection	IP	23			
Weight (with oil filling)	kg (lbs)	23 (50.7)		24 (52.9)	
Dimensions (W x H x D)	mm (in.)	422 x 263 x 236 (16.61 x 10.35 x 9.29)			
Connections					
Intake ³⁾	G ((BSP) Inside thread)	1/2"		1/2"	
Exhaust ³⁾	G ((BSP) Inside thread)	1/2"		1/2"	

Ordering Information	SOGEVAC SV 16	SOGEVAC SV 25
SOGEVAC SV 16/SV 25 ³⁾ with three-phase motor and integrated gas ballast valve 230/400 V, 50 Hz 208 - 230/460 V, 60 Hz 200 V, 50/60 Hz with single-phase motor and integrated gas ballast valve 100 V, 50 Hz 230 V, 50 Hz 115 V, 60 Hz 230 V, 60 Hz Other voltages/frequencies ⁴⁾ Filling with special oil	Part No. 109 01 Part No. 109 80 Part No. 955 01 Part No. 955 30 Part No. 109 00 Part No. 109 81 Part No. 109 82	Part No. 109 03 Part No. 109 90 Part No. 955 03 Part No. 955 32 Part No. 109 02 Part No. 109 91 Part No. 109 92
Accessories		upon request upon request
Water cooling kit ^{4), 5)}		Part No. 712 34 720
Oil level monitor ^{4), 5)}		Part No. 711 19 108
Exhaust filter gauge, mechanical ^{4), 5)}		Part No. 951 91
Spare parts		
Exhaust filter cartridge		Part No. 712 32 023
Vanes, set of 3 pieces		Part No. 712 34 370
Set of gaskets NBR (standard)		Part No. 971 97 152
Set of gaskets FPM		Part No. 712 30 010
Repair kit complete		Part No. 712 41 270
Pump module complete	Part No. 712 32 230	Part No. 712 32 220

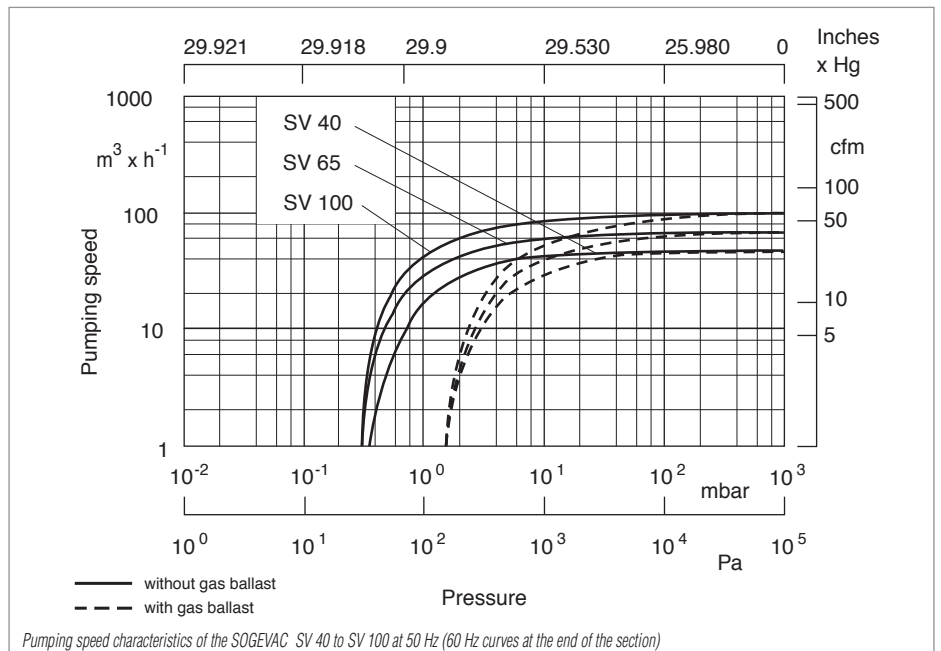
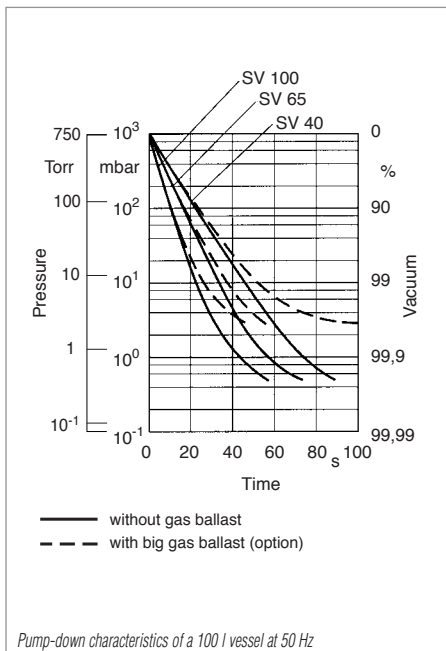
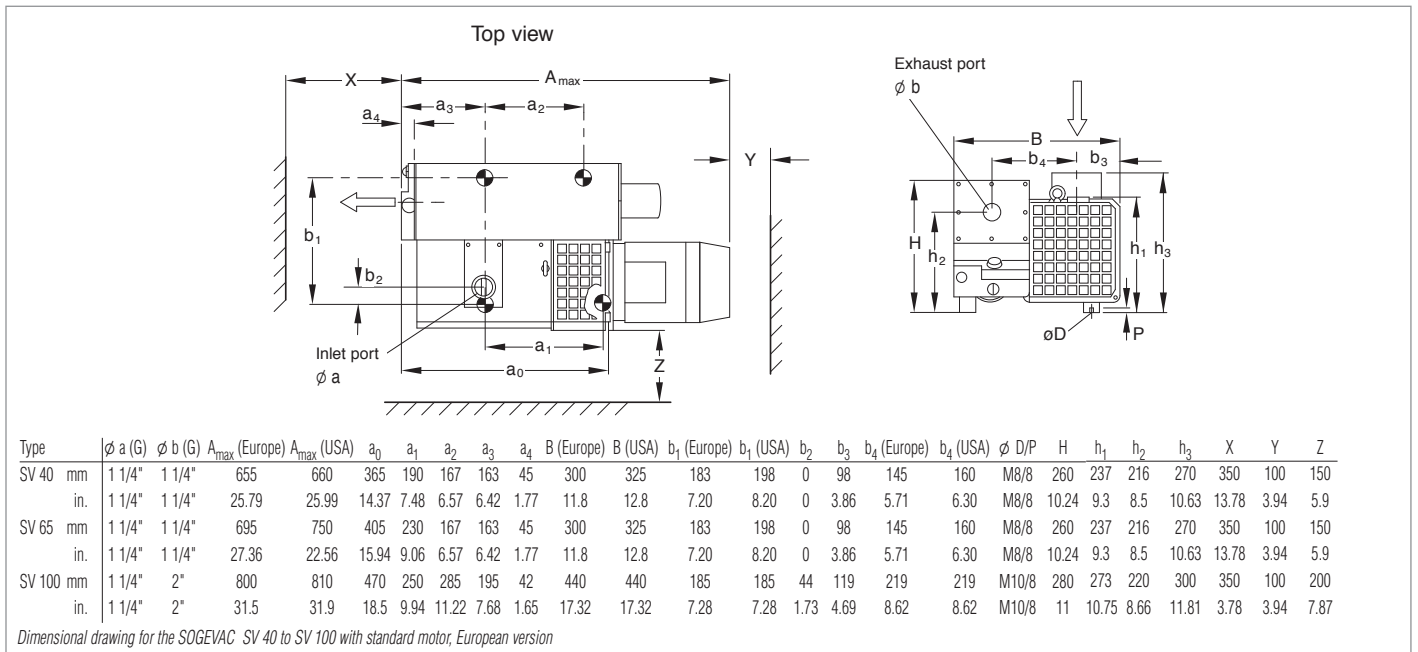
¹⁾ To DIN 28 400 and following numbers
²⁾ Operated at the ultimate pressure without gas ballast, free-field measurement at a distance of 1 m
³⁾ European and Japanese pumps have BSP, North and South American versions have NPT
⁴⁾ Please indicate when ordering a pump
⁵⁾ Can be retrofitted

Technical description see Section "General"

SOGEVAC SV 40/SV 65/SV 100



SOGEVAC SV 100



Technical Data		SOGEVAC SV 40		SOGEVAC SV 65		SOGEVAC SV 100	
		50 Hz	60 Hz	50 Hz	60 Hz	50 Hz	60 Hz
Nominal speed ¹⁾	m ³ x h ⁻¹ (cfm)	45 (26.5)	55 (32.4)	65 (38.3)	78 (45.9)	100 (58.9)	120 (70.6)
Pumping speed ¹⁾	m ³ x h ⁻¹ (cfm)	40 (23.6)	48 (28.3)	53 (31.2)	64 (37.7)	94 (55.4)	113 (66.5)
Ultimate partial pressure without gas ballast ¹⁾	mbar (Torr)	≤ 0.5 (≤ 0.4)	≤ 0.5 (≤ 0.4)	≤ 0.5 (≤ 0.4)	≤ 0.5 (≤ 0.4)	≤ 0.5 (≤ 0.4)	≤ 0.5 (≤ 0.4)
Ultimate total pressure	with standard gas ballast ¹⁾	≤ 1.5 (≤ 1.1)	≤ 1.5 (≤ 1.1)	≤ 1.5 (≤ 1.1)	≤ 1.5 (≤ 1.1)	≤ 1.5 (≤ 1.1)	≤ 1.5 (≤ 1.1)
	with big gas ballast (Option) ²⁾	≤ 4 (≤ 3)	≤ 4 (≤ 3)	≤ 4 (≤ 3)	≤ 4 (≤ 3)	≤ 4 (≤ 3)	≤ 4 (≤ 3)
Water vapor tolerance	with standard gas ballast ¹⁾	15 (11.3)	20 (15)	25 (18.8)	25 (18.8)	25 (18.8)	30 (22.5)
	with big gas ballast	30 (22.5)	40 (30)	50 (37.5)	40 (30)	50 (37.5)	60 (45)
Water vapor tolerable load	with standard gas ballast	0.3 (0.32)	0.7 (0.73)	1.0 (1.05)	1.2 (1.3)	1.7 (1.8)	2.0 (2.1)
	with big gas ballast	0.6 (0.63)	1.25 (1.3)	2.0 (2.1)	1.9 (2.0)	3.5 (3.7)	4.2 (4.4)
Oil capacity, min.	l (qt)	2.0 (2.1)	2.0 (2.1)	2.0 (2.1)	2.0 (2.1)	3.5 (3.7)	3.5 (3.7)
Noise level ³⁾	dB(A)	63	68	64	69	70	74
Admissible ambient temperature	°C (°F)	12 - 40 (54 - 104)	12 - 40 (54 - 104)	12 - 40 (54 - 104)	12 - 40 (54 - 104)	12 - 40 (54 - 104)	12 - 40 (54 - 104)
Motor power	kW (hp)	1.1 (1.5)	1.5 (2.0)	1.5 (2.0)	1.8 (2.5)	2.2 (3.0)	3 (4.0)
Nominal speed	min ⁻¹ (rpm)	1450 (1450)	1750 (1750)	1450 (1450)	1750 (1750)	1450 (1450)	1750 (1750)
Type of protection	IP	55	TEFC/55 ⁴⁾	55	TEFC/55 ⁴⁾	55	TEFC/55 ⁴⁾
Weight (with oil filling)	kg (lbs)	40 (88.2)	41 (90.4)	46 (101.4)	47 (103.4)	96 (211.2)	97 (213.4)
Dimensions (W x H x D)	mm (in.)	655 x 300 x 260	655 x 300 x 260	695 x 300 x 260	695 x 300 x 260	800 x 440 x 280	800 x 440 x 280
		(25.79x11.81x10.24)	(25.79x11.81x10.24)	(25.95x11.81x10.24)	(25.95x11.81x10.24)	(31.50x17.32x11.02)	(31.50x17.32x11.02)
Connection ⁵⁾							
	Intake, thread	G (BSP)	1 1/4"	1 1/4"	1 1/4"	1 1/4"	1 1/4"
	Exhaust, thread	G (BSP)	1 1/4"	1 1/4"	1 1/4"	1 1/4"	2"

¹⁾ To DIN 28 400 and following numbers

²⁾ Ordering Information see Section "Accessories"

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

⁴⁾ CEI motor (Europe) 50/60 Hz has IP 55, NEMA motor (North and South America) has TEFC

⁵⁾ European and Japanese pumps have BSP, North and South American versions have NPT

Technical description see Section "General"

Ordering Information	SOGEVAC SV 40		SOGEVAC SV 65		SOGEVAC SV 100	
	50 Hz	60 Hz	50 Hz	60 Hz	50 Hz	60 Hz
SOGEVAC SV 40/SV 65/SV 100 ¹⁾ with three-phase motor, without gas ballast 230/400 V, 50 Hz and 230/460 V, 60 Hz (CEI) 230/400 V, 50 Hz and 460 V, 60 Hz (CEI) 200 V, 50/60 Hz (JIS) with three-phase motor and integrated gas ballast valve 230/400 V, 50 Hz and 230/460 V, 60 Hz (CEI) 230/400 V, 50 Hz and 460 V, 60 Hz (CEI) 208 - 230/460 V, 60 Hz (NEMA) [400 V, 50 Hz] 200 V, 50/60 Hz (JIS) Other voltages/frequencies ²⁾ Filling with special oil ²⁾	Part No. 109 04 – Part No. 955 04	Part No. 109 05 – Part No. 950 05 Part No. 955 05	Part No. 109 06 – Part No. 955 06	Part No. 109 07 – Part No. 950 07 Part No. 955 07 upon request upon request	– Part No. 109 10 Part No. 955 10	– Part No. 109 11 Part No. 950 11 Part No. 955 11
Accessories	–	–	–	–	Part No. 953 30	Part No. 953 30
Adaptor for Roots pump RUVAC 251 or 501 ^{2), 3)}	Part No. 711 19 108	Part No. 711 19 108	Part No. 711 19 108	Part No. 711 19 108	Part No. 711 19 108	Part No. 711 19 108
Oil level monitor ²⁾	Part No. 711 19 111	Part No. 711 19 111	Part No. 711 19 111	Part No. 711 19 111	Part No. 711 19 111	Part No. 711 19 111
Thermal switch ^{2), 3)}	Part No. 711 19 171	Part No. 711 19 171	Part No. 711 19 171	Part No. 711 19 171	Part No. 711 19 172	Part No. 711 19 172
Water cooling kit ^{2), 3)}	Part No. 951 94	Part No. 951 94	Part No. 951 94	Part No. 951 94	Part No. 951 94	Part No. 951 94
Exhaust filter gauge, mechanical ^{2), 3)}	Part No. 951 23	Part No. 951 23	Part No. 951 23	Part No. 951 23	Part No. 951 28	Part No. 951 28
Great gasballast ^{2), 3)}	Part No. 196 60	Part No. 196 60	Part No. 196 60	Part No. 196 60	Part No. 951 32	Part No. 951 32
Gas ballast valve, electromagnetic 24 V DC ^{2), 3)}						
Spare parts						
Oil filter	Part No. 712 12 718	Part No. 712 12 718	Part No. 712 12 718	Part No. 712 12 718	Part No. 712 13 158	Part No. 712 13 158
Exhaust filter cartridge	Part No. 710 64 763	Part No. 710 64 763	Part No. 710 64 763	Part No. 710 64 763	Part No. 710 64 763 (2 pieces required)	Part No. 710 64 763 (2 pieces required)
Vanes, set of 3 pieces	Part No. 714 01 060	Part No. 714 01 060	Part No. 714 01 070	Part No. 714 01 070	Part No. 714 01 510	Part No. 714 01 510
Set of gaskets NBR (standard)	Part No. 971 97 252	Part No. 971 97 252	Part No. 971 97 252	Part No. 971 97 252	Part No. 971 97 452	Part No. 971 97 452
Set of gaskets FPM	Part No. 714 03 490	Part No. 714 03 490	Part No. 714 03 490	Part No. 714 03 490	Part No. 714 03 500	Part No. 714 03 500
Set of gaskets EPDM	Part No. 714 03 510	Part No. 714 03 510	Part No. 714 03 510	Part No. 714 03 510	–	–
Repair kit complete	Part No. 714 03 540	Part No. 714 03 540	Part No. 714 03 550	Part No. 714 03 550	Part No. 714 03 560	Part No. 714 03 560
Pump module complete	Part No. 710 01 710	Part No. 710 01 710	Part No. 710 01 730	Part No. 710 01 730	Part No. 710 01 750	Part No. 710 01 750

¹⁾ European (CEI motor) and Japanese (JIS motor) pumps have BSP, North and South American (NEMA motor) versions have NPT

²⁾ Please indicate when ordering a pump

³⁾ Can be retrofitted

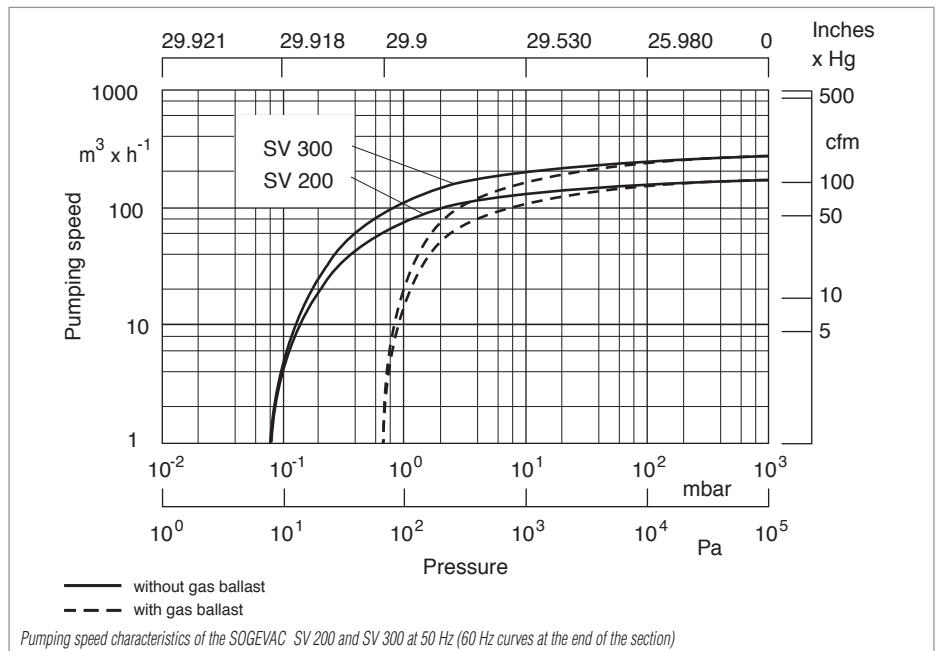
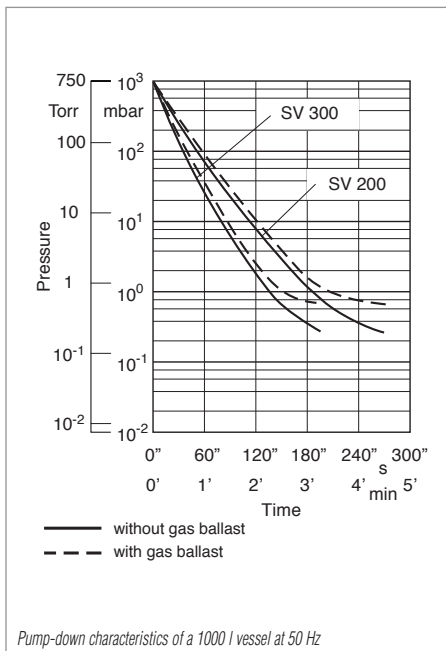
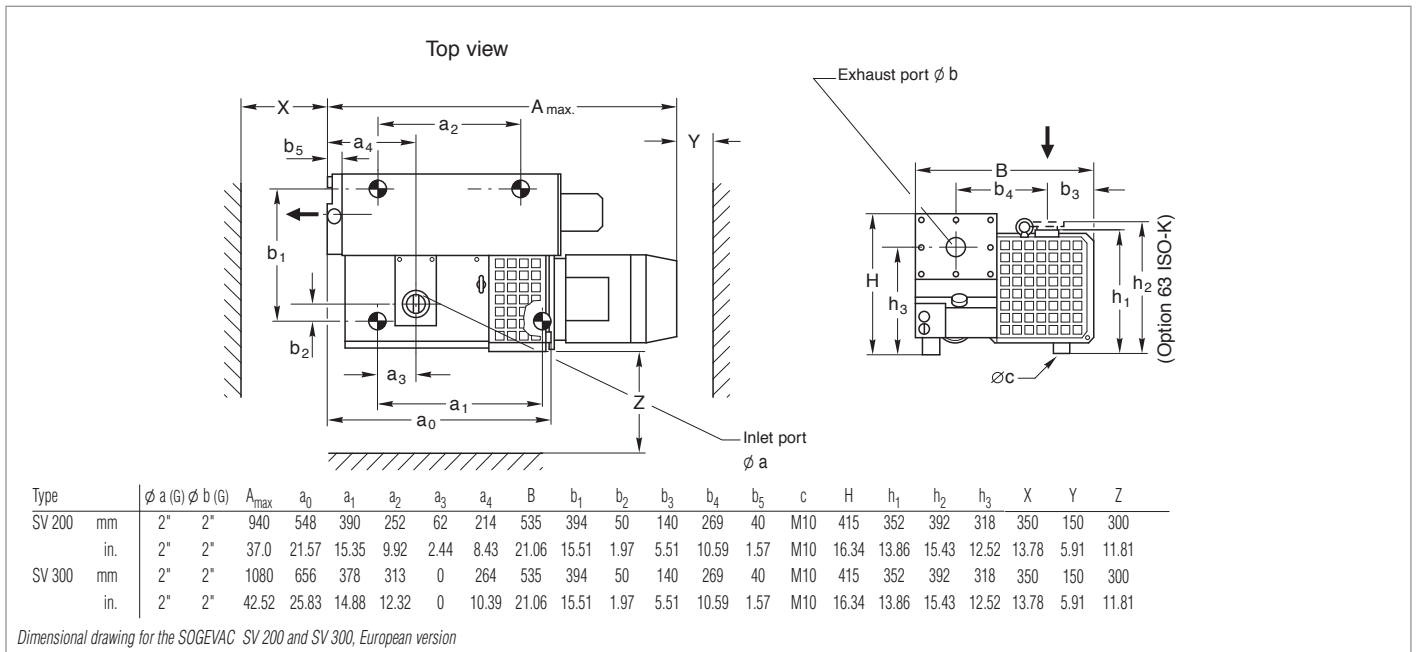
Notes

C02

SOGEVAC SV 200/SV 300



SOGEVAC SV 300



Technical Data		SOGEVAC SV 200		SOGEVAC SV 300	
		50 Hz	60 Hz	50 Hz	60 Hz
Nominal speed ¹⁾	m ³ x h ⁻¹ (cfm)	180 (106)	220 (129.5)	280 (164.9)	340 (200.3)
Pumping speed ¹⁾	m ³ x h ⁻¹ (cfm)	170 (100.1)	200 (117.8)	240 (141.4)	290 (170.8)
Ultimate partial pressure without gas ballast ¹⁾	mbar (Torr)	≤ 8 x 10 ⁻² (≤ 6 x 10 ⁻²)	≤ 8 x 10 ⁻² (≤ 6 x 10 ⁻²)	≤ 8 x 10 ⁻² (≤ 6 x 10 ⁻²)	≤ 8 x 10 ⁻² (≤ 6 x 10 ⁻²)
Ultimate total pressure with gas ballast ¹⁾	mbar (Torr)	≤ 0.7 (≤ 0.5)	≤ 0.7 (≤ 0.5)	≤ 0.7 (≤ 0.5)	≤ 0.7 (≤ 0.5)
Water vapor tolerance					
with standard gas ballast ¹⁾	mbar (Torr)	30 (22.5)	40 (30)	30 (22.5)	40 (30)
with big gas ballast ²⁾	mbar (Torr)	50 (37.5)	50 (37.5)	50 (37.5)	50 (37.5)
Water vapor capacity					
with standard gas ballast	kg x h ⁻¹ (qt/hr)	3.4 (3.6)	5.4 (5.7)	5.4 (5.7)	7.4 (7.8)
Oil capacity, min.	l (qt)	5.0 (5.3)	5.0 (5.3)	8.5 (8.9)	8.5 / 11.5
Noise level ³⁾	dB(A)	69	73	70	74
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 power	kW (hp)	4.0 (5.5)	5.5 (7.5)	5.5 (7.5)	7.5 (10.0)
Nominal speed	min ⁻¹ (rpm)	1450 (1450)	1750 (1750)	1450 (1450)	1750 (1750)
Type of protection	IP	55	TEFC/55 ⁵⁾	55	TEFC/55 ⁵⁾
Weight (with oil filling)	kg (lbs)	140 (308.7)	155 (341.8)	180 (396.9)	195 (430)
Dimensions (W x H x D))	mm (in.)	940 x 535 x 415 (37 x 21.06 x 17.71)	940 x 535 x 415 (37 x 21.06 x 17.71)	1080 x 535 x 415 (42.51 x 21.06 x 17.71)	1080 x 535 x 415 (42.51 x 21.06 x 17.71)
Connections ⁴⁾					
Intake, thread	G (BSP)	2"	2"	2"	2"
Exhaust, thread	G (BSP)	2"	2"	2"	2"

¹⁾ To DIN 28 400 and following numbers

²⁾ Ordering Information see Section "Accessories"

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

⁴⁾ European and Japanese pumps have BSP, North and South American versions have NPT

⁵⁾ CEI motor (Europe) 50/60 Hz has IP 55, NEMA motor (North and South America) has TEFC

Technical description see Section "General"

Ordering Information	SOGEVAC SV 200		SOGEVAC SV 300	
	50 Hz	60 Hz	50 Hz	60 Hz
SOGEVAC SV 200/SV 300 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) 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) [400 V, 50 Hz] ²⁾ 200 V, 50/60 Hz (JIS) Other voltages/frequencies ³⁾ Filling with special oil ³⁾	Part No. 109 26 Part No. 955 26		Part No. 109 30 Part No. 955 36	
	Part No. 109 27 Part No. 950 27 Part No. 955 27		Part No. 109 31 Part No. 950 31 Part No. 955 37	upon request upon request
Accessories				
Adaptor for Roots pump ^{3), 4)} RUVAC 501 (BR 2) RUVAC 1001 (BR 2) Mounting pedestal for fitting to a Roots pump	Part No. 953 90 Part No. 953 91 Part No. 711 19 209		Part No. 953 90 Part No. 953 91 Part No. 711 19 209	
Oil level monitor ^{3), 4)}	Part No. 953 96		Part No. 953 96	
Thermal switch ^{3), 4)}	Part No. 951 36		Part No. 951 36	
Exhaust filter gauge, mechanical ^{3), 4)} Exhaust filter monitoring switch, electric ³⁾	Part No. 951 94 upon request		Part No. 951 94 upon request	
Great gasballast ^{3), 4)}	Part No. 951 30		Part No. 951 30	
Gas ballast valve, electromagnetic 24 V DC ^{3), 4)}	Part No. 951 31		Part No. 951 31	
Two gas ballasts ³⁾	upon request		upon request	
Water cooling with thermostatic valve ³⁾	upon request		upon request	
Spare parts				
Oil filter	Part No. 710 18 858		Part No. 710 18 858	
Exhaust filter cartridge (4x required)	Part No. 710 64 763		Part No. 710 64 773	
Vanes, set of 3 pieces	Part No. 714 12 000		Part No. 714 12 010	
Set of gaskets NBR (standard)	Part No. 971 97 552		Part No. 971 97 652	
Set of gaskets FPM	Part No. 714 36 730		Part No. 714 36 740	
Repair kit complete	Part No. 714 36 190		Part No. 714 36 200	
Pump module complete	Part No. 714 36 770		Part No. 714 36 780	

¹⁾ European and Japanese pumps have BSP, North and South American versions have NPT
²⁾ CEI motor (Europe) 50/60 Hz has IP 54, NEMA motor (North and South America) has TEFC
³⁾ Please indicate when ordering a pump
⁴⁾ Can be retrofitted

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

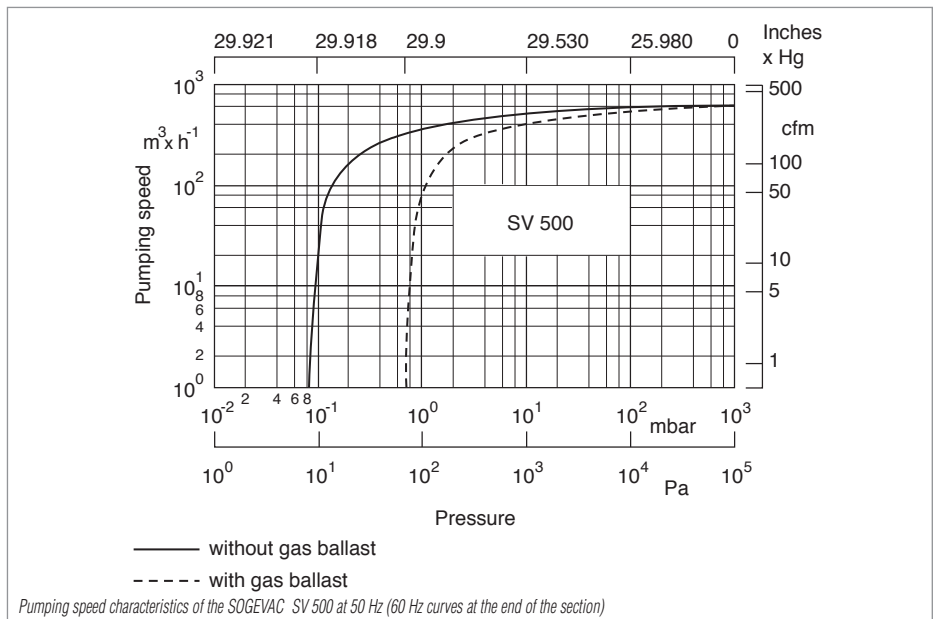
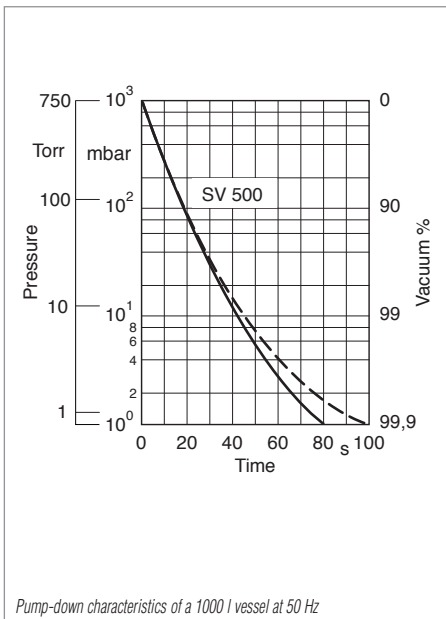
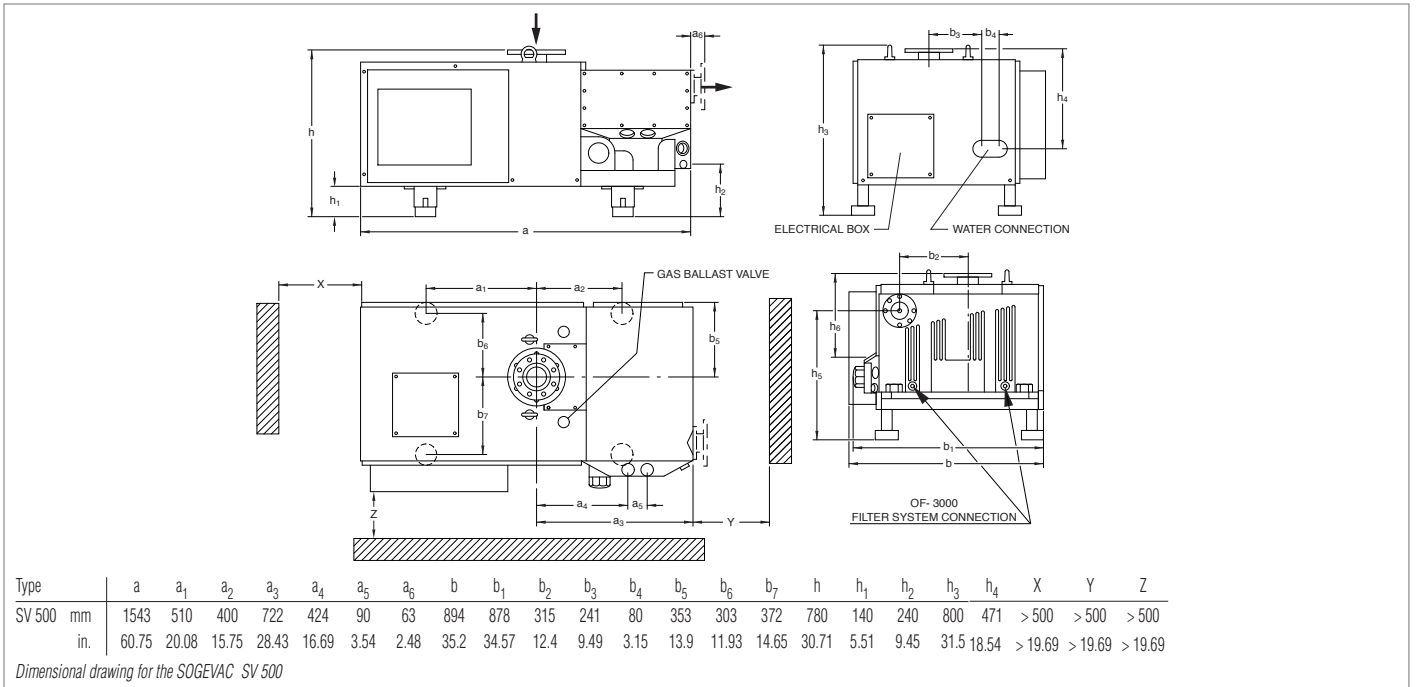
Notes

C02

SOGEVAC SV 500



SOGEVAC SV 500



Technical Data		SOGEVAC SV 500		Ordering Information		SOGEVAC SV 500			
Nominal speed ¹⁾	m ³ x h ⁻¹ (cfm)	570 (335.7)		SOGEVAC SV 500 ¹⁾ with three-phase motor, integrated gas ballast valve (manual), air-cooled and over-temperature switch (pump) 200 V, 50/60 Hz (JIS) 400 Δ V, 50 Hz (+10% -6%) (CEI) 230/460 V, 60 Hz (NEMA) [400 V, 50 Hz] Other voltages/frequencies ²⁾ Filling with special oil ²⁾	Part No. 956 54 Part No. 956 55 Part No. 956 57 upon request upon request				
Pumping speed ¹⁾	m ³ x h ⁻¹ (cfm)	510 (300.4)							
Ultimate partial pressure ¹⁾	without gas ballast	≤ 8 x 10 ⁻² (≈ 6x 10 ⁻²)							
	with gas ballast	≤ 1 (≈ 0.75)							
Gas ballast	Number / base type	1 + (1 option) / manual							
Ultimate total pressure	with standard gas ballast	≤ 1 (≈ 0.75)							
	with 1 gas ballast	40 (30)							
Water vapor tolerance	with 2 gas ballast	60 (45)							
Water vapor capacity	with 1 gas ballast	13 (14)							
	with 2 gas ballast	19.5 (???)							
Noise level ²⁾	dB(A)	71							
Motor power	rated rotational speed	kW (hp) - min ⁻¹							
Mains voltage	V	400 Δ (± 10 %)							
Type of protection	IP	54 F							
Pump rated rotational speed	min ⁻¹ (rpm)	880 (880)							
Thermal switch (pump)		yes							
Oil type / Capacity	l (qt)	GS 77 / 35 (37)							
Weight (with oil filling)	kg (lbs)	630 (1389)							
Cooling		Air (option: water ⁴⁾)							
Connection	Intake	DN	100 PN 10 & 100 ISO-K	4" ANSI 150 - 100 ISO-K	Accessories	Adaptor for Roots pump ^{2), 3)} RUVAC 1001 RUVAC 2001	Part No. 953 47 Part No. 953 48		
								Exhaust	DN
	DN 100 PN 10 & 100 ISO-K ⁴⁾	-							
								Exhaust filter gauge mechanical ^{2), 3)}	Part No. 951 95
								Exhaust filter monitoring switch electric ²⁾	upon request
								Water cooling with thermostatic valve ²⁾	upon request
								Second gas ballast valve ^{2), 3)}	upon request
								Exhaust DN 100 PN 10 - 100 ISO-K (Europe only) ^{2), 3)}	Part No. 951 89
								Intake flange, DN 100 ISO-K ^{2), 3)}	standard
					Side exhaust, DN 100 ISO-K ^{2), 3)}	Part No. 951 88			
					Spare parts				
					Oil filter	Part No. 714 05 318			
					Exhaust filter cartridge (8x required)	Part No. 710 64 773			
					Vanes, set of 3 pieces	Part No. 714 12 020			
					Set of gaskets NBR / FPM (standard)	Part No. 971 97 701			
					Set of gaskets FPM	Part No. 714 05 380			
					Pump module complete	Part No. 714 19 360			

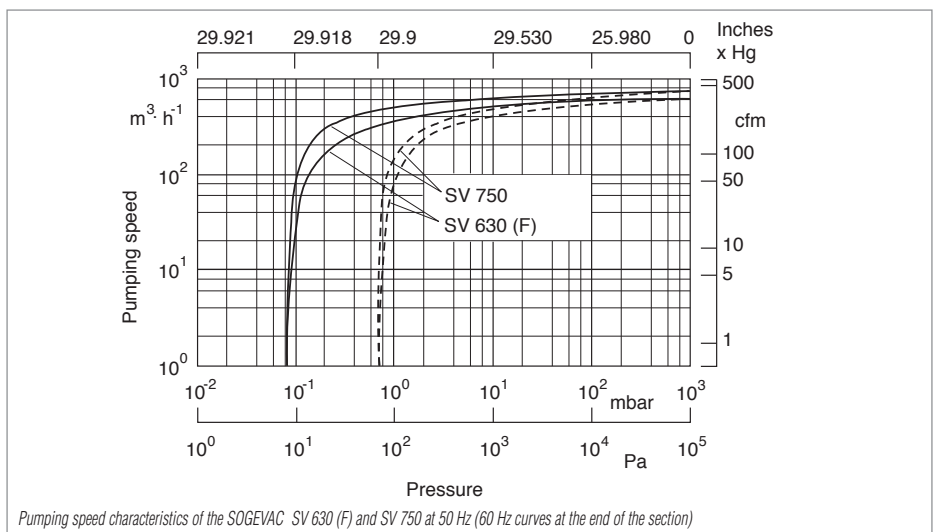
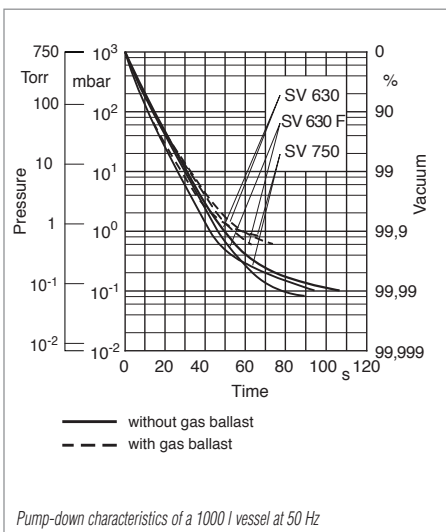
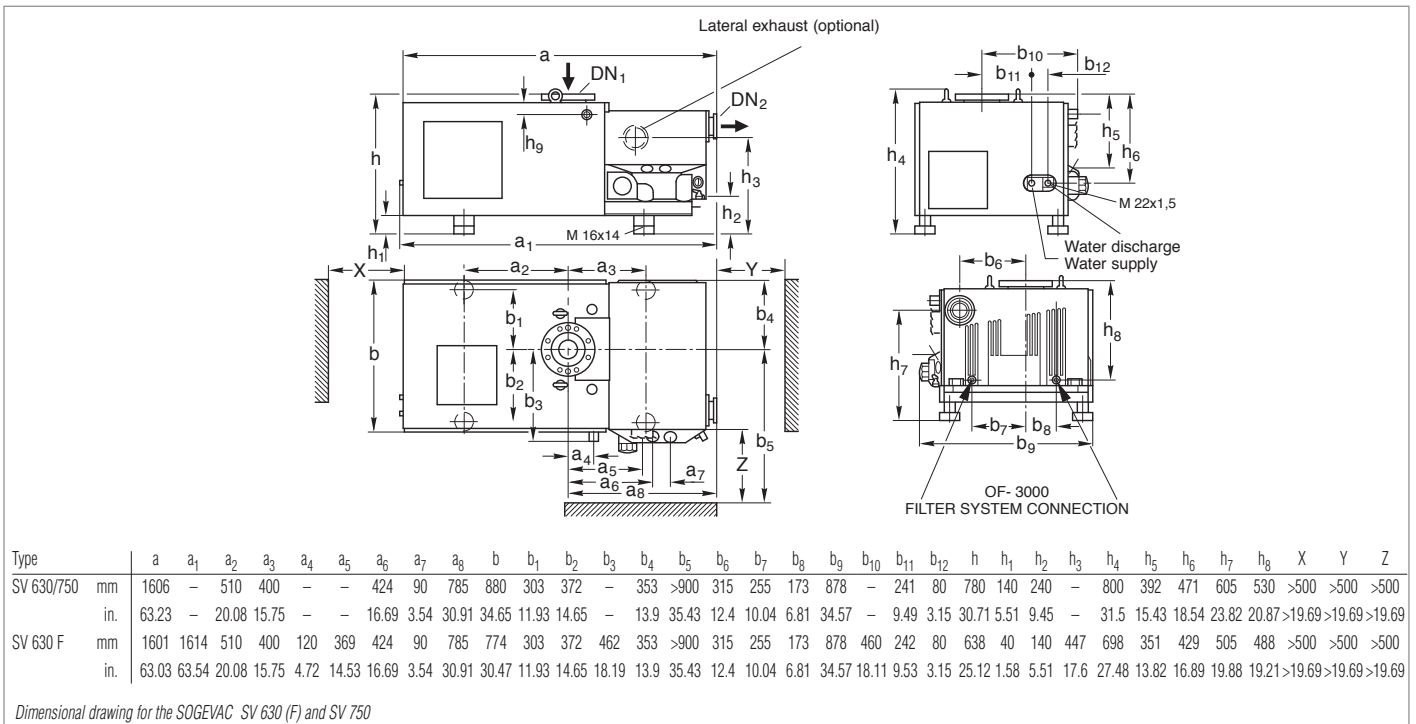
¹⁾ Junction box with six terminals for star/delta circuit
²⁾ Please indicate when ordering a pump
³⁾ Can be retrofitted
⁴⁾ Option

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

SOGEVAC SV 630/SV 630 F/SV 750



SOGEVAC SV 630



Technical Data		SOGEVAC SV 630		SOGEVAC SV 630 F		SOGEVAC SV 750
		50 Hz	60 Hz	50 Hz	60 Hz	50 Hz
Nominal speed ¹⁾	m ³ x h ⁻¹ (cfm)	700 (412.3)	840 (494.8)	700 (412.3)	840 (494.8)	840 (494.8)
Pumping speed ¹⁾	m ³ x h ⁻¹ (cfm)	640 (377)	755 (444.7)	640 (377)	755 (444.7)	755 (444.7)
Ultimate partial pressure without gas ballast ¹⁾	mbar (Torr)	< 8 x 10 ⁻² (< 6 x 10 ⁻²)		< 8 x 10 ⁻² (< 6 x 10 ⁻²)		< 8 x 10 ⁻² (< 6 x 10 ⁻²)
Ultimate total pressure with standard gas ballast ¹⁾	mbar (Torr)	≤ 0.7 (≤ 0.53)		≤ 0.7 (≤ 0.53)		≤ 0.7 (≤ 0.53)
Gas ballast	Number/Type	1 (+1 option) / manual		1 (+1 option) / EM 24 VDC		1 (+1 option) / manual
Water vapor tolerance with 1 gas ballast	mbar (Torr)	40 (30)	50 (37.5)	25 (18.8)	30 (22.5)	50 (22.5)
with 2 gas ballasts	mbar (Torr)	60 (45)	70 (52.5)	35 (26.3)	40 (30)	70 (30)
Water vapor capacity with 1 gas ballast	kg x h ⁻¹ (qt/hr)	17 (18)	24 (25)	11 (12)	14 (15)	24 (25)
with 2 gas ballasts	kg x h ⁻¹ (qt/hr)	26 (27)	34 (35)	15 (16)	19 (20)	34 (35)
Oil capacity min.	l (qt)	35 (37)		35 (37)		35 (37)
Noise level ²⁾	dB(A)	≤ 75	≤ 78	≤ 75	≤ 78	≤ 78
Admissible ambient temperature	°C (°F)	12 to 40 (54 to 104)		12 to 40 (54 to 104)		12 to 40 (54 to 104)
Motor power	kW (hp)	15 (20)	18.5 (25)	15 (20)	18.5 (25)	18.5 (25)
Nominal motor speed / Pump speed	min ⁻¹ (rpm)	1500 / 990 (1500 / 990)		1500 / 990 (1500 / 990)		1500 / 1170 (1500 / 990)
Type of protection	IP	54 - F	54 - F/TEFC ³⁾	54 - F	54 - F/TEFC ³⁾	54 - F
Cooling		air (water) ⁴⁾		water (+ thermostatic valve)		air (water) ⁴⁾
Weight (with oil filling)	kg (lbs)	630 (1389)		630 (1389)		630 (1389)
Dimensions (W x H x D)	mm (in.)	1606 x 880 x 800 (63.23 x 34.64 x 31.49)		1601 x 878 x 698 (63.03 x 34.56 x 27.48)		1606 x 880 x 800 (63.23 x 34.64 x 31.49)
Connection						
Intake (EUROPE/USA)	DN ₁	100 ISO-K + 100 PN 10 / 100 ISO-K + 4" ASA 150		160 DIN		100 ISO-K + 100 PN 10
Exhaust (EUROPE/USA)	DN ₂	ø 80 (100 ISO-K ³⁾ , ⁴⁾ / 100 ISO-K + 4" ASA 150		100 ISO-K		ø 80 (100 ISO-K ⁴⁾)

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

⁴⁾ Option

Technical description see Section "General"

Ordering Information	SOGEVAC SV 630		SOGEVAC SV 630 F		SOGEVAC SV 750
	50 Hz	60 Hz	50 Hz	60 Hz	50 Hz
SOGEVAC SV 630 ¹⁾ with three-phase motor, integrated gas ballast valve (manual), air-cooled and over-temperature switch (pump) 200 V, 50/60 Hz (JIS) 400 Δ V, 50 Hz (+10% -6%) and 460 V, 60 Hz (\pm 10%) (CEI) 230/460 V, 60 Hz (NEMA) [400 V, 50 Hz]	Part No. 956 62		-		-
SOGEVAC SV 630 F ¹⁾ with three-phase motor, integrated gas ballast valve (EM 24 V DC), controlled anti-suckback valve (EM 24 V DC), water-cooled and over-temperature switch (pump and motor) 200 V, 50/60 Hz (JIS) 400 Δ V, 50 Hz (+10% -6%) and 460 V, 60 Hz (\pm 10%) (CEI) 230/460 V, 60 Hz (NEMA) [400 V, 50 Hz]	-		Part No. 956 66		-
SOGEVAC SV 750 ¹⁾ with three-phase motor, integrated gas ballast valve (manual), air-cooled and over-temperature switch (pump) 400 Δ V, 50 Hz (\pm 10%) (CEI)	-		-		Part No. 956 75
Other voltages/frequencies ²⁾ Filling with special oil ²⁾	upon request upon request		upon request upon request		upon request upon request
Accessories					
Adaptor for Roots pump ^{2), 3)} RUVAC 1001 RUVAC 2001	Part No. 953 47 Part No. 953 48		Part No. 953 47 Standard		Part No. 953 47 Part No. 953 48
Oil level monitor ^{2), 3)}	Part No. 953 97		Part No. 953 97		Part No. 953 97
Exhaust filter gauge, mechanical ^{2), 3)} Exhaust filter monitoring switch, electric ²⁾	Part No. 951 95 upon request		Part No. 951 95 upon request		Part No. 951 95 upon request
Second gas ballast valve ^{2), 3)}	upon request		upon request		upon request
Water cooling with thermostatic valve ²⁾	upon request		Standard		upon request
Exhaust DN 100 PN 10 - 100 ISO-K (Europe only) ^{2), 3)}	Part No. 951 89		Standard		Part No. 951 89
Intake flange, DN 100 ISO-K ^{2), 3)}	Standard		Part No. 714 03 480		Standard
Lateral exhaust, DN 100 ISO-K ^{2), 3)}			Part No. 951 88		
Spare parts					
Oil filter			Part No. 714 05 318		
Exhaust filter cartridge (10x required)			Part No. 710 64 773		
Vanes, set of 3 pieces			Part No. 714 12 020		
Set of gaskets NBR / FPM (standard)			Part No. 971 97 701		
Set of gaskets FPM			Part No. 714 05 380		
Repair kit complete	Part No. 714 05 390		Part No. 714 05 390		Part No. 714 18 560
Pump module complete			Part No. 714 08 510		

¹⁾ Junction box with 6 terminals for star/delta circuit – SV 750 works only at 50 Hz

²⁾ Please indicate when ordering a pump

³⁾ Can be retrofitted

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

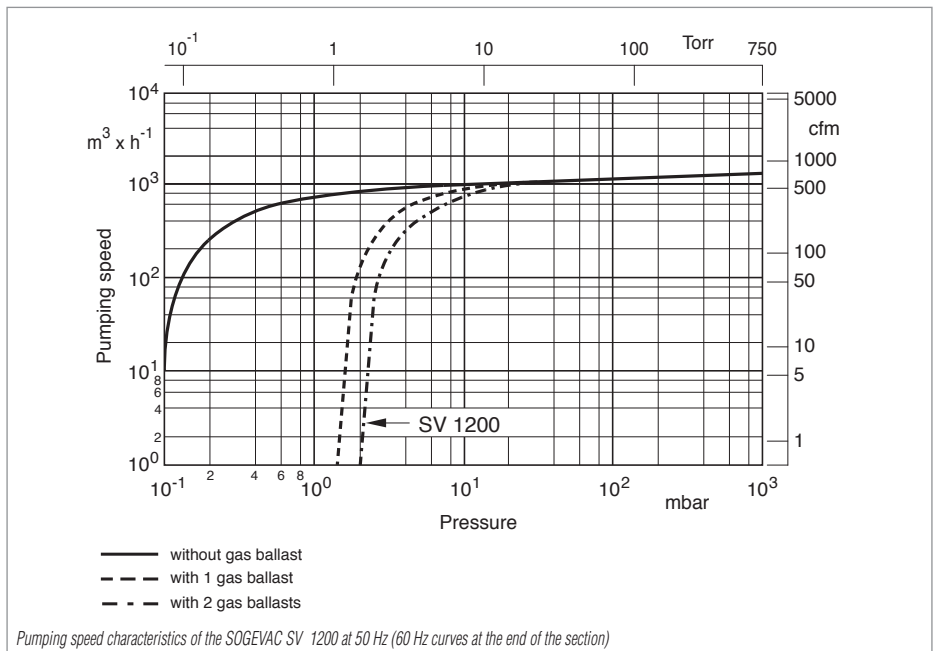
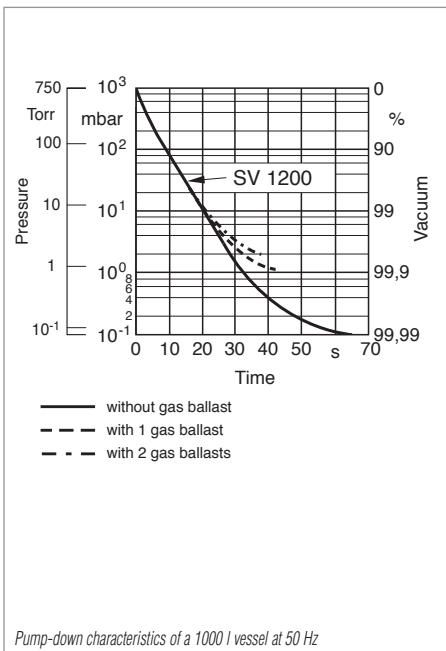
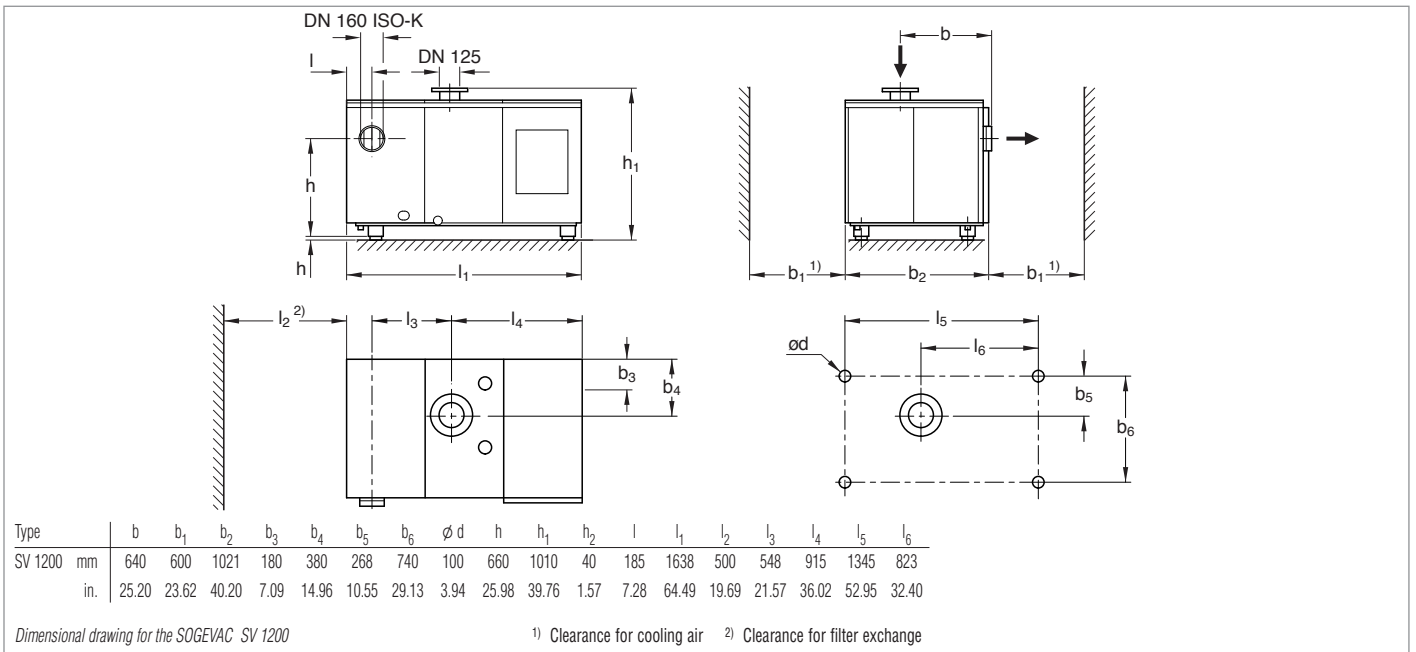
Notes

C02

SOGEVAC SV 1200



SOGEVAC SV 1200



Technical Data		SOGEVAC SV 1200	
		50 Hz	60 Hz
Nominal speed ¹⁾	m ³ x h ⁻¹ (cfm)	1150 (677)	
Pumping speed ¹⁾	m ³ x h ⁻¹ (cfm)	1070 (630)	
Ultimate partial pressure without gas ballast ¹⁾	mbar (Torr)	≤ 0.1 (≤ 0.08)	
Ultimate total pressure	with 1 standard 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	mbar (Torr) 20 (15)	
	with 2 gas ballasts	mbar (Torr) 40 (30)	
Water vapor capacity	with 1 gas ballast	kg x h ⁻¹ (qt/hr) 12.5 (13)	
	with 2 gas ballasts	kg x h ⁻¹ (qt/hr) 25 (26)	
Oil capacity min.	l (qt)	60 (63)	
Noise level ³⁾	dB(A)	75	78
Admissible ambient temperature	°C (°F)	12 to 40 (54 to 104)	
Motor power	kW (hp)	22 (30)	
Nominal motor speed / Pump speed	min ⁻¹ (rpm)	1460/700 (1460/700)	1750/700 (1750/700)
Type of protection	IP	54	54-F TEFC ⁷⁾
Weight (with oil filling)	kg (lbs)	1370 (3021)	
Dimensions (W x H x D)	mm (in.)	1660 x 1005 x 1050 (65.35 x 39.57 x 41.34)	
Connection	Intake	DN 125 PN 10	ANSI 150 - 6" ⁵⁾
	Exhaust	DN 160 ISO-K	ANSI 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
- 4) Junction box with 6 terminals for star/delta circuit
- 5) NEMA (for North and South American versions)
- 6) Please indicate when ordering a pump
- 7) CEI motor (Europe) 50/60 Hz has IP 54, NEMA motor (North and South America) has TEFC
- 8) Can be retrofitted

Technical description see Section "General"

Ordering Information	SOGEVAC SV 1200
SOGEVAC SV 1200 with three-phase motor, integrated gas ballast valves, air-cooled and over-temperature switch 400 Δ V, 50 Hz (CEI) ⁴⁾ 208 - 230/460 V, 60 Hz (NEMA) ⁵⁾ Other voltages/frequencies ⁶⁾ Filling with special oil ⁶⁾	Part No. 109 70 Part No. 950 70 upon request upon request
Accessories	
Water cooling with thermostatic valve ²⁾	upon request
Adaptor for Roots pump ^{6), 8)}	
RUVAC 2001	Part No. 953 37
RUVAC 3001	Part No. 953 38
Oil level monitor ^{6), 8)}	Part No. 953 99
Exhaust filter monitoring switch electric ⁶⁾	upon request
Spare parts	
Oil filter	Part No. 712 14 598
Exhaust filter cartridge (14x required)	Part No. 710 64 773
Vanes, set of 3 pieces	Part No. 712 14 310
Set of gaskets NBR (standard)	Part No. 971 96 681
Set of gaskets FPM	Part No. 712 36 060
Repair kit complete (50 Hz)	Part No. 712 34 800
Pump module complete (50 Hz)	Part No. 712 26 820

Dust Filters (Suction Side)



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

Advantages to the User

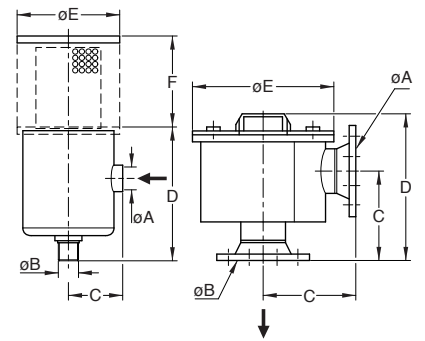
- ◆ Same housing for different cartridges
- ◆ High separation capacity
- ◆ Quickly exchangeable cartridge

Paper Filter Cartridge (Standard)

- ◆ Separates particles down to 1 µm (Dry process: dust, powders, chips etc.)

Typ		φ A	φ B	C	D	φ 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	70.6F

Dimensional drawing for the dust filters F 16-25 to F 1200



Polyester Filter Cartridge

- ◆ Separation of particles down to 3 µm (Moist process: dust, powders, chips etc.)

Metal Filter Cartridge

- ◆ 0.08 mm mesh
- ◆ Collects solid particles down to 0.08 mm (plastics, paper, packaging materials, food stuffs)

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	Paper cartridge	Polyester Filter Cartridge	Metal cartridge	Activated charcoal cartridge
Throttling of pumping speed through a clean filter	2 %	2 %	1 %	2 %
Efficiency for 1 µm particles	98 %	98 %	-	-

Ordering Information

Dust Filter	Paper cartridge	Polyester-Filterpatrone	Metal cartridge	Activated charcoal cartridge
F 16-25 for SV 16, SV 25 (G 1/2")	Part No. 951 50	Part No. 711 27 094	Part No. 711 27 093	Part No. 711 27 092
Spare cartridge for F 16-25	Part No. 710 40 762	Part No. 710 40 762	Part No. 710 65 813	Part No. 710 65 713
F 40 for SV 40 (G 1 1/4")	Part No. 951 55	Part No. 711 27 104	Part No. 711 27 103	Part No. 711 27 102
Spare cartridge for F 40	Part No. 710 46 118	Part No. 710 46 118	Part No. 710 49 083	Part No. 710 49 103
F 65-100 for SV 65, SV 100 (G 1 1/4")	Part No. 951 60	Part No. 711 27 114	Part No. 711 27 113	Part No. 711 27 112
Spare cartridge for F 65-100	Part No. 712 13 283	Part No. 712 13 283	Part No. 712 13 324	Part No. 712 13 304
F 200-300 for SV 200, SV 300 (G 2")	Part No. 951 65	Part No. 711 27 124	Part No. 711 27 123	Part No. 711 27 122
F 200-300 for SV 200, SV 300 (63 ISO-K)	Part No. 951 68	—	Part No. 711 27 126	Part No. 711 27 125
Spare cartridge for F 200-300 (G 2" or 63 ISO-K)	Part No. 712 13 293	Part No. 712 13 293	Part No. 712 13 334	Part No. 712 13 314
F 630 for SV 630 (F), SV 750 (DN 100 PN 10)	Part No. 951 71	Part No. 711 27 164	Part No. 711 27 163	Part No. 711 27 162
F 630 for SV 630 (F), SV 750 (100 ISO-K)	Part No. 951 72	—	Part No. 711 27 167	Part No. 711 27 166
Spare cartridge for F 630 (DN 100 PN or 100 ISO-K)	Part No. 710 35 242	Part No. 712 61 508	Part No. 710 37 734	Part No. 710 37 724
F 1200 for SV 1200 (DN 125 PN 10)	Part No. 951 75	Part No. 711 27 144	Part No. 711 27 143	Part No. 711 27 142
Spare cartridge for F 1200 (2 are required)	Part No. 710 35 242	Part No. 712 61 508	Part No. 710 37 734	Part No. 710 37 724
Spare parts				
Set of gaskets for F 16-25	NBR	Part No. 714 10 820	Part No. 714 10 820	Part No. 714 10 820
Set of gaskets for F 40	NBR	Part No. 714 10 830	Part No. 714 10 830	Part No. 714 10 830
Set of gaskets for F 65-100	NBR	Part No. 714 10 840	Part No. 714 10 840	Part No. 714 10 840
Set of gaskets for F 200-300	NBR	Part No. 714 10 850	Part No. 714 10 850	Part No. 714 10 850
O-ring gasket for F 630 / F 1200	NBR	Part No. 712 41 032	Part No. 712 41 032	Part No. 712 41 032

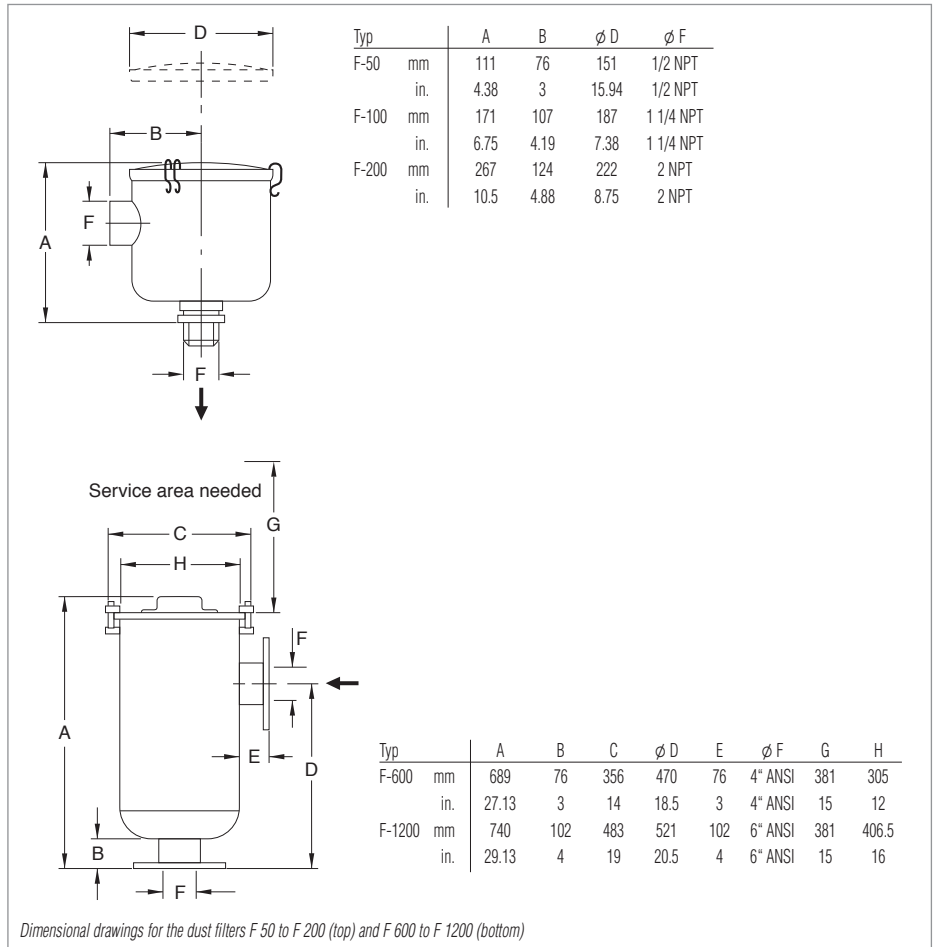
Version for the North and South American Continents

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 ten microns, or activated carbon elements for the adsorption of chemical vapor.



Technical Data

Dust Filter		Polyester	Metal	Paper	Carbon
New cartridge pressure loses	%	2	1	2	2
Efficiency for 10 micron particulates	%	98	-	98	-
Filter for SV 16, SV 25, UV 25		-	-	F-50	-
Filter for SV 40, SV 65, SV 100		-	F-100	F-100	F-100
Filter for SV 200, 300		-	F-200	F-200	F-200
Filter for SV 500, 630		F-600	-	-	-
Filter for SV 1200		F-1200	-	-	-

Ordering Information

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

SL Condensate Traps



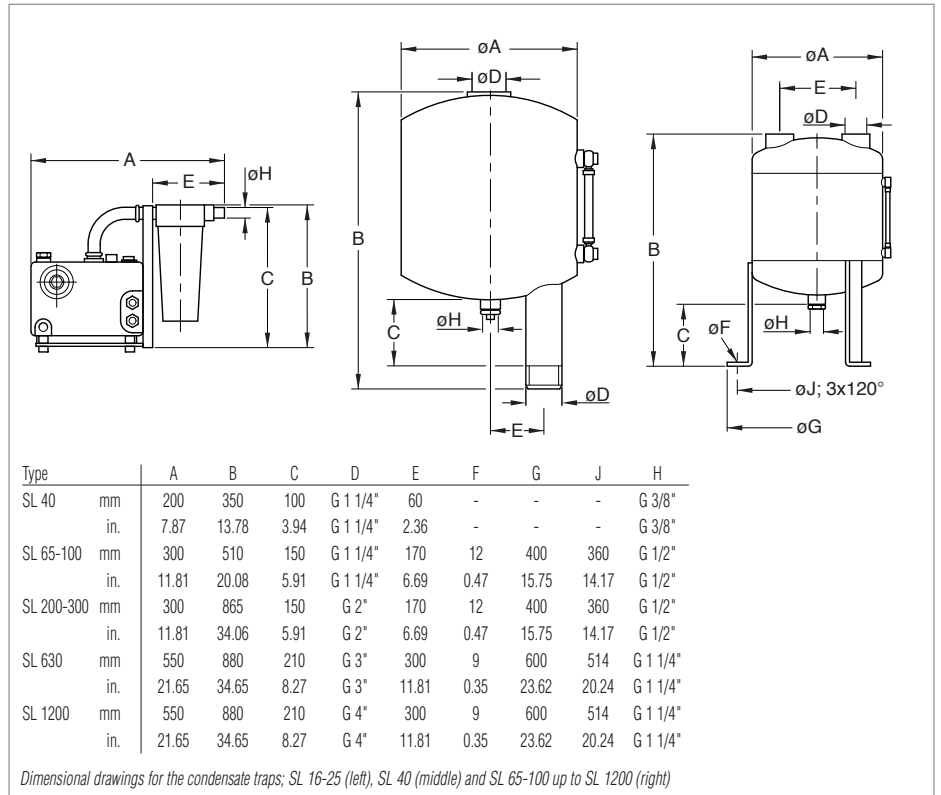
SOGEVAC SV 40 with SL 40 condensate trap

The SL 16-25 condensate trap consists of a steel separator whereas the collection vessel is made of transparent plastic.

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

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 condensate traps are equipped with a sight glass tube, so that it is easy to determine when to

empty the vessels. The condensate drain is sealed by a screw-in cap. This cap may be replaced by a drain cock.

Technical Data

Condensate Trap		SL 16-25	SL 40	SL 65-100	SL 200-300	SL 630	SL 1200
For pump	SOGEVAC SV	16/25 and 10 B/16 B/25 B	40 and 40 B	40/65/100 and 40 B/65 B/100 B	200/300	500/630/750	500/630/750/1200
Condensate capacity	l (qt)	2 (2.1)	4 (4.2)	16 (16.9)	40 (42.3)	80 (84.6)	80 (84.6)
Weight	kg (lbs)	3.5 (7.7)	5 (11)	11 (24.3)	17 (37.5)	58 (127.9)	59 (130.1)

Ordering Information

Condensate Trap		SL 16-25	SL 40	SL 65-100	SL 200-300	SL 630	SL 1200
Condensate trap	Part No.	951 38	951 40	951 42	951 44	951 47	951 48
Drain cock	Part No.	-	711 30 111	711 30 113	711 30 113	711 30 105	711 30 105
Double spigot for drain cock	Part No.	-	-	-	-	711 18 033	711 18 033

Version for the North and South American Continents

Technical Data

Condensate Trap		SL 16-25	SL 40	SL 65-100	SL 200-300	SL 630	SL 1200
For pump	SOGEVAC SV	16/25 + UV 25	40	65/100	200/300	500/630/750	630/750/1200
Condensate capacity	l (qt)	2 (2.1)	4 (4.2)	16 (16.9)	40 (42.3)	80 (84.6)	80 (84.6)
Weight	kg (lbs)	3.5 (7.7)	5 (11)	11 (24.3)	17 (37.5)	58 (127.9)	59 (130.1)

Ordering Information

Condensate Trap		SL 16-25	SL 40	SL 65-100	SL 200-300	SL 630	SL 1200
Condensate trap	Part No.	951 38 (BSP)	951 43 (NPT)	951 43 (NPT)	951 45 (NPT)	951 47 (BSP)	951 48 (BSP)
Drain cock	Part No.	-	711 30 113	711 30 113	711 30 113	711 30 105	711 30 105
Double spigot for drain cock	Part No.	-	-	-	-	711 18 033	711 18 033

SEP Separators and SEPC Condensers



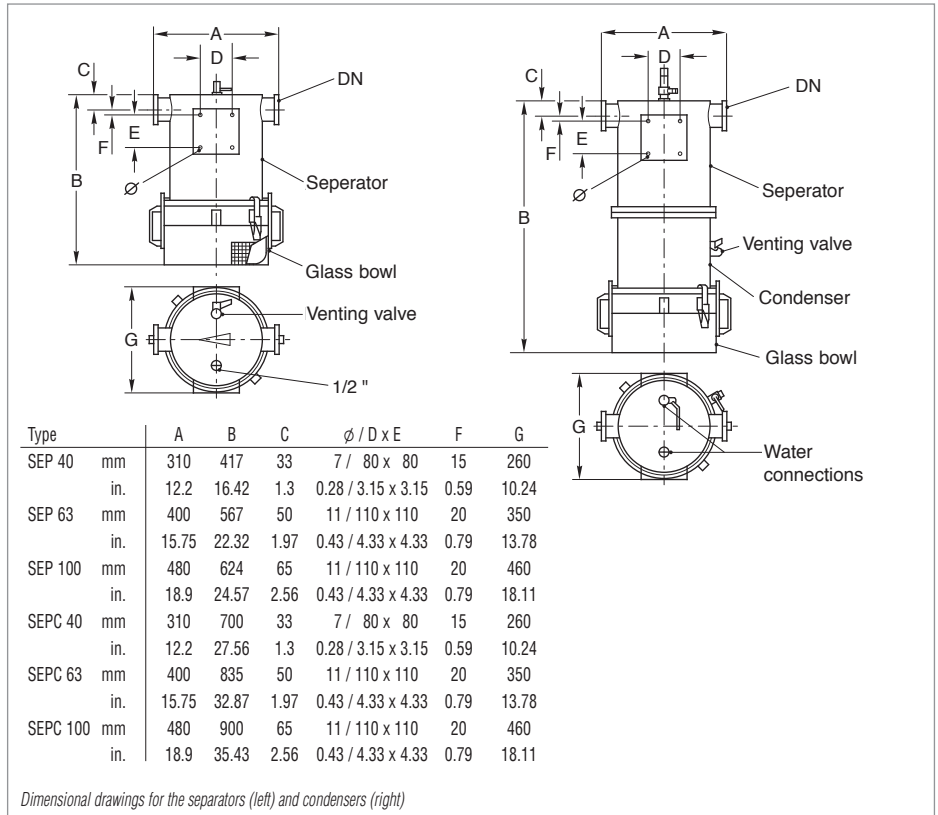
The separators from the SEP and the condensers from the SEPC range have been designed to be integrated in the vacuum circuit. They are employed in all those cases where the pumped gases may contain liquid drops (SEP), condensable vapors (SEPC) or solid particles which may impair proper operation of the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



Technical Data

Separator	SEP 40	SEP 63	SEP 100	-	-	-
Condenser	-	-	-	SEPC 40	SEPC 63	SEPC 100
For pump	SOGEVAC SV 40/65/100	200/300	630/750	40/65/100	200/300	630/750
Connection flange	DN 40 KF	63 ISO-K	100 ISO-K	40 KF	63 ISO-K	100 ISO-K
Capacity of the bowl	l (qt)	6 (6.3)	12 (12.7)	6 (6.3)	12 (12.7)	12 (12.7)
Condensation area	m ²	-	-	2.5	5	5
Condensation capacity ¹⁾	l/h	-	-	10	20	20
For water ²⁾	l/h	-	-	1500	3000	3000
Water connection dia.	mm (in.)	-	-	19 (0.75)	19 (0.75)	19 (0.75)
Weight	kg (lbs)	15 (33.1)	20 (44.1)	40 (88.2)	30 (66.2)	40 (88.2) 65 (143.3)

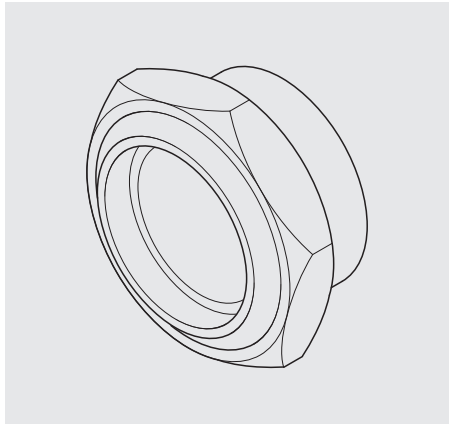
Ordering Information

Separator	SEP 40	SEP 63	SEP 100	-	-	-
Condenser	-	-	-	SEPC 40	SEPC 63	SEPC 100
Steel design	Part No. 953 54	953 56	953 60	953 64	953 66	953 68
Stainless steel design	Part No. 953 55	953 57	953 61	953 65	953 67	953 69
Support	Part No.	712 43 380				

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

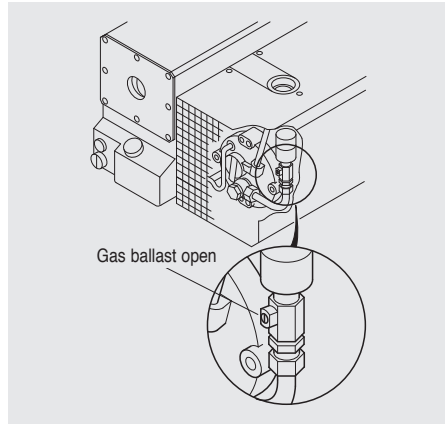
²⁾ Cooling water at a supply temperature of 10 °C (50 °F) and a discharge temperature < 15 °C (< 59 °F)

Special Oil Sight Glass



The special oil sight glass may be used instead of the standard one. It is equipped with a glass window and may be installed when wanting to pump aggressive gases or vapors.

Gas Ballast Valve



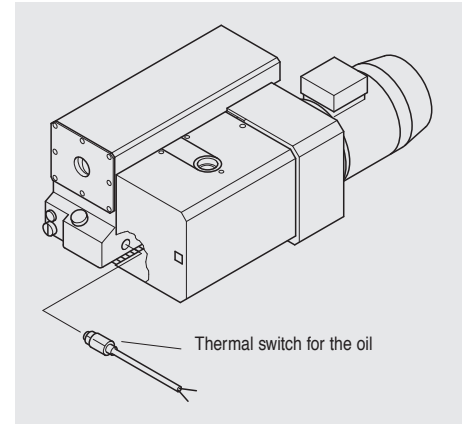
The pumps SOGEVAC SV 16, SV 25, SV 500, SV 630 (F) and SV 750 are equipped as standard with a gas ballast.

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

Pumps SV 40 to SV 300 may be ordered either with or without gas ballast valve.

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

Thermal Switch



The thermal switch is built into the oil circuit. 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:
 250 V AC, 50 Hz - 10 A
 125 V AC, 50 Hz - 12 A
 30 V DC - 5 A

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

Technical Notes

The gas ballast valve permits pumping of condensable vapors.

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

Ordering Information

SOGEVAC	SV 16/25	SV 40	SV 65	SV 100	SV 200 ^{1, 2)}	SV 300 ^{1, 2)}	SV 500/630/750 ^{1, 2)}	SV 630 F ^{1, 2)}	SV 1200 ^{1, 2)}
Gas ballast valve (standard)	integrated	Part No. 951 26	Part No. 951 26	Part No. 951 27	Part No. 951 29	Part No. 951 29	integrated (manual)	integrated (24 V DC)	integrated (manual)
Thermal switch	-	Part No. ²⁾ 711 19 111	Part No. ²⁾ 711 19 111	Part No. ²⁾ 711 19 111	Part No. ²⁾ 951 36	Part No. ²⁾ 951 36	integrated	integrated	integrated
Special oil sight glass	-	Part No. 712 19 488	Part No. 712 19 488	Part No. 712 19 488	Part No. 712 19 488	Part No. 712 19 488	integrated	integrated	integrated
Oil level monitor	Part No. 711 19 108	Part No. 711 19 108 ²⁾	Part No. 711 19 108 ²⁾	Part No. 711 19 108 ²⁾	Part No. 953 96	Part No. 953 96	Part No. 953 97	Part No. 953 97	Part No. 953 99
Gas ballast, big	-	Part No. 196 60	Part No. 196 60	Part No. 951 32	Part No. 951 30	Part No. 951 30	Part No. 951 33 ¹⁾	Part No. 951 34 ¹⁾	-
Gas ballast, with EM 24 V DC valve	-	Part No. 951 23	Part No. 951 23	Part No. 951 28	Part No. 951 31	Part No. 951 31	Part No. 951 34 ²⁾	standard	upon request ²⁾
Exhaust filter monitoring switch electric	-	-	-	-	upon request	upon request	upon request	upon request	upon request

¹⁾ Second gas ballast possible. Contact LEYBOLD

²⁾ Please state when ordering the pump

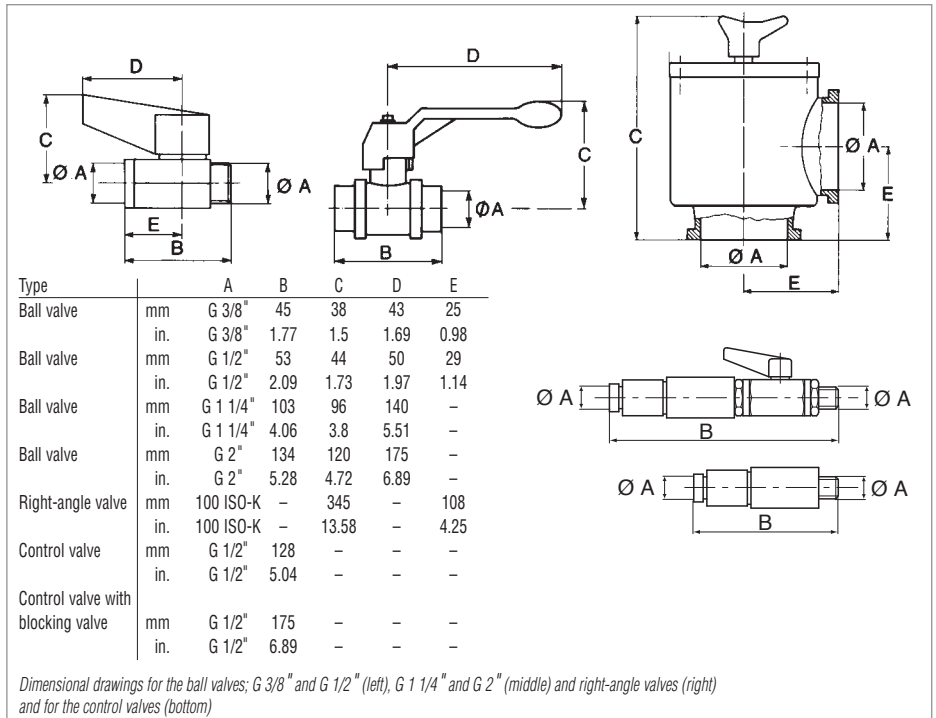
Ball Valves and Valves



Advantages to the User

- ◆ Leak rate $\leq 1 \times 10^{-6}$ mbar $\times l \times s^{-1}$
($\leq 0.75 \times 10^{-6}$ Torr $\times l \times s^{-1}$)
- ◆ 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 Product Section C14 "Vacuum Valves".



Materials

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.

Technical Data

Type	Ball valve	Ball valve	Ball valve	Ball valve	Right-angle valve	Control valve	Control valve with blocking valve	
Connection	F/M 3/8" BSP	F/M 1/2" BSP	F/F 1 1/4" BSP	F/F 2" BSP	DN 100 ISO-K	F/M 1/2" BSP	F/M 1/2" BSP	
Weight	kg (lbs)	0.12 (0.3)	0.15 (0.33)	1.24 (2.7)	3.22 (7.1)	8.0 (17.6)	0.135 (0.3)	0.369 (0.81)

Ordering Information

Type	Ball valve	Ball valve	Ball valve	Ball valve	Right-angle valve	Control valve	Control valve with blocking valve
Part No.	711 30 111	711 30 113	711 30 105	711 30 107	107 81	951 86	951 87

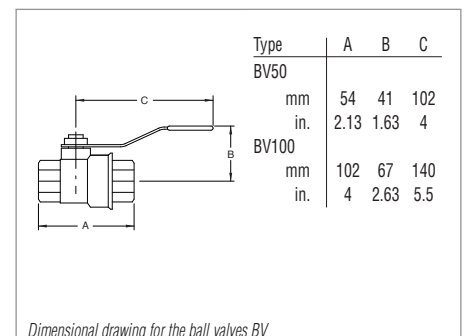
Version for the North and South American Continents

Technical Data

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

Ordering Information

Type	BV50	BV100
Part No.	899 810	899 800



Version for the North and South American Continents

OF3000 Oil Filtering System for SOGEVAC



The OF3000 is a compact, highly mobile filtering system designed for use with mechanical pumps in applications generating large volumes of heavy particulate filtration.

A positive feed gear pump and check valve assembly protect against excessive backpressure in the canister should the filter element become clogged. Flexible hoses and matched dripless connectors ensure easy maneuverability of the OF3000's rollaround cart, while also eliminating the possibility of oil spills.

Operation

Contaminated oil is removed from the drain location on the vacuum pump and is cycled to the element assembly. Clean oil is subsequently circulated back to the oil fill port of the vacuum pump.

The tangential flow inlet port to the oil filter canister allows full oil flow while utilizing the entire filter capability of the element. This translates into longer filter life, fewer element changes, and less oil loss.

Similarly, chemically severe OF3000C models have proven successful in aluminum etching and other processes where boron trichloride and other highly toxic gases are employed. The canister, gear pump, fittings and quick disconnects of the corrosive-service model have been specially treated with a fluorocarbon material that substantially increases the life of these components.

Advantages to the User

- ◆ Compact, mobile design
- ◆ Choice of five filter elements
- ◆ Dripless quick disconnects for easy removal and replacement of filter elements
- ◆ No spillage - recessed lid and oil level
- ◆ Conductive teflon hoses for static charge dissipation
- ◆ Integral gear pump with built-in bypass
- ◆ Pressure gauge
- ◆ Oil sight glass
- ◆ Single phase 50/60 Hz motor standard
- ◆ Tangential flow inlets - improves oil flow
- ◆ Canister drain valve

Filtering Elements

Fullers Earth - Provides high capacity for standard acids and can be used to trap particulates down to 10 micron size.

Hydrophylic - Effective for hydrolyzed acids and particulates as low as one micron.

Activated Alumina - Effective on Lewis acids and polar compounds. Can be used to trap particulates down to 10 microns.

Particulate (Paper) - Suitable for particulate removal down to 10 microns.

Particulate (Fiberglass) - Suitable for particulate removal down to 10 microns.

Version for the North and South American Continents

Technical Data		OF3000	Ordering Information	OF3000
Gear pump motor		1/6 HP, 115/208/220 V, single phase, 50/60 Hz, wired for 115 V, with on/off switch	OF3000, less element and oil (standard)	Part No. 898 625
Gear pump		0.7 gpm @ 1800 rpm	OF3000C, coated, prepared for PFPE	Part No. 899 450
Pressure gauge		0 to 100 psig (0 to 70 kPa)	OF3000, prepared for PFPE	Part No. 899 455
Fluid capacity (approx.)	gal	3	Accessories	
Flexible hoses	in. I.D.	78 teflon/carbon black with stainless steel braid - 6 ft lengths	Aluminum oxide	Part No. 898 523
Dimensions	in. (mm)	18 x 14 x 26 (457 x 355 x 661)	Hydrophilic	Part No. 898 525
Weight (dry)	lbs (kg)	65 (29.4)	Fullers earth	Part No. 99 171 159
			Particulate (paper)	Part No. 898 599
			Particulate (fiberglass)	Part No. 99 171 158

CO2

Version for the North and South American Continents

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.

Model	Fits Pump Models	Thread Size	Part No.	Replacement Element
SVXCXF 50	SV 16/25/UV 25	1/2" NPTF	899 502	899 503
SVXCXF 100	SV 40/65	1 1/2" NPTF	899 500	899 501
SVXCXF 200	SV 100/200/300	2" NPTF	899 498	899 499

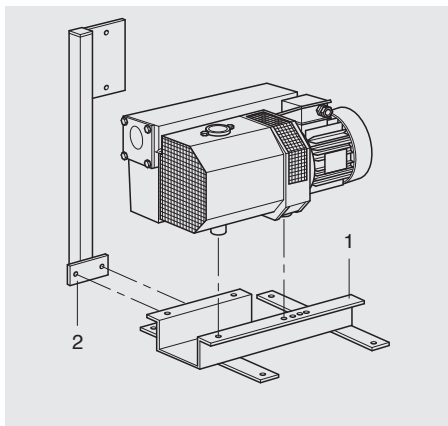
Mounting Accessories



SOGEVAC SV 630 F with RUVAC WAU 2001



SOGEVAC SV 300 with RUVAC WAU 501



Installation accessories are available for the SOGEVAC SV 40 to SV 300.

The base frame (1) simplifies installation of the pump in systems and also simplifies any maintenance work.

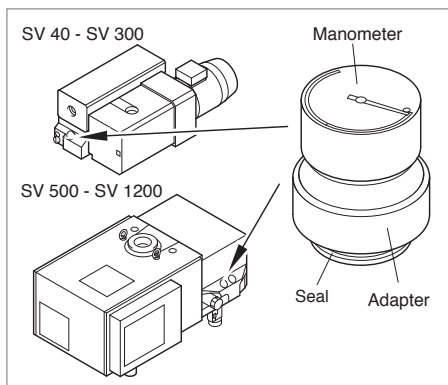
The bracket for electrical connections (2) is attached to the base frame; the solenoid control system is attached to this bracket.

Ordering Information

SOGEVAC	SV 40	SV 65	SV 100	SV 200	SV 300
Base frame	Part No. 711 19 203	Part No. 711 19 203	Part No. 711 19 205	Part No. 711 19 208	Part No. 711 19 208
Oil drain cock G 3/4"	Part No. 711 30 114	Part No. 711 30 114	Part No. 711 30 114	Part No. 711 30 114	Part No. 711 30 114
Bracket for electric connections	Part No. 711 19 223	Part No. 711 19 223	Part No. 711 19 223	Part No. 711 19 226	Part No. 711 19 226
Base frame for Roots installation	not possible	not possible	Part No. 711 19 204	Part No. 711 19 209	Part No. 711 19 209

¹⁾ Required for mounting the WAU 1001 on to the SV 200/300

Exhaust Filter Gauge



The manometer (40 mm dia.), glued in the adapter, will replace the oil filling plug. Dial has 2 colors:

green: $1000 < P < 1450$ mbar abs.
(< 1087.5 Torr abs.)
Exhaust filter OK

red: $P > 1450$ mbar abs.
(> 1087.5 Torr abs.)
Exhaust filter clogged

Technical Information

Indication of the manometer is only valid when the pump has reached its working temperature.

Ordering Information

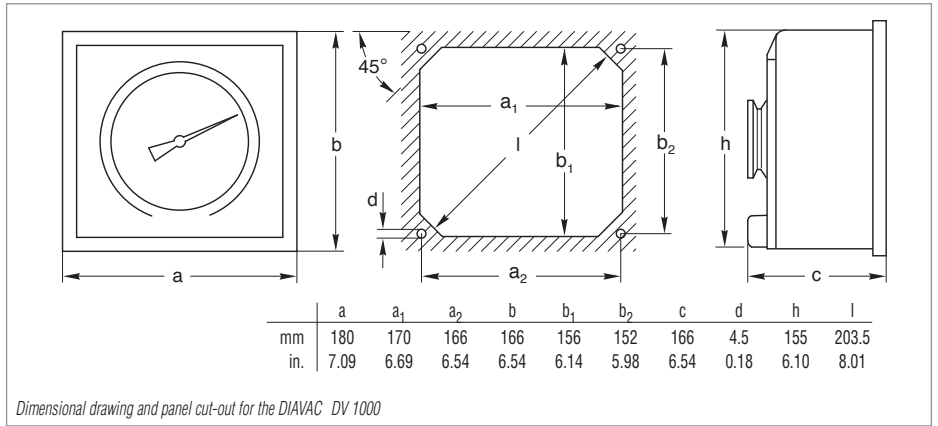
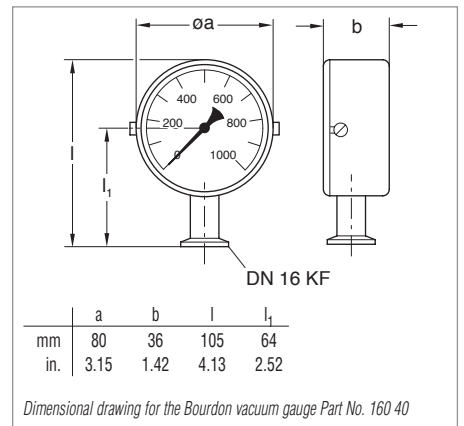
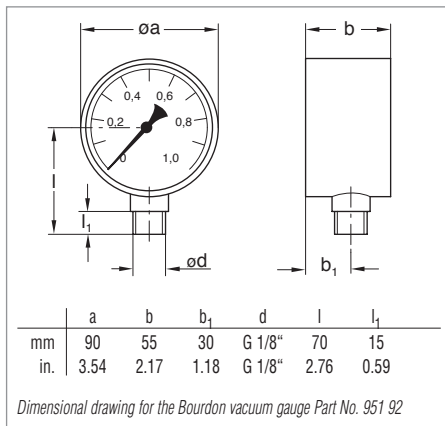
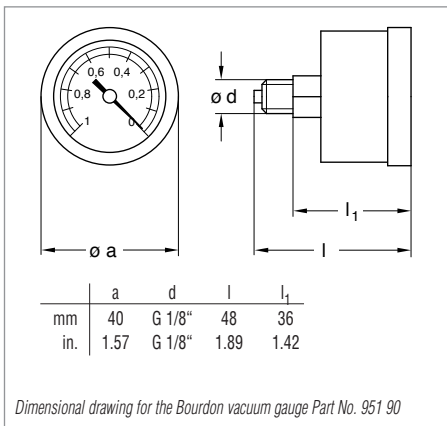
For pump	SOGEVAC	SV 16/25	SV 40 to SV 300	SV 500 to SV 1200 ²⁾
Manometer (with adapter and seal)	Part No.	951 91	951 94	951 95

²⁾ Not visible over SV 1200

Bourdon Vacuum Gauges



C02



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

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 KF	DN 40 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

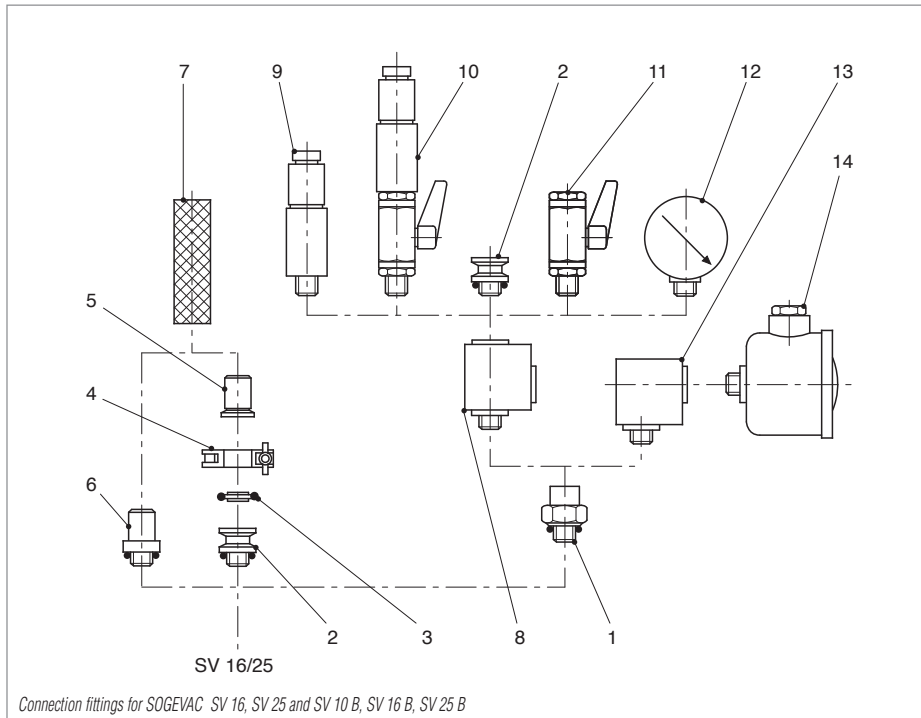
Ordering Information

Bourdon vacuum gauge	Part No. 951 90	Part No. 951 92	Part No. 160 40	Part No. 160 67
----------------------	-----------------	-----------------	-----------------	-----------------

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

Further information on other vacuum gauges (1) is provided in Product Section C16 "Total Pressure Gauges"

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



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 Product Section C13 "Vacuum Fittings and Feedthroughs".

Technical Data and Ordering Information

Item Description	Connection	Material	SV 16, SV 25
1 Screw coupling	G M/F 1/2"	Al	Part No. 711 18 020
2 Threaded flange adaptor ¹⁾	G M 1/2" – DN 16 KF	Al, anodized	Part No. 711 18 120
3 Centering ring ¹⁾	DN 16 KF	Al	Part No. 183 26
4 Clamping ring	DN 10/16 KF	Al	Part No. 183 41
5 Hose connection	DN 16 KF – DN 25 mm	Al, anodized	Part No. 711 18 300
6 Hose connection ¹⁾	G M 1/2" – DN 25 mm	Al, anodized	Part No. 711 18 011
7 PVC tubing	Ø 25 mm, 1 m long	PVC	Part No. 711 18 323
8 Tee piece	G M/F/F 1/2"	Al, anodized	Part No. 711 18 250
9 Vacuum control valve	G M 1/2"	Brass/Al	Part No. 951 86
10 Vacuum control valve with blocking valve	G M 1/2"	Brass, nickered/Al	Part No. 951 87
11 Ball valve	G M/F 1/2"	Brass, nickered	Part No. 711 30 113
	G M/F 1/2" NPTF	Brass, nickered	Part No. 899 810
12 Bourdon vacuum gauge	G M 1/2"		Part No. 951 92
13 Elbow 90°	G M/F 1/2"	Al, anodized	Part No. 711 18 210
14 Dust filter ²⁾			
	with paper cartridge	G M/F 1/2"	Part No. 951 50
		G M/F 1/2" NPT	Part No. 899 460
	with activated charcoal cartridge	G M/F 1/2"	Part No. 711 27 092
	with metal cartridge	G M/F 1/2"	Part No. 711 27 093
	G M/F 1/2"	Part No. 711 27 094	

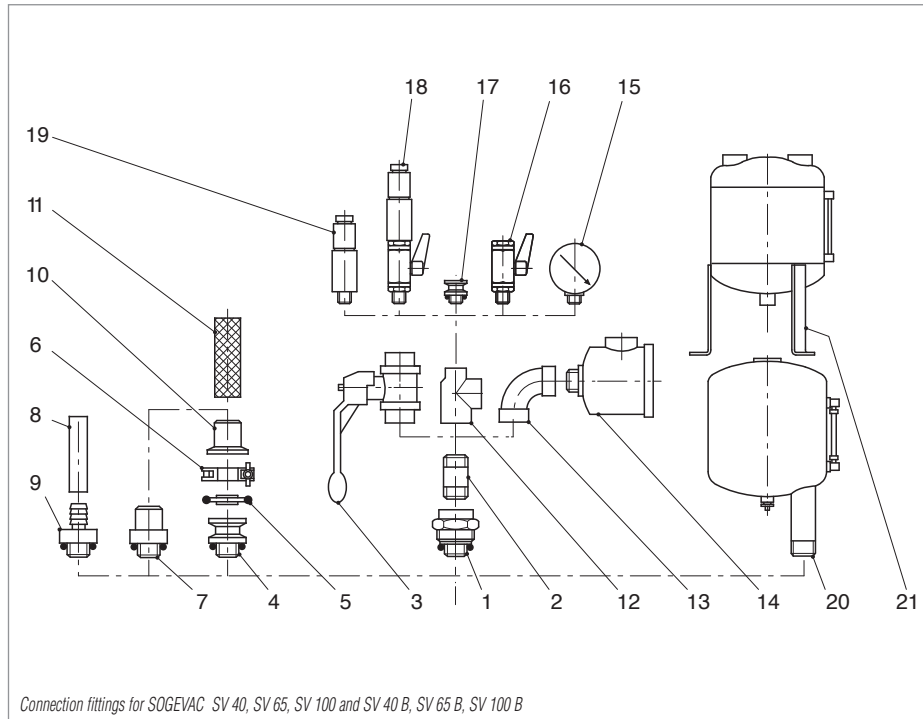
¹⁾ With NBR-O-Ring

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

M = Outside thread

F = Inside thread

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



Technical Data and Ordering Information

Item	Description	Connection	Material	SV 40	SV 65	SV 100
1	Screw coupling ¹⁾	G M/F 1 1/4"	Al, NBR	Part No. 711 18 023	Part No. 711 18 023	Part No. 711 18 023
2	Double nipple	G M/M 1 1/4"	Steel	Part No. 711 18 033	Part No. 711 18 033	Part No. 711 18 033
3	Ball valve	G F/F 1 1/4"	Brass, nickered	Part No. 711 30 105	Part No. 711 30 105	Part No. 711 30 105
4	Threaded flange adaptor ¹⁾	G M 1 1/4" BSP – DN 40 KF	Al, anodized	Part No. 711 18 123	Part No. 711 18 123	Part No. 711 18 123
5	Centering ring	DN 40 KF	Al	Part No. 183 28	Part No. 183 28	Part No. 183 28
6	Clamping ring	DN 32/40 KF	Al	Part No. 183 43	Part No. 183 43	Part No. 183 43
7	Hose connection ¹⁾	G M 1 1/4" / DN 40 mm	Al, anodized	Part No. 711 18 013	Part No. 711 18 013	Part No. 711 18 013
8	Rubber hose	∅ 10 x 25 mm, 1 m long		Part No. 172 03	Part No. 172 03	Part No. 172 03
9	Hose connection ¹⁾	G M 1 1/4" – DN 10	Al, anodized	Part No. 711 18 153	Part No. 711 18 153	Part No. 711 18 153
10	Hose connection	DN 40 KF/DN 40 mm	Al, anodized	Part No. 711 18 303	Part No. 711 18 303	Part No. 711 18 303
11	PVC tubing	∅ 40 mm, 1 m long		Part No. 711 18 324	Part No. 711 18 324	Part No. 711 18 324
12	Tee reducer bush	G F/F/F 1 1/4" – 1 1/4" – 1/2"	Gray cast iron	Part No. 711 18 263	Part No. 711 18 263	Part No. 711 18 263
13	Elbow 90°	G F/F 1 1/4"	Gray cast iron	Part No. 711 18 213	Part No. 711 18 213	Part No. 711 18 213
14	Dust filter ²⁾	G M/F 1 1/4"				
	with paper cartridge			Part No. 951 55	Part No. 951 60	Part No. 951 60
	with activated charcoal cartridge			Part No. 711 27 102	Part No. 711 27 112	Part No. 711 27 112
	with metal cartridge			Part No. 711 27 103	Part No. 711 27 113	Part No. 711 27 113
	with polyester filter cartridge			Part No. 711 27 104	Part No. 711 27 114	Part No. 711 27 114
15	Bourdon vacuum gauge	G M 1/2"		Part No. 951 92	Part No. 951 92	Part No. 951 92
16	Ball valve	G M/F 1/2"	Brass, nickered	Part No. 711 30 113	Part No. 711 30 113	Part No. 711 30 113
17	Threaded flange adaptor ¹⁾	G M 1/2" – DN 16 KF	Al, anodized	Part No. 711 18 120	Part No. 711 18 120	Part No. 711 18 120
18	Vacuum control valve with blocking valve	G M 1/2"	Brass, nickered/Al	Part No. 951 87	Part No. 951 87	Part No. 951 87
19	Vacuum control valve	G M 1/2"	Brass, nickered/Al	Part No. 951 86	Part No. 951 86	Part No. 951 86
20	Condensate trap	G M/F 1 1/4" – 1 1/4" – 3/8"		Part No. 951 40	–	–
21	Condensate trap	G F/F/F 1 1/4" – 1 1/4" – 1/2"		Part No. 951 42	Part No. 951 42	Part No. 951 42

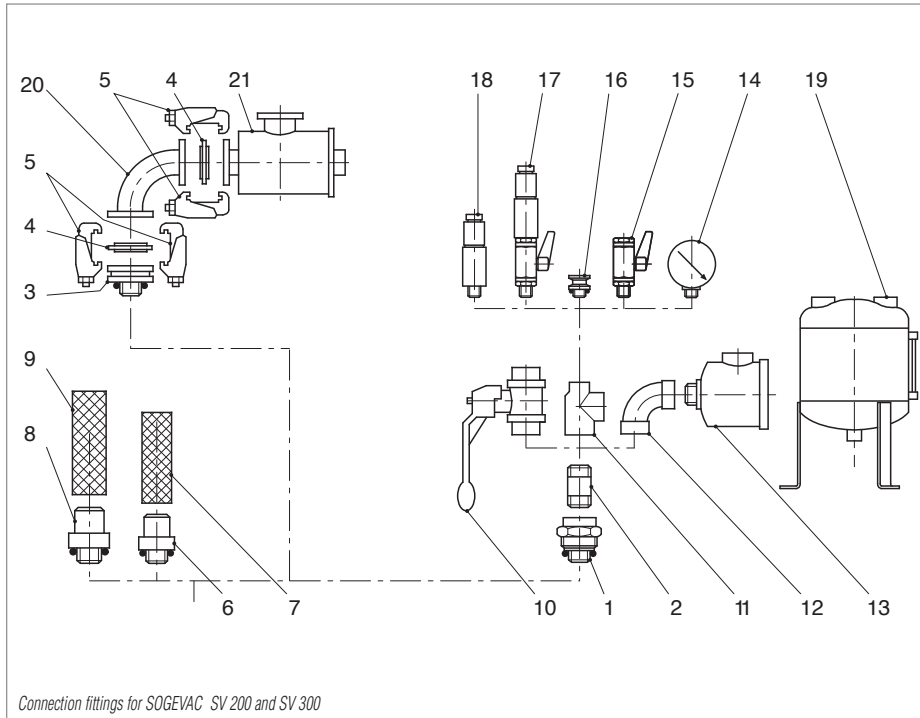
¹⁾ incl. O-ring

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

M = Outside thread

F = Inside thread

Connection Fittings for SOGEVAC SV 200, SV 300



Connection fittings for SOGEVAC SV 200 and SV 300

Technical Data and Ordering Information

Item	Description	Connection	Material	SV 200 and SV 300
1	Screw coupling ¹⁾	G M/F 2"	Al, anodized	Part No. 711 18 025
2	Double nipple	G M/M 2" – 150 mm	Steel	Part No. 711 18 035
3	Threaded flange adaptor ¹⁾	G M 2" – DN 63 ISO-K	Steel, zinc coated	Part No. 711 18 126
4	Centering ring with outer ring ¹⁾	DN 63 ISO-K	Al, CR	Part No. 268 05
5	Set of clamping screws DN ISO-K (4 pieces)	M10 x 24	Steel, zinc coated	Part No. 267 01
6	Hose connection ¹⁾	G M 2" – DN 50 mm	Al, anodized	Part No. 711 18 015
7	PVC tubing	∅ 50 mm, 1 m long	PVC	Part No. 711 18 325
8	Hose connection ¹⁾	G M 2" – DN 60 mm	Al, anodized	Part No. 711 18 016
9	PVC tubing	∅ 60 mm, 1 m long		Part No. 711 18 326
10	Ball valve	G F/F 2"	Brass, nickered	Part No. 711 30 107
11	Tee reducer	G F/F/F 2" – 2" – 1/2"	Gray cast iron	Part No. 711 18 265
12	Elbow 90°	G F/F 2"	Gray cast iron	Part No. 711 18 215
13	Dust filter ²⁾	G M/F 2"		
	with paper cartridge			Part No. 951 65
	with activated charcoal cartridge			Part No. 711 27 122
	with metal cartridge			Part No. 711 27 123
	with polyester filter cartridge			Part No. 711 27 124
14	Bourdon vacuum gauge	G M 1/2"		Part No. 951 92
15	Ball valve	G M/F 1/2"	Brass, nickered/Al	Part No. 711 30 113
16	Threaded KF small-flange adaptor ¹⁾	G M 1/2" – DN 16 KF	Al, anodized	Part No. 711 18 120
17	Vacuum control valve with blocking valve	G M 1/2"	Brass, nickered/Al	Part No. 951 87
18	Vacuum control valve	G M 1/2"	Brass, nickered/Al	Part No. 951 86
19	Condensate trap	G F/F/F 2" – 2" – 1/2"		Part No. 951 44
20	Elbow 90°	DN 63 ISO-K	Stainless steel	Part No. 887 25
21	Dust filter with paper cartridge	DN 63 ISO-K		Part No. 951 68

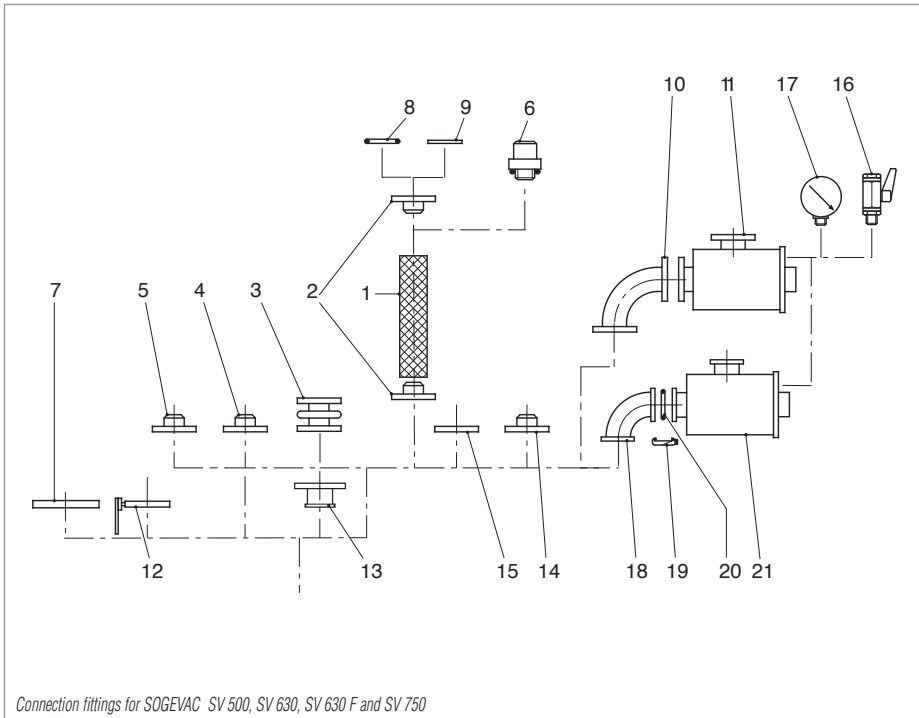
¹⁾ incl. O-ring

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

M = Outside thread

F = Inside thread

Connection Fittings for SOGEVAC SV 500, SV 630, SV 630 F, SV 750



Connection fittings for SOGEVAC SV 500, SV 630, SV 630 F and SV 750

Technical Data and Ordering Information

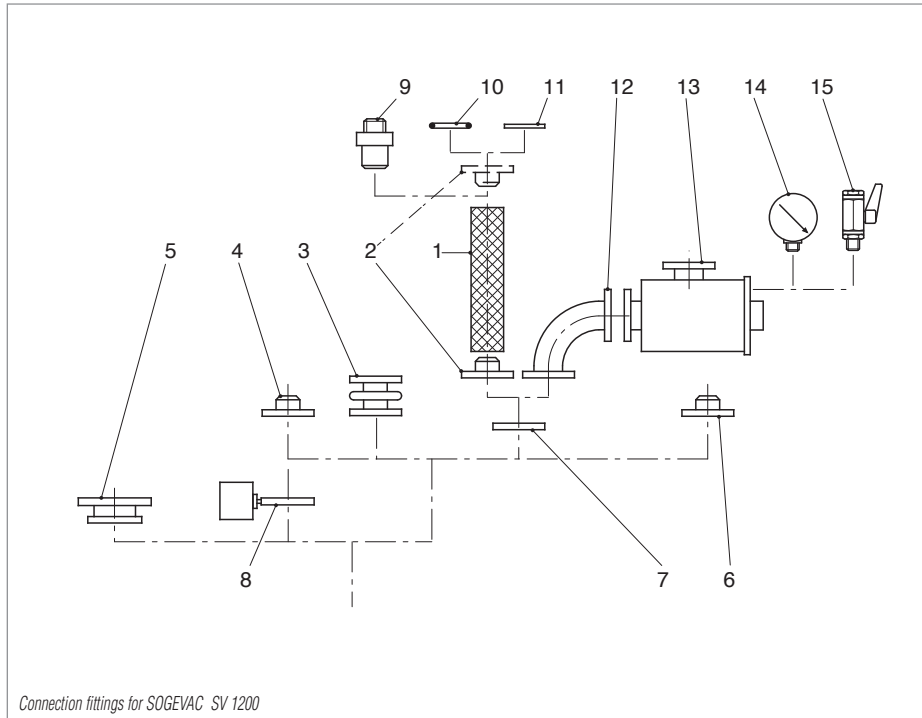
Item	Description	Connection	Material	SV 500, SV 630, SV 630 F and SV 750
1	PVC tubing	∅ 90 mm, 1 m long		Part No. 711 18 329
2	Hose connection	DN 100 PN 10 – DN 90 mm	Steel	Part No. 711 18 362
3	Coupling	DN 100 – PN 10	Stainless steel/Al/Rubber	Part No. 711 18 342
4	Adaptor flange	DN 100 PN 10 – G 4" F	Steel	Part No. 711 18 372
5	Adaptor flange	DN 100 PN 10 – F3" G	Steel	Part No. 711 18 370
6	Hose connection	G 4" M – DN 90	Steel/NBR	Part No. 711 18 017
7	Roots adaptor	RUVAC 1001	Steel/NBR	Part No. 953 47
	Roots adaptor	RUVAC 2001	Steel/FPM	Part No. 953 48
8	O-ring	∅ 110 x 5	NBR	Part No. 712 42 882
9	Centering ring with O-ring	DN 100 PN 10 – DN 100 ISO-K	Al/NBR	Part No. 711 18 391
10	Elbow 90°	DN 100 PN 10	Steel	Part No. 711 18 284
11	Dust filter F 630 ¹⁾	DN 100 PN 10		
	with paper cartridge			Part No. 951 71
	with activated charcoal cartridge			Part No. 711 27 162
	with metal cartridge			Part No. 711 27 163
	with polyester filter cartridge			Part No. 711 27 164
12	Manually operated blocking valve	DN 100 PN 10	Gray cast iron	Part No. 711 30 116
13	Adaptor	DN 100 PN 10 – 100 ISO-K	Al	Part No. 711 18 336
14	Adaptor flange with tubulation	DN 100 PN 10 (Tube ∅ 108)	Steel	Part No. 711 18 351
15	Collar flange	DN 100 PN 10 – DN 100 ISO-K	Steel	Part No. 711 18 383
16	Ball valve	G 1/2" M/F	Brass, nicked/Al	Part No. 711 30 113
17	Bourdon vacuum gauge	G 1/2" M		Part No. 951 92
18	Elbow 90°	DN 100 ISO-K	Stainless steel	Part No. 887 26
19	Set of clamps for DN ISO-K	M 10 x 24	Steel, zinc coated	Part No. 267 01
	Set = 4 pieces			
20	Centering ring ²⁾	DN 100 ISO-K	Al/CR	Part No. 268 06
21	Dust filter ¹⁾	DN 100 ISO-K		
	with paper cartridge			Part No. 951 72
	with activated charcoal cartridge			Part No. 711 27 166
	with metal cartridge			Part No. 711 27 167
	Screwset (not drawn)			
	Set = 8 Screws and 8 nuts	DN 100 PN 10	Steel, zinc coated	Part No. 714 12 440

M = Outside thread F = Inside thread

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

²⁾ incl. O-ring

Connection Fittings for SOGEVAC SV 1200



Technical Data and Ordering Information

Item	Description	Connection	Material	SV 1200
1	PVC tubing	∅ 90 mm, 1 m long	PVC	Part No. 711 18 329
2	Hose connection	DN 125 PN 10 – DN 90 mm	Steel	Part No. 711 18 363
3	Kupplung	DN 125 PN 10	Stainless steel/Al/Rubber	Part No. 711 18 343
4	Flange with tubulation ¹⁾	DN 125 (Tube 139.7)	Steel	Part No. 712 28 863
5	Roots adaptor	RUVAC 2001	Steel	Part No. 953 37
6	Adaptor flange	DN 125 PN 10 – G 4" F	Steel	Part No. 711 18 117
7	Collar flange	DN 125 PN 10 – DN 160 ISO-K	Steel	Part No. 711 18 386
8	Electropneumatic valve	DN 125 PN 10	Gray cast iron	Part No. 715 69 202
9	Hose connection	G 4" M – DN 90 mm	Steel/NBR	Part No. 711 18 017
10	O-ring			
	165 x 5		NBR	Part No. 712 42 902
	165 x 5		FPM	Part No. 712 42 912
11	Centering ring ¹⁾	DN 125 PN 10 – DN 160 ISO-K	Al	Part No. 711 18 396
12	Elbow 90°	DN 125 PN 10	Steel	Part No. 711 18 287
13	Dust filter ²⁾	DN 125 PN 10		
	with paper cartridge			Part No. 951 75
	with activated charcoal cartridge			Part No. 711 27 142
	with metal cartridge			Part No. 711 27 143
	with polyester filter cartridge			Part No. 711 27 144
14	Bourdon vacuum gauge	G 1/2" M		Part No. 951 92
15	Ball valve	G 1/2" M/F	Brass, nickeled/Al	Part No. 711 30 113

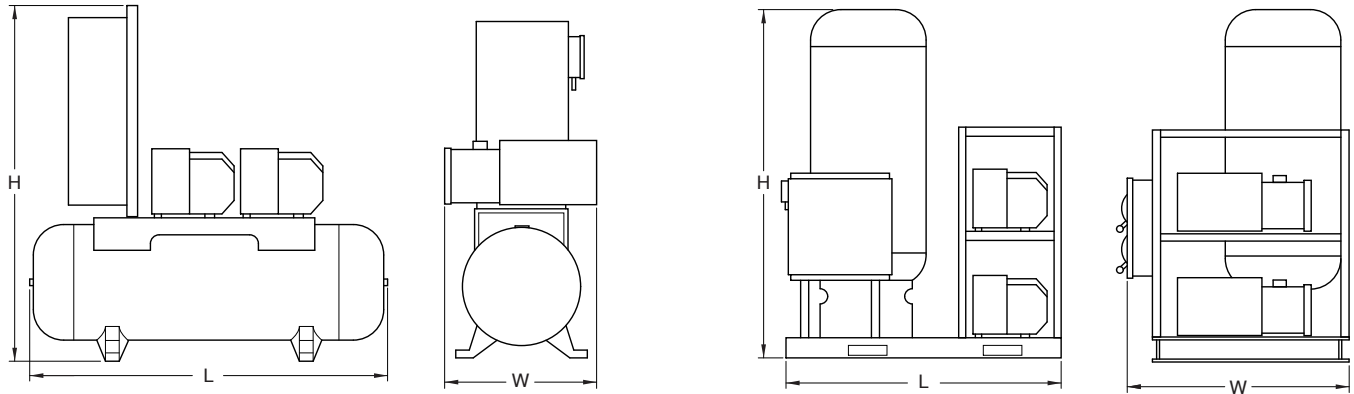
¹⁾ incl. O-ring

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

M = Outside thread

Version for the North and South American Continents

Central Vacuum Systems



Pump model	Tank size (gal)	L	W	H
Tank mount - simplex				
SV 16, UV 25	30	42 (1067)	20 (508)	51 (1295)
SV 40, SV 65	60	50 (1270)	25 (635)	48 (1219)
SV 100	80	65 (1651)	25 (635)	56 (1422)
SV 200, SV 300	120	70 (1778)	28 (711)	58 (1473)
Tank mount - duplex				
SV 16, UV 25	60	50 (1270)	27 (686)	53 (1346)
SV 40, SV 65	80	65 (1651)	30 (762)	53 (1346)
SV 100	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, UV 25	60	45 (1143)	38 (965)	56 (1422)
SV 40	80	49 (1245)	42 (1067)	56 (1422)
SV 65	120	62 (1575)	45 (1143)	88 (2235)
SV 100	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 systems, tank mounted [left] and stack mounted [right]; dimensions in inch, dimensions in brackets () are in mm

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

Version for the North and South American Continents

Central Vacuum Systems

Technical Data		Performance Characteristics						
		SV 16	UV 25	SV 40	SV 65	SV 100	SV 200	SV 300
Free air displacement	cfm (m ³ x h ⁻¹)	11 (18.6)	17.7 (30)	32.4 (55)	45.9 (77.9)	70.6 (119.8)	129.5 (219.8)	200.3 (340)
Actual pumping speed	cfm (m ³ x h ⁻¹)	10 (16.9)	15.3 (26)	28.3 (48)	37.7 (64)	66.5 (112.9)	117.8 (200)	170.8 (289.9)
Guaranteed base pressure	in HgVac	29.89	29.89	29.89	29.89	29.89	< 29.99	< 29.99
Base pressure with gas ballast	in HgVac	29.80	29.80	29.80	29.80	29.80	< 29.90	< 29.90
Water vapor tolerance	in HgVac	29.01	29.01	28.74	28.74	28.74	28.80	28.80
Water vapor pumping with gas ballast	qt/hr	0.5	0.5	0.73	1.3	2.1	5.7	7.8
Noise level at 3 feet with 1 pump running without gas ballast	dB(A)	58	59	64	65	72	73	74
Motor	hp	1	1.5	2	3	5	7.5	10
Pump rotational speed	rpm	1750	1750	1750	1750	1750	1750	1750
Oil capacity	qt	2	2	2	2.5	3.75	5.5	9
Inlet / exhaust-NPT	in.	1/2 / 1/2	1/2 / 3/4	1-1/4 / 1-1/4	1-1/4 / 1-1/4	1-1/4 / 2	2 / 2	2 / 2
Pump weight	lbs	50.7	83.8	90.4	103.4	213.4	341.8	430.0



Central vacuum system, simplex



Central vacuum system, duplex



Central vacuum system, triplex

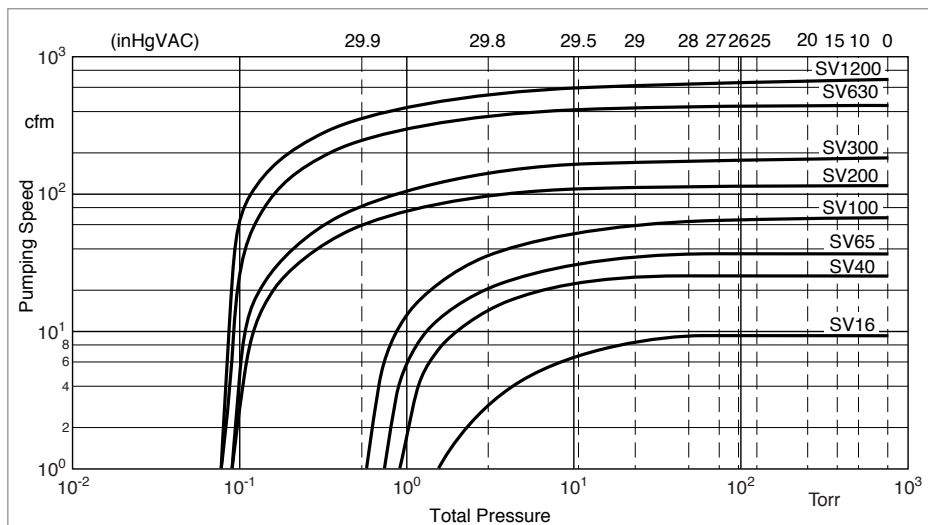
Version for the North and South American Continents

Central Vacuum Systems

Technical Data		Tank Mount	Tank Mount	Stack Mount
		Simplex	Duplex	Duplex and Simplex
SV 16, UV 25	Tank size (gal)	30	60	60
SV 40	Tank size (gal)	60	80	80
SV 65	Tank size (gal)	60	120	120
SV 100	Tank size (gal)	80	120	120
SV 200	Tank size (gal)	120	240	200
SV 300	Tank size (gal)	120	240	200

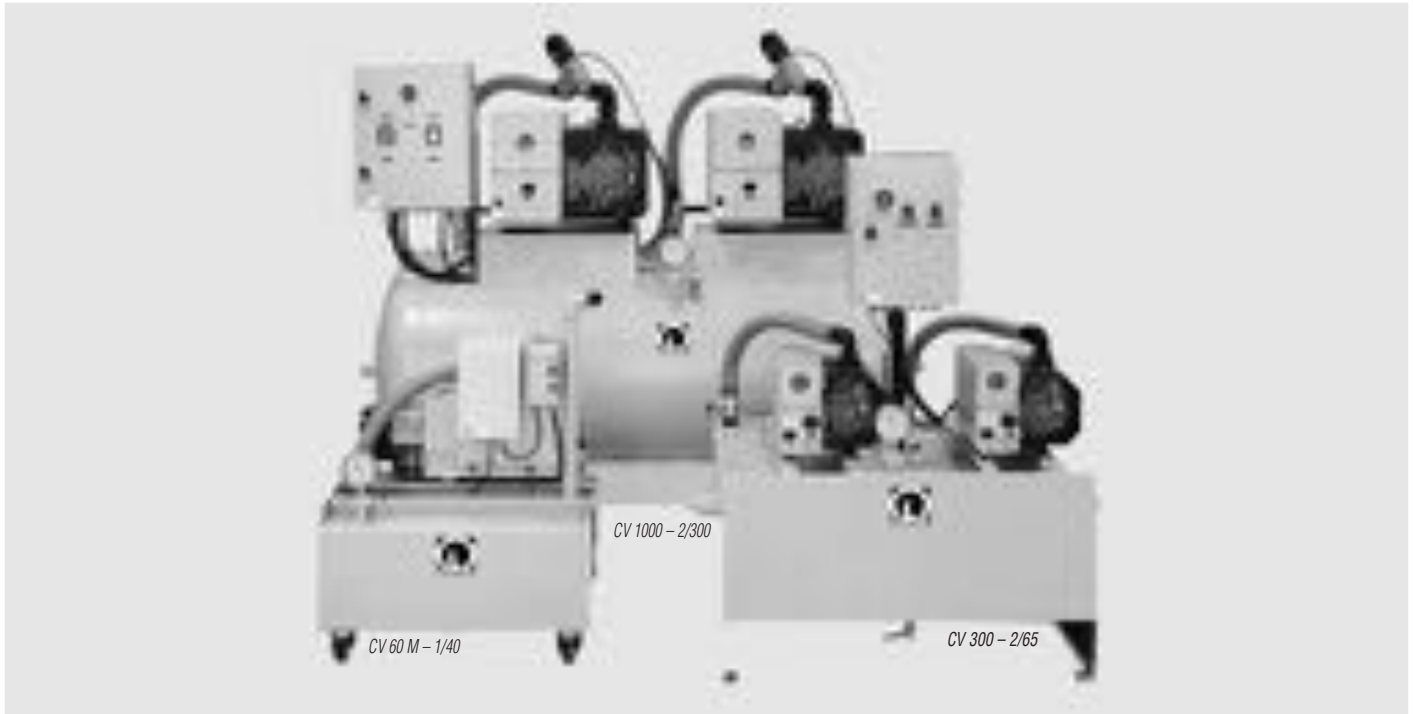


Ordering Information		Part No.	C	-					XX
System									
Simplex		S							
Duplex		D							
Triplex		T							
Pumps									
SV 16 (1 hp)		016							
UV 25 (1.5 hp)		025							
SV 40 (2 hp)		040							
SV 65 (3 hp)		065							
SV 100 (5 hp)		100							
SV 200 (7 hp)		200							
SV 300 (10 hp)		300							
Mounting									
Tank mount		T							
Stack mount		S							
Voltage									
460/3/60		A							
230/3/60		B							
230/1/60 (available for SV 16/UV 25 only)		C							
208/3/60		D							
115/1/60 (available for SV 16/UV 25 only)		E							
Duty									
Continuous		C							
Demant Start/Stop		D							



Pumping speed characteristics for the Central Vacuum Systems at 60 Hz

Central Vacuum Systems



Description

Independently of the properties of the gases which are to be pumped, central vacuum systems are defined according to the following engineering requirements:

- ◆ Operating pressure
- ◆ Quantity of gas to be pumped
- ◆ Duration of the pumping cycle
- ◆ Choice of control system

Many Combinations

- ◆ Modular system
- ◆ Pumps having pumping speeds from 16 to 1200 m³/h (9.4 to 706.8 cfm)
- ◆ Backup volumes from 30 to 1500 l (32 qt to 1586 l) (larger buffer volumes upon request)
- ◆ Very short delivery time (due to the modular system)

Contact us for further information.

Advantages to the User

- ◆ Two different types of control
- ◆ Pressure control between two adjustable pressures for central systems with one or two pumps
- ◆ Changeover and safety unit for two or three pumps
- ◆ Simple process-independent set-up
- ◆ Operating hours counter for each pump



Mobile vacuum station CV 30-LABO for laboratories

Technical Data and Ordering Information

Central type	Vessel size l (qt)	Nominal pumping speed m ³ x h ⁻¹	Connection BSP	Mains voltage at 50 Hz V	Required Power kW (hp)	Part No.
--------------	-----------------------	---	-------------------	--------------------------------	---------------------------	----------

Central Vacuum System with 1 Pump and Basic Control

60M – 1 x 25	60 (63.42)	25	1 1/4"	230, 1~	0.75 (1)	954 00
60 – 1 x 25	60 (63.42)	25	1 1/4"	400, 3~	0.75 (1)	954 01
60M – 1 x 40	60 (63.42)	40	1 1/4"	230, 1~	1.1 (1.5)	954 02
60 – 1 x 40	60 (63.42)	40	1 1/4"	400, 3~	1.1 (1.5)	954 03
60M – 1 x 65	60 (63.42)	65	1 1/4"	230, 1~	1.5 (2)	954 04
60 – 1 x 65	60 (63.42)	65	1 1/4"	400, 3~	1.5 (2)	954 05
150 – 1 x 40	150 (158.56)	40	1 1/4"	400, 3~	1.1 (1.5)	954 06
150 – 1 x 65	150 (158.56)	65	1 1/4"	400, 3~	1.5 (2)	954 07
300 – 1 x 40	300 (317.12)	40	2"	400, 3~	1.1 (1.5)	954 08
300 – 1 x 65	300 (317.12)	65	2"	400, 3~	1.5 (2)	954 09
300 – 1 x 100	300 (317.12)	100	2"	400, 3~	2.5 (3.4)	954 10
500 – 1 x 40	500 (528.54)	40	2"	400, 3~	1.1 (1.5)	954 11
500 – 1 x 65	500 (528.54)	65	2"	400, 3~	1.5 (2)	954 12
500 – 1 x 100	500 (528.54)	100	2"	400, 3~	2.5 (3.4)	954 13
500 – 1 x 200	500 (528.54)	200	2"	400, 3~	4 (5.4)	954 14
500 – 1 x 300	500 (528.54)	300	2"	400, 3~	5.5 (7.5)	954 15
750 – 1 x 100	750 (792.81)	100	2"	400, 3~	2.5 (3.4)	954 16
750 – 1 x 200	750 (792.81)	200	2"	400, 3~	4 (5.4)	954 17
750 – 1 x 300	750 (792.81)	300	2"	400, 3~	5.5 (7.5)	954 18
1000 – 1 x 100	1000 (1057.08)	100	2"	400, 3~	2.5 (3.4)	954 19
1000 – 1 x 200	1000 (1057.08)	200	2"	400, 3~	4 (5.4)	954 20
1000 – 1 x 300	1000 (1057.08)	300	2"	400, 3~	5.5 (7.5)	954 21

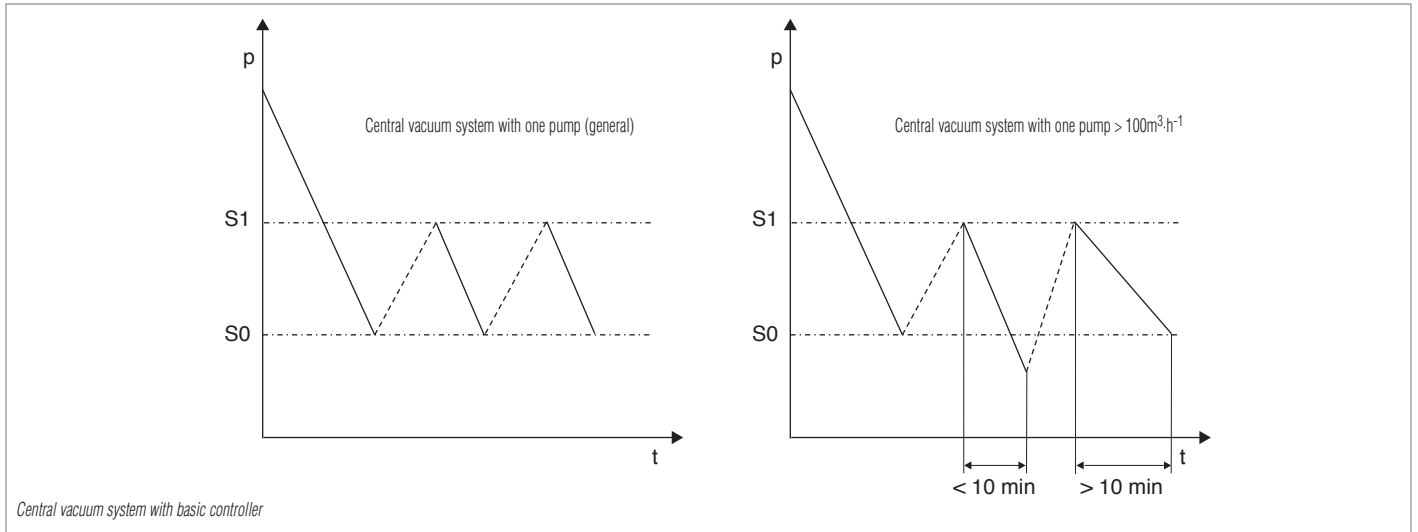
Central Vacuum System with 2 Pumps and Basic Control

150 – 2 x 40	150 (158.56)	80	1 1/4"	400, 3~	2.2 (3)	954 52
150 – 2 x 65	150 (158.56)	130	1 1/4"	400, 3~	3 (4.1)	954 53
300 – 2 x 40	300 (317.12)	80	1 1/4"	400, 3~	2.2 (3)	954 54
300 – 2 x 65	300 (317.12)	130	1 1/4"	400, 3~	3 (4.1)	954 55
300 – 2 x 100	300 (317.12)	200	1 1/4"	400, 3~	5 (6.8)	954 56
500 – 2 x 40	500 (528.54)	80	2"	400, 3~	2.2 (3)	954 57
500 – 2 x 65	500 (528.54)	130	2"	400, 3~	3 (4.1)	954 58
500 – 2 x 100	500 (528.54)	200	2"	400, 3~	5 (6.8)	954 59
500 – 2 x 200	500 (528.54)	360	2"	400, 3~	8 (10.9)	954 60
750 – 2 x 100	750 (792.81)	200	2"	400, 3~	5 (6.8)	954 61
750 – 2 x 200	750 (792.81)	360	2"	400, 3~	8 (10.9)	954 62
750 – 2 x 300	750 (792.81)	560	2"	400, 3~	11 (15)	954 63
1000 – 2 x 100	1000 (1057.08)	200	2"	400, 3~	5 (6.8)	954 64
1000 – 2 x 200	1000 (1057.08)	360	2"	400, 3~	8 (10.9)	954 65
1000 – 2 x 300	1000 (1057.08)	560	2"	400, 3~	11 (15)	954 66

Central Vacuum System with 2 Pumps and Changeover and Safety Unit

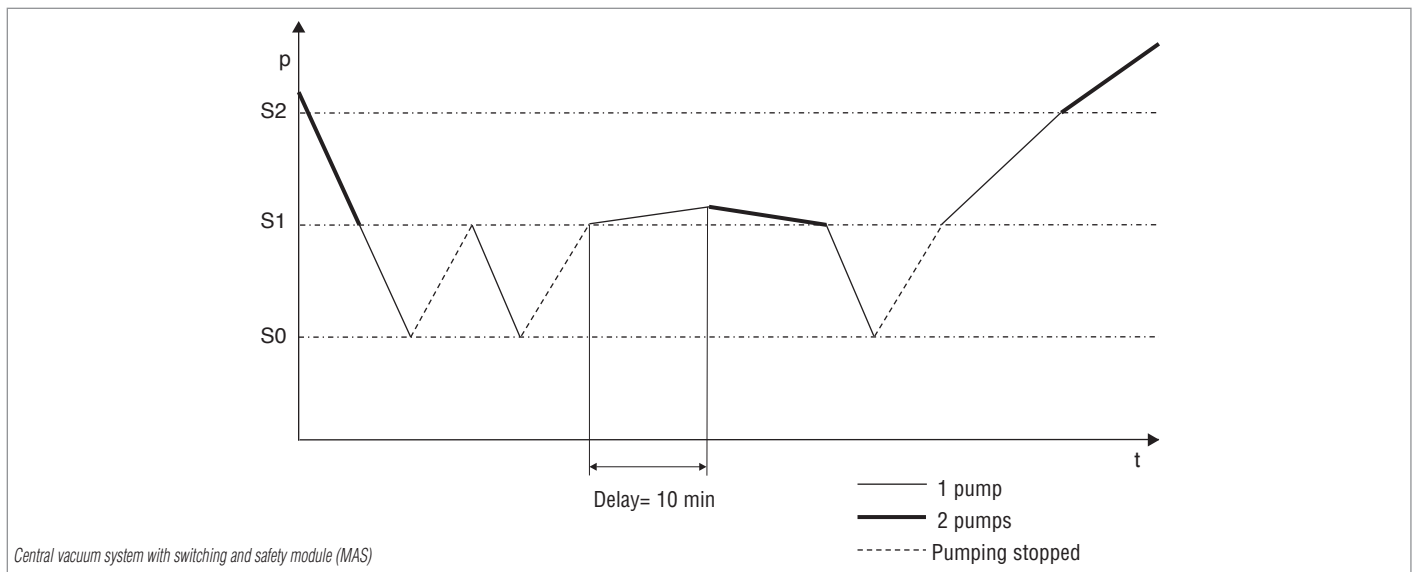
150 – 2 x 40 MAS	150 (158.56)	40 / 80	1 1/4"	400, 3~	2.2 (3)	954 77
150 – 2 x 65 MAS	150 (158.56)	65 / 130	1 1/4"	400, 3~	3 (4.1)	954 78
300 – 2 x 40 MAS	300 (317.12)	40 / 80	1 1/4"	400, 3~	2.2 (3)	954 79
300 – 2 x 65 MAS	300 (317.12)	65 / 130	1 1/4"	400, 3~	3 (4.1)	954 80
300 – 2 x 100 MAS	300 (317.12)	100 / 200	1 1/4"	400, 3~	5 (6.8)	954 81
500 – 2 x 40 MAS	500 (528.54)	40 / 80	2"	400, 3~	2.2 (3)	954 82
500 – 2 x 65 MAS	500 (528.54)	65 / 130	2"	400, 3~	3 (4.1)	954 83
500 – 2 x 100 MAS	500 (528.54)	100 / 200	2"	400, 3~	5 (6.8)	954 84
500 – 2 x 200 MAS	500 (528.54)	180 / 360	2"	400, 3~	8 (10.9)	954 85
750 – 2 x 100 MAS	750 (792.81)	100 / 200	2"	400, 3~	5 (6.8)	954 86
750 – 2 x 200 MAS	750 (792.81)	180 / 360	2"	400, 3~	8 (10.9)	954 87
750 – 2 x 300 MAS	750 (792.81)	280 / 560	2"	400, 3~	11 (15)	954 88
1000 – 2 x 100 MAS	1000 (1057.08)	100 / 200	2"	400, 3~	5 (6.8)	954 89
1000 – 2 x 200 MAS	1000 (1057.08)	180 / 360	2"	400, 3~	8 (10.9)	954 90
1000 – 2 x 300 MAS	1000 (1057.08)	280 / 560	2"	400, 3~	11 (15)	954 91

Control Principles for Central Vacuum Systems



Central Vacuum System with Basic Controller

The basic controller is controlled through 2 freely selectable switching thresholds. The controller drives the vacuum pump or a valve. In the case of pumps with pumping speeds over $100\text{ m}^3/\text{h}$ (58.9 cfm) the switching frequency is either restricted to 6 times per hour or they are controlled by a valve.



Central Vacuum System with Switching and Safety Module

This controller has 3 switching thresholds and is for 2 pumps running in parallel. At peak demand both pumps, and during normal demand only one pump will be running. After pre-defined intervals the pumps will change so as to evenly spread the number of operating hours across both pumps.

Vacuum Pump Oils

Lubricating oils for rotary 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 must resist cracking upon being mechanically stressed.

All the vacuum pump 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 pumps from the SOGEVAC series.

We therefore recommend the exclusive use of vacuum pump oils fully qualified by Leybold so as to ensure optimum performance of the Leybold vacuum pumps and also to ensure optimum oil change intervals.

Under vacuum conditions lubricating oils may behave quite differently than expected. When using not suitably qualified third party oils, the oil change intervals and the performance of the vacuum pump may be reduced. Also unwanted deposits may occur which may even cause severe damage to the vacuum pump.

For these reasons please understand that we must make our warranty commitment dependent on the use of oils which have been qualified by us. Damages caused by the use of not suitably qualified lubricating oils are not covered by our warranty.

In order to adapt the pumps to the different applications of our customers, different types of oil are used in the SOGEVAC pumps.

Please note that owing to differing properties not all types of oil may be used in all pumps of the SOGEVAC 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.

Lubricant types

Mineral oils

Mineral oils are products distilled and refined from crude oil. These do not consist of precisely defined compounds 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.

Synthetic oils

Synthetic oils are produced by a chemical reaction. 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.

The oils given in the following belong to the group of synthetic oils:

Ester oils

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.

Perfluorinated polyether (PFPE)

These are oils which are only composed of carbon (C), fluorine (F) and oxygen atoms (O). The existing C-O and C-F bonds are highly stable. For this reason PFPE oils are practically inert against all chemical and oxidising influences.

Perfluorinated polyether will not polymerise under the influence of high energy radiation.

PFPE is non-flammable. Leybold NC1/14 has the approval of BAM (Federal Institute for Materials Research and Testing) for pumping of pure oxygen.

Perfluorinated polyether are used when pumping strongly reactive substances like oxygen (O₂), fluorine F₂ and uranium hexafluoride UF₆. Regarding Lewis acids (for example, boron trifluoride BF₃, aluminum trichloride AlCl₃) they are not completely inert. Here reactions may take place at temperatures over 100 °C (212 °F).

Perfluorinated polyether are thermally highly stable. Thermal decomposition may only take place at temperatures of over 290 °C (554 °F).

Caution: Perfluorinated polyether will – when decomposed – release toxic and corrosive gases: hydrogen fluoride HF, carbonyl difluoride COF₂. 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 perfluorinated polyether, since it is essential that the pump 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.

For all lubricants in our line of products you may obtain Safety Data Sheets from the Dept. Technical Support in Cologne.

Oil recommendations for various areas of application

Application Data	Special oil GS 32	Special oil GS 77	FM 32	FM 68
Type of oil	Paraffin-base mineral oil with additives to improve oxidization stability and wearing properties	Paraffin-base mineral oil with additives to improve oxidization stability and wearing properties	Medicinal white oil with additives – in accordance with FDA and USDA H1	Medicinal white oil with additives – in accordance with FDA and USDA H1
Examples of areas of application and process media	Standard oil For pumping air, chemically inert permanent gases (noble gases, for example), water vapor, solvent vapors pumped by laboratory pumps operated with cold traps	Standard oil For pumping air, chemically inert permanent gases (noble gases, for example), water vapor, solvent vapors pumped by laboratory pumps operated with cold traps	Food sector acc. to USDA H1 approved for accidental contact with foodstuffs	Food sector acc. to USDA H1 approved for accidental contact with foodstuffs
Remarks	The ultimate pressures stated in our catalogs are based on operation of the pump with GS 32 (except for the DOT and PFPE pumps)	The ultimate pressures stated in our catalogs are based on operation of the pump with GS 77 (except for the DOT and PFPE pumps)		
Elastomer compatibility				
FPM (Viton)	Suited	Suited	Suited	Suited
NBR (Perbunan) ¹⁾	Suited	Suited	Suited	Suited
EPDM	Not suited	Not suited	Not suited	Not suited

Technical Data	Special oil GS 32	Special oil GS 77	FM 32	FM 68
Viscosity at 40 °C (104 °F) mm ² /s	30	77	32	68
Viscosity at 100 °C (212 °F) mm ² /s	6	10	6	9
Flash point °C (°F)	220 (428)	245 (473)	228 (442)	260 (500)
Vapor pressure at 100 °C (212 °F) mbar (Torr)	5 x 10 ⁻³ (6.7 x 10 ⁻³)	1 x 10 ⁻³ (0.75 x 10 ⁻³)	5 x 10 ⁻³ (6.7 x 10 ⁻³)	1 x 10 ⁻³ (0.75 x 10 ⁻³)
Density at 15 °C g/ml	0.86	0.87	0.87	0.87
Pour point °C (°F)	-27 (17)	-24 (11)	-9 (-16)	-18 (0)

Ordering Information	Special oil GS 32	Special oil GS 77	FM 32	FM 68
1 litre (1.06 qt)	Part No. 711 17 772	–	Part No. 711 17 782	–
2 litres (2.1 qt)	Part No. 711 17 723	–	–	–
5 litres (5.29 qt)	Part No. 711 17 724	Part No. 711 17 774	Part No. 711 17 783	Part No. 711 17 784
25 litres (26.43 qt)	–	Part No. 711 17 776	–	Part No. 711 17 786
60 litres (63.42 qt)	Part No. 711 17 727	–	–	–
200 litres (211.42 qt)	–	Part No. 711 17 779	–	–

Please note that the technical data stated are only typical data. Slight variations from batch to batch must be expected. The technical data stated here can not be taken as assured properties

¹⁾ Resistance to decomposing is very much dependent on the share of acrylonitrile in the NBR

Application Data	Anderol® 495	Anderol® 555	NC 10	DOT 4	NC 1/14
Type of oil	Ester oil	Ester oil	Alkyl sulphonic acid ester	Brake fluid	Perfluorinated polyether PFPE
Examples of areas of application and process media	Used at elevated temperatures. Starting of the pump at temperatures between 0 and 12 °C (32 and 54 °F)	Used at elevated temperatures, pumping of air, chemically inert permanent gases (noble gases, for example), carbon dioxide CO ₂ , carbon monoxide CO, aliphatic compounds (for example methane CH ₄ , propane C ₃ H ₈ , ethylene C ₂ H ₄), organic solvent vapors	Used for pumping process media which tend to polymerise (for example, styrene C ₈ H ₈ , butadiene C ₄ H ₆)	Filling of brake fluid circuits in the car industry only	For pumping strong oxidants like oxygen, O ₂ , ozone O ₃ , nitrogen oxides NO _x and sulphur oxides (SO ₂ , SO ₃) as well as reactive substances like halogens (for example fluorine F ₂ , chlorine Cl ₂), halogen hydride (for example hydrogen chloride HCl, hydrogen bromide HBr), uranium hexafluoride UF ₆ , and conditionally Lewis acids (for example, boron trichloride BCl ₃)
Remarks	Do not pump any inorganic acids (HCl, HF, for example), no free halogens (Cl ₂ , F ₂ , for example) or alkaline media (NH ₃ , for example)	Do not pump any inorganic acids (HCl, HF, for example), no free halogens (Cl ₂ , F ₂ , for example) or alkaline media (NH ₃ , for example)	Do not use a chemical oil filter Mixing with other types of oil must be absolutely avoided Do not pump any inorganic acids (for example HCl, HF)!	Use only in pumps modified for DOT 4 Mixing with other types of oil must be absolutely avoided	Use only in pumps modified for PFPE Mixing with other types of oil must be absolutely avoided Avoid pumping water vapour, especially in connection with corrosive media (see above) The use of a chemical oil filter CF / CFS is strongly recommended
Elastomer compatibility					
FPM (Viton)	Suited	Suited	Suited	Not suited	Suited
NBR (Perbunan) ¹⁾	Conditionally suited	Conditionally suited	Not suited	Not suited	Suited
EPDM	Not suited	Not suited	Not suited	Suited	Suited

Technical Data	Anderol® 495	Anderol® 555	NC 10	DOT 4	NC 1/14
Viscosity at 40 °C (104 °F)	mm ² /s 28	94	38	N/I	47
Viscosity at 100 °C (212 °F)	mm ² /s 6	9	4	> 2	5
Flash point	°C (°F) 245 (473)	250 (482)	210 (410)	> 120 (> 248)	No known ³⁾
Vapor pressure at 20 °C (68 °F)	mbar (Torr) No known	7 x 10 ⁻⁵ (9.3 x 10 ⁻⁵)	1 x 10 ⁻⁴ (0.75 x 10 ⁻⁴)	1.3 (1)	3 x 10 ⁻⁷ (2.5 x 10 ⁻⁷)
Vapor pressure at 100 °C (212 °F)	mbar (Torr) No known	1,5 x 10 ⁻³ (2 x 10 ⁻³)	No known	No known	6 x 10 ⁻⁴ (8 x 10 ⁻⁴)
Density at 15 °C (59 °F)	g/ml 0.92	0.96	1.05 ²⁾	1.05	1.89 ²⁾
Pour point	°C (°F) -57 (-71)	-42 (-44)	-15 (-5)	No known	-40 (-40)
Middle molecular weight	g/mol No known	530	No known	No known	2,500

Ordering Information	Anderol® 495	Anderol® 555	NC 10	DOT 4	NC 1/14
1 litre (1.06 qt)	-	-	-	Part No. 200 10 037	Part No. 177 38/Part No. 711 17 792
2 litres (2.1 qt)	Part No. 711 17 763	-	-	-	-
5 litres (5.29 qt)	Part No. 711 17 764	Part No. 711 17 754	-	-	-
20 litres (26.43 qt)	Part No. 711 17 766	Part No. 711 17 756	Part No. 177 25	-	-
60 litres (63.42 qt)	Part No. 711 17 767	Part No. 711 17 757	-	-	-
200 litres (211.42 qt)	-	Part No. 200 03 257	-	-	-

Please note that the technical data stated are only typical data. Slight variations from batch to batch must be expected.

The technical data stated here can not be taken as assured properties

¹⁾ Resistance to decomposing is very much dependent on the share of acrylonitrile in the NBR

²⁾ at 20 °C (68 °F)

³⁾ **Caution:** When being decomposed at temperatures over 290 °C (554 °F), toxic and corrosive gases will be released. 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

ANDEROL® is a trademark of ANDEROL BV

Version for the North and South American Continents

Application Data	HE-100	HE-700
Type of oil	Paraffin-base mineral oil with additives to improve oxidization stability and wearing properties	Paraffin-base mineral oil with additives to improve oxidization stability and wearing properties
Examples of areas of application and process media	Standard oil For pumping air, chemically inert permanent gases (noble gases, for example), water vapor, solvent vapors pumped by laboratory pumps operated with cold traps	Standard oil For pumping air, chemically inert permanent gases (noble gases, for example), water vapor, solvent vapors pumped by laboratory pumps operated with cold traps
Remarks	The ultimate pressures stated in our catalogs are based on operation of the pump with HE-100 (except for the DOT and PFPE pumps)	The ultimate pressures stated in our catalogs are based on operation of the pump with HE-700 (except for the DOT and PFPE pumps)
Elastomer compatibility FPM (Viton) NBR (Perbunan) ¹⁾ EPDM	Suited Suited Not suited	Suited Suited Not suited

Technical Data	HE-100	HE-700
Viscosity at 40 °C (104 °F) mm ² /s	32	79
Viscosity at 100 °C (212 °F) mm ² /s	5.3	9.5
Flash point °C (°F)	206 (403)	224 (435)
Vapor pressure at 93 °C (200 °F) mbar (Torr)	2.1 x 10 ⁻³ (1.6 x 10 ⁻³)	1.6 x 10 ⁻² (1.2 x 10 ⁻²)
Pour point °C (°F)	-27 (-17)	-20 (-4)

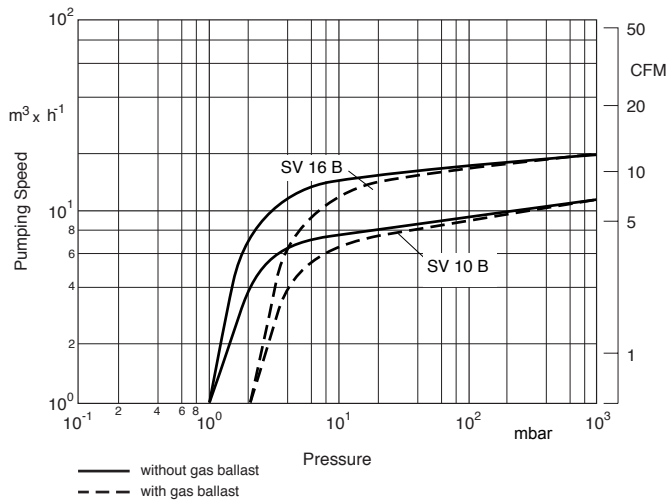
Ordering Information	HE-100	HE-700
1 qt	Part No. 898 537	-
1 gal	Part No. 898 538	Part No. 726 25 023
55 gal	Part No. 898 539	Part No. 726 25 022

Please note that the technical data stated are only typical data. Slight variations from batch to batch must be expected. The technical data stated here can not be taken as assured properties

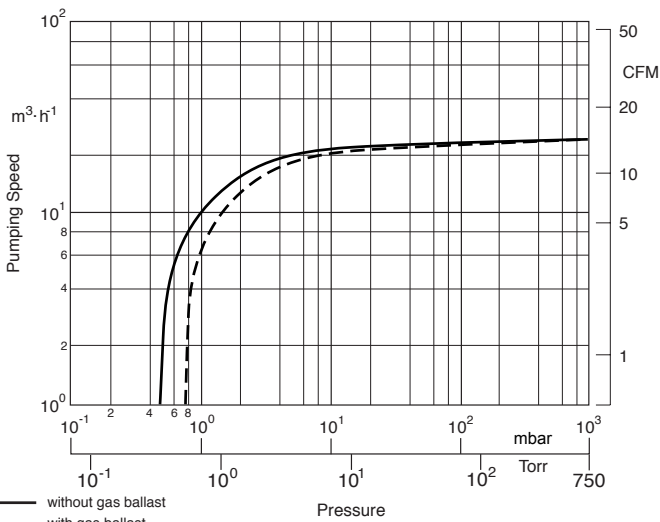
¹⁾ Resistance to decomposing is very much dependent on the share of acrylonitrile in the NBR

Note: HE-100 is the standard oil for SV 16 to SV 100, HE-700 is the standard oil for SV 200 to SV 1200

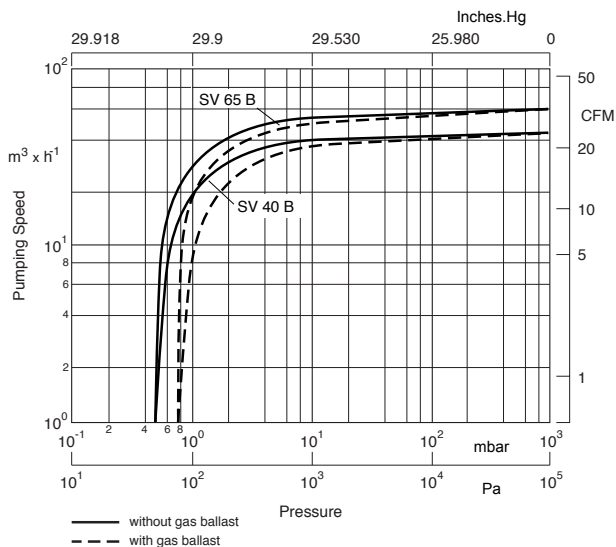
Version for the North and South American Continents



Pumping speed characteristics for the SOGEVAC SV 10 B and SV 16 B at 60 Hz

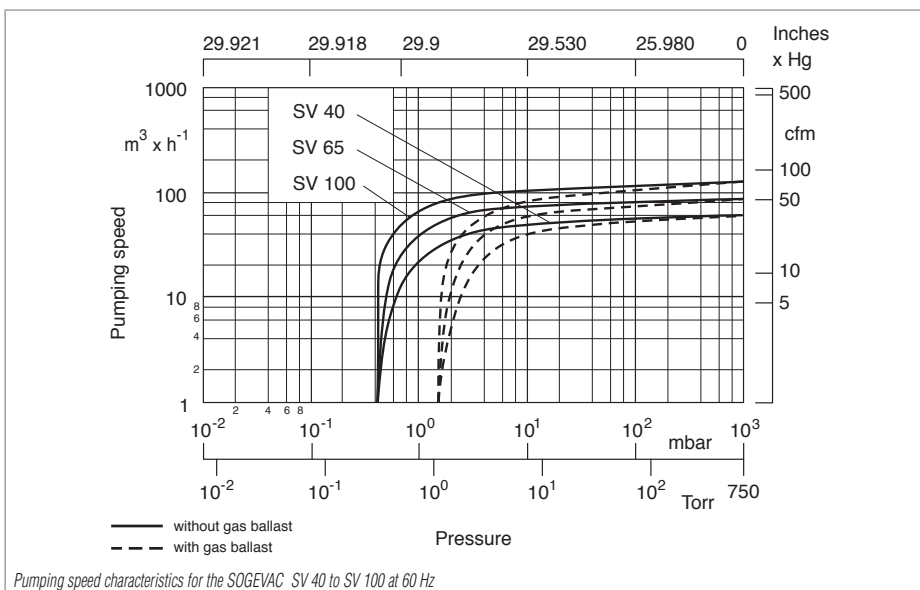
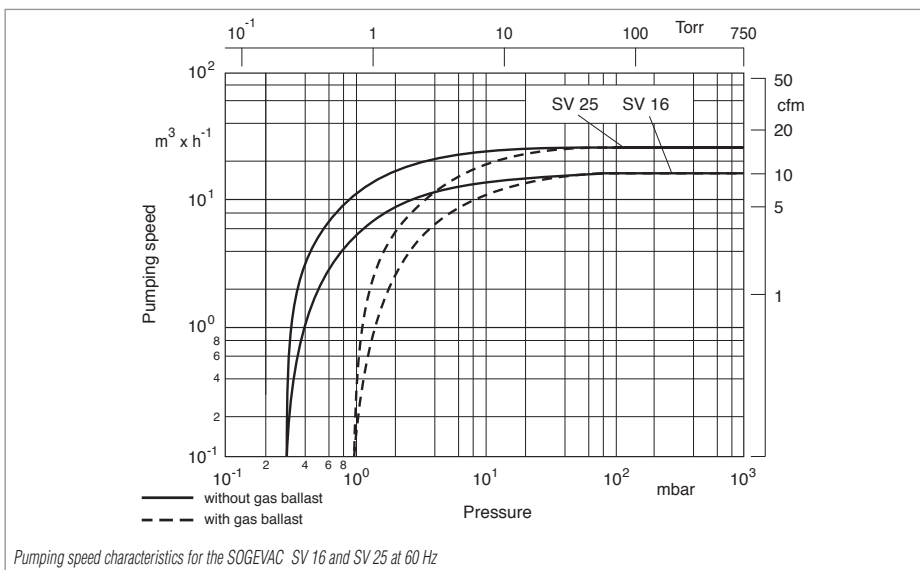
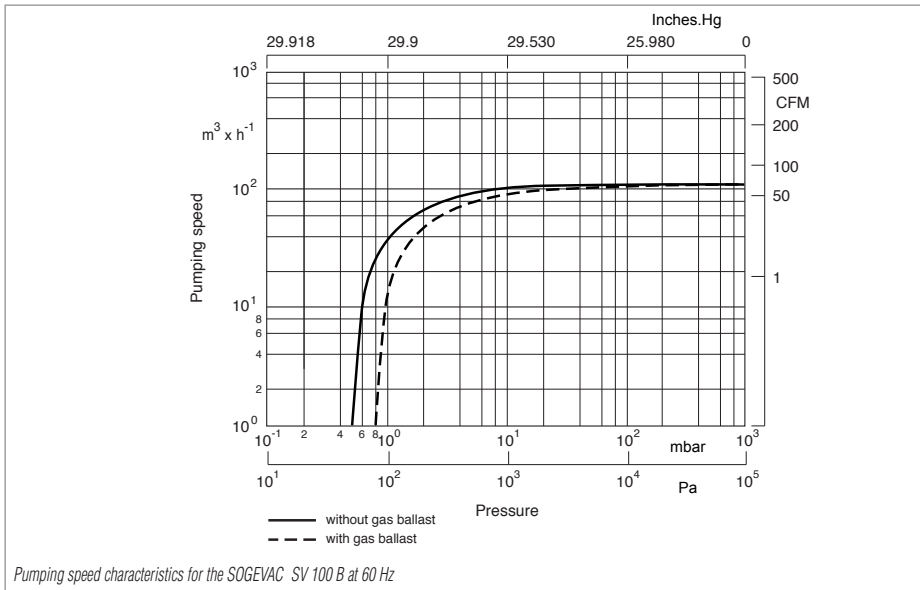


Pumping speed characteristics for the SOGEVAC SV 25 B at 60 Hz



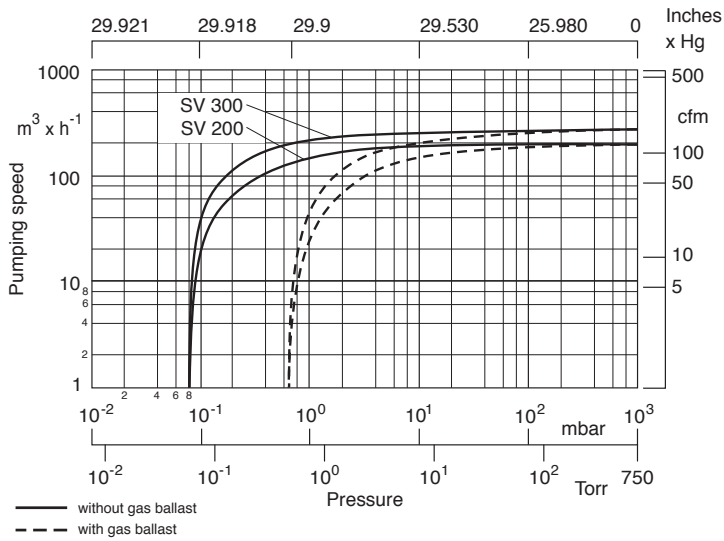
Pumping speed characteristics for the SOGEVAC SV 40 B and SV 65 B at 60 Hz

Version for the North and South American Continents

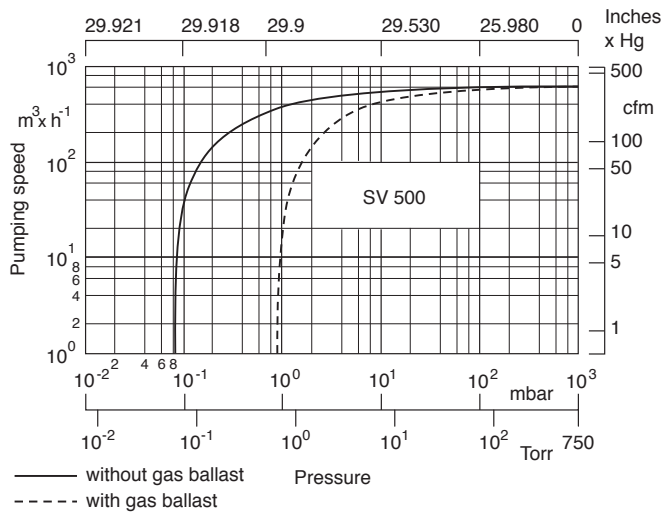


Version for the North and South American Continents

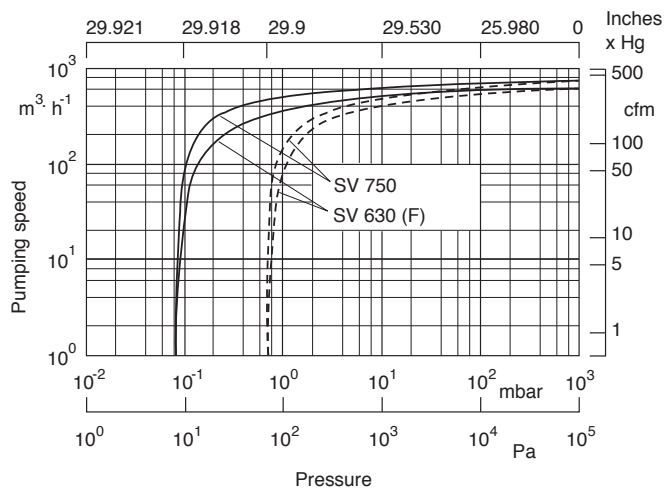
C02



Pumping speed characteristics for the SOGEVAC SV 200 and SV 300 at 60 Hz

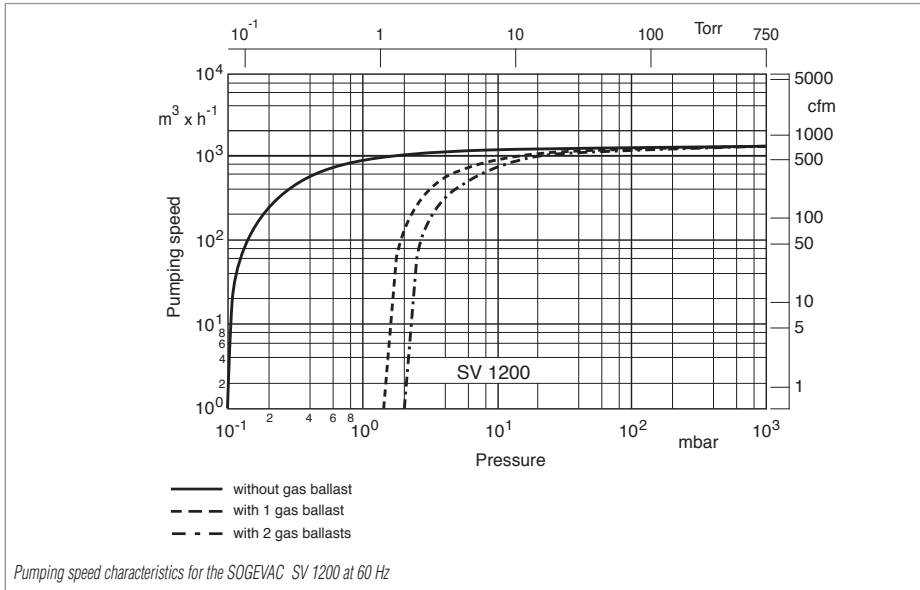


Pumping speed characteristics for the SOGEVAC SV 500 at 60 Hz



Pumping speed characteristics for the SOGEVAC SV 630 (F) and SV 750 at 60 Hz

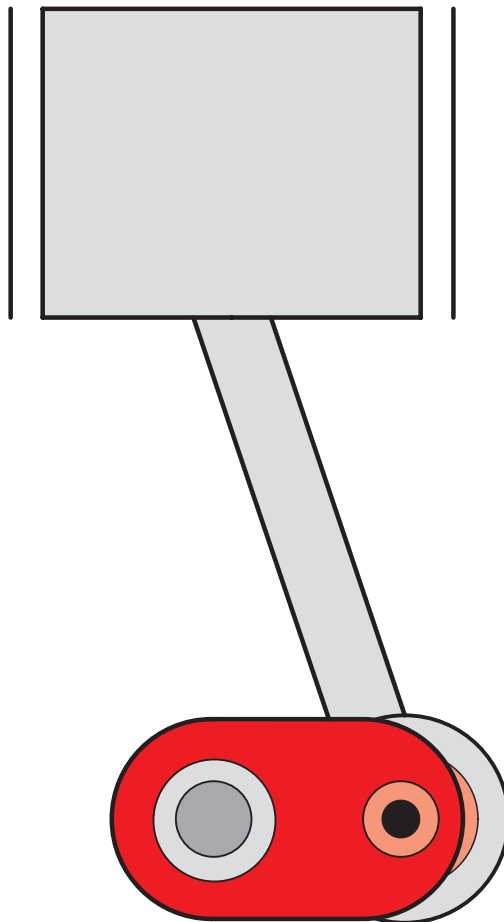
Version for the North and South American Continents



CO3

Dry Compressing Piston Vacuum Pumps

EcoDry L
EcoDry M



General

Applications and Accessories **C03.03**
 General Information on the EcoDry L and M **C03.04**

Products

EcoDry L **C03.06**
 EcoDry M. **C03.10**

Accessories

EcoDry L

Cart **C03.14**
 Roots Pump Adapter **C03.15**
 Gasballast Valve, manually operated (Retrofit Kit) **C03.16**

EcoDry M

Exhaust Silencer. **C03.17**
 Vibration Absorbing Feet **C03.17**
 Vibration Absorbing Kit **C03.18**

EcoDry L and EcoDry M 15/20

Solenoid Gas Ballast Valve **C03.19**

Miscellaneous

60 Hz Curves **C03.20**

Applications and Accessories

Pump		EcoDry L	EcoDry M 15/20/30
Applications			
Applications in physics		◆	◆
Applications in loadlock		◆	◆
Vacuum locks		◆	◆
Mass spectrometers		◆	◆
Electron microscope		◆	◆
Lamps and bulbs manufacture		◆	◆
Coating systems		◆	◆
Freeze drying			◆
Backing of Turbomolecular pumps and Compound-Turbomolecular pumps		◆	◆
Accessories			
	Page		
Cart	C03.14	◆	
Roots pump adapter	C03.15	◆	
Gas ballast valve, manually operated (retrofit kit)	C03.16	◆	
Exhaust silencer	C03.17		◆
Vibration absorbing feet	C03.17		◆
Vibration absorbing kit	C03.18		◆
Solenoid gas ballast valve	C03.19	◆	◆

C03

EcoDry L - The New Dry Compressing Piston Vacuum Pump for Clean Processes

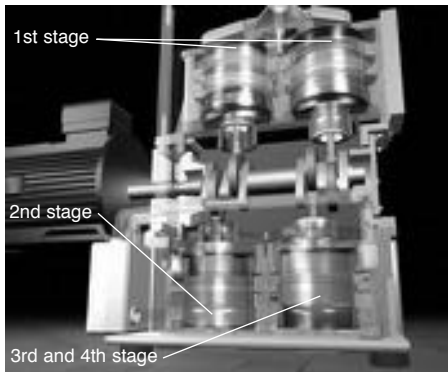


Fig. 1 Cross section of the EcoDry L

The EcoDry L (see Fig. 1) is a 4-stage absolutely dry compressing piston vacuum pump of the latest generation.

It does not have any oil lubricated components and does not contain hydrocarbon lubricants.

The four pistons are of the double-action type. This means that there is a compression chamber both at the top and the bottom of each piston.

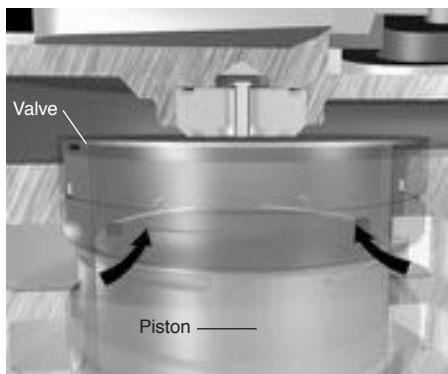


Fig. 2 Piston and valve arrangement

The gas which is pumped enters through slits which are controlled by the action of the piston, into the compression chamber where it is compressed against a large valve which extends over the entire cross section of the piston (see Fig. 2).

These valves have been designed to be extremely rugged and will operate very reliably.

Compared to other vacuum pumps, the rational speed is very low (about 900 to 1100 rpm; for 50/60 Hz operation).

For the purpose of an optimised distribution of the moving mass and also for the purpose of reducing the noise and vibration levels, the

pistons have been arranged opposing each other.

During the compression cycle the pistons move at low contact forces and entirely dry so that the bushings are hardly subject to any wear at all.

Sealing is performed through dynamic seals which provide a dry seal in the direction of the drive unit and a grease seal (free of hydrocarbons) in the direction of the atmosphere.

The extremely favourable and low coefficient of friction between the surface of the piston or the sealing surface and the bushing is the basis for the very high level of reliability and the low power consumption of this pump.

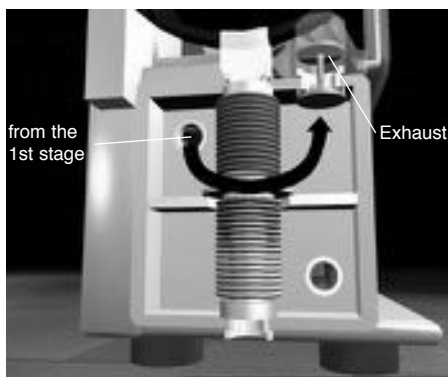


Fig. 3 Bypass valve, > 200 mbar (> 150 Torr) intake pressure

In combination with the standard integrated bypass valve (see Fig. 3 and 4) which drives the compression stages mechanically and for this reason most reliably, the amount of power consumed is highly attractive over the entire operating pressure range.

The EcoDry L is simple by design and consists only of a few components. Therefore, no special tools will be required for servicing.

Moreover, during servicing of the pump no special alignments or adjustments will be required since the components which replace the wearing parts have already been adapted to the pump so as to ensure reliable operation.

During operation, any maintenance or care requirements have been reduced to a minimum because it is not necessary to check any oil levels or exchange and replace any exhaust filter components and alike.

The EcoDry L is available for three-phase mains supplies and with its standard motor it may be installed almost anywhere in the world without modifications.

The standard operating hours counter in the junction box of the motor allows the user to precisely check the number of operating hours.

The accessories which are available have been adapted specifically to the areas of application for this pump and allow the EcoDry L to be adapted in the best possible way to the requirements of the specific application.

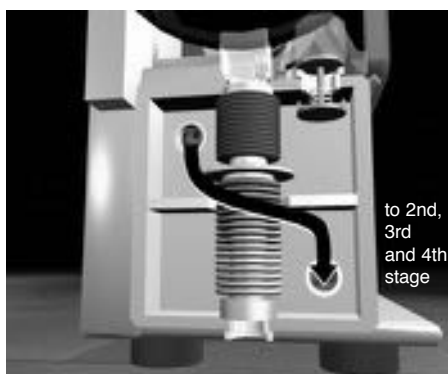
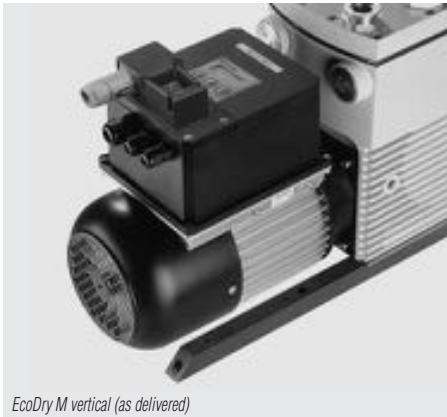


Fig. 4 Bypass valve, < 200 mbar (< 150 Torr) intake pressure

EcoDry M - Extension of the Product Range of Piston Vacuum Pumps



EcoDry M vertical (as delivered)



EcoDry M horizontal

Like the well-proven EcoDry L, the EcoDry M incorporates a dry sliding mechanism without the need for oil or hydrocarbons.

Through the further development and optimisation of the compression cycle, the EcoDry M 15/30 attains through its three compression stages a base pressure (total) in the lower part of the 10^{-2} mbar range.

Since the EcoDry M 15/20/30 may be operated either vertically (as normally delivered) or horizontally, this pump is highly flexible when it has to be integrated into the customer's system.

C03

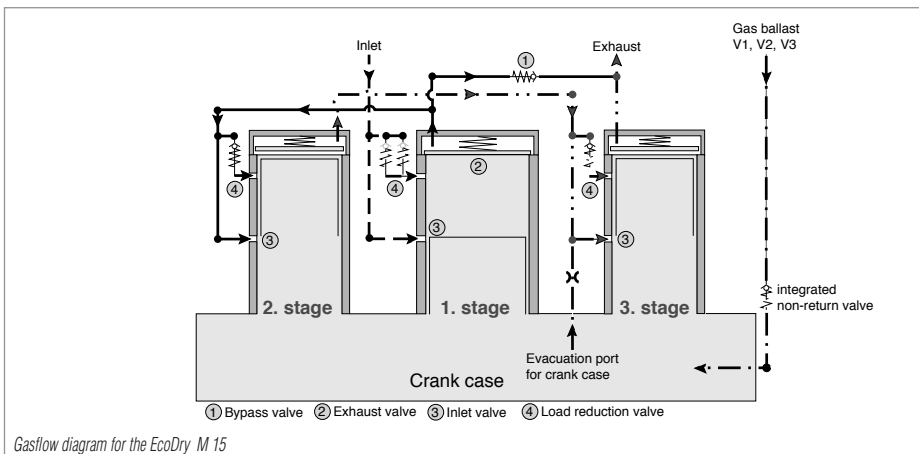
In contrast to the EcoDry L, the EcoDry M 15/20/30 is equipped, besides the well-proven inlet slits, also with pressure controlled inlet valves. These cut the power requirement during the intake phase of the individual compression stages.

This results in a lower overall power requirement of the pump, thereby making operation of the pump more cost-effective.

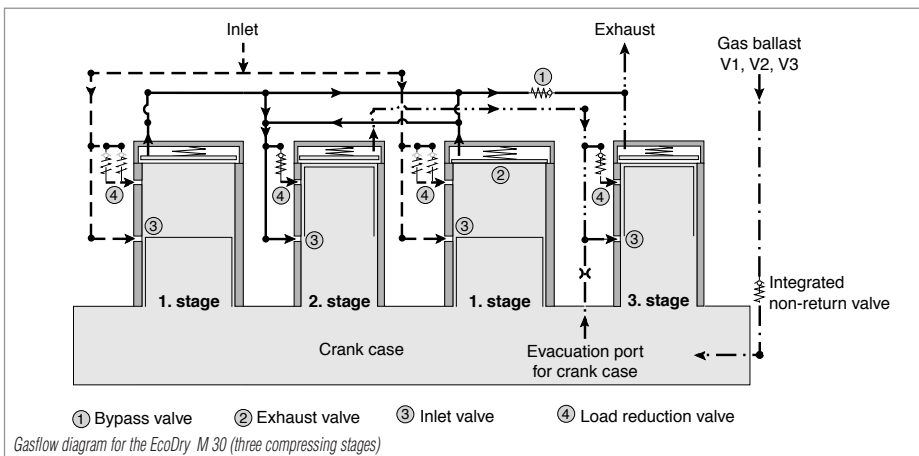
The EcoDry M 15/20/30 does not require any external cooling media like cooling water for example.

The EcoDry M 15/20/30 is offered with different motor versions allowing operation of the pump off almost any mains voltage and frequency in the world (see technical data)

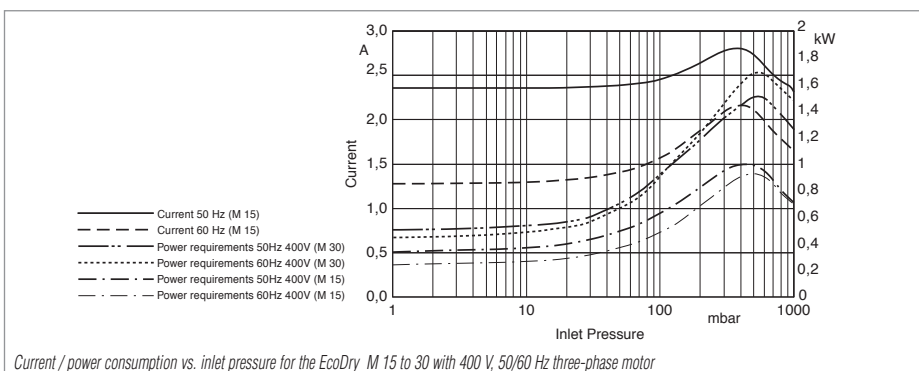
Also new is the universal frequency controlled motor which may be operated off all single phase mains world-wide (90 to 264 V, 50/60 Hz).



Gasflow diagram for the EcoDry M 15



Gasflow diagram for the EcoDry M 30 (three compressing stages)



Current / power consumption vs. inlet pressure for the EcoDry M 15 to 30 with 400 V, 50/60 Hz three-phase motor

Dry Compressing Piston Vacuum Pump



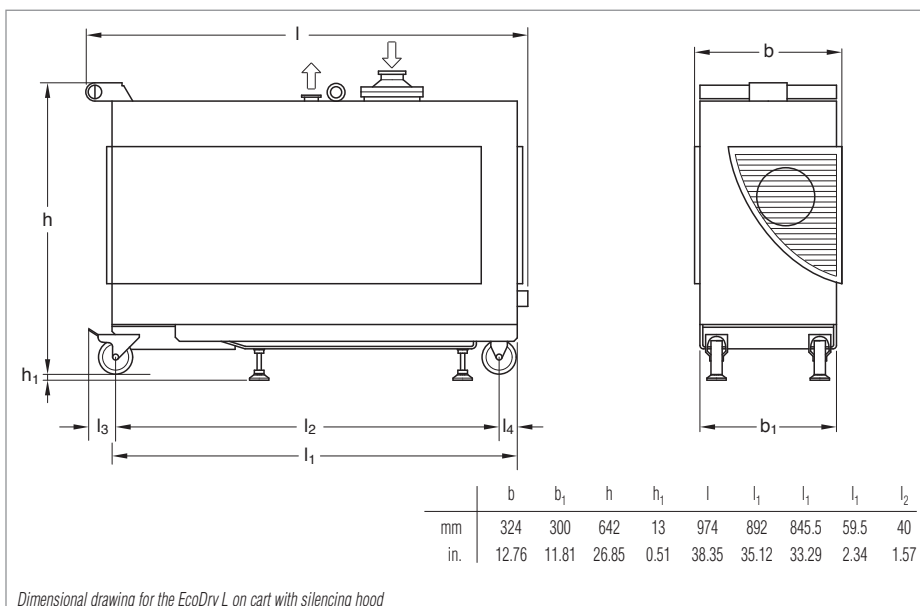
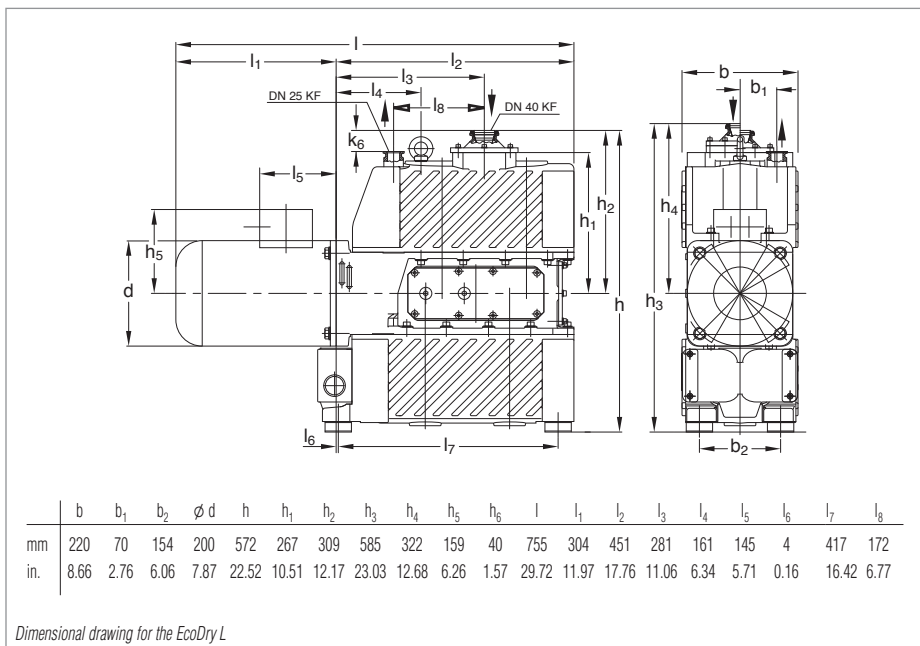
Our positive displacement pump EcoDry L is really very simple: No blower, no water cooling, no grease-lubricated bearings in the vacuum, and of course *no* oil.

In fact, the design principle of the EcoDry L is so simple that the unit can operate for approximately two years with no maintenance (depending on the application).

For proper use of the EcoDry L please contact our sales department.

Maintenance is simple and can be done worldwide by Leybold Service.

The EcoDry L is available as a complete system with silencing hood and fitted on to a cart. This helps to cut the already low noise level to an even much lower level (see ordering information).

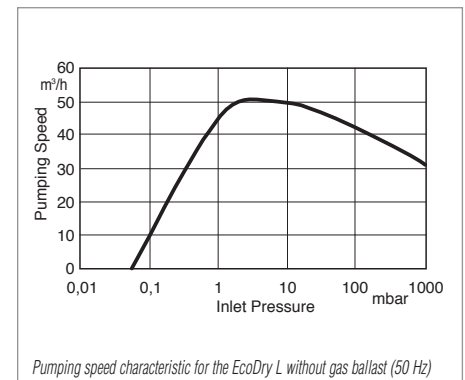
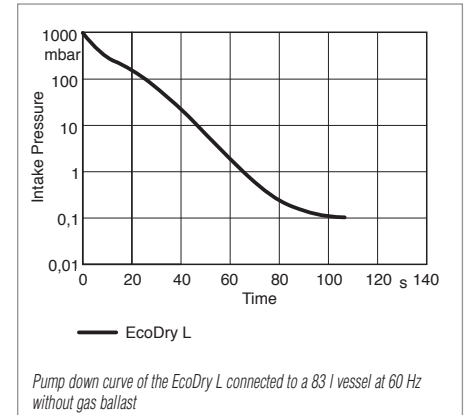


Advantages to the User

- ◆ Maintenance-poor, free of oil and bearing lubrication, free of hydrocarbons
- ◆ Low level of particle emissions
- ◆ Long service life and most reliable
- ◆ Low power consumption
- ◆ Low operating costs (no waste disposal costs for oil etc.)
- ◆ Service friendly
- ◆ No additional blower and water cooling system is required
- ◆ Plug & play
- ◆ High pumping speed at low pressure
- ◆ No grease-lubricated bearing in the vacuum section
- ◆ Totally dry compression chamber
- ◆ Leak tight
- ◆ Runs at 1100 rpm (60 Hz mains)
- ◆ Integrated operating hours counter in the motor junction box
- ◆ Full cross section valves
- ◆ Gas ballast (optional)
- ◆ High water vapor tolerance with gas ballast (optional)
- ◆ For both horizontal and vertical operation ¹⁾

Typical Applications

- ◆ Applications in physics
- ◆ Loadlock chambers
- ◆ Transfer chambers
- ◆ Mass spectrometers
- ◆ Electron microscopes
- ◆ Lighting
- ◆ Thinfilm coaters
- ◆ Forevacuum pump for dry high-vacuum systems
- ◆ Pumping of oxygen concentrations over 21 percent by volume upon request



¹⁾ When planning to operate the EcoDry L horizontally please contact LEYBOLD sales first.

The versions equipped with a silencing hood can only be operated vertically!

Technical Data		EcoDry L
Max. pumping speed		
50 Hz	m ³ x h ⁻¹ (cfm)	38 (22)
60 Hz	m ³ x h ⁻¹ (cfm)	48 (28)
Ultimate total pressure		
50 Hz, without gas ballast ¹⁾	mbar (Torr)	6 x 10 ⁻² (3 x 10 ⁻²)
Max. permissible inlet pressure	mbar (Torr)	1000 (750)
Max. permissible permanent inlet pressure	mbar (Torr)	
1.5 kW (2.0 hp) motor	mbar (Torr)	≤ 30 (22.5)
2.2 kW (3.0 hp) motor	mbar (Torr)	1000 (750)
Water vapor tolerance, max. ²⁾	mbar (Torr)	30 (22.5)
Main voltage		3 P - AC 190 - 210 V, 50 Hz 3 P - AC 190 - 250 V, 60 Hz 3 P - AC 380 - 420 V, 50 Hz 3 P - AC 380 - 500 V, 60 Hz
Motor power requirements ³⁾	W (hp)	≤ 500 (≤ 0.7) at ultimate pressure
Motor rating, max. ³⁾	W (hp)	1500 (2.0)
Max. ambient temperature	°C (°F)	≤ + 50 (≤ + 122)
Speed		
50 Hz	min ⁻¹	approx. 900
60 Hz	min ⁻¹	approx. 1100
Type of protection	IP	54
Weight, approx.	kg (lbs)	95 (209.5)
with silencing hood		
Part No. 130 106, approx.	kg (lbs)	140 (309)
Part No. 130 105, approx.	kg (lbs)	145 (320)
Noise level (60 Hz operation) ⁴⁾	dB(A)	64
Versions with silencing hood (60 Hz operation) ⁴⁾	dB(A)	≤ 58
Connections		
Inlet port fitting	DN	40 KF
Exhaust port fitting	DN	25 KF

Ordering Information ⁵⁾	EcoDry L
EcoDry L with 1.5 kW (2.0 hp) ⁷⁾	Part No. 139 50
EcoDry L with 1.5 kW (2.0 hp) motor and gasballast ⁷⁾	Part No. 123 15
EcoDry L (1.5 kW motor) with silencing hood (fitted to cart, fan 230 V) ⁶⁾	Part No. 130 106
EcoDry L with 2.2 kW (3.0 hp) motor ⁷⁾	Part No. 123 00
EcoDry L (2.2 kW motor) with silencing hood (fitted to cart, fan 230 V) ⁶⁾	Upon request
Cart	Part No. 139 52
Roots pump adapter	Part No. 139 55
Gas ballast valve	
manually operated	Part No. 123 05
solenoid	Part No. 169 50

- 1) By delivery
- 2) Version with gas ballast (position III)
- 3) Version with 1.5 kW (2.0 hp) motor
- 4) Operating at ultimate pressure
- 5) Other EcoDry L versions upon request
- 6) Other EcoDry L versions with silencing hood upon request
- 7) Higher pumped off volumes > 100 l (3.5 ft³) < 1 m³ are possible with optional 2.2 kW (3.0 hp) motors

Notes

C03

EcoDry M - Modular Line of Dry Compressing Piston Vacuum Pumps



EcoDry M line

Like the well-proven EcoDry L, the EcoDry M incorporates a dry sliding mechanism, and thus neither oil nor lubricants containing hydrocarbons.

Through the further development and optimization of the compression cycle, the EcoDry M 15/30 attains through its three compression stages a base pressure (total) in the lower part of the 10^{-2} mbar (0.75×10^{-2} Torr) range.

The modular design of the EcoDry M allows us to offer besides the EcoDry M 15 (S_{eff} about $15 \text{ m}^3/\text{h}$ (8.8 cfm)), also the EcoDry M 20 (S_{eff} about $20 \text{ m}^3/\text{h}$ (11.8 cfm)) and the EcoDry M 30 ($S_{\text{eff}} \approx 30 \text{ m}^3/\text{h}$ (17.8 cfm)).

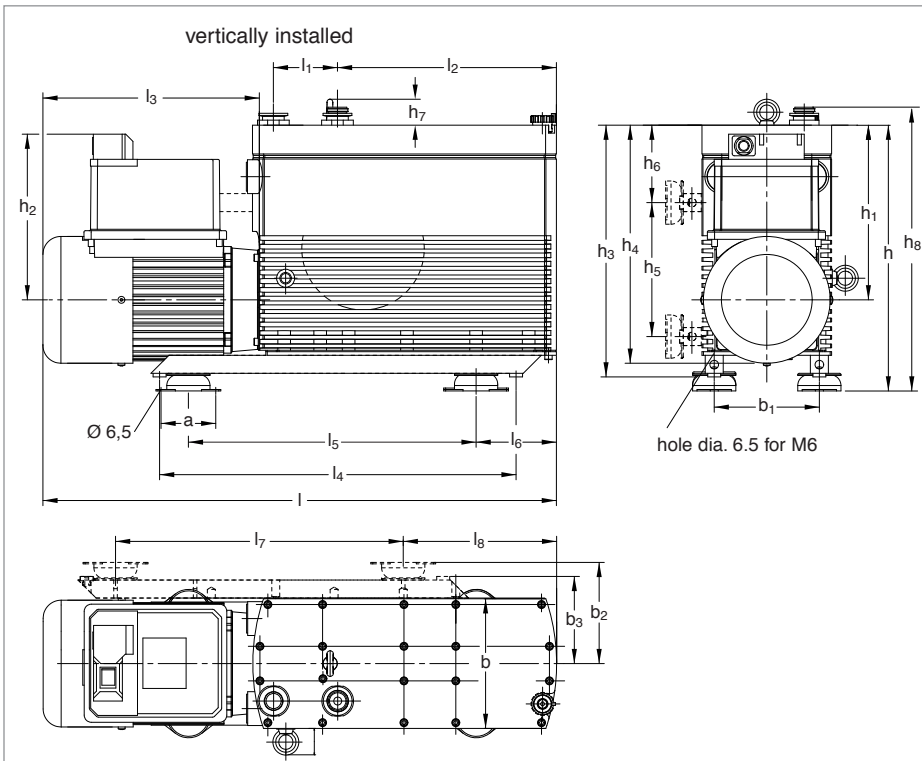
These pumps basically differ by the way in which the third stage of the pump is arranged.

In the EcoDry M 15 the three compression stages are connected in series.

In the EcoDry M 20 the 1st and 2nd stage are connected in parallel and the 3rd stage in series.

In the M 30 all stages operate like those of the M 15 in 3 compressing stages whereby the 2nd and the 4th stage form the single compressing stage (1st stage).

This results in the higher pumping speed of about $20 \text{ m}^3/\text{h}$ (11.8 cfm) and a base pressure (total) in the middle of the 10^{-1} mbar range for the EcoDry M 20.



Type	a	b	b ₁	b ₂	b ₃	h	h ₁	h ₂	h ₃	h ₄	h ₅	h ₆	h ₇	h ₈	l	l ₁	l ₂	l ₃	l ₄	l ₅	l ₆	l ₇	l ₈	
M 15/20 FC-Motor	mm	76	180	146	138	121	352.5	228	230	335	316	186	93	37.5	373.5	598	89	191	300.5	495	289	105.5	289	101
	in.	2.99	7.09	5.75	5.43	4.76	13.88	8.98	9.06	13.19	12.44	7.32	3.66	1.48	14.7	23.54	3.5	7.52	11.83	19.49	11.28	4.15	11.28	3.98
M 30 FC-Motor	mm	76	180	146	140.5	121	369	242.5	230	349.5	330.5	186	107.5	36	390	713	89	304	300.5	495	399.5	111.5	399.5	213
	in.	2.99	7.09	5.75	5.53	4.76	14.53	9.55	9.06	13.76	13.01	7.32	4.23	1.42	15.35	28.07	3.5	11.97	11.83	19.49	15.73	4.39	15.73	8.39
M 15/20 DS-Motor	mm	76	180	146	138	121	352.5	228	148	335	316	186	93	37.5	373.5	594	89	191	269.5	495	289	105.5	289	101
	in.	2.99	7.09	5.75	5.43	4.76	13.88	8.98	5.83	13.19	12.44	7.32	3.66	1.48	14.7	23.39	3.5	7.52	10.61	19.49	11.28	4.15	11.28	3.98
M 30 DS-Motor	mm	76	180	146	140.5	121	369	242.5	148	344.5	330.5	186	107.5	36	390	709	89	304	269.5	495	399.5	111.5	399.5	213
	in.	2.99	7.09	5.75	5.53	4.76	14.53	9.55	5.83	13.56	13.01	7.32	4.23	1.42	15.35	27.91	3.5	11.97	10.61	19.49	15.73	4.39	15.73	8.39
M 15/20 WS-Motor	mm	76	180	146	138	121	352.5	228	150	335	316	186	93	37.5	388	598	89	191	300.5	495	289	105.5	289	101
	in.	2.99	7.09	5.75	5.43	4.76	13.88	8.98	5.91	13.19	12.44	7.32	3.66	1.48	12.28	23.54	3.5	7.52	11.83	19.49	11.28	4.15	11.28	3.98
M 30 WS-Motor	mm	76	180	146	140.5	121	369	242.5	150	349.5	330.5	186	107.5	36	390	723	89	304	300.5	495	399.5	111.5	399.5	213
	in.	2.99	7.09	5.75	5.53	4.76	14.53	9.55	5.91	13.76	13.01	7.32	4.23	1.42	15.35	28.46	3.5	11.97	11.83	19.49	15.73	4.39	15.73	8.39

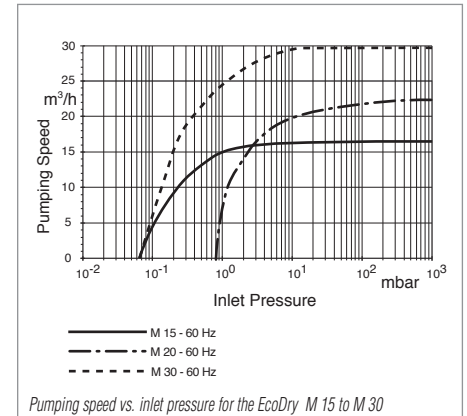
Dimensional drawing for the EcoDry M 15/20 and M 30 with FC motor; DS and WS motor similaire (dimensions listed are with standard feet)

Avantages to the User

- ◆ Maintenance-poor, free of oil and bearing lubrication, free of hydrocarbons
- ◆ Extremely low particle emissions on the intake and exhaust sides
- ◆ Rugged and most reliable
- ◆ Low power consumption
- ◆ Service friendly
- ◆ Air cooling
- ◆ Plug & play
- ◆ Good pumping speed characteristic at low base pressure
- ◆ High water vapour tolerance (gas ballast standard)
- ◆ No grease lubricated bearings in the vacuum section
- ◆ Leak tight
- ◆ Compact size
- ◆ Runs at 750 rpm (60 Hz mains)
- ◆ Rugged full cross section exhaust valves
- ◆ For both horizontal and vertical operation

Typical Applications

- ◆ Applications in physics
- ◆ Loadlock chambers
- ◆ Transfer chambers
- ◆ Mass spectrometers
- ◆ Electron microscopes
- ◆ Lighting
- ◆ Thinfilm coaters
- ◆ Freeze drying
- ◆ Forevacuum pump for dry high-vacuum systems
- ◆ Pumping of oxygen concentrations over 21 percent by volume upon request



Smart Drive Technology for a Tailor-made Vacuum



EcoDry M with FC motor

To increase the performance of the EcoDry M piston vacuum pumps, the use of a frequency converter integrated within the motor is recommended.

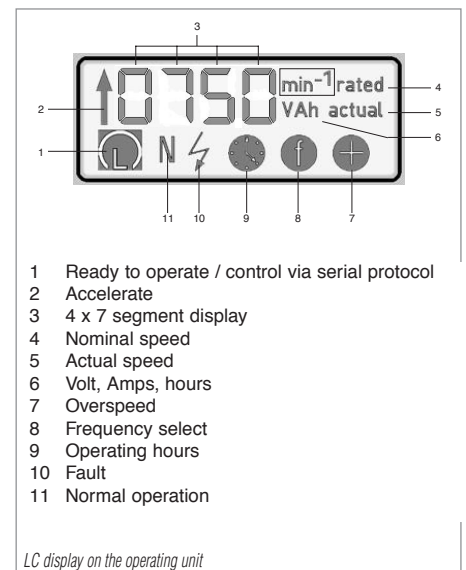
LEYBOLD VACUUM is now offering this universal feature for the entire EcoDry M line (EcoDry M 15, M 20 and M30).

Avantages to the User

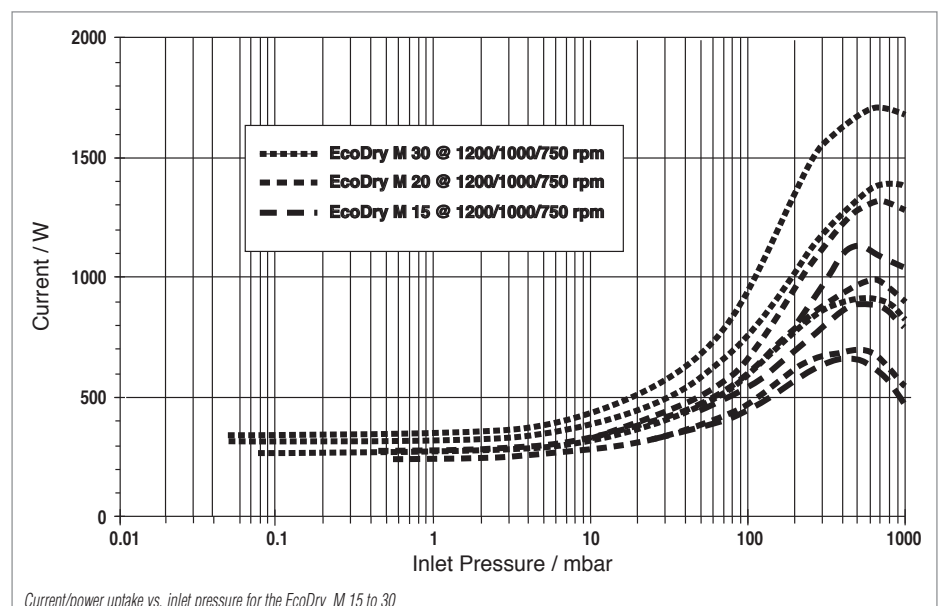
- ◆ Universal – can be run off all AC mains world-wide (50 and 60 Hz)
- ◆ Cost-effective to purchase and operate
- ◆ Increased pumping speed by up to 18% compared to standard 50 Hz AC mains powered versions
- ◆ Menu controlled two key operation for selecting the required speed range of 750, 1000 or 1200 rpm
- ◆ Infinitely variable speed control from 750 to 1200 rpm via analog interface
- ◆ Process and application control is possible by connecting vacuum gauges with an analog output (0-10 V); THERMOVAC TM 21, for example
- ◆ “Economy” operation (load optimised operation) can be set up in a well-defined manner to reduce power consumption, vibration and noise levels.
- ◆ Conserving, low-wear operation through well-defined speed control
- ◆ LC display for indicating operational information like speed, operating hours, status
- ◆ CE and NRTL compliant

Technical Data

- ◆ Mains supply voltage range 90 to 264 V (13 A – 7 A) at 50/60 Hz
- ◆ Motor speed manually adjustable in three steps to 750, 1000 and 1200 rpm
- ◆ RS 485 C and analog interface (0-10 V)



LC display on the operating unit



Current/power uptake vs. inlet pressure for the EcoDry M 15 to 30

Technical Data			EcoDry M 15		EcoDry M 20		EcoDry M 30	
			3-phase motor	FC motor ¹⁾	3-phase motor	FC motor	3-phase motor	FC motor
No. of cylinders			3		3		4	
No. of stages			3		2		3	
Max. pumping speed								
	50 Hz ¹⁾	m ³ x h ⁻¹ (cfm)	14 (8.2)	–	19 (11.2)	–	27 (15.9)	–
	60 Hz ¹⁾	m ³ x h ⁻¹ (cfm)	16 (9.4)	–	22 (12.9)	–	30 (17.7)	–
at 750 min ⁻¹	50/60 Hz ¹⁾	m ³ x h ⁻¹ (cfm)	–	11 (6.5)	–	14 (8.2)	–	19 (11.2)
at 1000 min ⁻¹	50/60 Hz ¹⁾	m ³ x h ⁻¹ (cfm)	–	15 (8.8)	–	18 (10.5)	–	25 (14.7)
at 1200 min ⁻¹	50/60 Hz ¹⁾	m ³ x h ⁻¹ (cfm)	–	16 (9.4)	–	22 (12.9)	–	30 (17.7)
Ultimate pressure (absolute) ²⁾								
3-phase motor 60 Hz			5.5 x 10 ⁻² (4.1 x 10 ⁻²)		8 x 10 ⁻¹ (6 x 10 ⁻¹)		5.5 x 10 ⁻² (4.1 x 10 ⁻²)	
FC motor ¹⁾ at 1000 min ⁻¹ 50/60 Hz			–		–		–	
			5.5 x 10 ⁻² (4.1 x 10 ⁻²)		8 x 10 ⁻¹ (6 x 10 ⁻¹)		5.5 x 10 ⁻² (4.1 x 10 ⁻²)	
Max. permissible inlet pressure			Atmosphere		Atmosphere		Atmosphere	
Max. permissible permanent inlet pressure			100 (75)		100 (75)		100 (75)	
Water vapor tolerance (with gas ballast)			25 (18.8)		25 (18.8)		25 (18.8)	
Leak rate (integral)								
mbar x l x s ⁻¹ (atm x cc x sec (within 2%))			≤ 1 x 10 ⁻⁴		≤ 1 x 10 ⁻⁴		≤ 1 x 10 ⁻⁴	
Power consumption								
at < 10 mbar (7.5 Torr) inlet pressure			W (hp)		W (hp)		W (hp)	
			300 (0.41) 280 (0.38)		300 (0.41) 280 (0.38)		450 (0.6) 330 (0.45)	
Motors			- 10 % to + 5 %		- 10 % to + 5 %		- 10 % to + 5 %	
3-phase, 50 Hz (IP 54)			220-240/346-415		220-240/346-415		220-240/346-415	
3-phase, 60 Hz (IP 54)			200-277/380-480		200-277/380-480		200-277/380-480	
FC motor, 50/60 Hz (IP 44)			–		–		–	
			90-264		90-264		90-264	
Rotational speed								
with 3-phase motor 50 / 60 Hz			min ⁻¹		min ⁻¹		min ⁻¹	
			1000 / 1200		1000 / 1200		1000 / 1200	
with FC motor 50 / 60 Hz			min ⁻¹		min ⁻¹		min ⁻¹	
			–		–		–	
via analog interface 0-10 V, 50/60 Hz			min ⁻¹		min ⁻¹		min ⁻¹	
			–		–		–	
			750/1000/1200		750/1000/1200		750/1000/1200	
			750-1200, variable		750-1200, variable		750-1200, variable	
Noise level at ultimate pressure without gas ballast (50 Hz at 3-phase and 750 min ⁻¹ with FC motor)			dB(A)		dB(A)		dB(A)	
			≤ 59		≤ 59		≤ 59	
Ambient temperature			°C (°F)		°C (°F)		°C (°F)	
			0 to + 50 (32 to + 122)		0 to + 50 (32 to + 122)		0 to + 50 (32 to + 122)	
Connections								
Inlet port fitting			DN		DN		DN	
			25 KF		25 KF		25 KF	
Exhaust port fitting			DN		DN		DN	
			25 KF		25 KF		25 KF	
Dimensions, approx. (L x W x H) standard, flanges at motor side								
standing			mm		mm		mm	
			545 x 182 x 356		545 x 182 x 356		709 x 182 x 369	
			(21.5 x 7.17 x 14.0)		(21.5 x 7.17 x 14.0)		(27.9 x 7.17 x 14.5)	
lying			mm		mm		mm	
			545 x 356 x 211		545 x 356 x 211		709 x 369 x 211	
			(21.5 x 14.0 x 8.3)		(21.5 x 14.0 x 8.3)		(27.9 x 14.5 x 8.3)	
Weight, approx.			kg (lbs)		kg (lbs)		kg (lbs)	
			40.5 (89.4) 47 (103.8)		40.5 (89.4) 47 (103.8)		53 (117) 59 (130.2)	

Ordering Information		EcoDry M 15		EcoDry M 20		EcoDry M 30	
		EcoDry M					
3-phase DC motor		Part No. 130 000		Part No. 130 010		Part No. 130 030	
1-phase AC motor		–		–		–	
115 V, 50/60 Hz (USA)		Part No. 130 001		Part No. 130 011		Part No. 130 031	
230 V, 50/60 Hz (EURO)		Part No. 130 002		Part No. 130 012		Part No. 130 032	
FC motor, 90 - 264 V		–		–		–	
FC motor, 90 - 264 V and silencing hood		Part No. 130 005		Part No. 130 015		Part No. 130 033	
		Part No. 130 006		–		Part No. 130 034	
Exhaust silencer		Part No. 130 050		Part No. 130 050		Part No. 130 050	
Vibration absorber (set of 4 pieces)		Part No. 130 051		Part No. 130 051		Part No. 130 051	
Vibration absorbing kit		Part No. 130 052		Part No. 130 052		Part No. 130 052	
Solenoid gas ballast valve		Part No. 169 50		Part No. 169 50		Part No. 169 50	
Universal silencing hood		Part No. 130 056		Part No. 130 056		Part No. 130 056	
Cable set for universal silencing hood							
for FC motor		Part No. 130 057		Part No. 130 057		Part No. 130 057	
for 3-phase DC motor		Part No. 130 058		Part No. 130 058		Part No. 130 058	
for 1-phase AC motor		Part No. 130 059		Part No. 130 059		Part No. 130 059	

¹⁾ According to DIN 28400 and subsequent numbers

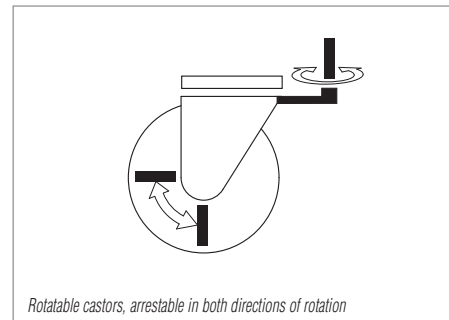
²⁾ By delivery

^{*)} FC motor = Frequency Controlled Motor

Cart



EcoDry L on the cart



Rotatable castors, arrestable in both directions of rotation

	b	b ₁	b ₂	b ₃	∅ d	∅ d ₁	∅ d ₂	h
mm	300	70	154	226	200	61	180	572
in.	11.81	2.76	6.06	8.90	7.87	2.40	7.09	22.52
	h ₁	h ₂	h ₃	h ₄	h ₅	h ₆	h ₇	l
mm	267	309	263	40	159	13	60	755
in.	10.51	12.17	10.35	1.57	6.26	0.5	10.35	29.72
	l ₁	l ₂	l ₃	l ₄	l ₅	l ₆	l ₇	l ₈
mm	304	451	261	161	145	4	417	450
in.	11.97	17.76	10.28	6.34	5.71	0.16	16.42	17.72
	l ₉	l ₁₀	l ₁₁	l ₁₂	l ₁₃	l ₁₄	l ₁₅	
mm	815	892	95	78.5	40	172	299	
in.	32.09	35.12	3.74	3.09	1.57	6.77	11.77	

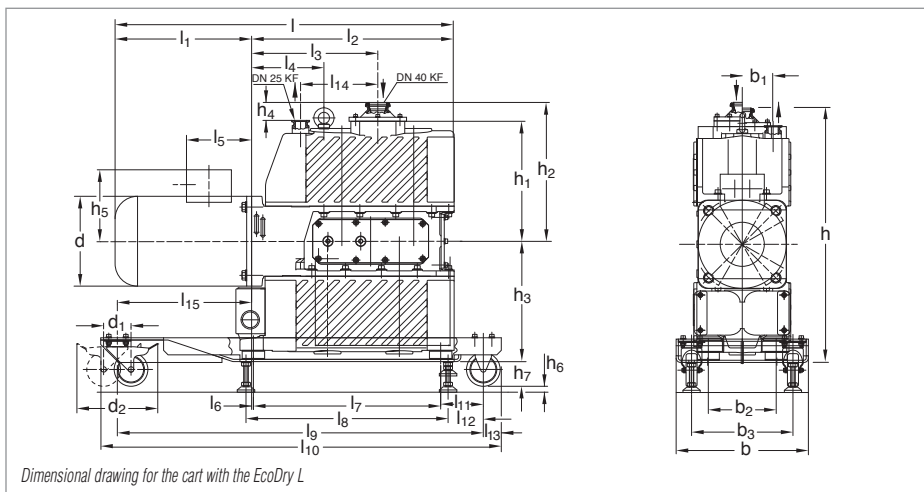
Avantages to the User

- ◆ Makes the EcoDry L easy to move
- ◆ Compact
- ◆ Rugged and safe design
- ◆ 2 rotatable and two fixed castors (the rotatable castors are arrestable)
- ◆ Feet for secure positioning
- ◆ Can be retrofitted to any EcoDry L
- ◆ Silencing hood may be retrofitted

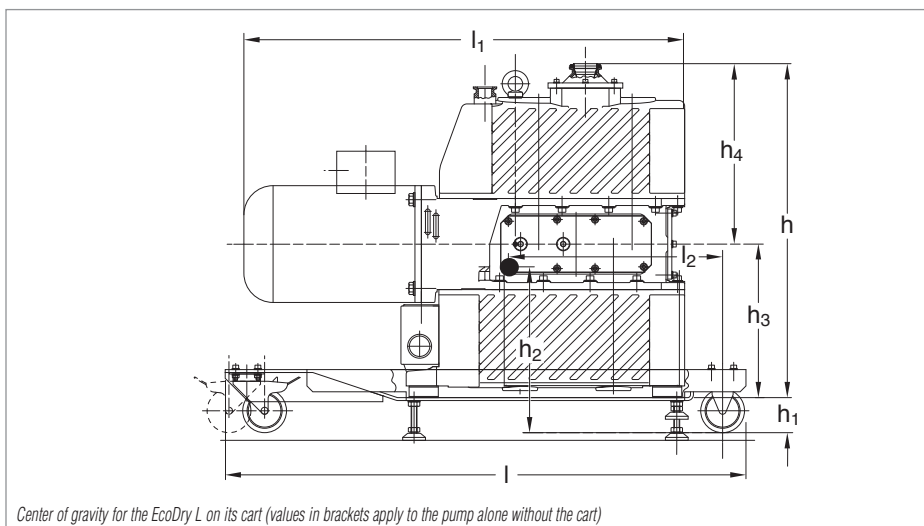
Technical Note

This cart has been designed to accept any EcoDry L alone and it has not been designed as a platform for an EcoDry L with a Roots pump. Only the vertical version of the EcoDry L (as shown) may be placed on the cart.

	h	h ₁	h ₂	h ₃	h ₄	l	l ₁	l ₂
mm	572	60	283	263	309	892	755	368
in.	22.52	2.36	11.14	10.35	12.17	35.12	29.72	14.49



Dimensional drawing for the cart with the EcoDry L



Center of gravity for the EcoDry L on its cart (values in brackets apply to the pump alone without the cart)

Technical Data		Cart
Dimensions (W x H x D)	mm (in.)	892 x 108 x 300 (35.12 x 4.25 x 11.81)
Weight, approx.	kg (lbs)	15.5 (34.2)
Ordering Information		Cart
Cart		Part No. 139 52

Roots Pump Adapter



The Roots pump adapter permits direct installation of a RUVAC WS/WSU 251 Roots pump to an EcoDry L.

Advantages to the User

- ◆ Short link to the Roots pump
- ◆ Wider feet for secure positioning
- ◆ Measurement flange may be screwed-in directly

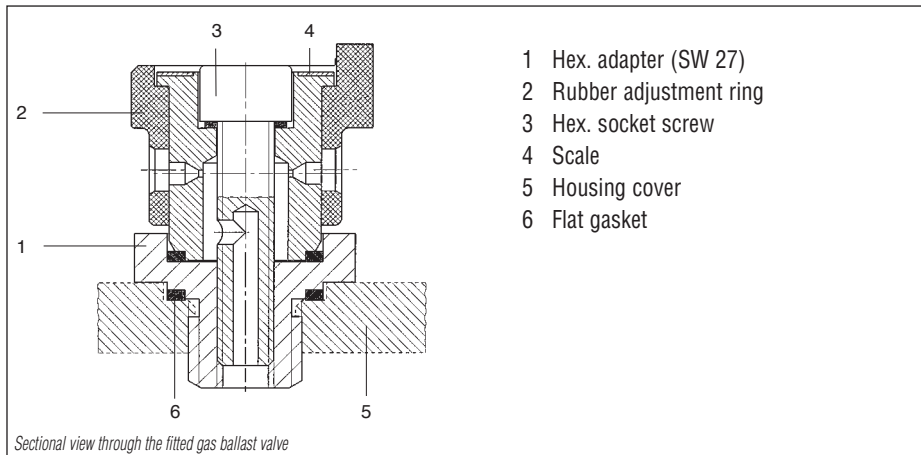
Technical Note

Please contact our sales department when planning to operate the EcoDry L in connection with a Roots pump.

The Roots pump can not be placed on a cart.

Technical Data		Roots Pump Adapter
Weight, approx.	kg (lbs)	4.4 (9.7)
Ordering Information		Roots Pump Adapter
Roots pump adapter consisting of adapter, O-ring, feet and bolts		Part No. 139 55
DN 10/16 KF / M 16 x 1.5 measurement flange		Part No. 168 40

Gas Ballast Valve, manually operated (Retrofit Kit)



- 1 Hex. adapter (SW 27)
- 2 Rubber adjustment ring
- 3 Hex. socket screw
- 4 Scale
- 5 Housing cover
- 6 Flat gasket

The manually operated gas ballast valve is used to operate the EcoDry L pump in connection with condensable media, like water vapor, for example.

This valve has three different positions which ensure that the gas ballast flow can be adapted to suit the particular application.

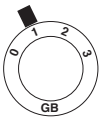
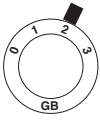
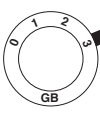
By using the retro-fit kit, the range of applications covered by a standard EcoDry L (without gas ballast) is extended to applications involving water vapor.

Advantages to the User

- ◆ Easy retrofitting
- ◆ Simple to use
- ◆ Water vapor tolerance down to 30 mbar (22.5 Torr) guaranteed

Technical Data		Gas Ballast Valve, manually operated
Dimensions (dia. x h)	mm (in.)	45 x 45 (1.77 x 1.77)
Ordering Information		Gas Ballast Valve, manually operated
Gas ballast valve, manually operated		Part No. 123 05

Gas Ballast Quantities

Position on the gas ballast valve	Pumped quantity in m ³ x h ⁻¹ (cfm)	≅	Water vapor in kg x h ⁻¹
	0.37 (0.22)		0.025
	1.0 (0.59)		0.09
	2.25 (1.32)		1.0 = 30 mbar (22.5 Torr) water vapor tolerance

Exhaust Silencer



Exhaust silencer

The noise level of the EcoDry M is similar to that of oil-sealed rotary vane vacuum pumps and is setting new standards for dry-compressing vacuum pumps. If no exhaust line is required, this simple exhaust silencer may be fitted when pumping only inert or permanent gases. The silencer is fitted simply by exchanging the exhaust port on the pump against the exhaust silencer.

C03

Technical Data		Exhaust Silencer
Dimensions (dia. x h)	mm (in.)	48 x 122 (1.89 x 4.80)
Ordering Information		Exhaust Silencer
Exhaust silencer		Part No. 130 050

Vibration Absorbing Feet



Vibration absorbing foot

Owing to the innovative arrangement of the pistons within the EcoDry M, the vibration levels are basically low. However, for most vibration sensitive applications these vibration absorbing feet are needed to decouple the vibrations from the surface supporting the pump.

Technical Data		Vibration Absorbing Feet
Bore diameter	mm (in.)	6.5 (0.26)
Distance between the bores	mm (in.)	76 (2.99)
Ordering Information		Vibration Absorbing Feet
Vibration absorbing feet, Set of 4		Part No. 130 051

Vibration Absorbing Kit



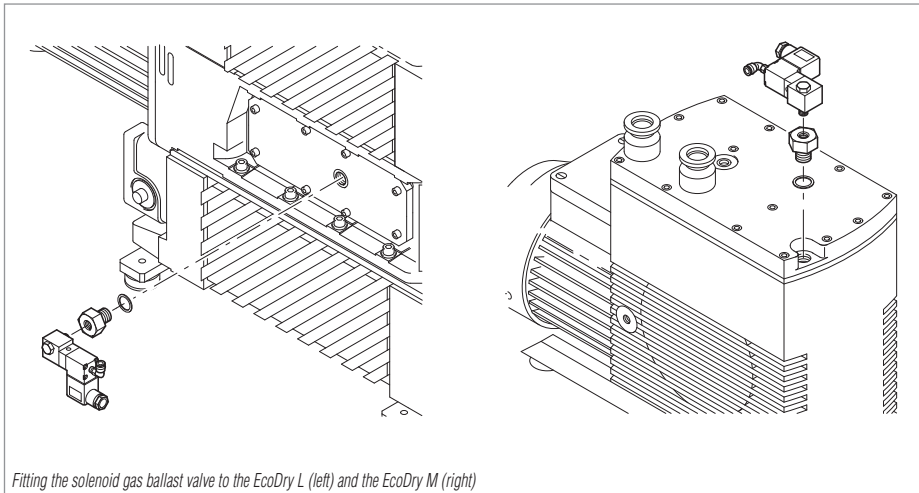
Vibration absorbing kit

This vibration absorbing kit was specifically developed for those applications which are most demanding vibration-wise, like some analytical applications.

The vibration absorbing kit reduces the vibrations transferred to the pump's supporting surface and the intake line to a level significantly below the vibration levels produced by a rotary vane vacuum pump.

Technical Data		Vibration Absorbing Kit
Dimensions (W x H x D)	mm (in.)	440 x 315 x 70 (17.32 x 12.40 x 2.76)
Weight, approx.	kg (lbs)	4.7 (10.38)
Ordering Information		Vibration Absorbing Kit
Vibration absorbing kit		Part No. 130 052

Solenoid Gas Ballast Valve



Fitting the solenoid gas ballast valve to the EcoDry L (left) and the EcoDry M (right)

The solenoid gas ballast valve allows preventive operation with gas ballast when pumping condensable media.

The gas ballast may be operated either with ambient air or an inert gas like nitrogen, for example. A coupling for connecting a PVC hose of 6 mm dia. x 1 is provided.

This valve is of the normally open type and may thus be used as a permanent gas ballast. When wanting to cyclically supply the gas ballast into the pump, a voltage of 24 V DC is required to drive the gas ballast valve.

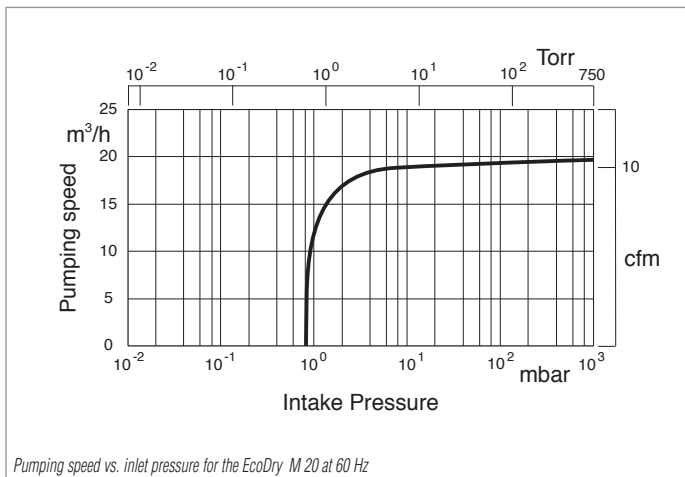
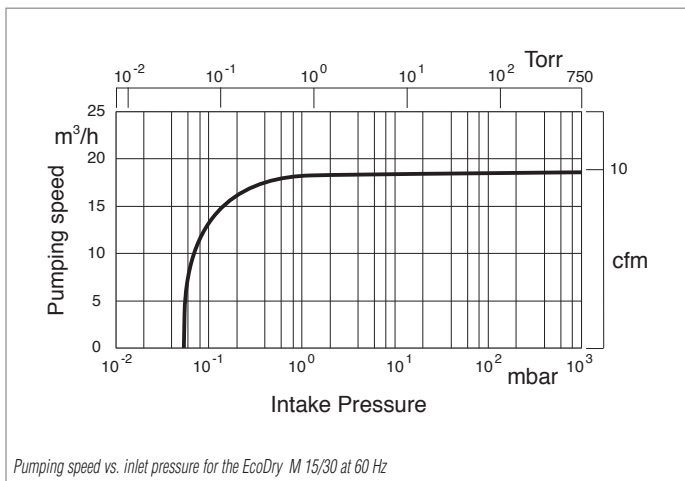
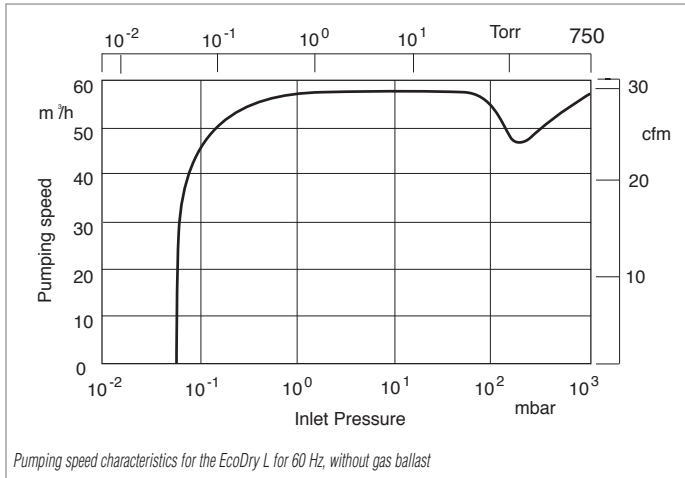
C03

Avantages to the User

- ◆ Protection against condensation within the pump
- ◆ No contamination by the ambient air (when using inert gas)
- ◆ Low consumption of inert gas
- ◆ Can be used on all EcoDry L and M versions

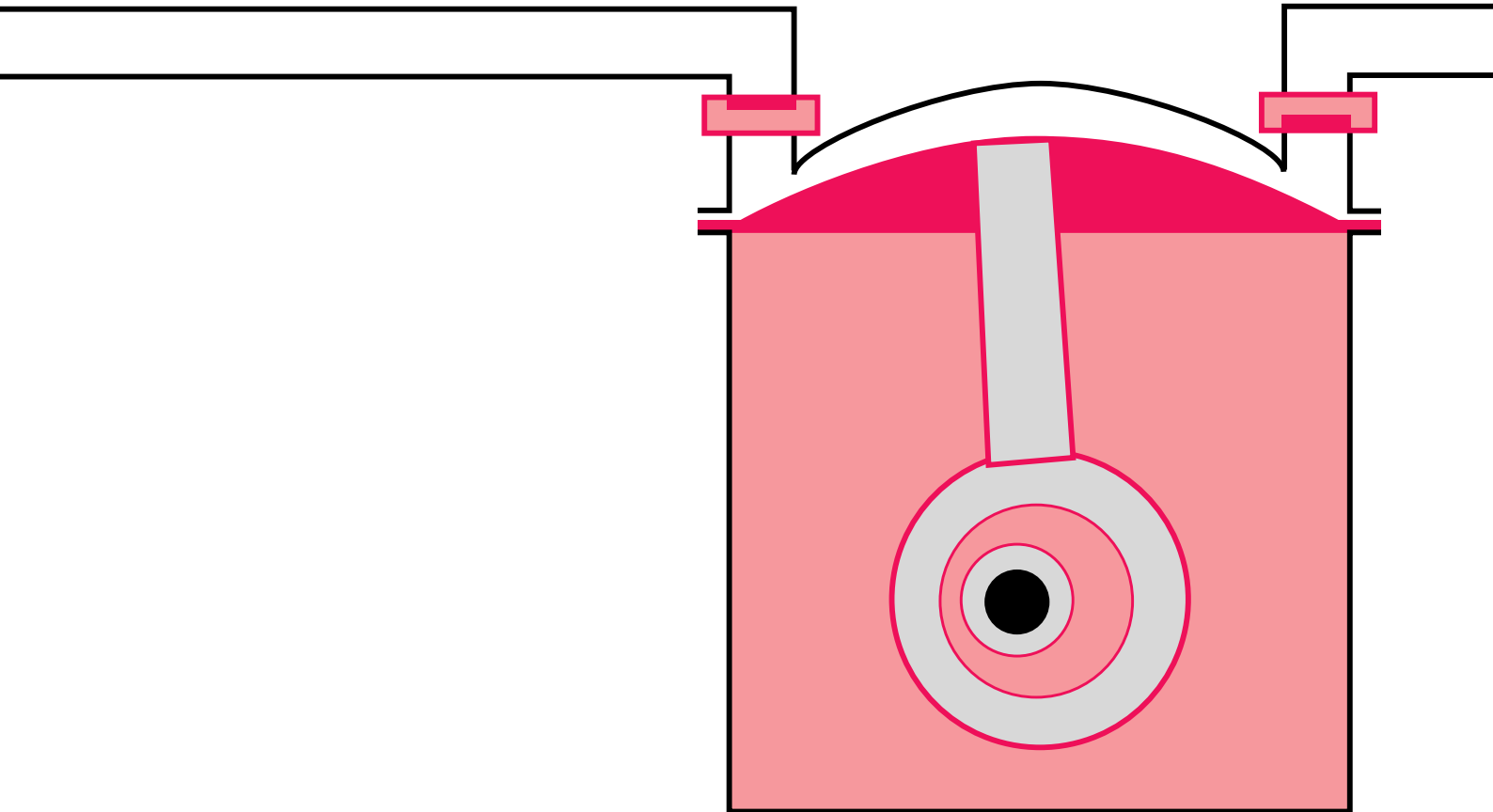
Technical Data		Solenoid Gas Ballast Valve	
		EcoDry L	EcoDry M
Control voltage	V DC	24	
Permissible inert gas pressure, absolute	bar	1 to 4	
Inert gas connection		Hose connection for PVC hose 6 mm dia. x 1 (0.24 in. dia. x 0.04 in.)	
Inert gas flow	m ³ · h ⁻¹ (cfm)	0.15 to 0.7 (0.09 x 0.4)	0.10 to 0.55 (0.06 x 0.32)
Ordering Information		Solenoid Gas Ballast Valve	
Solenoid gas ballast valve		Part No. 169 50	

Version for the North and South American Continents



DIVAC

Diaphragm Vacuum Pumps



General

Survey of the range for the DIVAC	C04.03
The customized diaphragm pump and the accessories recommended for your application in the chemical laboratory.....	C04.04

Products

Diaphragm Vacuum Pumps for the Chemical Laboratory	
Single-Stage Diaphragm Vacuum Pumps DIVAC 0.6, 1.2, 2.2	C04.06
Dual-Stage Diaphragm Vacuum Pumps DIVAC 0.6 L, 1.2 L, 2.2 L	C04.08
Dual-Stage Diaphragm Vacuum Pumps with Automatic Drying System DIVAC 1.2 L AD, 2.2 L AD	C04.10
Modular Laboratory Pump Concept	C04.12
Components for the modular DIVAC System	C04.13
DIVAC SR, SH, SC Sub-assemblies	C04.14
Dry Compressing Backing Pumps for Turbomolecular Pumps	C04.16
DIVAC 0.8 T and 0.8 LT	C04.18
DIVAC 2.5 T and 2.5 VT	C04.20
DIVAC 3.6 TC and 4.8 VT	C04.22

What this Series Offers

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 DIVAC L pump system^{*)} can be implemented in each case.

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).

The newly developed automatic drying system is used in all applications where very moist and wet gases need to be pumped over extended periods of time. Here the pumping speed remains constant and the service life of the pumps is not impaired by the liquid.

^{*)} Comprising the DIVAC diaphragm pump and a DIVAC sub-assembly

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.

The DIVAC TC pumps are capable of handling aggressive and corrosive gases as encountered in research or in connection with sputtering processes. The parts of the pump in contact with the medium are made of PTFE (Teflon), FFPM (Kalrez) and PVDF (Solef), and for this reason the pumps are highly resistant to the media mentioned.

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

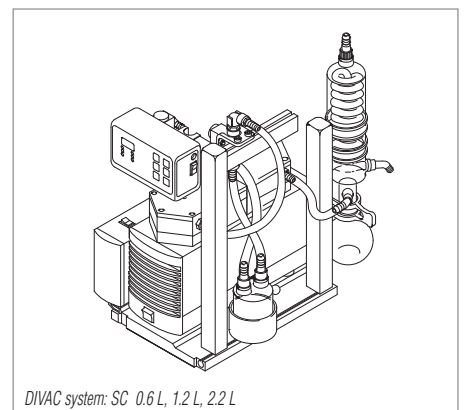
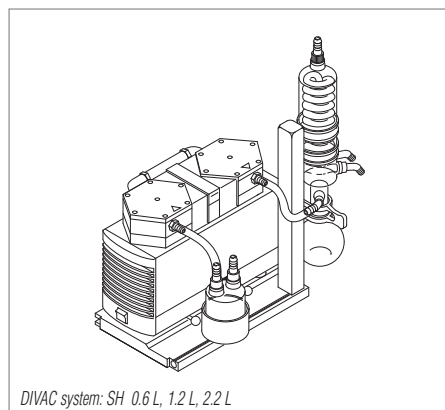
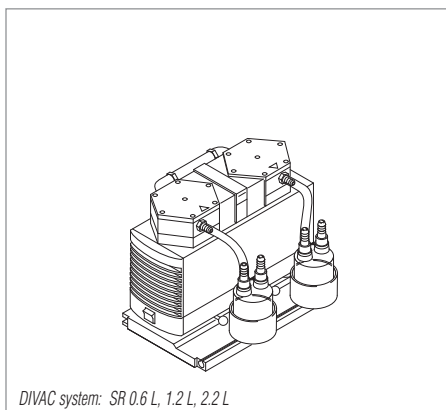
- ◆ Vacuum filtration
- ◆ Vacuum distillation
- ◆ Vacuum drying
- ◆ On rotary evaporators
- ◆ To extract and transfer gases
- ◆ Gel drying
- ◆ Steam sterilization

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 application in the chemical laboratory

Modular diaphragm pump system		Sublimation	Analysis preparation	Filtration	Distillation	Drying in the drying cabinet	Drying cabinets (2 cabinets with one pump)	Rotary evaporator	Steam sterilisation
DIVAC 0.6 L	◆	◆	◆	◆	◆				
DIVAC 1.2 L	◆							◆	
DIVAC 2.2 L						◆	◆		
DIVAC 1.2 L AD	◆			◆	◆			◆	◆
DIVAC 2.2L AD					◆	◆	◆	◆	◆
Base plate	◆	◆	◆	◆	◆	◆	◆	◆	◆
Separator (intake side)		◆	◆	◆	◆	◆	◆	◆	
Separator (exhaust side)	◆		◆		◆	◆	◆	◆	◆
High-performance condenser (including stand and holder)					◆	◆	◆	◆	
Vacuum controller								◆	
Gas ballast unit						◆	◆		
Corresponds to the DIVAC system	-	-	-	SR 0.6 L	SH 0.6 L	SH 2.2 L	SH 2.2 L	SC 1.2 L	-



Advantages to the User

- ◆ Good base vacuum of 8 mbar (100 mbar for single-head DIVAC pumps)
- ◆ All parts of the pump head in contact with the gas are resistant against aggressive media through the use of PTFE (Teflon), FPM (Kalrez) and PVDF (Solef)
- ◆ Dry compressing, oil-free
- ◆ Very high water vapour 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
- ◆ Illuminated mains switch on the pump
- ◆ Overheat protection for the vacuum pump by means of a thermofuse
- ◆ Available in three pumping speed categories
- ◆ Modular system
 - can easily be adapted to special requirements
- ◆ Wide range of accessories like separator, condenser, base plate, vacuum controller

Features of the Modular Designed Laboratory Pumpsystem

- ◆ All system components are combined to form assemblies which can be easily replaced or retrofitted
- ◆ Easy relocation since the entire assembly is mounted as a unit on a stable base plate for easy transportation
- ◆ Individual components with plug connectors for easy removal and mounting
- ◆ Compact design – Small footprint
- ◆ For the SC configuration – with separator, high-performance condenser and controller – all electrical connections are arranged inside the control unit and made by way of plug connectors
- ◆ Trouble-free provisions for mounting additional laboratory equipment in grooved rails, on laboratory stands and crossbars in the assembly
- ◆ Simple replacement of diaphragms and valves

Additional Benefits of the Automatic Drying System

- ◆ High vapour and condensate tolerance through the newly developed automatic drying system
- ◆ Maintaining of maximum pumping speed
- ◆ Longer durability of the structured diaphragm
- ◆ Individual adaptation of the drying cycle to different processes
- ◆ Vacuum chamber is not vented during the drying phase
- ◆ Overnight evacuations are possible through the automatic cycling system

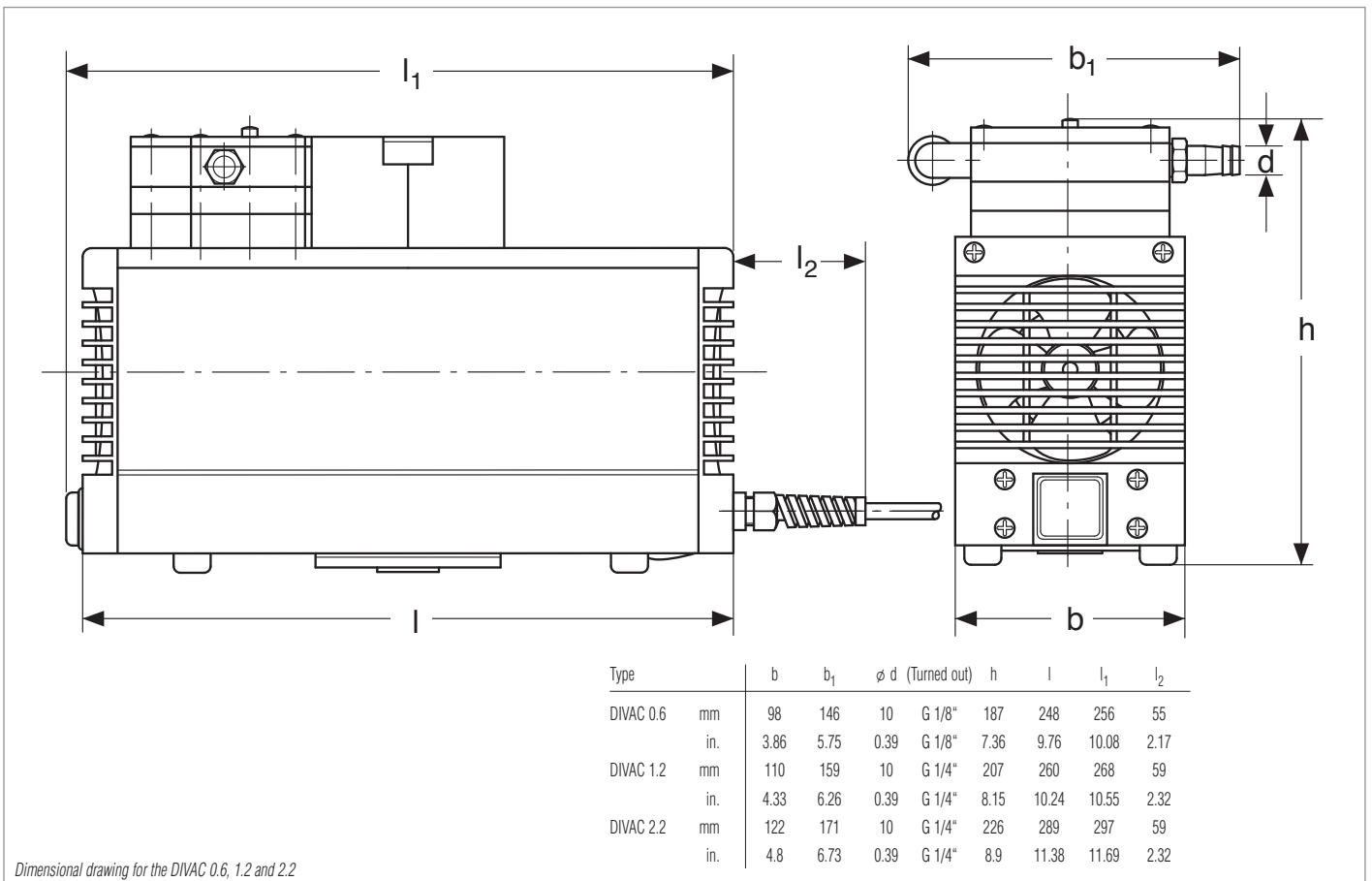
C04

Single-Stage Diaphragm Vacuum Pumps DIVAC 0.6, 1.2, 2.2

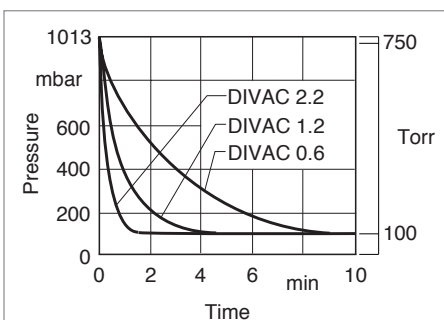
Typical Applications

Vacuum generation for

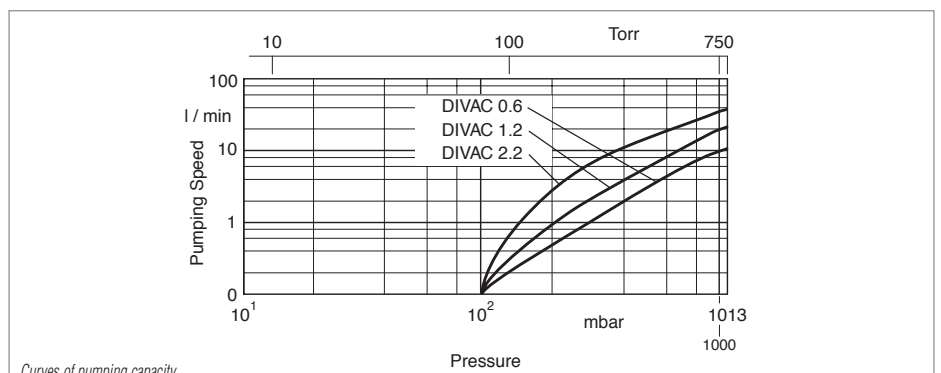
- ◆ Rotary evaporators
- ◆ Drying chambers
- ◆ Filtration units
- ◆ Distillation configurations
- ◆ Gel dryers



Dimensional drawing for the DIVAC 0.6, 1.2 and 2.2



Curves of pump-down time of a 10l vessel



Curves of pumping capacity

Technical Data		DIVAC 0.6	DIVAC 1.2	DIVAC 2.2
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)	≤ 100 (≤ 75)		
Max. exhaust back pressure (absolute)	mbar (Torr)	2000 (1500)		
Pump heads		1		
Connections		Hose nozzle ID 10		
Inlet (suction side)	DN	Hose nozzle ID 10		
Exhaust (delivery side)	DN	G 1/8"		
Thread	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, approx.	°C (°F)	+ 5 bis + 40 (+41 to +104)		
Permissible ambient temperature, approx.	°C (°F)	+ 5 bis + 40 (+41 to +104)		
Voltage / nominal frequency (1 ph. motor)		230 ± 10% / 50		
Earthed plug	V/Hz	115 ± 10% / 60		
NEMA plug	V/Hz	100 ± 10% / 50/60		
NEMA plug	V/Hz	44		
Protective class	IP	100		
Motor power *)	W	100	130	180
Current consumption *)	A	0.6	0.9	1.35
Motordrehzahl		1500		
50 Hz	min ⁻¹	1800		
60 Hz	min ⁻¹	256 x 146 x 187 (10.08 x 5.75 x 7.36)		
Dimensions (W *) x H *) x D), approx.	mm (in.)	256 x 146 x 187 (10.08 x 5.75 x 7.36)	268 x 159 x 207 (10.55 x 6.3 x 8.15)	297 x 171 x 226 (11.69 x 6.73 x 8.9)
Weight, approx.	kg (lbs)	5.9 (13.02)	7.1 (15.57)	10.3 (22.74)
Material		PTFE (Teflon)		
Pump head		PTFE coated		
Structured diaphragm		FFPM (Kalrez)		
Valves		PVDF (Solef)		
Nozzles				
Ordering Information		DIVAC 0.6	DIVAC 1.2	DIVAC 2.2
Diaphragm vacuum pump, 230 V, 50 Hz, with 2.3 m (8 ft) power cord and earthed plug		Part No. 127 60	Part No. 127 61	Part No. 127 62
Diaphragm vacuum pump, 100 V, 50/60 Hz, with 2.3 m (8 ft) power cord and NEMA plug		upon request	upon request	upon request
Diaphragm vacuum pump, 115 V, 60 Hz, with 2.3 m (8 ft) power cord and NEMA plug		upon request	upon request	upon request
Spare parts kit consisting of 1 diaphragm, 2 gasket rings, 2 valve disks		Part No. 127 63	Part No. 127 64	Part No. 127 65
Hose nozzles (1 exhaust port and 2 inlet ports)		Part No. 200 650 25 (2x)	Part No. 200 650 26 (2x)	Part No. 200 650 26 (2x)

*) for 230 V / 50 Hz version

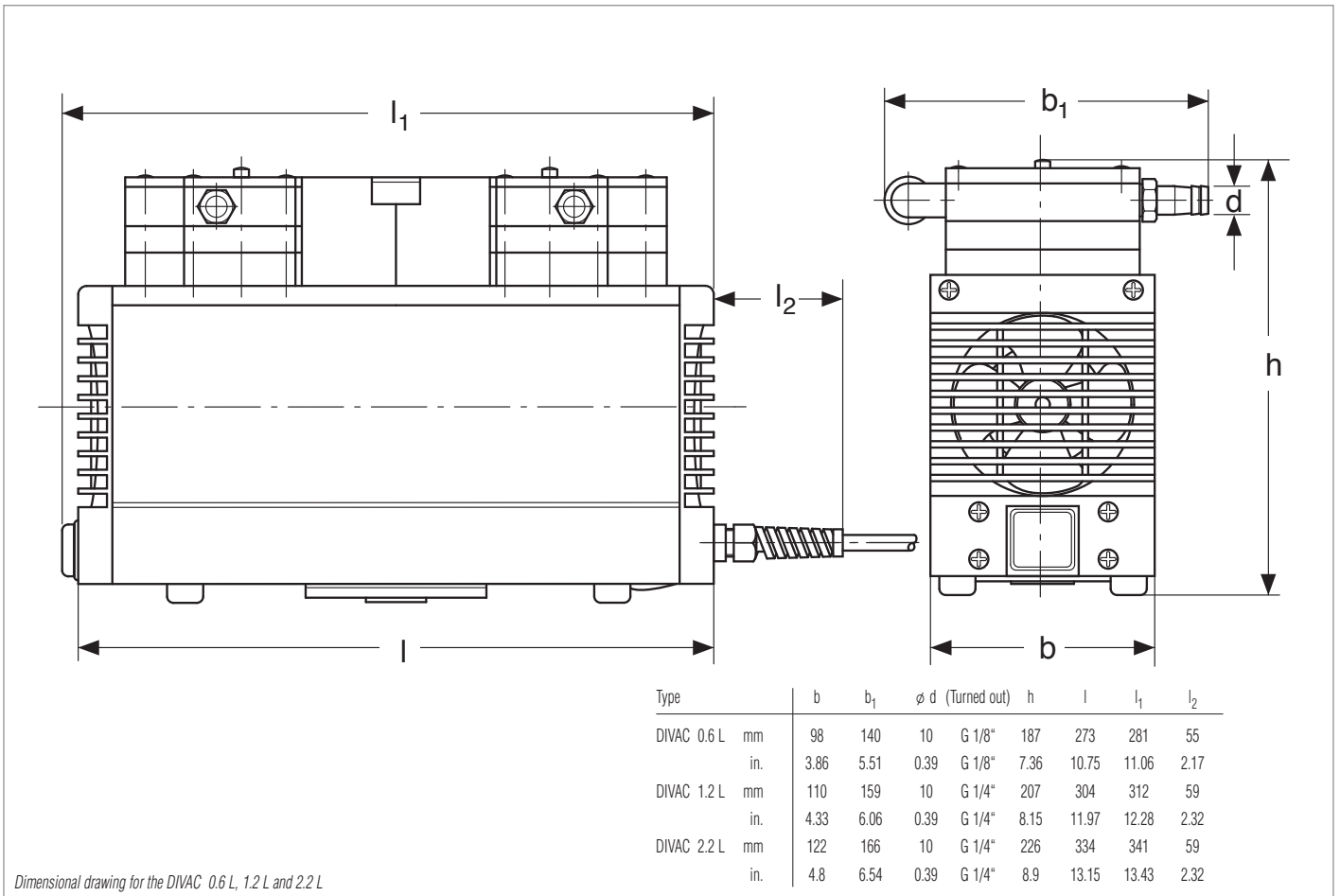
Dual-Stage Diaphragm Vacuum Pumps DIVAC 0.6 L, 1.2 L, 2.2 L



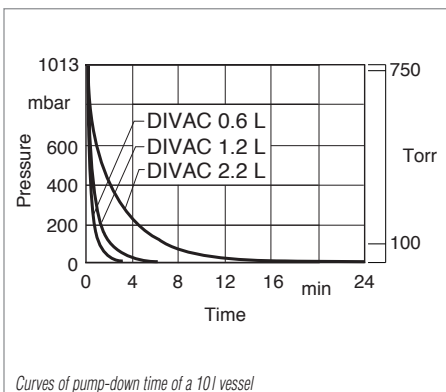
Typical Applications

Vacuum generation for

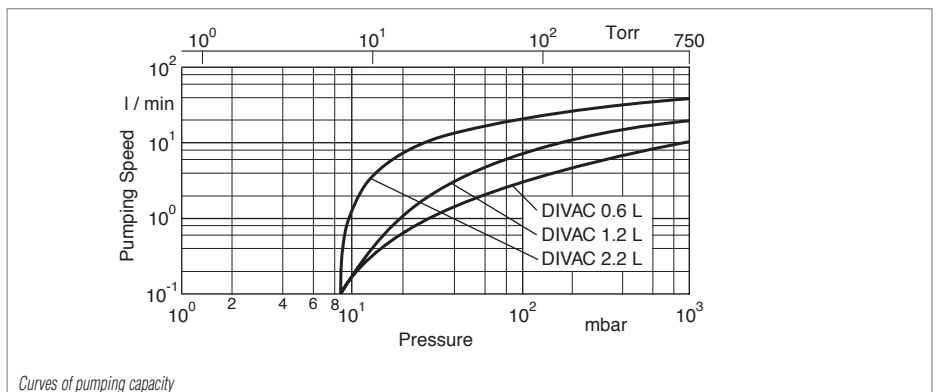
- ◆ Rotary evaporators
- ◆ Drying chambers
- ◆ Filtration units
- ◆ Distillation configurations
- ◆ Gel dryers



Dimensional drawing for the DIVAC 0.6 L, 1.2 L and 2.2 L



Curves of pump-down time of a 10l vessel

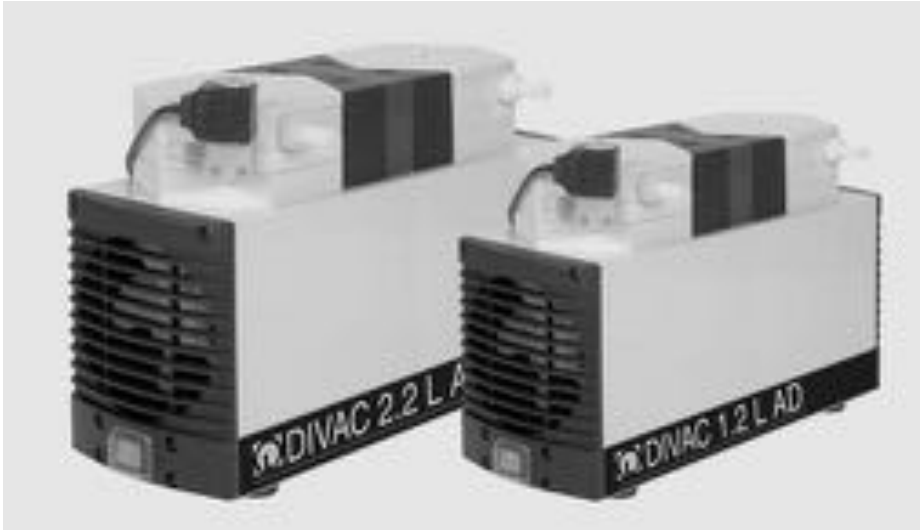


Curves of pumping capacity

Technical Data		DIVAC 0.6 L	DIVAC 1.2 L	DIVAC 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		
Connections				
Inlet (suction side)	DN	Hose nozzle ID 10		
Exhaust (delivery side)	DN	Hose nozzle ID 10		
Thread	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, approx.	°C (°F)	+ 5 bis + 40 (+41 to +104)		
Permissible ambient temperature, approx.	°C (°F)	+ 5 bis + 40 (+41 to +104)		
Voltage / nominal frequency (1 ph. motor)				
Earthed 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 *)	W	90	120	245
Current consumption *)	A	0.6	0.7	1.8
Motor speed				
50 Hz	min ⁻¹	1500		
60 Hz	min ⁻¹	1800		
Dimensions (W *) x H *) 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	DIVAC 1.2 L	DIVAC 2.2 L
Diaphragm vacuum pump, 230 V, 50 Hz, with 2.3 m (8 ft) power cord and earthed plug		Part No. 135 00	Part No. 135 06	Part No. 135 12
Diaphragm vacuum pump, 100 V, 50/60 Hz, with 2.3 m (8 ft) power cord and NEMA plug		Part No. 135 02	Part No. 135 08	Part No. 135 14
Diaphragm vacuum pump, 115 V, 60 Hz, with 2.3 m (8 ft) power cord and NEMA plug		Part No. 135 03	Part No. 135 09	Part No. 135 15
Spare parts set comprising 2 diaphragms, 4 gasket rings, 4 valve plates		Part No. 135 23	Part No. 135 24	Part No. 135 25
Hose nozzle kit consisting of 2 hose nipple, piping		Part No. 200 650 05	Part No. 200 650 06	Part No. 200 650 0

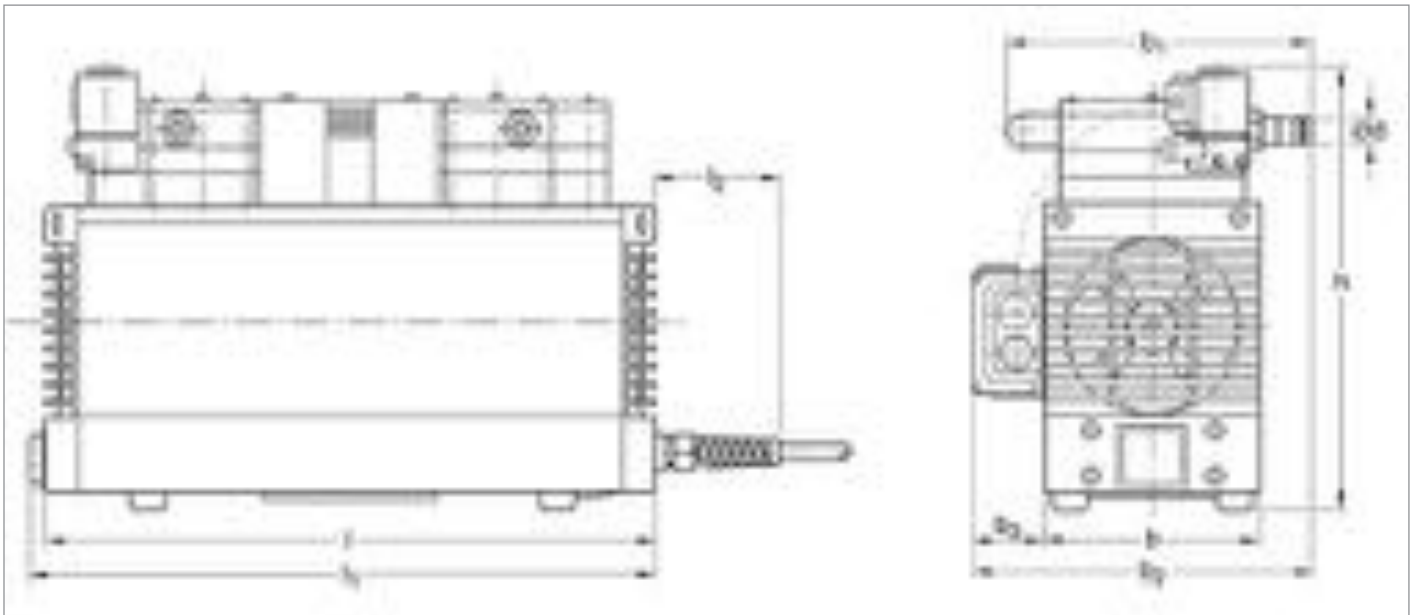
*) for 230 V / 50 Hz version

Dual-Stage Diaphragm Vacuum Pumps DIVAC 1.2 L AD, 2.2 L AD



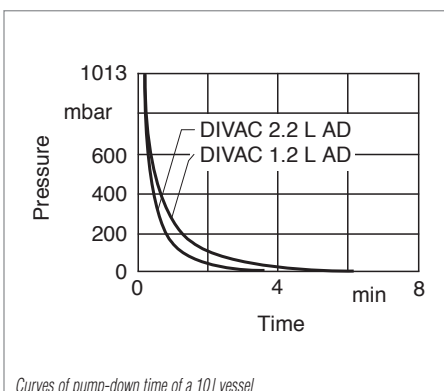
The automatic drying system of this dual-stage diaphragm pump enables problem-free pumping of very damp and wet vapors.

With the automatic function, resulting liquid is blown out of the pump head using individually adjustable parameters, restoring the maximum suction capacity. The vacuum in the recipient is maintained during drying.

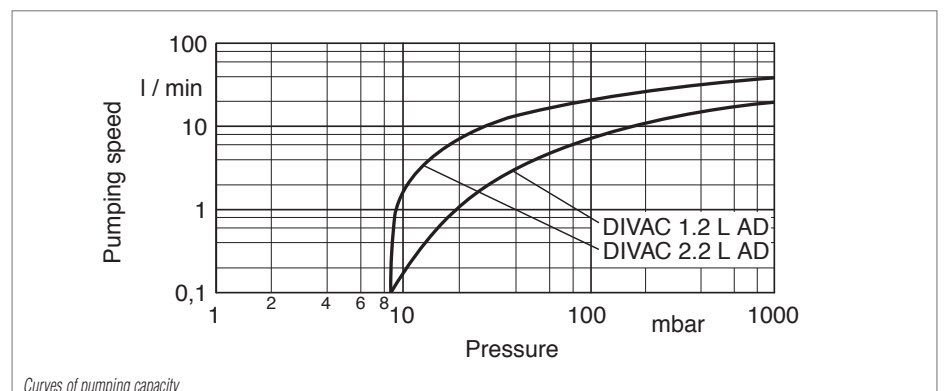


Typ		b	b ₁	b ₂	b ₃	ø d	(Turned out)	h	l	l ₁	l ₂
DIVAC 1.2 L AD	mm	110	154	177	42	10	G 1/4"	220	304	312	59
	in.	4.33	6.06	6.97	1.65	0.39	G 1/4"	8.666	11.97	12.28	2.32
DIVAC 2.2 L AD	mm	122	165	189	42	10	G 1/4"	239	334	341	59
	in.	4.80	6.5	7.44	1.65	0.39	G 1/4"	9.41	13.15	13.43	2.32

Dimensional drawing for the DIVAC 1.2 L AD und 2.2 L AD



Curves of pump-down time of a 101 vessel

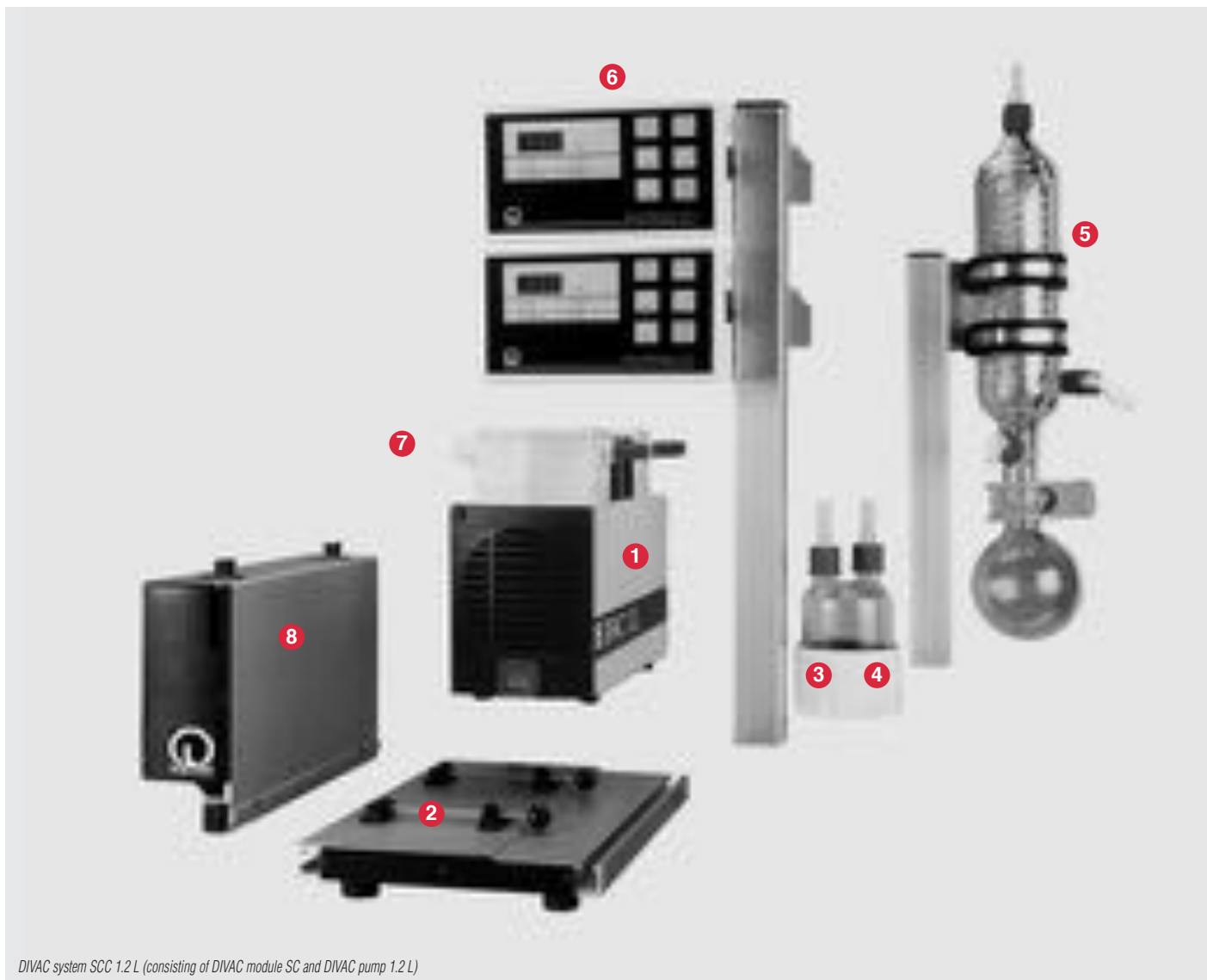


Curves of pumping capacity

Technical Data		DIVAC 1.2 L AD	DIVAC 2.2 L AD
Pumping speed, max. (Atm.)	m ³ · h ⁻¹ (cfm)	1.2 (0.7)	2.0 (1.2)
Ultimate pressure	mbar (Torr)	≤ 10 (≤ 7.5)	
Max. exhaust back pressure (absolute)	mbar (Torr)	2000 (1500)	
Pump heads		2	
Connections			
Inlet (suction side)	DN	hose nozzle ID 10	
Exhaust (delivery side)	DN	hose nozzle ID 10	
Thread	G	G 1/4"	
Noise level acc. to DIN 45 635 Part 13, ca.	dB(A)	50	52
Permissible gas admission temperature, max.	°C (°F)	+ 5 bis + 40 (+41 to +104)	
Permissible ambient temperature, max.	°C (°F)	+ 5 bis + 40 (+41 to +104)	
Voltage / nominal frequency (1 ph. motor)			
Earthed 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 *)	W	120	245
Current consumption *)	A	0.7	1.8
Motor speed			
50 Hz	min ⁻¹	1500	
60 Hz	min ⁻¹	1800	
Dimensions (W *) x H *) x D), approx.	mm (in.)	312 x 177 x 220 (12.28 x 6.97 x 8.66)	341 x 189 x 239 (13.43 x 7.44 x 9.41)
Weight, approx.	kg (lbs)	9.6 (21.2)	12.9 (28.48)
Material			
Pump head		PTFE (Teflon)	
Structured diaphragm		PTFE coated	
Valves		FFPM (Kalrez)	
Nozzles		PVDF (Solef)	
Ordering Information		DIVAC 1.2 L AD	DIVAC 2.2 L AD
Diaphragm vacuum pump 230 V, 50 Hz, with 2.3 m power cord and earthed plug		Part No. 500 750	Part No. 500 755
Diaphragm vacuum pump 100 V, 50/60 Hz, with 2.3 m power cord and NEMA plug		Part No. 500 751	Part No. 500 756
Diaphragm vacuum pump 115 V, 60 Hz, with 2.3 m power cord and NEMA plug		Part No. 500 752	Part No. 500 757
Spare parts kit consisting of 2 diaphragms, 4 gasket rings, 4 valve plates		Part No. 135 24	Part No. 135 25
Hose nozzle kit consisting of 2 hose nippel, piping		Part No. 200 650 06	Part No. 200 650 07
Accessories			
Separating vessel on the delivery side		Part No. 135 20	Part No. 135 20
Neoprene hose, 10 mm ID		Part No. 200 650 02	Part No. 200 650 02
Base panel		Part No. 135 18	Part No. 135 19

*) for 230 V / 50 Hz version

Modular Laboratory Pump Concept



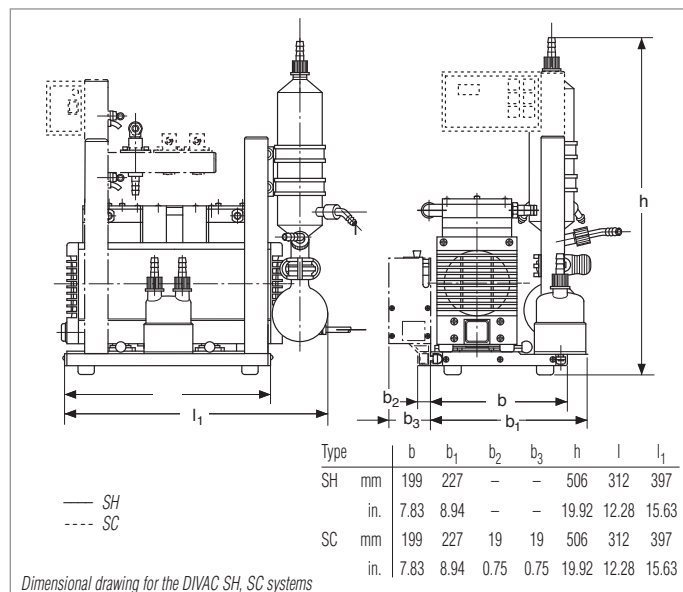
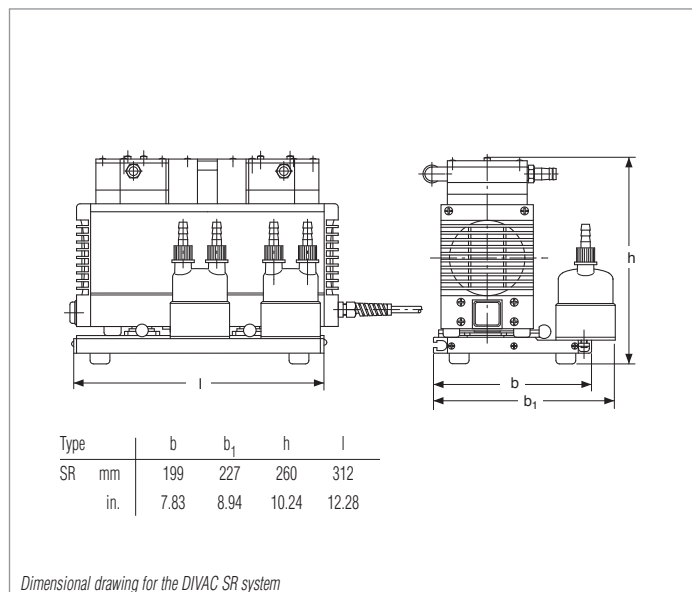
DIVAC system SCC 1.2 L (consisting of DIVAC module SC and DIVAC pump 1.2 L)

Advantages to the User

- ◆ Modular
- ◆ Quiet-running
- ◆ Compact
- ◆ Environmentally friendly
- ◆ Resistant to chemicals
- ◆ Good ultimate vacuum
- ◆ Reliable
- ◆ Versions for different supply voltages are available

- ① DIVAC 0.6L, 1.2L, 2.2L
- ② Base plate
- ③ Separator intake side
- ④ Separator exhaust side (only included with module SR)
- ⑤ High-performance condenser
- ⑥ Vacuum controller NC 800
- ⑦ Gas ballast unit (optional)
- ⑧ Control unit

Electrical Data	DIVAC SC System		
	100 V	115 V	230 V
Power drawn			
Vacuum controller NC 800	W	14	14
Fuses (2 each, slow-blow)	A	6.3	3.15
Control unit fuses (2 each, slow-blow)	A	6.3	3.15



C04

Components for the modular DIVAC system

Ordering Information	DIVAC 0.6 L	DIVAC 1.2 L	DIVAC 2.2 L
Base plate for system mounting	Part No. 135 18	Part No. 135 18	Part No. 135 19
Separator (intake or exhaust side)	Part No. 135 20	Part No. 135 20	Part No. 135 20
High-performance condenser	Part No. 135 21	Part No. 135 21	Part No. 135 21
Gas ballast valve	-	Part No. 135 27	Part No. 135 27
Vacuum controller			
90 - 260 V, 50/60 Hz	Part No. 500 760	Part No. 500 760	Part No. 500 760
Neoprene hose, inside dia. 10 mm (0.39 in.)	Part No. 200 65 002	Part No. 200 65 002	Part No. 200 65 002

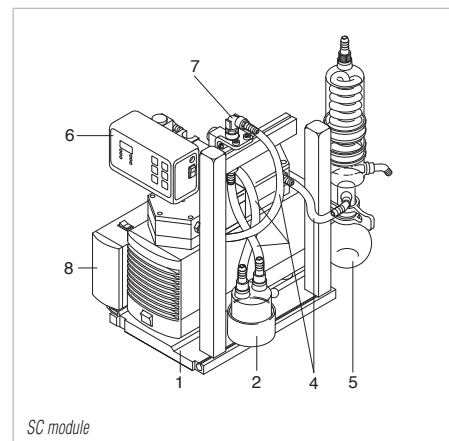
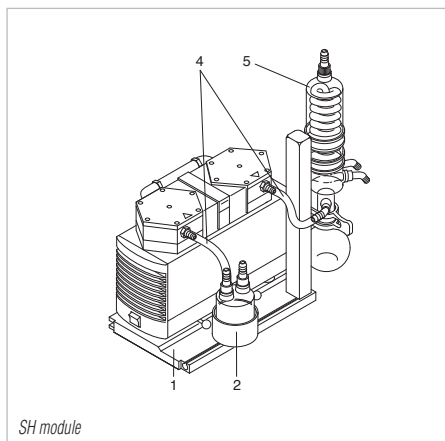
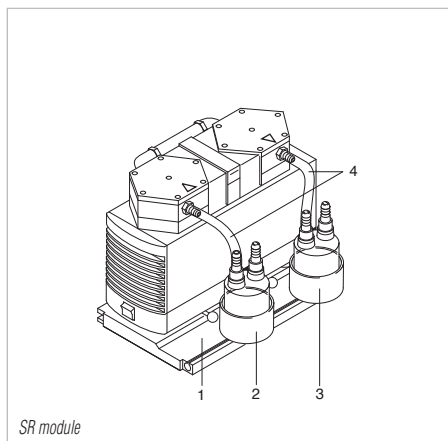
Assemble your own pump system, selecting from the variety of modules available

Additional Ordering Information

When placing your order please also indicate the catalog number for the required pump (see section “Modular Laboratory Pump Concept”)

Example: The DIVAC SH 0.6 L system comprises the DIVAC SH module (Part No. 135 50) and the DIVAC 0.6 L pump (Part No. 135 00)

Module	Item	Comprises	Part No.	
			European version 230 V, 50 Hz Euro-plug	USA/Japan version 115 V, 60 Hz 100 V, 50/60 Hz USA/Japan plug
SR	1	Base plate and system mount	135 40	135 40
	2	Separator, intake side		
	3	Separator, exhaust side		
	4	Hose connectors		
SH	1	Base plate and system mount	135 50	135 50
	2	Separator, intake side		
	4	Hose connectors		
	5	High-performance condenser		
SC	1	Base plate and system mount	135 60	upon request
	2	Separator, intake side		
	4	Hose connectors		
	5	High-performance condenser		
	6	Vacuum controller		
	7	Pump relief valve		
	8	Control unit (incl. cable)		



Note: The SR to SC sub-assemblies do not include the pump!

DIVAC 0.8 T to 4.8 VT

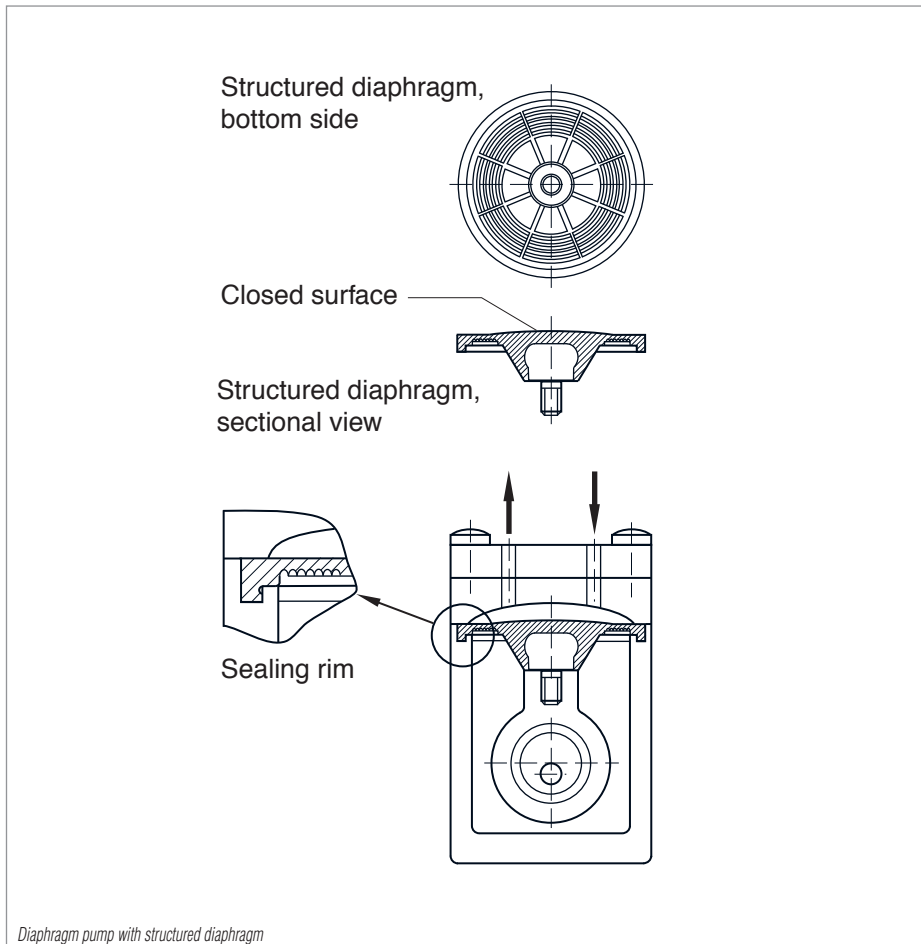


Vacuum pumps for pure pumping and evacuation of air and gases owing to oil-free operation.

The requirements regarding technology are ever increasing. In the area of vacuum technology the demand for a dry vacuum, i.e. a vacuum which is free of oil and thus free of hydrocarbons, is increasing more and more.

We are able to meet this requirement through our dry compressing backing pumps for turbomolecular pumps.

These are ideally suited for all applications in the rough and medium vacuum range where clean media need to be pumped. But also for corrosive media we have solutions for you.



The structured diaphragm with its sealed surface provides the basis for a long service life and a low base pressure.

Diaphragm pump with structured diaphragm

Advantages to the User

- ◆ Dry compressing, free of oil and hydrocarbons
- ◆ Matched to the turbomolecular pumps from LEYBOLD (TW 70 to TW 1600)
- ◆ Low ultimate pressure
- ◆ 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 by staff of the customer
- ◆ Favourable price-to-performance ratio
- ◆ Uniform appearance
- ◆ Can be operated in any position

Typical Applications

- ◆ Backing pump for wide pressure range turbomolecular pumps
- ◆ Massspectrometers
- ◆ Medical equipment
- ◆ Analyzes
- ◆ For laboratory applications also with corrosive media (DIVAC 3.6 TC only)
- ◆ General use for rough and fine vacuum applications

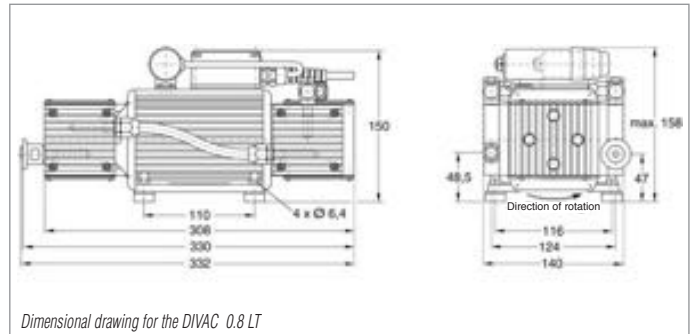
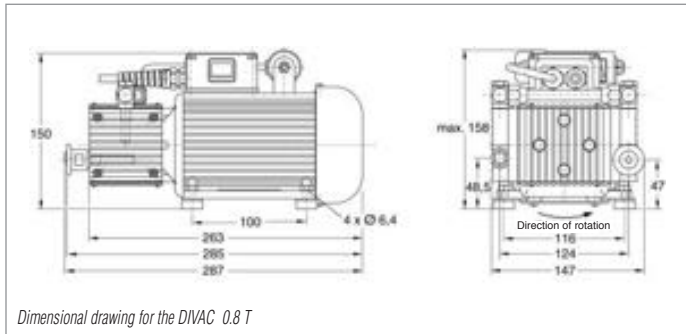
DIVAC 0.8 T and 0.8 LT



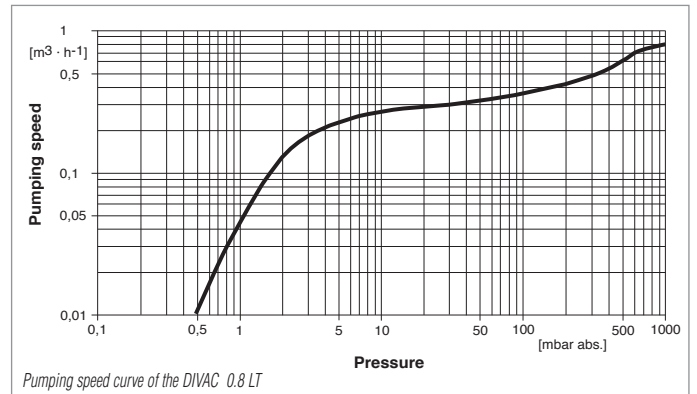
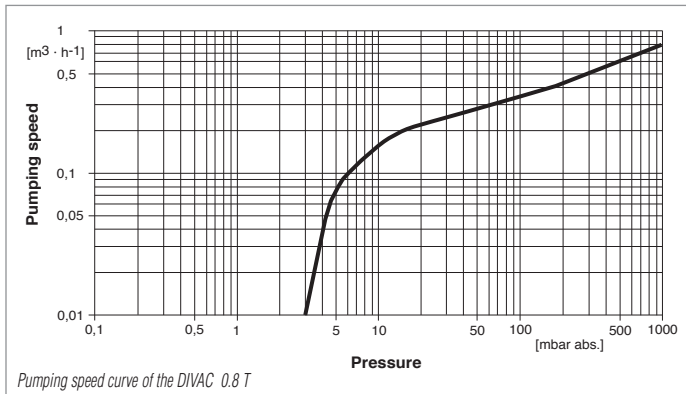
DIVAC 0.8 T



DIVAC 0.8 LT



Dimensional drawings are also available by way of .DXF files (sales@leyboldvakuum.com)



Technical Data		DIVAC 0.8 T	DIVAC 0.8 LT
Pumping speed, max. (Atm.)	m ³ /h (cfm)	0.77 (0.45)	
Ultimate pressure (absolute)	mbar (Torr)	≤ 3 (≤ 2.25)	≤ 0.5 (≤ 0.38)
Max. exhaust back pressure (absolute)	mbar (Torr)	2000 (1500)	
Pump heads		2	4
Connections			
Inlet (suction side)	DN	16 KF	
Exhaust (delivery side)	DN	Silencer	
Thread	G	G 1/8"	
Noise level acc. to DIN 45 635 Part 13, ca.	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)			
Earthed 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	W	50	80
Current consumption	A	0.4	0.5
Nominal speed, approx. (50/60 Hz)	min ⁻¹	1500/1800	
Dimensions (W x H 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 (3.4)
Material			
Diaphragm		Neoprene	
Valves		EPDM	
Pump head		Aluminum	

C04

Ordering information	DIVAC 0.8 T	DIVAC 0.8 LT
Diaphragm, vacuum backing pumps for turbomolecular pumps including 1 m long mains cord, country-specific plug, silencer ¹⁾ , rubber feet, as well as ON/OFF switch 198-264 V / 50/60 Hz 90-127 V / 50/60 Hz 230 V / 50 Hz ± 10% 115 V / 60 Hz ± 10%	Part No. 127 80 Part No. 127 81 - -	- - Part No. 127 83 Part No. 127 84
Spare parts kit consisting of 2 diaphragms, 4 valves, 4 valve gaskets, 4 gaskets	Part No. 127 95	Part No. 127 95 (2x)
Exhaust silencer	Part No. 127 98	Part No. 127 98

T = For use in connection with Turbomolecular pumps
 L = Very low ultimate pressure (Low pressure)
 V = Low vibration levels (Vibration less)
 C = Chemical (Corrosive)

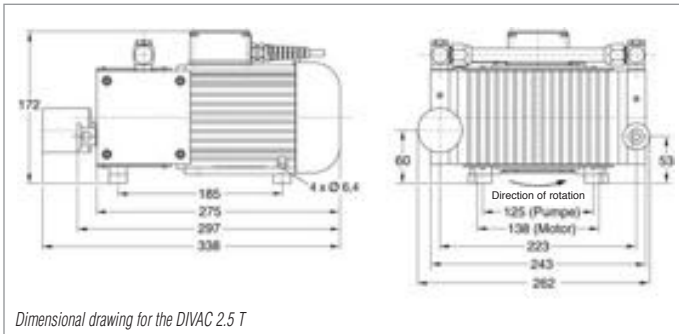
DIVAC 2.5 T and 2.5 VT



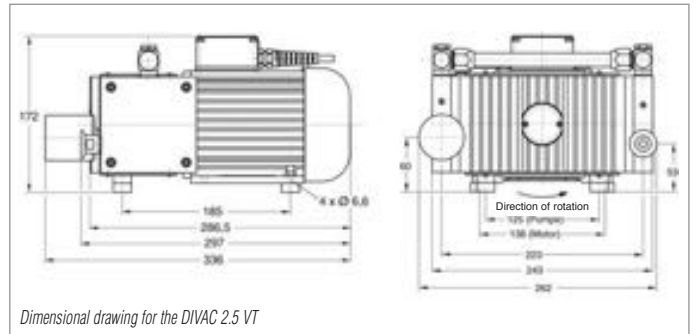
DIVAC 2.5 T



DIVAC 2.5 VT

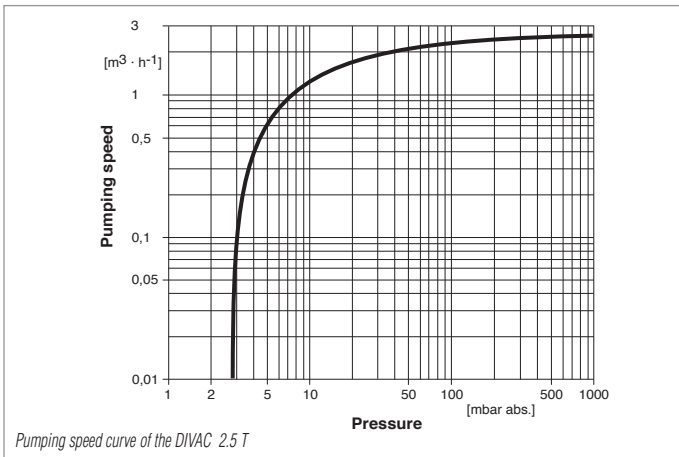


Dimensional drawing for the DIVAC 2.5 T

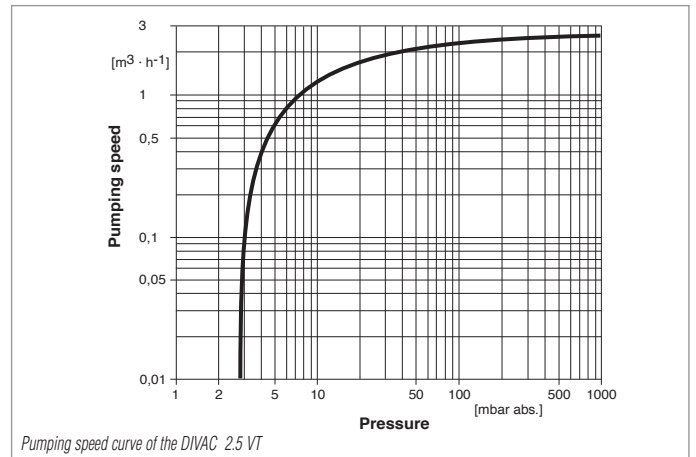


Dimensional drawing for the DIVAC 2.5 VT

Dimensional drawings are also available by way of .DXF files (sales@leyboldvakuum.com)



Pumping speed curve of the DIVAC 2.5 T



Pumping speed curve of the DIVAC 2.5 VT

Technical Data		DIVAC 2.5 T	DIVAC 2.5 VT
Pumping speed, max. (Atm.)	m ³ /h (cfm)	2.57 (1.51)	
Ultimate pressure (absolute)	mbar (Torr)	≤ 3 (≤ 2.25)	
Max. exhaust back pressure (absolute)	mbar (Torr)	2000 (1500)	
Pump heads		2	
Connections			
Inlet (suction side)	DN	16 KF	
Exhaust (delivery side)		Silencer	
Thread	G	G 1/4"	
Noise level acc. to DIN 45 635 Part 13, ca.	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)			
Earthed plug	V/Hz	230/50 ± 10%	
NEMA plug	V/Hz	115/60 ± 10%	
Protective class	IP	54	
Motor power	W	300	
Current consumption	A	1.4	
Nominal speed, approx. (50/60 Hz)	min ⁻¹	1500/1800	
Dimensions (W x H x D), approx.	mm (in.)	336 x 262 x 172 (13.23 x 10.31 x 6.77)	
Weight, approx.	kg (lbs)	12.9 (5.84)	13.1 (5.93)
Material			
Diaphragm		EPDM	
Valves		Neoprene	
Pump head		Aluminum	

C04

Ordering information	DIVAC 2.5 T	DIVAC 2.5 VT
Diaphragm, vacuum backing pumps for turbomolecular pumps including 1 m long mains cord, country-specific plug, silencer ¹⁾ , rubber feet, as well as ON/OFF switch 230 V / 50 Hz ± 10% 115 V / 60 Hz ± 10%	Part No. 127 86 Part No. 127 87	Part No. 127 89 Part No. 127 90
Spare parts kit consisting of 2 diaphragms, 4 valves, 4 valve gaskets, 4 gaskets	Part No. 127 96	Part No. 127 96
Exhaust silencer	Part No. 127 99	Part No. 127 99

T = For use in connection with Turbomolecular pumps
 L = Very low ultimate pressure (Low pressure)
 V = Low vibration levels (Vibration less)
 C = Chemical (Corrosive)

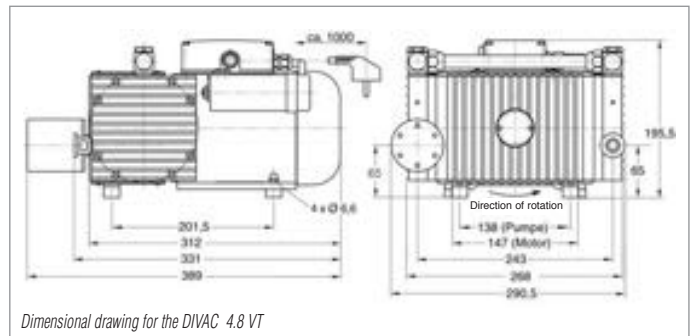
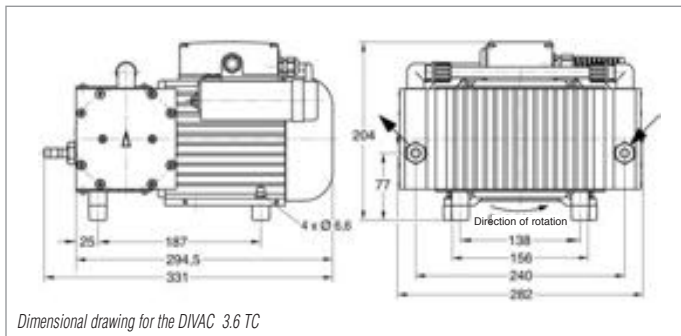
DIVAC 3.6 TC and 4.8 VT



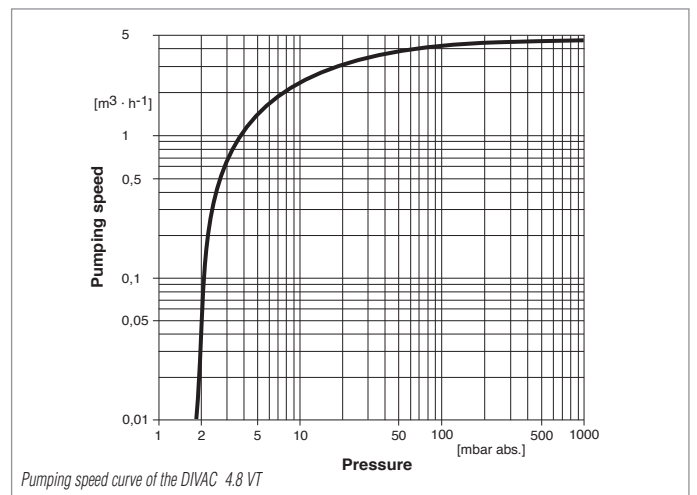
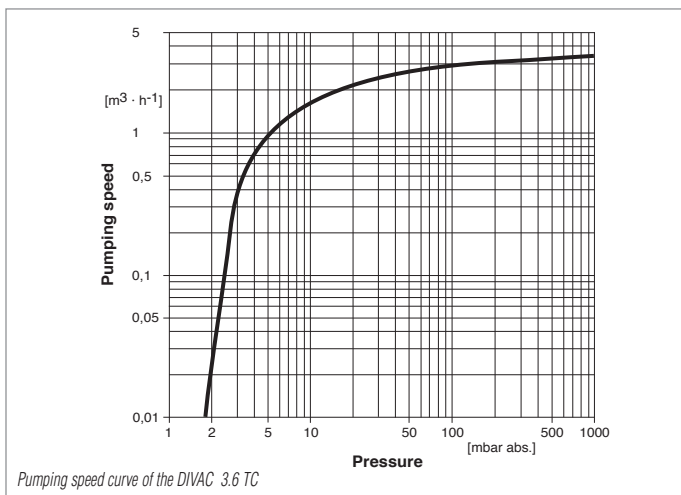
DIVAC 3.6 TC



DIVAC 4.8 VT



Dimensional drawings are also available by way of .DXF files (sales@leyboldvakuum.com)



Technical Data		DIVAC 3.6 TC	DIVAC 4.8 VT
Pumping speed, max. (Atm.)	m ³ /h (cfm)	3.6 (2.12)	4.8 (2.83)
Ultimate pressure (absolute)	mbar (Torr)	≤ 2 (≤ 1.5)	
Max. exhaust back pressure (absolute)	mbar (Torr)	2000 (1500)	
Pump heads		2	
Connections			
Inlet (suction side)	DN	hose nozzle DN 10 + 1m long chemical hose	16 KF
Exhaust (delivery side)		Hose nozzle DN 10	Silencer
Thread	G	G 3/8"	G 3/8"
Noise level acc. to DIN 45 635 Part 13, approx.	dB(A)	50	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)			
earthed plug	V/Hz	230/50 ± 10%	
NEMA plug	V/Hz	115/60 ± 10%	
Protective class	IP	54	
Motor power	W	220	350
Current consumption	A	1.6	2.6
Nominal speed, approx. (50/60 Hz)	min ⁻¹	1500/1800	
Dimensions (W x H x D), approx.	mm (in.)	329 x 277 x 205 (12.95 x 10.91 x 8.07)	324 x 273 x 220 (12.76 x 10.75 x 8.66)
Weight, approx.	kg (lbs)	14.3 (6.48)	18.0 (8.15)
Material			
Diaphragm		PTFE (Teflon)	EPDM
Valves		PTFE coated	Viton
Pump head		FFPM (Kalrez)	Aluminum

C04

Ordering information	DIVAC 3.6 TC	DIVAC 4.8 VT
Diaphragm, vacuum backing pumps for turbomolecular pumps including 1 m long mains cord, country-specific plug, silencer ¹⁾ , rubber feet, as well as ON/OFF switch as well as ON/OFF switch 230 V / 50 Hz ± 10% 115 V / 60 Hz ± 10% 100 V / 50/60 Hz	Part No. 500 210 Part No. 500 211 Part No. 500 212	Part No. 127 92 Part No. 127 93 –
Spare parts kit consisting of 2 diaphragms, 4 valves, 4 valve gaskets, 4 gaskets ²⁾	Part No. 500 215	Part No. 127 97
Exhaust silencer	–	Part No. 127 94
Hose nipple 3/8" PVDF	Part No. 500 214	–

¹⁾ For the DIVAC 3.6 TC hose nozzle instead of silencer

²⁾ Not required for DIVAC 3.6 TC

T = For use in connection with Turbomolecular pumps

L = Very low ultimate pressure (Low pressure)

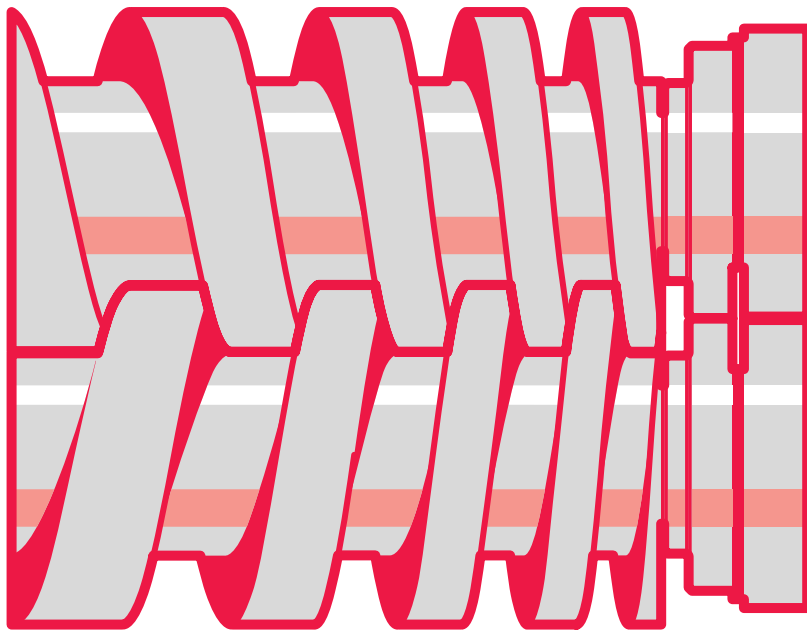
V = Low vibration levels (Vibration less)

C = Chemical (Corrosive)

C05

SCREWLine

Dry Compressing Screw Vacuum Pump
for Industrial Applications
SCREWLine SP630



General

SCREWLine SP630 Dry Compressing Screw Vacuum Pump **C05.03**

Products

SCREWLine SP630 **C05.04**

Accessories

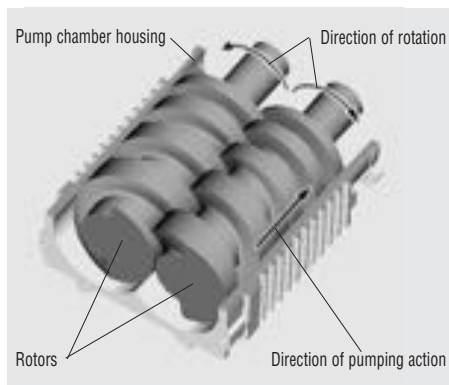
Vacuum Pump Oils **C05.07**

Dry Compressing Screw Vacuum Pump SCREWLine

Principle of Operation

The ScrewLine is a dry compressing vacuum pump, the operation of which is based on the screw principle.

The pump chamber is formed by two synchronised displacing rotors and the housing in which the rotors are accommodated. Owing to the opposing direction of rotation of the rotors, the chambers "move" continuously from the inlet to the exhaust side (see figure below) so that a low-pulsation gas flow is produced. The ScrewLine uses a minimum of parts since only one pair of rotors is needed to compress the gas in several stages. This considerably simplifies any maintenance and servicing work.



Operating principle of the ScrewLine SP630 screw vacuum pump

The ScrewLine is relatively insensitive to foreign materials, since the gas flow does not have to be deflected several times from stage to stage as is the case in other types of dry compressing pumps.

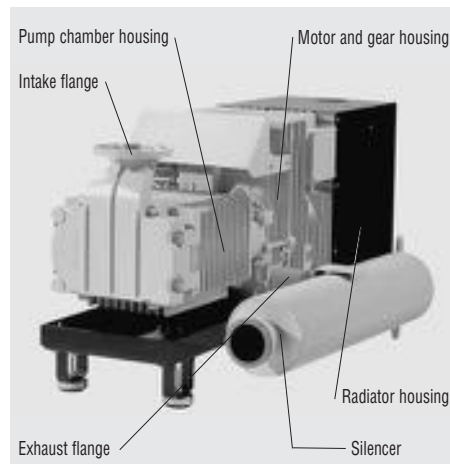
This ensures a high uptime of the pump on industrial processes.

In dry compressing vacuum pumps it needs to be observed that shaft sealing rings and bearings on the vacuum side of a pump can always cause problems. On the one hand lubricants may enter into the vacuum process from the bearings and on the other hand aggressive process media endanger the bearings and the gaskets.

In the ScrewLine the two shaft seals are non-contacting and almost free of wear. In standard applications no seal gas is required. However, a seal gas supply may optionally be connected to the seals if the process application should require this. Owing to the cantilevered rotors of the ScrewLine, a potential source which might cause a breakdown of the bearings on the intake side has been completely eliminated.

A further advantage of the cantilevered arrangement is that the pump chamber is easily accessible without having to disassemble any bearings. This is important in the case of applications which are likely to contaminate the pump.

The figure below shows the ScrewLine SP630 with covers removed and equipped with the optionally available silencer.



ScrewLine SP630 without covers

The ScrewLine SP630 is driven by an integrated three-phase asynchronous motor driving one of three shafts. This shaft also drives an oil supply pump, a fan and via a gear the two rotor shafts.

The oil pump pumps the oil from the oil sump through a filter and the oil/air heat exchanger into the rotors and back into the oil sump.

Besides the integrated oil cooling arrangement for the rotors, the entire machine is air cooled.

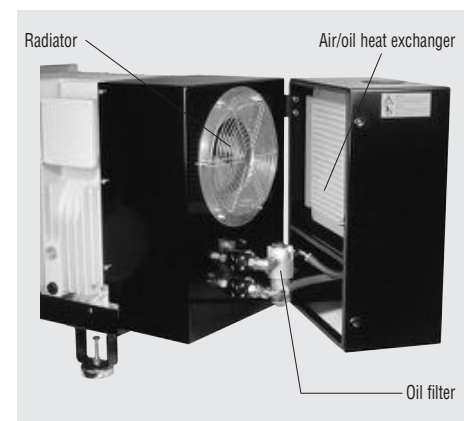
The fan sucks in the cooling air through the oil/air heat exchanger and injects the pre-warmed air via the motor's housing into the pump chamber housing.

This cooling arrangement ensures a close correlation of all components temperatures so that these may adapt themselves automatically to the prevailing operating condition.

During the development of the ScrewLine pump special emphasis was placed on a maintenance-friendly servicing concept.

This is achieved by the cantilevered rotors and also that all parts of the pump which need to be accessed when making connections and for running maintenance are accessible from one side, resulting in a high degree of flexibility as to positioning the pump. Maintenance will in most applications, be limited to a regular check on the pump (visual inspection) and an annual change of the gear oil and the oil filter. The filter is readily accessible and can be replaced when changing the oil. Also the air/oil heat exchanger may be easily cleaned by blowing out the radiator with compressed air.

The ScrewLine offers to the user a high degree of flexibility. The standard universal flanges ensure easy integration into the system, and with the accessories available for the ScrewLine, the pump may be optimally adapted to the specific requirements of differing applications.



Covers of the cooler removed for access to the oil filter and the heat exchanger of the ScrewLine SP630

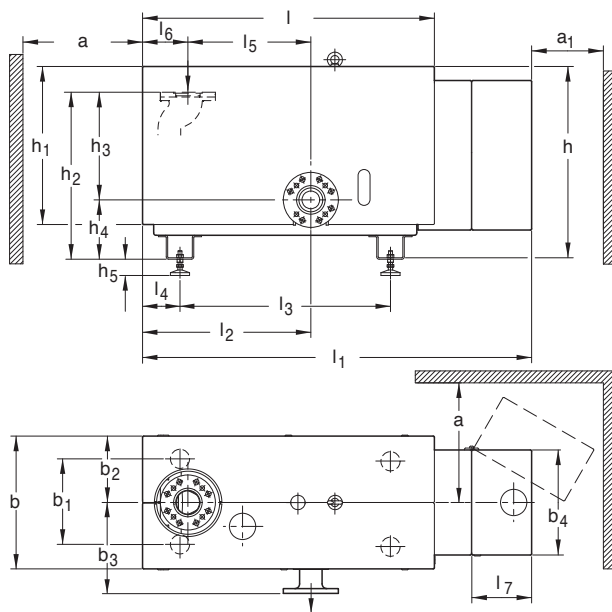
The New Dry Compressing Screw Vacuum Pump for Industrial Applications



ScrewLine SP630

The dry compressing screw vacuum pump ScrewLine SP630 was developed for the special requirements of industrial applications.

The innovative design allows this pump to be used where a reliable, compact and low-maintenance vacuum solution is required.



Dimensional drawing for the ScrewLine SP630

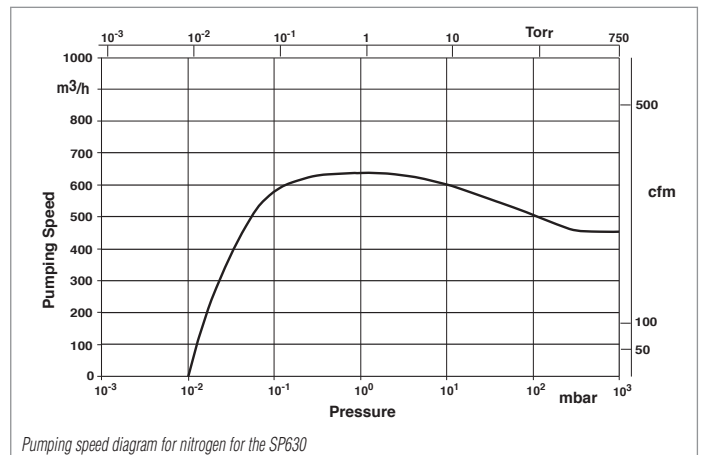
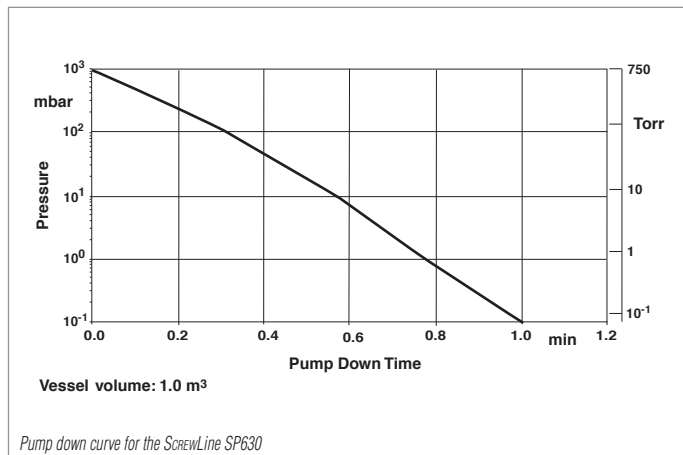
	a	a ₁	b	b ₁	b ₂	b ₃	b ₄
mm	> 500	> 300	555	360	276	380	439
in.	> 19.69	> 11.81	21.85	14.17	10.87	14.96	17.28
	h	h ₁	h ₂	h ₃	h ₄	h ₅	l
mm	806	636	698	450	248	68	1220
in.	31.73	25.04	27.48	17.72	9.76	2.68	48.03
	l ₁	l ₂	l ₃	l ₄	l ₅	l ₆	l ₇
mm	1626	703	880	157	514	189	250
in.	64.02	27.68	34.65	6.18	20.24	7.44	9.84

Advantages to the User

- ◆ Low cost of ownership
 - No purge gas and no cooling water is required in standard applications
 - Low power consumption
- ◆ Cost-wise optimized product
 - Basic model and accessories allows the pump to be equipped according to requirements
- ◆ Minimized downtimes, maximum availability
 - Highly rugged due to the application oriented design
- ◆ Low waste disposal costs
 - No contaminated waste oil is produced
- ◆ Rugged and reliable
 - No bearings on the intake side
- ◆ Good compatibility with particles and vapours (gas ballast is optional)
- ◆ Long maintenance intervals and easy servicing
 - Only an annual change of the gear oil is necessary
 - Simple and quick access to all parts which need to be serviced
 - Cleaning of the rotors is possible on-site
- ◆ Highly flexible
 - The modular concept allows this pump to adapt the pumping speed up to 2000 m³/h in combination with RUVAC Roots pumps
 - The universal flanges on the pump permit simple integration and flexible adaptation to your system
- ◆ High pumping speed at low base pressure

Typical Applications

- ◆ Industrial furnaces (hardening, annealing, sintering, carburizing, melting and many more)
- ◆ Coating technology
- ◆ Metallurgical systems
- ◆ Packaging technology
- ◆ Drying processes



Technical Data		SCREWLine SP630	
		50 Hz	60 Hz
Pumping speed, max.	m ³ x h ⁻¹ (cfm)	630 (371)	
Ultimate total pressure without gas ballast	mbar (Torr)	≤ 0.01 (≤ 0.0075)	
Intake pressure limits Continuous operation	mbar (Torr)	1030 (773)	
Cooling		Air	
Power supply	ΔΔ	52 A at 190 V - 210 V ± 5%	52 A at 190 V - 240 V ± 5%
	Δ	26 A at 380 V - 420 V ± 5%	26 A at 380 V - 480 V ± 5%
Motor	Nominal power	15 (20)	
	Nominal voltage (ΔΔ / Δ / ± 10%)	200 / 400	
Max. ambient temperature	°C (°F)	+40 (+104)	
Type of protection	IP	55	
Lubricant filling (gear chamber)	l	12 – 15	
Noise level ¹⁾	dB(A)	≤ 75	upon request
Connections Intake and Exhaust		DN 100 / PN 6 (EN 1092-2) DN 100 / PN 10 (EN 1092-2) NPS 4 Class 150 (in accordance with ASME B 16.5-1996) DN 100 ISO-K (in accordance with ISO 1609-1986 (E))	
Weight, approx.	kg (lbs)	530 (1166)	
Dimensions (W x D x H)	mm (in.)	1630 x 660 x 880 (64 x 26 x 35)	
Ordering Information		SCREWLine SP630	
		50 Hz	60 Hz
ScrewLine 630		Part No. 117 001 ^{*)}	Part No. 117 002 ^{*)}
Exhaust silencer		Part No. 119 001 ^{*)}	
Roots pump adapter for RUVAC 2001		Part No. 119 021 ^{*)}	
Dust filter ²⁾		Part No. 951 72	

¹⁾ With closed exhaust line or exhaust silencer

²⁾ For information on the dust filter please refer to Product Section C02, Chapter "Accessories"

^{*)} Available from July 2003

Vacuum Pump Oils

Lubricating oils for vacuum pumps must meet tough requirements. They need to have excellent lubricating properties and resist cracking when subjected to mechanical loads.

The vacuum pump oil ANDEROL® 555 listed in the following has undergone extensive testing under application conditions in our own laboratories and has been fully qualified for use in the ScrewLine pumps.

If other types of oil shall be used please get in touch with LEYBOLD first.

We therefore recommend the exclusive use of vacuum pump oils fully qualified by Leybold so as to ensure optimum performance of the Leybold vacuum pumps and also to ensure optimum oil change intervals.

Under vacuum conditions lubricating oils, especially those with additives may behave quite differently than expected. Additives may adversely affect the attainable ultimate pressure and may react with the media being pumped.

For these reasons please understand that we must make our warranty commitment dependent on the use of oils which have been qualified by us. Damages caused by the use of not suitably qualified lubricating oils are not covered by our warranty.

Lubricant Types

Synthetic Oils

Synthetic oils are produced by a chemical reaction. 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.

For all lubricants in our line of products you may obtain Safety Data Sheets from the Dept. Technical Support in Cologne.

The oils given in the following belong to the group of synthetic oils:

Ester oils

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.

Polyalphaolefin (PAO) Oils

Polyalphaolefin oils are synthetic hydrocarbons which are paraffin like, but have a uniform structure. Thermal and chemical resistance is better compared to mineral oils. Elastomer compatibility and resistance against hydrolysis are comparable to mineral oils.

C05

Application Data		ANDEROL® 555
Type of oil		Diester oil
Elastomer compatibility		Suited
FPM (Viton)		Conditionally suited
NBR (Perbunan) ¹⁾		Not suited
EPDM		
Technical Data		ANDEROL® 555
Viscosity		
at 40 °C (104 °F)	mm ² /s (= cSt)	94
at 100 °C (212 °F)	mm ² /s (= cSt)	9
Flash point	°C (°F)	250 (482)
Vapor pressure		
at 20 °C (68 °F)	mbar (Torr)	7 x 10 ⁻⁵ (5.25 x 10 ⁻⁵)
at 100 °C (212 °F)	mbar (Torr)	1.5 x 10 ⁻³ (1.1 x 10 ⁻⁵)
Density at 15 °C (59 °F)	g/ml	0,96
Pour point	°C (°F)	-42 (-44)
Middle molecular weight	g/mol	530
Ordering Information		Maintenance Kit for changing the Gear Oil
Maintenance kit Stage 1, SP630 for changing the gear oil		
15 l ANDEROL® 555, oil filter cartridge and gasket		Part No. EK110000792

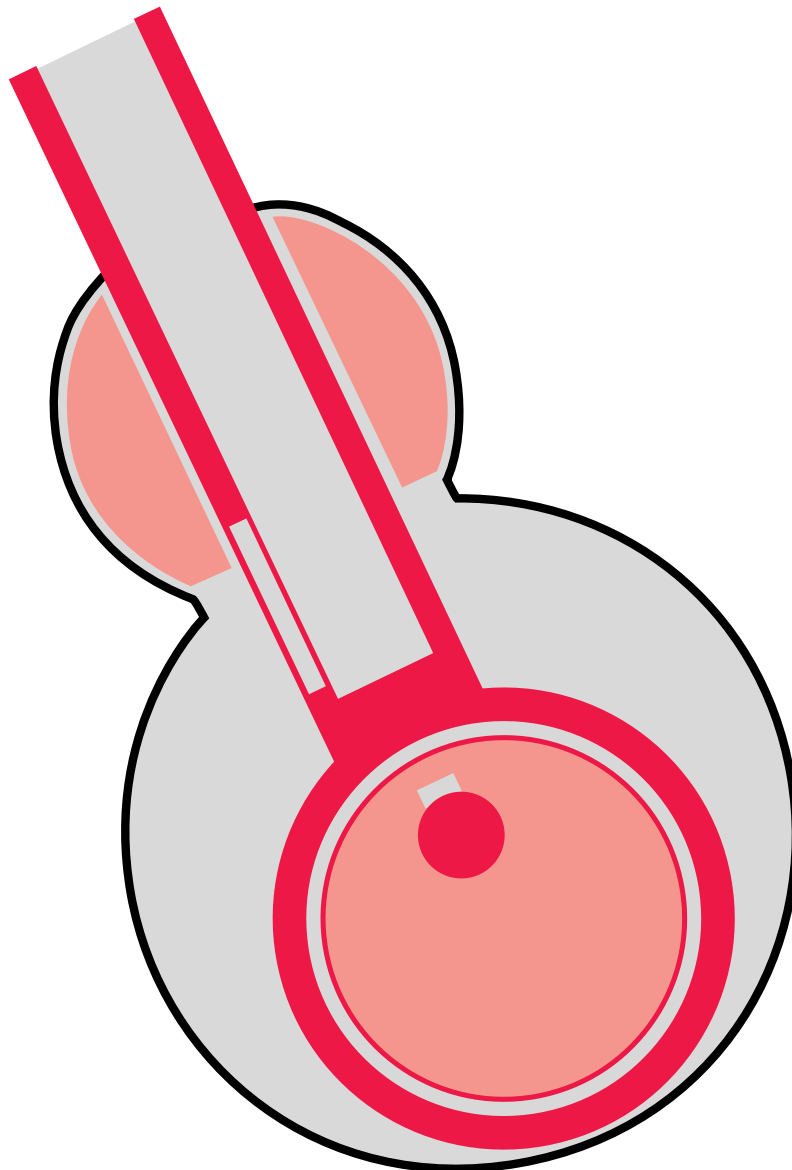
Please note that the technical data stated are only typical data. Slight variations from batch to batch must be expected. The technical data stated here can not be taken as assured properties

¹⁾ Resistance to decomposing is very much dependent on the share of acrylonitrile in the NBR
ANDEROL® is a trademark of ANDEROL BV

E and DK

Rotary Piston Vacuum Pumps

Single- and two-stage, oil-sealed,
200 - 250 m³ x h⁻¹ (117.8 - 147 cfm)



General

Applications and Operation	C06.03
Application and Accessories	C06.03

Products

Single-Stage Rotary Piston Vacuum Pump E 250	C06.04
Two-Stage Rotary Piston Vacuum Pump DK 200	C06.06

Accessories**Global Versions**

Valves	C06.08
Exhaust Filter Box AFK 2	C06.09
Oil Filter Unit	C06.10
Oil Control Unit	C06.10
Condensate Separator AK 100-250	C06.11
Exhaust Filter AF 100-250 A	C06.11
Dust Filter FS 100-250	C06.12
Dust Separator AS 100-250	C06.13

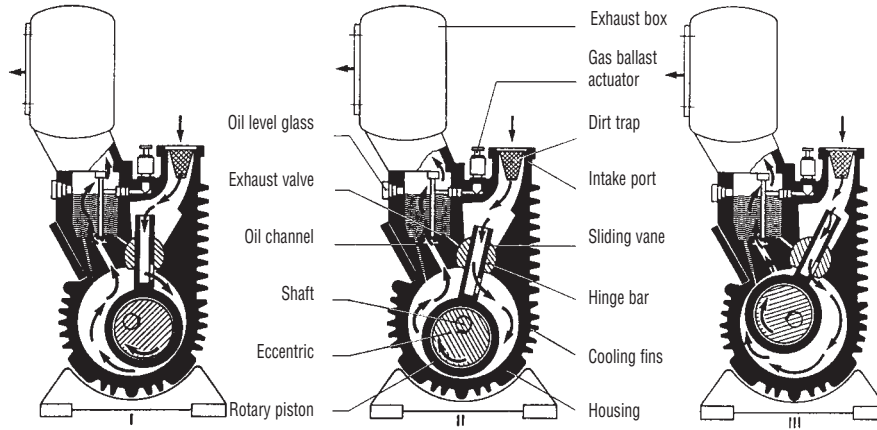
Versions for the North and South American Continents

Oil Filtering System OF1000	C06.14
Oil Filtering System OF3000	C06.16
Vibration Absorber	C06.17
Condensate Separator AK 100-250	C06.18
Exhaust Filter AF 100-250 A	C06.18

Miscellaneous

Vacuum Pump Oils	C06.19
60 Hz Curves	C06.22

Applications and Operation



Functional diagram of a rotary piston vacuum pump

Advantages to the User

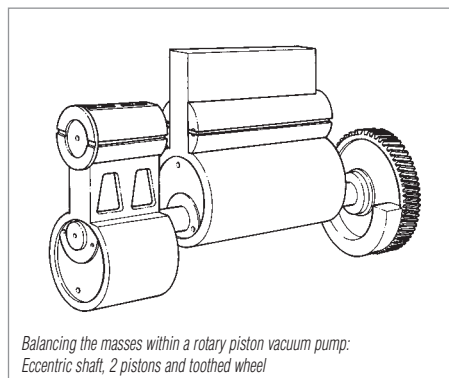
- ◆ Gas ballast facility
- ◆ Easy maintenance
- ◆ Good ultimate pressure with and without gas ballast
- ◆ High pumping speed at low intake pressures
- ◆ Compact design with flange mounted motor
- ◆ High water vapor tolerance
- ◆ Reliable continuous operation
- ◆ Tolerant and rugged, due to non-contact rotary piston within the pump chamber
- ◆ Very smooth operation due to dynamically balanced masses
- ◆ Separate oil filling for the gear protects the gear against contaminated pump oil
- ◆ Oil is used for sealing, lubrication and cooling
- ◆ A built-in anti-reverse lock prevents incorrect rotation of the piston and also stops it being pulled back when the pump is switched off while under vacuum

- ◆ Air cooling makes the pump environmentally-friendly and economic
- ◆ Clear design and service-friendly due to the modular design

Technical Note

- ◆ By installing a filter, the oil may be cleaned simultaneously

C06



Balancing the masses within a rotary piston vacuum pump: Eccentric shaft, 2 pistons and toothed wheel

Pumps		E-250	DK-200
Application			
Manufacture of semiconductors		◆	◆
Coating		◆	◆
Chemistry		◆	◆
Metallurgy		◆	◆
Electrical engineering		◆	◆
Mechanical engineering		◆	◆
Backing pump for a Roots vacuum pump in diffusion pump systems		◆	◆
Accessories			
	Page		
AFK Exhaust Filter Box	C06.09	◆	◆
Oil Filter Unit	C06.10	◆	◆
Oil Control Unit	C06.10	◆	◆
AK Condensate Separator	C06.11/18	◆	◆
AF Exhaust Filter	C06.11/18	◆	◆
FS Dust Filter	C06.12	◆	◆
AS Dust Separator	C06.13	◆	◆
Oil Filtering System OF1000	C06.14	◆	◆
Oil Filtering System OF3000	C06.16	◆	◆
Vibration Absorber	C06.17	◆	◆

Single-Stage Rotary Piston Vacuum Pump E 250

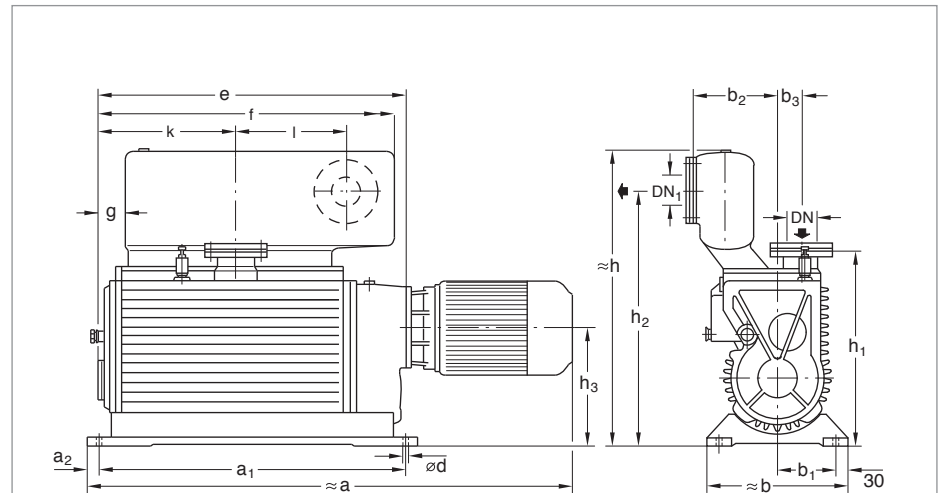
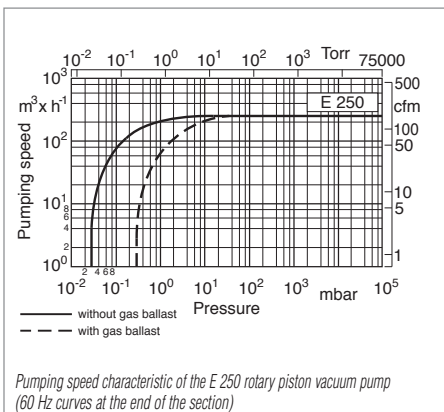
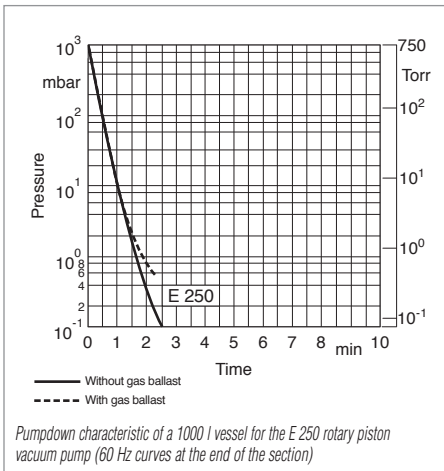


Typical Applications

- ◆ Chemical, metallurgical and electronic vacuum processes
- ◆ Impregnating, degassing and drying processes in experimentation systems, in drying cabinets, extrusion etc.
- ◆ Pressure range down to 4×10^{-2} mbar (2.4×10^{-2} Torr) without gas ballast or to 5×10^{-1} mbar (3×10^{-1} Torr) with gas ballast
- ◆ Backing pump for Roots vacuum pumps at intake pressure down to 10^{-3} mbar (0.75×10^{-3} Torr)

Supplied Equipment

- ◆ With DN 65 DIN flanges on the intake and exhaust sides for direct connection of DN 63 ISO-K flange components
- ◆ Ready for operation, complete with oil filling
- ◆ Special models for different motor voltages, motor frequencies and other protection class ratings are available. Details on these upon request.



	DN	DN ₁	a ¹⁾	a ₁	a ₂	b	b ₁	b ₂	b ₃	ød	e	f	g	h	h ₁	h ₂	h ₃	k	l
mm	63 ISO-K	63 ISO-K	1190	780	30	340	140	202	52	14	777	750	65	740	475	636	295	337	290
in.	63 ISO-K	63 ISO-K	4.17	2.73	1.05	1.19	0.49	0.71	0.18	0.05	2.72	2.63	0.23	2.59	1.66	2.23	1.03	1.78	1.02

Pump flanges to DIN 2501 with sealing disc and collar flange for the connection of ISO-K (KF) components

¹⁾ Only for the motor which is supplied as standard

Dimensional drawing for the single-stage rotary piston vacuum pump E 250

Technical Data		E 250	
		50 Hz	60 Hz
Nominal pumping speed ¹⁾	m ³ x h ⁻¹ (cfm)	290 (170.8)	
Pumping speed ¹⁾	m ³ x h ⁻¹ (cfm)	250 (147.3)	
Ultimate partial pressure without gas ballast ¹⁾	mbar (Torr)	< 4x 10 ⁻² (< 2.4 x 10 ⁻²)	
Water vapour tolerance ¹⁾	mbar (Torr)	60 (45)	
Average noise level to DIN 45 635 ²⁾	dB(A)	< 76	
Mains voltage 3-ph.	V	230/400	208-230/460
Motor power at			
220 / 380 V, 50 Hz	kW (hp)	5.5 (7.5)	
220-230 / 460 V, 50 Hz	kW (hp)	5.5 (7.5)	
200-230 V / 460 V, 60 Hz	kW (hp)	5.5 (7.5)	
Nominal motor speed	rpm	1500	1800
Speed of the pump	rpm	540	
Motor protection	IP	54	
Oil filling	l (qt)	8.4 (8.9)	
Weight	kg (lbs)	375 (827)	
Intake port	DN	63 ISO-K	
Exhaust port	DN	63 ISO-K	

Ordering Information		E 250
Single-stage rotary piston vacuum pump		
E 250, with 50 Hz-motor ³⁾		Part No. 105 36
(220 / 380 V +/- 10%)		
E 250, with 460 V/50 Hz motor ³⁾		Part No. 895 08
(220-230 V / 460 V +/- 10%)		
E 250, with 460 V/60 Hz motor ^{3), *)}		Part No. 895 09
(200-230 V / 460 V +/- 10%) USA version		Part No. 166 37
E 250, without motor, with 50 Hz gear ^{3) 4)}		
Sealing kit, pump		Part No. 192 63
Vibration absorbing metal feet		Part No. 101 55
SECUVAC valve		
200-230 V, 50/60 Hz		Part No. 215 207
115 V, 50/60 Hz		Part No. 215 206
ANSI adaptor		upon request

¹⁾ To DIN 28 400 and following numbers

²⁾ Operated at ultimate pressure without gas ballast, free field measurement at a distance of 1 m (3.5 ft). When fitting accessories, for example AFK2, the noise level may change by 2 to 3 dB(A)

³⁾ For operation at a different frequency, the gear will have to be exchanged. Please state the main frequency and connection (star or delta) in your order

⁴⁾ The maximum speed must not exceed 1,500 rpm at 50 Hz. The motor rating must be at least 5 kW (6.8 hp)

*) Continuous operation from 60 mbar (45 Torr)

Two-stage Rotary Piston Vacuum Pump DK 200

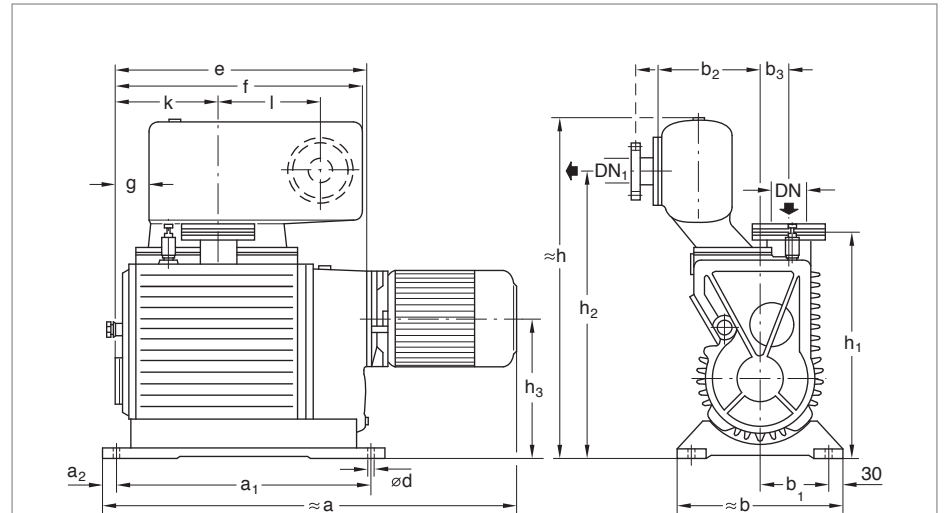
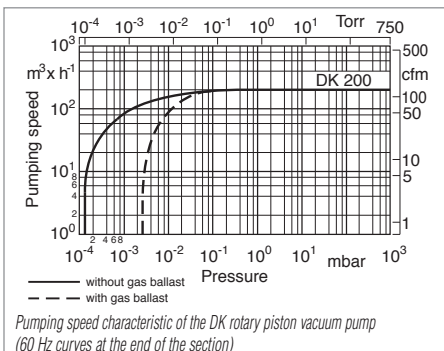
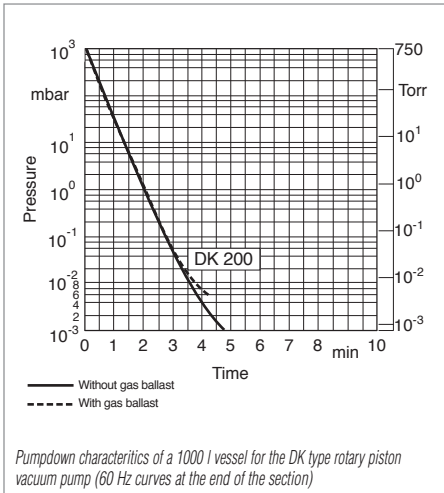


Typical Applications

- ◆ For particularly low ultimate pressures
- ◆ High vacuum stage with degassed oil from a separate oil reservoir
- ◆ For all chemical, metallurgical and electronic vacuum processes in the pressure range down to 5 x 10⁻⁴ mbar (3 x 10⁻⁴ Torr) without gas ballast and 4 x 10⁻³ mbar (2.4 x 10⁻³ Torr) with gas ballast
- ◆ Backing pump for Roots vacuum pumps
- ◆ Use as backing pump in pump systems in connection with diffusion, booster-type diffusion and vapor pumps

Supplied Equipment

- ◆ With DN 65 DIN flanges on the intake and exhaust sides for direct connection of DN 63 ISO-K flange components
- ◆ Ready for operation, complete with oil filling
- ◆ Special models for different motor voltages, motor frequencies and other protection class ratings available



	DN	DN ₁	a ¹⁾	a ₁	a ₂	b	b ₁	b ₂	b ₃	ød	e	f	g	h	h ₁	h ₂	h ₃	k	l
mm	63 ISO-K	63 ISO-K	1190	780	30	340	140	202	52	14	777	750	65	740	475	636	295	337	290
in.	63 ISO-K	63 ISO-K	4.17	2.73	1.05	1.19	0.49	0.71	0.18	0.05	2.72	2.63	0.23	2.59	1.66	2.23	1.03	1.78	1.02

Pump flanges to DIN 2501 with sealing disc and collar flange for the connection of ISO-K (KF) components

¹⁾ Only for the motor which is supplied as standard

Dimensional drawing for the DK 200 two-stage rotary piston vacuum pump

Technical Data		DK 200	
		50 Hz	60 Hz
Nominal pumping speed ¹⁾	m ³ x h ⁻¹ (cfm)	225 (132.5)	
Pumping speed ¹⁾	m ³ x h ⁻¹ (cfm)	200 (117.8)	
Ultimate partial pressure without gas ballast ¹⁾	mbar (Torr)	< 5 x 10 ⁻⁴ (< 3 x 10 ⁻⁴)	
Water vapour tolerance ¹⁾	mbar (Torr)	26 (19.5)	
Average noise level to DIN 45 635 ²⁾	dB(A)	< 76	
Main voltage	V	230/400/3/50	208-230/460/3/60
Motor power at			
220 / 380 V, 50 Hz	kW (hp)	5.5 (7.5)	
200-230 V / 380 V, 60 Hz	kW (hp)	5.5 (7.5)	
Nominal motor speed	rpm	1500	1800
Speed of the pump	rpm	540	
Motor protection	IP	54	
Oil filling	l (qt)	4.4 (4.6)	
Weight	kg (lbs)	375 (827)	
Intake port	DN	63 ISO-K	
Exhaust port	DN	63 ISO-K	

Ordering Information	DK 200
Two-stage rotary piston vacuum pump DK 200, with 50 Hz motor ³⁾ (220 / 380 V +/- 10%) DK 200, with 60 Hz motor ³⁾ , *) (200-230 V / 460 V +/- 10%) USA version DK 200, without motor, 50 Hz gear ³⁾ ⁴⁾	Part No. 111 16 Part No. 895 10 Part No. 166 17
Sealing kit, pump	Part No. 192 63
Vibration absorbing metal feet	Part No. 101 55
SECUVAC valve	Part No. 105 62
ANSI adaptor	upon request

¹⁾ To DIN 28 400 and following numbers

²⁾ Operated at ultimate pressure without gas ballast, free field measurement at a distance of 1 m (3.5 ft). When fitting accessories, for example AFK2, the noise level may change by 2 to 3 dB(A)

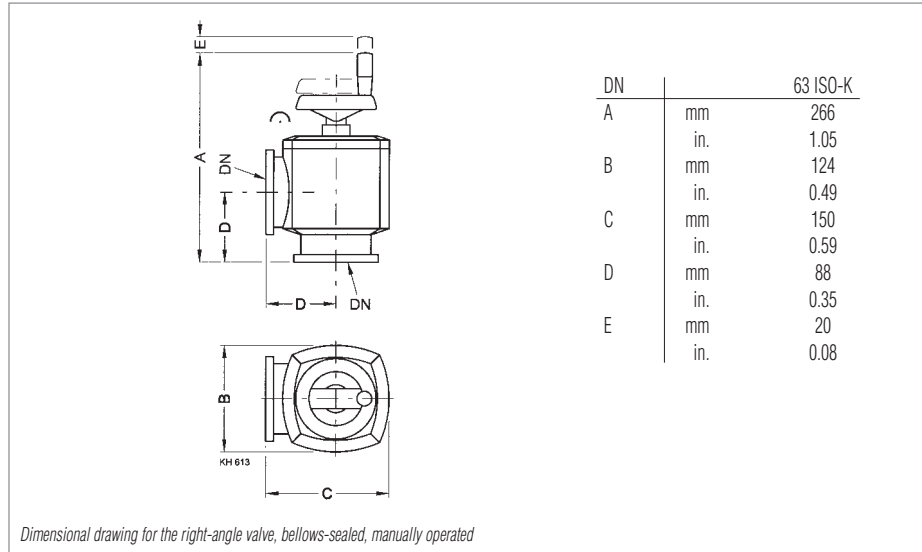
³⁾ For operation at a different frequency, the gear will have to be exchanged. Please state the main frequency in your order

⁴⁾ The maximum speed must not exceed 1,500 rpm at 50 Hz. The motor rating must be at least 5 kW (6.8 hp)

*) Continuous operation from 30 mbar (22.5 Torr)

Valves

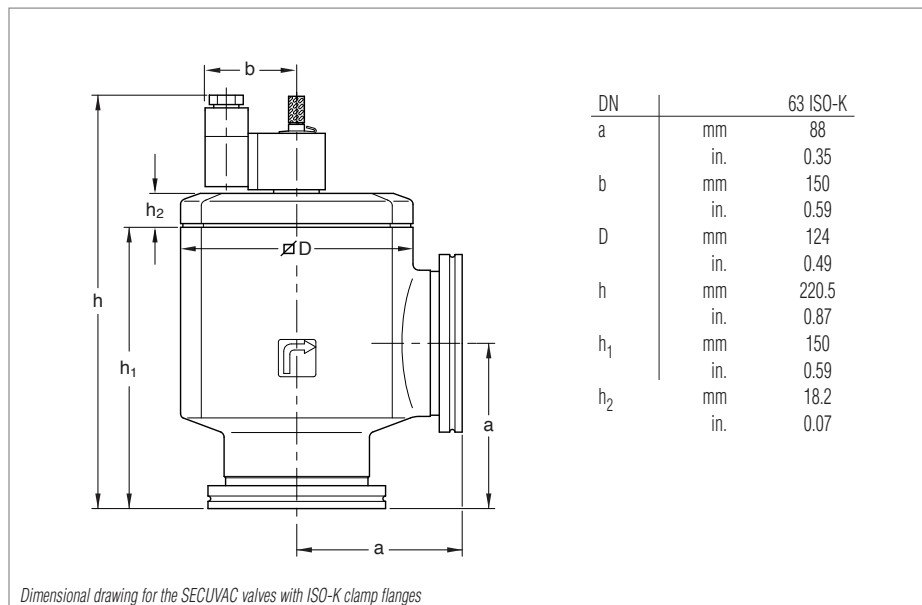
The flange components which are required for installation of the accessories to the pump must be ordered separately. For flange components and valves please refer to the corresponding Product Sections C13 and C14.



Advantages to the User

- ◆ The pump may warm up while the intake line is isolated
- ◆ Energy-conserving and environmentally-friendly operation at ultimate pressure
- ◆ The pump may continue to operate while the vacuum chamber is vented for brief periods
- ◆ After completion of a process the pump may continue to operate so as to regenerate the oil

Ordering Information	Right Angle Valve
Right angle valve DN 63 ISO-K, AI, manually operated	Part No. 107 80



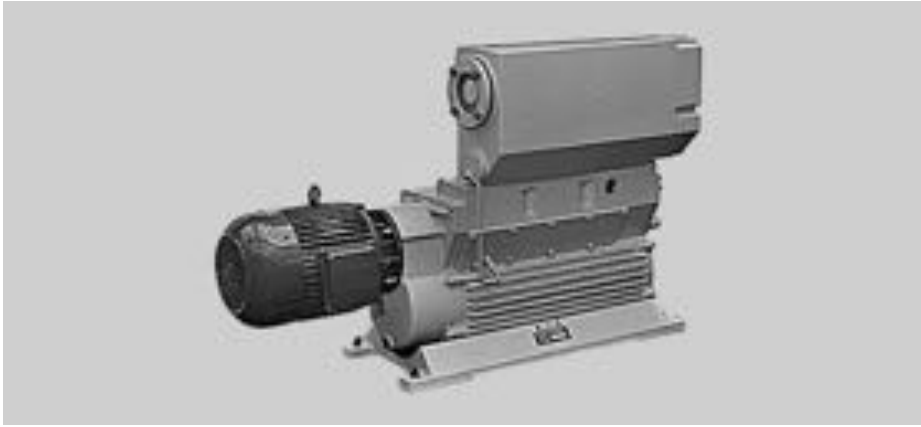
Advantages to the User

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 intake line has been evacuated
- ◆ Delayed isolation of the vacuum chamber and venting the vacuum pump (negligible "gulp")

Ordering Information	SECUVAC Valve
SECUVAC valve DN 63 ISO-K 24 V DC 100 - 115 V AC 200 - 230 V AC	Part No. 215 205 Part No. 215 206 Part No. 215 207

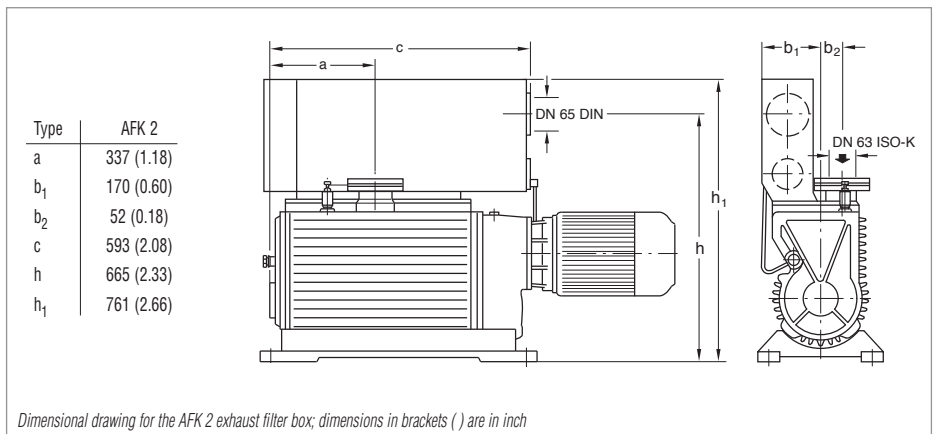
Exhaust Filter Box AFK 2



The oil mists entrained in the exhaust gas from the pump are cleaned in the exhaust filter box. The exhaust filter box is installed instead of the standard filter box on the rotary piston vacuum pump.

Advantages to the User

- ◆ At intake pressures below 100 mbar (75 Torr) this is a space saving alternative to the separate exhaust filter
- ◆ Almost oil-free exhaust gas, over 99 % effective
- ◆ Exchangeable filter elements
- ◆ Built-in overpressure valves
- ◆ Low oil consumption due to the integrated oil return line



Technical Notes

In case of toxic or hazardous gases and vapors the exhaust lines must comply with the safety regulations.

Technical Data		AFK 2
Weight	kg (lbs)	10 (22.1)
Connection for collar flange	DN	63 ISO-K
Ordering Information		AFK 2
AFK 2 exhaust filter box, for E 250, DK 200		Part No. 189 47
Replacement filter element (FE) (2 are required)		Part No. 189 85

Oil Filter Unit



Mechanical oil filters are required when a severe contamination of the pump's oil can be expected due to solid particles like dust, for example.

Advantages to the User

- ◆ Protection of the pump against contamination of its oil
- ◆ Longer service life for the oil
- ◆ Easy to fit without having to disassemble the pump

Mechanical Oil Filter Unit

- ◆ Automatic oil circulation from the oil reservoir on the exhaust side via the filter to the intake chamber
- ◆ Filter insert which is easy to exchange (bypass filter)
- ◆ Particulate retention to 3 microns

Technical Notes

Increases the required quantity of oil by about 1.3 liters (1.34 qt).

When using the oil filter, the pump must be vented when shut down in order to prevent the oil from rising into the intake line; for this we suggest you install a SECUVAC valve.

Ordering Information

Mechanical oil filter unit with special filter insert, complete with adaptor screw and mount for attachment to the pump

Oil Filter Unit

Part No. 101 31

Replacement filter

Part No. 101 32

Ordering Information

Oil control unit

Oil Control Unit

Part No. 101 37

Replacement filter

Part No. 101 32

Oil Control Unit



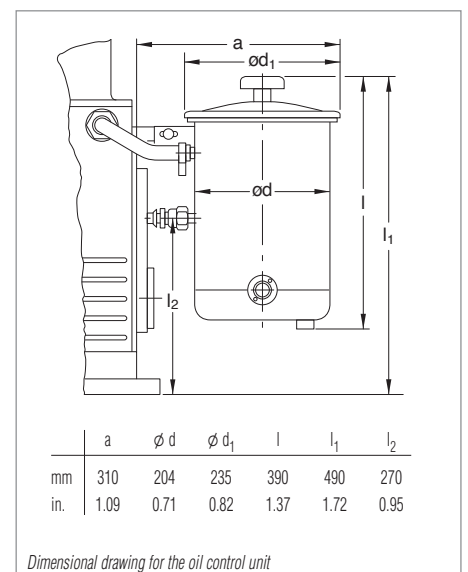
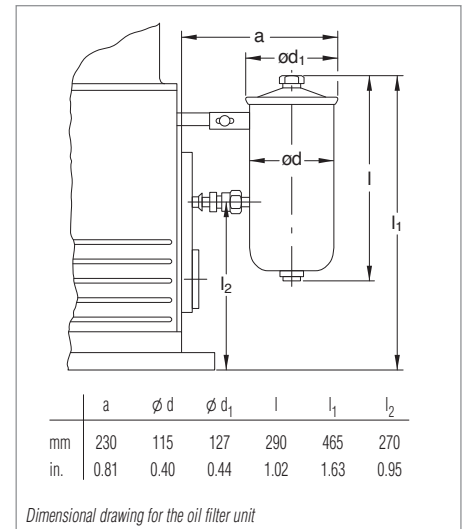
Adding the oil can be automated through the oil control unit without having to interrupt operation. For this purpose, an additional oil reservoir holding 7 liters (7.4 qt) is connected to the pump.

Advantages to the User

- ◆ Optimum oil level over long periods of operation
- ◆ Reduction of oil losses
- ◆ Visual function check (transparent connecting hose)
- ◆ Simple installation of the unit without the need to disassemble the pump
- ◆ Closed circuit by connection of oil reservoir, vessel and pump
- ◆ Built-in filter insert separates mechanical contamination

Technical Notes

You must under all circumstances use a SECUVAC valve, otherwise the oil reservoir will be emptied by the pump as soon as it is switched off.



AK 100-250 Condensate Separator



Welded condensate collecting vessels.

Advantages to the User

- ◆ May be used either on the intake or the exhaust side
- ◆ Corrosion-protected
- ◆ Condensate level glass
- ◆ Protects the pump against condensate which collects in the exhaust line and the intake line
- ◆ Effect independent of the direction of flow

Technical Notes

When used on the intake side the drain cock must provide a vacuum-tight seal.

Half of the quantity of required clamping screws is provided.

AF 100-250 A Exhaust Filter



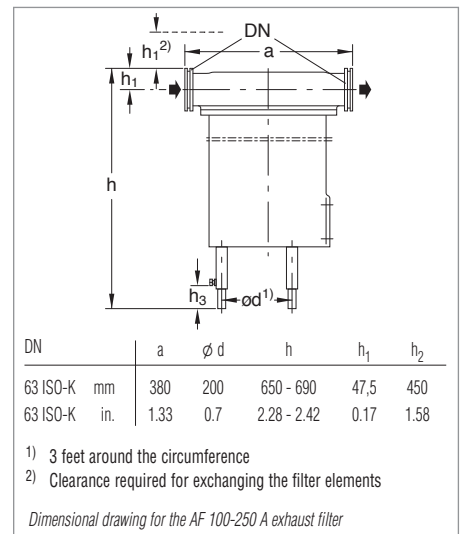
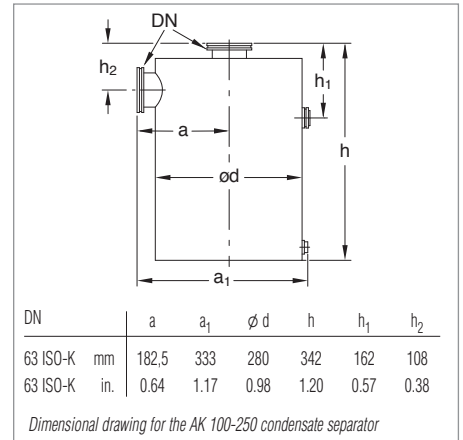
To remove oil mists entrained in the exhaust gas.

Advantages to the User

- ◆ Over 99% effective
- ◆ Optimally matched to our rotary piston vacuum pumps
- ◆ Exchangeable filter insert
- ◆ Built-in overpressure valves
- ◆ Sight glass for checking the amount of separated oil
- ◆ Solvent-resistant, helium-tight
- ◆ Cast aluminium housing
- ◆ Oil return (optional)

Technical Notes

In case of toxic or hazardous gases and vapors the exhaust lines must comply with the safety regulations.



Technical Data		AK 100-250
Capacity for condensate	l (qt)	10 (9.46)
Weight	kg (lbs)	12 (26.5)
Connection	DN	63 ISO-K

Ordering Information		AK 100-250
AK 100-250 condensate separator		Part No. 188 45
Drain cock, vacuum-tight		Part No. 190 90
Connection components		
Connection to the intake side of the E 250, DK 200		
Elbow		Part No. 887 25
Centering ring		Part No. 268 07

Technical Data		AF 100-250 A
Weight	kg (lbs)	12 (26.5)
Connection	DN	63 ISO-K

Ordering Information		AF 100-250 A
AF 100-250 A exhaust filter		Part No. 189 45
Replacement filter element (2 are required)		Part No. 189 85
Drain cock, vacuum-tight		Part No. 190 90
Connection components		
Connection to the E 250, DK 200		
Bellows		Part No. 887 70
Centering ring ISO-K		Part No. 268 07

FS 100-250 Dust Filter



Dust filters protect the pumps against the intake of dust.

Advantages to the User

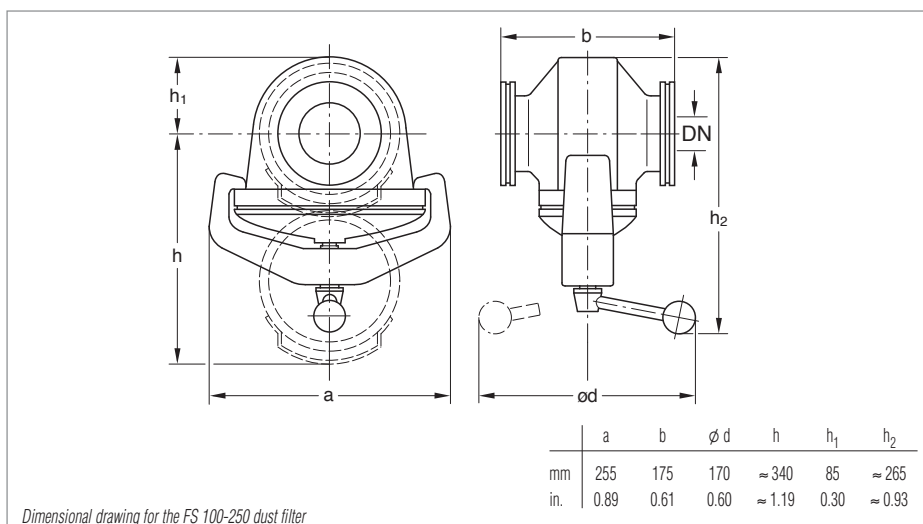
- ◆ Easy to disassemble
- ◆ Vacuum-tight cast housing
- ◆ Replacement filters
- ◆ Separates dust from a grain size of 1 µm

Technical Notes

Install horizontally so that the filter insert may be removed from below.

In case of very large quantities of dust use a dust separator.

Only throttles the pumping speed significantly at very low intake pressures.



Supplied Equipment

Half of the quantity of required clamping screws is provided.

Technical Data		FS 100-250
Connection to pump		E 250, DK 200
Throttling of pumping speed		
at an intake pressure of 13 mbar (9.8 Torr) approx. %		28
at an intake pressure of 1.3 mbar (0.98 Torr) approx. %		38
Weight	kg (lbs)	11 (24.3)
Connection	DN	63 ISO-K
Ordering Information		FS 100-250
FS 100-250 dust filter		Part No. 278 17
Filter insert		Part No. 178 37
Replacement cotton wadding cartridges (1 set = 10 pieces)		Part No. 178 27
Connection components		
Connection to the E 250, DK 200		
Elbow		Part No. 887 25
Centering ring		Part No. 268 07
ANSI adaptor		upon request

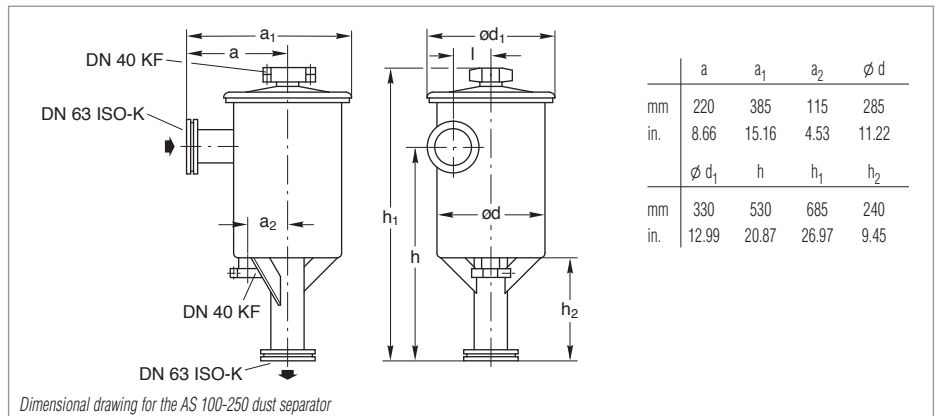
AS 100-250 Dust Separator



Dust separators protect the pumps against being contaminated by dust.

Advantages to the user

- ◆ Dust separator for large quantities of dust
- ◆ Dual-stage, thus low throttling effect
- ◆ Cyclone and wet filter
- ◆ Replacement inserts for both filters
- ◆ Dust of a grain size of 2 µm and more are separated in a cyclone
- ◆ Finer dust is separated in an insert moistened with oil



Technical Notes

Dust separator filters throttle the pumping speed only at low intake pressures.

Supplied Equipment

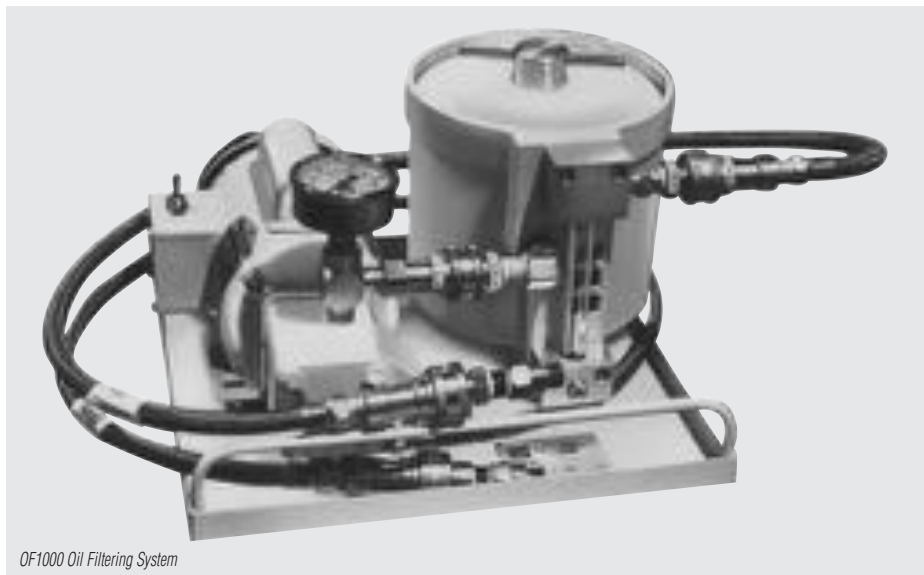
Half of the quantity of required clamping screws is provided.

Technical Data		AS 100-250
Connection to pump		E 250, DK 200
Throttling of pumping speed		
at an intake pressure of 13 mbar (9.8 Torr) approx. %		3.5
at an intake pressure of 1.3 (0.98 Torr) mbar approx. %		7
Capacity for dust	l	4.0
Weight	kg (lbs)	27 (59.5)
Connection	DN	63 ISO-K
Ordering Information		AS 100-250
AS 100-250 dust separator		Part No. 178 02
Filter insert		Part No. 178 06



Version for the North and South American Continents

OF1000 Oil Filtering System



OF1000 Oil Filtering System

Advantages to the User

- ◆ Choice of Single- and Dual-Canister Models for Standard or Chemically Severe Applications
- ◆ Compact Design
- ◆ Reliable Operation
- ◆ Choice of Four Filtering Elements
- ◆ Dripless Quick Disconnects for Easy Removal and Replacement of Filter Elements
- ◆ Recessed Lid and Oil Level – No Oil Spillage
- ◆ Conductive Teflon Hoses for Static Charge Dissipation – No Oil Leakage Due to Static Burning
- ◆ Integral Gear Pump with Built-In Bypass
- ◆ Fluid Sight Glass and Flow Monitor
- ◆ Pressure Gauge
- ◆ Small Precharge Fluid Volume
- ◆ Single Phase 50/60 Hz Motors Standard

Applications

Standard series models are widely used in silicon production processes, including LPCVD, low-pressure epitaxy, ion implantation, reactive ion etching and several plasma processes. Such processes employ a variety of gases which can react with pump fluid, resulting in the formation of sludge, particulates and acids. The standard OF1000 model has proven effective at extending maintenance intervals in such applications.

Similarly, chemically resistant OF1000C models have proven successful in aluminum etching and other processes where boron trichloride and other highly toxic gases are employed. The canister, gear pump, fittings and quick disconnects of the corrosive-service model have been specially treated with a fluorocarbon material that substantially increases the life of these components.

OF 1000 Oil Filtering Systems are designed to remove acids and particulates from the lubricating fluid used in Leybold mechanical vacuum pumps. The systems are located externally from the vacuum pump, and utilize their own integral gear pump in conjunction with a bypass to continuously recycle fluid through a filtering medium; the medium is housed in an element/canister assembly which additionally serves to absorb heat, and thus reduce the operating temperature of the vacuum pump.

OF1000 Systems are available in both single- and dual-canister designs. Both types are highly compact and reliable, and can be supplied in models for standard or chemically severe applications.

Single-canister OF1000 models are distinguished by their smaller footprint while dual-canister configurations afford the advantages of multi-media filtration and increased oil capacity. Dual-canister models are designed for series flow through two side-by-side mounted canisters, and thus can be used to filter oil through two different media on the same pass or for double filtration through elements containing the same medium. The models also enable the vacuum pump to operate at somewhat lower temperatures, while providing it with a larger supply of clean, filtered oil.

All OF1000 models are supplied with a choice of four filtering elements. The Fullers Earth element provides high capacity for standard acids and can be used to trap particulates down to 10 micron in size. Hydrophilic, activated alumina and fiberglass particulate elements are also available. The hydrophilic element is particularly effective for hydrolyzed acids, and can also be used to trap particles as small as 1 micron. The activated alumina element provides 10 micron particulate retention and is extremely effective for Lewis acids and polar compounds. The fiberglass element is suitable for particulate removal down to 10 micron.

The element/canister assembly of OF1000 systems is easy to install, extremely easy to remove and replace. The recessed lid and oil level of the assembly safeguards against the possibility of spillage. Dripless quick disconnects are also provided for easy canister removal and safer disposal of the filtering element and oil.

OF1000 Systems also come equipped with flexible Teflon hoses designed to resist dielectric breakdown. The systems thus ward against the possibility of oil leaks due to pinholing or static burning of the hose.

Version for the North and South American Continents

Technical Data		Single-Canister Systems	Dual-Canister Systems
Gear Pump Motor		1/6 HP, 115/208/220V, single phase, 50/60Hz, wired for 115V, with on/off switch ¹⁾	
Gear Pump		0.7 gpm @ 1800 RPM	
Pressure Gauge		0 to 100 psig (0 to 70 kPa)	
Pump Fluid Capacity		15 lb perfluorinated polyether or 3.75 qt hydrocarbon oil	29 lb perfluorinated polyether or 7.25 qt hydrocarbon oil
Flexible Hoses		3/8 in. I.D. teflon/carbon black with stainless steel braid – 4 ft lengths ²⁾	
Dimensions	in. (mm)	16 x 14 x 11 (406 x 356 x 279)	23 x 14 x 11 (585 x 356 x 279)
Flow Arrangement		–	series ³⁾
Weight (Dry)	lbs	45	60
Ordering Information		Single-Canister Systems	Dual-Canister Systems
Oil Filtering System			
OF1000 Less Filtering Element and Oil		Part No. 898 550	Part No. 898 552
OF1000 Prepared for PFPE, Less Filtering Element and Oil		Part No. 898 551	Part No. 898 553
OF1000C Chemically Severe Service, Prepared for PFPE Fluid		Part No. 898 561	Part No. 898 554
Accessories			
Spare Filter Canister Assembly With Quick Disconnect Prepared for PFPE, With Quick Disconnect Chemically Severe Service		Part No. 898 555 Part No. 898 556 Part No. 898 566	Part No. 898 557 (front), Part No. 898 555 (rear) Part No. 898 558 (front), Part No. 898 556 (rear) Part No. 898 559 (front), Part No. 898 566 (rear)
Filtering Elements			
Aluminum Oxide — High Capacity for Reagent Grade HCl; Removes Lewis Acids and PolarCompounds; 10 Micron Particulate Retention		Part No. 898 504	Part No. 898 504
Fullers Earth — Acid and Particulate Filter with Capacity of 34 ml Reagent Grade HCl; 10 Micron Particulate Retention		Part No. 898 505	Part No. 898 505
Hydrophilic — Water and HCl Acid Absorbing Capabilities; 1 Micron Particulate Retention		Part No. 898 506	Part No. 898 506
Particulate — Fiberglass Element with 10 Micron Particulate Retention		Part No. 898 507	Part No. 898 507

¹⁾ Hazardous duty models and special voltages also available

²⁾ Optional 6, 10 and 15 feet hoses available

³⁾ Optional parallel flow arrangement also available

Version for the North and South American Continents

OF3000 Oil Filtering System



The OF3000 is a compact, highly mobile filtering system designed for use with mechanical pumps in applications generating large volumes of heavy particulate filtration.

A positive feed gear pump and check valve assembly protect against excessive backpressure in the canister should the filter element become clogged. Flexible hoses and matched dripless connectors ensure easy maneuverability of the OF3000's rollaround cart, while also eliminating the possibility of oil spills.

Operation

Contaminated oil is removed from the drain location on the vacuum pump and is cycled to the element assembly. Clean oil is subsequently circulated back to the oil fill port of the vacuum pump.

The tangential flow inlet port to the oil filter canister allows full oil flow while utilizing the entire filter capability of the element. This translates into longer filter life, fewer element changes, and less oil loss.

Similarly, chemically severe OF3000 models have proven successful in aluminum etching and other processes where boron trichloride and other highly toxic gases are employed. The canister, gear pump, fittings and quick disconnects of the corrosive-service model have been specially treated with a fluorocarbon material that substantially increases the life of these components.

Advantages to the User

- ◆ Compact, mobile design
- ◆ Choice of five filter elements
- ◆ Dripless quick disconnects for easy removal and replacement of filter elements
- ◆ No spillage - recessed lid and oil level
- ◆ Conductive teflon hoses for static charge dissipation
- ◆ Integral gear pump with built-in bypass
- ◆ Pressure gauge
- ◆ Oil sight glass
- ◆ Single phase 50/60 Hz motor standard
- ◆ Tangential flow inlets - improves oil flow
- ◆ Canister drain valve

Filtering Elements

Fullers Earth - Provides high capacity for standard acids and can be used to trap particulates down to 10 micron size.

Hydrophilic - Effective for hydrolyzed acids and particulates as low as one micron.

Activated Alumina - Effective on Lewis acids and polar compounds. Can be used to trap particulates down to 10 microns.

Particulate (Paper) - Suitable for particulate removal down to 10 microns.

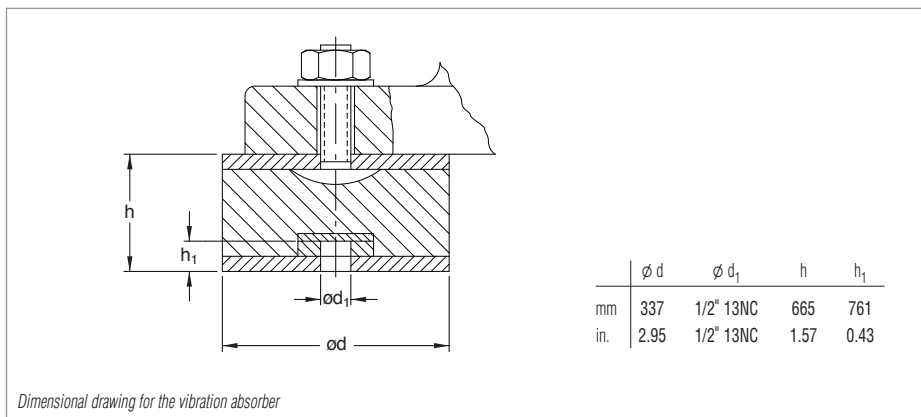
Particulate (Fiberglass) - Suitable for particulate removal down to 10 microns.

Version for the North and South American Continents

Technical Data		OF3000	Ordering Information	OF3000
Gear pump motor		1/6 HP, 115/208/220 V, single phase, 50/60 Hz, wired for 115 V, with on/off switch	OF3000, less element and oil (standard)	Part No. 898 625
Gear pump		0.7 gpm @ 1800 rpm	OF3000C, coated, prepared for PFPE	Part No. 898 450
Pressure gauge		0 to 100 psig (0 to 70 kPa)	OF3000, prepared for PFPE	Part No. 898 455
Fluid capacity (approx.)	gal	3	Accessories	
Flexible hoses	in. I.D.	78 teflon/carbon black with stainless steel braid - 6 ft lengths	Aluminum oxide	Part No. 898 523
Dimensions	in. (mm)	18 x 14 x 26 (457 x 355 x 661)	Hydrophilic	Part No. 898 525
Weight (dry)	lbs (kg)	65 (29.4)	Fullers earth	Part No. 99 171 159
			Particulate (paper)	Part No. 898 599
			Particulate (fiberglass)	Part No. 99 171 158



Vibration Absorber



E and DK series rotary piston mechanical pumps are dynamically balanced for vibration-free performance in normal. In applications where pumps must be installed on light frames or wooden flooring, however, excess vibration can result from the lack of solid support.

Advantages to the User

- ◆ Reduce transmitted vibration by 60%
- ◆ Rubber vibration-absorbent varies in hardness for pumps of different weights
- ◆ Tapped holes provided in absorbers for attaching to frame or floor
- ◆ Shipped complete with all necessary mounting hardware

Ordering Information	Vibration Absorber
Vibration absorber (set of 4) (for E 250, DK 200)	Part No. 101 55-1

Version for the North and South American Continents

AK 100-250 Condensate Separator



Welded condensate collecting vessels.

Advantages to the User

- ◆ May be used either on the intake or the exhaust side
- ◆ Corrosion-protected
- ◆ Condensate level glass
- ◆ Protects the pump against condensate which collects in the exhaust line and the intake line
- ◆ Effect independent of the direction of flow

Technical Notes

When used on the intake side the drain cock must provide a vacuum-tight seal.

Half of the quantity of required clamping screws is provided.

AF 100-250 A Exhaust Filter



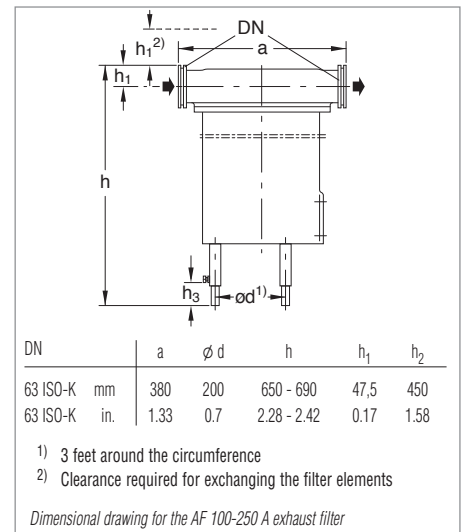
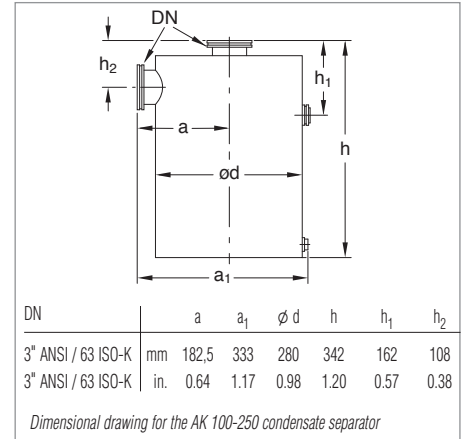
To remove oil mists entrained in the exhaust gas.

Advantages to the User

- ◆ Over 99% effective
- ◆ Optimally matched to our rotary piston vacuum pumps
- ◆ Exchangeable filter insert
- ◆ Built-in overpressure valves
- ◆ Sight glass for checking the amount of separated oil
- ◆ Solvent-resistant, helium-tight
- ◆ Cast aluminium housing
- ◆ Oil return (optional)

Technical Notes

In case of toxic or hazardous gases and vapors the exhaust lines must comply with the safety regulations.



Technical Data		AK 100-250
Capacity for condensate	l (qt)	10 (9.46)
Weight	kg (lbs)	12 (26.5)
Connection	DN	63 ISO-K
Ordering Information		AK 100-250
AK 100-250 condensate separator, DN 63 ISO-K		Part No. 188 45
AK 100-250 condensate separator, ASA		Part No. 188 45-M
Vacuum-tight draining tap (pump inlet)		Part No. 190 90
Inlet position (E 150, E 250, DK 100, DK 200)		
3" elbow (1 is required)		Part No. 98-278-0347
3" ANSI rotatable flanges (2 are required)		Part No. 98-278-0700
3" ANSI seal disc (2 are required)		Part No. 910-181-605
Exhaust position (E 250, DK 200)		
3" ANSI seal disc (2 are required)		Part No. 910-181-605

Technical Data		AF 100-250 A
Weight	kg (lbs)	12 (26.5)
Connection	DN	63 ISO-K
Ordering Information		AF 100-250 A
AF 100-250 A exhaust filter, DN 63 ISO-K		Part No. 189 45
AF 100-250 A exhaust filter, ASA		Part No. 189 45-M
Kit includes		
Exhaust filter		Part No. 189 45
ANSI bellows		Part No. 991-051-013
ANSI sealing disc (2 are required)		Part No. 910-181-605
ANSI rotatable flange		Part No. 982-780-700
Spare filter elements for E 250, DK 200 (2 are required)		Part No. 390-261-44
Drain tap		Part No. 188 90
Note: Fittings will adapt filter only to exhaust port of pump. Kit does not include fittings to adapt exit port of filter. Please refer to section C13 "Vacuum Fittings" for additional options		

Vacuum Pump Oils

Lubricating oils for rotary vacuum pumps need to fulfil demanding requirements. Their vapor pressure must be low also at high temperatures, water content and water uptake must be minimal. Their viscosity characteristics need to be flat, lubricating properties need to be excellent and they must resist cracking upon being mechanically stressed.

All the vacuum pump 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 pumps from the E + DK series.

We therefore recommend the exclusive use of vacuum pump oils fully qualified by Leybold so as to ensure optimum performance of the Leybold vacuum pumps and also to ensure optimum oil change intervals.

Under vacuum conditions lubricating oils, especially those with additives may behave quite differently than expected. Additives may adversely affect the attainable ultimate pressure and may react with the media being pumped.

When using not suitably qualified third party oils, the oil change intervals and the performance of the vacuum pump may be reduced. Also unwanted deposits may occur which may even cause severe damage to the vacuum pump. For these reasons please understand that we must make our warranty commitment dependent on the use of oils which have been qualified by us. Damages caused by the use of not suitably qualified lubricating oils are not covered by our warranty.

In order to adapt the pumps to the different applications of our customers, different types of oil are used in the E + DK pumps.

Please note that owing to differing properties not all types of oil may be used in all pumps of the E + DK series. If you can not find the combination of pump and oil you require please ask us for a quotation.

Lubricant Types

Mineral Oils

Mineral oils are products distilled and refined from crude oil. These do not consist of precisely defined compounds but rather consist of a complex mixture. The way in which the mineral oil is pre-treated and its composition are 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.

Perfluorinated polyether (PFPE)

These are oils which are only composed of carbon (C), fluorine (F) and oxygen atoms (O). The existing C-O and C-F bonds are highly stable. For this reason PFPE oils are practically inert against all chemical and oxidising influences.

Perfluorinated polyether will not polymerise under the influence of high energy radiation.

For all lubricants from our line of products you may obtain Safety Data Sheets from the Dept. Technical Support in Cologne.

PFPE is non-flammable. Leybold NC1/14 has the approval of BAM (Federal Institute for Materials Research and Testing) for pumping of pure oxygen.

Perfluorinated polyether are used when pumping strongly reactive substances like oxygen (O₂), fluorine F₂ and uranium hexafluoride UF₆. Regarding Lewis acids (for example, boron trifluoride BF₃, aluminum trichloride AlCl₃) they are not completely inert. Here reactions may take place at temperatures over 100 °C (212 °F).

Perfluorinated polyether are thermally highly stable. Thermal decomposition may only take place at temperatures of over 290 °C (554 °F).

Caution: Perfluorinated polyether will – when decomposed – release toxic and corrosive gases: hydrogen fluoride HF, carbonyl difluoride COF₂. 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 perfluorinated polyether, since it is essential that the pumps be free of hydrocarbons.

Changing from one basic type of oil to PFPE must be left exclusively to authorised Service Centers. The pump 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.

Application Data	Special Oil N62	NC 1/14
Type of oil	Paraffin-base mineral oil, core fraction, free of additives	Perfluorinated polyether PFPE
Examples of areas of application and process media	Standard oil For pumping air, chemically inert permanent gases (noble gases, for example), water vapor, solvent vapors in the case of laboratory pumps operated with cold traps	For pumping strong oxidants like oxygen, O ₂ , ozone O ₃ , nitrogen oxides NO _x and sulphur oxides (SO ₂ , SO ₃) as well as reactive substances like halogens (for example fluorine F ₂ , chlorine Cl ₂), hydrogen halides (for example hydrogen chloride HCl, hydrogen bromide HBr), uranium hexafluoride UF ₆ , and conditionally Lewis acids (for example boron trichloride BCl ₃) Use only in pumps modified for PTFE
Remarks	The ultimate pressures stated in our catalogs are based on operation of the pump with N62 (except for the PFPE pumps) Service life may be extended through the use of an oil filter	Avoid pumping water vapour, in particular in connection with corrosive media (see above) Ingress of water vapor must be avoided The use of an oil filter is strongly recommended
Elastomer compatibility		
FPM (Viton)	Suited	Suited
NBR (Perbunan) ¹⁾	Conditionally suited	Suited
EPDM	Not suited	Suited

Technical Data	Special Oil N62	NC 1/14
Viscosity		
at 40 °C (104 °F)	mm ² /s 90	47
at 100 °C (212 °F)	mm ² /s 10	5
Flash point	°C (°F) > 255 (> 491)	- 2)
Vapor pressure		
at 20 °C (68 °F)	mbar (Torr) < 1 x 10 ⁻⁵ (< 0.75 x 10 ⁻⁵)	3 x 10 ⁻⁷ (2.25 x 10 ⁻⁷)
at 100 °C (212 °F)	mbar (Torr) < 3 x 10 ⁻³ (< 2.25 x 10 ⁻³)	6 x 10 ⁻⁴ (4.5 x 10 ⁻⁴)
Density at 20 °C (68 °F)	g/ml 0.88	1.89
Pour point	°C (°F) < -9 (< -16)	-40 (40)
Middle molecular weight	g/mol 550	2500

Ordering Information	Special Oil N62	NC 1/14
1 litre (1.06 qt)	Part No. 177 01	Part No. 177 38
5 litres (5.29 qt)	Part No. 177 02	-
20 litres (21.14 qt)	Part No. 177 03	-
180 kg (397.4 lbs)	Part No. 177 05	-

Please note that the technical data stated are only typical data. Slight variations from batch to batch must be expected.

The technical data stated here can not be taken as assured properties

- Resistance to decomposing is very much dependent on the share of acrylonitrile in the NBR
- Caution:** Perfluorinated polyether will, when being decomposed at temperatures over 290 °C (554 °F), release toxic and corrosive gases
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

Version for the North and South American Continents

Application Data	HE-200	HE-2700
Type of oil	Paraffin-base mineral oil, core fraction, free of additives	Perfluorinated polyether PFPE
Examples of areas of application and process media	Standard oil for Leybold USA For pumping air, chemically inert permanent gases (noble gases, for example), water vapor, solvent vapors in the case of laboratory pumps operated with cold traps	For pumping strong oxidants like oxygen, O ₂ , ozone O ₃ , nitrogen oxides NO _x and sulphur oxides (SO ₂ , SO ₃) as well as reactive substances like halogens (for example fluorine F ₂ , chlorine Cl ₂), hydrogen halides (for example hydrogen chloride HCl, hydrogen bromide HBr), uranium hexafluoride UF ₆ , and conditionally Lewis acids (for example, boron trichloride BCl ₃)
Remarks	The ultimate pressures stated in our catalogs are based on operation of the pump with HE-200 (except for the DOT and PFPE pumps) Service life may be extended through the use of an oil filter.	Use only correspondingly modified pumps Mixing with other types of oil must be absolutely avoided The uptake of water vapor must be avoided The use of an oil filter is strongly recommended
Elastomer compatibility		
FPM (Viton)	Suited	Suited
NBR (Perbunan) ¹⁾	Conditionally suited	Suited
EPDM	Not suited	Suited

C06

Technical Data	HE-200	HE-2700
Viscosity		
at 20 °C (68 °F) mm ² /s (= cSt)	–	250
at 40 °C (104 °F) mm ² /s (= cSt)	58	–
at 100 °C (212 °F) mm ² /s (= cSt)	9.1	10
Flash point °C (°F)	224 (435)	Not known ²⁾
Vapor pressure		
at 20 °C (68 °F) mbar (Torr)	–	6.7 x 10 ⁻⁷ (5 x 10 ⁻⁷)
at 25 °C (77 °F) mbar (Torr)	4.7 x 10 ⁻⁶ (3.5 x 10 ⁻⁶)	–
at 100 °C (212 °F) mbar (Torr)	3.9 x 10 ⁻⁴ (2.9 x 10 ⁻⁴)	6.7 x 10 ⁻⁵ (5 x 10 ⁻⁵)
Density at 20 °C (68 °F) g/ml	0.88	1.89
Pour point °C (°F)	- 10 (14)	- 34 (- 30)
Molecular weight	480	4600

Ordering Information	HE-200	HE-2700
1 qt (1 l)	Part No. 98 198 006	–
1 gal (3.8 l)	Part No. 98 198 007	–
5 gal (18.9 l)	Part No. 98 198 008	–
55 gal (208 l)	Part No. 98 198 010	–
Bottle 2 lb (0.91 kg)	–	Part No. 898 565-1
Bottle 4 lb (1.81 kg)	–	Part No. 898 565-2
Bottle 16 lb (7.25 kg)	–	Part No. 898 565-4

Please note that the technical data stated are only typical data. Slight variations from batch to batch must be expected.

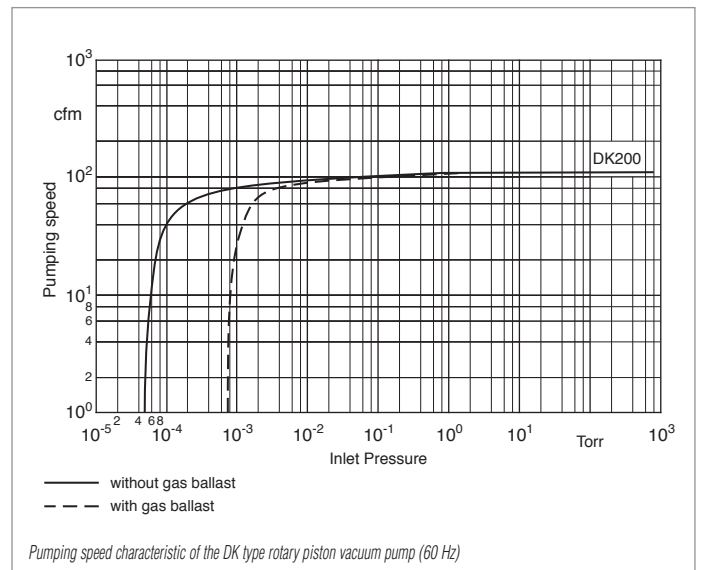
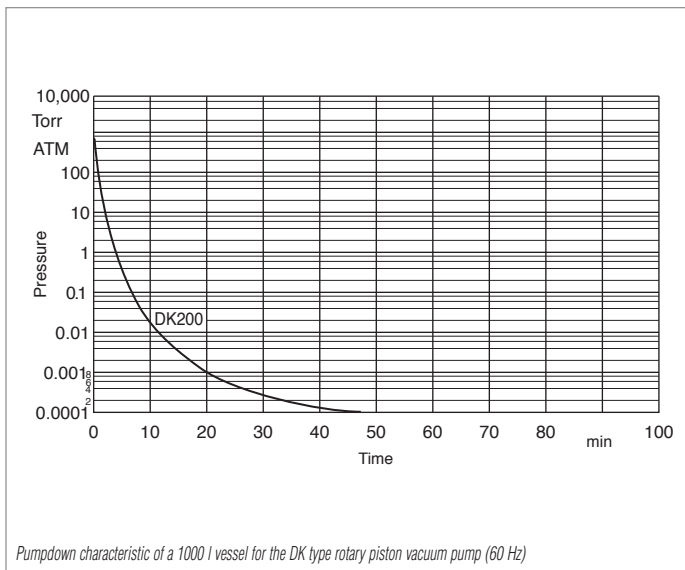
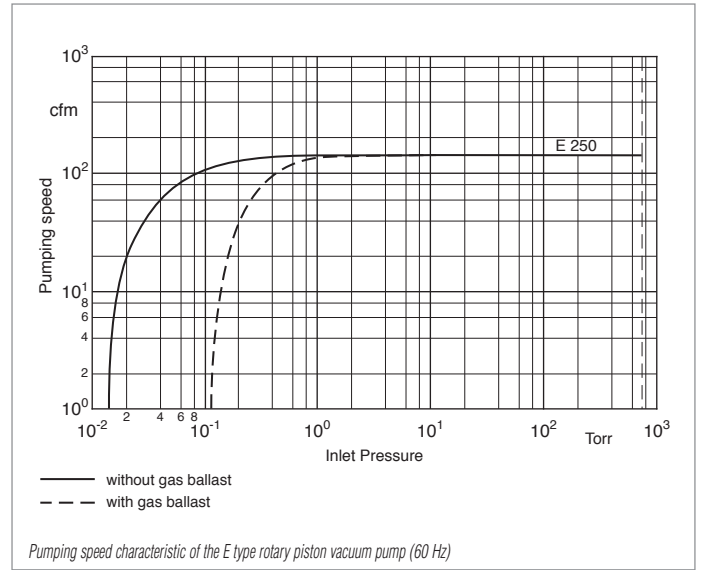
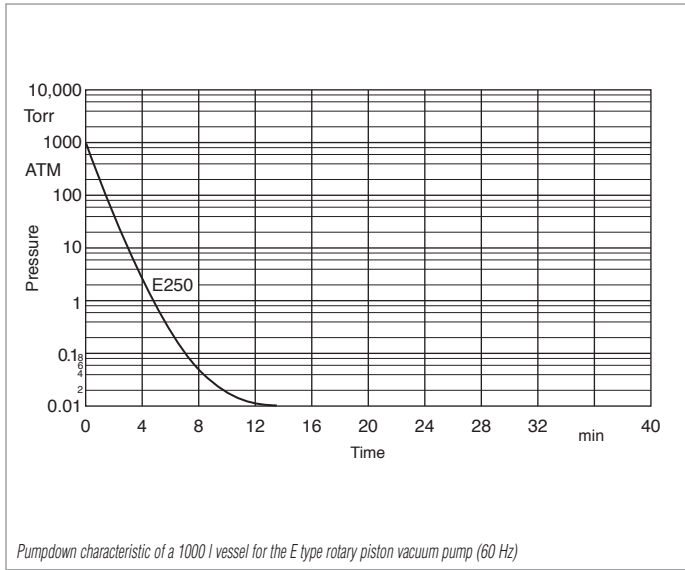
The technical data stated here can not be taken as assured properties

¹⁾ Resistance to decomposing is very much dependent on the share of acrylonitrile in the NBR

²⁾ **Caution:** Perfluorinated polyether will, when being decomposed at temperatures over 290 °C (554 °F), release toxic and corrosive gases

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

Version for the North and South American Continents

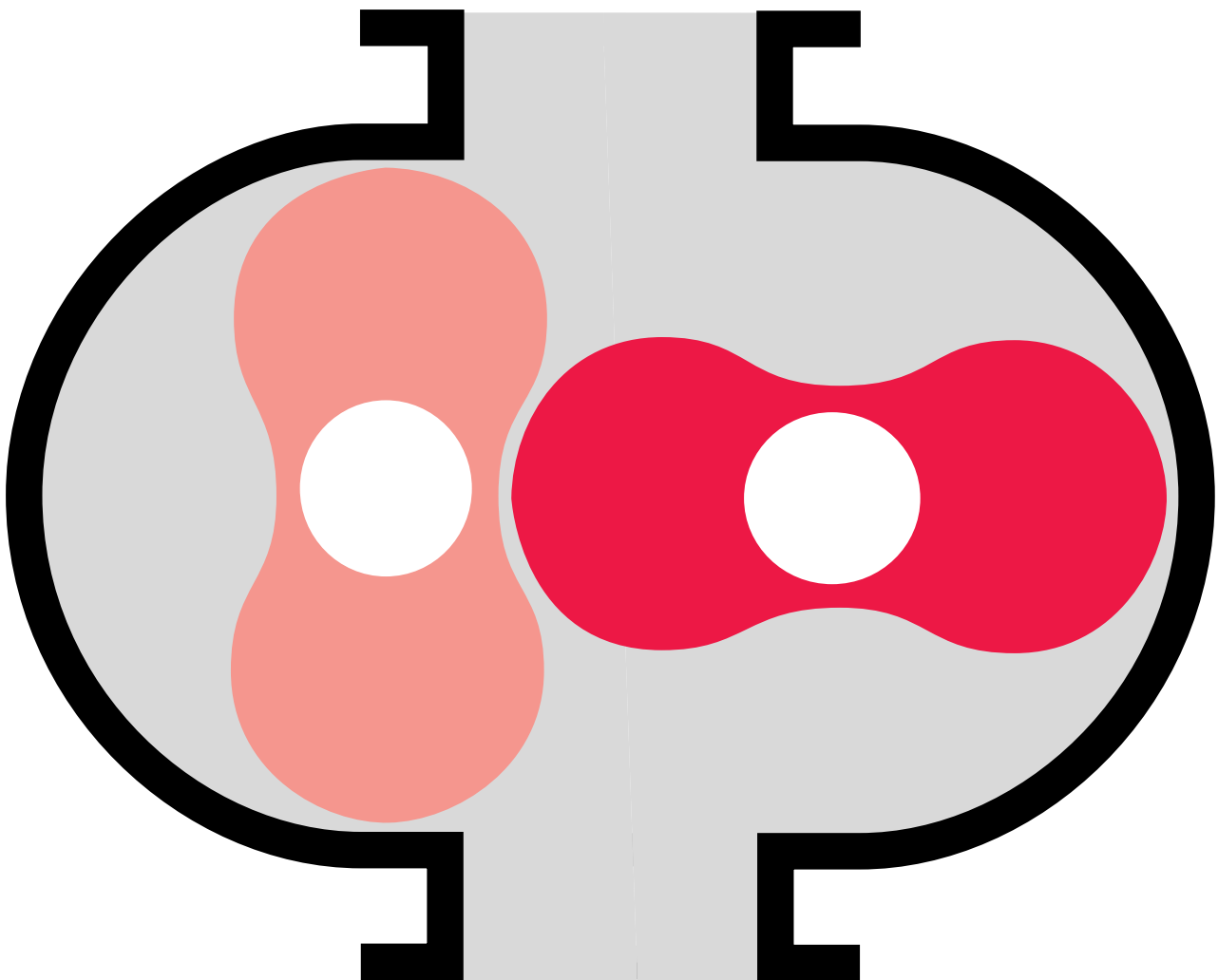


CO7

RUVAC

Roots Vacuum Pumps
Single-Stage

250 - 13 000 m³ x h⁻¹ (147.3 - 7657 cfm)



General

Applications and Accessories C07.02
 General Information on Roots Vacuum Pumps C07.03

Products

RUVAC WA/WAU Roots Vacuum Pumps with Flange-Mounted Motors C07.06
 RUVAC WS/WSU/PFPE Roots Vacuum Pumps with Canned Motors C07.08
 RUVAC WSLF Roots Vacuum Pumps for Laser Gas Systems C07.10
 RUVAC RA Roots Vacuum Pumps with Flange-Mounted Motors (50 Hz) C07.12
 RUVAC RA Roots Vacuum Pumps with Direct-Coupled Motors (60 Hz) C07.14

Accessories

Pressure Switches C07.16

Miscellaneous

Vacuum Pump Oils C07.17

Applications and Accessories

Roots Vacuum Pumps		WA/WAU	WS/WSU	WS/PFPE	WSLF	RA
Applications						
Semiconductor production				◆		
Vacuum coating		◆				◆
Large scale research			◆			◆
Chemistry/Pharmaceutical		◆				◆
Metallurgy/Furnaces		◆	◆			◆
Lamps and tubes manufacture			◆			
Laser engineering					◆	
Packaging		◆				
Central vacuum supplies		◆	◆			
Freeze drying		◆	◆			
Leak testing systems			◆			
Electrical engineering		◆	◆			◆
High purity gases/closed refrigerant cycles			◆		◆	
Mechanical engineering		◆	◆	◆	◆	◆
Automotive industry		◆	◆	◆	◆	◆
Accessories	Page					
Pressure switches	C07.16	◆	◆	◆	◆	◆

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

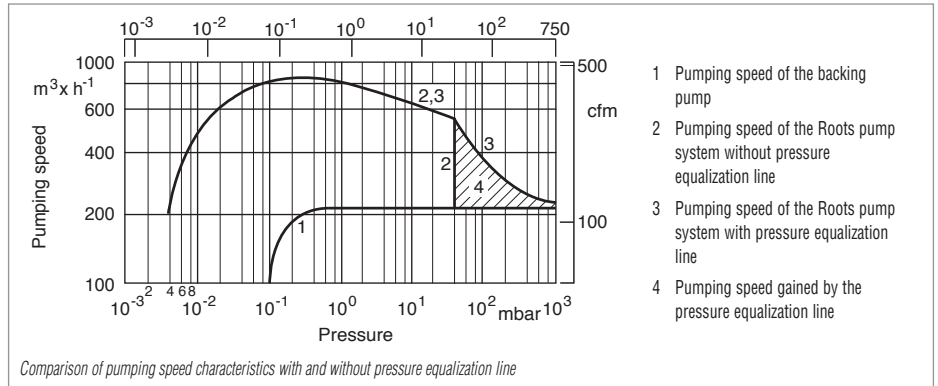
As a rule of the thumb one may say that Roots vacuum pumps are capable of improving the attainable ultimate pressure of a pump system by a factor of 10. With two Roots vacuum pump stages and a corresponding backing pump it is possible to attain pressures in the range down to 10^{-5} mbar (0.75×10^{-5} Torr). Under certain circumstances this will make the use of additional high vacuum pumps (turbomolecular 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 $1000 \text{ m}^3/\text{h}$ (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.

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).
- ◆ High-purity gases or hazardous gases impose strict requirements on the leak-tightness of the system. Canned motors 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 force-fed 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.

The effective air cooling arrangement reduces operating costs to a minimum. Cooling water is not required. These characteristics make the Roots vacuum pump attractive for almost all rough and medium vacuum applications.



Pump system with RA Roots vacuum pumps



Pump system with RA Roots vacuum pump and SOGEVAC rotary vane vacuum pump

Semiconductor Technology

In the area of semiconductor technology, Roots vacuum pumps are found in etching processes among others, and in use with dry compressing vacuum 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 x 10⁻¹ Torr) for the turbomolecular pump. In the case of dry compression, corrosive gases which also have a high particulate content must be pumped.

Canned motors and PFPE fluids provide a good seal against the outside and allow long periods between servicing, high reliability and thus very low operating costs (WS-PFPE-types).

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.

Due to the uncontrolled influx of gas, a high of pumping speed must be attained quickly, in order to keep the vacuum (1 to 30 mbar (0.75 to 22.5 Torr)) permanently available to all consumers. This in particular, is implemented by Roots vacuum pumps having a pressure equalization line (WAU-types).

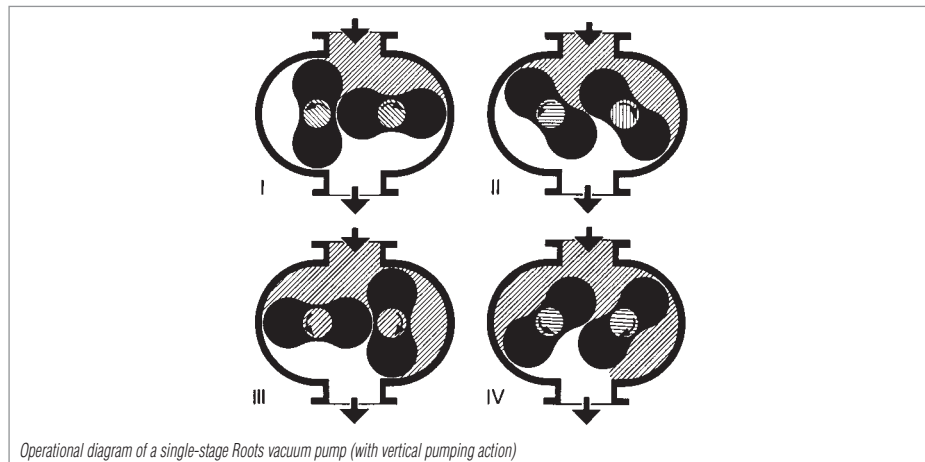
Chemistry

Replacement of vapor jet or gas jet pumps on liquid ring pumps in drying and distillation plants is necessary for attaining the required operating pressure of about 1 mbar (0.75 Torr). Reduction of operating costs by entirely eliminating vapor or gas quantities includes separation of these on the pressure side (WA and RA-types).

Laser Systems

Continuous circulation of the gas in order to remove heat from a closed cycle in which pressure differentials of up to 100 mbar (75 Torr) must be maintained. The tough requirements regarding purity necessitate a total absence of contamination by oil and dust. This is ensured by reducing the pressure level in the oil chambers as well as by coating the pump chamber. The pumps are assembled and tested under clean room conditions.

The canned motor ensures a high degree of leak-tightness to the outside and permits operation in connection with a frequency converter (WSLF-types).



Operating Principle

Roots vacuum pumps, which are also called Roots blowers, are rotary plunger type pumps where two symmetrically 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) 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.

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 ($p > 10$ mbar ($p > 7.5$ Torr)) whereas in the medium vacuum range ($p < 1$ mbar ($p < 0.75$ 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 (exception RAV) 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.

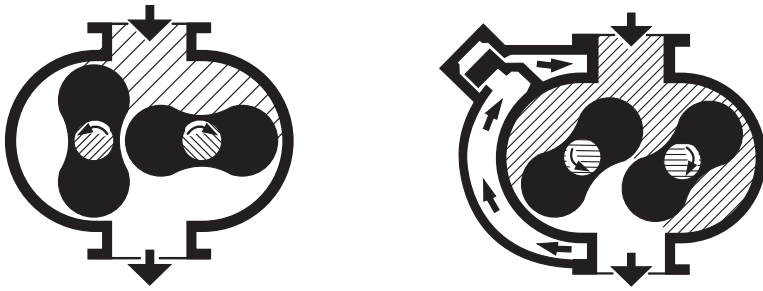
Suitably designed oil supply systems in both chambers ensure that a sufficient quantity of oil is supplied to the gear wheels and bearings at all permissible speeds.

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.





Schematic section through a RUVAC WA/WS (left) and a RUVAC WAU/WSU (rights)

- ◆ **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.
- ◆ **Pressure equalization line**
The integrated pressure equalization line connects the exhaust flange to the intake flange through a differential pressure valve. This valve opens at a high pressure differential between the flanges. Part of the gas then flows through this line back to the intake flange. This is why the Roots vacuum pump may be switched on at atmospheric pressure together with the backing pump. This also increases the pumping speed of the pump combination at high intake pressures.
- ◆ **Special ACE vibration absorber**
These pumps are best used in applications involving frequent pumpdown 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 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 (fluorocautchouc).

The WS/WSU series pumps are driven by canned motors.

Roots vacuum pumps of the series WAU/WSU 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 WSLF

The pumps of these series are especially adapted Roots vacuum pumps from the RUVAC WS series which are intended for operation with gas lasers.

They are driven by a canned motor so that a shaft seal for sealing against atmospheric pressure is not required.

Air-cooled series with nominal pumping speeds of $1000 \text{ m}^3 \times \text{h}^{-1}$ (589 cfm) are available.

The RUVAC WSLF series with increased motor ratings is intended for operation in connection with frequency converters.

These pumps are available with nickel-plated or plasma-nitrated surface as standard.

All pumps of these series are supplied with a horizontal pumping action.

Vertical pumping action is available upon request.

RUVAC RA

RA series Roots vacuum pumps are equipped with a directly flange-mounted three-phase motor (RA 13 000 via V-belt drive).

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 $65 \text{ m}^3 \times \text{h}^{-1}$ (9.4 and 38.3 cfm)
 - SOGEVAC with pumping speeds between 16 and $1200 \text{ m}^3 \times \text{h}^{-1}$ (9.4 and 707 cfm)
- ◆ Dry compressing piston vacuum pumps
 - EcoDry L with pumping speeds between 38 and $48 \text{ m}^3 \times \text{h}^{-1}$ (22 and 28 cfm)
- ◆ Dry compressing screw vacuum pump for PI
 - SCREWLine SP630 with pumping speed of $630 \text{ m}^3 \times \text{h}^{-1}$ (371 cfm)
- ◆ Rotary piston vacuum pumps
 - E and DK with pumping speeds between 200 and $250 \text{ m}^3 \times \text{h}^{-1}$ (117.8 and 147.3 cfm)
- ◆ Roots vacuum pumps with pre-inlet cooling
 - RUVAC RAV G with pumping speeds between 250 and $8100 \text{ m}^3 \times \text{h}^{-1}$ (147.3 and 4770.9 cfm)
- ◆ Liquid ring vacuum pumps upon request

RUVAC WA/WAU Roots Vacuum Pumps with Flange-Mounted Motors



RUVAC WAU 2001 single-stage Roots vacuum pump shown with ISO-K 160 collar flanges

Advantages to the User

- ◆ Two air-cooled series, each with four models
- ◆ Reliable and trouble-free
- ◆ Sealing rings with their housing can be readily replaced
- ◆ Shaft seals and elastomer seals made of FPM/Viton
- ◆ Standard motors in accordance with IEC dimensions
- ◆ Easy to exchange with custom motors
- ◆ Integrated pressure equalization line for protection against overloading at high pressures on WAU models

tection against overloading at high pressures on WAU models

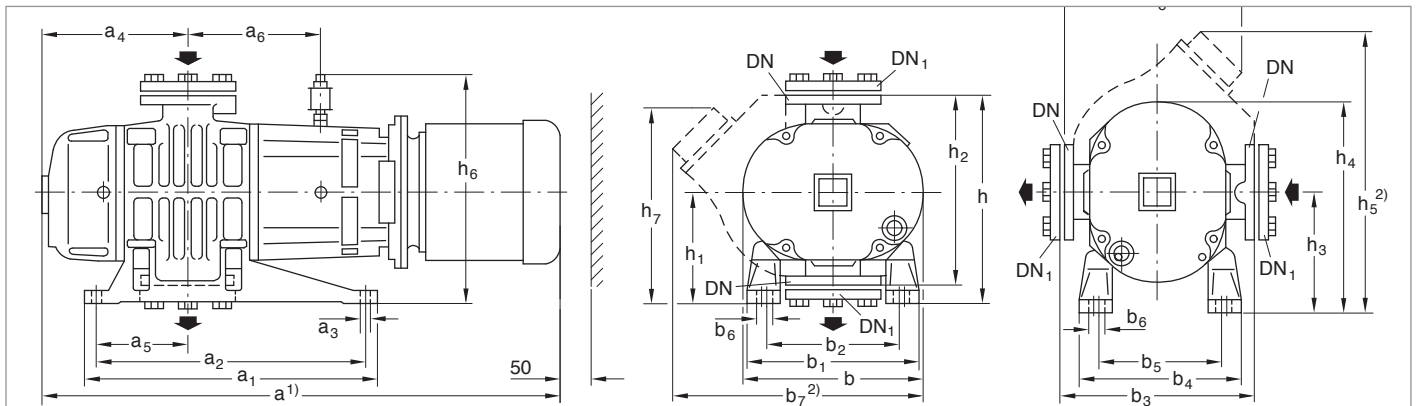
- ◆ Pumping direction may be changed as required
- ◆ Ex T3 and T4 motor possible

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
- ◆ Gasket in the intake flange with dirt sieve
- ◆ The required oil filling is included in separate bottles



	DN/DN ₁	a ¹⁾	a ₁	a ₂	a ₃	a ₄	a ₅	a ₆	b	b ₁	b ₂	b ₃	b ₄	b ₅	b ₆	b ₇ ²⁾	b ₈	h	h ₁	h ₂	h ₃	h ₄	h ₅ ²⁾	h ₆	h ₇	
WA/WAU 251	mm	63 ISO-K	732	405	365	14	212	120	194	250	270	210	280	230	170	24	305	285	300	160	280	180	306	360	330	307
	in.	63 ISO-K	28.82	15.94	14.37	0.55	8.35	4.72	7.64	9.84	10.63	8.27	11.02	9.06	6.69	0.94	12.01	11.22	11.81	6.30	11.02	7.09	12.05	14.17	12.99	12.09
WA/WAU 501	mm	63 ISO-K	835	486	450	14	239	155	218	307	299	229	320	271	201	24	390	313	340	180	320	194	348	430	370	332
	in.	63 ISO-K	32.87	19.13	17.72	0.55	9.41	6.10	8.58	12.09	11.77	9.02	12.60	10.67	7.91	0.94	15.35	12.32	13.39	7.09	12.60	7.48	13.70	16.93	14.57	13.07
WA/WAU 501H	mm	63 ISO-K	835	486	450	14	239	155	218	307	299	229	320	271	201	24	414	330	340	180	320	194	348	450	370	350
	in.	63 ISO-K	32.87	19.13	17.72	0.55	9.41	6.10	8.58	12.09	11.77	9.02	12.60	10.67	7.91	0.94	16.30	12.99	13.39	7.09	12.60	7.48	13.70	17.72	14.57	
WA/WAU 1001	mm	100 ISO-K	1050	560	520	16.5	300	180	262	372	352	278	370	320	246	24	490	366	396	211	370	227	414	532	425	392
	in.	100 ISO-K	41.34	22.05	20.47	0.65	9.41	6.10	10.31	14.65	13.86	10.94	14.57	12.60	7.91	0.94	19.29	14.41	15.59	8.31	14.57	8.94	16.30	20.94	425	15.43
WA/WAU 1001H	mm	100 ISO-K	1050	560	520	16.5	300	180	262	372	352	278	370	320	246	24	524	398	396	211	370	227	414	564	425	424
	in.	100 ISO-K	41.34	22.05	20.47	0.65	9.41	6.10	10.31	14.65	13.86	10.94	14.57	12.60	7.91	0.94	20.63	15.67	15.59	8.31	14.57	8.94	16.30	22.20	425	16.69
WA/WAU 2001	mm	160 ISO-K	1275	800	740	18	369	220	310	457	518	388	460	422	292	23	635	456	530	300	460	351	578	753	541	523
	in.	160 ISO-K	50.20	31.50	29.13	0.71	14.53	8.66	12.20	17.99	20.39	15.28	18.11	16.61	11.50	0.91	25.0	17.95	20.87	11.81	18.11	13.82	22.76	29.65	21.3	20.59
WA/WAU 2001H	mm	160 ISO-K	1275	800	740	18	369	220	310	457	518	388	460	422	292	23	642	460	530	300	460	351	578	760	541	530
	in.	160 ISO-K	50.20	31.50	29.13	0.71	14.53	8.66	12.20	17.99	20.39	15.28	18.11	16.61	11.50	0.91	25.28	18.11	20.87	11.81	18.11	13.82	22.76	29.92	21.3	20.87

¹⁾ Dimension a refers to the standard type of motor supplied by us
²⁾ RUVAC WAU only

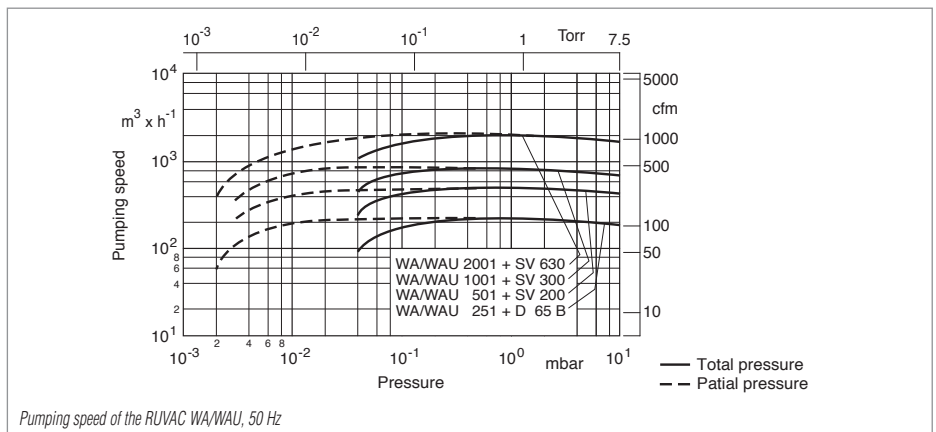
DN = ND 6 pump flange in accordance with DIN 2501
 DN₁ = Collar flange with gasket for connecting ISO-K standard components

Dimensional drawing for the RUVAC WA/WAU pumps

Technical Data		WA/WAU 251	WA/WAU(H) 501	WA/WAU(H) 1001	WA/WAU(H) 2001
Nominal pumping speed ¹⁾	m ³ x h ⁻¹ (cfm)	253 (149)	505 (297.4)	1000 (589)	2050 (1207.5)
Max. pumping speed	m ³ x h ⁻¹ (cfm)	210 (123.7)	450 (265.1)	890 (524.2)	1850 (1089.7)
at a pumping speed for the backing pump of	m ³ x h ⁻¹ (cfm)	65 (38.3)	160 (94.2)	250 (147.3)	630 (371.3)
Ultimate partial pressure ²⁾	mbar (Torr)	< 2 x 10 ⁻³ (1.5 x 10 ⁻³)	< 3 x 10 ⁻³ (2.25 x 10 ⁻³)	< 3 x 10 ⁻³ (2.25 x 10 ⁻³)	< 3 x 10 ⁻³ (2.25 x 10 ⁻³)
Ultimate total pressure ²⁾	mbar (Torr)	< 4 x 10 ⁻² (3 x 10 ⁻²)	< 4 x 10 ⁻² (3 x 10 ⁻²)	< 4 x 10 ⁻² (3 x 10 ⁻²)	< 4 x 10 ⁻² (3 x 10 ⁻²)
Permissible cut-in pressure RUVAC WA	mbar (Torr)	31 (23.3)	37 (27.8)	27 (20.3)	22 (16.5)
at a pumping speed for the backing pump of	m ³ x h ⁻¹ (cfm)	65 (38.3)	160 (94.2)	250 (147.3)	630 (371.3)
Max. permissible pressure difference during continuous operation ³⁾	mbar (Torr)	80 (60)	80 (60)	80 (60)	50 (37.5)
Main supply, 50 Hz	Δ/Y	V	220-240/380-420	220-240/380-420	380-420
60 Hz	Δ/Y	V	250-277/440-480	250-277/440-480	380-480/655-725
60 Hz	3 phase	V	200-230/460	200-230/460	460
Insulation class		F			
Motor power	kW (hp)	1.1 (1.5)	2.2 (3.0)	4.0 (5.4)	7.5 (10.2)
Nominal speed, approx. (50/60 Hz)	rpm	3000/3600			
Max. permissible speed	rpm	3600			
Type of protection	IP	54			
Oil filling for the bearing chamber ⁴⁾		1. Filling ⁵⁾ / 2. Filling	1. Filling ⁵⁾ / 2. Filling	1. Filling ⁵⁾ / 2. Filling	1. Filling ⁵⁾ / 2. Filling
vertical pumping action, approx.	l (qt)	0.65 (0.69) / 0.6 (0.63)	0.9 (0.95) / 0.8 (0.85)	2.0 (2.11) / 1.8 (1.90)	3.85 (4.07) / 3.6 (3.81)
horizontal pumping action, approx.	l (qt)	0.5 (0.53) / 0.45 (0.48)	0.75 (0.79) / 0.7 (0.74)	1.2 (1.27) / 1.1 (1.16)	2.6 (2.75) / 2.4 (2.54)
Oil filling of the shaft sealing ring housing	l (qt)	0.6 (0.63)	1.0 (1.06)	1.3 (1.37)	1.6 (1.69)
Connection flanges ^{*)}	DN	63 ISO-K	63 ISO-K	100 ISO-K	160 ISO-K
Weight WA/WAU	kg (lbs)	85/89 (187.4/196.2)	128/133 (282.2/293.3)	220/225 (485.1/496.1)	400/406 (882/895.2)
Noise level ⁶⁾	dB(A)	< 64	< 67	< 75	< 80

Ordering Information	WA/WAU 251	WA/WAU(H) 501	WA/WAU(H) 1001	WA/WAU(H) 2001
Roots vacuum pump				
RUVAC WA	Part No. 117 20	Part No. 117 30	Part No. 117 40	Part No. 117 50
RUVAC WA (60 Hz, 3 phase) ⁷⁾	Part No. 917 20	Part No. 917 30	Part No. 917 40	Part No. 917 50
RUVAC WAU	Part No. 117 21	Part No. 117 31	Part No. 117 41	Part No. 117 51
RUVAC WAU (60 Hz, 3 phase) ⁷⁾	Part No. 917 21	Part No. 917 31	Part No. 917 41	Part No. 917 51
RUVAC WA, without motor	Part No. 117 24	Part No. 117 34	Part No. 117 44	—
RUVAC WAU(H), with special ACE vibration absorber	—	Part No. 118 31	Part No. 118 41	Part No. 118 51
RUVAC WA/WAU(H) seal kit	Part No. 194 60	Part No. 194 64	Part No. 194 68	Part No. 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	Part No. 200 03 179	Part No. 200 03 179	Part No. 200 03 180	Part No. 200 03 181
WAU/WSU pump	Part No. 200 03 179	Part No. 200 03 179	Part No. 200 03 180	Part No. 200 03 182

- 1) To DIN 28 400 and subsequent numbers
- 2) With single-stage rotary vane vacuum pump TRIVAC, SOGEVAC
- 3) Applicable for ratio up to 1 : 10 between backing pump and Roots vacuum pump
- 4) Authoritative, however, is the oil level at the oil-level glass
- 5) After a complete disassembly
- 6) At an operating pressure below < 10⁻¹ mbar (< 0.75 x 10⁻¹ Torr)
- 7) 60 Hz pumps supplied with ANSI adapter flanges
- *) US models ASA flanges



RUVAC WS/WSU PFPE Roots Vacuum Pumps with Canned Motors



Single stage Roots vacuum pump RUVAC WSU 1001 shown with ISO-K 160 rotatable flanges

Advantages to the User

- ◆ Two series, each with four models
- ◆ Highly leak-tight air-cooled pumps driven by a canned motor
- ◆ Lubricated with mineral oil. RUVAC WS/WSU PFPE with perfluoropolyether (PFPE)
- ◆ WS and WS PFPE pumps are identical except for the lubricant and the shipping package
- ◆ No thermal problems due to the speed independent cooling arrangement using a separately connected fan, thus no thermal problems at low speeds
- ◆ Over-temperature switch in the stator coil of the motor
- ◆ All elastomer seals made of FPM/Viton
- ◆ Integrated pressure equalization line with differential pressure valve prevents overloading on WSU model
- ◆ RUVAC WS 251 to 2001 for use with a frequency converter for a wide frequency range
- ◆ No shaft feedthrough to the atmosphere, thus particularly leaktight
- ◆ Pumping direction may be changed as required

(0.75×10^{-2} and 0.75×10^{-4} Torr)

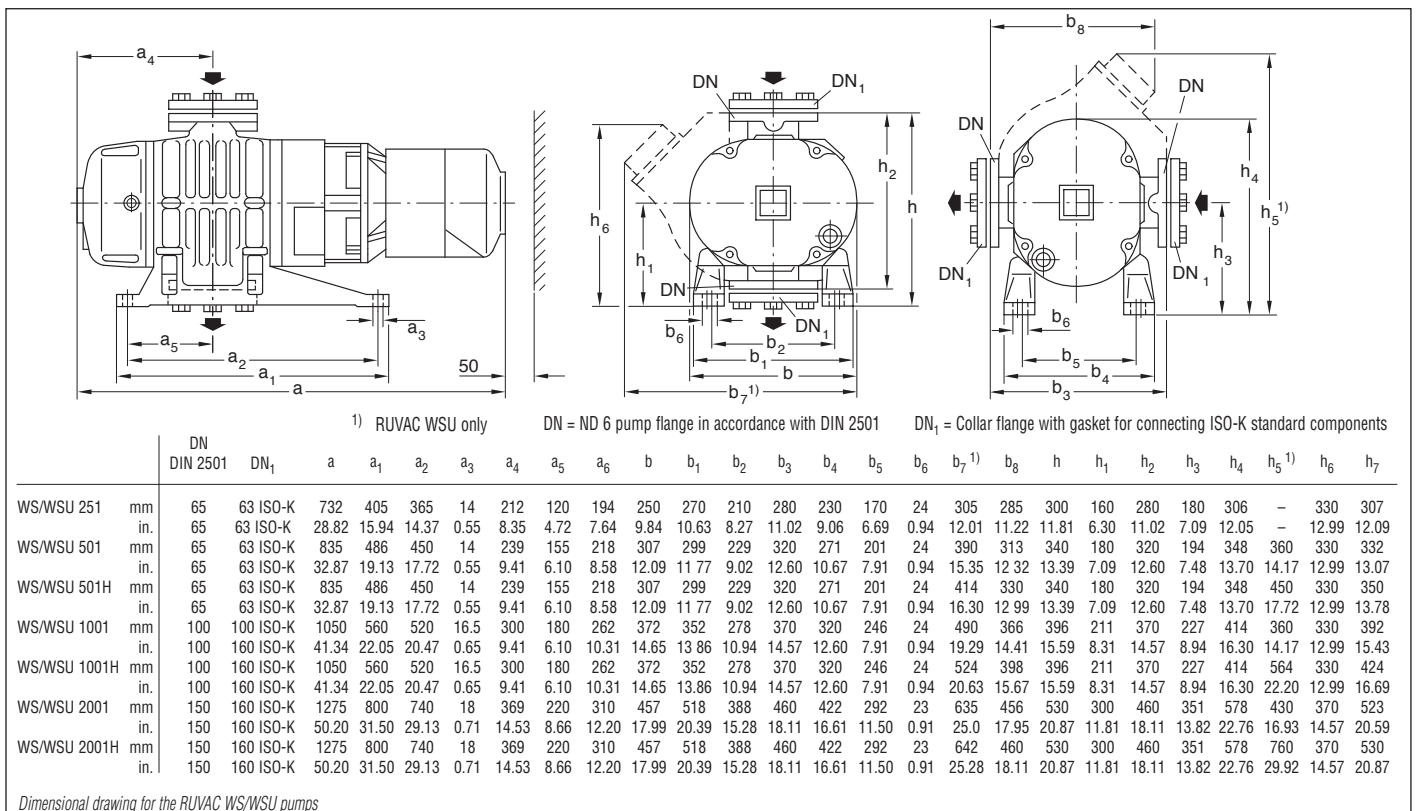
- ◆ Used where the possibility of contamination due air ingress or pumped media leakage must be avoided
- ◆ Suction or pumping of high-purity or radioactive gases

Supplied Equipment

- ◆ The required oil or PFPE filling is included in separate bottle
- ◆ Purged with nitrogen for corrosion protection
- ◆ Gasket in the intake flange with integrated dirt sieve

Typical Applications

- ◆ For applications which require a high pumping speed at pressures between 10^{-2} and 10^{-4} mbar



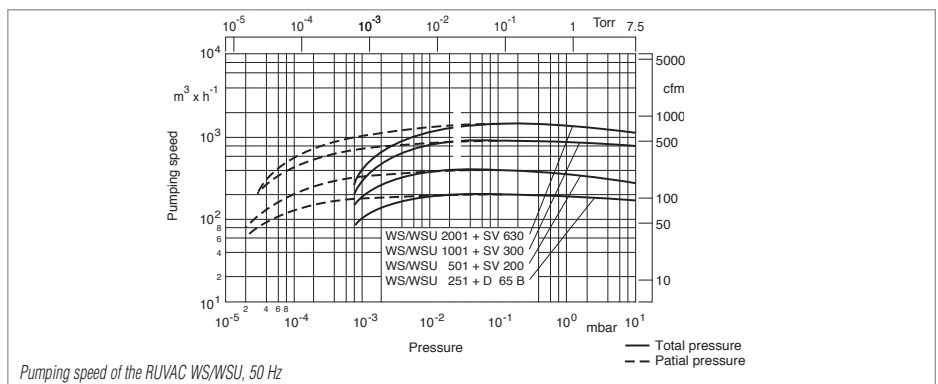
Dimensional drawing for the RUVAC WS/WSU pumps

Technical Data		WS/WSU 251	WS/WSU(H) 501	WS/WSU(H) 1001	WS/WSU(H) 2001
Nominal pumping speed ¹⁾	m ³ x h ⁻¹ (cfm)	253 (149)	505 (297.4)	1000 (589)	2050 (1207.5)
Max. pumping speed	m ³ x h ⁻¹ (cfm)	210 (123.7)	450 (265.1)	890 (524.2)	1850 (1089.7)
at a pumping speed for the backing pump of	m ³ x h ⁻¹ (cfm)	65 (38.3)	160 (94.2)	250 (147.3)	630 (371.3)
Ultimate partial pressure ²⁾	mbar (Torr)	< 2 x 10 ⁻⁵ (1.5 x 10 ⁻⁵)	< 3 x 10 ⁻⁵ (2.3 x 10 ⁻⁵)	< 3 x 10 ⁻⁵ (2.3 x 10 ⁻⁵)	< 3 x 10 ⁻⁵ (2.3 x 10 ⁻⁵)
Ultimate total pressure ²⁾	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)
Permissible cut-in pressure RUVAC WS at a pumping speed for the backing pump of	mbar (Torr)	31 (23.3)	37 (27.8)	27 (20.3)	22 (16.5)
	m ³ x h ⁻¹ (cfm)	65 (38.3)	100 (58.9)	250 (147.3)	250 (147.3)
Max. permissible pressure difference during continuous operation ³⁾	mbar (Torr)	80 (60)	80 (60)	80 (60)	50 (37.5)
Main supply, 50 Hz	Δ/Y	200/230/400			
60 Hz	Δ/Y	208/230/265/460			
Insulation class		F			
Motor power, 50/60 Hz	kW (hp)	1.1 (1.5) / 1.4 (1.9)	2.2 (3.0) / 2.4 (3.3)	4.0 (5.4) / 4.4 (6.0)	7.5 (10.2) / 8.5 (11.6)
Nominal speed, approx. (50/60 Hz)	rpm	3000/3600			
Max. permissible speed	rpm	6000	6000	6000	4200 ⁴⁾
Type of protection	IP	20			
Oil filling for the bearing chamber ⁵⁾		1. Filling ⁶⁾ / 2. Filling	1. Filling ⁶⁾ / 2. Filling	1. Filling ⁶⁾ / 2. Filling	1. Filling ⁶⁾ / 2. Filling
PFPE, vertical pumping action, approx.	l (qt)	0.6 (0.63) / 0.55 (0.58)	0.85 (0.9) / 0.75 (0.79)	1.95 (2.06) / 1.75 (1.85)	3.8 (4.02) / 3.5 (3.7)
horizontal pumping action, approx.	l (qt)	0.5 (0.53) / 0.45 (0.48)	0.75 (0.79) / 0.7 (0.74)	1.2 (1.27) / 1.1 (1.16)	2.6 (2.75) / 2.4 (2.54)
other oils, vertical pumping action, approx.	l (qt)	0.65 (0.69) / 0.6 (0.63)	0.9 (0.95) / 0.8 (0.85)	2.0 (2.11) / 1.8 (1.90)	3.85 (4.07) / 3.6 (3.81)
horizontal pumping action, approx.	l (qt)	0.5 (0.53) / 0.45 (0.48)	0.75 (0.79) / 0.7 (0.74)	1.2 (1.27) / 1.1 (1.16)	2.6 (2.75) / 2.4 (2.54)
Connection flanges	DN	63 ISO-K	63 ISO-K	100 ISO-K	160 ISO-K
Weight WS/WSU	kg (lbs)	90/95 (198.5/209.5)	130/135 (286.7/297.7)	228/233 (502.7/513.8)	458/465 (1009.9/1025.3)
Noise level ⁷⁾	dB(A)	< 63	< 63	< 68	< 72



Ordering Information	WS/WSU 251	WS/WSU(H) 501	WS/WSU(H) 1001	WS/WSU(H) 2001
Roots vacuum pump				
RUVAC WS	Part No. 117 22	Part No. 117 32	Part No. 117 42	Part No. 117 52
RUVAC WSU	Part No. 117 23	Part No. 117 33	Part No. 117 43	Part No. 117 53
RUVAC WS PFPE	Part No. 117 27	Part No. 117 37	Part No. 117 47	Part No. 117 57
RUVAC WSU PFPE	Part No. 117 28	Part No. 117 38	Part No. 917 48 ^{*)}	-
RUVAC WSU(H), with special ACE vibration absorber	-	Part No. 118 33	Part No. 118 43	Part No. 118 53
RUVAC WS/WSU(H) seal kit	Part No. 194 62	Part No. 194 66	Part No. 194 70	Part No. 194 74
Flange adapter set, consisting of Flange adapter with screws, bolts, washers and nuts for ANSI flange				
WA/WS pump	(3" ANSI) Part No. 200 03 179	(3" ANSI) Part No. 200 03 179	(4" ANSI) Part No. 200 03 180	(6" ANSI) Part No. 200 03 181
WAU/WSU pump	Part No. 200 03 179	Part No. 200 03 179	Part No. 200 03 180	Part No. 200 03 182

- 1) To DIN 28 400 and subsequent numbers
- 2) With single-stage rotary vane vacuum pumps TRIVAC
- 3) Applicable for ratio up to 1 : 10 between backing pump and Roots vacuum pump
- 4) Also 6000 rpm upon order
- 5) Authoritative, however, is the oil level at the oil-level glass
- 6) After a complete disassembly
- 7) At an operating pressure < 10⁻¹ mbar (< 0.75 x 10⁻¹ Torr)
- *) 60 Hz pumps supplied with ANSI adapter flanges



RUVAC WSLF Roots Vacuum Pumps for Laser Gas Systems



RUVAC WSLF 1001 LF Roots vacuum pump

Roots vacuum pumps driven by canned motors are available for gas laser systems.

Advantages to the User

- ◆ A gas mixture of helium, nitrogen and carbon monoxide is continuously circulated at a reduced system pressure
- ◆ High pumping speed from a small, quiet running pump
- ◆ Operation with a frequency converter is possible
- ◆ Nickel-plated pump chamber surfaces
- ◆ Through an additional vacuum pump the bearing chambers may be evacuated to a pressure lower than the pressure within the pumping chamber of the RUVAC

- ◆ Water-cooled oil separating system
- ◆ Integrated oil separating system for extended maintenance intervals

Typical Applications

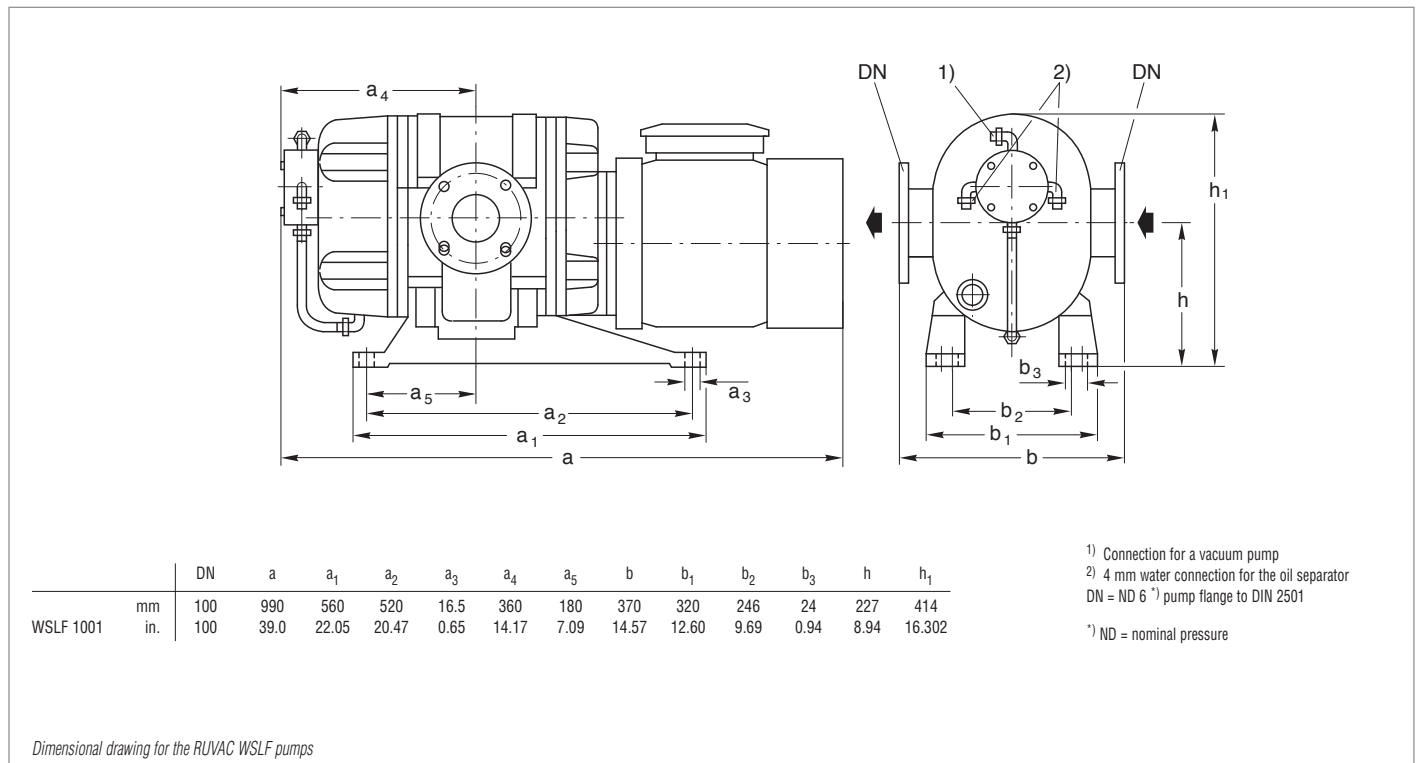
- ◆ Processing of ferrous and non-ferrous materials like welding, cutting and surface refinement

Technical Note

- ◆ The gas circulation system must be very clean and entirely free of hydrocarbons

Supplied Equipment

- ◆ Horizontal pumping action as standard
- ◆ With oil pressure switch and oil drain facility
- ◆ The required oil filling is included separately (special oil ANDEROL® 2100 HTCL)
- ◆ Purged with nitrogen for corrosion protection



Dimensional drawing for the RUVAC WSLF pumps

Technical Data		WSLF 1001
Nominal pumping speed ¹⁾	m ³ x h ⁻¹ (cfm)	1000 (589)
Max. permissible pressure difference during continuous operation	mbar (Torr)	80 (60)
Main supply, 50 Hz	Δ/Y V	200-230/400
60 Hz	Δ/Y V	200-265/460
Motor power, 50/60 Hz	kW (hp)	7.5 (10.2) / 8.5 (11.6)
Nominal speed, 50/60 Hz	rpm	3000/3600
Max. permissible speed	rpm	6000
Type of protection	IP	20
Oil filling of the bearing chambers	l (qt)	1.2 (1.27)
Connection flange DIN 2501	DN	100
Weight	kg (lbs)	275 (606.4)
Cooling water pressure	bar (psi)	1 - 5 (14.5 - 72.5)
Cooling water throughput	l x h ⁻¹ (cfm)	200 (0.9)
Hose connection for hose		6 x 1
Ordering Information		WSLF 1001
RUVAC WSLF Roots vacuum pump RUVAC WSLF 1001		Part No. 117 94
RUVAC WSLF seal kit		Part No. 194 70

¹⁾ To DIN 28 400 and subsequent numbers

RUVAC RA Roots Vacuum Pumps with Flange-Mounted Motors (50 Hz)



RUVAC RA 5001 single-stage Roots vacuum pump

Roots vacuum pumps offering a high pumping speed.

Advantages to the User

- ◆ Oil immersed radial shaft seals made of FPM for sealing against the atmosphere
- ◆ If required with external pressure equalisation line and differential pressure valve so that the pump may be switched on jointly with the backing pump at atmospheric pressure
- ◆ Motors can easily be exchanged for special voltage motors. Explosion protected motors and motors for special main frequencies upon request
- ◆ Over-temperature switch in the stator coil of the motor

- ◆ Rugged dry compressing vacuum pump
- ◆ Most reliable even under rough operating conditions

Typical Applications

- ◆ Large vacuum systems like sintering and annealing furnaces which require multi-stage pumpsets
- ◆ In large vacuum rectification systems Roots vacuum pumps with postcondensers for compressing of vapors

Custom Pumps

- ◆ If required the RA pumps are also available as C versions (chemical versions)
- ◆ Pumps made of special materials may be specified as well as pressure burst resistant pumps
- ◆ Custom designed pumps for pumping speeds of 250 m³/h to 2000 m³/h (147.3 to 1178 cfm)

Technical Note

- ◆ For operation ordering of oil is necessary (see section "Accessories")

RUVAC RA 13 000
* Width = 1000

DN = PN 10 pump flange to DIN-EN 1092-2

DN	a	a ₁	a ₂	a ₃	a ₄	a ₅	a ₆	b	b ₁	b ₂	ø d _{k6}	ø d ₁	h	h ₁	h ₂		
RA 3001	200	mm	980	470	510	290	350	1101	1570	652	538	600	35	23	500	35	250
	200	in.	38.58	18.50	20.08	11.42	13.78	43.35	61.81	25.67	21.18	23.62	1.38	0.91	19.69	1.38	9.84
RA 5001	200	mm	1013	468	545	280	360	1136	1610	800	652	720	42	23	630	50	315
	200	in.	39.88	18.43	21.46	11.02	14.17	44.72	63.39	31.50	25.67	28.35	1.65	0.91	24.80	1.97	12.40
RA 7000	250	mm	1143	533	610	410	490	1266	1740	800	652	720	42	23	630	50	315
	250	in.	45.0	20.98	24.02	16.14	19.29	49.84	68.50	31.50	25.67	28.35	1.65	0.91	24.80	1.97	12.40
RA 9001	300	mm	1467	685	782	655	800	1594	2220	910	810	830	55	27	710	30	355
	300	in.	57.76	26.97	30.79	25.79	31.50	62.76	87.40	35.83	31.89	32.68	2.17	1.06	27.95	1.18	13.98

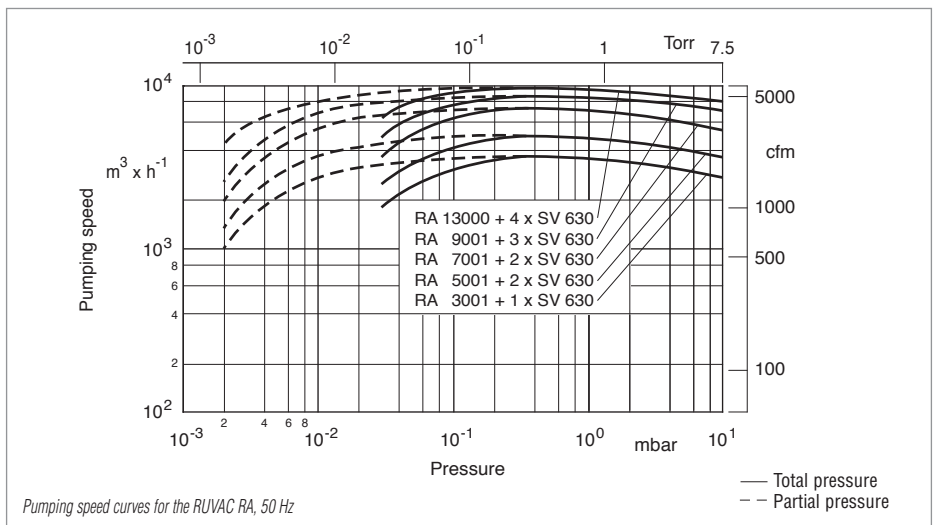
Dimensional drawing for the RUVAC RA pumps

Technical Data		RA 3001	RA 5001	RA 7001	RA 9001	RA 13000
Nominal pumping speed ¹⁾	m ³ x h ⁻¹ (cfm)	3900 (2297)	5550 (3269)	7470 (4400)	9720 (5725)	13000 (7657)
Max. pumping speed	m ³ x h ⁻¹ (cfm)	2900 (1708)	4100 (2415)	5600 (3298)	7500 (4418)	10000 (5890)
at a pumping speed for the backing pump of	m ³ x h ⁻¹ (cfm)	630 (371)	800 (471)	1260 (742)	1890 (1113)	2500 (1473)
Ultimate partial pressure ²⁾	mbar (Torr)	< 2 x 10 ⁻³ (< 1.5 x 10 ⁻³)				
Ultimate total pressure ²⁾	mbar (Torr)	< 3 x 10 ⁻² (< 2.3 x 10 ⁻²)				
Max. permissible pressure difference during continuous operation ³⁾ for < 3min.	mbar (Torr)	53 (39.8)	53 (39.8)	53 (39.8)	66 (49.5)	93 (69.8)
	mbar (Torr)	93 (69.8)	93 (69.8)	93 (69.8)	133 (99.8)	93 (69.8)
Main supply, 50 Hz	V	400 Δ				
Motor power	kW (hp)	11 (15)	15 (20.4)	18.5 (25.2)	22 (30)	30 (40.8)
Nominal speed, 50 Hz	rpm	3000	3000	3000	1500	2000
Max. permissible speed	rpm	3600	3600	3600	1800	2000
Type of protection	IP	54				
Oil filling, approx.						
vertical pumping action	l (qt)	7.0 (7.4)	12.0 (12.7)	12.0 (12.7)	11.0 (11.6)	11.0 (11.6)
horizontal pumping action	l (qt)	3.5 (3.7)	5.4 (5.7)	5.4 (5.7)	7.6 (8.0)	7.6 (8.0)
Connection flange, suction side ^{4, 5)}	DN	200	200	250	300	300
	pressure side ^{4, 5)}	DN	200	200	250	300
Adapter flange package, suction side	DN	250 ISO-K	250 ISO-K	250 ISO-K	320 ISO-K	320 ISO-K
	pressure side	DN	160 ISO-K	160 ISO-K	250 ISO-K	250 ISO-K
Weight complete, approx.	kg (lbs)	620 (1367.1)	770 (1697.9)	870 (1918.4)	1500 (3307.5)	upon request



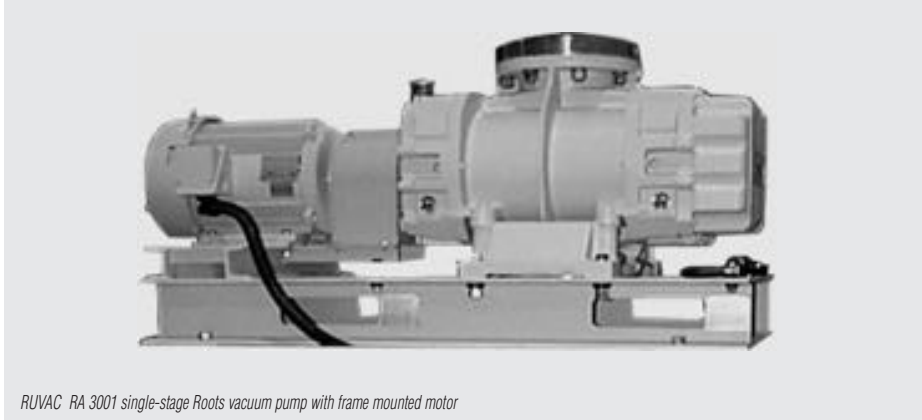
Ordering Information	RA 3001	RA 5001	RA 7001	RA 9001	RA 13000
RUVAC RA Roots vacuum pump with motor 400 V, 50 Hz, coupling and lantern ⁶⁾	Part No. 119 50	Part No. 119 53	Part No. 119 60	Part No. 119 63	upon request
RUVAC RA seal kit	upon request				
Adapter flange package for suction and pressure side, including centering ring with integrated dirt sieve in the intake flange	Part No. 200 14 472	Part No. 200 14 472	-	-	-

- 1) To DIN 28 400 and subsequent numbers
- 2) With single-stage rotary vane vacuum pumps SOGEVAC
- 3) Valid for a ratio of 1 : 5 between backing pump and Roots vacuum pump
- 4) According to DIN 2532
- 5) Without adapter flange to ISO-K flange
- 6) Without oil filling



Version for the North and South American Continents

RUVAC RA Roots Vacuum Pumps with Frame Mounted Motors (60 Hz)



RUVAC RA 3001 single-stage Roots vacuum pump with frame mounted motor

Roots vacuum pumps offering a high pumping speed.

Advantages to the User

- ◆ Oil immersed radial shaft seals made of FPM/Viton for sealing against the atmosphere
- ◆ External pressure equalization line and differential pressure valve so that the pump may be switched on simultaneously with the backing pump at atmospheric pressure
- ◆ Motors can easily be exchanged for special voltage motors. Explosion protected motors and motors for special main frequencies upon request
- ◆ Over-temperature switch in the stator coil of the motor

- ◆ Rugged dry compressing vacuum pump
- ◆ Most reliable even under rough operating conditions

Typical Applications

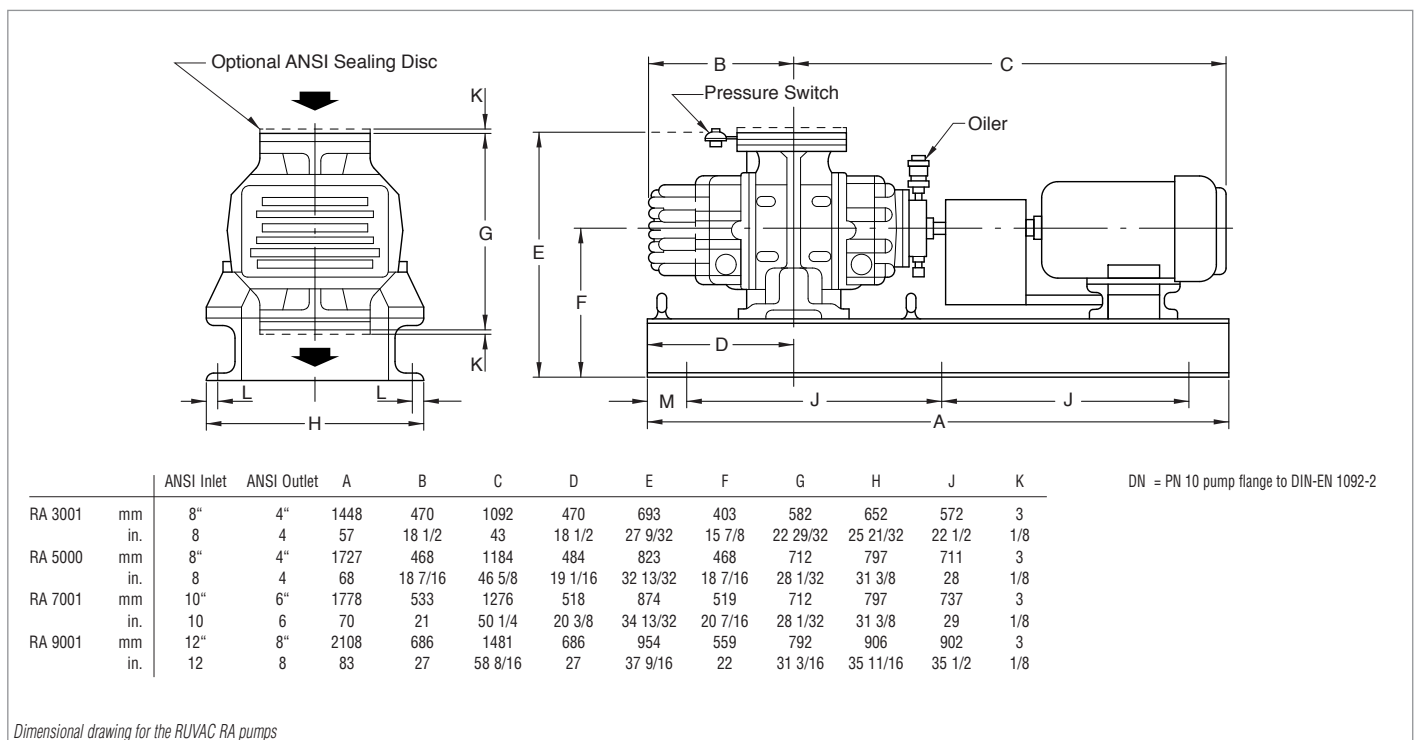
- ◆ Large vacuum systems like sintering and annealing furnaces which require multi-stage pumpsets
- ◆ In large vacuum rectification systems Roots vacuum pumps with postcondensers for compressing of vapors

Custom Pumps

- ◆ If required the RA pumps are also available as C versions (chemical versions)
- ◆ Pumps made of special materials may be specified as well as pressure burst resistant pumps
- ◆ Custom designed pumps for pumping speeds of 250 m³/h to 2000 m³/h (147.3 to 1178 cfm)

Technical Note

- ◆ For operation ordering of oil is necessary (see section "Accessories")



Dimensional drawing for the RUVAC RA pumps

Version for the North and South American Continents

Technical Data		RA 3001	RA 5001	RA 7001	RA 9001
Displacement at 60 Hz	m ³ x h ⁻¹ (cfm)	4555 (2681)	6475 (3814)	8723 (5134)	11 356 (6684)
Backing pump speed	m ³ x h ⁻¹ (cfm)	773 (455)	1546 (910)	1546 (910)	2319 (1365)
Rotation speed (nominal)	rpm	3600	3600	3600	1800
Motor power (standard motor)	kW (hp)	15 (20.4)	20 (27.2)	25 (34)	30 (40.8)
Oil filling, approx.	l (qt)	8 (8.5)	9 (9.5)	9 (9.5)	13 (14)
Normal starting pressure for continuous operation with recommended forepump (standard motor)	mbar (Torr)	13 (10)	20 (15)	13 (10)	27 (20)
Maximum differential pressure during continuous operation (standard motor)	mbar (Torr)	53 (40)	53 (40)	53 (40)	67 (50)
Starting pressure for intermittent operation (≤ 3 min) with recommended forepump (standard motor)	mbar (Torr)	27 (20)	33 (25)	20 (15)	53 (40)
Maximum differential pressure during intermittent operation (≤ 3 min - standard motor)	mbar (Torr)	93 (70)	93 (70)	93 (70)	133 (100)
Weight, approx.	kg (lbs)	634 (1400)	815 (1800)	906 (2000)	1540 (2400)
Ordering Information		RA 3001	RA 5001	RA 7001	RA 9001
RUVAC RA Roots vacuum pump with 3-phase, T.E.F.C. motor (standard), 230/460 V, 60 Hz, base, flexible coupling, coupling guard, screen, ANSI flanges, PS 115 pressure switch and lubricant		Part No. 98-236-3001	Part No. 98-236-5001	Part No. 98-236-7001	Part No. 98-236-9001
Sealing disc, inlet	Part No. 910-181-608	Part No. 910-181-608	Part No. 910-181-609	Part No. 910-181-610	
Sealing disc, outlet	Part No. 910-181-606	Part No. 910-181-606	Part No. 910-181-607	Part No. 910-181-608	
Pressure switch amplifier SV 110	Part No. 160 78-1				

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
Pressure switch	
PS 115, adjustable setting	Part No. 160 04
Pressure switch setting	Part No. 160 05
Accessories for fitting the PS pressure switch	
Screw-in adaptor DN 16 KF, M 16 x 1.5 mm (0.06 in.)	Part No. 168 40
Elbow DN 16 KF	Part No. 184 36
Centering ring DN 16 KF (2 are required)	Part No. 183 26
Clamping ring DN 16 KF (2 are required)	Part No. 183 41
SV 110 switching amplifier (for PS 114/115)	Part No. 160 78
Oil pressure switch for RUVAC WSLF 1001 and WS-PFPE	Part No. 194 82

Vacuum Pump Oils

Lubricating oils for rotary vacuum pumps need to fulfil demanding requirements. Their vapor pressure must be low also at high temperatures, water content and water uptake must be minimal. Their viscosity characteristics needs to be flat, lubricating properties need to be excellent and they must resist cracking upon being mechanically stressed.

All the vacuum pump 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 pumps from the RUVAC series.

We therefore recommend the exclusive use of vacuum pump oils fully qualified by Leybold so as to ensure optimum performance of the Leybold vacuum pumps and also to ensure optimum oil change intervals.

Under vacuum conditions lubricating oils, especially those with additives may behave quite differently than expected. Additives may adversely affect the attainable ultimate pressure and may react with the media being pumped.

When using not suitably qualified third party oils, the oil change intervals and the performance of the vacuum pump may be reduced. Also unwanted deposits may occur which may even cause severe damage to the vacuum pump.

For these reasons please understand that we must make our warranty commitment dependent on the use of oils which have been qualified by us. Damages caused by the use of not suitably qualified lubricating oils are not covered by our warranty.

In order to adapt the pumps to the different applications of our customers, different types of oil are used in the RUVAC pumps.

Please note that owing to differing properties not all types of oil may be used in all pumps of the RUVAC series. If you can not find the combination of pump and oil you require please ask us for a quotation.

Lubricant Types

Mineral Oils

Mineral oils are products distilled and refined from crude oil. These do not consist of precisely defined compounds but rather consist of a complex mixture. The way in which the mineral oil is pre-treated and its composition are 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.

Synthetic Oils

Synthetic oils are produced by a chemical reaction. 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.

The oils given in the following belong to the group of synthetic oils:

Ester Oils

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.

For all lubricants from our line of products you may obtain Safety Data Sheets from the Dept. Technical Support in Cologne.

Perfluorinated polyether (PFPE)

These are oils which are only composed of carbon (C), fluorine (F) and oxygen atoms (O). The existing C-O and C-F bonds are highly stable. For this reason PFPE oils are practically inert against all chemical and oxidising influences.

Perfluorinated polyether will not polymerise under the influence of high energy radiation.

PFPE is non-flammable. Leybold NC1/14 has the approval of BAM (Federal Institute for Materials Research and Testing) for pumping of pure oxygen.

Perfluorinated polyether are used when pumping strongly reactive substances like oxygen (O₂), fluorine F₂ and uranium hexafluoride UF₆. Regarding Lewis acids (for example, boron trifluoride BF₃, aluminum trichloride AlCl₃) they are not completely inert. Here reactions may take place at temperatures over 100 °C (212 °F).

Perfluorinated polyether are thermally highly stable. Thermal decomposition may only take place at temperatures of over 290 °C (554 °F).

Caution: Perfluorinated polyether will – when decomposed – release toxic and corrosive gases: hydrogen fluoride HF, carbonyl difluoride COF₂. 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 perfluorinated polyether, since it is essential that the pumps be free of hydrocarbons.

Changing from one basic type of oil to PFPE must be left exclusively to authorised Service Centers. The pump 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.

Overview Oils

Application Data	Special Oil N62	ANDEROL® 555	ANDEROL® 2100 HTCL	NC 1/14
Type of oil	Paraffin-base mineral oil, core fraction, free of additives	Diester oil	Polyolester	Perfluorinated polyether PFPE
Examples of areas of application and process media	Standard oil For pumping air, chemically inert permanent gases (noble gases, for example), water vapor	Used at elevated temperatures. Pumping of air, chemically inert permanent gases (noble gases, for example), carbon dioxide CO ₂ , carbon monoxide CO, aliphatic compounds (for example, methane CH ₄ , propane C ₃ H ₈ , ethylene C ₂ H ₄), organic solvent vapors	Used in the RUVAC WSLF for operation in connection with gas lasers	For pumping strong oxidants like oxygen, O ₂ , ozone O ₃ , nitrogen oxides NO _x and sulphur oxides (SO ₂ , SO ₃) as well as reactive substances like halogens (for example fluorine F ₂ , chlorine Cl ₂), hydrogen halides (for example hydrogen chloride HCl, hydrogen bromide HBr), uranium hexafluoride UF ₆ and conditionally Lewis acids (for example, boron trichloride BCl ₃)
Remarks	The ultimate pressures stated in our catalogs are based on operation of the pump with N62 (except for the PFPE pumps)			Use only PFPE modified pumps. For operation with PFPE we recommend the exclusive use of such pump types which are equipped with a split-pole motor Mixing with other types of oil must be absolutely avoided
Elastomer compatibility FPM (Viton) NBR (Perbunan) ¹⁾ EPDM	Suited Conditionally suited Not suited	Suited Conditionally suited Not suited	Suited Conditionally suited Not suited	Suited Suited Suited

Technical Data	Special Oil N62	ANDEROL® 555	ANDEROL® 2100 HTCL	NC 1/14	
Viscosity at 40 °C (104 °F) at 100 °C (212 °F)	mm ² /s mm ² /s	90 10	94 9	94 13	47 5
Flash point	°C (°F)	> 255 (491)	250 (482)	265 (509)	– ²⁾
Vapor pressure at 20 °C (68 °F) at 100 °C (212 °F)	mbar (Torr) mbar (Torr)	< 1 x 10 ⁻⁵ (< 0.75 x 10 ⁻⁵) < 3 x 10 ⁻³ (< 2.3 x 10 ⁻³)	7 x 10 ⁻⁵ (5.3 x 10 ⁻⁵) 1.5 x 10 ⁻³ (1.1 x 10 ⁻³)	5 x 10 ⁻⁵ (3.8 x 10 ⁻⁵) 8.5 x 10 ⁻⁴ (6.4 x 10 ⁻⁴)	3 x 10 ⁻⁷ (2.3 x 10 ⁻⁷) 6 x 10 ⁻⁴ (4.5 x 10 ⁻⁴)
Density at 15 °C (59 °F)	g/ml	0.88 ³⁾	0.96	0.92	1.89 ³⁾
Pour point	°C (°F)	< -9 (< -16)	-42 (-44)	-35 (-31)	-40 (-40)
Middle molecular weight	g/mol	550	530	No known	2500

Ordering Information	Special Oil N62	ANDEROL 555	ANDEROL 2100 HTCL	NC 1/14
1 litre (1.06 qt)	Part No. 177 01	Part No. 200 10 272	Part No. 200 14 333	Part No. 177 38
5 litres (5.29 qt)	Part No. 177 02	Part No. 200 10 891	–	–
20 litres (21.14 qt)	Part No. 177 03	Part No. 200 00 193	–	–
180 kg (397.35 lbs)	Part No. 177 05	–	–	–

Please note that the technical data stated are only typical data. Slight variations from batch to batch must be expected.

The technical data stated here can not be taken as assured properties

- Resistance to decomposing is very much dependent on the share of acrylonitrile in the NBR
- Caution:** Perfluorinated polyether will, when being decomposed at temperatures over 290 °C (554 °F), release toxic and corrosive gases
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
- at 20 °C (68 °F)

ANDEROL® is a trademark of ANDEROL BV

Version for the North and South American Continents

Application Data	HE-200	HE-1600
Type of oil	Paraffin-base mineral oil, core fraction, free of additives	Perfluorinated polyether PFPE
Examples of areas of application and process media	Standard oil for Leybold USA For pumping air, chemically inert permanent gases (noble gases, for example), water vapor, solvent vapors in the case of laboratory pumps operated with cold traps	For pumping strong oxidants like oxygen, O ₂ , ozone O ₃ , nitrogen oxides NO _x and sulphur oxides (SO ₂ , SO ₃) as well as reactive substances like halogens (for example fluorine F ₂ , chlorine Cl ₂), hydrogen halides (for example hydrogen chloride HCl, hydrogen bromide HBr), uranium hexafluoride UF ₆ and conditionally Lewis acids (for example, boron trichloride BCl ₃)
Remarks	The ultimate pressures stated in operation of the pump with HE-200 (except for the PFPE pumps) Service life may be extended through the use of an oil filter	Use only correspondingly modified pumps. For operation with PFPE we recommend the exclusive use of such pump types which are equipped with a split-pole motor Mixing with other types of oil must be absolutely avoided
Elastomer compatibility		
FPM (Viton)	Suited	Suited
NBR (Perbunan) ¹⁾	Conditionally suited	Suited
EPDM	Not suited	Suited

C07

Technical Data	HE-200	HE-1600
Viscosity at 40 °C (104 °F) mm ² /s	58	–
Viscosity at 20 °C (68 °F) mm ² /s	–	140
Viscosity at 100 °C (212 °F) mm ² /s	9	–
Viscosity at 99 °C (210 °F) mm ² /s	–	7
Flash point °C (°F)	224 (435)	Not known ²⁾
Vapor pressure at 100 °C (212 °F) mbar (Torr)	3.9 x 10 ⁻⁴ (2.9 x 10 ⁻⁴)	2.7 x 10 ⁻⁴ (2.0 x 10 ⁻⁴)
Pour point °C (°F)	-10 (14)	-40 (-40)
Middle molecular weight g/mol	480	3000

Ordering Information	HE-200	HE-1600
1.0 litre (1 qt)	Part No. 98-198-006	–
3.8 litres (1 gal)	Part No. 98-198-007	–
18.9 litres (5 gal)	Part No. 98-198-008	–
208 litres (55gal)	Part No. 98-198-010	–
0.9 kg (2 lbs)	–	Part No. 898 564-1
1.8 kg (4 lbs)	–	Part No. 898 564-2
7.2 kg (16 lbs)	–	Part No. 898 564-4

Please note that the technical data stated are only typical data. Slight variations from batch to batch must be expected.

The technical data stated here can not be taken as assured properties

¹⁾ Resistance to decomposing is very much dependent on the share of acrylonitrile in the NBR

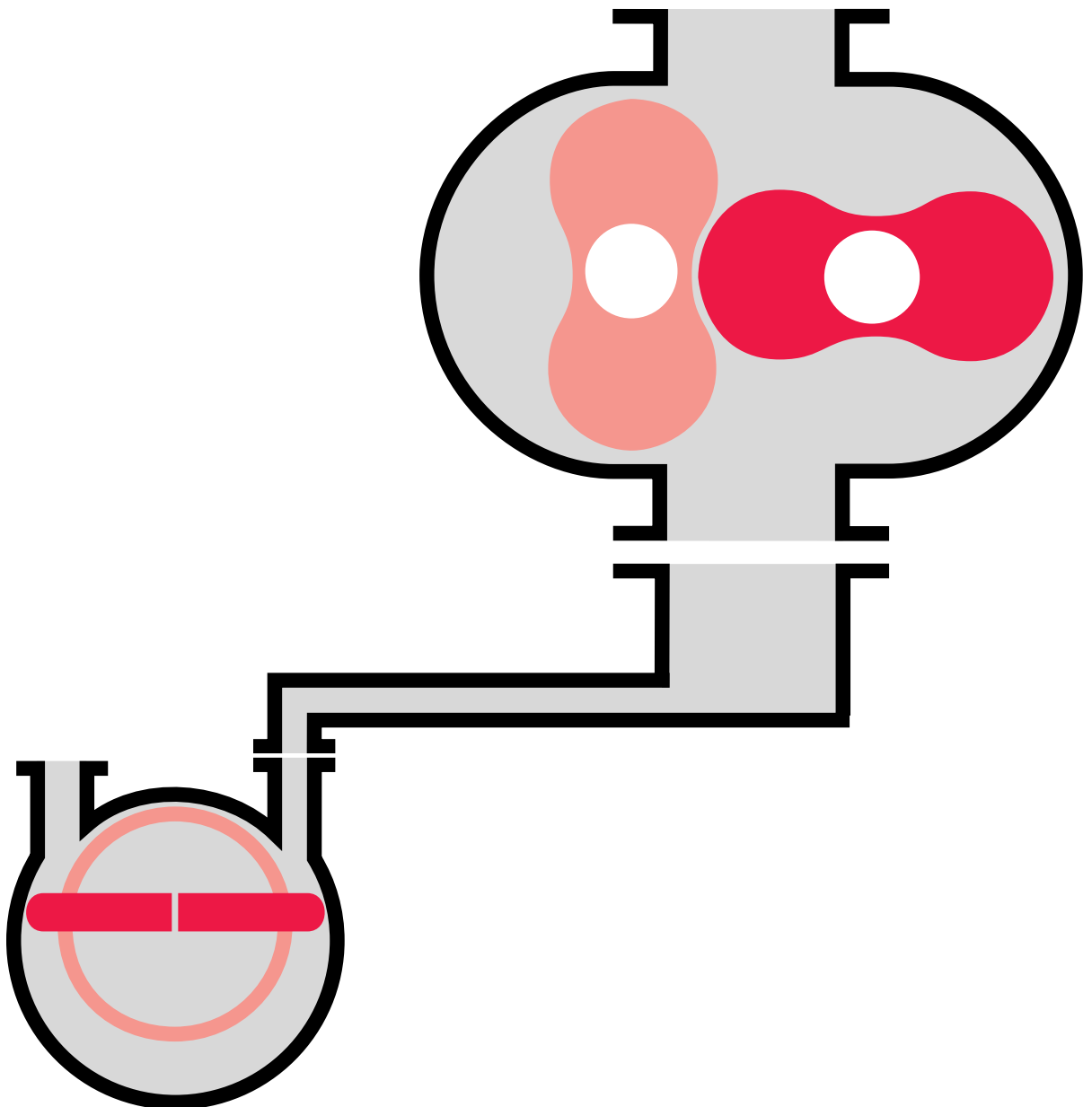
²⁾ **Caution:** Perfluorinated polyether compounds will, when being decomposed at temperatures over 290 °C (554 °F), release toxic and corrosive gases.

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

C08

RUTA

Vacuum Pump Systems
250 - 13 000 m³ x h⁻¹
(147.3 - 7657 cfm)



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 long-standing 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 vacuum 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 product section 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.

General

Applications and Accessories **C08.03**
 Overview on the Types of Pumps Systems **C08.03**

Products

Pump Systems (Global Versions)

Three-Stage RUTA Pump Systems with Two-Stage TRIVAC Backing Pumps **C08.06**
 Two-Stage RUTA Pump Systems with Single-Stage SOGEVAC Backing Pumps, Adaptor Version **C08.08**
 Two-Stage RUTA Pump Systems with Single-Stage SOGEVAC Backing Pumps, Frame Version **C08.10**
 Two- and Three-Stage RUTA Pump Systems with Single- and Two-Stage Rotary Piston Vacuum Pumps as Backing Pumps **C08.12**
 Dry Compressing RUTA Pump System with EcoDry L Backing Pump **C08.14**
 Dry Compressing RUTA Pump Systems with SCREWLine SP630 Backing Pump **C08.16**
 RUVAC RAV Roots Vacuum Pumps with Pre-Admission Cooling **C08.18**
 Two- and Three-Stage RUTA RAV Pump Systems with RUVAC RAV Roots Vacuum Pumps . . **C08.20**
 TVD Pump Systems for Drying, Evaporation and Distillation Applications. **C08.22**

Pump Systems (Versions for the North and South American Continents)

RBS - B/BCS Roots Pump Systems with Two-Stage TRIVAC Backing Pumps **C08.24**
 HTS Close-Coupled Pump Systems with Single-Stage SOGEVAC Backing Pumps. **C08.28**
 HTS Frame Mounted Pump Systems with Single-Stage SOGEVAC Backing Pumps. **C08.32**
 RM - Roots / Mechanical Pump Systems with Single- and Two-Stage Rotary Piston Vacuum Pumps as Backing Pumps. **C08.34**
 Dry Compressing Vacuum Pump Systems with EcoDry L Backing Pump **C08.36**

Miscellaneous

Checklist for Inquiries (Fax Form) **C08.38**

Designation of Roots Vacuum Pump Systems

LEYBOLD pump combinations of Roots vacuum pumps with backing pumps are called "RUTA".

The pump system designation is arranged as follows:

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.

RUTA WAU 2001 / WAU 501 / K / S 65 B / A

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))

Applications and Accessories

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 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 RA 3001/WAU1001/SV300

Overview on the Types of Pump Systems

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 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, WS and RA or WAU and WSU with integrated bypass line or RA with external bypass line (RAU) 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 16 000 m^3/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, three or multi-stage pump systems equipped with single or two-stage backing pumps are available (see figure).

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 and RA/RAU 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 cleanliness.

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 three solutions:

1. Composite pumping systems combining an EcoDry pump with one or more Roots blower pumps.
2. Pump systems consisting of the SCREWLine screw vacuum pump developed specifically for the process industry in combination with one or several Roots vacuum pumps.
3. Single or multi-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.

Combinations of EcoDry and Roots blower achieve an ultimate pressure of 2×10^{-3} mbar (1.5×10^{-3} Torr).

Already in connection with one Roots pump, pump systems with a SCREWLine 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) and two-stage combinations 50 mbar (37.5 Torr).

Multi-stage combinations with Roots vacuum pumps of all three 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 RA 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.

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 application, the backing pump used in such systems may be a rotary vane vacuum pump, a liquid ring vacuum pump or a combination of an ejector pump and a liquid ring 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 set-point 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.

The product is no longer in the foreground, solutions to problems are demanded instead.

LEYBOLD Vacuum 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.



TVD pump system, mobile with control cabinet

Accessories

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).

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.



RUTA RA 3001/S630F/G with sound proofing box

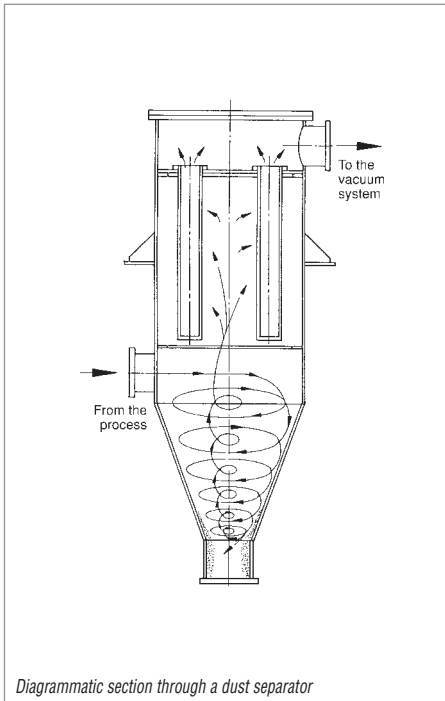
Isolation against Vibrations

RUTA vacuum pump systems produce only slight vibrations. To reduce these vibrations even further, vibration absorbers can be fitted under the pump system.

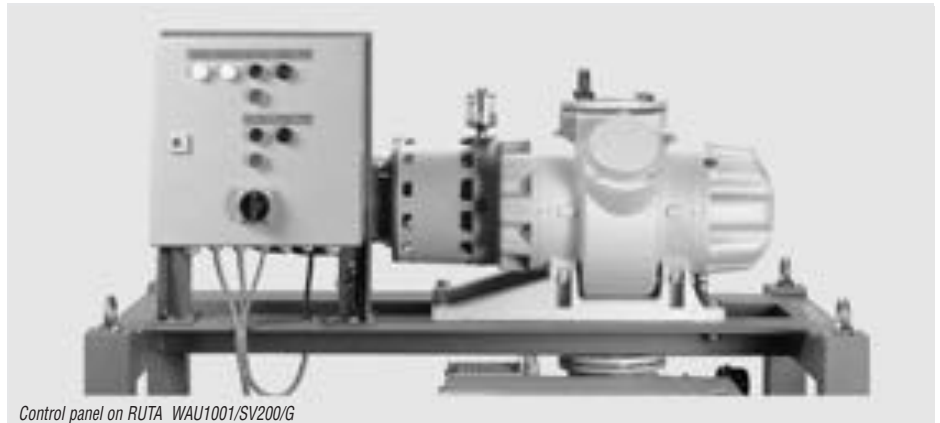
Dust Separators

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 custom-designed for the specific process and the required pumping speed.



Filtering surface suitable for pumping speeds	m ²	0.2	0.5	1.0	2.0	3.0	5.0
min.	m ³ x h ⁻¹ (cfm)	100 (58.9)	300 (176.7)	600 (353.4)	1 000 (589)	1 500 (883.5)	3 000 (1767)
max.	m ³ x h ⁻¹ (cfm)	300 (176.7)	800 (471.2)	1 500 (883.5)	3 000 (1767)	4 000 (2356)	8 000 (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							



Electric Control Facilities

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 wall-mounted.

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 dependant control

- ◆ Time-dependant 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.

Three-Stage RUTA Pump Systems with Two-Stage TRIVAC Backing Pumps



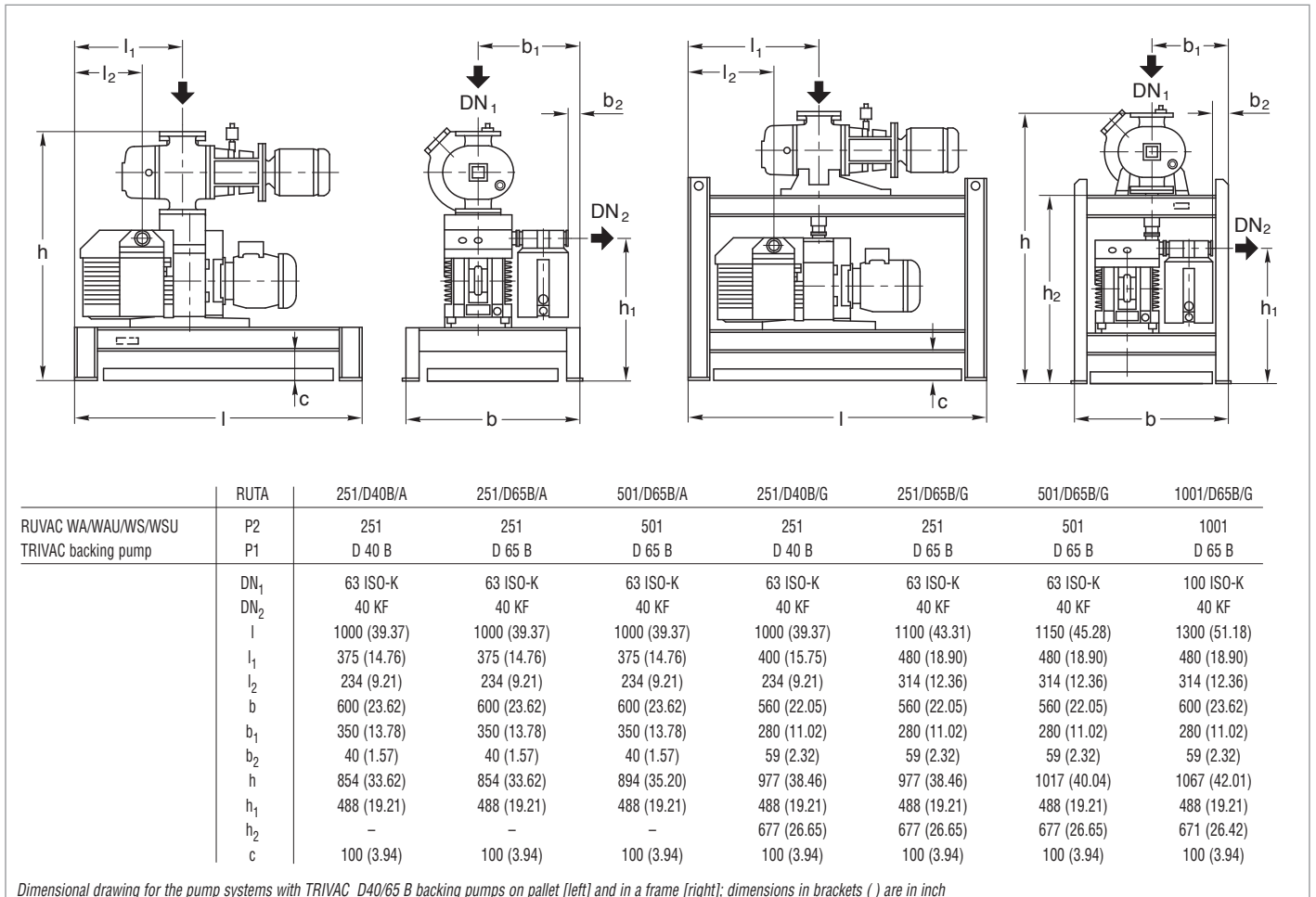
RUTA WAU 501/D65B/A

Standard Equipment

- ◆ Exhaust filter
- ◆ Oil collecting pan
- ◆ Manually operated gas ballast
- ◆ Crane eyes on the frame
- ◆ Floor mounting
- ◆ CE approval
- ◆ The oil is supplied with the pump

Options

- ◆ Frequency converter 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



Dimensional drawing for the pump systems with TRIVAC D40/65 B backing pumps on pallet [left] and in a frame [right]; dimensions in brackets () are in inch

Technical Data, 50 Hz

RUTA WAU

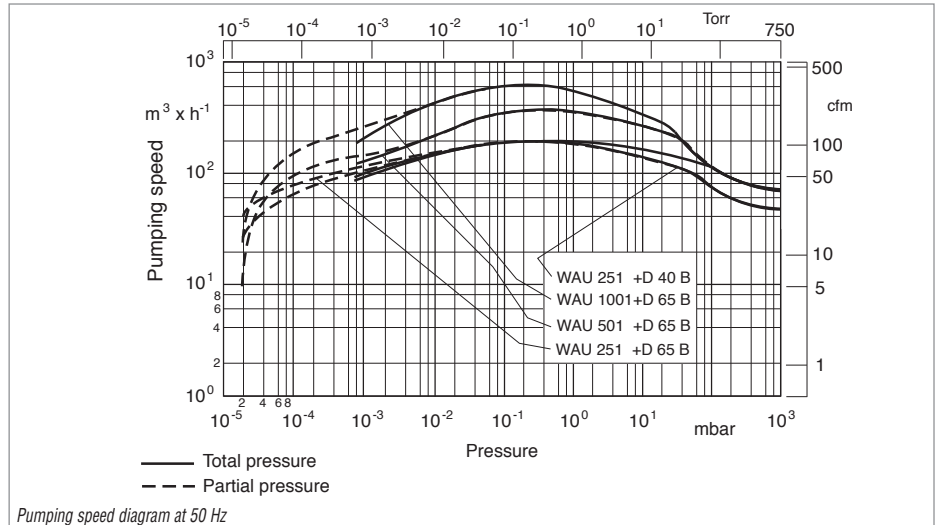
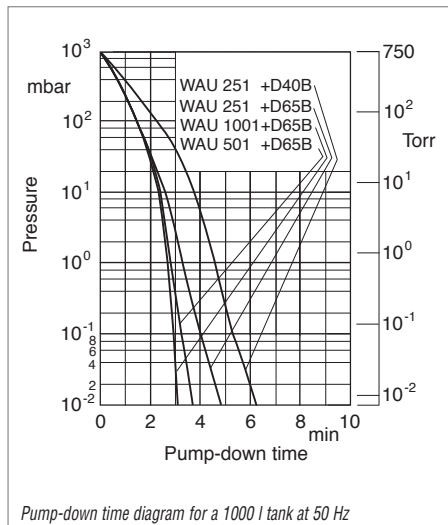
		251/D40B/A	251/D65B/A	501/D65B/A	251/D40B/G	251/D65B/G	501/D65B/G	1001/D65B/G
RUVAC (WA/WAU/WS/WSU possible)	P2	251	251	501	251	251	501	1001
TRIVAC backing pump	P1	D 40 B	D 65 B	D 65 B	D 40 B	D 65 B	D 65 B	D 65 B
Pumping speed, 50 Hz at 10 ⁻¹ mbar (0.75 x 10 ⁻¹ Torr)	m ³ x h ⁻¹ (cfm)	200 (117.8)	210 (123.7)	380 (223.8)	185 (109)	205 (120.7)	340 (200.3)	620 (365.2)
Ultimate partial pressure	mbar (Torr)	< 2 x 10 ⁻⁵ (< 1.5 x 10 ⁻⁵)	< 2 x 10 ⁻⁵ (< 1.5 x 10 ⁻⁵)	< 2 x 10 ⁻⁵ (< 1.5 x 10 ⁻⁵)	< 2 x 10 ⁻⁵ (< 1.5 x 10 ⁻⁵)	< 2 x 10 ⁻⁵ (< 1.5 x 10 ⁻⁵)	< 2 x 10 ⁻⁵ (< 1.5 x 10 ⁻⁵)	< 2 x 10 ⁻⁵ (< 1.5 x 10 ⁻⁵)
Ultimate total pressure with gas ballast	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)	< 8 x 10 ⁻⁴ (< 6 x 10 ⁻⁴)	< 8 x 10 ⁻⁴ (< 6 x 10 ⁻⁴)	< 8 x 10 ⁻⁴ (< 6 x 10 ⁻⁴)
Installed motor power	kW (hp)	2.6 (3.5)	3.3 (4.5)	4.4 (6.0)	2.6 (3.5)	3.3 (4.5)	4.4 (6.0)	6.2 (8.4)
Power consumption at 10 ⁻¹ mbar (0.75 x 10 ⁻¹ Torr)	kW (hp)	2.0 (2.7)	2.5 (3.4)	2.7 (3.7)	2.0 (2.7)	2.5 (3.4)	2.7 (3.7)	3.0 (4.1)
Noise level to DIN 45 635								
max.	dB(A)	64	65	67	64	65	67	77
without gas ballast at 1 mbar (0.75 x 1 Torr)	dB(A)	62	63	63	62	63	63	70
Oil filling, total, approx.	l (qt)	3.3 (3.49)	4 (4.23)	4.3 (4.55)	3.3 (3.49)	4 (4.23)	4.3 (4.55)	5.3 (5.60)
Weight, total, approx.	kg (lbs)	245 (540.2)	260 (573.3)	305 (627.5)	280 (617.4)	310 (683.6)	350 (771.8)	460 (1014.3)
Connecting flanges								
Inlet port	DN ₁	63 ISO-K	63 ISO-K	63 ISO-K	63 ISO-K	63 ISO-K	63 ISO-K	100 ISO-K
Outlet port	DN ₂	40 KF	40 KF	40 KF	40 KF	40 KF	40 KF	40 KF



Ordering Information

RUTA WAU

		15251/D40B/A	251/D65B/A	501/D65B/A	251/D40B/G	251/D65B/G	501/D65B/G	1001/D65B/G
RUVAC (WA/WAU/WS/WSU possible)	P2	WAU 251	WAU 251	WAU 501	WAU 251	WAU 251	WAU 501	WAU 1001
TRIVAC backing pump	P1	D 40 B	D 65 B	D 65 B	D 40 B	D 65 B	D 65 B	D 65 B
Pump system, complete (adaptor version), pallet mounted, with RUVAC WAU Roots vacuum pump	Part No.	023 06	023 07	023 08	-	-	-	-
Pump system, complete (frame version), frame mounted, with RUVAC WAU Roots vacuum pump	Part No.	-	-	-	023 16	023 17	023 18	023 19



Two-Stage RUTA Pump Systems with Single-Stage SOGEVAC Backing Pumps, Adaptor Version



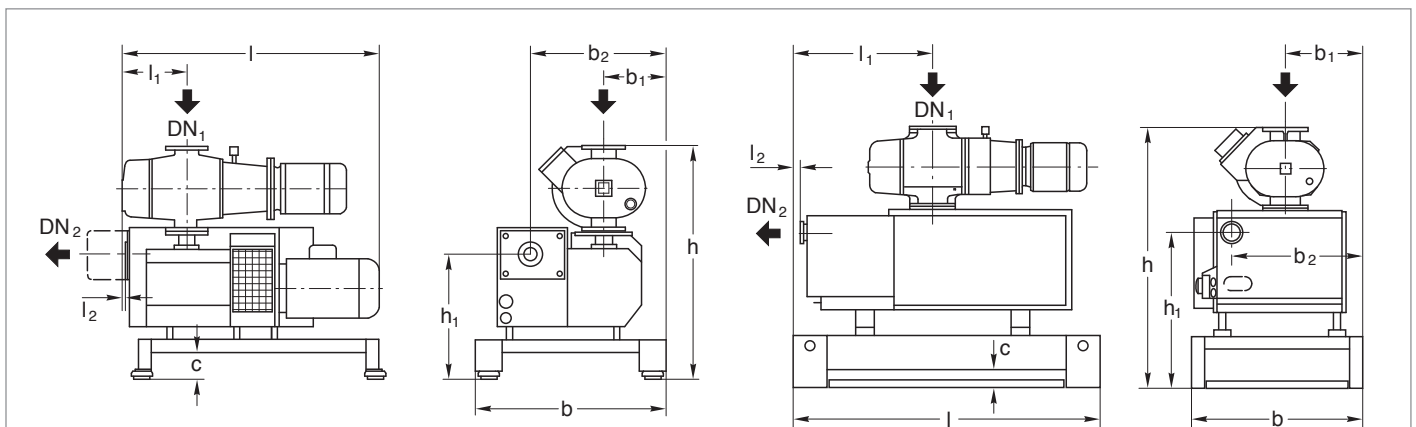
RUTA WAU1001/SV200/A

Standard Equipment

- ◆ Exhaust filter with oil return line
- ◆ Oil filter
- ◆ Oil collecting pan
- ◆ Manually operated gas ballast
- ◆ Floor mounting
- ◆ CE approval
- ◆ The oil is supplied with the pump

Options

- ◆ Frequency converter for controlling the speed of the Roots pump
- ◆ 24 V DC gas ballast valve
- ◆ Sound proofing box
- ◆ Vibration absorbers
- ◆ Castors
- ◆ Different types of floor mounts
- ◆ Oil drain valve on each pump
- ◆ Special motors
- ◆ Electric control systems

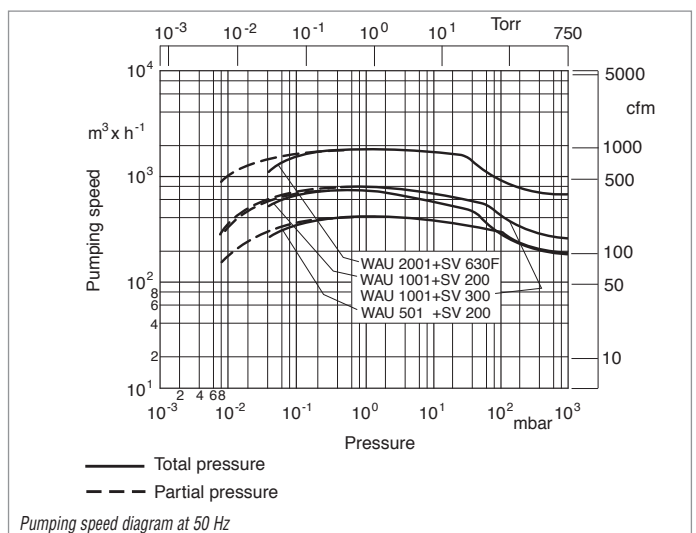
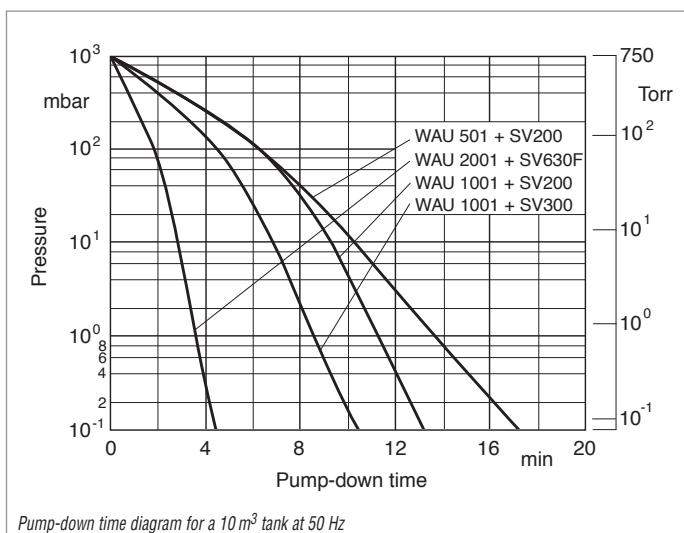


	RUTA	501/SV 200/A	1001/SV 200/A	1001/SV 300/A	2001/SV 630/A
RUVAC WA/WAU/WS/WSU	P2	501	1001	1001	2001
SOGEVAC backing pump	P1	SV 200	SV 200	SV 300	SV 630
	DN ₁	63 ISO-K	100 ISO-K	100 ISO-K	160 ISO-K
	DN ₂	2"	2"	2"	100 ISO-K
	l	962 (37.87)	1050 (41.34)	1082 (42.60)	1800 (70.87)
	l ₁	242 (9.53)	303 (11.93)	303 (11.93)	820 (32.28)
	l ₂	70 (2.76)	77 (3.03)	77 (3.03)	35 (1.38)
	b	700 (27.56)	700 (27.56)	700 (27.56)	1000 (39.37)
	b ₁	230 (9.06)	230 (9.06)	230 (9.06)	450 (17.72)
	b ₂	499 (19.65)	499 (19.65)	499 (19.65)	764 (30.08)
	h	873 (34.37)	923 (36.34)	923 (36.34)	1402 (55.20)
	h ₁	468 (18.43)	468 (18.43)	468 (18.43)	805 (31.69)
	c	100 (3.94)	100 (3.94)	100 (3.94)	100 (3.94)

Dimensional drawing for the pump systems with SOGEVAC SV 200 and 300 backing pumps [left], SOGEVAC SV 630 [right]; dimensions in brackets () are in inch

Technical Data, 50 Hz		RUTA WAU			
		501/SV200/A	1001/SV200/A	1001/SV300/A	2001/SV630F/A
RUVAC (WA/WAU/WS/WSU possible)	P2	501	1001	1001	2001
SOGEVAC backing pump	P1	SV 200	SV 200	SV 300	SV 630 F
Pumping speed, 50 Hz at 10^{-1} mbar (0.75×10^{-1} Torr)	$m^3 \times h^{-1}$ (cfm)	365 (215)	715 (421)	730 (430)	1690 (995.4)
Ultimate partial pressure	mbar (Torr)	$< 8 \times 10^{-3}$ ($< 6 \times 10^{-3}$)	$< 8 \times 10^{-3}$ ($< 6 \times 10^{-3}$)	$< 8 \times 10^{-3}$ ($< 6 \times 10^{-3}$)	$< 8 \times 10^{-3}$ ($< 6 \times 10^{-3}$)
Ultimate total pressure with gas ballast	mbar (Torr)	$< 4 \times 10^{-2}$ ($< 3 \times 10^{-2}$)	$< 4 \times 10^{-2}$ ($< 3 \times 10^{-2}$)	$< 4 \times 10^{-2}$ ($< 3 \times 10^{-2}$)	$< 4 \times 10^{-2}$ ($< 3 \times 10^{-2}$)
Installed motor power	kW (hp)	6.2 (8.4)	8 (10.9)	9.5 (12.9)	22.5 (30.6)
Power consumption at 10^{-1} mbar (0.75×10^{-1} Torr)	kW (hp)	3 (4.1)	3.5 (4.8)	4 (5.4)	16.5 (22.4)
Noise level to DIN 45 635 without gas ballast at 10^{-1} mbar (0.75×10^{-1} Torr)	dB(A)	70	75	76	80
Oil filling, total, approx.	l (qt)	6 (6.34)	7 (7.4)	11 (11.63)	39 (41.23)
Weight, total approx.	kg (lbs)	335 (738.7)	430 (948.2)	480 (1058.4)	1 140 (2513.7)
Connecting flanges					
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/SV300/A	2001/SV630F/A
RUVAC (WA/WAU/WS/WSU possible)	P2	WAU 501	WAU 1001	WAU 1001	WAU 2001
SOGEVAC backing pump	P1	SV 200	SV 200	SV 300	SV 630 F
Pump system, complete (adaptor version), pallet mounted, with RUVAC WAU Roots vacuum pump		Part No. 022 06	Part No. 022 08	Part No. 022 09	Part No. 022 11



Two-Stage RUTA Pump Systems with Single-Stage SOGEVAC Backing Pumps, Frame Version



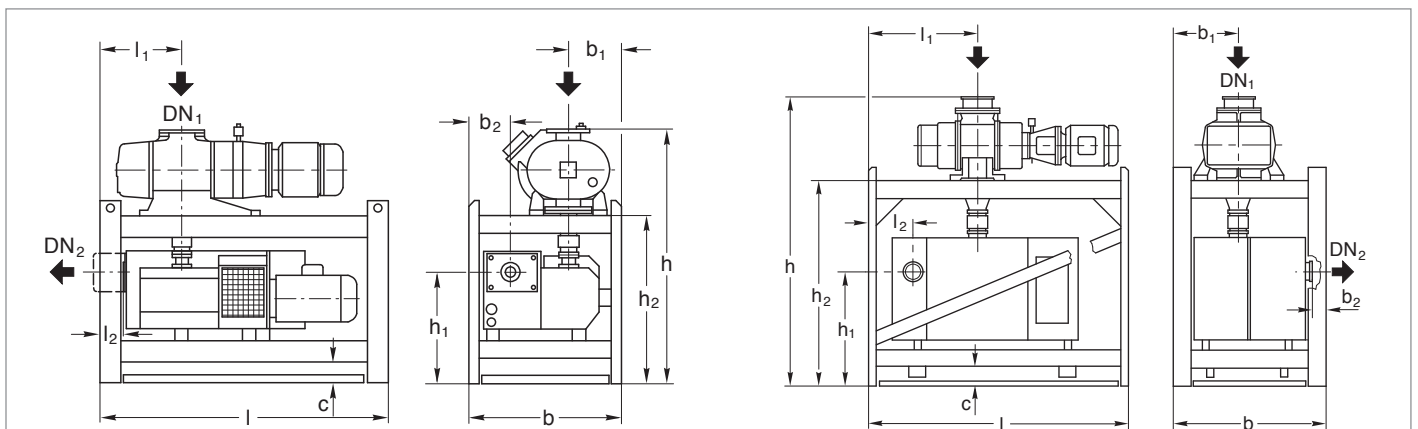
RUTA WAU2001/SV300/G

Standard Equipment

- ◆ Exhaust filter with oil return line
- ◆ Oil filter
- ◆ Oil collecting pan
- ◆ Manually operated gas ballast
- ◆ Crane eyes on the frame
- ◆ Floor mounting
- ◆ CE approval
- ◆ The oil is supplied with the pump

Options

- ◆ Frequency converter for controlling the speed of the Roots pump
- ◆ 24 V DC gas ballast valve
- ◆ Sound proofing box
- ◆ Vibration absorbers
- ◆ Castors
- ◆ Different types of floor mounts
- ◆ Oil drain valve on each pump
- ◆ Special motors
- ◆ Electric control systems

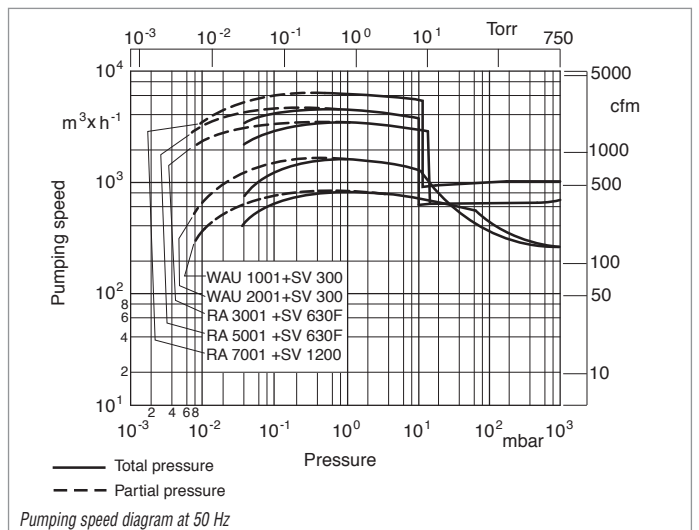
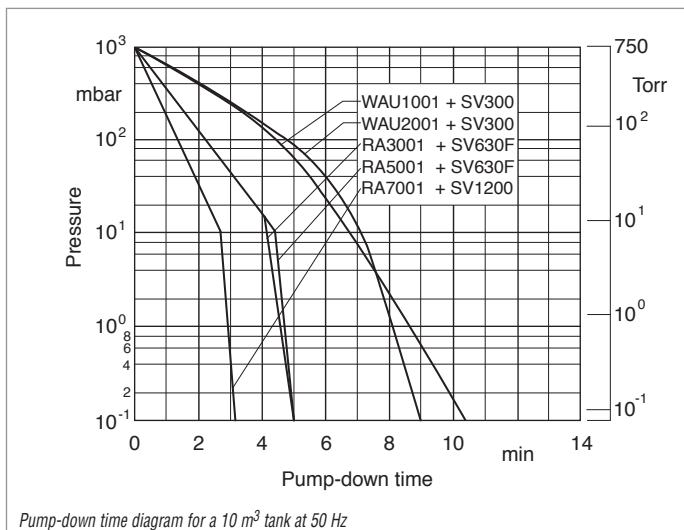


	RUTA	1001/SV300/G	2001/SV300/G	3001/SV630/G	5001/SV630/G	7001/SV1200/G
RUVAC RA	P2	-	-	3001	5001	7001
RUVAC WA/WAU/WSU	P2	1001	2001	-	-	-
SOGEVAC backing pump	P1	SV 300	SV 300	SV 630	SV 630	SV 1200
DN ₁		100 ISO-K	160 ISO-K	250 ISO-K	250 ISO-K	250 ISO-K
DN ₂		2"	2"	100 ISO-K	100 ISO-K	160 ISO-K
l		1340 (52.76)	1340 (52.76)	2150 (84.65)	2150 (84.65)	2325 (91.54)
l ₁		380 (14.96)	380 (14.96)	950 (37.40)	950 (37.40)	975 (38.39)
l ₂		110 (4.33)	110 (4.33)	165 (6.5)	165 (6.5)	405 (15.94)
b		710 (27.95)	780 (30.71)	1100 (43.31)	1100 (43.31)	1360 (53.54)
b ₁		250 (9.84)	320 (12.60)	500 (19.69)	500 (19.69)	580 (22.83)
b ₂		191 (7.52)	191 (7.52)	285 (11.22)	285 (11.22)	158 (6.22)
h		1176 (46.30)	1259 (49.57)	1792 (70.55)	1896 (74.65)	2580 (101.58)
h ₁		518 (20.39)	518 (20.39)	745 (29.33)	745 (29.33)	1020 (40.16)
h ₂		780 (30.71)	729 (28.70)	1177 (46.34)	1151 (45.31)	1835 (72.24)
c		100 (3.94)	100 (3.94)	100 (3.94)	100 (3.94)	100 (3.94)

Dimensional drawing for the pump systems with SOGEVAC SV 300 and 630 backing pumps [left], SOGEVAC SV 1200 [right]; dimensions in brackets () are in inch

Technical Data, 50 Hz		RUTA				
		1001/SV300/G	2001/SV300/G	3001/SV630F/G	5001/SV630F/G	7001/SV1200/G
RUVAC RA	P2	–	–	3001	5001	7001
RUVAC (WA/WAU/WS/WSU possible)	P2	1001	2001	–	–	–
SOGEVAC backing pump	P1	SV 300	SV 300	SV 630 F	SV 630 F	SV 1200
Pumping speed, 50 Hz at 10 ⁻¹ mbar (0.75 x 10 ⁻¹ Torr) m ³ x h ⁻¹ (cfm)		730 (430)	1445 (850)	3090 (1818)	4210 (2478)	5520 (3250)
Ultimate partial pressure	mbar (Torr)	< 8 x 10 ⁻³ (< 6 x 10 ⁻³)	< 8 x 10 ⁻³ (< 6 x 10 ⁻³)	< 8 x 10 ⁻³ (< 6 x 10 ⁻³)	< 8 x 10 ⁻³ (< 6 x 10 ⁻³)	< 9 x 10 ⁻³ (< 6.75 x 10 ⁻³)
Ultimate total pressure with gas ballast	mbar (Torr)	< 4 x 10 ⁻² (< 3 x 10 ⁻²)	< 4 x 10 ⁻² (< 3 x 10 ⁻²)	< 4 x 10 ⁻² (< 3 x 10 ⁻²)	< 4 x 10 ⁻² (< 3 x 10 ⁻²)	< 4 x 10 ⁻² (< 3 x 10 ⁻²)
Installed motor power	kW (hp)	9.5 (12.9)	13 (17.7)	26 (35.4)	30 (40.8)	33.5 (45.6)
Power consumption at 10 ⁻¹ mbar (0.75 x 10 ⁻¹ Torr)	kW (hp)	4 (5.4)	4.5 (6.1)	17 (23.1)	17.5 (23.8)	18 (24.5)
Noise level to DIN 45 635 without gas ballast at 10 ⁻¹ mbar (0.75 x 10 ⁻¹ Torr)	dB(A)	75	79	82	80	82
Oil filling, total, approx.	l (qt)	11 (11.63)	13 (13.74)	42 (44.4)	47 (49.68)	62 (65.54)
Weight, total, approx.	kg (lbs)	560 (1234.8)	740 (1631.7)	1750 (3858.8)	1900 (4189.5)	3000 (6615)
Connecting flanges						
Inlet port	DN ₁	100 ISO-K	160 ISO-K	250 ISO-K	250 ISO-K	250 ISO-K
Outlet port	DN ₂	2"	2"	100 ISO-K	100 ISO-K	160 ISO-K

Ordering Information		RUTA				
		1001/SV300/G	2001/SV300/G	3001/SV630F/G	5001/SV630F/G	7001/SV1200/G
RUVAC	P2	–	–	RA 3001	RA 5001	RA 7001
RUVAC (WA/WAU/WS/WSU possible)	P2	WAU 1001	WAU 2001	–	–	–
SOGEVAC backing pump	P1	SV 300	SV 300	SV 630 F	SV 630 F	SV 1200
Pumping system, complete (frame version) frame mounted, with Roots vacuum pump						
RUVAC RA		–	–	Part No. 022 35	Part No. 022 37	Part No. 022 39
RUVAC WAU		Part No. 022 31	Part No. 022 33	–	–	–



Two and Three-Stage RUTA Pump Systems with Single- and Two-Stage Rotary Piston Vacuum Pumps as Backing Pumps



RUTA WAU 2001/E250/G

Standard Equipment

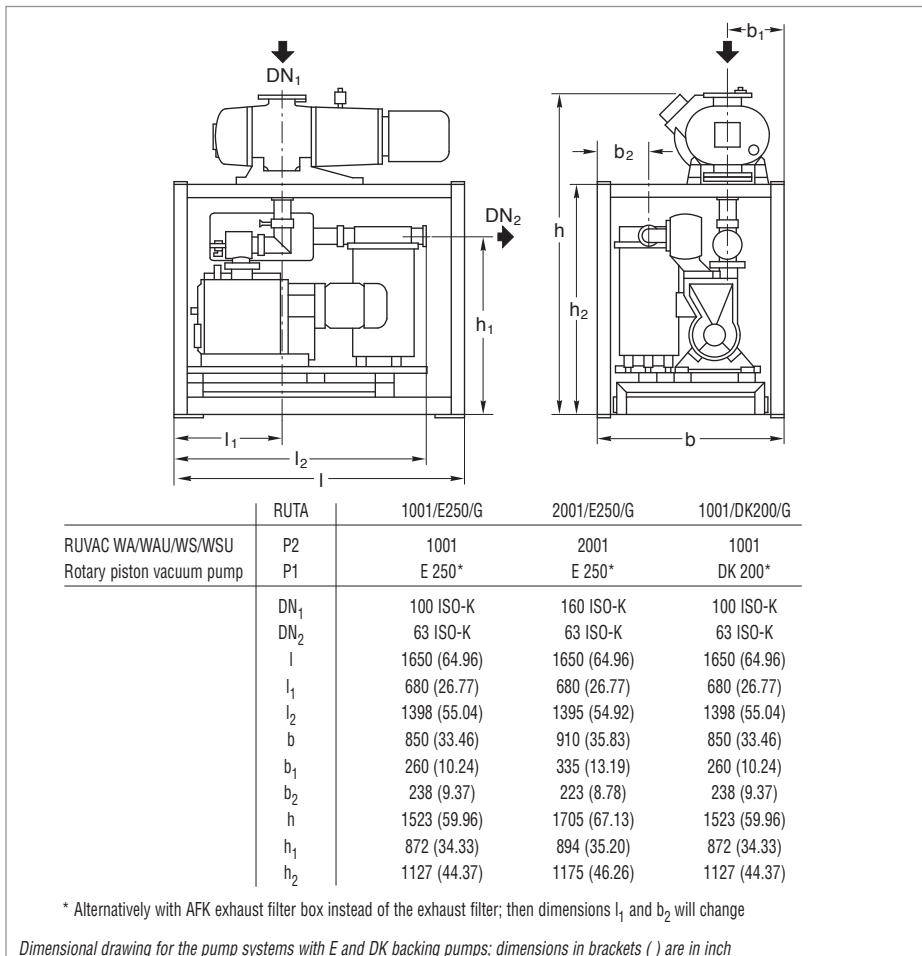
- ◆ Exhaust filter attached
- ◆ Oil collecting pan
- ◆ SECUVAC valve 24 V DC
- ◆ Backing pump removable by a fork lifter
- ◆ Crane eyes on the frame
- ◆ Floor mounting
- ◆ CE approval

- ◆ The oil is supplied with the pump

Options

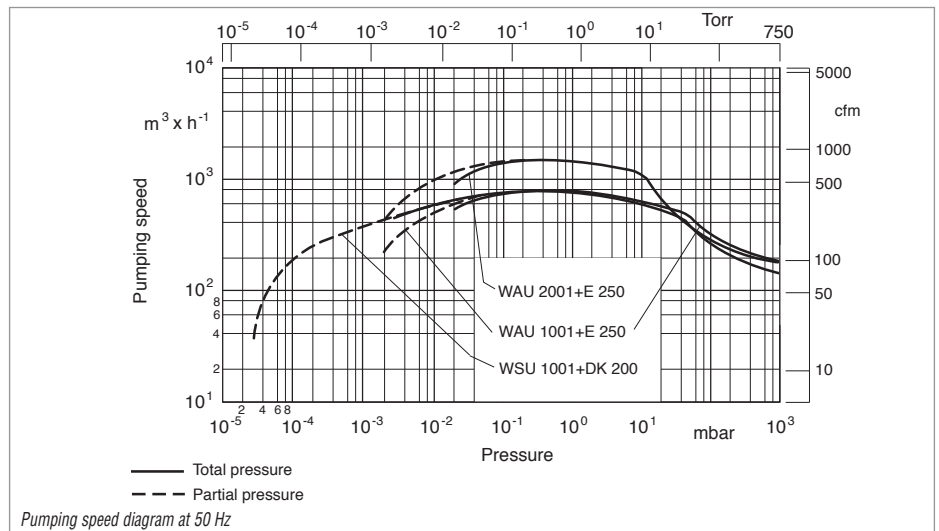
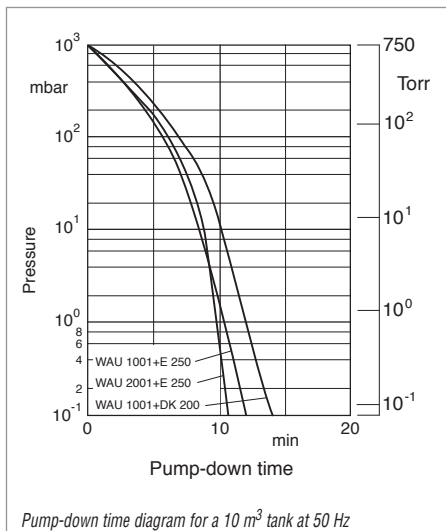
- ◆ Frequency converter for controlling the speed of the Roots pump
- ◆ Oil filter
- ◆ 24 V DC gas ballast valve

- ◆ Sound proofing box
- ◆ Vibration absorbers
- ◆ Different types of floor mount
- ◆ Oil drain valve on each pump
- ◆ Exhaust filter box with oil return
- ◆ Special motors
- ◆ Electric control systems



Technical Data, 50 Hz		RUTA WAU		RUTA WSU
		1001/E250/G	2001/E250/G	1001/DK200/G
RUVAC (WA/WAU/WS/WSU possible)	P2	1001	2001	1001
Rotary piston vacuum pump	P1	E 250	E 250	DK 200
Pumping speed, 50 Hz				
at 1 mbar (0.75 Torr)	m ³ x h ⁻¹ (cfm)	800 (471.2)	1350 (795.2)	–
at 10 ⁻¹ mbar (0.75 x 10 ⁻¹ Torr)	m ³ x h ⁻¹ (cfm)	–	–	815 (480)
Ultimate partial pressure	mbar (Torr)	2 x 10 ⁻³ (1.5 x 10 ⁻³)	2 x 10 ⁻³ (1.5 x 10 ⁻³)	3 x 10 ⁻⁵ (2.3 x 10 ⁻⁵)
Ultimate total pressure with gas ballast	mbar (Torr)	2 x 10 ⁻² (1.5 x 10 ⁻²)	2 x 10 ⁻² (1.5 x 10 ⁻²)	3 x 10 ⁻⁴ (2.3 x 10 ⁻⁴)
Installed motor power	kW (hp)	9.5 (12.9)	13 (17.7)	9.5 (12.9)
Power consumption				
at 1 mbar (0.75 Torr)	kW (hp)	4.0 (5.4)	4.7 (6.4)	–
at 10 ⁻¹ mbar (0.75 x 10 ⁻¹ Torr)	kW (hp)	–	–	4.4 (6.0)
Noise level to DIN 45 635				
max.	dB(A)	80	83	80
without gas ballast at 1 mbar (0.75 Torr)	dB(A)	75	80	–
without gas ballast at 10 ⁻¹ mbar (0.75 x 10 ⁻¹ Torr)	dB(A)	–	–	75
Oil filling, total, approx.	l (qt)	11 (11.63)	12 (12.68)	6 (6.34)
Weight, total, approx.	kg (lbs)	895 (1973.5)	1080 (2381.4)	930 (2050.7)
Connecting flanges				
Inlet port	DN ₁	100 ISO-K	160 ISO-K	100 ISO-K
Outlet port	DN ₂	63 ISO-K	63 ISO-K	63 ISO-K

Ordering Information		RUTA WAU		RUTA WSU
		1001/E250/G	2001/E250/G	1001/DK200/G
RUVAC (WA/WAU/WS/WSU possible)	P2	WAU 1001	WAU 2001	WSU 1001
Rotary piston vacuum pump	P1	E 250	E 250	DK 200
Pumping system, complete (frame version) frame mounted, with Roots vacuum pumps				
RUVAC WAU		Part No. 023 36	Part No. 023 45	–
RUVAC WSU		–	–	Part No. 025 36



Dry-Compressing Vacuum Pump System RUTA with EcoDry L Backing Pump



RUTA WSU 251/EcoDry L/A

Advantages to the User

- ◆ Maintenance-free, oil-free and hydrocarbon-free
- ◆ No particle generation
- ◆ Low power consumption
- ◆ Requires no cooling water
- ◆ High pumping speed at low pressure
- ◆ Tolerates liquids, particles and water vapor
- ◆ No grease-lubricated bearing in the vacuum section
- ◆ Low noise and low vibration
- ◆ Compact size
- ◆ CE approval

Typical Applications

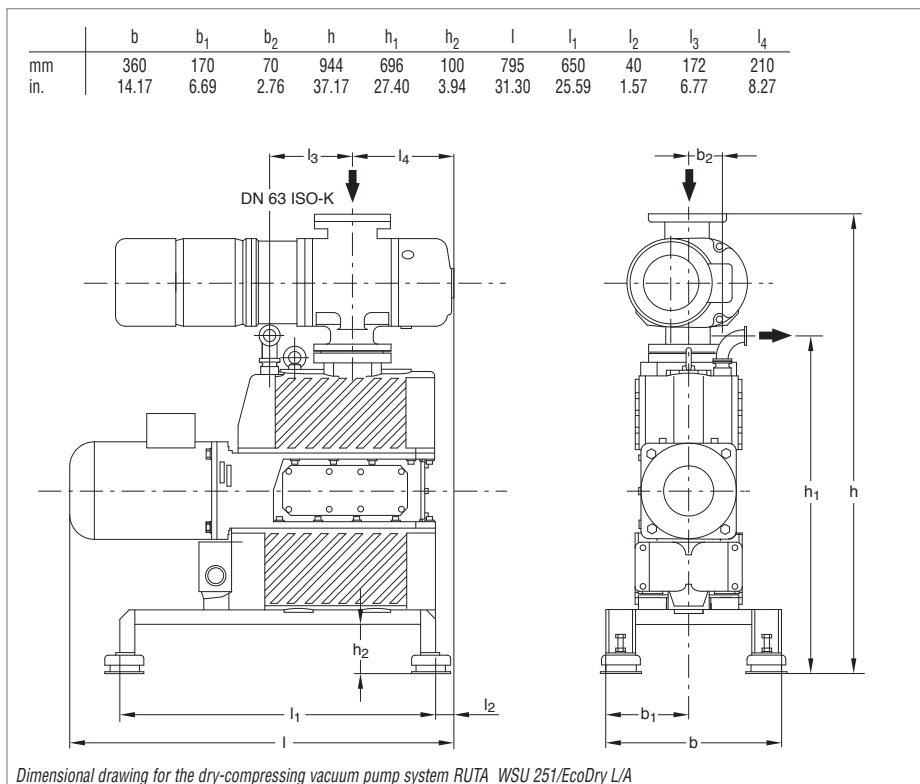
- ◆ Applications in physics
- ◆ Loadlock applications
- ◆ Vacuum locks
- ◆ Lamps manufacture
- ◆ Coating systems
- ◆ Sterilizers
- ◆ Generation of the forevacuum in dry high vacuum pump systems

Standard Equipment

- ◆ Pallet with vibration absorbers
- ◆ 100 mm (3.94 in.) floor clearance for easy moving
- ◆ Connection for horizontal exhaust line
- ◆ Roots pump with mineral oil filling (required oil is supplied with the system upon delivery)

Options

- ◆ Frequency converter for controlling the speed of the Roots pump
- ◆ EcoDry L with 2.2 kW (3 hp) motor for sustained operation at high intake pressures
- ◆ Soft start valve on the EcoDry L
- ◆ Gas ballast
- ◆ Different types of floor mount
- ◆ Castors
- ◆ DN 10/16 KF measurement flange between the pumps
- ◆ PFPE Roots pump model
- ◆ Custom motors (voltage/frequency/protection)
- ◆ Electrical control system

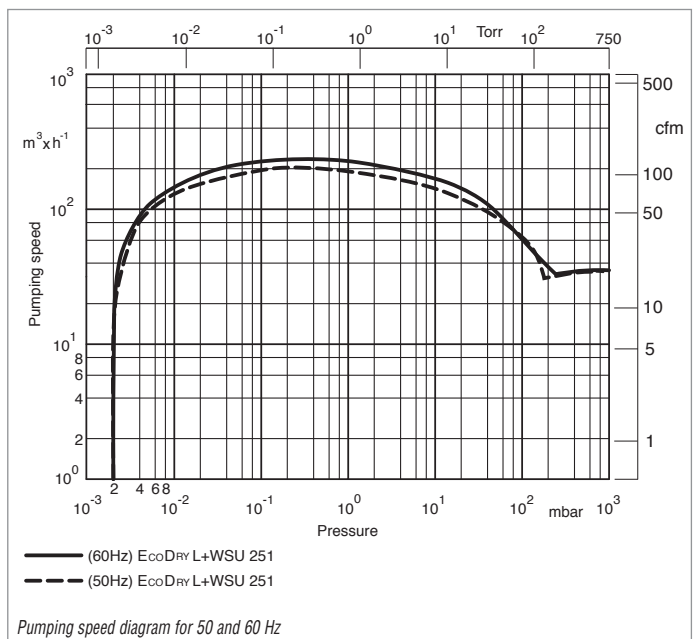
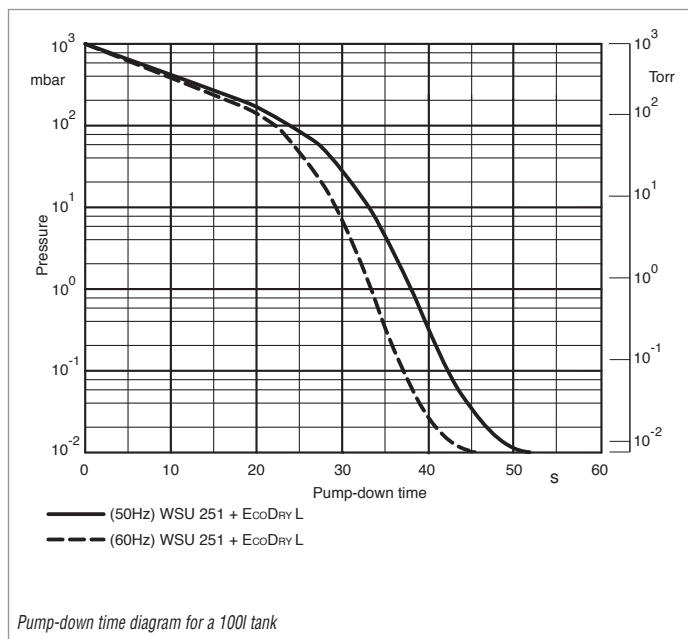


Dimensional drawing for the dry-compressing vacuum pump system RUTA WSU 251/EcoDry L/A

Technical Data		RUTA WSU 251/EcoDry L/A	
		50 Hz	60 Hz
RUVAC (WA/WAU/WS/WSU possible)	P2	WSU 251	WSU 251
Backing pump	P1	EcoDry L	EcoDry L
Pumping speed at 10^{-1} mbar (0.75×10^{-1} Torr) $\text{m}^3 \times \text{h}^{-1}$ (cfm)		185 (109)	230 (135.5)
Ultimate total pressure without gas ballast mbar (Torr)		2×10^{-3} (1.5×10^{-3})	2×10^{-3} (1.5×10^{-3})
Installed motor power			
WSU 251	kW (hp)	1.1 (1.5)	1.4 (1.9)
EcoDry L			
Standard / Option	kW (hp)	1.5 / 2.2 (2.0 / 3.0)	1.8 / 2.6 (2.4 / 3.5)
Total	kW (hp)	2.6 / 3.3 (3.5 / 4.5)	3.2 / 4.0 (4.4 / 5.4)
Power consumption at 10^{-1} mbar (0.75×10^{-1} Torr)	kW (hp)	0.9 (1.2)	1.0 (1.4)
Noise level to DIN 45 635 without gas ballast at 1 mbar (0.75 Torr)	dB(A)	67	69
Weight total, approx.	kg (lbs)	210 (463.1)	210 (463.1)
Connecting flanges			
Inlet port	DN ₁	63 ISO-K	63 ISO-K
Outlet port	DN ₂	25 KF	25 KF



Ordering Information		RUTA WSU 251/EcoDry L/A
RUVAC (WA/WAU/WS/WSU possible)	P2	WSU 251
Backing pump	P1	EcoDry L
Pumping system, complete (adaptor version), pallet mounted 400 V / 50 Hz and 460 V / 60 Hz		Part No. 127 41



Dry Compressing RUTA Pump Systems with SCREWLine SP630 Backing Pump



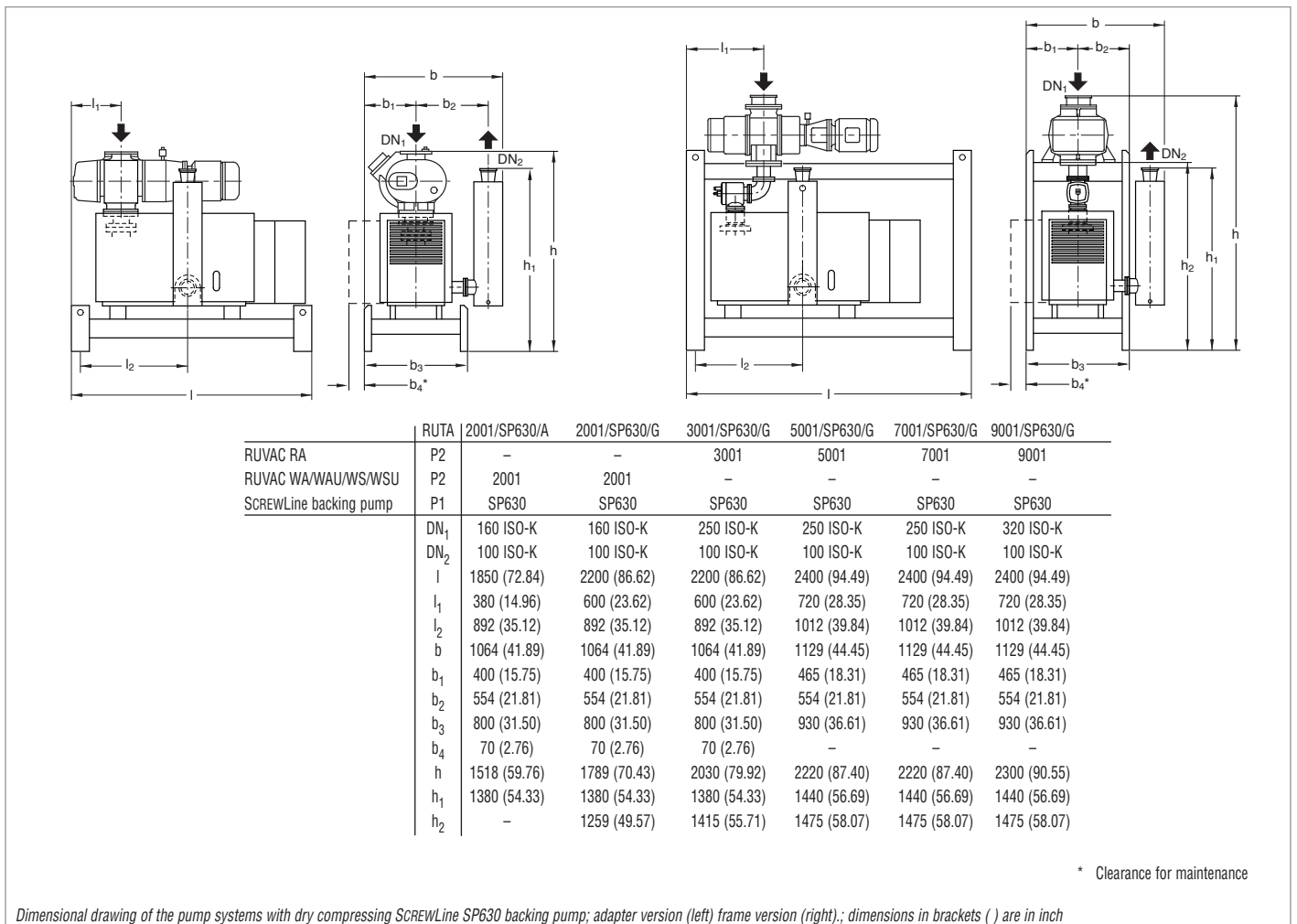
RUTA WAU 2001/SP630/G

Standard Equipment

- ◆ Silencer
- ◆ SECUVAC valve (not for adapter version)
- ◆ Gear oil collecting pan
- ◆ Crane eyes on the frame
- ◆ Floor mounting
- ◆ Gear oil is supplied with the pump

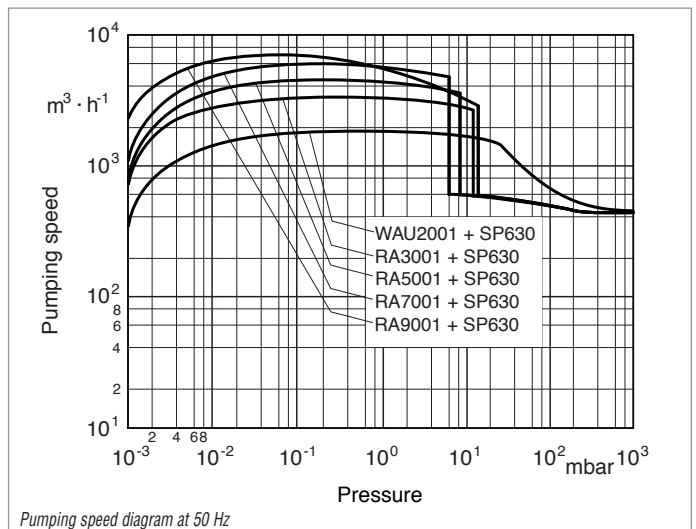
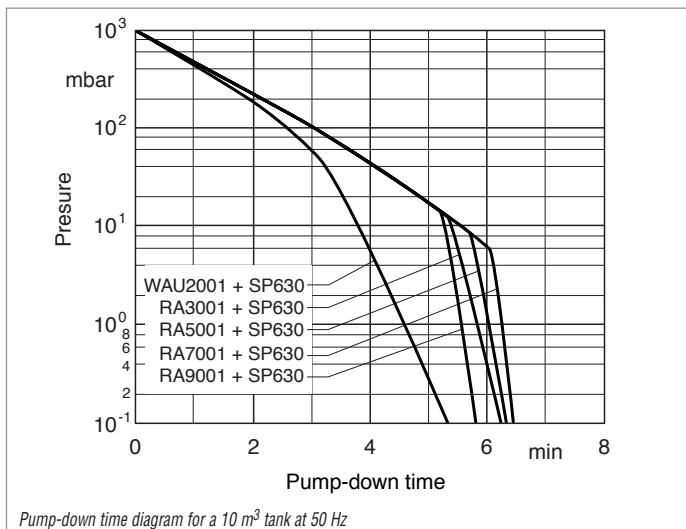
Options

- ◆ Frequency converter 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
- ◆ Gear oil drain valve on each pump
- ◆ Electric control systems



Technical Data, 50 Hz		RUTA WAU		RUTA RA			
		2001/SP630/A	2001/SP630/G	3001/SP630/G	5001/SP630/G	7001/SP630/G	9001/SP630/G
RUVAC RA	P2	–	–	3001	5001	7001	9001
RUVAC (WA/WAU/WS/WSU possible)	P2	2001	2001	–	–	–	–
ScrewLine backing pump	P1	SP630	SP630	SP630	SP630	SP630	SP630
Pumping speed, 50 Hz at 10^{-1} mbar (7.5×10^{-2} Torr)	$m^3 \times h^{-1}$ (cfm)	1780 (1050)	1780 (1050)	3280 (1930)	4510 (2660)	5940 (3500)	6920 (4070)
Ultimate total pressure without gas ballast	mbar (Torr)	$< 1 \times 10^{-3}$ ($< 7.5 \times 10^{-4}$)	$< 1 \times 10^{-3}$ ($< 7.5 \times 10^{-4}$)	$< 1 \times 10^{-3}$ ($< 7.5 \times 10^{-4}$)	$< 1 \times 10^{-3}$ ($< 7.5 \times 10^{-4}$)	$< 1 \times 10^{-3}$ ($< 7.5 \times 10^{-4}$)	$< 1 \times 10^{-3}$ ($< 7.5 \times 10^{-4}$)
Installed motor power	kW (hp)	22.5 (30)	22.5 (30)	26 (35)	30 (40)	33.5 (45)	37 (50)
Electrical power consumption at 10^{-1} mbar	kW (hp)	11.7 (15.7)	11.7 (15.7)	12.2 (16.4)	12.6 (16.9)	13.0 (17.4)	13.5 (18.1)
Noise level in accordance with DIN 45 635 with silencer at 10^{-1} mbar (7.5×10^{-2} Torr)	dB(A)	79	79	81	79	82	80
Weight, total, approx.	kg (lbs)	1100 (2430)	1300 (2870)	1550 (3420)	1900 (4190)	2000 (4410)	2630 (5800)
Connecting flanges							
Inlet port	DN ₁	160 ISO-K	160 ISO-K	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	100 ISO-K	100 ISO-K

Ordering Information		RUTA WAU		RUTA RA			
		2001/SP630/A	2001/SP630/G	3001/SP630/G	5001/SP630/G	7001/SP630/G	9001/SP630/G
RUVAC	P2	–	–	RA 3001	RA 5001	RA 7001	RA 9001
RUVAC (WA/WAU/WS/WSU possible)	P2	WAU 2001	WAU 2001	–	–	–	–
ScrewLine backing pump	P1	SP630	SP630	SP630	SP630	SP630	SP630
Complete pump system (adapter version) fitted on to a pallet, with Roots vacuum pump RUVAC WAU		Part No. 500 740	–	–	–	–	–
Complete pump system (frame version), mounted in a frame, with Roots vacuum pump RUVAC WAU		–	Part No. 500 741	–	–	–	–
RUVAC RA		–	–	Part No. 500 742	Part No. 500 743	Part No. 500 744	Part No. 500 745



RUVAC RAV Roots Vacuum Pumps with Pre-Admission Cooling



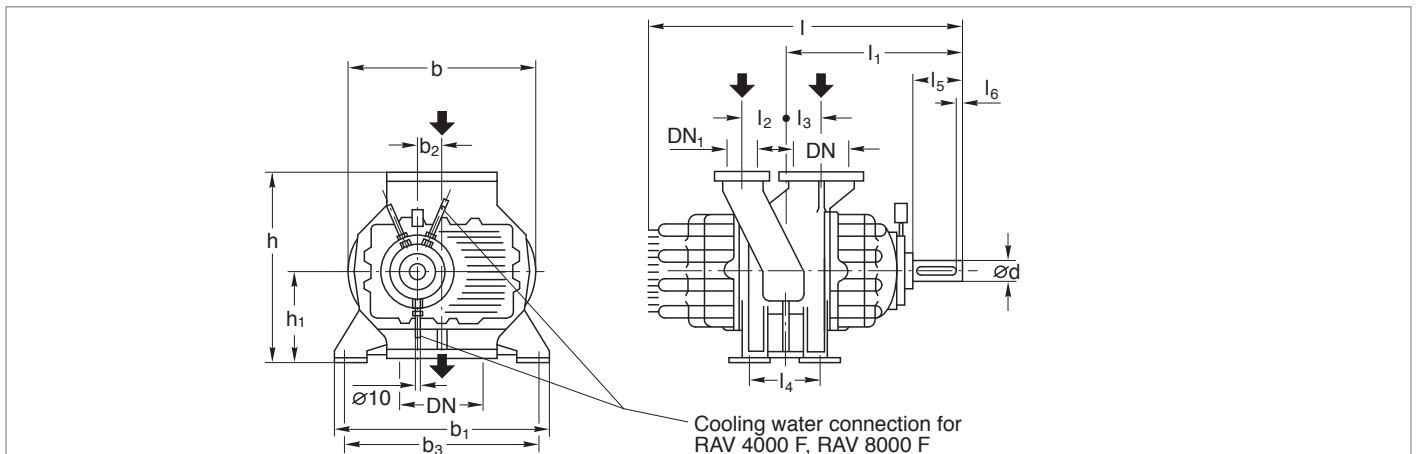
Advantages to the User

- ◆ **RUVAC RAV G:**
Operating pressure range of 150 mbar (112.5 Torr) against atmospheric pressure;
Total leak rate $< 10^{-1}$ mbar x l x s⁻¹ (0.75×10^{-2} Torr x l x s⁻¹)
- ◆ **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 x s⁻¹ (0.75×10^{-2} Torr x l x s⁻¹)
- ◆ 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 (0.75×10^{-3} 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)

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



RUVAC RAV	DN DIN 2533	DN ₁ DIN 2533	l	l ₁	l ₂	l ₃	l ₄	l ₅	l ₆	b	b ₁	b ₂	b ₃	Type F	Type G	h	h ₁	
														d	d			
250 F/G	mm	80	50	529	283	90	100	125	50	5	321	332	34	300	25 k6	28 k6	313	132
	in.	80	50	20.83	11.14	3.54	3.94	4.92	1.97	0.20	12.64	13.07	1.34	11.81	0.98 k6	1.10 k6	12.32	5.20
500 F/G	mm	100	50	604	324	120	100	150	70	5	321	390	42.6	350	25 k6	38 k6	370	160
	in.	100	50	23.78	12.76	4.72	3.94	5.91	2.76	0.20	12.64	15.35	1.68	13.78	0.98 k6	1.50 k6	14.57	6.30
1000 F/G	mm	100	80	705	380	125	115	210	90	5	427	440	53.3	400	42 k6	45 k6	410	180
	in.	100	80	27.76	14.96	4.92	4.53	8.27	3.54	0.20	16.81	17.32	2.10	15.75	1.65 k6	1.77 k6	16.14	7.09
2000 F/G	mm	150	100	806	423	160	130	270	80	5	476	570	67.6	510	42 k6	55 k6	450	200
	in.	150	100	31.73	16.65	6.30	5.12	10.63	3.15	0.20	18.74	22.44	2.66	20.08	1.65 k6	2.17 k6	17.72	7.87
4000 F/G	mm	250 ^{*)}	150	1143	610	250	200	410	95	5	682	800	106	720	55 k6	70 m6	680	315
	in.	250 ^{*)}	150	45.0	24.02	9.84	7.87	16.14	3.74	0.20	26.85	31.50	4.17	28.35	2.17 k6	2.76 m6	26.77	12.40
8000 F/G	mm	300 ^{*)}	200 ^{*)}	1337	717	300	230	525	100	8	954	910	135	830	70 k6	90 m6	760	355
	in.	300 ^{*)}	200 ^{*)}	52.64	28.23	11.81	9.06	20.67	3.94	0.31	37.56	35.83	5.31	32.68	2.76 k6	3.54 m6	29.92	13.98

Dimensional drawing for the RUVAC RAV pumps

^{*)} DIN 2532

DN₁ = Pre-inlet

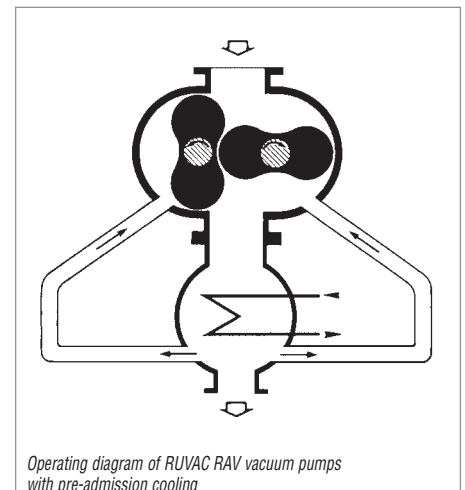
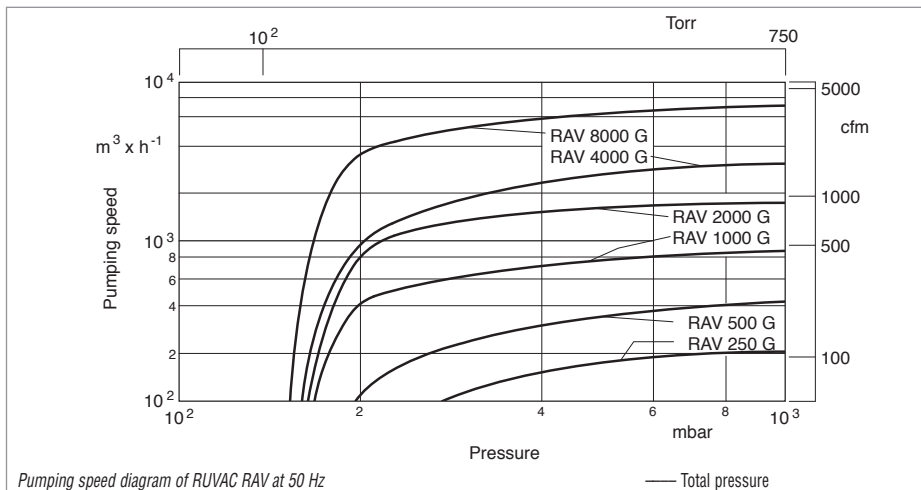
Technical Data, 50 Hz		250 G	500 G	1000 G	2000 G	4000 G	8000 G
Pumping speed ¹⁾	m ³ x h ⁻¹ (cfm)	250 (147.3)	500 (294.5)	1000 (589)	2000 (1178)	3700 (2179.3)	8100 (4770.9)
Nominal speed	min ⁻¹	3000	3000	3000	3000	1500	1500
Max. permissible pressure difference ²⁾	mbar (Torr)	850 (637)	850 (637)	850 (637)	850 (637)	850 (637)	850 (637)
Connecting flange	DN	80	100	100	150	250	300
Max. permissible motor power							
	for direct drive	kW (hp)	11 (15)	18.5 (25.2)	30 (40.8)	55 (74.8)	95 (129.3)
for belt drive	kW (hp)	11 (15)	18.5 (25.2)	30 (40.8)	55 (74.8)	95 (129.3)	200 (272.1)
Weight	kg (lbs)	95 (210)	160 (353)	225 (496)	310 (684)	720 (1588)	1230 (2712)

Ordering Information	250 G	500 G	1000 G	2000 G	4000 G	8000 G
RUVAC RAV G Roots vacuum pump	upon request	upon request	upon request	upon request	upon request	upon request

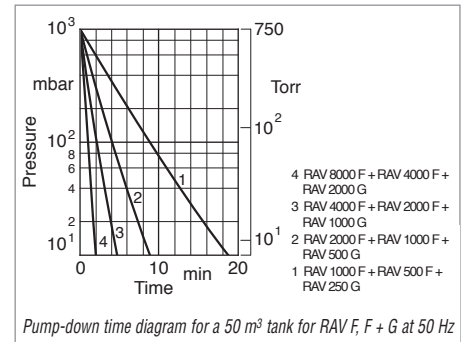
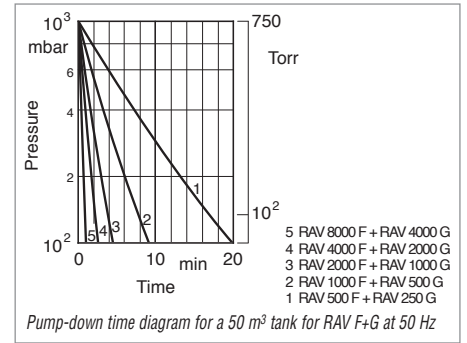
Technical Data, 50 Hz		250 F	500 F	1000 F	2000 F	4000 F	8000 F
Pumping speed ¹⁾	m ³ x h ⁻¹ (cfm)	250 (147.3)	500 (294.5)	1000 (589)	2000(1178)	3700 (2179.3)	8100 (4770.9)
Nominal speed	min ⁻¹	3000	3000	3000	3000	1500	1500
Max. permissible pressure difference ²⁾	mbar (Torr)	850 (637)	850 (637)	850 (637)	850 (637)	850 (637)	850 (637)
Connecting flange	DN	80	100	100	150	250	300
Max. permissible motor power							
	for direct drive	kW (hp)	11 (15)	18.5 (25.2)	30 (40.8)	55 (74.8)	95 (129.3)
for belt drive	kW (hp)	4 (5.4)	4 (5.4)	7.5 (10.2)	15 (20.4)	37 (50.3)	75 (102.0)
Weight, approx.	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	250 F	500 F	1000 F	2000 F	4000 F	8000 F
RUVAC RAV F Roots vacuum pump	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

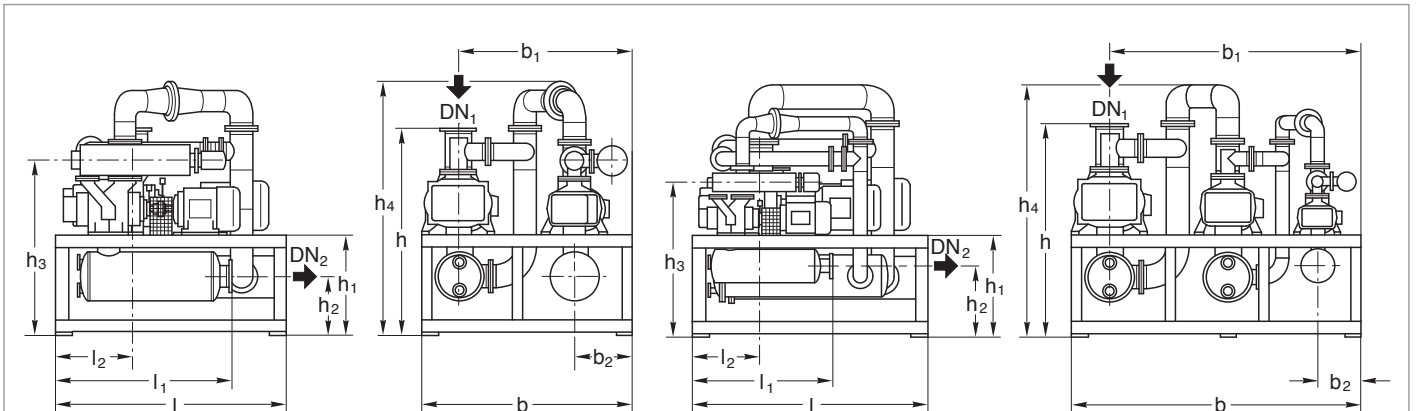


Two- and Three-Stage RUTA RAV Pump Systems with RUVAC RAV Roots Vacuum Pumps



Standard Equipment

- ◆ Roots vacuum pumps with pre-admission cooling
- ◆ One or two RAV F pumps are connected upstream of the RUVAC RAV G pump operating as a backing pump
- ◆ CE approval
- ◆ Ultimate pressures below 10 mbar (7.5 Torr) can be attained
- ◆ Gas cooler, pre-admission silencer and filter
- ◆ Non-return flap
- ◆ Exhaust silencer



	RUTA	500 F/250 G	1000 F/500 G	2000 F/1000 G	4000 F/2000 G	8000 F/4000 G	1000 F/500 F/250 G	2000 F/1000 F/500 G	4000 F/2000 F/1000 G	8000 F/4000 F/2000 G
RUVAC RAV	P3	-	-	-	-	-	1000 F	2000 F	4000 F	8000 F
RUVAC RAV	P2	500 F	1000 F	2000 F	4000 F	8000 F	500 F	1000 F	2000 F	4000 F
RUVAC RAV	P1	250 G	500 G	1000 G	2000 G	4000 G	250 G	500 G	1000 G	2000 G
	DN ₁	100 (3.94)	100 (3.94)	150 (5.91)	250 (9.84)	300 (11.81)	100 (3.94)	150 (5.91)	250 (9.84)	300 (11.81)
	DN ₂	80 (3.15)	100 (3.94)	100 (3.94)	150 (5.91)	250 (9.84)	80 (3.15)	100 (3.94)	100 (3.94)	150 (5.91)
	l	1290 (50.79)	1560 (61.42)	1830 (72.03)	2400 (94.49)	2790 (109.84)	1560 (61.42)	1830 (72.05)	2400 (94.49)	2790 (109.84)
	l ₁	420 (16.54)	480 (18.90)	570 (22.44)	800 (31.50)	950 (37.40)	480 (18.90)	570 (22.44)	800 (31.50)	950 (37.40)
	l ₂	1050 (41.34)	1100 (43.31)	1300 (51.18)	1650 (64.96)	2150 (84.65)	1050 (41.34)	1100 (43.31)	1350 (53.15)	1650 (64.96)
	b	1300 (51.18)	1500 (59.06)	1680 (66.14)	2050 (80.71)	2600 (102.36)	2170 (85.43)	2400 (94.49)	2850 (112.20)	3400 (133.86)
	b ₁	1050 (41.34)	1180 (46.46)	1300 (51.18)	1550 (61.02)	2100 (82.68)	1850 (72.83)	2000 (78.74)	2400 (94.49)	2950 (116.14)
	b ₂	400 (15.75)	400 (15.75)	450 (17.72)	500 (19.69)	700 (27.56)	400 (15.75)	400 (15.75)	450 (17.72)	500 (19.69)
	h	1550 (61.02)	1700 (66.93)	1930 (75.98)	2550 (100.39)	3100 (122.05)	1720 (67.72)	1950 (76.77)	2550 (100.39)	3000 (118.11)
	h ₁	720 (28.35)	820 (32.28)	1000 (39.37)	1100 (43.31)	1200 (47.24)	800 (31.5)	1000 (39.37)	1150 (45.28)	1200 (47.24)
	h ₂	500 (19.69)	570 (22.44)	750 (29.53)	700 (27.56)	700 (27.56)	600 (23.62)	750 (29.53)	850 (33.46)	850 (33.46)
	h ₃	1180 (46.46)	1340 (52.76)	1540 (60.63)	1750 (68.90)	2100 (82.68)	1280 (50.39)	1500 (59.06)	1700 (66.93)	1830 (72.05)
	h ₄	1370 (53.94)	1520 (59.84)	1750 (68.90)	2210 (87.01)	2500 (98.43)	1520 (59.84)	1750 (68.90)	2210 (87.01)	2500 (98.43)

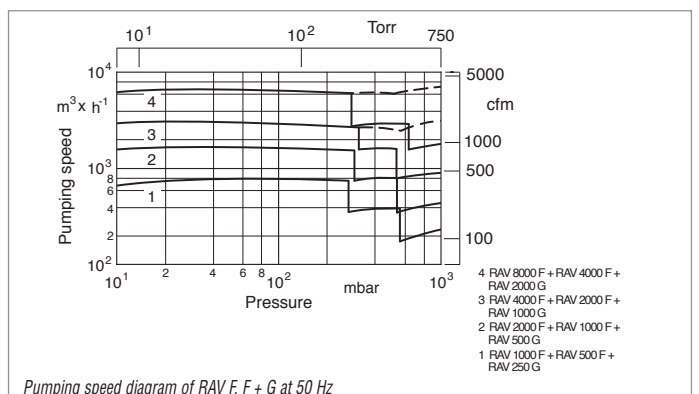
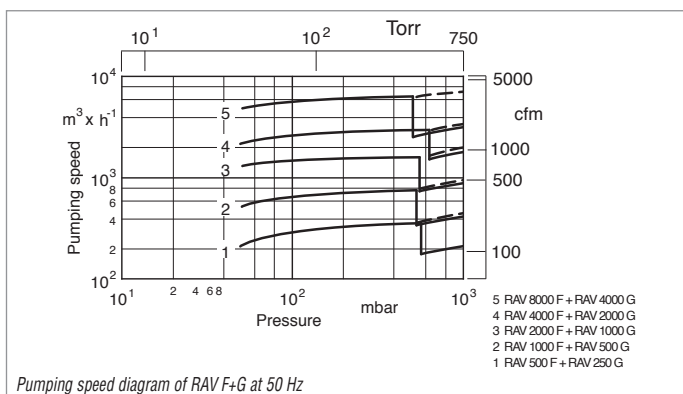
Dimensional drawing for two-stage RUTA RAV pump systems [left] and three-stage RUTA RAV pump systems [right]; dimensions in brackets () are in inch

Technical Data, 50 Hz		RUTA RAV								
		500 F/ 250 G	1000 F/ 500 G	2000 F/ 1000 G	4000 F/ 2000 G	8000 F/ 4000 G	1000 F/ 500 F/ 250 G	2000 F/ 1000 F/ 500 G	4000 F/ 2000 F/ 1000 G	8000 F/ 4000 F/ 2000 G
RUVAC RAV	P3	–	–	–	–	–	1 000 F	2 000 F	4 000 F	8 000 F
RUVAC RAV	P2	500 F	1 000 F	2 000 F	4 000 F	8 000 F	500 F	1 000 F	2 000 F	4 000 F
RUVAC RAV	P1	250 G	500 G	1 000 G	2 000 G	4 000 G	250 G	500 G	1 000 G	2 000 G
Pumping speed, 50 Hz										
at 200 mbar (150 Torr)	m ³ x h ⁻¹ (cfm)	322 (189.7)	708 (417)	1 518 (894.1)	2 685 (1 581.5)	5 821 (3 428.6)	–	–	–	–
at 100 mbar (75 Torr)	m ³ x h ⁻¹ (cfm)	–	–	–	–	–	741 (436.4)	1 573 (926.5)	2 862 (1 685.7)	6 243 (3 677.1)
Ultimate total pressure (other motors are required)		mbar (Torr)	< 50 (< 37.5)	< 50 (< 37.5)	< 50 (< 37.5)	< 50 (< 37.5)	< 10 (< 7.5)	< 10 (< 7.5)	< 10 (< 7.5)	< 10 (< 7.5)
Cut-in pressure										
P3 *)	mbar (Torr)	–	–	–	–	–	278 (208.5)	265 (198.8)	312 (234)	289 (216.8)
P2 *)	mbar (Torr)	576 (432)	538 (403.5)	548 (411)	630 (472.5)	502 (376.5)	576 (432)	538 (403.5)	548 (411)	630 (472.5)
P1	mbar (Torr)	1 013 (760)	1 013 (760)	1 013 (760)	1 013 (760)	1 013 (760)	1 013 (760)	1 013 (760)	1 013 (760)	1 013 (760)
Installed motor power		kW (hp)	15 (20.4)	22 (29.9)	44 (59.9)	82 (111.6)	165 (224.5)	22.5 (30.6)	37 (50.3)	62.5 (85.0)
Power consumption										
at 200 mbar (150 Torr)	kW (hp)	7.8 (10.6)	15.8 (21.5)	31.5 (42.9)	56.4 (76.7)	122 (166.0)	–	–	–	–
at 100 mbar (75 Torr)	kW (hp)	–	–	–	–	–	12 (16.3)	24.4 (33.2)	42.3 (57.6)	90.6 (123.3)
Cooling water consumption (T<30°, DT<10 K), max. (gas coolers and pumps)		m ³ x h ⁻¹ (cfm)	0.5 (0.3)	1 (0.6)	2 (1.2)	3 (1.8)	7 (4.1)	1 (0.6)	2 (1.2)	4 (2.4)
Noise level to DIN 45 635 with pre-inlet and pulsation silencers and pump exhaust leading outside plus additional sound proofing box (a further reduction is possible)										
	dB(A)	86	88	93	104	106	88	95	106	108
	dB(A)	72	74	80	84	86	75	77	86	88
Oil filling, total, approx.		l (qt)	2 (2.11)	2.5 (2.64)	4 (4.23)	14.5 (15.33)	23 (24.31)	3.5 (3.70)	5 (5.29)	16 (16.91)
Total weight, incl. silencers for pre-admission and exhaust, approx.		kg (lbs)	1 000 (2205)	1 600 (3528)	2 200 (4851)	4 000 (8820)	7 500 (16538)	2 000 (4410)	3 000 (6615)	5 000 (11025)
Connecting flanges (pipe connection) ¹⁾										
Inlet port	DN ₁	100	100	150	250	300	100	150	250	300
Outlet port	DN ₂	80	100	100	150	250	80	100	100	150
Gas admission port without filter	DN	50	50	80	100	150	50	50	80	100

C08

Ordering Information		RUTA RAV								
		500 F/ 250 G	1000 F/ 500 G	2000 F/ 1000 G	4000 F/ 2000 G	8000 F/ 4000 G	1000 F/ 500 F/ 250 G	2000 F/ 1000 F/ 500 G	4000 F/ 2000 F/ 1000 G	8000 F/ 4000 F/ 2000 G
Pump system		upon request	upon request	upon request	upon request	upon request	upon request	upon request	upon request	upon request

*) With exhaust flap and bypass line 1013 mbar (760 Torr) ¹⁾ to DIN 25 33



TVD Pump Systems for Drying, Evaporation and Distillation Applications



TVD 200

Advantages to the User

- ◆ Operating agent may be re-used, 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

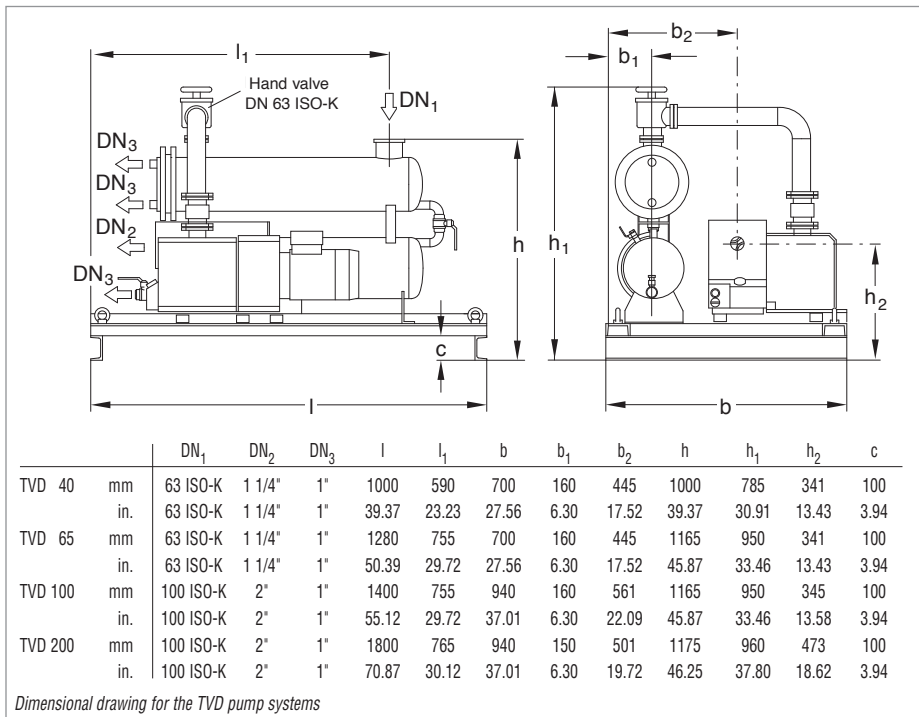
- ◆ Drying of powders and solids, for example
- ◆ Cleaning of waste water
- ◆ Vacuum distillation

Standard Equipment

- ◆ Condenser at the intake side
- ◆ Receiver with condensate level indicator
- ◆ Manually operated valves on the receiver
- ◆ SOGEVAC rotary vane pump with integrated exhaust filters, anti-suckback valve and gas ballast valve

Options

- ◆ Valve between condenser and rotary vane 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



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 (31.71)	50 (52.85)	50 (52.85)	50 (52.85)
Rotary vane vacuum pump	SOGEVAC	SV 40	SV 65	SV 100	SV 200
Nominal pumping speed	m ³ x h ⁻¹ (cfm)	46 (27.1)	65 (38.3)	100 (58.9)	180 (106)
Pumping speed at 50 Hz					
for air	m ³ x h ⁻¹ (cfm)	46 (27.1)	53 (31.2)	94 (55.4)	170 (100.1)
for water vapor at 50 mbar (37.5 Torr)	m ³ x h ⁻¹ (cfm)	280 (165)	560 (330)	840 (495)	1400 (825)
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 to DIN 45635 *)	dB(A)	63	64	70	69
Condensing capacity for water	l x h ⁻¹	10	20	30	50
Installed motor power	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
Pump system	Part No. 021 01	Part No. 021 02	Part No. 021 03	Part No. 021 04

*) Operating at ultimate pressure with gas ballast



Version for the North and South American Continents

RBS - B/BCS Roots Pump Systems with Two-Stage TRIVAC Backing Pumps



RBS - B/BCS Roots Pumping Systems

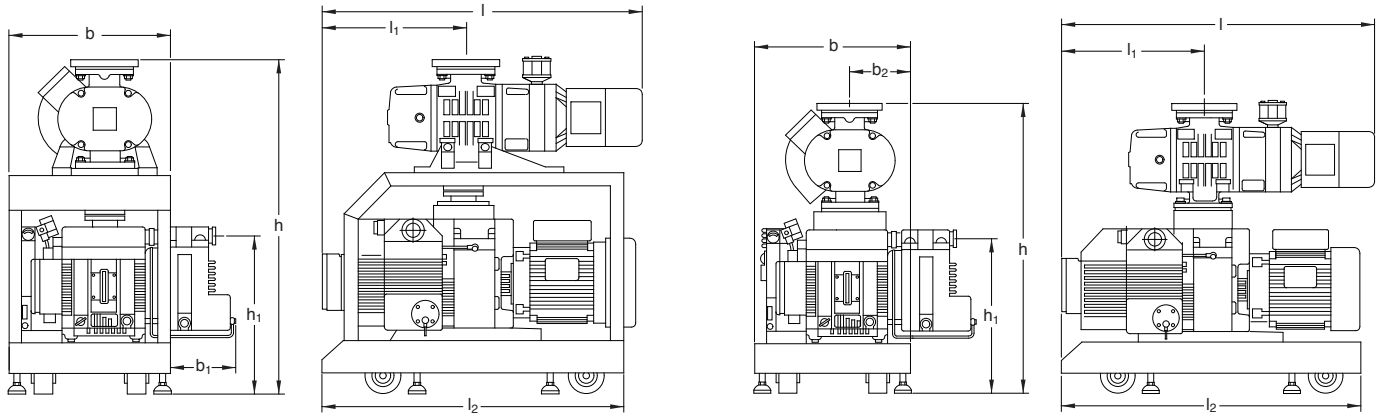
Standard Equipment

- ◆ System consists of TRIVAC dual stage B or BCS direct drive vane pump and RUVAC blower
- ◆ Complete air cooled system
- ◆ Frame equipped with caster wheels and leveling pads
- ◆ Compact construction with quiet operation
- ◆ Available with either 18 inch or 26 inch wide frame
- ◆ Manual operation of gas ballast
- ◆ Frame mounted or close-coupled RUVAC blower

Options

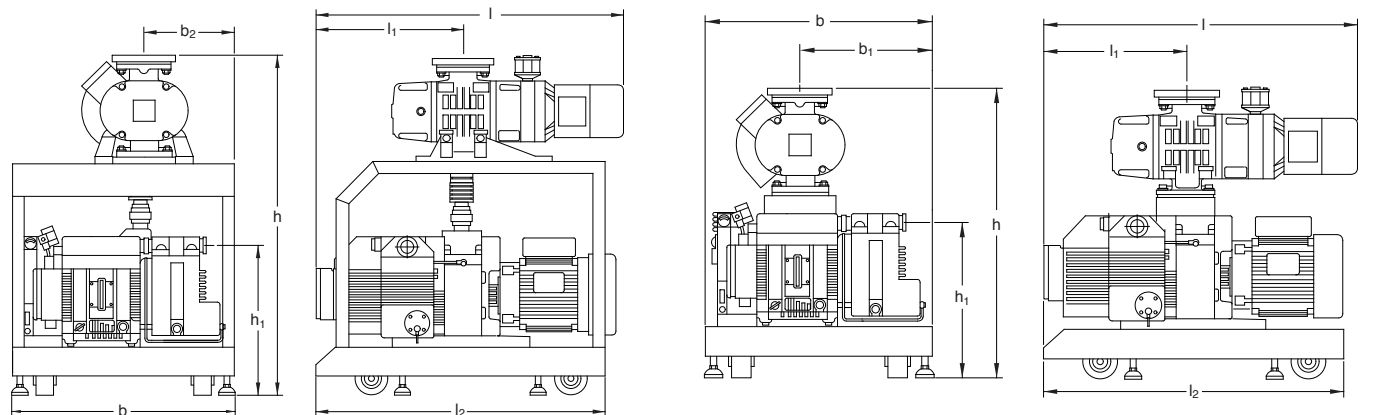
- ◆ All TRIVAC accessories, Exhaust filter, 24 V DC gas ballast valve, chemical oil filter, and electrical limit switch system
- ◆ Full frame drip pan
- ◆ Oil drain valves
- ◆ Special motor voltages and frequencies
- ◆ Special oil for unique applications
- ◆ Full NEMA 12 electrical controls for control start/stop and monitoring of system from remote and local locations – PSS/LOS/ROS system

Version for the North and South American Continents



System	b	b ₁	b ₂	h		h ₁	l	l ₁		l ₂
				Frame	Close-coupled			Frame	Close-coupled	
D 40 B/BCS										
WA/WAU 251	18 (457)	8 (203)	7 (178)	38 3/16 (967)	33 3/16 (853)	17 15/16 (456)	34 29/32 (887)	14 (356)	34 (864)	
WS/WSU 251	18 (457)	8 (203)	7 (178)	38 3/16 (967)	33 3/16 (853)	17 15/16 (456)	32 3/4 (832)	14 (356)	34 (864)	
WA/WAU 501	18 (457)	8 (203)	7 (178)	39 5/16 (999)	34 3/4 (883)	17 15/16 (456)	40 13/32 (1026)	14 (356)	34 (864)	
WS/WSU 501	18 (457)	8 (203)	7 (178)	39 5/16 (999)	34 3/4 (883)	17 15/16 (456)	33 13/16 (859)	14 (356)	34 (864)	
D 65 B/BCS										
WA/WAU 251	18 (457)	8 (203)	7 (178)	38 3/16 (967)	33 3/16 (853)	17 15/16 (456)	36 29/32 (937)	16 (406)	34 (864)	
WS/WSU 251	18 (457)	8 (203)	7 (178)	38 3/16 (967)	33 3/16 (853)	17 15/16 (456)	34 3/4 (883)	16 (406)	34 (864)	
WA/WAU 501	18 (457)	8 (203)	7 (178)	39 5/8 (1007)	34 3/4 (883)	17 15/16 (456)	42 13/32 (1007)	16 (406)	34 (864)	
WS/WSU 501	18 (457)	8 (203)	7 (178)	39 5/8 (1007)	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 D40/65 B backing pumps, frame mounted package [left] and close-coupled package [right]; dimensions in brackets () are in mm



System	b	b ₁	b ₂	h		h ₁	l		l ₁		l ₂
				Frame	Close-coupled		Frame	Close-coupled	Frame	Close-coupled	
D 40 B/BCS											
WA/WAU 251	26 (660)	15 1/2 (394)	10 15/16 (278)	41 3/16 (1046)	33 3/16 (853)	17 15/16 (456)	35 29/32 (912)	34 29/32 (887)	15 (381)	14 (356)	34 (864)
WS/WSU 251	26 (660)	15 1/2 (394)	10 15/16 (278)	41 3/16 (1046)	33 3/16 (853)	17 15/16 (456)	33 3/4 (857)	32 3/4 (832)	15 (381)	14 (356)	34 (864)
WA/WAU 501	26 (660)	15 1/2 (394)	10 15/16 (278)	42 3/4 (1086)	34 3/4 (883)	17 15/16 (456)	41 13/32 (1052)	40 13/32 (1026)	15 (381)	14 (356)	34 (864)
WS/WSU 501	26 (660)	15 1/2 (394)	10 15/16 (278)	42 3/4 (1086)	34 3/4 (883)	17 15/16 (456)	34 13/16 (884)	33 13/16 (859)	15 (381)	14 (356)	34 (864)
D 65 B/BCS											
WA/WAU 251	26 (660)	15 1/2 (394)	10 15/16 (278)	41 3/16 (1046)	33 3/16 (853)	17 15/16 (456)	37 29/32 (963)	36 29/32 (937)	17 (432)	16 (406)	34 (864)
WS/WSU 251	26 (660)	15 1/2 (394)	10 15/16 (278)	41 3/16 (1046)	33 3/16 (853)	17 15/16 (456)	35 3/4 (908)	34 3/4 (883)	17 (432)	16 (406)	34 (864)
WA/WAU 501	26 (660)	15 1/2 (394)	10 15/16 (278)	42 3/4 (1086)	34 3/4 (883)	17 15/16 (456)	43 13/32 (1103)	42 13/32 (1077)	17 (432)	16 (406)	34 (864)
WS/WSU 501	26 (660)	15 1/2 (394)	10 15/16 (278)	42 3/4 (1086)	34 3/4 (883)	17 15/16 (456)	36 13/16 (935)	35 13/16 (910)	17 (432)	16 (406)	34 (864)
WA/WAU 1001	26 (660)	15 1/2 (394)	10 15/16 (278)	44 31/32 (1142)	-	17 15/16 (456)	48 7/8 (1241)	-	17 (432)	-	34 (864)
WS/WSU 1001	26 (660)	15 1/2 (394)	10 15/16 (278)	44 31/32 (1142)	-	17 15/16 (456)	39 29/32 (1014)	-	17 (432)	-	34 (864)

Dimensional drawing for the RBS - B/BCS Roots Pumping Systems 26" with TRIVAC D40/65 B backing pumps, frame mounted package [left] and close-coupled package [right]; dimensions in brackets () are in mm

Version for the North and South American Continents

Technical Data		RBS - B/BCS Roots Pump Systems				
		251/D40B	251/D65B	501/D40B	501/D65B	1001/D65B
RUVAC (WA/WAU/WS/WSU possible)		251	251	501	501	1001
TRIVAC backing pump		D 40 B/BCS	D 65 B/BCS	D 40 B/BCS	D 65 B/BCS	D 65 B/BCS
Pumping speed @ 0.1 Torr	cfm (m ³ x h ⁻¹)	140 (1237)	150 (1254)	232 (394)	267 (453)	427 (725)
Ultimate total pressure	Torr (mbar)	2 x 10 ⁻⁴ (< 4 x 10 ⁻⁴)	2 x 10 ⁻⁴ (< 4 x 10 ⁻⁴)	2 x 10 ⁻⁴ (< 4 x 10 ⁻⁴)	2 x 10 ⁻⁴ (< 4 x 10 ⁻⁴)	2 x 10 ⁻⁴ (< 4 x 10 ⁻⁴)
Connecting flanges						
Inlet port						
WA/WAU		3" ANSI	3" ANSI	3" ANSI	3" ANSI	4" ANSI
WS/WSU		63 ISO-K	63 ISO-K	63 ISO-K	63 ISO-K	100 ISO-K
Outlet port		40 KF	40 KF	40 KF	40 KF	40 KF
Operating voltage		208/230/460	208/230/460	208/230/460	208/230/460	208/230/460
Phase / Frequency ¹⁾	Hz	3 / 60	3 / 60	3 / 60	3 / 60	3 / 60
Full load amps ²⁾						
RUVAC						
WA/WAU		4.6/4.2/2.1	4.6/4.2/2.1	9.4/8.2/4.1	9.4/8.2/4.1	15.2/13.2/6.1
WS/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	15.7/15.7/9.1
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	9.0/8.8/4.5
Displacement						
RUVAC	cfm	179	179	357	357	707
TRIVAC	cfm	32	53	32	53	53
Maximum differential pressure	Torr	60	60	60	60	60
Normal starting pressure ³⁾	Torr	20	30	12	16	8
Oil capacity						
RUVAC WA/WAU/WS/WSU	qt	1.49 / 0.75	1.49 / 0.75	1.40 / 1.10	1.40 / 1.10	4.00 / 2.10
TRIVAC	qt	2.70	3.40	2.70	3.40	3.40
Nominal rotation speed						
RUVAC	rpm	3600	3600	3600	3600	3600
TRIVAC	rpm	1800	1800	1800	1800	1800
Motor power						
RUVAC WA/WAU/WS/WSU	hp	1.5 / 1.7	1.5 / 1.7	3.0 / 3.4	3.0 / 3.4	5.0 / 6.1
TRIVAC	hp	3.0	3.0	3.0	3.0	3.0

Ordering Information

RBS - B/BCS Roots Pump Systems

RBS - B/BCS Roots pump system
(supplied with hydrocarbon oil)

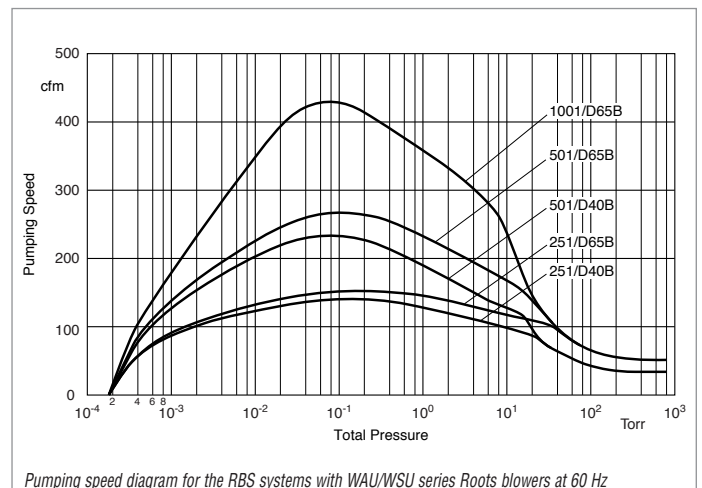
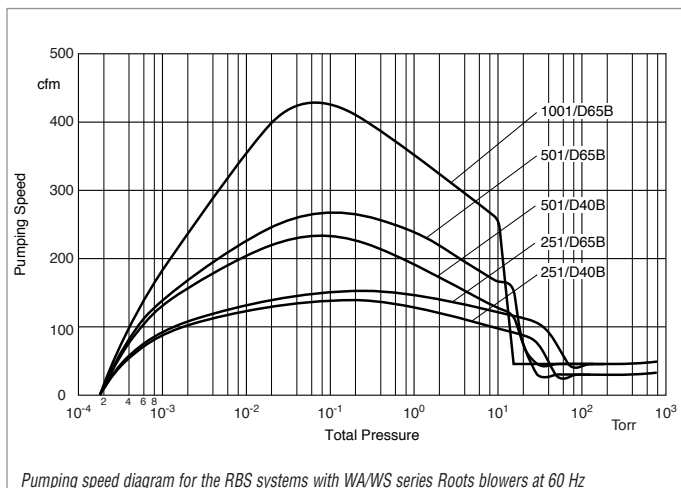
See Price List for the "North American Continent" for Ordering Information

¹⁾ For 50 Hz systems, consult the factory

²⁾ Determined by operating voltage

³⁾ WAU/WSU pumps start at atmospheric pressure (760 Torr)

For more detailed gauge specifications see Product Section C16 "Total Pressure Gauges"



Version for the North and South American Continents

HTS Close-Coupled Systems with Single-Stage SOGEVAC Backing Pumps



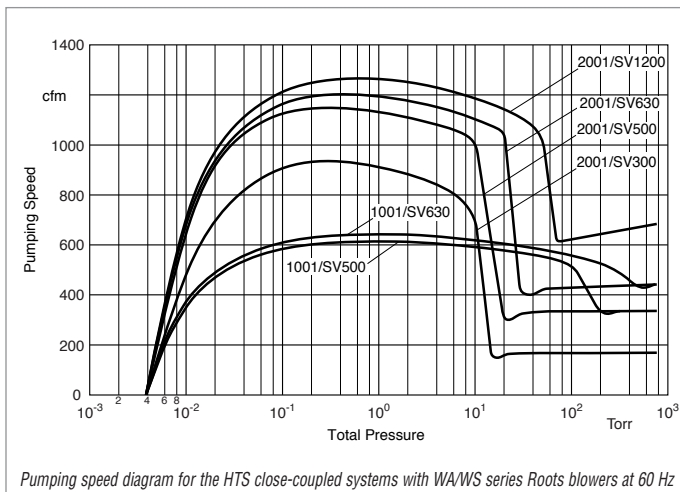
HTS close coupled System

Standard Equipment

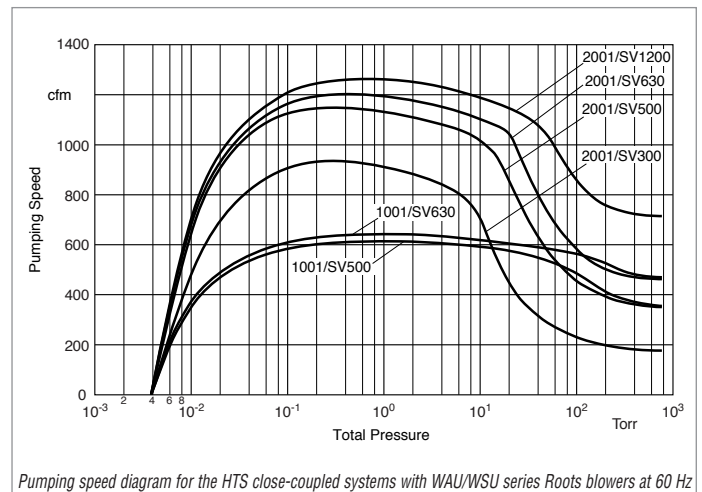
- ◆ System consists of single stage SOGEVAC vane pump
- ◆ Complete air cooled system
- ◆ Frame mounted or close-coupled RUVAC blower
- ◆ Compact construction with quiet operation
- ◆ Manual operation of gas ballast
- ◆ Spin-on type oil filter

Options

- ◆ SOGEVAC accessories: oil level monitoring, exhaust case gauge, 24 V DC gas ballast purge, water-cooling
- ◆ Full frame drip pan for frame mounted systems
- ◆ Frame mounted caster wheels
- ◆ Frame mounted leveling pads
- ◆ Oil drain valves
- ◆ 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



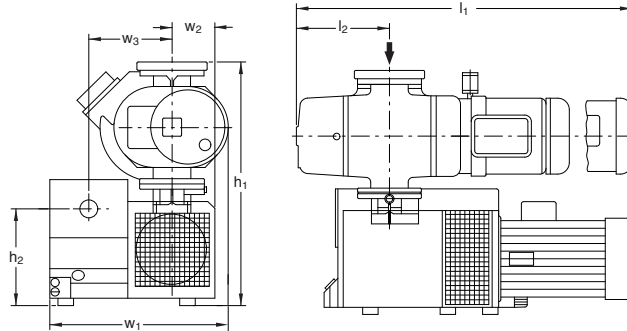
Pumping speed diagram for the HTS close-coupled systems with WAWS series Roots blowers at 60 Hz



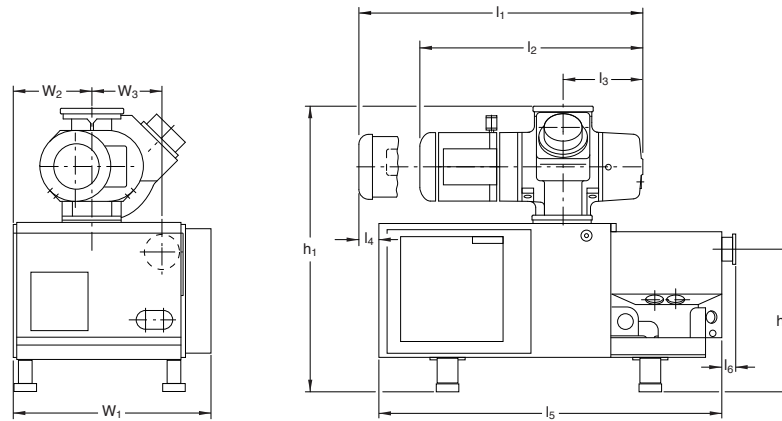
Pumping speed diagram for the HTS close-coupled systems with WAU/WSU series Roots blowers at 60 Hz

Version for the North and South American Continents

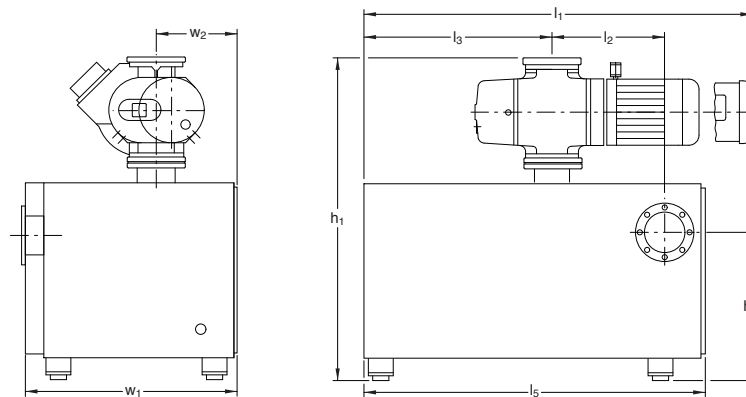
Dimensions for SV 200 and SV 300 only



Dimensions for SV 500 and 630 only



Dimensions for SV 1200 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
WAW/WSU 501	SV 200	29 7/16 (748)	12 17/32 (318)	40 7/32 (1029)	9 17/32 (242)	-	-	-	-	21 11/16 (551)	6 1/8 (156)	10 19/32 (269)
WAW/WSU 501	SV 300	29 7/16 (748)	12 17/32 (318)	43 7/8 (1114)	9 17/32 (242)	-	-	-	-	21 11/16 (551)	6 1/8 (156)	10 19/32 (269)
WAW/WSU 1001	SV 200	31 7/16 (799)	12 17/32 (318)	42 25/32 (1087)	11 15/16 (303)	-	-	-	-	21 1/16 (535)	5 1/2 (140)	10 19/32 (269)
WAW/WSU 1001	SV 300	31 7/16 (799)	12 17/32 (318)	45 7/16 (1154)	11 15/16 (303)	-	-	-	-	22 13/16 (579)	7 1/4 (184)	10 19/32 (269)
WAW/WSU 2001	SV 500	48 5/16 (1227)	23 13/16 (605)	50 3/16 (1275)	39 9/16 (1005)	14 9/16 (370)	3 5/16 (84)	60 3/4 (1543)	2 1/2 (64)	34 15/16 (887)	13 7/8 (352)	12 13/32 (315)
WAW/WSU 2001	SV 630	48 5/16 (1227)	23 13/16 (605)	50 3/16 (1275)	39 9/16 (1005)	14 9/16 (370)	3 5/16 (84)	60 3/4 (1543)	2 1/2 (64)	34 15/16 (887)	13 7/8 (352)	12 13/32 (315)
WAW/WSU 2001	SV 1200	61 9/16 (1564)	27 9/16 (700)	73 5/32 (1858)	21 1/4 (540)	36 1/32 (915)	-	64 9/16 (1640)	-	39 9/16 (1005)	15 5/32 (385)	-

Dimensional drawing for the HTS close-coupled system with single-stage SOGEVAC backing pumps; dimensions in brackets () are in mm

Version for the North and South American Continents

Technical Data		HTS Close-Coupled Systems						
		501/SV200	501/SV300	1001/SV200	1001/SV300	2001/SV500	2001/SV630	2001/SV1200
RUVAC (WA/WAU/WS/WSU possible)		501	501	1001	1001	2001	2001	2001
SOGEVAC		SV 200	SV 300	SV 200	SV 300	SV 500	SV 630	SV 1200
Pumping speed @ 0.1 Torr	cfm (m ³ x h ⁻¹)	277 (470)	285 (483)	504 (855)	545 (925)	1123 (1906)	1186 (2031)	1250 (2122)
Ultimate total pressure	Torr (mbar)	< 8 x 10 ⁻³ (< 1 x 10 ⁻²)	< 8 x 10 ⁻³ (< 1 x 10 ⁻²)	< 8 x 10 ⁻³ (< 1 x 10 ⁻²)	< 8 x 10 ⁻³ (< 1 x 10 ⁻²)	< 8 x 10 ⁻³ (< 1 x 10 ⁻²)	< 8 x 10 ⁻³ (< 1 x 10 ⁻²)	< 8 x 10 ⁻³ (< 1 x 10 ⁻²)
Connecting flanges								
Inlet port								
WA/WAU		3" ANSI	3" ANSI	4" ANSI	4" ANSI	6" ANSI	6" ANSI	6" ANSI
WS/WSU		63 ISO-K	63 ISO-K	100 ISO-K	100 ISO-K	160 ISO-K	160 ISO-K	160 ISO-K
Outlet port		2" NPT	2" NPT	2" NPT	2" NPT	4" ANSI	4" ANSI	6" ANSI
Operating voltage		208/230/460	208/230/460	208/230/460	208/230/460	208/230/460	208/230/460	208/230/460
Phase / Frequency ¹⁾		- / Hz	3 / 60	3 / 60	3 / 60	3 / 60	3 / 60	3 / 60
Full load amps ²⁾								
RUVAC								
WA/WAU		9.4/8.2/4.1	9.4/8.2/4.1	15.2/13.2/6.1	15.2/13.2/6.1	28.0/24.8/12.4	28.0/24.8/12.4	28.0/24.8/12.4
WS/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	21.0/26.0/15.0	21.0/26.0/15.0	21.0/26.0/15.0
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	41.1/35.7/17.9	65.0/58.0/29.5	78.0/70.0/35.0
Displacement								
RUVAC		cfm	357	357	707	707	1449	1449
SOGEVAC		cfm	130	200	130	200	335	495
Oil capacity								
RUVAC								
WA/WAU		qt	1.40	1.40	4.00	4.00	6.10	6.10
WS/WSU		qt	1.10	1.10	2.10	2.10	4.20	4.20
SOGEVAC		qt	5.30	9.00	5.30	9.00	37.00	42.00
Nominal rotation speed								
RUVAC WAU/WSU		rpm	3600	3600	3600	3600	3600	3600
SOGEVAC		rpm	1800	1800	1800	1800	880	1170
Motor power								
RUVAC WAU/WSU		hp	3.0 / 3.4	3.0 / 3.4	5.0 / 6.1	5.0 / 6.1	5.0 / 6.1	10.0 / 11.4
SOGEVAC		hp	7.5	10.0	7.5	10.0	15.0	25.0

Ordering Information

HTS Close-Coupled Systems

HTS - close-coupled systems

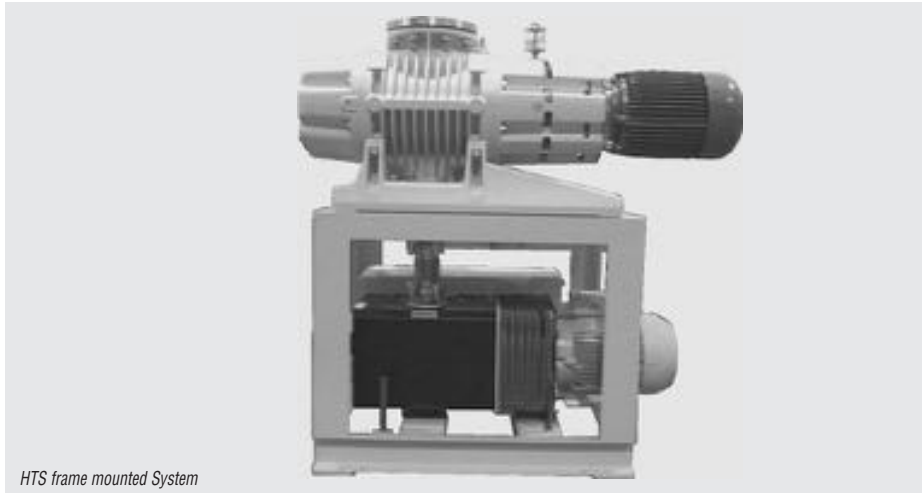
See Price List for the "North American Continent" for Ordering Information

¹⁾ For 50 Hz systems, consult the factory

²⁾ Determined by operating voltage

Version for the North and South American Continents

HTS Frame Mounted Systems with Single-Stage SOGEVAC Backing Pumps



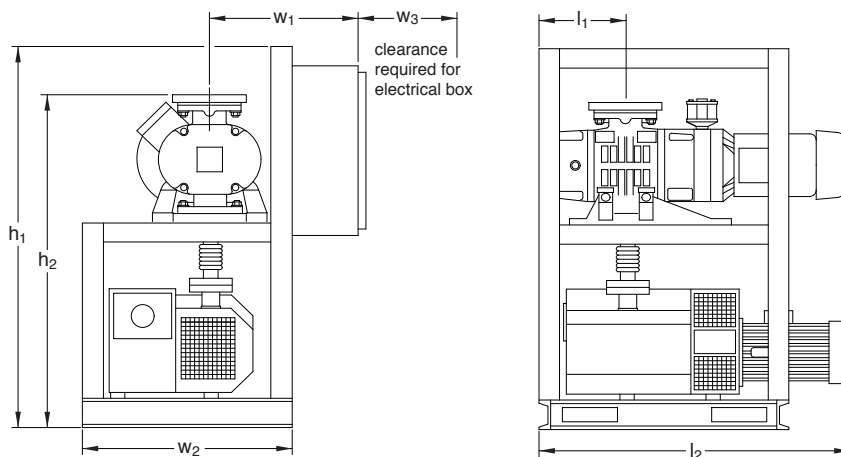
HTS frame mounted System

Standard Equipment

- ◆ System consists of single stage SOGEVAC direct drive vane pump
- ◆ Complete air cooled system
- ◆ Frame mounted 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, supplemental water-cooling.
- ◆ Full frame drip pan for frame mounted systems
- ◆ Frame mounted caster wheels
- ◆ Frame mounted leveling pads
- ◆ Oil drain valves
- ◆ 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



Roots Pump	Vane Pump	h_1	h_2	l_1	l_2	w_1	w_2	w_3
WAU/WSU 251	SV 100	58 1/2 (1486)	41 1/2 (1054)	10 11/16 (272)	34 3/4 (883)	23 (584)	30 (762)	24 (610)
WAU/WSU 501	SV 100	58 1/2 (1486)	43 (1092)	10 11/16 (272)	34 3/4 (883)	23 (584)	30 (762)	24 (610)
WAU/WSU 501	SV 200	58 1/2 (1486)	43 (1092)	10 11/16 (272)	40 5/8 (1032)	23 (584)	30 (762)	24 (610)
WAU/WSU 501	SV 300	58 1/2 (1486)	43 (1092)	10 11/16 (272)	44 1/8 (1121)	23 (584)	30 (762)	24 (610)
WAU/WSU 1001	SV 300	58 1/2 (1486)	45 1/2 (1156)	11 15/16 (278)	44 1/8 (1121)	23 (584)	32 (813)	24 (610)
WAU/WSU 2001	SV 300	58 1/2 (1486)	50 3/4 (1290)	14 11/16 (373)	53(1346)	23 (584)	32 (813)	24 (610)

Note: Dimension h for systems supplied with electrical controls

Dimensional drawing for the HTS frame mounted system with single-stage SOGEVAC backing pumps; dimensions in brackets () are in mm

Version for the North and South American Continents

Technical Data		HTS Frame Mounted Systems						
		251/SV100	501/SV100	501/SV200	501/SV300	1001/SV300	1001/SV500	2001/SV300
RUVAC (WA/WAU/WS/WSU possible)		251	501	501	501	1001	1001	2001
SOGEVAC		SV 100	SV 100	SV 200	SV 300	SV 300	SV 500	SV 300
Pumping speed @ 0.1 Torr	cfm (m ³ x h ⁻¹)	138 (234)	232 (393)	277 (470)	285 (483)	545 (925)	614 (1042)	912 (1548)
Ultimate total pressure	Torr (mbar)	2 x 10 ⁻² (3 x 10 ⁻²)	2 x 10 ⁻² (3 x 10 ⁻²)	< 8 x 10 ⁻³ (< 1 x 10 ⁻²)	< 8 x 10 ⁻³ (< 1 x 10 ⁻²)	< 8 x 10 ⁻³ (< 1 x 10 ⁻²)	< 8 x 10 ⁻³ (< 1 x 10 ⁻²)	< 8 x 10 ⁻³ (< 1 x 10 ⁻²)
Connecting flanges								
Inlet port								
WA/WAU		3" ANSI	3" ANSI	3" ANSI	3" ANSI	4" ANSI	4" ANSI	6" ANSI
WS/WSU		63 ISO-K	63 ISO-K	63 ISO-K	63 ISO-K	100 ISO-K	100 ISO-K	160 ISO-K
Outlet port								
		2" NPT	2" NPT	2" NPT	2" NPT	2" NPT	4" ANSI	2" NPT
Operating voltage		208/230/460	208/230/460	208/230/460	208/230/460	208/230/460	208/230/460	208/230/460
Phase / Frequency ¹⁾	- / Hz	3 / 60	3 / 60	3 / 60	3 / 60	3 / 60	3 / 60	3 / 60
Full load amps ²⁾								
RUVAC								
WA/WAU		4.6/4.2/4.1	9.4/8.2/4.1	9.4/8.2/4.1	9.4/8.2/4.1	15.2/13.2/6.1	15.2/13.2/6.1	28.0/24.8/12.4
WS/WSU		4.8/5.5/3.2	7.8/10.0/5.8	7.8/10.0/5.8	7.8/10.0/5.8	13.0/14.7/8.5	13.0/14.7/8.5	21.0/26.0/15.0
SOGEVAC								
		14.2/13.0/6.5	14.2/13.0/6.5	21.0/18.0/9.0	29.0/25.0/12.5	29.0/25.0/12.5	41.1/35.7/17.9	29.0/25.0/12.5
Displacement								
RUVAC	cfm	179	357	357	357	707	707	1449
SOGEVAC	cfm	71	71	130	200	200	335	200
Oil capacity								
RUVAC								
WA/WAU	qt	1.50	1.40	1.40	1.40	4.00	4.00	6.10
WS/WSU	qt	0.80	1.10	1.10	1.10	2.10	2.10	4.20
SOGEVAC								
	qt	3.70	3.70	5.30	9.00	9.00	37.00	9.00
Nominal rotation speed								
RUVAC WAU/WSU	rpm	3600	3600	3600	3600	3600	3600	3600
SOGEVAC	rpm	1800	1800	1800	1800	1800	880	1800
Motor power								
RUVAC WAU/WSU	hp	1.5 / 1.7	3.0 / 3.4	3.0 / 3.4	3.0 / 3.4	5.0 / 6.1	5.0 / 6.1	10.0 / 11.4
SOGEVAC	hp	5.0	5.0	7.5	10.0	10.0	15.0	10.0

C08

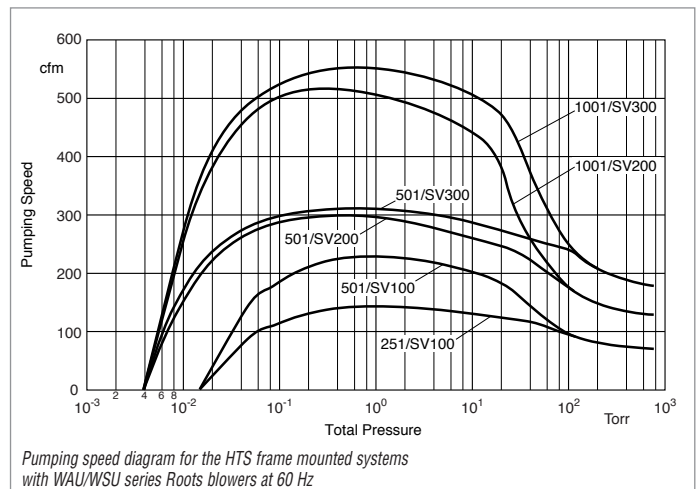
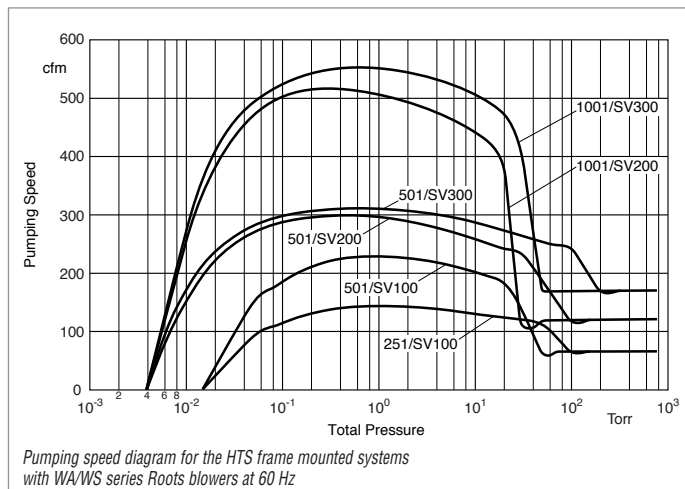
Ordering Information

HTS Frame Mounted Systems

HTS - frame mounted systems

See Price List for the "North American Continent" for Ordering Information

- ¹⁾ For 50 Hz systems, consult the factory
- ²⁾ Determined by operating voltage



Version for the North and South American Continents

RM - Roots / Mechanical Pump Systems with Single- and Two-Stage Rotary Piston Vacuum Pumps as Backing Pumps



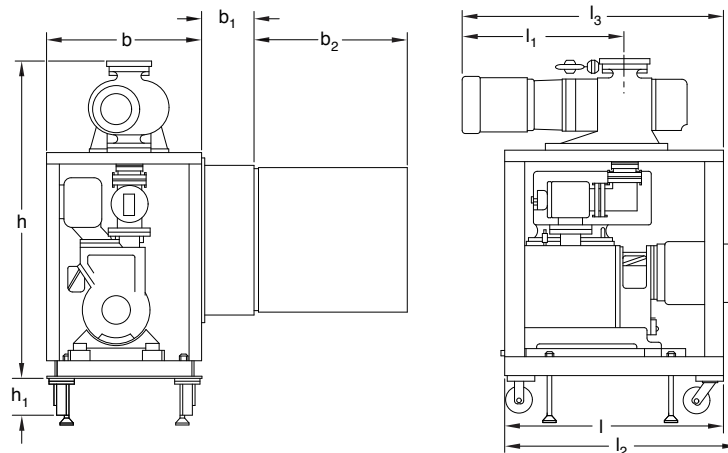
RM - Roots / Mechanical Pump System

Options

- ◆ Piston pump oil regulator
- ◆ Remote gear drive oil filtration system - OF1000/3000
- ◆ Full frame drip pan
- ◆ Oil drain valve
- ◆ Frame caster wheels
- ◆ Frame leveling pads
- ◆ Special motor voltages and frequencies
- ◆ Special oil for unique applications
- ◆ Full NEMA12 electrical controls for control start/stop of system from remote and local locations
- ◆ SECUVAC, Foreline

Standard Equipment

- ◆ System consist of Single stage or Dual stage rotary piston pump
- ◆ Proven rugged Piston pump design
- ◆ Air cooled pumps
- ◆ Mechanical pump mounted on vibration absorbers
- ◆ Frame mounted pumps
- ◆ Interconnecting bellows and spool adapter
- ◆ Manual operation of Gas Ballast
- ◆ Vertical or horizontal mounting of RUVAC blower



System	b	b ₁	b ₂	h	h ₁	l	l ₁	l ₂	l ₃
1001/E250/DK200									
WAWAU 1001	24 (609.6)	9 1/16 (230.5)	24 (609.6)	55 13/16 (1418)	6 1/2 (165)	37 (940)	30 1/16 (764)	48 3/8 (1229)	42 11/16 (1084)
WSWSU 1001	24 (609.6)	9 1/16 (230.5)	24 (609.6)	55 13/16 (1418)	6 1/2 (165)	37 (940)	20 9/16 (522)	48 3/8 (1229)	-
2001/E250/DK200									
WAWAU 2001	24 (609.6)	9 1/16 (230.5)	24 (609.6)	60 3/8 (1534)	6 1/2 (165)	40 (1016)	37 1/32 (941)	48 5/16 (1227)	47 19/32 (1209)
WSWSU 2001	24 (609.6)	9 1/16 (230.5)	24 (609.6)	60 3/8 (1534)	6 1/2 (165)	40 (1016)	26 7/32 (674)	48 5/16 (1227)	-

Dimensional drawing for the RM - Roots / mechanical pump system; dimensions in brackets () are in mm

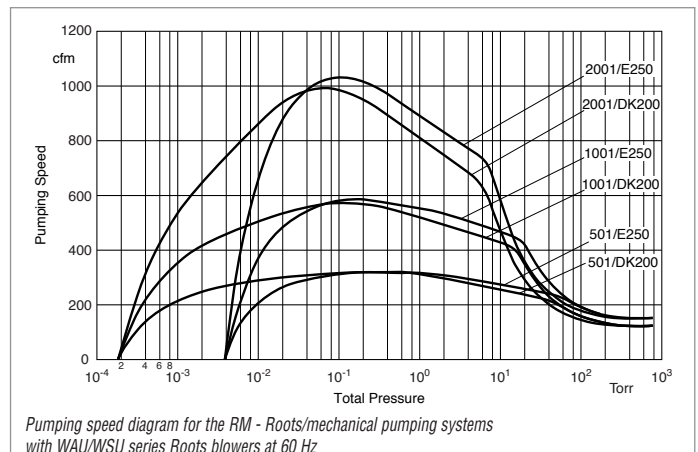
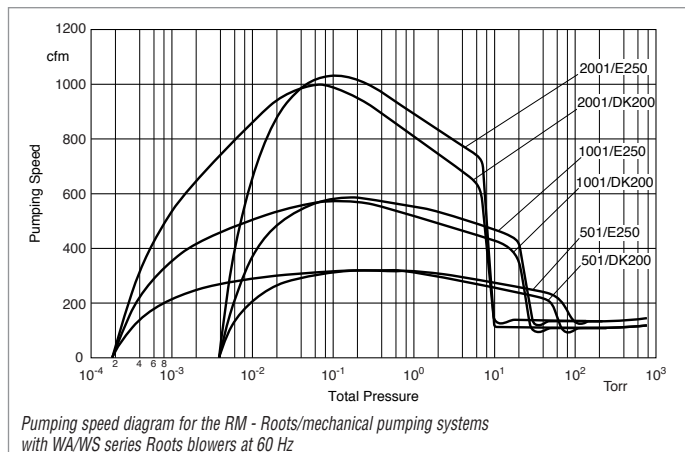
Version for the North and South American Continents

Technical Data		RM - Roots / Mechanical Pumping System					
		501/E250	501/DK200	1001/E250	1001/DK200	2001/E250	2001/DK200
RUVAC (WA/WAU/WS/WSU possible)		501	501	1001	1001	2001	2001
Rotary piston vacuum pump		E 250	DK 200	E 250	DK 200	E 250	DK 200
Pumping speed @ 0.1 Torr	cfm (m ³ x h ⁻¹)	312 (529)	313 (531)	574 (974)	570 (967)	1031 (1750)	985 (1672)
Ultimate total pressure with gas ballast	Torr (mbar)	4 x 10 ⁻³ (< 6 x 10 ⁻³)	2 x 10 ⁻⁴ (< 3 x 10 ⁻⁴)	4 x 10 ⁻³ (< 6 x 10 ⁻³)	2 x 10 ⁻⁴ (< 3 x 10 ⁻⁴)	4 x 10 ⁻³ (< 6 x 10 ⁻³)	2 x 10 ⁻⁴ (< 3 x 10 ⁻⁴)
Connecting flanges							
Inlet port							
WA/WAU		3" ANSI	3" ANSI	4" ANSI	4" ANSI	6" ANSI	6" ANSI
WS/WSU		63 ISO-K	63 ISO-K	100 ISO-K	100 ISO-K	160 ISO-K	160 ISO-K
Outlet port		3" ANSI	3" ANSI	3" ANSI	3" ANSI	3" ANSI	3" ANSI
Operating voltage		208/230/460	208/230/460	208/230/460	208/230/460	208/230/460	208/230/460
Phase / Frequency ¹⁾	- / Hz	3 / 60	3 / 60	3 / 60	3 / 60	3 / 60	3 / 60
Full load amps ²⁾							
RUVAC							
WA/WAU		9.2/8.5/4.8	9.2/8.5/4.8	15.2/13.2/6.1	15.2/13.2/6.1	28/24.8/12.4	28/24.8/12.4
WS/WSU		9.0/9.0/5.2	9.0/9.0/5.2	15.7/15.7/9.1	15.7/15.7/9.1	26/26/15	26/26/15
Rotary piston vacuum pump		24/21/10.5	24/21/10.5	24/21/10.5	24/21/10.5	24/21/10.5	24/21/10.5
Displacement							
RUVAC		cfm	cfm	cfm	cfm	cfm	cfm
Rotary piston vacuum pump		cfm	cfm	cfm	cfm	cfm	cfm
Maximum differential pressure		Torr	Torr	Torr	Torr	Torr	Torr
Normal starting pressure ³⁾		Torr	Torr	Torr	Torr	Torr	Torr
Oil capacity							
RUVAC							
WA/WAU		qt	qt	qt	qt	qt	qt
WS/WSU		qt	qt	qt	qt	qt	qt
Rotary piston vacuum pump		qt	qt	qt	qt	qt	qt
Nominal rotation speed of pump							
RUVAC		rpm	rpm	rpm	rpm	rpm	rpm
Rotary piston vacuum pump		rpm	rpm	rpm	rpm	rpm	rpm
Motor power							
RUVAC WA/WAU/WS/WSU		hp	hp	hp	hp	hp	hp
Rotary piston vacuum pump		hp	hp	hp	hp	hp	hp



Ordering Information		RM - Roots / Mechanical Pumping System	
RM - Roots / mechanical pumping system		See Price List for the "North American Continent" for Ordering Information	

¹⁾ For 50 Hz systems, consult the factory ²⁾ Determined by operating voltage ³⁾ WAU/WSU pumps start at atmospheric pressure (760 Torr)



Version for the North and South American Continents

Dry-Compressing Vacuum Pump System with EcoDry L Backing Pump



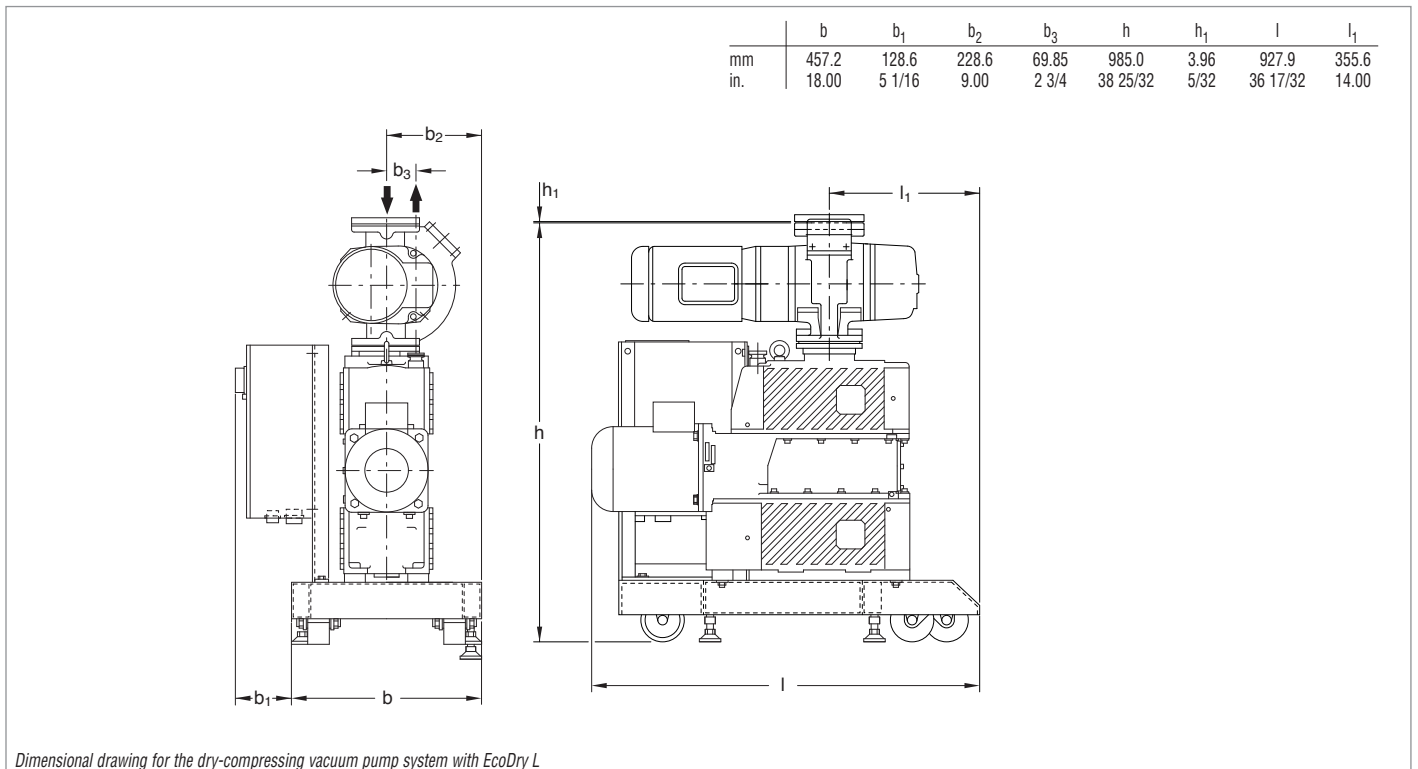
Dry-compressing system with EcoDry L

Advantages to the User

- ◆ Maintenance-free, oil-free and hydrocarbon-free
- ◆ Air cooled pumps
- ◆ Simple operation, high reliability, easy maintenance
- ◆ Compact frame base
- ◆ Frame base equipped with caster wheels and leveling pads
- ◆ Close-coupled RUVAC blower

Options

- ◆ Special motor voltages and frequencies
- ◆ Full NEMA 12 electrical controls for control start/stop of system
- ◆ Special design controls
- ◆ Gas ballast valve on EcoDry L



Dimensional drawing for the dry-compressing vacuum pump system with EcoDry L

Version for the North and South American Continents

Technical Data		EcoDry L Dry-Compressing Pump System with EcoDry L	
		50 Hz	60 Hz
RUVAC (WS/WSU possible)		WS/WSU 251	WS/WSU 251
Backing pump		EcoDry L	EcoDry L
Pumping speed at 0.1 Torr	m ³ x h ⁻¹ (cfm)	195 (115)	236 (139)
Ultimate total pressure without gas ballast	mbar (Torr)	2 x 10 ⁻³ (1.5 x 10 ⁻³)	2 x 10 ⁻³ (1.5 x 10 ⁻³)
Installed motor power			
WSU 251	kW (hp)	1.1 (1.5)	1.4 (1.9)
EcoDry L			
Standard / Option	kW (hp)	1.5 / 2.2 (2.0 / 3.0)	1.8 / 2.6 (2.4 / 3.5)
Total	kW (hp)	2.6 / 3.3 (3.5 / 4.5)	3.2 / 4.0 (4.4 / 5.4)
Power consumption at 10 ⁻¹ mbar (0.75 x 10 ⁻¹ Torr)	kW (hp)	0.9 (1.2)	1.0 (1.4)
Noise level to DIN 45 635 without gas ballast at 1 mbar (0.75 Torr)	dB(A)	67	69
Total oil filling, approx.	l (qt)	0.7 (0.74)	0.7 (0.74)
Weight total, approx.	kg (lbs)	210 (463.1)	210 (463.1)
Connecting flanges			
Inlet port	DN ₁	63 ISO-K	63 ISO-K
Outlet port	DN ₂	25 KF	25 KF

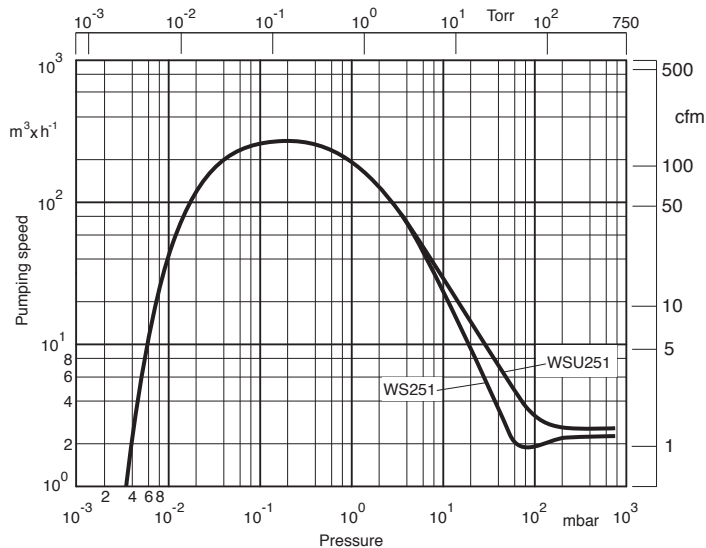


Ordering Information

WS/WSU 251/EcoDry L

Pumping system, complete (adaptor version), base frame mounted

See Price List for the "North American Continent" for Ordering Information



Pumping speed diagram at 60 Hz (EcoDry L + RUVAC WS/WSU 251)

To **LEYBOLD VAKUUM GmbH**
 Dept. Pump Systems and Systems
 Fax: +49 (0)221/347 - 1277

From company: _____
 Name/Department: _____
 Phone: _____
 Fax: _____

Date: _____
 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?
 _____ min/h

5. What operating pressures are planned?
 _____ mbar (Torr)

6. How high is the ambient temperature?
 - when installed in the building:
 min. _____ °C (°F) / max. _____ °C (°F)
 - when installed out in the open
 min. _____ °C (°F) / max. _____ °C (°F)

7. How high is the intake temperature?
 _____ °C (°F)

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 the case of materials which are not commonly listed in the tables please state:
 a) Molecular weight _____
 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 _____

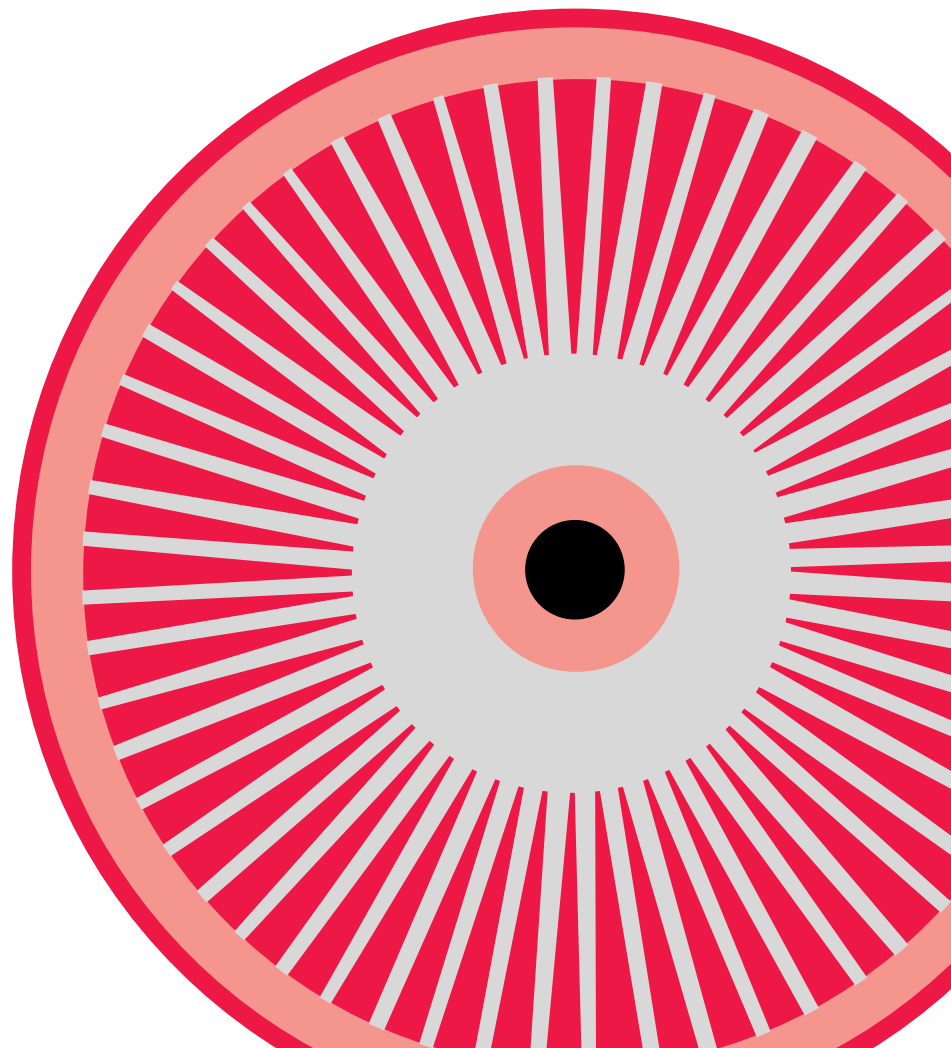
13. What kind of mechanical connection specifications are planned?
 a) Length of the intake line _____
 b) Diameter of the intake line _____

14. Which cooling media are available (water, brine etc.)? Which temperature?
 _____ min. _____ °C (°F)
 _____ max. _____ °C (°F)

CO9

Turbomolecular Pumps

35 - 3200 l x s⁻¹



General

General	C09.03
Application and Accessories	C09.07

Products and Accessories

Turbomolecular Pumps with Mechanical Rotor Suspension	
without Compound Stage	C09.08
with Compound Stage	C09.16
Electronic Frequency Converters	
for Turbomolecular Pumps with Mechanical Rotor Suspension	C09.32
Turbomolecular Pumps with Magnetic Rotor Suspension	
without Compound Stage	C09.38
with Compound Stage	C09.46
Electronic Frequency Converters	
for Turbomolecular Pumps with Magnetic Rotor Suspension	C09.56

Other Accessories

Vibration Absorber	C09.61
Air Cooling Unit	C09.61
Flange Heater for CF High Vacuum Flange	C09.61
Fine Filter	C09.61
Purge Gas and Venting Valve	C09.62
Power Failure Venting Valve	C09.62
Solenoid Venting Valve	C09.62
Accessories for Serial Interfaces RS 232 C and RS 485 C	C09.63

General Information

The turbomolecular pumps from Leybold generate a clean high and ultra-high vacuum, are easy to operate and are exceptionally reliable. In connection with a well rated backing pump, pressures below 10^{-10} mbar (0.75×10^{-10} Torr) can be attained.

LEYBOLD offers two product lines:

1. TURBOVAC line

Turbomolecular pumps with mechanical rotor suspension

2. TURBOVAC MAG line

Turbomolecular pumps with magnetic rotor suspension

Each of the two product lines contains “classic” turbomolecular pumps as well as turbomolecular pumps with a compound stage.

LEYBOLD is one of the world’s leading manufacturer of turbomolecular pumps. Consequently, the TURBOVAC and the TURBOVAC MAG pumps are successfully used in many applications. A list of the most important ones is given in the section “Applications and Accessories”.

Principle of Operation

The turbomolecular pump is a turbine with blades. By the momentum transfer from the rapidly rotating rotor blades to the gas molecules their initially non-directed thermal motion is changed to a directed motion.

Hence, the pumping process in a turbomolecular pump results from the directed motion of the gas molecules from the inlet flange to the fore-vacuum port.

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 rotor and stator blades (typically some tenths of a millimeter). Consequently, the molecules collide primarily with the rotor blades with the result that the pumping process is highly efficient. In the *range of laminar flow*, i.e. at pressures over 10^{-1} mbar the situation is completely different. The effect of the rotor is impaired by the frequent collisions between the molecules. Therefore, a turbomolecular pump is not capable of pumping gases at atmospheric pressure thus necessitating the use of a suitably rated fore-vacuum pump.

To create the directed motion of the gas molecules, the tips of the rotor blades have to move at high speeds. Hence, a high rotational speed of the rotor is required. In the case of LEYBOLD turbomolecular pumps the rotor speeds vary from about 36,000 rpm for the larger rotor diameters (e.g. TURBOVAC 1000 about 20 cm (7.87 in.)) to 72,000 rpm. for small rotor diameters (e.g. TURBOVAC 50 about 6 cm (2.36 in.))



TURBOVAC TW 70 H turbomolecular pump with mechanical rotor suspension and dual compound stage



TURBOVAC TW 701 turbomolecular pump with mechanical rotor suspension and compound stage



MAG W 1500 CT turbomolecular pump with magnetic rotor suspension and compound stage

Characteristic Quantities

Pumping speed (volume flow rate), S, [$l \times s^{-1}$]

The pumping speed for a given type of gas depends on the diameter of the high-vacuum flange, the rotor/stator design, the speed at which the rotor revolves and the molecular weight of the gas.

The pumping speed S is a non-linear function of the inlet pressure p_1 : $S = S(p_1)$

Gas throughput, Q, [$mbar \times l \times s^{-1}$]

Gas throughput Q is linked to the pumping speed S and the inlet pressure p_1 through the relationship $Q = Q(p_1) = p_1 \cdot S(p_1)$.

The maximum permissible gas throughput Q_{max} is attained at the maximum permissible inlet pressure $p_{1, max}$: $Q_{max} = Q(p_{1, max})$.

Compression, K

For a given type of gas, compression K is defined as the ratio between fore-vacuum pressure p_{VV} (= pressure on the fore-vacuum side of the turbomolecular pump) and the high-vacuum pressure p_{HV} (= pressure on the high-vacuum side of the turbomolecular pump):

$$K = K(p_{VV}) = p_{VV} / p_{HV} = p_{VV} / p_{HV}(p_{VV})$$

Compression depends very much on the gas throughput: at a given fore-vacuum pressure, compression increases when the gas throughput is reduced.

Idle compression, K_0

Idle compression K_0 of a turbomolecular pump is defined as the amount of compression of this pump at “Zero” gas throughput. What is problematic about this definition is the fact that the demanded “Zero” throughput can never be implemented in practice (finite leak rate, degassing of sealing components, desorption from wall surfaces). Data on idle compression need therefore to be gained from measurements run at extremely low throughputs.

Idle compression of a pump equipped with metal seals is significantly higher compared to the same pump sealed with O-rings.

Ultimate pressure (base pressure), p_{ult} , [mbar]

The ultimate pressure of a turbomolecular pump is defined as that pressure which is attained in the test chamber 48 hours after a 24 hour degassing period of the measurement system.

The ultimate pressure will chiefly depend on the foreline pump used and the type of seal used at the high-vacuum flange.



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 x s^{-1}** (inlet flange diameter = 40 mm (1.57 in.)) to **$1,600 \text{ l x s}^{-1}$** (inlet flange diameter = 250 mm (9.84 in.)).

Through the compact design, the most reliable ceramics ball bearings and the simplicity of operation, this line of pumps is used in all high-vacuum and ultrahigh vacuum areas of application.

In particular the TURBOVAC pumps are very successfully operated in mass spectroscopy applications, gas and liquid chromatographic analysis, CD, DVD and hard disk production, manufacturing of large-surface optical layers, and non-corrosive semiconductor fabrication processes.

The **most important advantages of the TURBOVAC product line** are

- ◆ Oil-free pumps for the generation of clean high-and ultra-high-vacuum conditions
- ◆ Highly performance in any orientation
- ◆ Highly degree of operating reliability
- ◆ Easy to operate
- ◆ Compact design

Ceramic Ball Bearings Technology

All TURBOVAC pumps are fitted with **ceramic ball bearings**, i.e. **ceramic balls** are running in **steel races**. The bearings are **lubricated for life by grease**.

Ceramic balls are lighter, harder and smoother than balls made of steel. Therefore, with ceramic balls the wear on the races is significantly reduced. Consequently, the lifetime of the bearings, and hence the lifetime of the pump, is increased. The **TURBOVAC pumps** fitted with grease-lubricated ceramic ball bearings **can be mounted in any orientation**. As the ball bearing is encapsulated, the grease cannot enter the high-vacuum space, even if the pump is mounted up-side-down.

Components supplied with the Turbomolecular Pumps

High-vacuum Flange:

KF and ISO models

- ◆ Centering ring with FPM O-ring

ANSI Models:

- ◆ FPM O-ring for the groove in the flange

CF Models:

- ◆ Without gaskets *)

Fore-vacuum Port:

- ◆ Centering rings, O-rings and clamps for all KF type fore-vacuum flanges are included.

Purge / vent ports are blanked-off

*) For CF gaskets, see Product Section C15

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 x s^{-1}** (inlet flange diameter = 100 mm (3.94 in.)) to **$2,000 \text{ l x s}^{-1}$** (inlet flange diameter = 250 mm (9.84 in.)).

The TURBOVAC MAG pumps are mostly installed on semiconductor processing lines like etching, CVD, PVD and ion implantation, i.e. in applications where corrosive gases need to be pumped. Also electron beam microscopy is an important area 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
- ◆ Designed for pumping of corrosive gases

Magnetic Bearings Technology

The world-wide success of the TURBOVAC MAG product line results from **more than 25 years of experience** in developing and manufacturing turbomolecular pumps with magnetic rotor suspension.

In **1976 LEYBOLD** started the market introduction of the famous **TURBOVAC 560 M**. This pump was the first magnetically levitated turbomolecular pump which became commercially available. Nowadays LEYBOLD uses **two design principles for the magnetic rotor suspension**:

1. One axis with active bearing

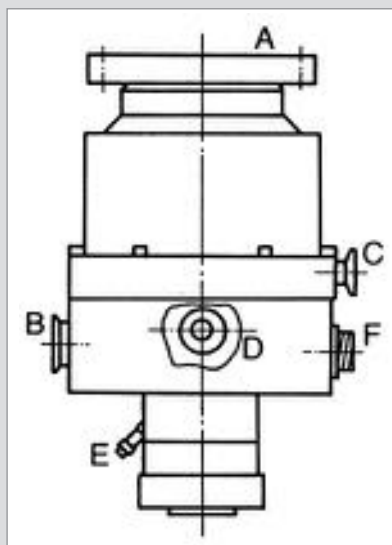
The rotor is suspended by permanent magnets. In addition, the axial position of the rotor is controlled electromagnetically. The TURBOVAC 340 M and MAG 400 pumps are fitted with such a type of rotor suspension.

2. Five axes with active bearings

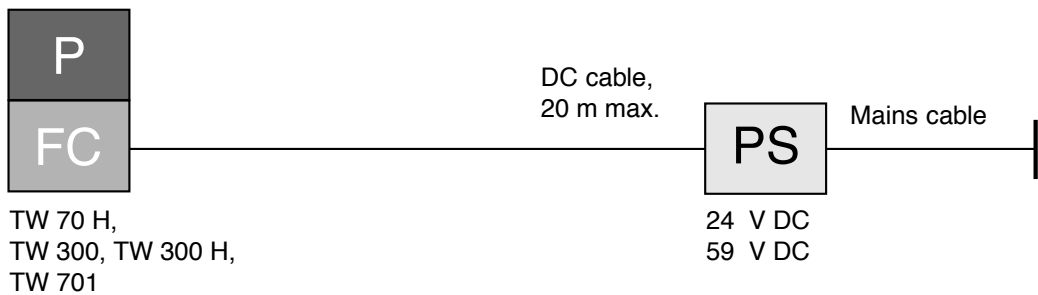
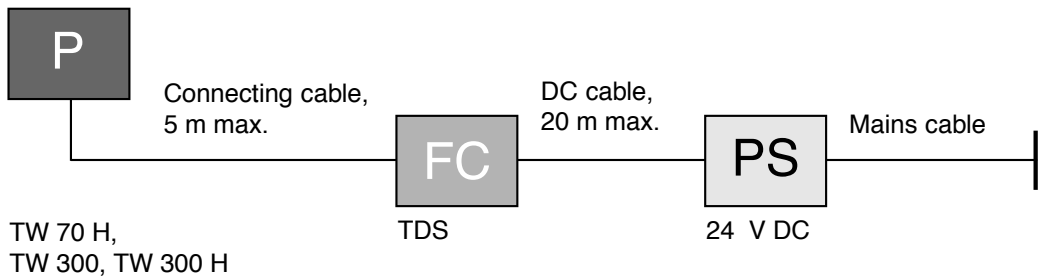
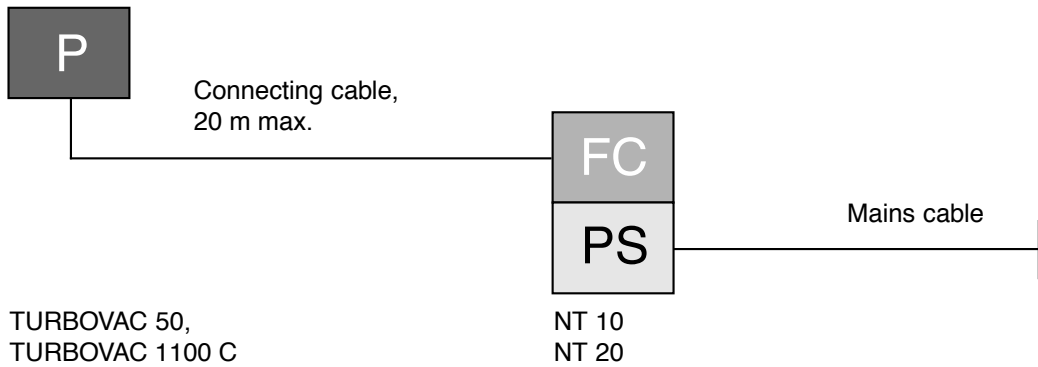
The position of the rotor is actively controlled by the precision magnetic bearing in all five degrees of freedom. The TURBOVAC MAG 830/1300, MAG 1500, MAG 2000, MAG 2200 and MAG 2800/3200 are equipped with such a bearing system.

Flange Designations used in this Product Section

A High vacuum flange	E Water cooling connection
B Forevacuum flange	F Electrical connection
C Venting flange	
D Purge gas flange	



Pump / Converter Configurations for TURBOVAC Product Line



P = Pump

FC = Frequency Converter

PS = Power Supply



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 many 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 Vacuum has continually optimised its products.

The new TURBOVAC wide range series is a further innovative step forward making available products which are most flexible and reliable.

- Owing to the modular concept the user may
- ◆ adapt his vacuum system precisely to his requirements
 - ◆ perfectly integrate the components within his system and
 - ◆ find the most cost-effective system configuration for his needs.

In combination with backing pumps like the TRIVAC or EcoDry, LEYBOLD Vacuum is able to offer the best vacuum system optimised for all major applications in the area of analytical instrumentation.



Mass spectrometer



High performance glass coating plant

Use of Turbomolecular Pumps in the Area of Semiconductor Processes

In the semiconductor industry turbomolecular pumps are used on the following processes, among others:

- ◆ Etching
- ◆ Sputtering
- ◆ Ion implantation
- ◆ Lithography.

In these applications pumping of aggressive gases is often required. This may necessitate the use of pumps equipped with a purge gas facility or a magnetic suspension in order to avoid damaged bearings. Especially during metal etching, deposits may occur in the fore-vacuum space of the turbomolecular pump. In order to prevent this the pumps must be heated to a certain temperature. Such temperature controlled variants are optionally available for the MAG 1500 C and MAG 2000 C. In contrast to turbomolecular pumps with mechanical bearings, magnetically levitated pumps provide the advantage that they prevent overheating of the bearings at high gas flows and effectively exclude any damage to the magnetic bearings by aggressive media.

Similar to electron microscopes, lithographic equipment requires very low vibration levels. For this reason, magnetically levitated turbomolecular pumps are also useful for these applications.

The recommended backing pumps are either dry compressing EcoDry pumps or rotary vane pumps from the TRIVAC range, possibly fitted with the BCS system.

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 0.75×10^{-2} Torr), and in the case of evaporation coating, pressures below 10^{-4} mbar (0.75×10^{-4} Torr) are utilised.

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), coating of tools and coating of precision lenses in the area of optical components, displays or architectural glass.

Research and Development

In the area of research, all types of turbomolecular pumps from LEYBOLD are being used.

In the case of particularly stringent requirements as such low vibration levels, a TURBOVAC with magnetic bearings should be selected; the same applies to those applications in which entirely hydrocarbon-free pump systems are required.



Nuclear fusion technology

Pumps		50	361	1100 C	T 1600	TW 70 H	TW 300	TW 300 H	TW 701	TW 1600	340 M	MAG 400 C/CCT	MAG 1500 C/CCT	MAG 2000 C/CCT	MAG W 830/1300 C	MAG W 1500 C/CCT	MAG W 2200 C	MAG W 2000 C/CCT	MAG W 2800/3200 C/CCT
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				♦	♦									♦			♦		
TV tube manufacturing		♦				♦													
R & D (Research and Development)																			
Surface analysis					♦						♦			♦					
UHV / XHV systems			♦	♦				♦	♦	♦									
Particle accelerators			♦				♦	♦	♦					♦					
Fusion experiments				♦	♦					♦									
Space simulation				♦						♦									
Semiconductor Processes																			
Load locks and transfer chambers		♦	♦	♦		♦		♦			♦	♦		♦					
Etch											♦	♦	♦		♦	♦	♦	♦	♦
CVD											♦	♦	♦		♦	♦	♦	♦	♦
PVD											♦	♦	♦	♦	♦	♦	♦	♦	♦
Ion implantation											♦	♦	♦	♦	♦	♦	♦	♦	♦
Accessories		Page																	
Frequency converters																			
NT 10	C09.32	♦																	
NT 20	C09.32		♦	♦															
NT 361	C09.34		♦																
TURBO.DRIVE S	C09.35					♦	♦	♦											
Power supply PS 700	C09.36								♦										
Power supplies for TURBO.DRIVE S	C09.37					♦	♦	♦	♦										
NT 340 M	C09.56									♦									
NT 340 MA	C09.57										♦								
MAG.DRIVE ^{digital}	C09.58											♦		♦	♦	♦	♦	♦	♦
MAG.DRIVE 2000	C09.60												♦						♦
Vibration absorber	C09.61	♦	♦	♦	♦	♦	♦	♦		♦									
Air cooling unit	C09.61	♦	♦																
Flange heaters for CF flanges	C09.61	♦	♦			♦	♦	♦	♦										
Fine filter	C09.61	♦																	
Venting valves	C09.62	♦	♦	♦			♦		♦		♦								
Purge gas and venting valve	C09.62		♦	♦	♦	♦	♦	♦	♦	♦	♦								
Power failure venting valve	C09.62	♦	♦	♦		♦	♦	♦	♦										
Water cooling	-	♦																	
Accessories for serial interfaces																			
RS 232 C and RS 485 C	C09.63				♦	♦	♦	♦	♦	♦		♦	♦		♦			♦	



TURBOVAC 50

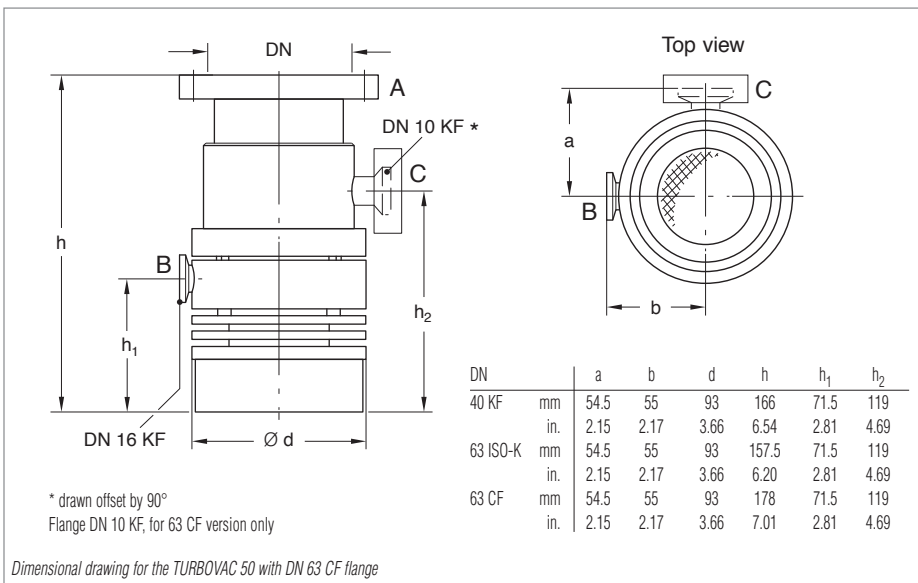


Typical Applications

- ◆ Leak detectors
- ◆ Mass spectrometers
- ◆ Electron beam microscopy
- ◆ TV tube manufacturing
- ◆ Load locks and transfer chambers

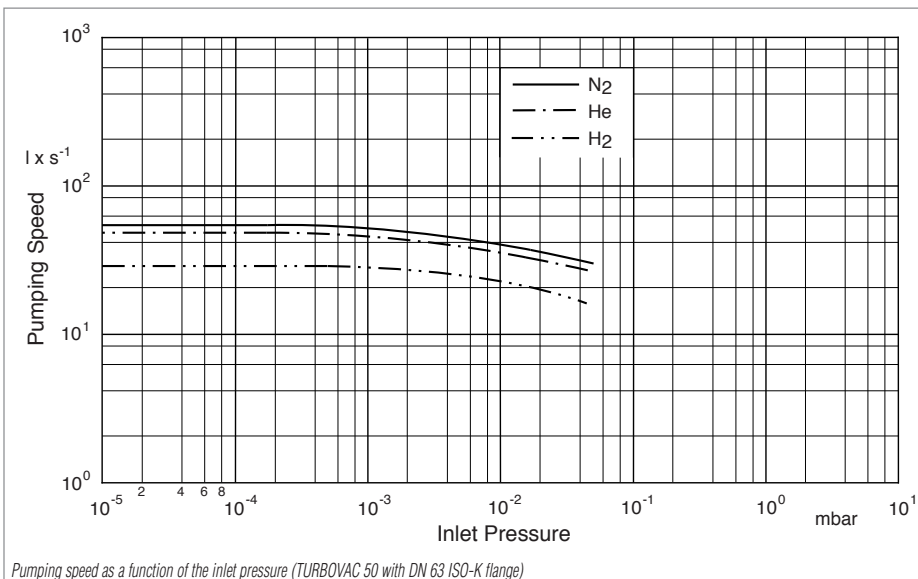
Technical Features

- ◆ Compact design
- ◆ Operation in any orientation
- ◆ Cooling by convection is sufficient for most applications
- ◆ Air and water cooling can be added easily
- ◆ Oil-free pump for generating clean high- and ultrahigh-vacuum conditions



Advantages to the User

- ◆ Space-saving
- ◆ Easy to integrate into complex vacuum systems
- ◆ Low operating costs
- ◆ Highly reliable operation also in processes loaded with particles



Technical Data		TURBOVAC 50		
Inlet flange	DN	O-ring sealed		Metal sealed
		40 KF	63 ISO-K	63 CF
Pump housing		Aluminum		Stainless steel
Pumping speed at 10 ⁻³ mbar				
N ₂	l x s ⁻¹	33	55	55
He	l x s ⁻¹	36	48	48
H ₂	l x s ⁻¹	28	30	30
Max. gas throughput *) at 10 ⁻² mbar				
N ₂	mbar x l x s ⁻¹	0.30	0.40	0.40
He	mbar x l x s ⁻¹	0.25	0.35	0.35
H ₂	mbar x l x s ⁻¹	0.20	0.25	0.25
Max. compression when idle		2 x 10 ⁶		2 x 10 ⁸
N ₂				
Ultimate pressure with TRIVAC D 2,5 E	mbar (Torr)	< 5 x 10 ⁻⁸ (< 3.75 x 10 ⁻⁸)		< 2 x 10 ⁻¹⁰ (< 1.5 x 10 ⁻¹⁰)
Max. fore-line pressure for N ₂	mbar (Torr)	1 x 10 ⁻¹ (< 0.75 x 10 ⁻¹)		
Recommended fore-vacuum pump		TRIVAC D 2,5 E		
Run-up time to 95% of nominal speed	min	2		
Cooling water connection (hose nozzles) (for Part No. 854 08)	mm (in.)	10 (0.39)		
Weight, approx.	kg (lbs)	2 (4.4)		
Max. power consumption / ultimate pressure	W	45 / 15		

Ordering Information				TURBOVAC 50
Inlet flange	Foreline flange	Cooling method	Interface	Part No.
DN 40 KF	DN 16 KF	Convection	-	854 00
DN 63 ISO-K	DN 16 KF	Convection	-	854 01
DN 63 CF	DN 16 KF	Convection	-	854 02
Accessories, necessary for all pumps				
Electronic frequency converter NT 10				
90 - 140 V				859 01
180 - 260 V				859 00
Connecting cable NT 10-Pumpe				
3 m (10.5 ft)				121 08
5 m (17.5 ft)				121 09
Accessories, optional				
Air cooling unit				
230 V AC				854 05
110 V AC				854 06
Water cooling kit				854 08
Flange heater 63 CF, 230 V, 50 Hz				854 04
Vibration absorber				
DN 63 ISO-K				800131V0063
DN 63 CF				500 070

*) for continuous operation when water-cooled

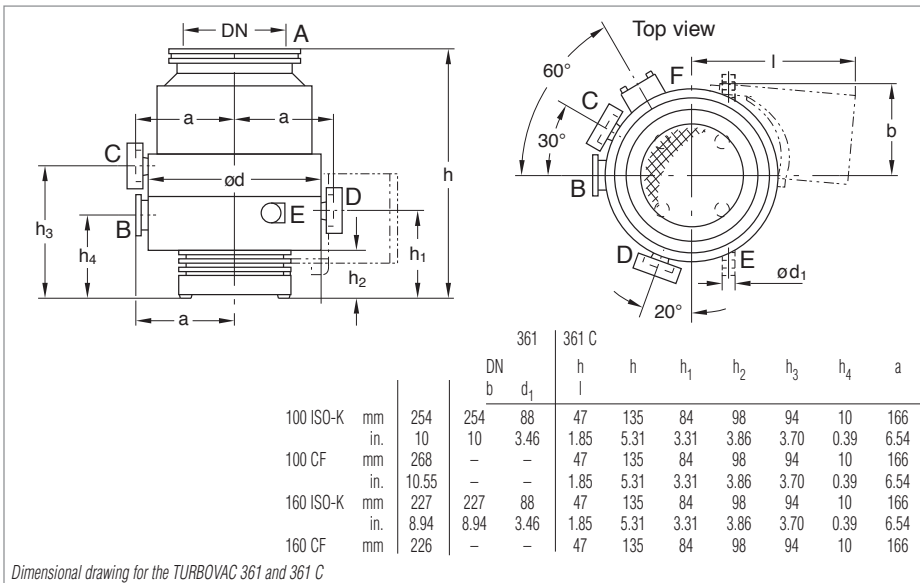
TURBOVAC 361, 361 C

Typical Applications

- ◆ Leak detectors
- ◆ Mass spectrometers
- ◆ Data storage
- ◆ Optical coating
- ◆ R & D, e.g.
 - UHV systems
 - Particle accelerators
- ◆ Load locks and transfer chambers

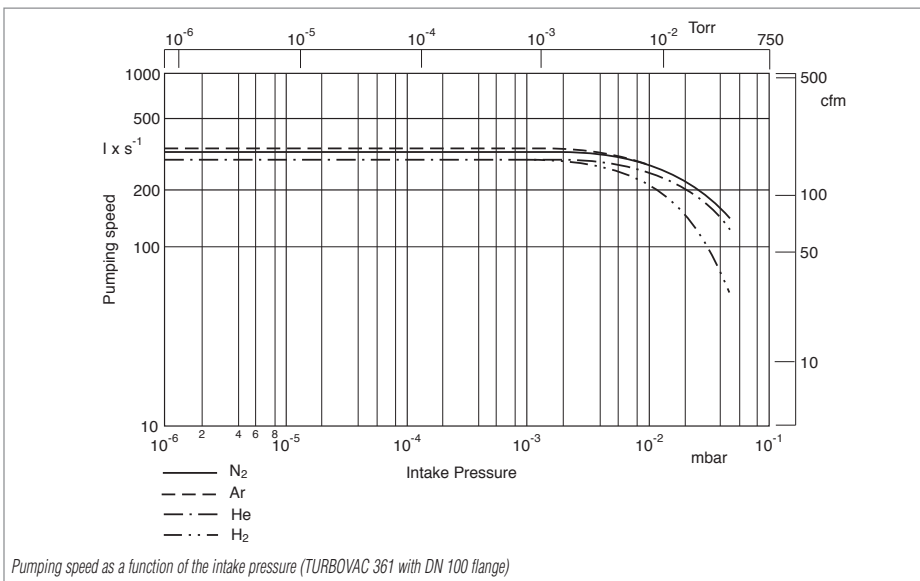
Technical Features

- ◆ Compact design
- ◆ Operation in any orientation
- ◆ Oil-free pump for generating clean high- and ultrahigh-vacuum conditions



Advantages to the User

- ◆ Space-saving
- ◆ Easy to integrate into complex vacuum systems
- ◆ Low operating costs
- ◆ Highly reliable operation also in processes loaded with particles



Technical Data		TURBOVAC 361	
Inlet flange	DN	100 ISO-K • 100 CF	160 ISO-K • 160 CF
Pumping speed			
N ₂	l x s ⁻¹	345	400
Ar	l x s ⁻¹	350	–
He	l x s ⁻¹	340	380
H ₂	l x s ⁻¹	340	370
Max. gas throughput			
N ₂	mbar x l x s ⁻¹	7.5	–
Ar	mbar x l x s ⁻¹	7.5	–
Compression ratio			
N ₂			1 x 10 ⁹
He			6 x 10 ⁴
H ₂			3 x 10 ³
Ultimate pressure	mbar (Torr)	< 1 x 10 ⁻¹⁰ (< 0.75 x 10 ⁻¹⁰)	
Max. continuous inlet pressure ^{*)}	mbar (Torr)	5 x 10 ⁻² (3.75 x 10 ⁻²)	
Max. foreline pressure for N ₂	mbar (Torr)	5 x 10 ⁻¹ (3.75 x 10 ⁻¹)	
Recommended fore-vacuum pump		From TRIVAC D 16 B to D 25 B	
Run-up time to 95% speed	min	≈ 2	
Purge / vent port	DN	10 KF	
Cooling water connections, hose nozzle	mm (in.)	10 (0.39)	
Weight, approx.	kg (lbs)	12 (26)	
Max. power consumption / at ultimate pressure	VA	680 / 480	

Ordering Information				TURBOVAC 361
Inlet flange	Foreline flange	Cooling method	Item	Part No.
DN 100 ISO-K	DN 25 KF	Water-cooled	TURBOVAC 361	856 70
DN 100 ISO-K	DN 25 KF	Water-cooled	TURBOVAC 361 C	856 75 ¹⁾
DN 100 CF	DN 25 KF	Water-cooled	TURBOVAC 361	856 71
DN 160 ISO-K	DN 25 KF	Water-cooled	TURBOVAC 361	856 72
DN 160 ISO-K	DN 25 KF	Water-cooled	TURBOVAC 361 C	856 77 ¹⁾
DN 160 CF	DN 25 KF	Water-cooled	TURBOVAC 361	856 73
Accessories, optional				
Air cooling unit				
230 V AC				855 31
110 V AC				894 08
Flange heater 100 CF				
230 V AC				854 27
110 V AC				854 28
Flange heater 160 CF				
230 V AC				854 37
110 V AC				854 38
Accessories, for all pumps				
Electronic frequency converter NT 20				
230 V AC				857 20
120 V AC				857 21
100 V AC				857 22
Connecting cable NT 20-pump				
3 m (10.5 ft)				857 65
5 m (17.5 ft)				857 66
10 m (35.0 ft)				857 67
20 m (70.0 ft)				857 68

*) water-cooled

1) with purge port

TURBOVAC 1100 C

Typical Applications

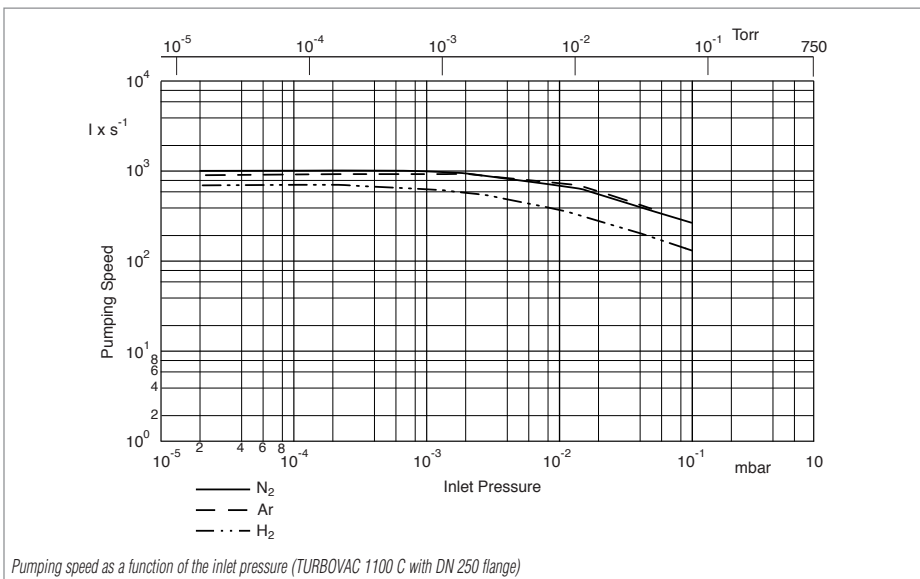
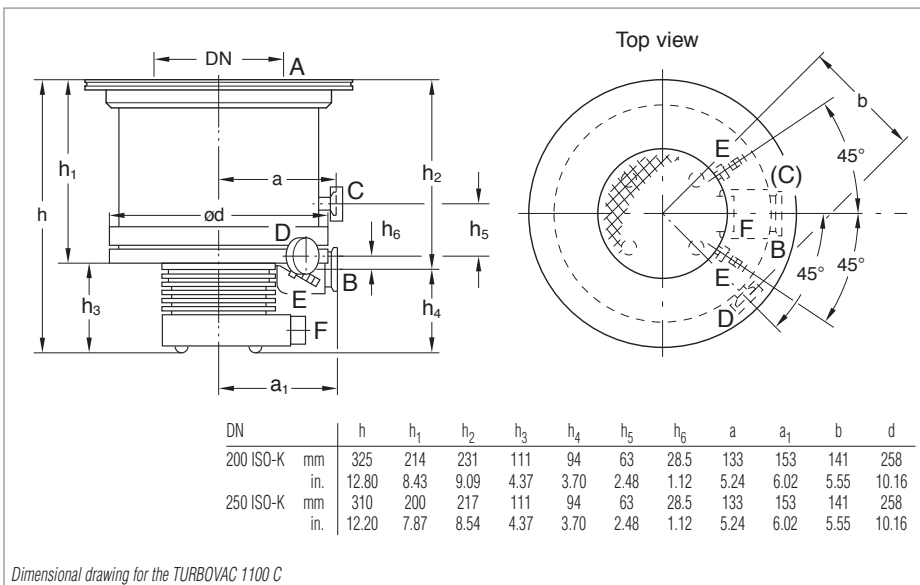
- ◆ Data storage
- ◆ Flat panel displays
- ◆ Optical coating
- ◆ Large area coating
- ◆ R & D, e.g.
 - Fusion experiments
 - Space simulation
- ◆ Load locks and transfer chambers

Technical Features

- ◆ Robust rotor design
- ◆ Operation in any orientation
- ◆ Highest pumping speed and throughput
- ◆ Integrated control system for monitoring the temperature of the bearings
- ◆ Oil-free pump for generating clean high- and ultrahigh-vacuum conditions

Advantages to the User

- ◆ Space-saving
- ◆ Easy to integrate into complex vacuum systems
- ◆ High productivity
- ◆ Low operating costs
- ◆ Highly reliable operation also in processes loaded with particles



Technical Data		TURBOVAC 1100 C	
Inlet flange	DN	200 ISO-K	250 ISO-K
Pumping speed			
N ₂	l x s ⁻¹	830	1050
Ar	l x s ⁻¹	760	980
He	l x s ⁻¹	750	850
H ₂	l x s ⁻¹	600	630
Max. gas throughput			
N ₂	mbar x l x s ⁻¹	25	
Ar	mbar x l x s ⁻¹	15	
He	mbar x l x s ⁻¹	25	
H ₂	mbar x l x s ⁻¹	30	
Compression ratio			
N ₂		1 x 10 ⁵	
Ar		1 x 10 ⁵	
H ₂		1 x 10 ⁴	
Ultimate pressure	mbar (Torr)	< 3 x 10 ⁻¹⁰ (< 2.2 x 10 ⁻¹⁰)	
Max. foreline pressure for N ₂	mbar (Torr)	0.1 (0.075)	
Recommended fore-vacuum pump		TRIVAC D 65 B / EcoDry M15/20	
Run-up time to 95% speed	min	9	
Purge / vent port	DN	10 KF	
Cooling water connections, hose nipple	mm (in.)	10 (0.39)	
Weight, approx.	kg (lbs)	22 (48)	
Supply voltage	V AC	42	
Max. power consumption	VA	400	

Ordering Information				TURBOVAC 1100 C
Inlet flange	Foreline flange	Cooling method	Interface	Part No.
DN 200 ISO-K	DN 63 ISO-K	Water-cooled	-	894 83
DN 250 ISO-K	DN 63 ISO-K	Water-cooled	-	894 80
Accessories, for all pumps				
Electronic frequency converter NT 20				
230 V AC				857 20
120 V AC				857 21
Connecting cable NT 20-pump				
3 m (10.5 ft)				857 65
5 m (17.5 ft)				857 66
10 m (35.0 ft)				857 67
20 m (70.0 ft)				857 68
Purge / vent valve				
24 V DC, 0.6 mbar x l x s ⁻¹ = 36 sccm				121 33

Note for the North and South American Continents:

For special application we recommend the TURBOVAC 1000 C. Please contact your sale office

TURBOVAC T 1600

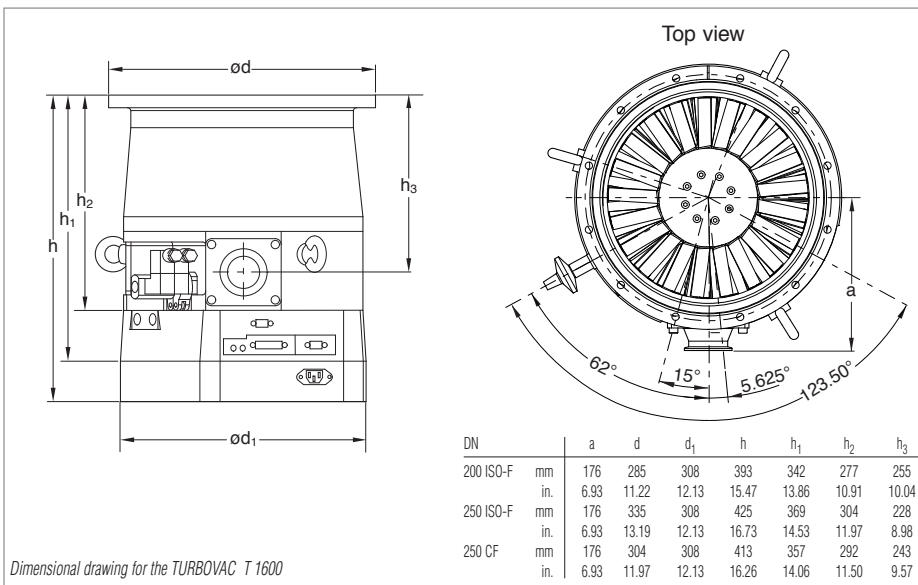


Typical Applications

- ◆ Data storage
- ◆ Flat panel displays
- ◆ Optical coating
- ◆ Large area coating
- ◆ R & D, e.g.
 - Fusion experiments
 - Space simulation

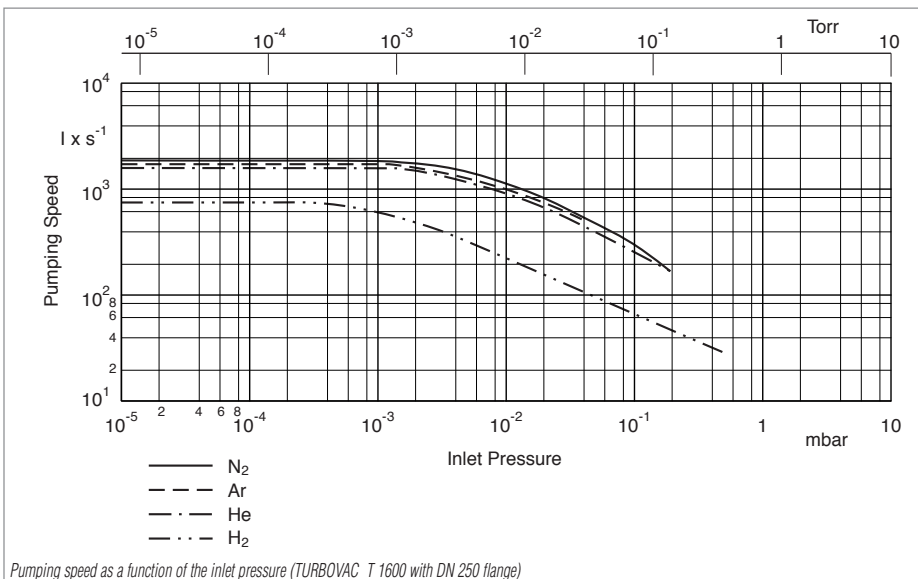
Technical Features

- ◆ Frequency converter and power supply integrated
- ◆ Robust rotor design
- ◆ Operation in any orientation
- ◆ Highest pumping speed and throughput
- ◆ Oil-free pump for generating clean high and ultrahigh-vacuum conditions
- ◆ Purge gas and venting valve integrated



Advantages to the User

- ◆ Space-saving
- ◆ Easy to integrate into complex vacuum systems
- ◆ High productivity
- ◆ Low operating costs
- ◆ Highly reliable operation also in processes loaded with particles



Technical Data		TURBOVAC T 1600	
Inlet flange	DN	200 ISO-F	250 ISO-F / 250 CF
Pumping speed			
N ₂	l x s ⁻¹	1100	1550
Ar	l x s ⁻¹	960	1410
He	l x s ⁻¹	1150	1300
H ₂	l x s ⁻¹	690	720
Max. gas throughput			
N ₂	mbar x l x s ⁻¹	30	
Ar	mbar x l x s ⁻¹	20	
He	mbar x l x s ⁻¹	30	
H ₂	mbar x l x s ⁻¹	20	
Compression ratio			
N ₂		5 x 10 ⁵	
Ar		1 x 10 ⁶	
He		1 x 10 ⁴	
H ₂		2 x 10 ²	
Ultimate pressure	mbar (Torr)	< 3 x 10 ⁻¹⁰ (< 2.2 x 10 ⁻¹⁰)	
Max. foreline pressure for N ₂	mbar (Torr)	0.5 (0.375)	
Recommended fore-vacuum pump (alternatively)		TRIVAC D 65 B + RUVAC WA 501 TRIVAC D 65 B EcoDry M	
Run-up time to 95% speed	min	< 10	
Purge / vent port (valve integrated)	DN	G 1/4"	
Cooling water connections	DN	G 3/8"	
Weight, approx.	kg (lbs)	40 (88)	
Supply voltage	V	100 - 240	
Max. power consumption (while running up)	VA	700	

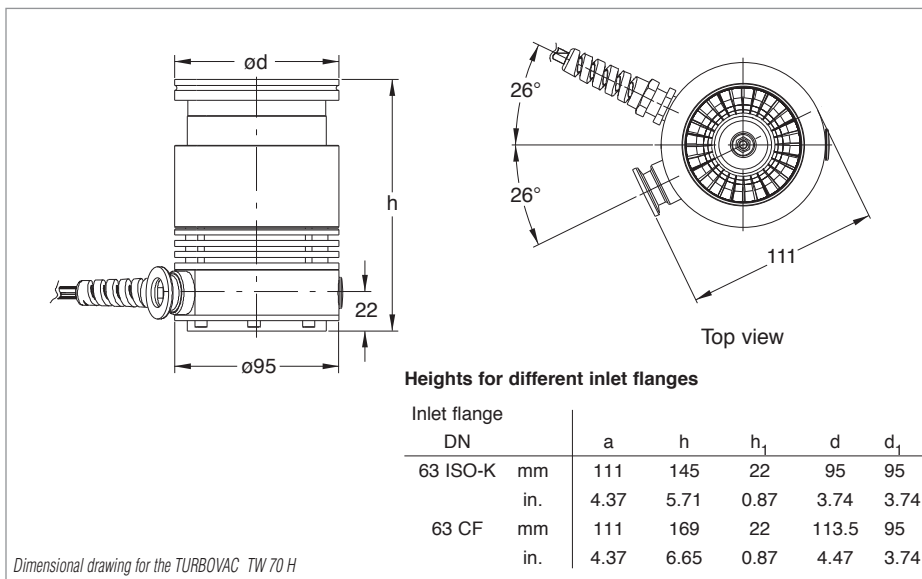
Ordering Information				TURBOVAC T 1600
Inlet flange	Foreline flange	Cooling method	Interface	Part No.
DN 200 ISO-F	DN 40 KF	Water-cooled	-	800040V1144
DN 200 ISO-F	DN 40 KF	Water-cooled	ProfiBus	800040V2144
DN 250 ISO-F	DN 40 KF	Water-cooled	-	800040V1444
DN 250 ISO-F	DN 40 KF	Water-cooled	ProfiBus	800040V2444
DN 250 ISO-F	DN 63 ISO-K	Water-cooled	-	800040V1544
DN 250 CF	DN 40 KF	Water-cooled	-	800040V1844
Accessories for RS 232 C and RS 485 C interfaces				see chapter "Turbomolecular Pumps", para. "Accessories"

TURBOVAC TW 70 H



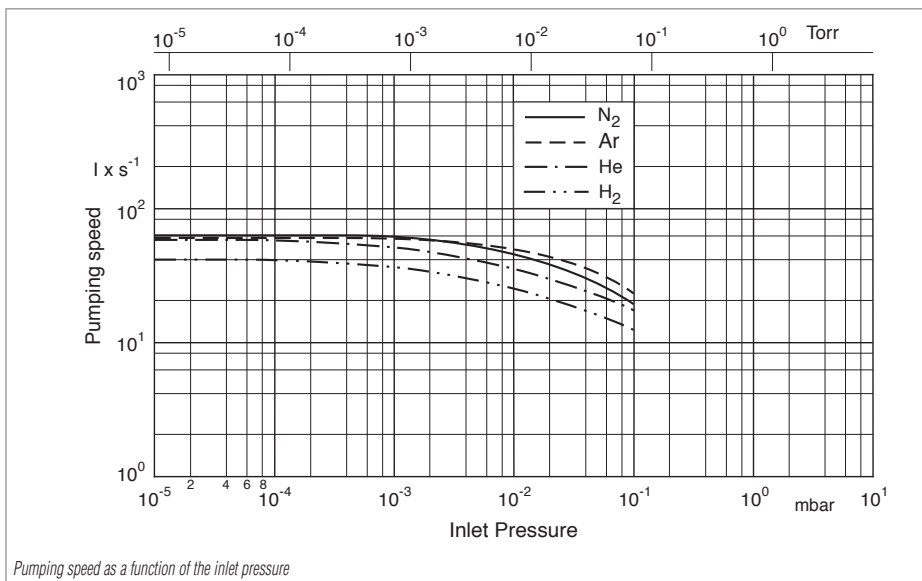
Typical Applications

- ◆ Mass spectrometers
- ◆ Electron beam microscopy
- ◆ Leak detectors
- ◆ R & D, e.g. - UHV systems
- ◆ Load locks and transfer chambers



Technical Features

- ◆ Integrated or external frequency converter
- ◆ Compact design
- ◆ Operation in any orientation
- ◆ High foreline tolerance
- ◆ Oil-free pump for generating clean high and ultrahigh-vacuum conditions



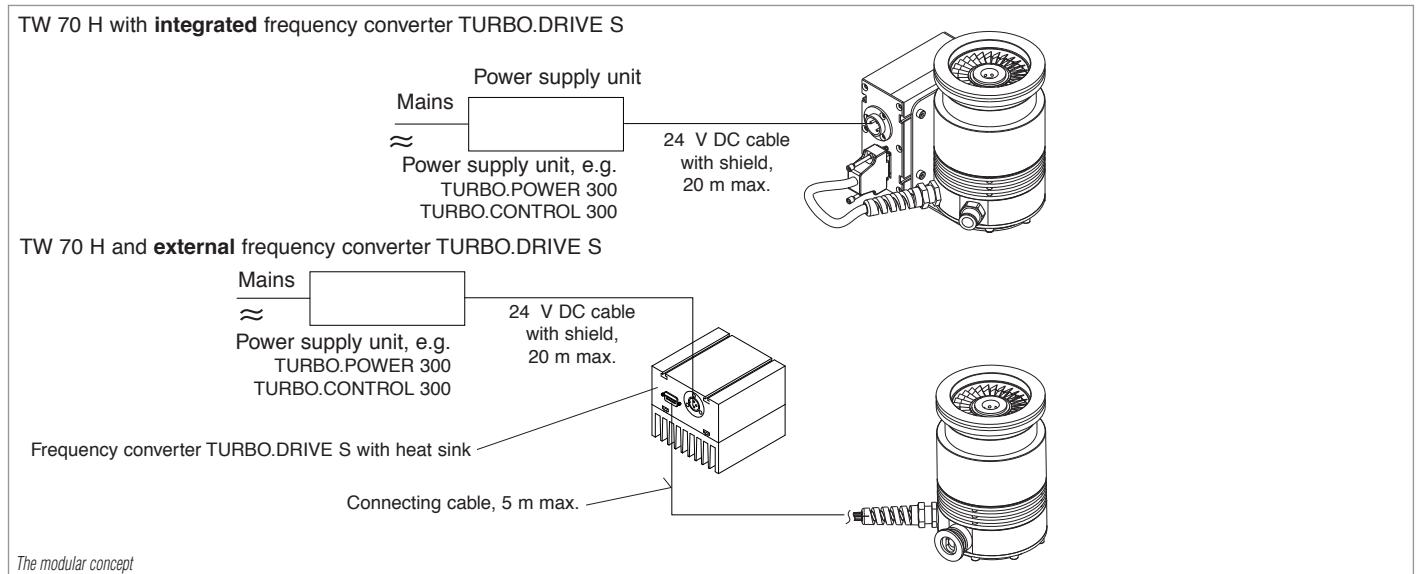
Advantages to the User

- ◆ Space-saving
- ◆ Easy to integrate into complex vacuum systems
- ◆ Allows the use of down-sized fore-vacuum pumps
- ◆ Low operating costs
- ◆ Highly reliable operation

Technical Data		TURBOVAC TW 70 H	
Inlet flange	DN	O-ring sealed 63 ISO-K	Metal sealed 63 CF
Pump housing		Aluminum	Stainless stel
Pumping speed at $10^{-5} / 10^{-3}$ mbar			
N ₂	l x s ⁻¹	60 / 56	
Ar	l x s ⁻¹	56 / 54	
H ₂	l x s ⁻¹	40 / 38	
He	l x s ⁻¹	52 / 50	
Max. gas throughput *) at 10 ⁻¹ mbar			
N ₂	mbar x l x s ⁻¹	1.9	
Ar	mbar x l x s ⁻¹	2.4	
H ₂	mbar x l x s ⁻¹	1.3	
He	mbar x l x s ⁻¹	1.9	
Max. compression when idle			
N ₂		1 x 10 ⁸ at 14 mbar	1 x 10 ¹⁰ at 10 mbar
Ar		1 x 10 ⁷ at 14 mbar	
H ₂		4 x 10 ³ at 0.2 mbar	
He		2 x 10 ⁵ at 2 mbar	
Ultimate pressure			
with two-stage oil-sealed rotary vane vacuum pump TRIVAC D 2,5 E	mbar	< 5 x 10 ⁻⁸ (< 3.75 x 10 ⁻⁸ Torr)	< 2 x 10 ⁻¹⁰ (< 1.5 x 10 ⁻¹⁰ Torr)
with dry compressing piston vacuum pump EcoDry M15	mbar		< 4 x 10 ⁻¹⁰ (< 3 x 10 ⁻¹⁰ Torr)
with diaphragm pump DIVAC 0,8 T	mbar		< 5 x 10 ⁻⁹ (< 3.75 x 10 ⁻⁹ Torr)
Max. fore-line pressure for N ₂	mbar	20 (15 Torr)	
Recommended fore-vacuum pump		TRIVAC D 2,5 E EcoDry M15 DIVAC 0,8 T	
two-stage oil-sealed rotary vane vacuum pump			
dry compressing piston vacuum pump			
diaphragm pump			
Run-up time to 95% of nominal speed	min	1.5	
Cooling water connection (option)		2 x G 1/8"	
Weight, approx.			
with / without frequency converter	kg (lbs)	3.0 / 2.3 (6.62 / 5.08)	
Operating voltage	V DC	24	
Max. power consumption			
Run up / ultimate presure	W	150 / 30	

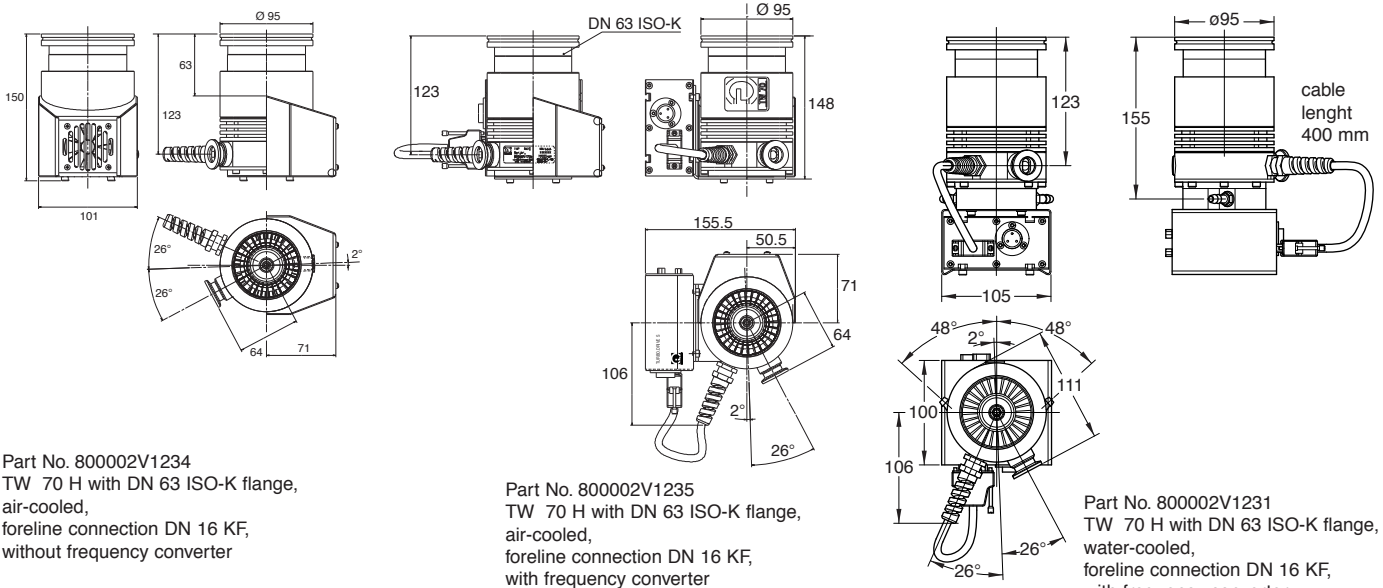
*) for continuous operation when water-cooled

The modular concept



Ordering Information				TURBOVAC TW 70 H
TW 70 H with integrated frequency converter TURBO.DRIVE S				Part No.
Inlet flange	Foreline flange	Cooling method	Interface	
DN 63 ISO-K	DN 16 KF	Air-cooled	RS 485 C	800002V1235
DN 63 ISO-K	DN 16 KF	Air-cooled	RS 232 C	800002V1236
DN 63 ISO-K	DN 16 KF	Water-cooled	RS 485 C	800002V1435
DN 63 ISO-K	Camozzi coupling ^{*)}	Air-cooled	RS 485 C	800002V1215
DN 63 ISO-K	Camozzi coupling ^{*)}	Water-cooled	RS 485 C	800002V1415
DN 63 CF	DN 16 KF	Air-cooled	RS 232 C	800002V2236
DN 63 CF	DN 16 KF	Water-cooled	RS 485 C	800002V2435
TW 70 H without frequency converter TURBO.DRIVE S				
Inlet flange	Foreline flange	Cooling method	Interface	
DN 63 ISO-K	DN 16 KF	Convection	-	800002V1934
DN 63 ISO-K	Camozzi coupling	Convection	-	800002V1914
DN 63 CF	DN 16 KF	Convection	-	800002V2934
For operation, one frequency converter TURBO.DRIVE S is necessary				
Electronic frequency converter TURBO.DRIVE S with heat sink, RS 485 C interface				800070V0006
Electronic frequency converter TURBO.DRIVE S with heat sink, RS 232 C interface				800070V0005
Connecting cable (TURBO.DRIVE S - pump)				
1 m (3.5 ft)				152 47
3 m (10.5 ft)				864 40
5 m (17.5 ft)				864 50
Accessories, necessary for all pumps				
START/STOP switch for manual operation of the turbomolecular pump				152 48
Power supplies				
TURBO.POWER 300				800100V0002
TURBO.CONTROL 300				800100V0001
Accessories, optional				
Water cooling unit with 2 x G 1/8" connection including 2 hose nozzles G 1/8", OD 8 mm for water hose, 2 gaskets (copper) 10 x 14 x 1				800135V0001
Air cooling unit				800136V0001
Flange heater 63 CF, 230 V, 50 Hz				854 04
Splinter guard				
DN 63 ISO-K				200 17 170
DN 63 CF				200 17 171
Vibration absorber				
DN 63 ISO-K				800131V0063
DN 63 CF				500 070
Accessories for serial interfaces RS 232 C and RS 485 C				see chapter "Turbomolecular Pumps", para. "Accessories"

^{*)} Quick coupling for plastic vacuum hoses with an OD of 10 mm. We recommend polyamide hoses



Selected dimensional drawings for the TURBOVAC TW 70 H versions

Notes



TURBOVAC TW 300

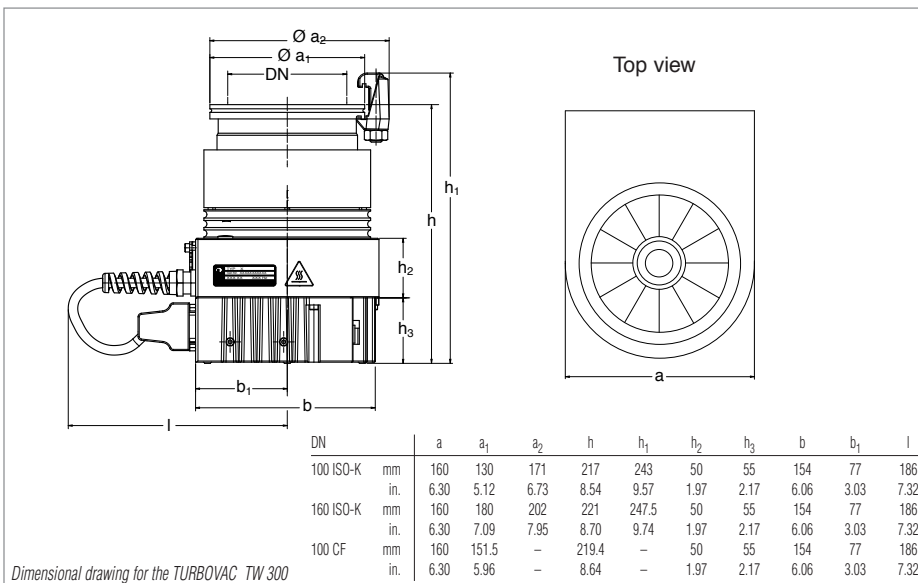


Typical Applications

- ◆ Mass spectrometers
- ◆ Production of thin films
- ◆ CD and DVD coating
- ◆ R & D, e.g.
 - UHV systems
 - Particle accelerators
- ◆ Load locks and transfer chambers

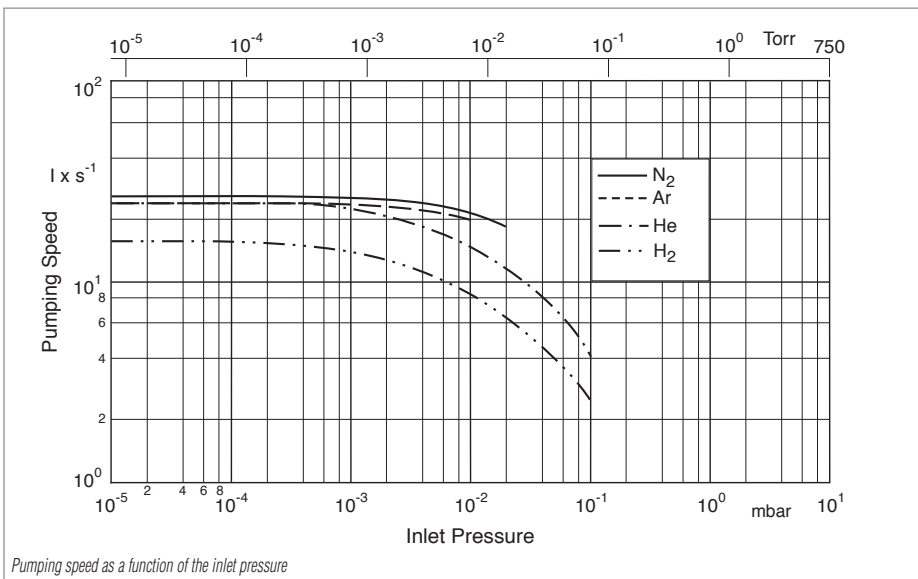
Technical Features

- ◆ Integrated or external frequency converter
- ◆ Compact design
- ◆ Operation in any orientation
- ◆ Highest pumping speed for Nitrogen and Argon
- ◆ Highly effective air-cooling unit
- ◆ Oil-free pump for generating clean high and ultrahigh-vacuum conditions



Advantages to the User

- ◆ Space-saving
- ◆ Easy to integrate into complex vacuum systems
- ◆ High foreline tolerance allows the use of downsized fore-vacuum pumps
- ◆ High productivity
- ◆ Low operating costs



Technical Data		TURBOVAC TW 300	
Inlet flange	DN	100 ISO-K	160 ISO-K
		O-ring sealed	
Pump housing		Aluminum	Metal sealed 100 CF
Pumping speed at $10^{-5} / 10^{-3}$ mbar			
N ₂	l x s ⁻¹		240 / 240
Ar	l x s ⁻¹		230 / 230
H ₂	l x s ⁻¹		140 / 125
He	l x s ⁻¹		230 / 220
Max. gas throughput *) at 10 ⁻¹ mbar			
N ₂ at 2 x 10 ⁻² mbar	mbar x l x s ⁻¹		3.7
Ar at 1 x 10 ⁻² mbar	mbar x l x s ⁻¹		2.0
H ₂ at 1 x 10 ⁻¹ mbar	mbar x l x s ⁻¹		2.3
He at 1 x 10 ⁻¹ mbar	mbar x l x s ⁻¹		4.5
Max. compression when idle			
N ₂		3,5 x 10 ⁸ at 7 mbar	6 x 10 ⁹ at 4 mbar
Ar		1 x 10 ⁸ at 10 mbar	
H ₂		4 x 10 ³ at 0,4 mbar	
He		1 x 10 ⁵ at 2 mbar	
Ultimate pressure (for CF pumps) with two-stage oil-sealed rotary vane vacuum pump TRIVAC D 2,5 E	mbar	< 2 x 10 ⁻⁹ (< 1.5 x 10 ⁻⁹ Torr)	< 2 x 10 ⁻¹⁰ (< 1.5 x 10 ⁻¹⁰ Torr)
with dry compressing piston vacuum pump EcoDry M15	mbar		< 8 x 10 ⁻¹⁰ (< 6 x 10 ⁻¹⁰ Torr)
with diaphragm pump DIVAC 2,5 VT	mbar		< 4 x 10 ⁻⁹ (< 3 x 10 ⁻⁹ Torr)
Max. fore-line pressure for N ₂	mbar		10 (15 Torr)
Recommended fore-vacuum pump two-stage oil-sealed rotary vane vacuum pump dry compressing piston vacuum pump diaphragm pump			TRIVAC D 2,5 E EcoDry M 15 DIVAC 2,5 VT
Run-up time to 95% of nominal speed	min		4
Purge / vent port	DN		16 KF
Cooling water connection (option)			2x G 1/8"
Weight, approx. with / without frequency converter	kg (lbs)		6.8 / 6.0 (15 / 13.2)
Operating voltage	V DC		24
Max. power consumption Run up / ultimate presure	W		150 / 30

*) for continuous operation when water-cooled

Note: TURBOVAC TW 250 S available for specific applications. Please consult factory

Ordering Information				TURBOVAC TW 300
TW 300 with integrated frequency converter TURBO.DRIVE S				Part No.
Inlet flange	Foreline flange	Cooling method	Interface	
DN 100 ISO-K	DN 16 KF	Convection	RS 485 C	800011V0007
DN 100 ISO-K	DN 16 KF	Air-cooled	RS 485 C	800011V0009
DN 100 ISO-K	DN 16 KF	Air-cooled	RS 232 C	800011V0018
DN 100 ISO-K	DN 16 KF	Water-cooled	RS 485 C	800011V0011
DN 160 ISO-K	DN 16 KF	Air-cooled	RS 485 C	800011V0016
DN 160 ISO-K	DN 16 KF	Water-cooled	RS 485 C	800011V0013
DN 100 CF	DN 16 KF	Convection	RS 485 C	800011V0008
DN 100 CF	DN 16 KF	Air-cooled	RS 485 C	800011V0010
DN 100 CF	DN 16 KF	Air-cooled	RS 232 C	800011V0019
DN 100 CF	DN 16 KF	Water-cooled	RS 485 C	800011V0012
TW 300 without frequency converter TURBO.DRIVE S				
Inlet flange	Foreline flange	Cooling method	Interface	
DN 100 ISO-K	DN 16 KF	Convection	-	800011V0001
DN 100 ISO-K	DN 16 KF	Air-cooled	-	800011V0003
DN 100 ISO-K	DN 16 KF	Water-cooled	-	800011V0005
DN 100 CF	DN 16 KF	Convection	-	800011V0002
DN 100 CF	DN 16 KF	Air-cooled	-	800011V0004
DN 100 CF	DN 16 KF	Water-cooled	-	800011V0006
For operation, one frequency converter TURBO.DRIVE S is necessary				
Electronic frequency converter TURBO.DRIVE S with heat sink, RS 485 C interface				800070V0006
Electronic frequency converter TURBO.DRIVE S with heat sink, RS 232 C interface				800070V0005
Connecting cable (TURBO.DRIVE S - pump)				
1 m (3.5 ft)				152 47
3 m (10.5 ft)				864 40
5 m (17.5 ft)				864 50
Accessories, necessary for all pumps				
START/STOP switch for manual operation of the turbomolecular pump				152 48
Power supplies				
TURBO.POWER 300				800100V0002
TURBO.CONTROL 300				800100V0001
Accessories, optional				
Water cooling unit with 2x G 1/8" connection including 2 hose nozzles G 1/8", OD 10 mm for water hose, 4 gaskets, 2 blank-off plugs				800135V0002
Air cooling unit				800 000 249
Flange heater				
100 CF, 230 V, 50 Hz				854 27
100 CF, 110 V, 60 Hz				854 28
Splinter guard				
DN 100 ISO-K/CF				
coarse (3.2 x 3.2 mm (0.13 x 0.13 in.))				200 18 692
fine (1.6 x 1.6 mm (0.06 x 0.06 in.))				200 18 340
DN 160 ISO-K				200 00 307
Vibration absorber				
DN 100 ISO-K				800131V0100
DN 100 CF				500 071
Accessories for serial interfaces RS 232 C and RS 485 C				see chapter "Turbomolecular Pumps", para. "Accessories"

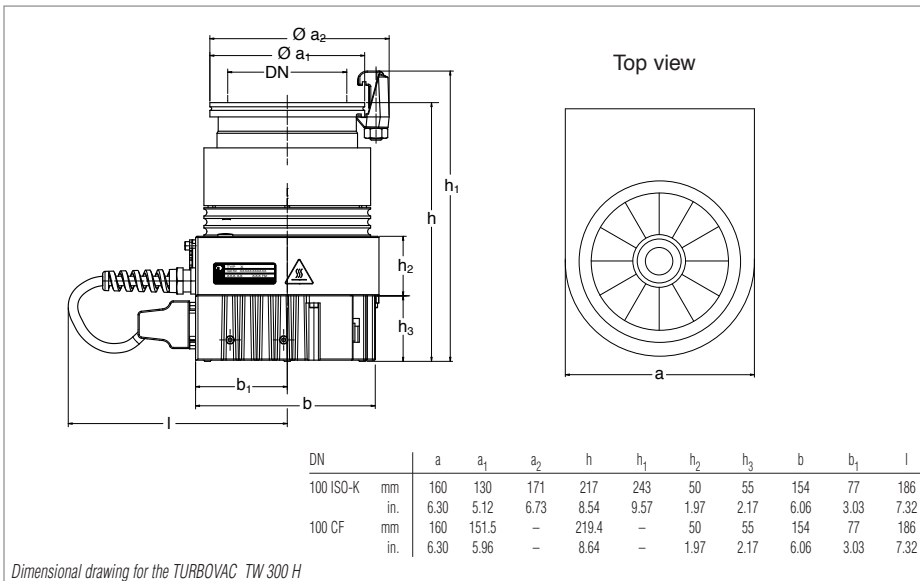
TURBOVAC TW 300 H

Typical Applications

- ◆ Mass spectrometers
- ◆ R & D, e.g.
 - UHV systems
 - Particle accelerators
- ◆ Load locks and transfer chambers

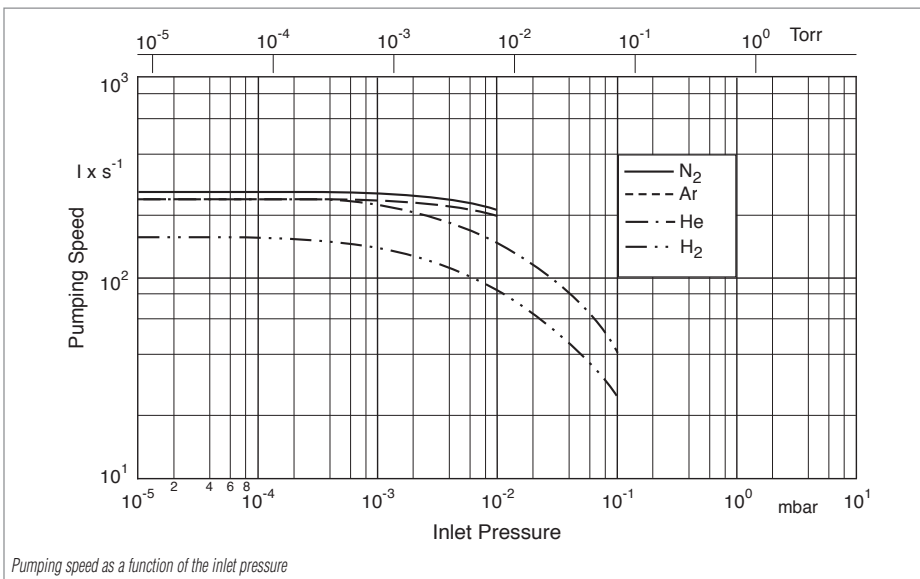
Technical Features

- ◆ Integrated or external frequency converter
- ◆ Compact design
- ◆ Operation in any orientation
- ◆ High pumping speed and compression for light gases
- ◆ Highly effective air-cooling unit
- ◆ Oil-free pump for generating clean high and ultrahigh-vacuum conditions



Advantages to the User

- ◆ Space-saving
- ◆ Easy to integrate into complex vacuum systems
- ◆ High foreline tolerance allows the use of downsized fore-vacuum pumps
- ◆ Low operating costs



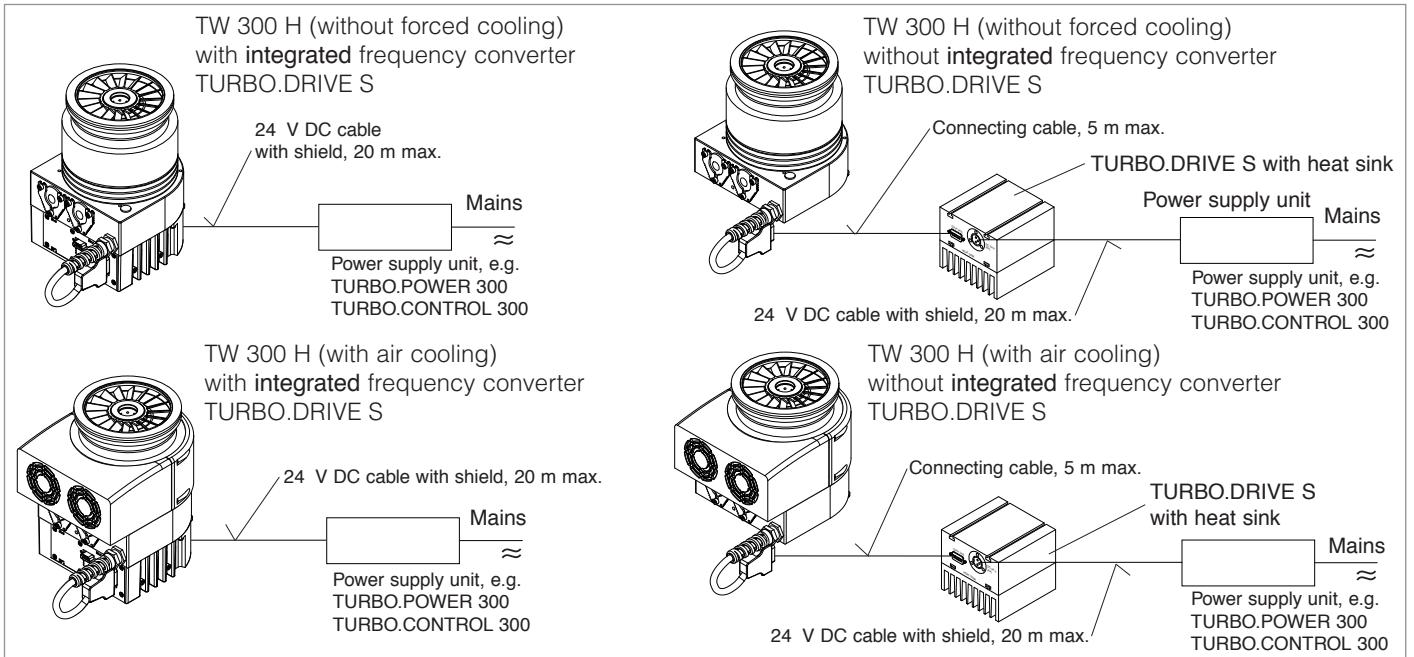
Technical Data		TURBOVAC TW 300 H	
Inlet flange	DN	O-ring sealed 100 ISO-K	Metal sealed 100 CF
Pump housing		Aluminum	Stainless steel
Pumping speed at $10^{-5} / 10^{-3}$ mbar			
N ₂	l x s ⁻¹	240 / 240	
Ar	l x s ⁻¹	240 / 240	
H ₂	l x s ⁻¹	160 / 140	
He	l x s ⁻¹	240 / 230	
Max. gas throughput *) at 10 ⁻¹ mbar			
N ₂ at 2 x 10 ⁻² mbar	mbar x l x s ⁻¹	3.7	
Ar at 1 x 10 ⁻² mbar	mbar x l x s ⁻¹	2.1	
H ₂ at 1 x 10 ⁻¹ mbar	mbar x l x s ⁻¹	2.6	
He at 1 x 10 ⁻¹ mbar	mbar x l x s ⁻¹	4.5	
Max. compression when idle			
N ₂		5,5 x 10 ⁸ at 8 mbar	1 x 10 ¹⁰ at 6 mbar
Ar		1,5 x 10 ⁸ at 10 mbar	
H ₂		1,5 x 10 ⁴ at 0.4 mbar	
He		4 x 10 ⁵ at 2 mbar	
Ultimate pressure (for CF pumps)			
with two-stage oil-sealed rotary vane vacuum pump TRIVAC D 2,5 E	mbar	< 1 x 10 ⁻⁸ (< 0.75 x 10 ⁻⁸ Torr)	< 1 x 10 ⁻¹⁰ (< 0.75 x 10 ⁻¹⁰ Torr)
with dry compressing piston vacuum pump EcoDry M15	mbar		< 2 x 10 ⁻¹⁰ (< 1.5 x 10 ⁻¹⁰ Torr)
with diaphragm pump DIVAC 2,5 VT	mbar		< 1 x 10 ⁻⁹ (< 0.75 x 10 ⁻⁹ Torr)
Max. fore-line pressure for N ₂	mbar	12 (9 Torr)	
Recommended fore-vacuum pump			
two-stage oil-sealed rotary vane vacuum pump		TRIVAC D 2,5 E	
dry compressing piston vacuum pump		EcoDry M15	
diaphragm pump		DIVAC 2,5 VT	
Run-up time to 95% of nominal speed	min	4	
Purge / vent port	DN	16 KF	
Cooling water connection (option)		2x G 1/8"	
Weight, approx.			
with / without frequency converter	kg (lbs)	6.8 / 6.0 (15 / 13.2)	
Operating voltage	V DC	24	
Max. power consumption			
Run up / ultimate pressure	W	150 / 30	

*) for continuous operation when water-cooled

Note: TURBOVAC TW 250 S available for specific applications. Please consult factory

Ordering Information				TURBOVAC TW 300 H
TW 300 H with integrated frequency converter TURBO.DRIVE S				Part No.
Inlet flange	Foreline flange	Cooling method	Interface	
DN 100 ISO-K	DN 16 KF	Convection	RS 485 C	800012V0007
DN 100 ISO-K	DN 16 KF	Air-cooled	RS 485 C	800012V0009
DN 100 ISO-K	DN 16 KF	Air-cooled	RS 232 C	800012V0013
DN 100 ISO-K	DN 16 KF	Water-cooled	RS 485 C	800012V0011
DN 100 CF	DN 16 KF	Convection	RS 485 C	800012V0008
DN 100 CF	DN 16 KF	Air-cooled	RS 485 C	800012V0010
DN 100 CF	DN 16 KF	Air-cooled	RS 232 C	800012V0014
DN 100 CF	DN 16 KF	Water-cooled	RS 485 C	800012V0012
TW 300 H without frequency converter TURBO.DRIVE S				
Inlet flange	Foreline flange	Cooling method	Interface	
DN 100 ISO-K	DN 16 KF	Convection	-	800012V0001
DN 100 ISO-K	DN 16 KF	Air-cooled	-	800012V0003
DN 100 ISO-K	DN 16 KF	Water-cooled	-	800012V0005
DN 100 CF	DN 16 KF	Convection	-	800012V0002
DN 100 CF	DN 16 KF	Air-cooled	-	800012V0004
DN 100 CF	DN 16 KF	Water-cooled	-	800012V0006
For operation, one frequency converter TURBO.DRIVE S is necessary				
Electronic frequency converter TURBO.DRIVE S with heat sink, RS 485 C interface				800070V0006
Electronic frequency converter TURBO.DRIVE S with heat sink, RS 232 C interface				800070V0005
Connecting cable (TURBO.DRIVE S - pump)				
1 m (3.5 ft)				152 47
3 m (10.5 ft)				864 40
5 m (17.5 ft)				864 50
Accessories, necessary for all pumps				
START/STOP switch for manual operation of the turbomolecular pump				152 48
Power supplies				
TURBO.POWER 300				800100V0002
TURBO.CONTROL 300				800100V0001
Accessories, optional				
Water cooling unit with G 1/8" connection including 2 hose nozzles G 1/8", OD 10 mm for water hose, 4 gaskets, 2 blank-off plugs				800135V0002
Air cooling unit				800 000 249
Flange heater				
100 CF, 230 V, 50 Hz				854 27
100 CF, 110 V, 60 Hz				854 28
Splinter guard DN 100 ISO-K/CF				
coarse (3,2 x 3,2 mm)				200 18 692
fine (1,6 x 1,6 mm)				200 18 340
Vibration absorber				
DN 100 ISO-K				800131V0100
DN 100 CF				500 071
Accessories for serial interfaces RS 232 C and RS 485 C				see chapter "Turbomolecular Pumps", para. "Accessories"

The modular concept



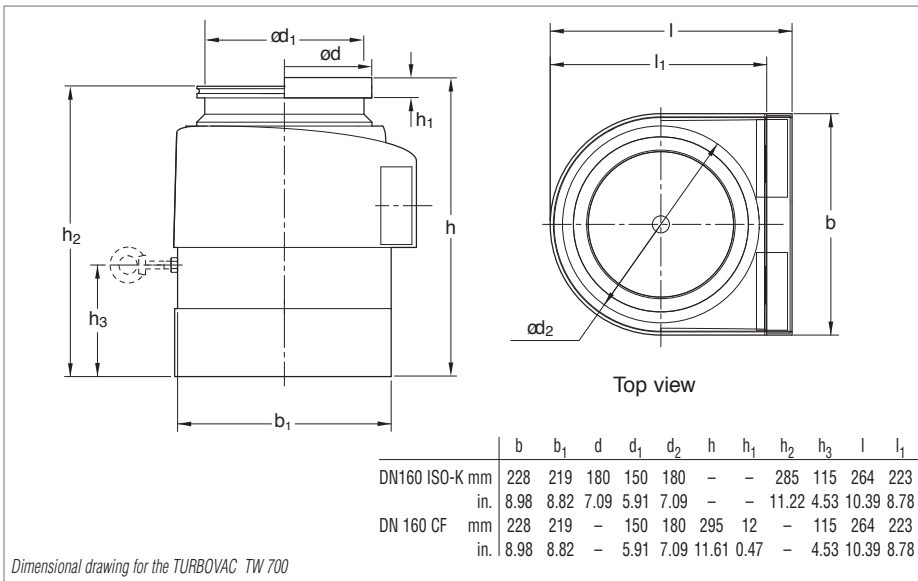
Notes

TURBOVAC TW 701



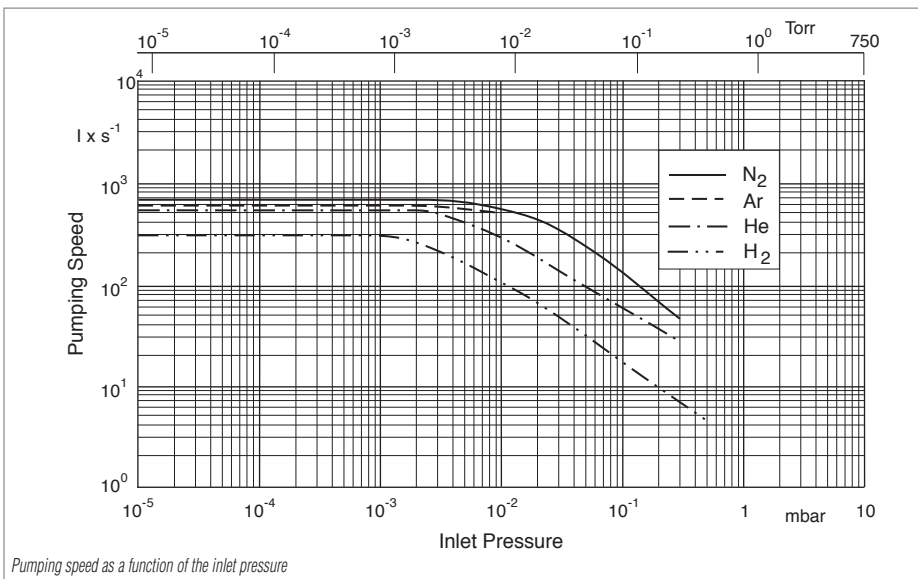
Typical Applications

- ◆ Mass spectrometers
- ◆ Data storage
- ◆ Flat panel displays
- ◆ R & D, e.g.
 - UHV systems
 - Particle accelerators
- ◆ Load locks and transfer chambers



Technical Features

- ◆ Integrated frequency converter
- ◆ Operation in any orientation
- ◆ Highest pumping speed and throughput for Nitrogen and Argon
- ◆ High foreline tolerance allows the use of downsized fore-vacuum pumps
- ◆ Highly effective air-cooling unit
- ◆ Oil-free pump for generating clean high- and ultrahigh-vacuum conditions



Advantages to the User

- ◆ Space-saving
- ◆ Easy to integrate into complex vacuum systems
- ◆ High productivity
- ◆ Low operating costs
- ◆ Highly reliable operation

Technical Data		TURBOVAC TW 701	
		160 ISO-K	160 CF
Inlet flange	DN		
Pumping speed			
N ₂	l x s ⁻¹		680
Ar	l x s ⁻¹		600
He	l x s ⁻¹		530
H ₂	l x s ⁻¹		330
Max. gas throughput			
N ₂	mbar x l x s ⁻¹		12
Ar	mbar x l x s ⁻¹		5 (water cooled)
He	mbar x l x s ⁻¹		7
H ₂	mbar x l x s ⁻¹		2.5
Compression ratio			
N ₂			8 x 10 ⁸
Ar			1 x 10 ⁸
He			1 x 10 ⁶
H ₂			2 x 10 ⁴
Ultimate pressure	mbar (Torr)	< 5.0 x 10 ⁻⁹ (< 3.75 x 10 ⁻⁹)	< 1.5 x 10 ⁻¹⁰ (< 1.1 x 10 ⁻¹⁰)
Max. foreline pressure for N ₂	mbar (Torr)		14 (10.5)
Recommended fore-vacuum pump		TRIVAC D 65 B, EcoDry M15, DIVAC 4.8 VT	
Run-up time to 95% speed	min		≈ 5
Purge port	DN		16 KF
Cooling water connections		2x G 1/8" (internal threads)	
Weight, approx.	kg (lbs)		19 (42)
Supply voltage, nominal	V DC		59
Max. power consumption	W		500

Ordering Information				TURBOVAC TW 701
Inlet flange	Foreline flange	Cooling method	Interface	Part No.
DN 160 ISO-K	DN 25 KF	Air-cooled	RS 232 C	800051V0021
DN 160 ISO-K	DN 25 KF	Water-cooled	RS 232 C	800051V0025
DN 160 ISO-K	DN 25 KF	Air-cooled	RS 485 C	800051V0024
DN 160 ISO-K	DN 25 KF	Water-cooled	RS 485 C	800051V0023
DN 160 CF	DN 25 KF	Air-cooled	RS 485 C	800051V0027
DN 160 CF	DN 25 KF	Water-cooled	RS 485 C	800051V0026
DN 200 CF (incl. splinter guard)	DN 25 KF	Water-cooled	RS 232 C	800051V0022
Power supply TURBO.CONTROL 700				see chapter "Turbomolecular Pumps with Mechanical Rotor Suspension" para. "Electronic Frequency Converter"
Accessories, optional				
Inlet screen				
DN 160 ISO-K				200 00 307
DN 160 CF				200 17 247
Flange heater 160 CF				
230 V AC				854 37
110 V AC				854 38
Vibration absorber				
DN 160 ISO-K				500 073
DN 160 CF				500 072
OEM power supply, 59 V DC				864 45
59 V DC cable				
3 m (10.5 ft)				200 12 729
5 m (17.5 ft)				200 12 730
10 m (35 ft)				200 12 731
20 m (70 ft)				200 15 064
Plug with integrated START/STOP switch				152 48
Purge gas and venting valve, 24 V DC, 0.6 mbar x l x s ⁻¹ = 36 sccm (purge gas pressure, abs.; 1.5 to 6 bar)				121 33
Accessories for RS 232 C and RS 485 C interfaces				see chapter "Turbomolecular Pumps", para. "Accessories"
Accessories, for the water connection				
Adaptor G (BPS) 1/8" – G (BPS) 1/4" pipe (Swagelok *)				200 91 671 (2x required)
Gasket				224 01 207 (2x required)
Adaptor G (BPS) 1/8" – 10 mm (0.39 in.) hose nozzle				200 18 366 (2x required)
Gasket				230 02 106 (2x required)
Adaptor G (BPS) 1/8" – NPT 1/8"				200 12 742 (2x required)
Gasket				238 20 110 (2x required)

*) Adapts German threads of water cooling to a more common English thread. The Part Number is for one each, but two are used for almost all installations

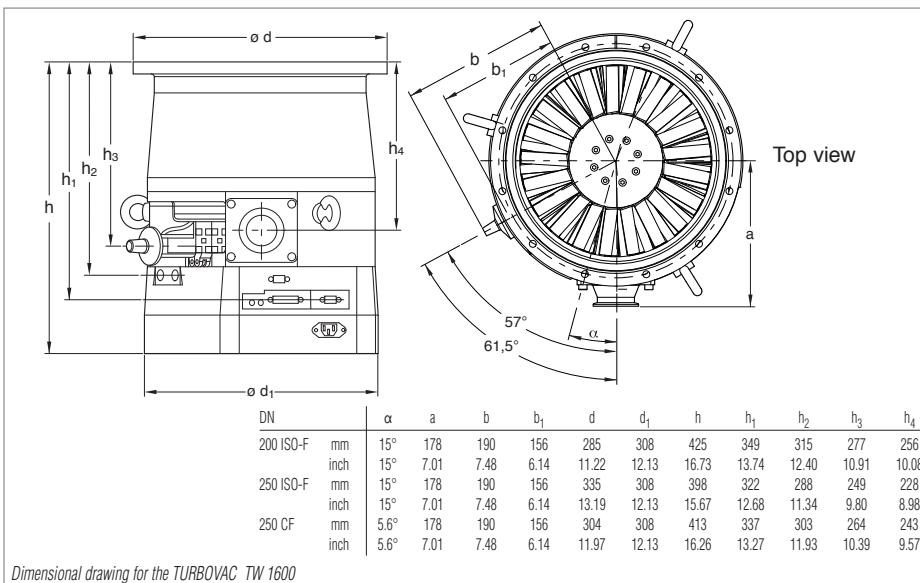
TURBOVAC TW 1600

Typical Applications

- ◆ Data storage
- ◆ Flat panel displays
- ◆ Optical coating
- ◆ Large area coating
- ◆ R & D, e.g.
 - Fusion experiments
 - Space simulation
 - UHV applications

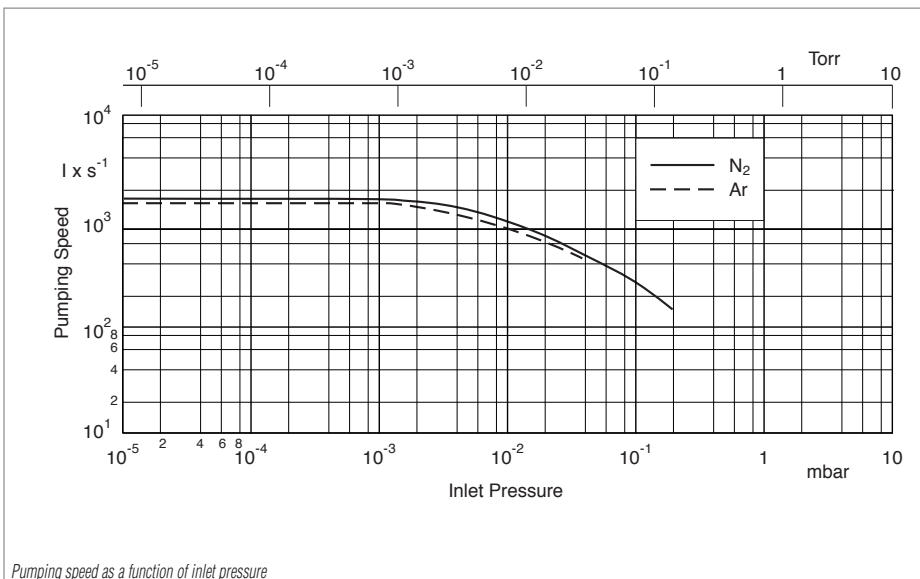
Technical Features

- ◆ Frequency converter and power supply integrated
- ◆ Robust rotor design
- ◆ Operation in any orientation
- ◆ Highest pumping speed and high throughput
- ◆ Oil-free pump for generating clean high and ultrahigh-vacuum conditions
- ◆ Purge gas and venting valve integrated
- ◆ High fore-vacuum tolerance



Advantages to the User

- ◆ Space-saving
- ◆ Easy to integrate into complex vacuum systems
- ◆ High productivity
- ◆ Low operating costs
- ◆ Operation with dry backing pumps



Technical Data		TURBOVAC TW 1600	
Inlet flange	DN	200 ISO-F	250 ISO-F / 250 CF
Pumping speed			
N ₂	l x s ⁻¹	1000	1420
Ar	l x s ⁻¹	820	1200
Max. gas throughput			
N ₂	mbar x l x s ⁻¹		7.4
Ar	mbar x l x s ⁻¹		6.8
Compression ratio k ₀ for O-ring sealed pumps			
N ₂			1 x 10 ⁷
Ar			1 x 10 ⁸
Ultimate pressure	mbar (Torr)	< 3 x 10 ⁻¹⁰ (< 2.25 x 10 ⁻¹⁰)	
Max. foreline pressure for N ₂	mbar (Torr)	8 (6)	
Recommended fore-vacuum pump (alternatively)		TRIVAC D 65 B + RUVAC WA 501 DIVAC 4.8 VT EcoDry M SOGEVAC SV 25	
Run-up time to 95% speed	min	< 10	
Purge / Vent port	DN	G 1/4"	
Cooling water connections		G 3/8"	
Weight, approx.	kg (lbs)	40 (88.3)	
Supply voltage	V AC	100 - 240	
Max. power consumption	W	700	

Ordering Information				TURBOVAC TW 1600
Inlet flange	Foreline flange	Cooling method	Interface	Part No.
DN 200 ISO-F	DN 40 KF	Water cooled	ProfiBus	800041V2144
DN 250 ISO-F	DN 40 KF	Water cooled	ProfiBus	800041V2444
DN 250 CF	DN 40 KF	Water cooled	ProfiBus	800041V2844
Accessories for RS 232 C and RS 485 C interfaces				see chapter "Turbomolecular Pumps", para. "Accessories"

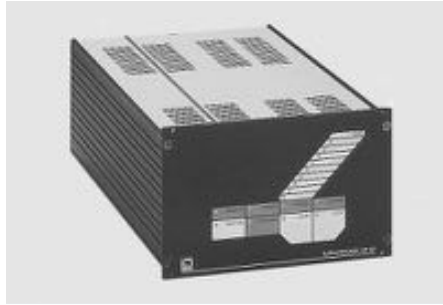
TURBOTRONIK NT 10



Technical Features

- ◆ For operating the TURBOVAC 50 turbomolecular pump
- ◆ Bench top unit
- ◆ Also for rack mounting (1/4 19", 3 HU)
- ◆ Controls and indicators on the front panel
- ◆ Inputs for remote control and process controller
- ◆ Freely assignable relays (e.g. to control the backing pumps)

TURBOTRONIK NT 20



Technical Features

- ◆ For operating the TURBOVAC 361 (C) and 1100 C turbomolecular pump
- ◆ Front panel with membrane keypad and LCD

Advantages to the User

- ◆ Remote control and process control via analog and programmable control inputs and outputs
- ◆ Connection for backing pump, venting valve, flange heater and air cooler
- ◆ Operation direct at the unit or via interface
- ◆ Floating connection of external monitoring devices via a terminal strip on the rear

Technical Data		NT 10	NT 20
Main connection, 50 to 60 Hz	V	90-140/180-260	–
Main, 50 to 60 Hz, selectable	V	–	85 to 265
Max. output voltage	V	3 x 150	3 x 42
Overload current limit	A	0.22	5
Permissible ambient temperature	°C (°F)	0 to +40 (32 to +104)	0 to +45 (32 to +113)
Dimensions (W x H x D)	mm (in.)	106 x 128 x 233 (4.17 x 5.04 x 9.17)	213 x 129 x 320 (1/2 19", 3 HU) (8.39 x 5.08 x 12.60 (1/2 19", 3 HU))
Weight, approx.	kg (lbs)	1.5 (3.3)	7 (15.4)
Ordering Information		NT 10	NT 20 ¹⁾
90 - 140 V (with US plug)		Part No. 859 01	–
100 V (with US plug)		–	Part No. 857 22 ²⁾
120 V (with US plug)		–	Part No. 857 21
180 - 260 V (with EURO plug)		Part No. 859 00	–
230 V (with EURO plug)		–	Part No. 857 20
Pump/converter connecting line			
3 m (10.5 ft)		Part No. 121 08	Part No. 857 65 ¹⁾
5 m (17.5 ft)		Part No. 121 09	Part No. 857 66 ¹⁾
10 m (35.0 ft)		–	Part No. 857 67 ¹⁾
20 m (70.0 ft)		–	Part No. 857 68 ¹⁾

¹⁾ If NT 20 is being ordered to replace NT 150/360, NT 151/361, then an NT 20 cable must also be ordered. (NT 20 has round connector on back, the other controller had a rectangular connector back.)

²⁾ Not suitable for driving the TURBOVAC 1100 C

Version for the North and South American Continents

TURBOTRONIK NT 361

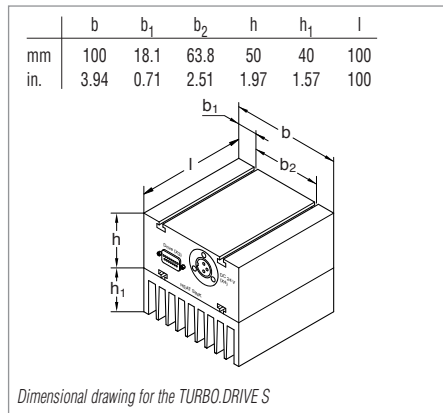


Advantages to the User

- ◆ For operating the TURBOVAC 361 turbomolecular pumps
- ◆ Sensing of the pump model via a resistance code
- ◆ Operation via pushbuttons
- ◆ Terminal strip for remote control and display functions

Technical Data		NT 361
Main connection, 60 Hz	V	120
Max. power consumption during run-up	VA	750
Power consumption during normal operation, approx.	VA	130
Max. output voltage / run-up current	V / A	3 x 45 / 5.5
Overload current limit	A	3.5
Nominal frequency	Hz	833/750
Permissible ambient temperature	°C (°F)	0 to +40 (32 to +104)
Dimensions (W x H x D)	mm (in.)	210 x 129 x 288 (8.27 x 5.08 x 11.34)
Weight, approx.	kg (lbs)	8.5 (18.7)
Ordering Information		NT 361
120 V (Main cord with US plug)		Part No. 854 72-6
Pump/converter connecting line		
3 m (10.5 ft)		Part No. 857 60
5 m (17.5 ft)		Part No. 857 61

TURBO.DRIVE S (TDS) for TW 70, TW 300 and TW 300 H Turbomolecular Pumps



Technical Features

- ◆ Compact size
- ◆ RS 232 C or RS 485 C interface
- ◆ Configurations
 - as a separate frequency converter
 - integrated within turbomolecular pump
- ◆ Remote control via remote control interface
- ◆ Flexible mounting
- ◆ Cost-effective supply of 24 V DC power

Technical Data

TURBO.DRIVE S

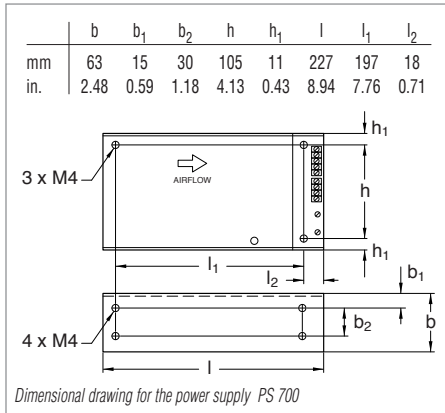
Input		
Voltage	V DC	24 ± 5%
Max. continuous current	A	7
Max. continuous power consumption	W	170
Ambient temperature	°C (°F)	+10 to +45 (+50 to +113)
Dimensions (W x H x D), including heat sink	mm (in.)	100 x 90 x 100 (3.94 x 3.54 x 3.94)
Weight	kg (lbs)	1.4 (3.1)
Serial Interface		RS 232 C or RS 485 C

Ordering Information

TURBO.DRIVE S

TURBO.DRIVE S with RS 232 C interface and heat sink	Part No. 800070V0005
TURBO.DRIVE S with RS 485 C interface and heat sink	Part No. 800070V0006
TURBO.DRIVE S with Profibus	upon request
Connecting cable TDS-pump	
1 m (3.5 ft)	Part No. 152 47
3 m (10.5 ft)	Part No. 864 40
5 m (17.5 ft)	Part No. 864 50
START/STOP switch (for manual operation)	Part No. 152 48
Hat rail adaptor as mounting aid	Part No. 800110V0003
Accessories for RS 232 C and RS 485 C interfaces	see chapter "Accessories for Turbomolecular Pumps", para. "Accessories"

Power Supply PS 700 for TW 701 Turbomolecular Pumps



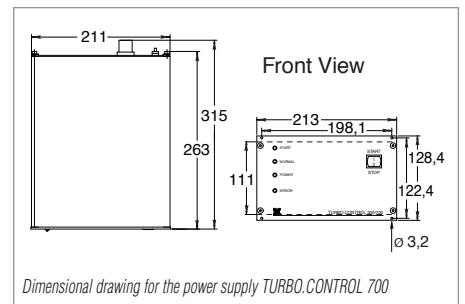
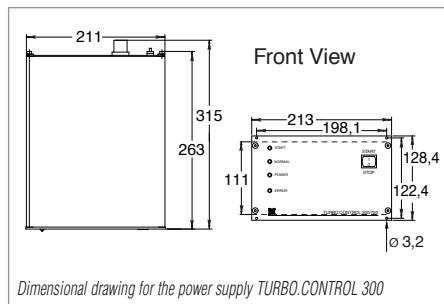
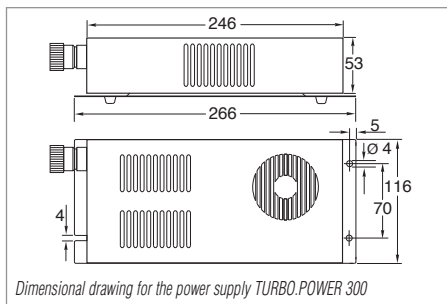
Technical Features

- ◆ 59 V DC OEM power supply for screw fixing in electrical cabinets

Technical Data		Power Supply PS 700
Input		
Mains voltage	V	85-265
Max. continuous power consumption	W	850
Output		
Voltage, nominal	V DC	59
Max. continuous current	A	13
Max. power output	W	750
Ambient temperature	°C (°F)	0 to +70 (32 to +158)
Dimensions (W x H x D)	mm (in.)	227 x 63 x 127 (8.94 x 2.48 x 5.0)
Weight	kg (lbs)	2 (4.4)
Ordering Information		Power Supply PS 700
OEM power supply 59 V DC		Part No. 864 45
59 V DC cable TW 700–power supply		
3 m (10.5 ft)		Part No. 200 12 729
5 m (17.5 ft)		Part No. 200 12 730
10 m (35.0 ft)		Part No. 200 12 731
20 m (70.0 ft)		Part No. 200 15 064
Mains cable for OEM power supply, 2 m (7 ft)		
with EURO plug		Part No. 800102V0001
with US plug		Part No. 800102V1001
START/STOP switch for TURBO.DRIVE S/L (for manual operation)		Part No. 152 48

Note: See the TPC and TPS controllers in the Product Section C10 “Turbomolecular Pump Systems” for additional controllers for the TURBOVAC TW 300 and TW 700

Power Supply Units for TURBO.DRIVE S and TW 700/701



Technical Features

- ◆ Cost-effective supply of 24 V DC power for TURBO.DRIVE S
- ◆ Plug & play
- ◆ Bench top unit or for cabinet mounting

Technical Features

- ◆ For supplying 24 V DC power to the TURBO.DRIVE S
- ◆ Plug & play
- ◆ Bench top unit or for cabinet mounting
- ◆ Mains switch
- ◆ START/STOP switch for the turbomolecular pump
- ◆ Remote control via remote interface
- ◆ Status indicating LEDs and status relays

Technical Features

- ◆ For supplying 56 V DC power to the TW 700/701
- ◆ Plug & play
- ◆ Bench top unit or for cabinet mounting
- ◆ Mains switch
- ◆ START/STOP switch for the turbomolecular pump
- ◆ Remote control via remote interface
- ◆ Status indicating LEDs and status relays



Technical Data	Power Supplies		
	TURBO.POWER 300	TURBO.CONTROL 300	TURBO.CONTROL 700
Input			
Mains voltage	85-264 V / 50/60 Hz	85-264 V / 50/60 Hz	85-264 V / 50/60 Hz
Max. power consumption	300	300	805
Output			
Voltage, nominal	24	24	56
Max. continuous current	8,4	8,4	8,5
Ambient temperature	0 to +40 (32 to +104)	0 to +40 (32 to +104)	0 to +40 (32 to +104)
Dimensions (W x H x D)	116 x 53 x 260 (4.57 x 2.09 x 10.24)	213 x 129 x 320 (8.39 x 5.08 x 12.6)	213 x 129 x 320 (8.39 x 5.08 x 12.6)
Weight	1.5 (3.31)	1.5 (3.31)	2.5 (5.52)

Ordering Information	Power Supplies		
	TURBO.POWER 300	TURBO.CONTROL 300	TURBO.CONTROL 700
Power supply			
TURBO.POWER 300	Part. No. 800100V0002	-	-
TURBO.CONTROL 300	-	Part. No. 800100V0001	-
TURBO.CONTROL 700	-	-	Part. No. 800101V0001
DC cable frequency converter – power supply unit			
1 m (3.5 ft)	24 V DC power cable Part. No. 800094V0100	24 V DC control cable Part. No. 800091V0100	56 V DC control cable Part. No. 800093V0100
3 m (10.5 ft)	Part. No. 800094V0300	Part. No. 800091V0300	Part. No. 800093V0300
5 m (17.5 ft)	Part. No. 800094V0500	Part. No. 800091V0500	Part. No. 800093V0500
10 m (35.0 ft)	Part. No. 800094V1000	Part. No. 800091V1000	Part. No. 800093V1000
20 m (70.0 ft)	Part. No. 800094V2000	Part. No. 800091V2000	Part. No. 800093V2000
Mains cable, 3 m (10.5 ft) with EURO plug with US plug 6-15 P		Part. No. 800102V0002 Part. No. 800102V1002	
Hat rail adaptor as mounting aid	Part. No. 800102V0002	-	-

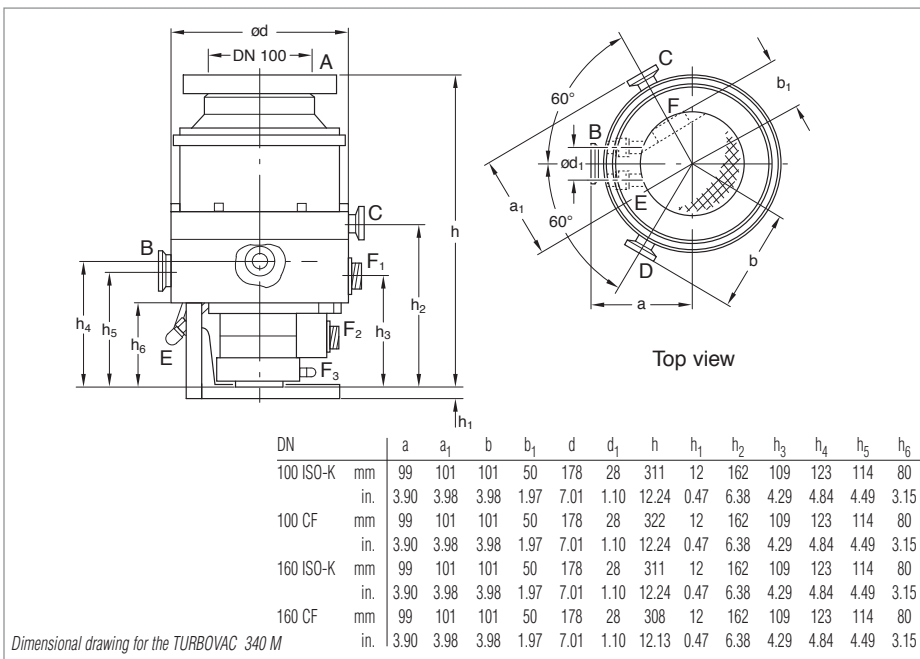
TURBOVAC 340 M

Typical Applications

- ◆ Gas analysis systems
- ◆ Particle accelerators
- ◆ Electron beam microscopy
- ◆ Research instruments and systems

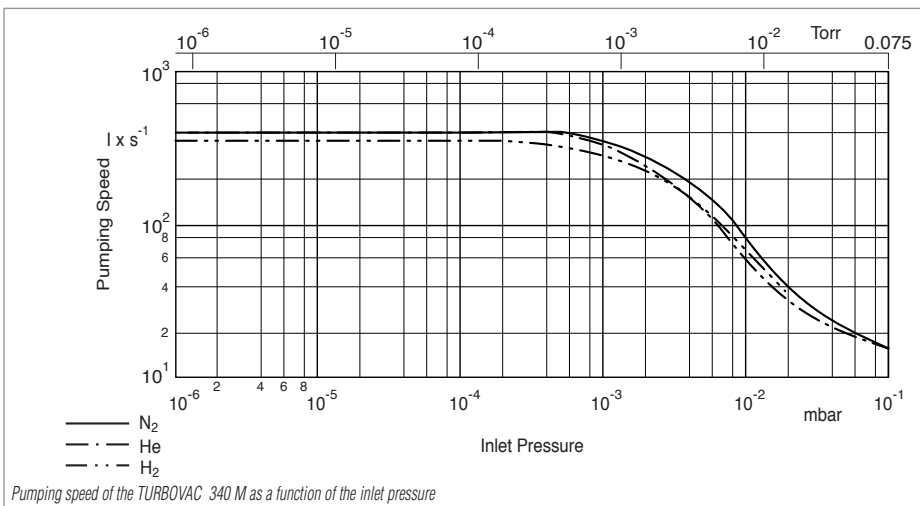
Technical Features

- ◆ Magnetic suspension
- ◆ Absolutely free of any lubricants
- ◆ Low noise and vibration levels
- ◆ Operation in any orientation
- ◆ Convection cooling
- ◆ Purge gas design



Advantages to the User

- ◆ Maintenance-free
- ◆ Convection cooling
- ◆ No batteries are required because of integrated generator mode in case of power failures



Technical Data		TURBOVAC 340 M	
Inlet flange	DN	100 ISO-K • 100 CF	160 ISO-K • 160 CF
Pumping speed			
N ₂	l x s ⁻¹	250	400
He	l x s ⁻¹	370	400
H ₂	l x s ⁻¹	340	370
Speed	rpm	51,600	
Compression ratio			
N ₂		> 10 ⁹	
He		6.4 x 10 ⁴	
H ₂		2.5 x 10 ³	
Ultimate pressure	mbar (Torr)	< 10 ⁻¹⁰ (< 0.75 x 10 ⁻¹⁰)	
Max. foreline pressure for N ₂	mbar (Torr)	5 x 10 ⁻¹ (3.75 x 10 ⁻¹)	
Recommended fore-vacuum pump		TRIVAC D 16 B EcoDry L	
Run-up time	min	3.5	
Fore-vacuum flange	DN	25 KF	
Purge / vent port	DN	10 KF	
Cooling water connections, hose nipple		not required	
Weight, approx.	kg (lbs)	16 (35)	

Ordering Information		TURBOVAC 340 M	
TURBOVAC turbomolecular pump with high-vacuum connection flange DN 100 ISO-K DN 100 CF DN 160 ISO-K DN 160 CF		Part No. 855 80 Part No. 855 81 Part No. 855 82 Part No. 855 83	
Accessories for all pumps			
Flange heater DN 100 CF, 230 V DN 160 CF, 230 V DN 160 CF, 110 V		Part No. 854 27 Part No. 854 37 Part No. 854 38	
Electronic frequency converter TURBOTRONIK NT 340 M 100 V 120 V 230 V		Part No. 857 31 Part No. 857 30 Part No. 857 29	
Connection line		see TURBOTRONIK	

MAG 400 C/CT

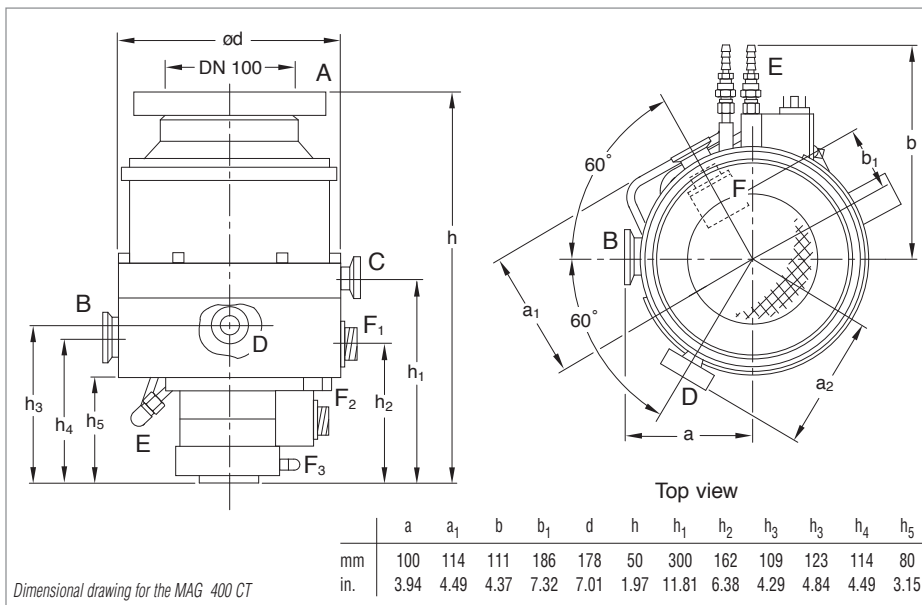


Typical Applications

- ◆ All major semiconductor processes such as Etch, CVD and Ion Implantation
- ◆ Gas analysis systems
- ◆ Particle accelerators
- ◆ Electron beam microscopy
- ◆ Research instruments and systems
- ◆ Load locks and transfer chambers

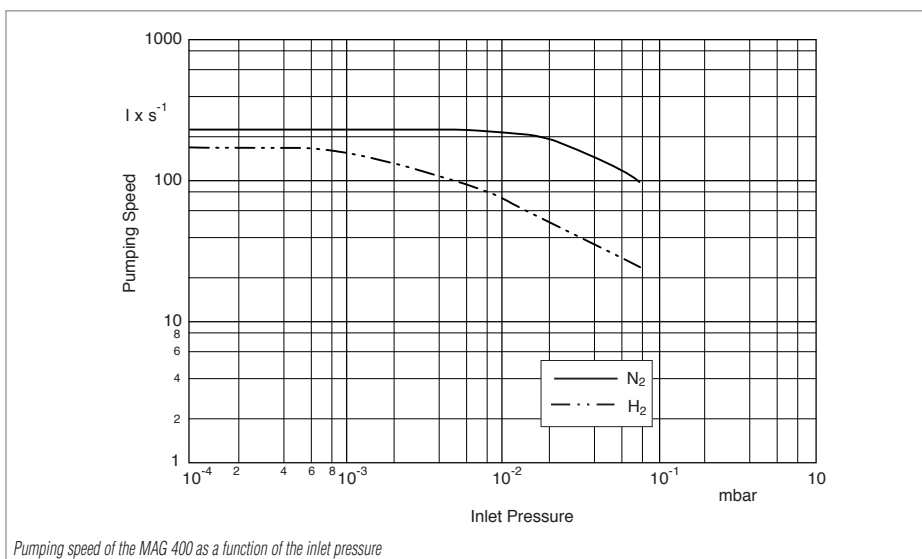
Technical Features

- ◆ Magnetic suspension
- ◆ Patented KEPLA-COAT® for rotor and stator to prevent corrosion
- ◆ Low noise and vibration levels
- ◆ Operation in any orientation
- ◆ Optimized corrosion-resistant advanced rotor design
- ◆ High temperature and high stress tolerance material
- ◆ Temperature management system (TMS) for etch application



Advantages to the User

- ◆ Maintenance-free
- ◆ Optimized vacuum performance
- ◆ Resistant against corrosive gases and process by-products
- ◆ Robust against shock-venting
- ◆ Temperature control for metal etch
- ◆ No deposition of etch by products due to TMS



Technical Data		MAG		
		400 C		400 CT
Inlet flange	DN		100 ISO-K	
Pumping speed				
N ₂	l x s ⁻¹		235	
H ₂	l x s ⁻¹		174	
Speed (high / low)	rpm		51,600 / 43,860	
Compression ratio				
N ₂			> 10 ⁹	
H ₂			2.5 x 10 ³	
Ultimate pressure	mbar (Torr)		< 10 ⁻¹⁰ (< 0.75 x 10 ⁻¹⁰)	
Max. foreline pressure for N ₂	mbar (Torr)		5 x 10 ⁻¹ (3.75 x 10 ⁻¹)	
Recommended fore-vacuum pump			TRIVAC D 65 BCS	
Run-up time	min		3.5	
Fore-vacuum flange	DN		25 KF	
Purge / vent port	DN		10 KF	
Cooling water connections, hose nipple	mm (in.)		7.5 (0.30)	
Weight, approx.	kg (lbs)		16 (35)	
Ordering Information		MAG		
		400 C		400 CT
MAG turbomolecular pump		Part No. 894 62		Part No. 894 63
Frequency converter TURBOTRONIK NT 340 MA (120 V)			Part No. 857 32	
Connection line motor			Part No. 859 10	
Connection line bearing			Part No. 859 11	
Accessories for the temperature control		–		see TURBOTRONIK
Purge gas and venting valve				
110 V, 50/60 Hz			Part No. 855 48	
230 V, 50/60 Hz			Part No. 855 49	
24 V DC, 5 W			Part No. 174 17	
Seal kit			Part No. 200 91 240	
Seal kit and Operating Instructions			Part No. 200 91 437	

MAG 1500 C/CT

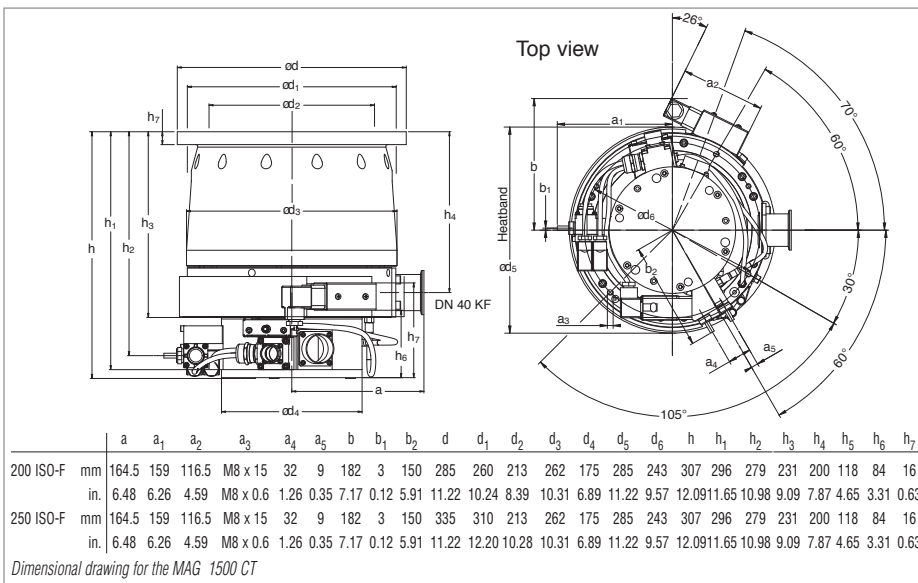


Typical Applications

- ◆ All major semiconductor processes such as Etch, CVD, PVD and Ion Implantation
- ◆ Load locks and transfer chambers

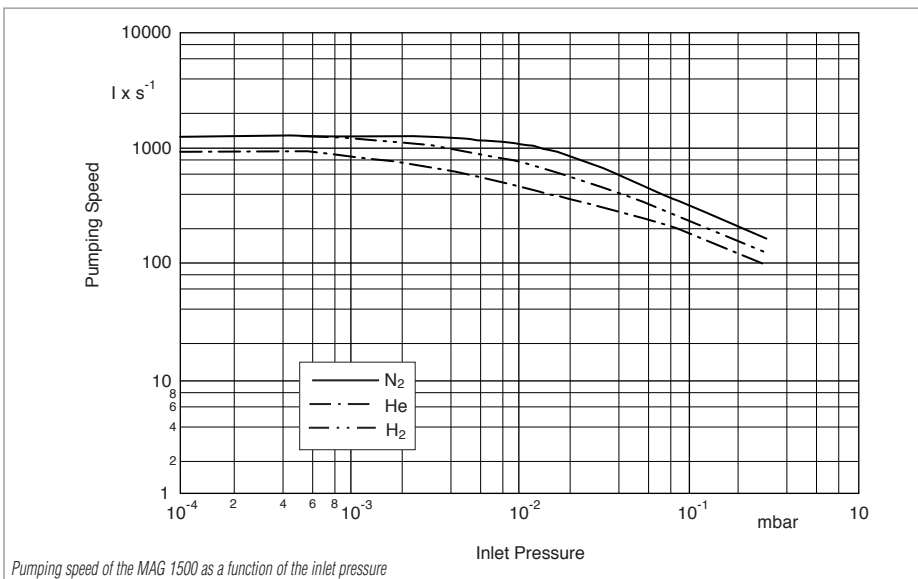
Technical Features

- ◆ Active 5-axis magnetic bearing system
- ◆ Patented KEPLA-COAT® for rotor and stator to prevent corrosion
- ◆ Low noise and vibration levels
- ◆ Operation in any orientation
- ◆ Advanced rotor design for high throughput
- ◆ Integrated purge gas system
- ◆ CT versions: Integrated temperature management system
- ◆ Bearing and temperature system are controlled digitally
- ◆ Intelligent power control system



Advantages to the User

- ◆ Maintenance-free
- ◆ High throughput for all process gases
- ◆ High pumping speed at low pressure
- ◆ High foreline pressure tolerance: up to 1.7 mbar (1.13 Torr)
- ◆ High resistance against corrosive gases
- ◆ Robust against particles and deposits
- ◆ Temperature control up to 90 °C (194 °F) to avoid condensation
- ◆ Lowest weight and size in its class
- ◆ Application specific design



Technical Data		MAG			
		1500 C		1500 CT	
Inlet flange	DN	200 ISO-F	250 ISO-F	200 ISO-F	250 ISO-F
Pumping speed					
N ₂	l x s ⁻¹	1100	1220	1100	1220
He	l x s ⁻¹	1150	1220	1150	1220
H ₂	l x s ⁻¹	920	1020	920	1020
Speed	rpm	36,000			
Compression ratio		> 10 ⁸			
N ₂		> 10 ⁸			
Ultimate pressure	mbar (Torr)	< 10 ⁻⁸ (< 0.75 x 10 ⁻⁸)			
Max. foreline pressure for N ₂	mbar (Torr)	1.7 (1.2)			
Recommended fore-vacuum pump Rotary vane pump or dry compressing pump offering a pumping speed of 100 m ³ /h		TRIVAC D 65 BCS			
Run-up time	min	< 6			
Fore-vacuum flange	DN	40 KF			
Purge / vent port	VCR Nut	1/4"			
Cooling water connections, hose nipple	mm (in.)	6.4 (0.25)			
Weight, approx.	kg (lbs)	32 (70)			

Ordering Information		MAG			
		1500 C		1500 CT	
MAG turbomolecular pump		Part No. 400020V0001	Part No. 400021V0001	Part No. 400020V0002	Part No. 400021V0002
MAG.DRIVE ^{digital} converter		Part No. 400035V0001			
Plug-in control		Part No. 121 36			
MAG.DRIVE ^{digital} with DeviceNet with Echolon		upon request upon request			
Connecting cables converter-pump					
1.5 m (5.25 ft) DRIVE/BEARING		Part No. 400036V0001			
1.5 m (5.25 ft) TMS		Part No. 400037V0001			
5 m (17.5 ft) DRIVE/BEARING		Part No. 400036V0004			
5 m (17.5 ft) TMS		Part No. 400037V0004			
10 m (35 ft) DRIVE/BEARING		Part No. 400036V0002			
10 m (35 ft) TMS		Part No. 400037V0002			
20 m (70 ft) DRIVE/BEARING		Part No. 400036V0003			
20 m (70 ft) TMS		Part No. 400037V0003			
Seal kit					
DN 200 standard		upon request			
DN 250 standard		upon request			
DN 250 metal		Part No. 200 07 901			

MAG 2000 C/CT

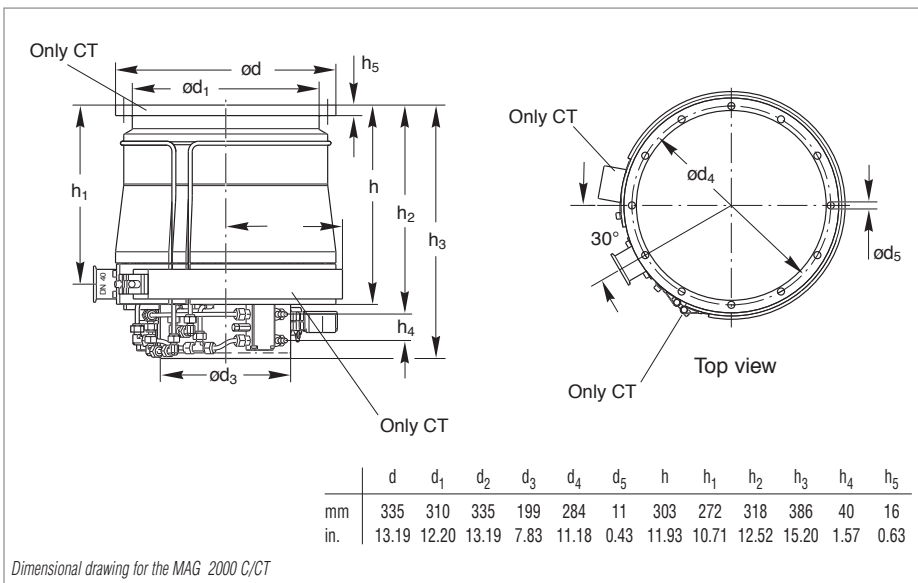


Typical Applications

- ◆ All major semiconductor processes such as Etch, CVD, PVD and Ion Implantation
- ◆ Load locks and transfer chambers

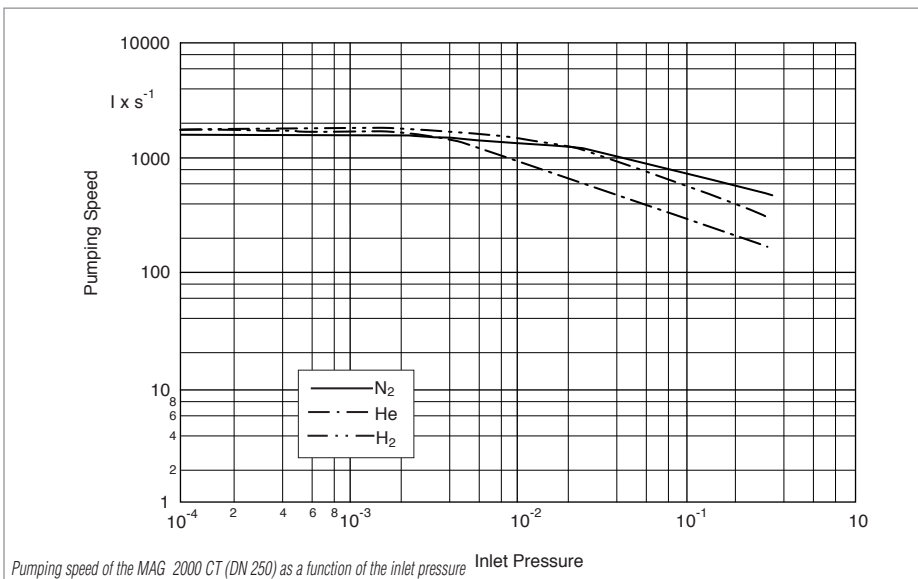
Technical Features

- ◆ Active 5-axis magnetic bearing system
- ◆ Patented KEPLA-COAT® for rotor and stator to prevent corrosion
- ◆ Low noise and vibration levels
- ◆ Operation in any orientation
- ◆ Advanced rotor design for high throughput
- ◆ Integrated purge gas system
- ◆ CT versions: Integrated temperature management system



Advantages to the User

- ◆ Maintenance-free
- ◆ High throughput for all etch gases
- ◆ High pumping speed at low pressure
- ◆ High foreline pressure tolerance: up to 2 mbar (1.5 Torr)
- ◆ High resistance against corrosive gases
- ◆ Robust against particles and deposits
- ◆ Temperature management system to avoid condensation
- ◆ Application specific design



Technical Data		MAG	
		2000 C	2000 CT
Inlet flange	DN	250 ISO-F	250 ISO-F
Pumping speed			
N ₂	l x s ⁻¹	1550	
He	l x s ⁻¹	1780	
H ₂	l x s ⁻¹	1390	
Speed	rpm	28,800	
Compression ratio			
N ₂		> 10 ⁸	
Ultimate pressure	mbar (Torr)	< 10 ⁻⁸ (< 0.75 x 10 ⁻⁸)	
Max. foreline pressure for N ₂	mbar (Torr)	1.6 (1.2)	
Recommended fore-vacuum pump Rotary vane pump or dry compressing pump offering a pumping speed of 100 m ³ /h		TRIVAC D 65 BCS	
Run-up time	min	< 8	
Fore-vacuum flange	DN	40 KF	
Purge / vent port	VCR nut	1/4"	
Cooling water connections, hose nipple	mm (in.)	6.4 (0.25)	
Weight, approx.	kg (lbs)	68 (150)	

Ordering Information		MAG	
		2000 C	2000 CT
MAG turbomolecular pump		Part No. 894 16	Part No. 894 30
MAG.DRIVE 2000 converter		Part No. 121 35	
Plug-in control		Part No. 121 36	
Connecting cables converter-pump			
1.5 m (5.25 ft) BEARING		Part No. 121 29	
1.5 m (5.25 ft) DRIVE/TMS		Part No. 121 30	
3 m (10.5 ft) BEARING		Part No. 121 17	
3 m (10.5 ft) DRIVE/TMS		Part No. 121 18	
5 m (17.5 ft) BEARING		Part No. 121 19	
5 m (17.5 ft) DRIVE/TMS		Part No. 121 20	
10 m (35 ft) BEARING		Part No. 121 21	
10 m (35 ft) DRIVE/TMS		Part No. 121 22	
20 m (70 ft) BEARING		Part No. 121 25	
20 m (70 ft) DRIVE/TMS		Part No. 121 26	
Seal kit			
DN 200		Part No. 200 91 684	
DN 250		Part No. 200 91 641	

MAG W 830/1300 C

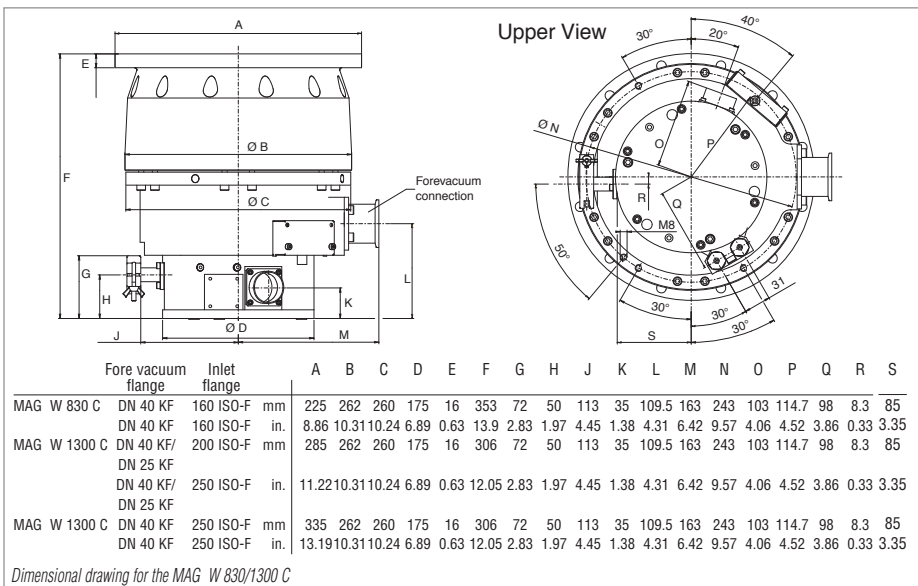


Typical Applications

- ◆ Semiconductor processes, like PVD and ion implantation
- ◆ Transfer chambers
- ◆ Particle accelerators
- ◆ Research
- ◆ Coaters

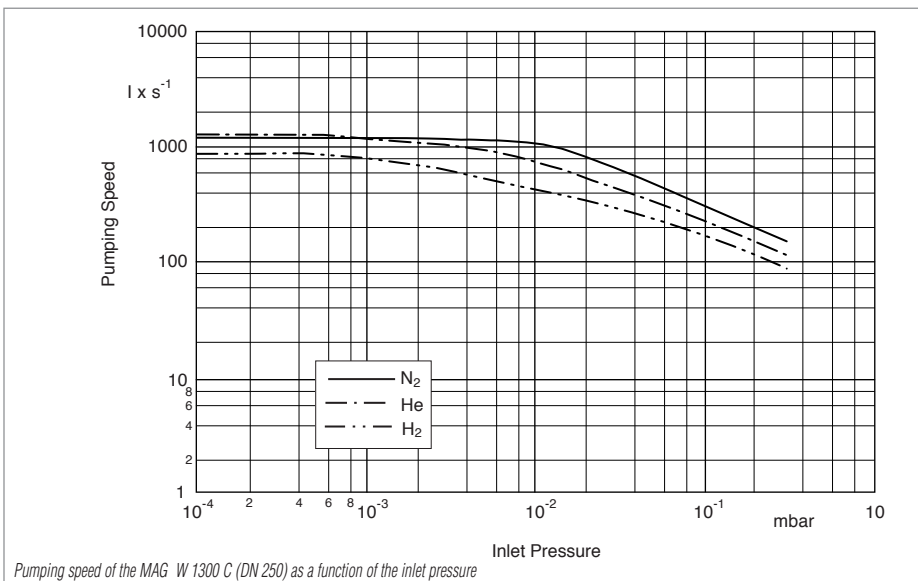
Technical Features

- ◆ Active 5-axis magnetic bearing system
- ◆ Digital monitoring of the bearing system
- ◆ Low noise and vibration levelssystem
- ◆ Operation in any orientationlevelssystem
- ◆ Advanced rotor design for high throughput
- ◆ Purge gas system
- ◆ Intelligent power control system



Advantages to the User

- ◆ Maintenance-free
- ◆ High throughput for all process gases
- ◆ High pumping speed at low pressure
- ◆ High foreline pressure tolerance: up to 2 mbar (1.5 Torr)
- ◆ Lowest weight and size in its class
- ◆ Application specific design



Technical Data		MAG		
		W 830 C	W 1300 C	W 1300 C
Inlet flange	DN	160 ISO-F	200 ISO-F	250 ISO-F
Pumping speed				
N ₂	l x s ⁻¹	700	1100	1220
He	l x s ⁻¹	650	1050	1180
H ₂	l x s ⁻¹	300	920	1020
Speed	min ⁻¹	24 000	36 000	
Compression				
N ₂		> 5 x 10 ⁷	> 10 ⁸	
Ultimate pressure	mbar (Torr)	< 10 ⁻⁸ (< 0.75 x 10 ⁻⁸)		
Max. fore-line pressure for N ₂	mbar (Torr)	2 (1.5)		
Recommended fore-vacuum pump Rotary vane pump or dry compressing pump offering a pumping speed of 100 m ³ /h		TRIVAC D 65 BCS		
Run-up time	min	< 4	< 6	
Fore vacuum flange	DN	40 KF		
Purge / vent port	DN	10/16 KF		
Cooling water connection (tube AD)	mm (in.)	1/4"	6 (0.24)	
Weight, approx.	kg (lbs)	32 (70.6)		

Ordering information		MAG		
		W 830 C	W 1300 C	W 1300 C
MAG turbomolecular pump		Part No. 400100V0005	Part No. 400110V0011	Part No. 400110V0021
MAG.DRIVE ^{digital} converter		Part No. 400035V0001		
Plug-in control		Part No. 121 36		
Purge gas valve		Part No. 121 33		
Connecting cable converter-pump				
1.5 m (5.25 ft) DRIVE/BEARING		Part No. 400036V0001		
3 m (10.5 ft) DRIVE/BEARING		Part No. 400036V0006		
5 m (17.5 ft) DRIVE/BEARING		Part No. 400036V0004		
10 m (35 ft) DRIVE/BEARING		Part No. 400036V0002		
20 m (70 ft) DRIVE/BEARING		Part No. 400036V0003		
Connecting cable for purge gas valve				
1.5 m (5.25 ft) pump/converter		Part No. 400038V0001		
3 m (10.5 ft) pump/converter		Part No. 400038V0006		
10 m (35 ft) pump/converter		Part No. 400038V0002		
Sealing kit				
DN 200 standard		upon request		
DN 250 standard		upon request		
DN 250 metal		Part No. 200 07 901		

MAG W 1500 C/CT

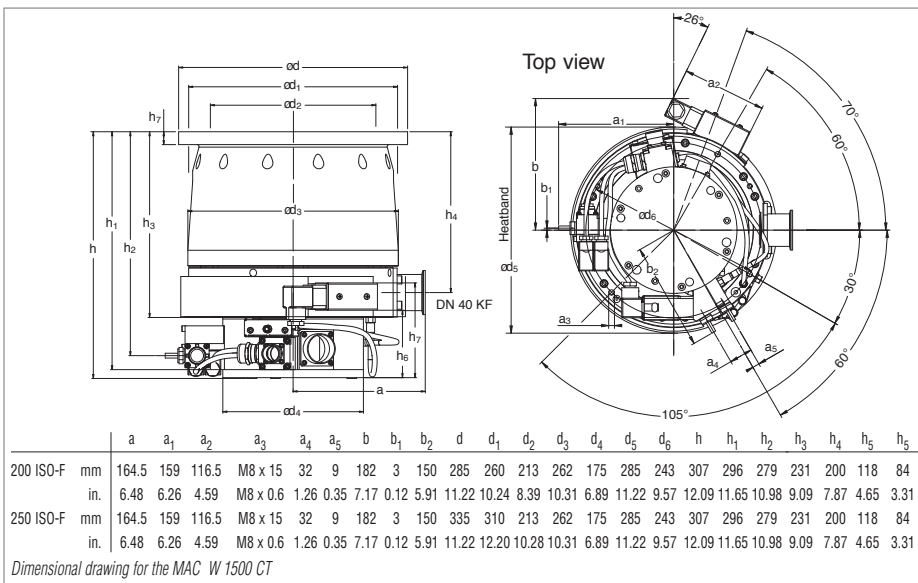


Typical Applications

- ◆ All major semiconductor processes such as Etch, CVD, PVD and Ion Implantation

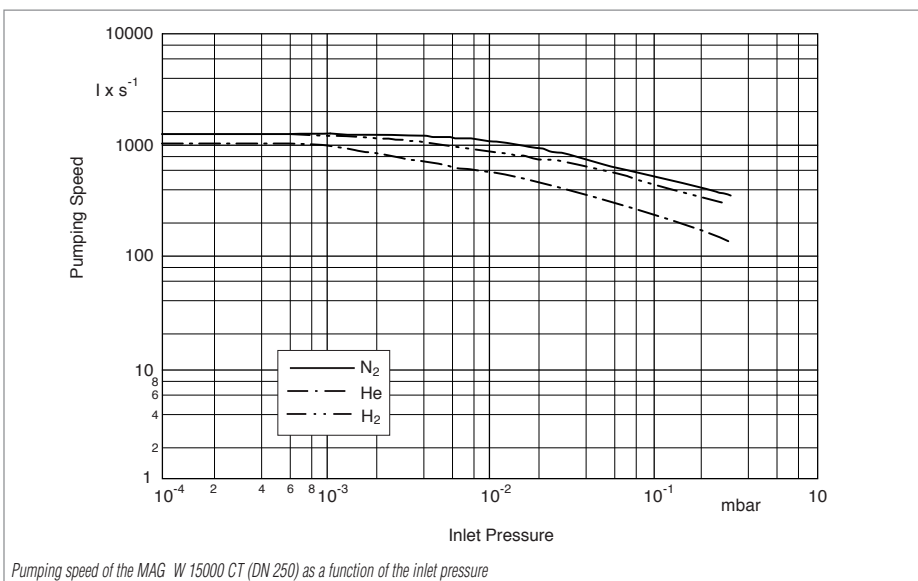
Technical Features

- ◆ Active 5-axis magnetic bearing system
- ◆ Bearing and temperature system are controlled digitally
- ◆ Corrosion resistant
- ◆ Low noise and vibration levels
- ◆ Operation in any orientation
- ◆ Compound rotor design for high pumping speed and foreline pressure
- ◆ Integrated purge gas system
- ◆ CT versions: Integrated temperature management system
- ◆ Intelligent power control system



Advantages to the User

- ◆ Maintenance-free
- ◆ High throughput for all process gases
- ◆ High pumping speed at low pressure
- ◆ High foreline pressure tolerance: up to 2.6 mbar (1.95 Torr)
- ◆ High resistance against corrosive gases
- ◆ Robust against particles and deposits
- ◆ Temperature control up to 90 °C (194 °F) to avoid condensation
- ◆ Lowest weight and size in its class
- ◆ Application specific design



Technical Data		MAG				
		W 1500 C		W 1500 CT		
Inlet flange	DN	200 ISO-F	250 ISO-F	200 ISO-F	250 ISO-F	200 CF
Pumping speed						
N ₂	l x s ⁻¹	1100	1220	1100	1220	1100
He	l x s ⁻¹	1150	1220	1150	1220	1150
H ₂	l x s ⁻¹	920	1020	920	1020	920
Speed	rpm	36 000				
Compression ratio		> 10 ⁸				
N ₂						
Ultimate pressure	mbar (Torr)	< 10 ⁻⁸ (< 0.7 x 10 ⁻⁸)		< 10 ⁻⁸ (< 0.7 x 10 ⁻⁸)	< 10 ⁻⁸ (< 0.7 x 10 ⁻⁸)	< 10 ⁻⁹ (< 0.7 x 10 ⁻⁹)
Max. foreline pressure for N ₂	mbar (Torr)	2.6 (1.95)				
Recommended fore-vacuum pump Rotary vane pump or dry compressing pump offering a pumping speed of 100 m ³ /h		TRIVAC D 65 BCS				
Run-up time	min	< 6				
Fore-vacuum flange	DN	40 KF				
Purge / vent port	VCR Nut	1/4"				
Cooling water connections, hose nipple	mm (in.)	6.4 (0.25)				
Weight, approx.	kg (lbs)	32 (70.64)				

Ordering Information	MAG				
	W 1500 C		W 1500 CT		
MAG turbomolecular pump	Part No. 400026V0001	Part No. 400027V0001	Part No. 400026V0002	Part No. 400027V0002	Part No. 400030V0002
MAG.DRIVE ^{digital} converter	400035V0001				
Plug-in control	Part No. 121 36				
Connecting cables converter-pump					
1.5 m (5.25 ft) DRIVE/BEARING	Part No. 400036V0001				
1.5 m (5.25 ft) TMS	Part No. 400037V0001				
5 m (17.5 ft) DRIVE/BEARING	Part No. 400036V0004				
5 m (17.5 ft) TMS	Part No. 400037V0004				
10 m (35 ft) DRIVE/BEARING	Part No. 400036V0002				
10 m (35 ft) TMS	Part No. 400037V0002				
20 m (70 ft) DRIVE/BEARING	Part No. 400036V0003				
20 m (70 ft) TMS	Part No. 400037V0003				
Seal kit					
DN 200 standard	upon request				
DN 250 standard	upon request				
DN 250 metal	Part No. 200 07 901				

MAG W 2000 C/CT

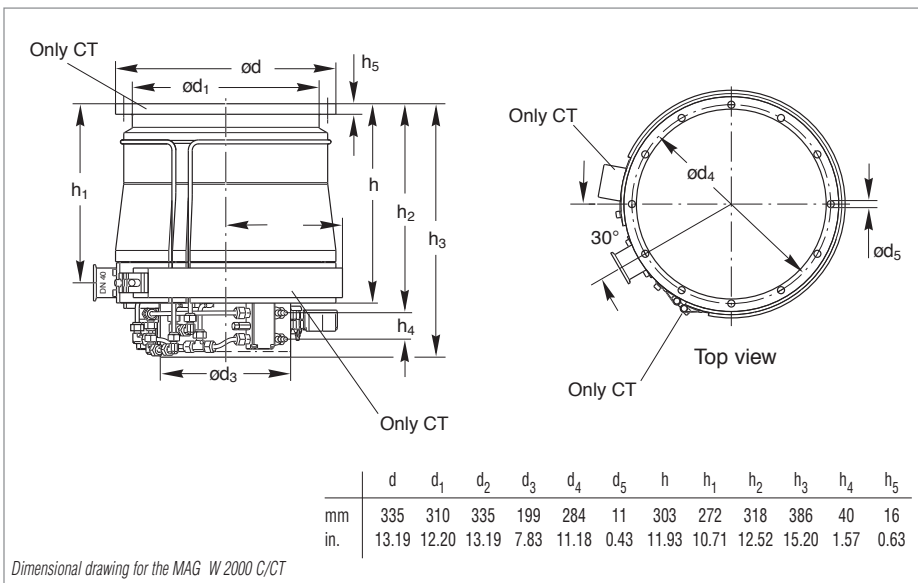


Typical Applications

- ◆ All major semiconductor processes such as Etch, CVD, PVD and Ion Implantation

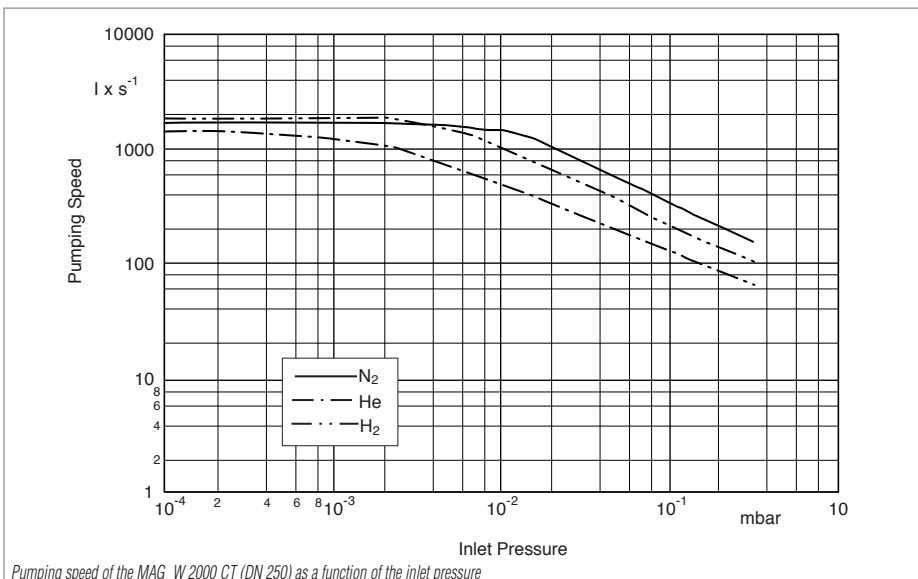
Technical Features

- ◆ Active 5-axis magnetic bearing system
- ◆ Patented KEPLA-COAT® for rotor and stator to prevent corrosion
- ◆ Low noise and vibration levels
- ◆ Operation in any orientation
- ◆ Compound rotor design for high pumping speed and foreline pressure
- ◆ Integrated purge gas system
- ◆ CT versions: Integrated temperature management system



Advantages to the User

- ◆ Maintenance-free
- ◆ High throughput for all etch gases
- ◆ High pumping speed at low pressure
- ◆ High foreline pressure tolerance: up to 5.3 mbar (4 Torr)
- ◆ High resistance against corrosive gases
- ◆ Robust against particles and deposits
- ◆ Temperature management system to avoid condensation
- ◆ Application specific design



Technical Data		MAG	
		W 2000 C	W 2000 CT
Inlet flange	DN	250 ISO-F	250 ISO-F
Pumping speed			
N ₂	l x s ⁻¹	1650	
He	l x s ⁻¹	1800	
H ₂	l x s ⁻¹	1720	
Speed	rpm	28,800	
Compression ratio			
N ₂		> 10 ⁸	
Ultimate pressure	mbar (Torr)	< 10 ⁻⁸ (< 0.75 x 10 ⁻⁸)	
Max. foreline pressure for N ₂	mbar (Torr)	3.5 (2.625)	
Recommended fore-vacuum pump Rotary vane pump or dry compressing pump offering a pumping speed of 100 m ³ /h		TRIVAC D 65 BCS	
Run-up time	min	< 8	
Fore-vacuum flange	DN	40 KF	
Purge / vent port	VCR nut	1/4"	
Cooling water connections, hose nipple	mm (in.)	6.4 (0.25)	
Weight, approx.	kg (lbs)	62 (137)	
Ordering Information		MAG	
		W 2000 C	W 2000 CT
MAG turbomolecular pump		Part No. 894 17	Part No. 894 31
MAG.DRIVE 2000 converter		Part No. 121 35	
Plug-in control		Part No. 121 36	
Connecting cables converter-pump			
1.5 m (5.25 ft) BEARING		Part No. 121 29	
1.5 m (5.25 ft) DRIVE/TMS		Part No. 121 30	
3 m (10.5 ft) BEARING		Part No. 121 17	
3 m (10.5 ft) DRIVE/TMS		Part No. 121 18	
5 m (17.5 ft) BEARING		Part No. 121 19	
5 m (17.5 ft) DRIVE/TMS		Part No. 121 20	
10 m (35 ft) BEARING		Part No. 121 21	
10 m (35 ft) DRIVE/TMS		Part No. 121 22	
20 m (70 ft) BEARING		Part No. 121 25	
20 m (70 ft) DRIVE/TMS		Part No. 121 26	
Seal kit			
DN 200		Part No. 200 91 684	
DN 250		Part No. 200 91 641	

MAG W 2200 C



Typical Applications

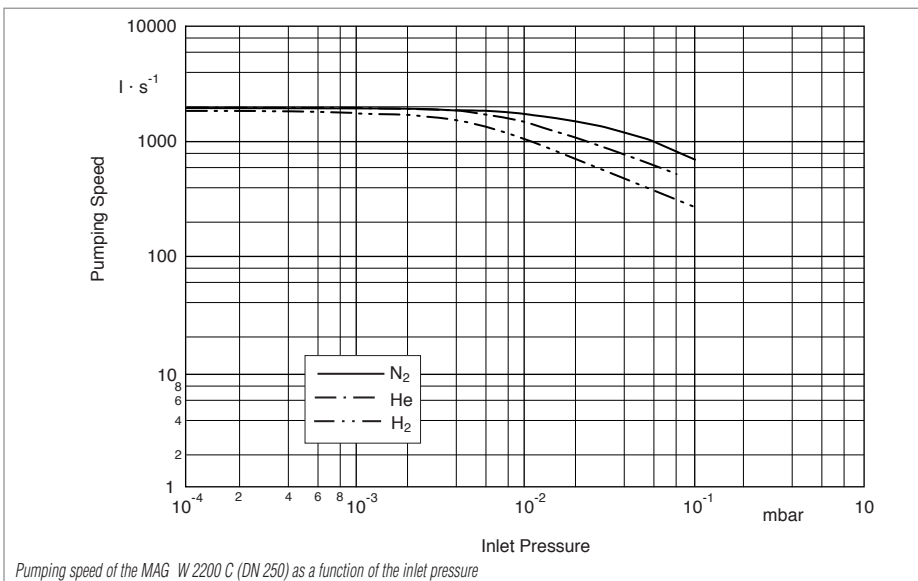
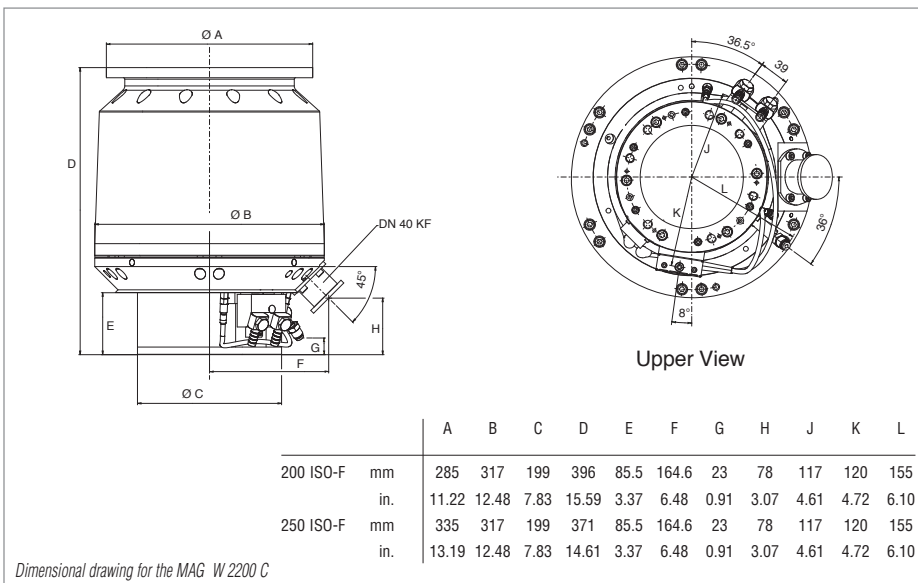
- ◆ All major semiconductor processes such as Etch, CVD, PVD and Ion Implantation
- ◆ Coaters

Technical Features

- ◆ Active 5-axis magnetic bearing system
- ◆ Bearing and temperature system are controlled digitally
- ◆ Corrosion resistant
- ◆ Low noise and vibration levels
- ◆ Operation in any orientation
- ◆ Compound rotor design for high pumping speed and foreline pressure
- ◆ Integrated purge gas system
- ◆ CT versions: Integrated temperature management system
- ◆ Intelligent power control system

Advantages to the User

- ◆ Maintenance-free
- ◆ High throughput for all process gases
- ◆ High pumping speed at low pressure
- ◆ High foreline pressure tolerance: up to 2 mbar (1.5 Torr)
- ◆ High resistance against corrosive gases
- ◆ Robust against particles and deposits
- ◆ Temperature control up to 90 °C (194 °F) to avoid condensation
- ◆ Lowest weight and size in its class
- ◆ Application specific design



Technical Data		MAG W 2200 C	
Inlet flange	DN	200 ISO-F	250 ISO-F
Pumping speed			
N ₂	l x s ⁻¹	1600	2000
Ar	l x s ⁻¹	1450	1900
H ₂	l x s ⁻¹	1650	1800
Speed	min ⁻¹	29400	
Compression			
N ₂		> 10 ⁸	
Ultimate pressure	mbar	< 10 ⁻⁸	
Max. fore-line pressure for N ₂	mbar (Torr)	2 (1.5)	
Recommended fore-vacuum pump Rotary vane pump or dry compressing pump offering a pumping speed of 100 m ³ /h		TRIVAC D 65 BCS	
Run-up time to 95% speed	min	< 8	
Fore vacuum flange	DN	40 KF	
Purge / vent port	VCR	1/4"	
Cooling water connection (tube AD)	mm (in.)	1/2"	
Weight, approx.	kg (lbs)	48 (106)	

Ordering information		MAG W 2200 C	
MAG turbomolecular pump		Part No. 400081V0011	Part No. 400081V0021
MAG.DRIVE ^{digital} converter		Part No. 400035V0001	
Plug-in control		Part No. 121 36	
Connecting cable converter-pump			
1.5 m (5.25 ft) DRIVE/BEARING		Part No. 400036V0001	
1.5 m (5.25 ft) TMS		Part No. 400037V0001	
3 m (10.5 ft) DRIVE/BEARING		Part No. 400036V0008	
3 m (10.5 ft) TMS		Part No. 400037V0008	
5 m (17.5 ft) DRIVE/BEARING		Part No. 400036V0004	
5 m (17.5 ft) TMS		Part No. 400037V0004	
10 m (35 ft) DRIVE/BEARING		Part No. 400036V0002	
10 m (35 ft) TMS		Part No. 400037V0002	
20 m (70 ft) DRIVE/BEARING		Part No. 400036V0003	
20 m (70 ft) TMS		Part No. 400037V0003	
Sealing kit			
DN 200 standard		upon request	
DN 250 standard		upon request	
DN 250 metal		Part No. 200 07 901	

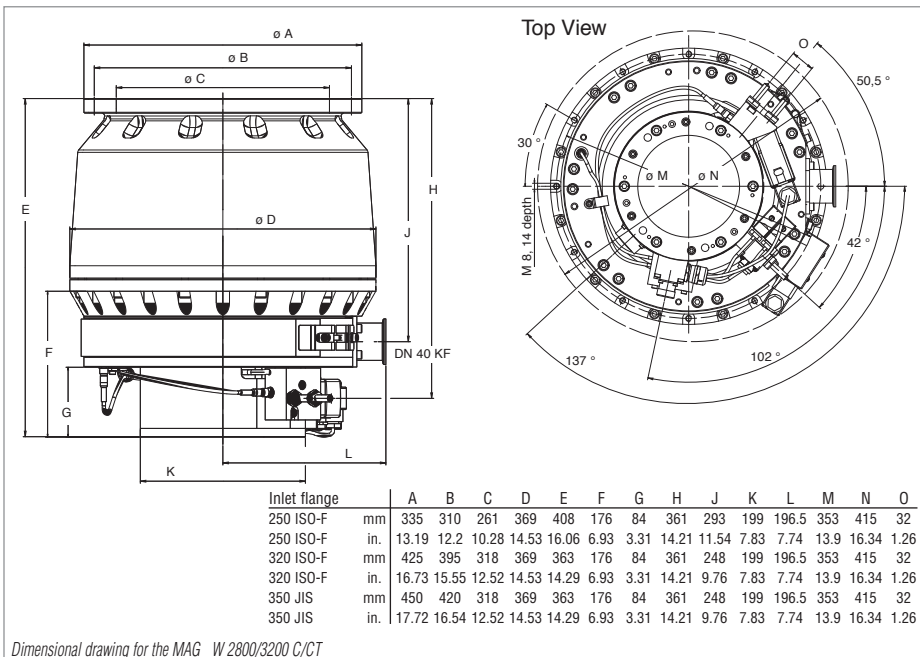
MAG W 2800/3200 C/CT



MAG W 2800 CT (left) and MAG W 3200 CT (right)

Typical Applications

- ◆ All major semiconductor processes such as Etch, CVD, PVD and Ion Implantation



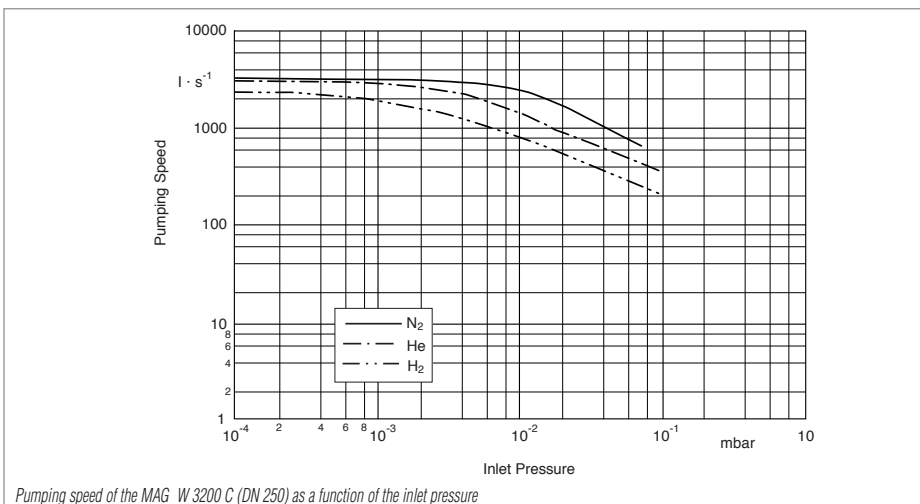
Dimensional drawing for the MAG W 2800/3200 C/CT

Technical Features

- ◆ Active 5-axis magnetic bearing system
- ◆ Bearing and temperature system are controlled digitally
- ◆ Corrosion resistant
- ◆ Low noise and vibration levelssystem
- ◆ Operation in any orientationlevelssystem
- ◆ Compound rotor design for high pumping speed and foreline pressure
- ◆ Integrated purge gas system
- ◆ CT versions: Integrated temperature management system
- ◆ Intelligent power control systemt

Advantages to the User

- ◆ Maintenance-free
- ◆ High throughput for all process gases
- ◆ High pumping speed at low pressure
- ◆ High foreline pressure tolerance: up to 2 mbar (1.5 Torr)
- ◆ High resistance against corrosive gases
- ◆ Robust against particles and deposits
- ◆ Temperature control up to 90 °C (194 °F) to avoid condensation
- ◆ Lowest weight and size in its class
- ◆ Application specific design



Technical Data		MAG			
		W 2800 C	W 2800 CT	W 3200 CT	
Inlet flange	DN	250 ISO-F	250 ISO-F	320 ISO-F	350 JIS
Pumping speed					
N ₂	l x s ⁻¹	2650		3200	
Ar	l x s ⁻¹	2450		3000	
H ₂	l x s ⁻¹	2100		2250	
Speed	min ⁻¹	28800			
Compression ratio					
N ₂		> 10 ⁸			
Ultimate pressure	mbar (Torr)	< 10 ⁻⁸ (< 0.75 x 10 ⁻⁸)			
Max. fore-line pressure for N ₂	mbar (Torr)	2 (1.5)			
Recommended fore-vacuum pump Rotary vane pump or dry compressing pump offering a pumping speed of 100 m ³ /h		TRIVAC D 65 BCS			
Run-up time	min	< 10			
Fore vacuum flange	DN	40 KF			
Purge / vent port	VCR	1/4"			
Cooling water connection	Swagelok tube	1/4"			
Weight, approx.	kg (lbs)	64 (141.3)		65 (143.5)	66 (145.7)
Ordering information		MAG			
		W 2800 C	W 2800 CT	W 3200 CT	
MAG turbomolecular pump		Part No. 400000V0001	Part No. 400000V0002	Part No. 400003V0002	Part No. 400004V0002
MAG.DRIVE ^{digital} converter		Part No. 400035V0001			
Plug-in control		Part No. 121 36			
Connecting cable converter-pump					
1,5 m (5.25 ft) DRIVE/BEARING		Part No. 400036V0001			
1,5 m (5.25 ft) TMS		Part No. 400037V0001			
3 m (10.5 ft) DRIVE/BEARING		Part No. 400036V0008			
3 m (10.5 ft) TMS		Part No. 400037V0008			
5 m (17.5 ft) DRIVE/BEARING		Part No. 400036V0004			
5 m (17.5 ft) TMS		Part No. 400037V0004			
10 m DRIVE/BEARING		Part No. 400036V0002			
10 m TMS		Part No. 400037V0002			
20 m (70 ft) DRIVE/BEARING		Part No. 400036V0003			
20 m (70 ft) TMS		Part No. 400037V0003			
Sealing kit					
DN 200 standard		upon request			
DN 250 standard		upon request			
DN 250 metal		Part No. 200 07 901			

TURBOTRONIK NT 340 M



Technical Features

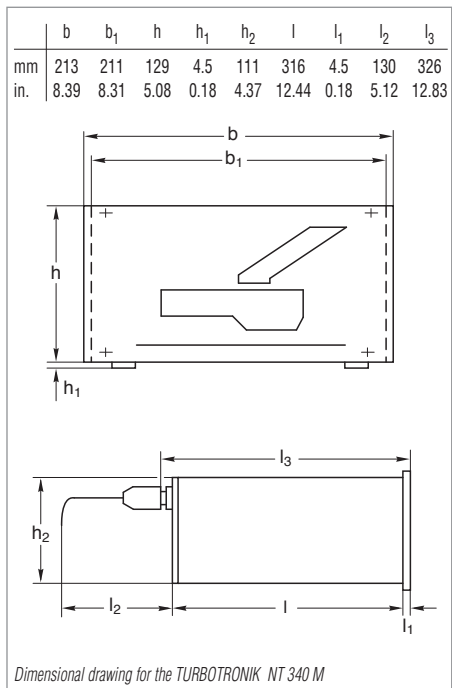
- ◆ For operating the TURBOVAC 340 M turbomolecular pump
- ◆ Compact control unit 1/2 19", 3 HU
- ◆ No batteries are required because of integrated generator mode in case of power failures
- ◆ Front panel with membrane keypad and LCD

Advantages to the User

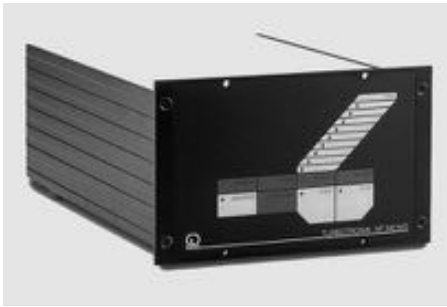
- ◆ Convenient control and monitoring facilities
- ◆ Remote control and process control via analog and programmable control inputs and outputs
- ◆ Connection for backing pump, venting valve and flange heater
- ◆ V.24/RS 232 C interface

Technical Data		NT 340 M
Mains connection, 50 to 60 Hz; selectable	V	100/120/220/240, +10%/-15 %
Max. output voltage	V	860/733
Overload current limit	A	7
Permissible ambient temperature	°C (°F)	0 to +45 (32 to +113)
Dimensions (W x H x D)	mm (in.)	213 x 129 x 340 (8.39 x 5.08 x 13.39)
Weight, approx.	kg (lbs)	7 (15.4)

Ordering Information		NT 340 M
100 V (Main cord with US plug)		Part No. 857 31
120 V (Main cord with US plug)		Part No. 857 30
230 V (Main cord with EURO plug)		Part No. 857 29
Connecting line leading to the connection of the TURBOVAC		
3 m (10.5 ft)		Part No. 857 70
5 m (17.5 ft)		Part No. 857 71



TURBOTRONIK NT 340 MA



Technical Features

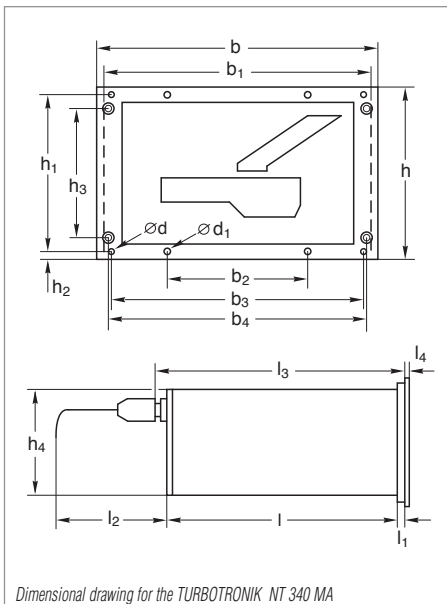
- ◆ For operating the TURBOVAC 400 C/CT turbomolecular pump
- ◆ Compact control unit 1/2 19", 3 HU
- ◆ No batteries are required because of integrated generator mode in case of power failures
- ◆ Front panel with membrane keypad and LCD

Advantages to the User

- ◆ Convenient control and monitoring facilities
- ◆ Remote control and process control via analog and programmable control inputs and outputs
- ◆ Connection for backing pump, venting valve and flange heater
- ◆ V.24/RS 232 C interface
- ◆ Temperature control for Aluminum etching processes

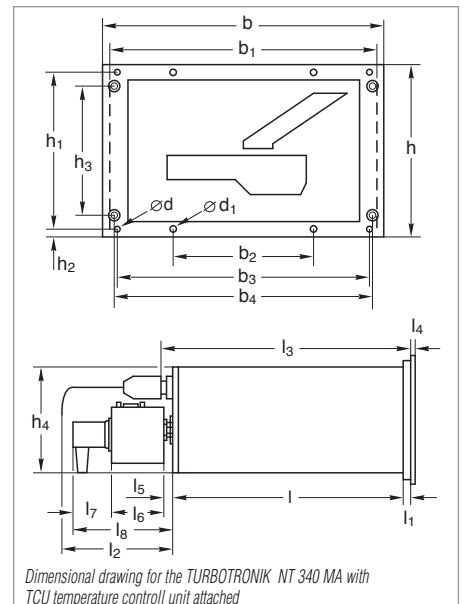
Technical Data		NT 340 MA
Main connection, 50-60 Hz	V	120, +10%/-15 %
Power consumption TURBOVAC including connected consumers	VA	< 400
	VA	< 1 000
Max. output voltage		
Motor / current limiting	V / A	50 / 7
Magnetic suspension / current limiting	V / A	± 16 / ± 7
Nominal frequency	Hz	860/733
Overload current limit	A	7
Permissible ambient temperature	°C (°F)	0 to +45 (32 to +113)
Dimensions (W x H x D)	mm (in.)	213 x 129 x 340 (8.39 x 5.08 x 13.39)
Weight, approx.	kg (lbs)	7 (15.4)

Ordering Information		NT 340 MA
120 V (Main cord with US plug)		Part No. 857 32
Connecting line leading to the motor of the TURBOVAC	3 m (10.5 ft)	Part No. 859 10
	bearing of the TURBOVAC	Part No. 859 11
Connection lines	to the heater (HEATER)	Part No. 859 31
	to the cooling water magnet valve (COOLER)	Part No. 859 32
	to the valve	Part No. 859 33
	to the temperature controll unit (I/O)	Part No. 859 34
	to the Pt 100	Part No. 859 39
Accessories for temperature control	Temperature control unit (TCU)	Part No. 859 20
	Temperature sensor Pt 100	Part No. 859 22



Dimensional drawing for the TURBOTRONIK NT 340 MA

	b	b ₁	b ₂	b ₃	b ₄	h	h ₁	h ₂	h ₃	
mm	219	211	109.5	198	202	132.5	122.5	5	99	
in.	8.62	8.31	4.31	7.80	7.95	5.22	4.82	0.20	3.90	
	h ₄	l	l ₁	l ₂	l ₃	l ₄	l ₅	l ₆	l ₇	l ₈
mm	111	316	4.5	130	326	3	12	55	38	105
in.	4.37	12.44	0.18	5.12	12.83	0.12	0.47	0.17	1.50	4.13



Dimensional drawing for the TURBOTRONIK NT 340 MA with TCU temperature control unit attached

MAG.DRIVE^{digital}



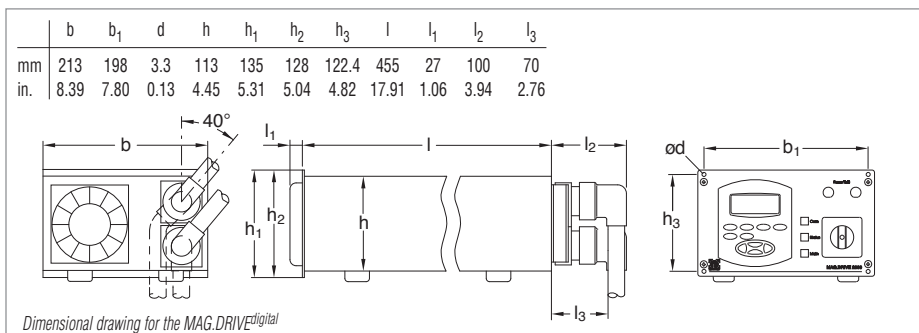
MAG.DRIVE^{digital} without plug-in control



MAG.DRIVE^{digital} with plug-in control

Advantages to the User

- ◆ Operation of turbomolecular pumps with magnetically levitated rotors:
MAG W 830/1300 C, MAG W 1500 C/CT,
MAG W 2200 C und MAG W 2800/3200 C/CT
- ◆ Easy operation through the controls or the use of plug-in control unit
- ◆ Communication to host computer of the customer via serial interface and conventional interface possible
- ◆ Setting of speed, temperature of the basic flange and other functions
- ◆ Warning in case the pump is running out of specification
- ◆ Storing of all parameters in the pump's memory
- ◆ Plug-in control
- ◆ Small size and low weight
- ◆ Integrated fan
- ◆ Integrated temperature management system
magnetic bearing control system



Technical Data		MAG.DRIVE ^{digital}	
Main connection, 50/60 Hz	V	200 - 240, +10%/-15%	
Current for connected consumers, max.	A	20	
Max. motor voltage	V	60	
Nominal frequency	Hz	50/60	
Permissible ambient temperature	°C (°F)	0 to +45 (32 to +113)	
Dimensions (W x H x D)	mm (in.)	483 x 213 x 1/2 19" (19.02 x 8.39 x 1/2 19")	
Weight, approx.	kg (lbs)	10 (22)	
Ordering Information		MAG.DRIVE ^{digital}	
MAG.DRIVE ^{digital}		Part No. 400035V0001	
Plug-in control		Part No. 121 36	
Connection line leading to the DRIVE/Bearing of the MAG			
	<p>Converter cable outlet DRIVE/BEARING X20</p> <p>1.5 m (5.25 ft) bended 225° 1.5 m (5.25 ft) straight 3.0 m (10.5 ft) straight 3.0 m (10.5 ft) bended 225° 3.0 m (10.5 ft) straight 5.0 m (17.5 ft) bended 225° 5.0 m (17.5 ft) straight 8.0 m (28 ft) bended 225° 10.0 m (35 ft) bended 225° 20.0 m (70 ft) bended 225° 23.0 m (80.5 ft) bended 225° 30.0 m (105 ft) bended 225°</p> <p>MAG (only for CT versions)</p> <p>Converter cable outlet TMS X21</p> <p>1.5 m (5.25 ft) bended 225° 1.5 m (5.25 ft) straight 3.0 m (10.5 ft) bended 225° 5.0 m (17.5 ft) bended 225° 8.0 m (28 ft) bended 225° 10.0 m (35 ft) bended 225° 20.0 m (70 ft) bended 225°</p> <p>Purge / Vent (only for optional purge vent valve Part No. 121 33)</p> <p>Converter cable outlet TMS X21</p> <p>3.0 m (10.5 ft) bended 225° 10.0 m (35 ft) bended 225°</p>	<p>Pump cable outlet DRIVE/BEARING X23</p> <p>PK X24</p> <p>straight straight bended 180° straight bended 270° straight straight straight straight straight straight straight straight</p> <p>Heater X31</p> <p>bended 180° bended 180° bended 180° bended 180° bended 180° bended 180° bended 180°</p> <p>Pump cable outlet</p> <p>Vent</p> <p>bended bended</p>	<p>Part No. 400036V0001 Part No. 400036V0007 Part No. 400036V0006 Part No. 400036V0008 Part No. 400036V0009 Part No. 400036V0004 Part No. 400036V0010 Part No. 400036V0005 Part No. 400036V0002 Part No. 400036V0003 Part No. 400036V0012 Part No. 400036V0012</p> <p>Part No. 400037V0001 Part No. 400037V0007 Part No. 400037V0008 Part No. 400037V0004 Part No. 400037V0005 Part No. 400037V0002 Part No. 400037V0003</p> <p>Part No. 400038V0006 Part No. 400038V0002</p>
Connector for hardware interface		upon request	
19" installation frame		Part No. 161 00	



MAG.DRIVE 2000



MAG.DRIVE 2000 without plug-in control



MAG.DRIVE 2000 with plug-in control

Advantages to the User

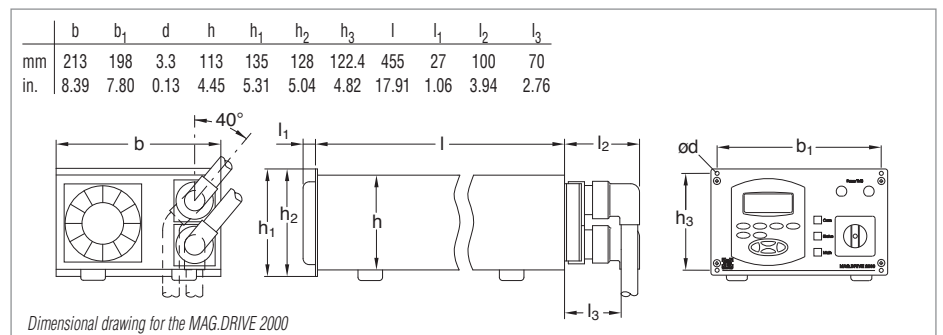
- ◆ Designed to operate the MAG 2000 C/CT and MAG W 2000 C/CT turbomolecular pumps
- ◆ Easy operation through the controls or the use of plug-in control unit
- ◆ Communication to host computer of the customer via serial interface and conventional interface possible, bus adapter optional
- ◆ Setting of speed, temperature of the basic flange and other functions
- ◆ Warning in case the pump is running out of specification
- ◆ Storing of all parameters in the pump's memory
- ◆ Plug-in control
- ◆ Small size and low weight
- ◆ Integrated fan
- ◆ Integrated temperature management system

Technical Data

Technical Data		MAG.DRIVE 2000
Main connection, 50/60 Hz	V	200 - 240, +10%/-15%
Current for connected consumers, max.	A	20
Max. output voltage	V	60
Nominal frequency	Hz	50/60
Permissible ambient temperature	°C (°F)	0 to +45 (32 to +113)
Dimensions (W x H x D)	mm (in.)	483 x 213 x 1/2 19" (19.02 x 8.39 x 1/2 19")
Weight, approx.	kg (lbs)	10 (22)

Ordering Information

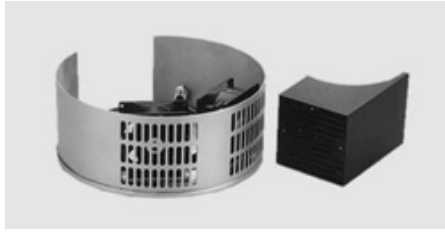
Ordering Information		MAG.DRIVE 2000
MAG.DRIVE 2000		Part No. 121 35
Plug-in control		Part No. 121 36
Connection line leading to the bearing of the TURBOVAC		
1.5 m (5.25 ft)		Part No. 121 29
10 m (35 ft)		Part No. 121 21
20 m (70 ft)		Part No. 121 25
motor of the TURBOVAC		
1.5 m (5.25 ft)		Part No. 121 30
10 m (35 ft)		Part No. 121 22
20 m (70 ft)		Part No. 121 26
Connector for hardware interface		upon request
19" installation frame		Part No. 161 00





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.



Air Cooling Unit

Also an air cooling unit is available as a retrofit kit for convection cooling of the TURBOVAC 50 pump with air. This kit can be easily fitted to the pump in each case using the mounting components contained in the kit.



Flange Heaters 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 and Ordering Information

Vibration absorber	Part No.
DN 63 ISO-K	854 25
DN 63 CF	500 070
DN 100 ISO-K	800131V0100
DN 100 CF	500 071
DN 160 ISO-K	500 073
DN 160 CF	500 072

Rated power consumption of the air cooling unit when connected to		
TURBOVAC 50, 151/361	10.5 W	
TURBOVAC 1100 C	21.0 W	
Part No.		
Air cooling unit for	230 V	110 V
TURBOVAC 50	854 05	854 06
TURBOVAC 151/361	855 31	894 08

Rated power consumption of the flange heater		
DN 40 CF	17 W	
DN 63 CF, DN 100 CF	100 W	
DN 160 CF	150 W	
Part No.		
Flange heater	230 V	110 V
DN 40 CF	853 97	–
DN 63 CF	854 04	854 07
DN 100 CF	854 27	–
DN 160 CF	854 37	854 38

Fine Filter

A fine filter integrated in the centering ring protects the pump against particles and dust on the high-vacuum side.

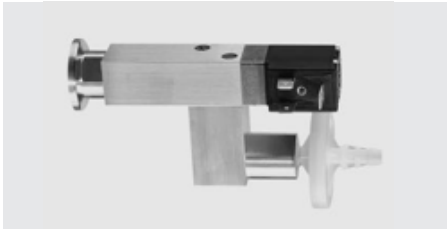
Technical Data and Ordering Information

Connection	DN	40 KF	63 ISO-K	100 ISO-K	160 ISO-K
Fine filter	Part No.	883 98	887 20	887 21	887 22

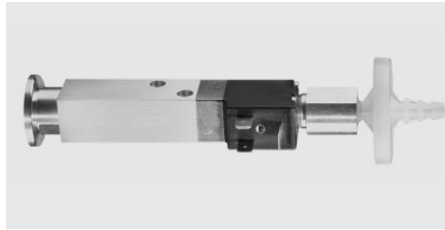
The following accessories are also available:

Vacuum gauge COMBIVAC 2T
Part No. 230 000
(see Product Section C16)

Delayed venting unit
Part No. 500 441
(see Product Section C10)



Solenoid Venting Valve



Power Failure Venting Valve

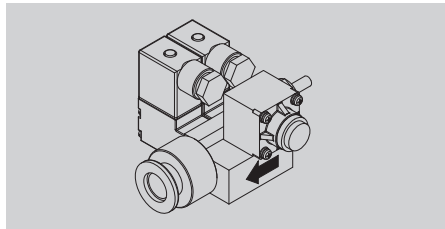
Technical Data and Ordering Information

Solenoid venting valve, normally closed	
Drive voltage	24 V DC
Power consumption	4 W
Weight, approx.	0.3 kg (0.66 lbs)
	Part No.
Solenoid venting valve	800120V0011

Power failure venting valve, normally open	
Drive voltage	24 V DC
Power consumption	4 W
Weight, approx.	0.3 kg (0.66 lbs)
	Part No.
Solenoid venting valve	800120V0021



Purge Gas and Venting Valve



Purge Gas and Venting Valve

Further valves are described in Product Section C14.

Technical Data and Ordering Information

Connecting flange	DN 10 KF	
Weight, approx.	0.7 kg (1.55 lbs)	
Purge gas and venting valve	230 V	110 V
	0.2 mbar x l x s ⁻¹ (12 sccm)	Part No. 855 19
		Part No. 855 18
0.4 mbar x l x s ⁻¹ (24 sccm)	Part No. 855 29	Part No. 855 28

Connecting flanges	
Inlet	1/4" pipe
Outlet	pump specific or DN 16 KF
Weight, approx.	0.5 kg (1.1 lbs)
Purge gas and venting valve	24 V DC
Purge gas pressure, abs.	1.5 to 6.0 bar
0.6 mbar x l x s ⁻¹ (36 sccm)	Part No. 121 33

Further 0.6 mbar x l x s⁻¹ valves upon request

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.

The following turbomolecular pumps or

electronic frequency converters are supported:

- TW 70 H / TURBO.DRIVE S
- TW 300, TW 300 H / TURBO.DRIVE S
- TW 701
- T 1600, TW 1600

Display Unit



Display unit for displaying parameters, for starting and stopping the turbomolecular pump and for changing the rotor's speed.

Ordering Information

Portable Display Unit

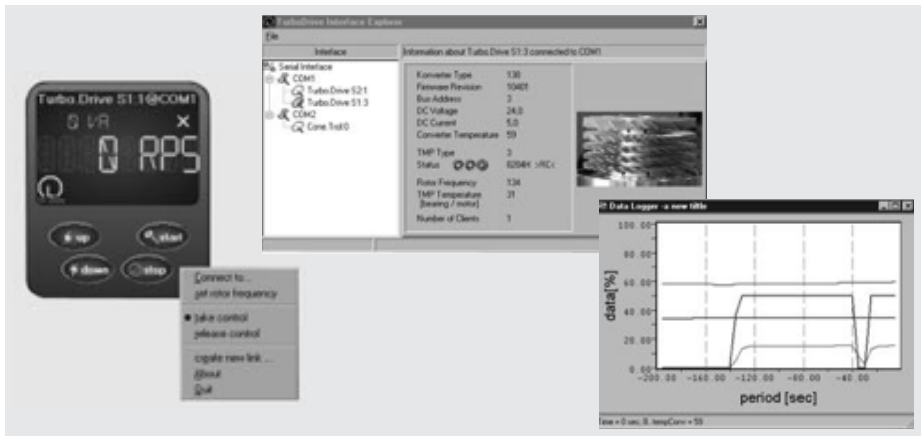
Software "Turbo.Drive Panel", 3.5 in. floppy

Display Unit

Upon request

Part No. 800110V0104

PC Software



PC software for Windows 95 or higher

Technical Features

- ◆ Convenient graphical user interface
- ◆ Several turbomolecular pumps can be operated in parallel
- ◆ Display, modify, save and compare the parameter lists of the turbomolecular pumps
- ◆ Integration of customer's software
- ◆ Recording parameter data over time (for example, temperatures, rotor frequency)

Ordering Information

PC software "Turbo.Drive Server", CD-ROM

PC Software

Part No. 800110V0102

Adaptor RS 232 C / RS 485 C for Frequency Converters with RS 485 C Interface

Ordering Information

Mains connection 220 V, 50 Hz, EURO plug

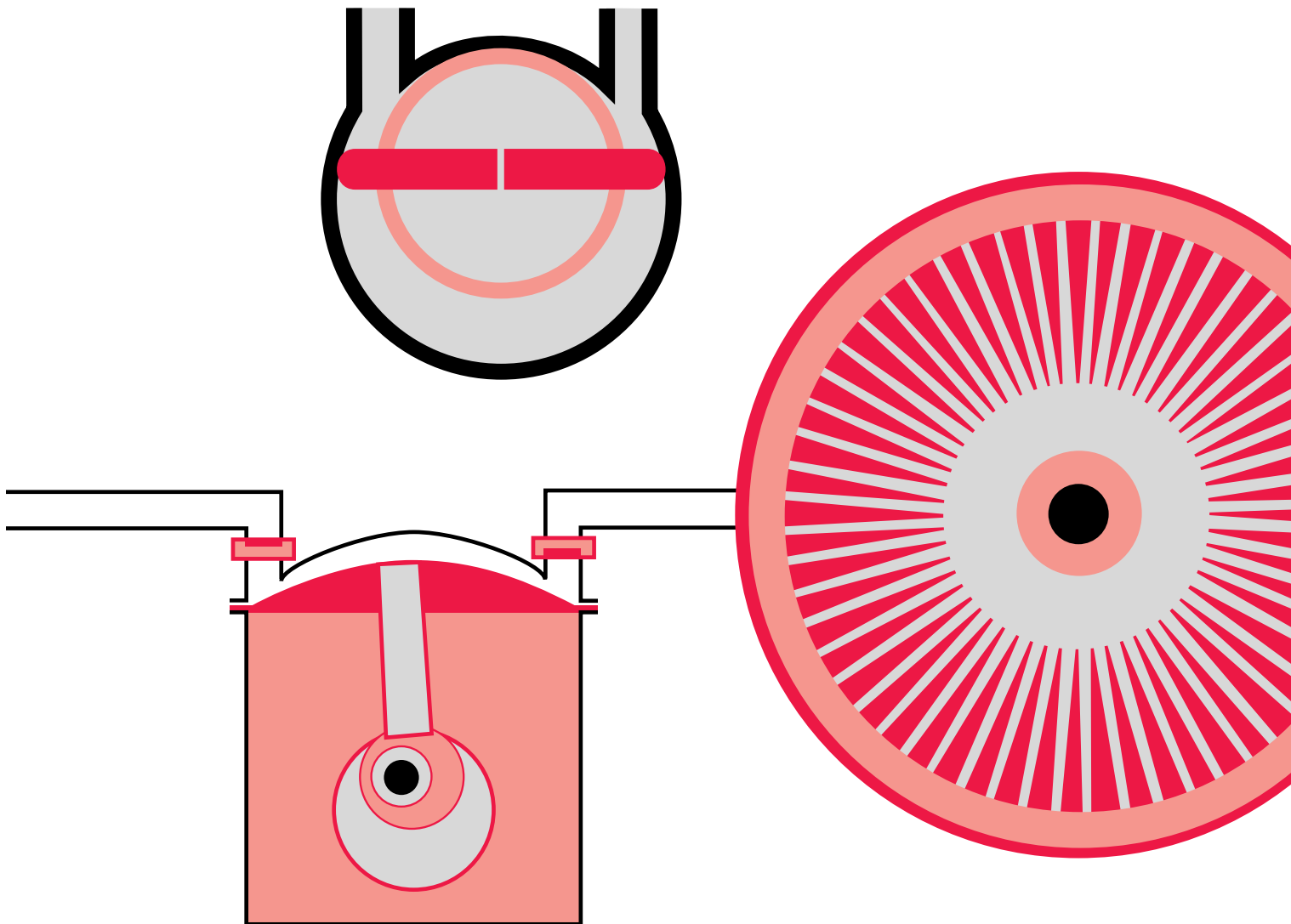
Adapter RS 232 C/RS 485 C

Part No. 800110V0101

C10

PT, CS

Turbomolecular Pump Systems
30 - 400 l x s⁻¹
Calibration Systems



General

General **C10.03**
 Applications and Accessories **C10.03**

Products

Turbomolecular Pump Systems (Global Versions)

PT 50 **C10.04**
 PT 151/PT 361 **C10.06**
 PT 50 KIT, **C10.08**
 PT 151 KIT, PT 361 KIT **C10.08**
 PT 300 Dry **C10.10**
 PT 301 Dry **C10.12**

Calibration Systems

CS3, CS5, CS7 **C10.14**

Adsorption Traps with Aluminium Oxide Insert **C10.16**

Delayed Venting Unit **C10.17**

Turbomolecular Pump Systems (Versions for the North and South American Continents)

TOSS 50. **C10.18**
 MINI-TOPS 50 **C10.20**
 TOPS 151/361 **C10.22**
 TURBOVAC TMV 40000. **C10.24**
 TOPiX. **C10.25**
 TiPS. **C10.26**
 BMH70 Dry **C10.28**

TSC TurboSystem Controller **C10.30**

TPC TurboPump Controller **C10.31**

Miscellaneous

60 Hz Curves **C10.32**

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 of accessories they may be easily adapted to meet specific requirements.

Application and Accessories

Pumps		PT 50	PT 151	PT 361	PT 50 KIT	PT 151 KIT	PT 361 KIT	PT 300 Dry	PT 301 Dry	TOSS 50	MINI-TOPS 50	TOPS 151/361	TURBOVAC TMV 40000	TOPIX	TIPS	BMH 70 Dry	
Applications																	
Microbalances		♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦
Sputtering		♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦
Spectroscopy		♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦
Production of TV and monitor picture tubes		♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦
Surface refining		♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦
Evaporation coating systems		♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦
Beam guidance systems		♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦
Laboratory pump systems		♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦
Accessories		Page															
Air cooling unit	-	♦	♦	♦	♦	♦	♦			♦	♦	♦	♦	♦			♦
Flange heater	-	♦	♦	♦	♦	♦	♦			♦	♦	♦	♦	♦			♦
Delayed venting unit	C10.17	♦	♦	♦	♦	♦				♦	♦	♦	♦	♦			♦
Venting valve	-	♦	♦	♦	♦	♦	♦			♦	♦	♦	♦	♦			♦
Power failure venting valve	-	♦	♦	♦	♦	♦	♦			♦	♦	♦	♦	♦			♦
Purge gas and venting valve	-		♦	♦		♦	♦										
Adsorption traps with aluminium oxide insert	C10.16	♦	♦	♦	♦	♦	♦			♦	♦	♦	♦	♦			♦
Exhaust filter	-	♦	♦	♦	♦	♦	♦			♦	♦	♦	♦	♦			♦
Water flow monitor	-		♦	♦		♦	♦					♦	♦	♦			
Water cooling unit	-	♦			♦					♦	♦						♦



PT 50 Turbomolecular Pump System



This turbomolecular pump system is a fully assembled and ready-to-operate ultra high vacuum system as a table top unit which requires a hydrocarbon-free high and ultra high vacuum.

Advantages to the User

- ◆ High effective pumping speed
- ◆ Low ultimate pressure ($< 10^{-8}$ mbar ($< 0.75 \times 10^{-8}$ Torr))
- ◆ High pumping speed of the backing pump
- ◆ Compact, small, rugged unit
- ◆ Simple to operate
- ◆ High level of reliability
- ◆ Maintenance-friendly design
- ◆ For use world-wide
- ◆ Installation of standard vacuum components in an open frame
- ◆ Components such as the backing pump, frequency converter, vacuum gauge and power failure venting valve are controlled via a rotary switch
- ◆ Service friendly assembly for maintenance without the need to disassemble backing or high vacuum pump
- ◆ The high vacuum pump can be removed from the pump system
- ◆ CE approval

The turbomolecular pump system consists of the following principal components:

- ◆ Grease lubricated turbomolecular pump TURBOVAC 50 with ceramic ball bearings, convection cooling and splinter guard
- ◆ Electronic frequency converter NT 10
- ◆ Dual-stage, oil sealed rotary vane vacuum pump TRIVAC D 2,5 E as backing pump
- ◆ Switchbox with rotary switch for driving the backing pump, the turbomolecular pump, a vacuum gauge (optional) and a power failure venting valve (optional)

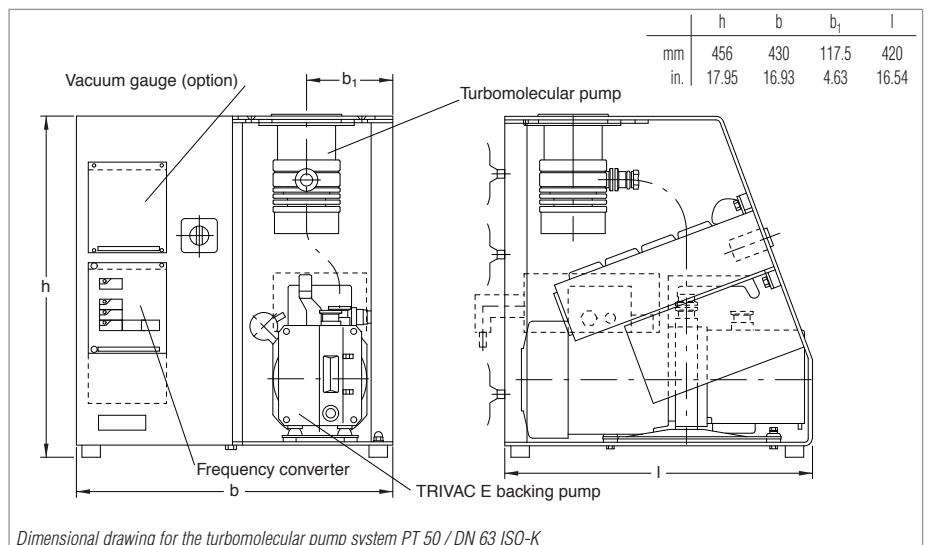
- ◆ Mains connection 230 V, 50 Hz with EURO plug
- ◆ Rugged table top unit which may also carry heavy assemblies
- ◆ All required connecting and sealing components are located within the pump system assembly

The pump system is prepared for installation of further components:

- ◆ Vacuum gauge
- ◆ Power failure venting valve
- ◆ Air cooling unit
- ◆ Assembly on the intake side with manifold, valves, gauge heads etc.
- ◆ Adsorption trap
- ◆ Exhaust filter
- ◆ Rotatable castors
- ◆ Mains cable with connection plug for UK, USA, Switzerland, Japan

Typical Applications

- ◆ Spectroscopy
- ◆ Tube manufacturing
- ◆ Beam guidance systems
- ◆ Micro balances
- ◆ Sputtering and evaporation systems
- ◆ Surface physics
- ◆ Laboratory pump systems
- ◆ Production of gas Lasers



Technical Data		PT 50		
Turbomolecular pump			TURBOVAC 50	
High vacuum connection	DN	40 KF	63 ISO-K	63 CF
Pumping speed for N ₂	l x s ⁻¹	33	55	55
Compression for N ₂ /H ₂			2 x 10 ⁷ / 10 ²	
Speed of the TURBOVAC	rpm		72 000	
Dual-stage rotary vane vacuum pump		TRIVAC D 2,5 E		
Nominal pumping speed acc. to PNEUROP				
	m ³ x h ⁻¹ (cfm)	2.7 (1.6)		
Ultimate total pressure	mbar (Torr)	10 ⁻³ (0.75 x 10 ⁻³)		
Attainable ultimate pressure				
with FPM gasket	mbar (Torr)	< 10 ⁻⁶ (< 0.75 x 10 ⁻⁶)	< 10 ⁻⁶ (< 0.75 x 10 ⁻⁶)	< 10 ⁻⁶ (< 0.75 x 10 ⁻⁶)
with aluminum or Cu gasket ¹⁾	mbar (Torr)	–	–	< 10 ⁻⁸ (< 0.75 x 10 ⁻⁸)
Main supply, 50/60 Hz	V	100-120 / 200-240 ± 5%		
Rated power consumption, approx.	VA	500		
Dimensions (W x H x D)	mm (in.)	430 x 456 x 420 (16.93 x 17.95 x 16.54)		
Weight, approx.	kg (lbs)	27 (59.4)		
Ordering Information		PT 50		
PT 50 turbomolecular pump system				
DN 40 KF		Part No. 128 80	–	–
DN 63 ISO-K		–	Part No. 128 81	–
DN 63 CF		–	–	Part No. 128 83
Air cooling unit				
115 V			Part No. 854 06	
230 V			Part No. 854 05	
Flange heater				
DN 63 CF, 115 V			Part No. 854 07	
DN 63 CF, 230 V			Part No. 854 04	
Delayed venting unit ²⁾			Part No. 500 441	
Venting valve, DN 10 KF manually operated			Part No. 173 24	
Power failure venting valve, DN 10 KF				
24 V DC			Part No. 174 46	
115 V, 60 Hz			Part No. 200 06 420	
230 V, 50/60 Hz			Part No. 173 26	
Adsorption trap, DN 16 KF			Part No. 854 14	
Adsorbent			Part No. 854 10	
AF 8 exhaust filter			Part No. 190 50	
Mains cord				
USA/JAP	115 V, 50/60 Hz		Part No. 200 81 090	
USA/JAP	230 V, 50/60 Hz		Part No. 200 81 141	
CH	230 V, 50/60 Hz		Part No. 200 81 099	
UK	230 V, 50/60 Hz		Part No. 200 81 097	
Connecting cable for operating the TURBOVAC outside the pump system				
3 m (10.0 ft)			Part No. 121 08	
5 m (17.5 ft)			Part No. 121 09	
10 m (35.0 ft)			Part No. 119 90	

¹⁾ use only for CF flanges

²⁾ for 24 V DC valves

PT 151/PT 361 Turbomolecular Pump Systems



These turbomolecular pump systems are ready-to-operate vacuum units for generating a vacuum in the high and ultra high vacuum range which is free of hydrocarbons.

When pumping aggressive or abrasive process gases, a purge gas facility must be used for the pumps.

Advantages to the User

- ◆ Low ultimate pressure ($< 10^{-7}$ mbar (Torr)), free of hydrocarbons
- ◆ High effective pumping speed
- ◆ Compact, mobile unit
- ◆ Simple to operate
- ◆ High level of reliability
- ◆ Purge gas and venting ports
- ◆ Components such as backing pump, frequency converter and TURBOVAC, as well as venting or degassing are controlled via a single multi function switch
- ◆ Service friendly assembly for maintenance without the need to disassemble backing or high vacuum pump
- ◆ Pump systems prepared for installation of larger backing pumps (for barrier gas operation, for example)
- ◆ Additional mains sockets for accessories
- ◆ CE approval

The turbomolecular pump systems consists of the following principal components:

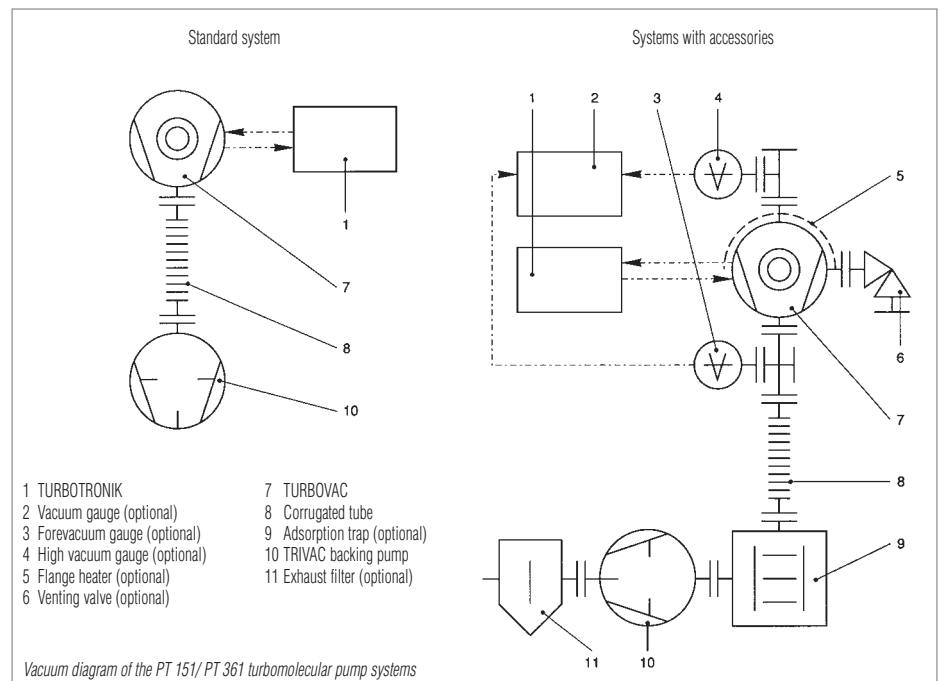
- ◆ Grease lubricated turbomolecular pump TURBOVAC 151 or 361 with splinter guard
- ◆ Electronic frequency converter NT 20
- ◆ Dual-stage, oil sealed TRIVAC D 4 B or D 16 B rotary vane vacuum pump as backing pump
- ◆ Switch box with mains power outlet and rotary switch to operate the connected units

The pump systems are prepared for installation of further components:

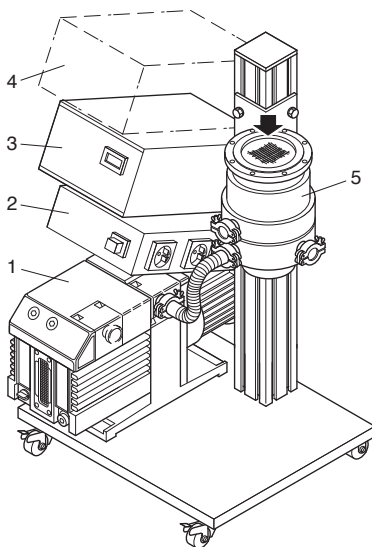
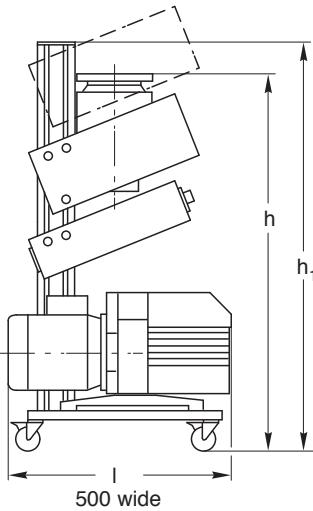
- ◆ Vacuum gauges (up to two)
- ◆ Adsorption trap
- ◆ Exhaust filter
- ◆ Air cooling unit
- ◆ Flange heater
- ◆ Venting valve

Typical Applications

- ◆ Spectroscopy
- ◆ Tube manufacturing
- ◆ Beam guidance systems
- ◆ Micro balances
- ◆ Sputtering and evaporation systems
- ◆ Surface physics



	h	h ₁	l	wide
mm	800	890	484	500
in.	31.50	35.04	19.06	19.69



- 1 TRIVAC backing pump
- 2 Switch box
- 3 TURBOTRONIK
- 4 Vacuum gauge (optional)
- 5 TURBOVAC

PT 151 Turbomolecular pump system

Technical Data		PT 151	PT 361
Turbomolecular pump		TURBOVAC 151	TURBOVAC 361
High vacuum connection	DN	100 ISO-K	100 CF
Pumping speed for N ₂	l x s ⁻¹	145	345
Compression for N ₂ /H ₂		> 10 ⁹	> 10 ⁹
Speed of the TURBOVAC	rpm	50 000	50 000
Dual-stage rotary vane vacuum pump		TRIVAC D 4 B	TRIVAC D 16 B
Nominal pumping speed (DIN 28 400)	m ³ x h ⁻¹ (cfm)	4.8 (2.83)	18.9 (11.13)
Exhaust connection	DN	16 KF	25 KF
Attainable ultimate pressure			
with FPM seal	mbar (Torr)	10 ⁻⁸ (0.75 x 10 ⁻⁸)	10 ⁻⁸ (0.75 x 10 ⁻⁸)
with Cu seal	mbar (Torr)	– 10 ⁻¹⁰ (0.75 x 10 ⁻¹⁰)	– 10 ⁻¹⁰ (0.75 x 10 ⁻¹⁰)
Cooling water consumption	l/h	20	20
Cooling water connection, hose nozzle, outside dia.	mm (in.)	11 (0.43)	11 (0.43)
Power consumption	kVA	0.7	1.5
Mains supply			
EURO version	V	230 V, 50 Hz	230 V, 50 Hz
USA version	V	115 V, 60 Hz	115 V, 60 Hz
Dimensions (W x H x D)	mm (in.)	500 x 890 x 484 (19.69 x 35.04 x 19.06)	500 x 890 x 484 (19.69 x 35.04 x 19.06)
Weight, approx.	kg (lbs)	45 (99.2)	62 (136.7)
Ordering Information		PT 151	PT 361
PT 151 / PT 361 turbomolecular pump system			
EURO version, 230 V / 50 Hz, Schuko plug			
DN 100 ISO-K		Part No.128 84	Part No.128 86
DN 100 CF		Part No.128 85	Part No.128 88
USA version, 115 V / 60 Hz, USA plug			
DN 100 ISO-K		Part No.152 57	Part No.152 59
DN 100 CF		Part No.152 58	Part No.152 60
Air cooling unit			
115 V			Part No. 894 08
230 V			Part No. 855 31
Flange heater, DN 100 CF			
115 V			Part No. 854 28
230 V			Part No. 854 27
Delayed venting unit *)			Part. No. 500 441
Venting valve, DN 10 KF			
manually operated			Part. No. 173 24
Power failure venting valve, DN 10 KF			
24 V DC			Part No. 174 46
115 V, 60 Hz			Part No. 200 06 420
230 V, 50/60 Hz			Part No. 173 26
Adsorption trap			
DN 16 KF		Part No. 854 14	–
DN 25 KF		–	Part No. 854 15
Adsorbent			Part No. 854 10
Exhaust filter			
AF 4-8		Part No. 189 06	–
AF 16-25		–	Part No. 189 11
Purge gas and venting valve, 230 V			Part No. 855 19

*) for 24 V DC valves

PT 50 KIT, PT 151 KIT, PT 361 KIT Turbomolecular Pump Systems

Under the motto "Do-it-yourself and save money" you may assemble the turbomolecular pump systems PT 50 KIT, PT 151 KIT and PT 361 KIT yourself.

The turbomolecular pump systems PT 50 KIT, PT 151 KIT and PT 361 KIT are made of the same components as used for the turn-key systems:

- ◆ Base panel with column
- ◆ TURBOVAC 50 turbomolecular pump (PT 50 KIT) or 151 or 361 (PT 151 KIT or PT 361 KIT)
- ◆ Rotary vane vacuum pump TRIVAC D 2,5 E (PT 50 KIT) or D 4 B or D 16 B (PT 151 KIT or PT 361 KIT)
- ◆ TURBOTRONIK NT 10 electronic frequency converter (PT 50 KIT) or NT 20 (PT 151 KIT and PT 361 KIT)
- ◆ All necessary mounting parts, connection parts and gaskets are supplied
- ◆ Simple and accurate assembly instructions
- ◆ Detailed exploded view
- ◆ Description which is easy to understand
- ◆ Additional detailed knowledge is gained about the product by assembling it yourself
- ◆ CE approval

The technical data, the areas of application and the design characteristics correspond to the turbomolecular pump systems PT 50, PT 151 and PT 361 described on the preceding pages.

Typical Applications

- ◆ Spectroscopy
- ◆ Tube manufacturing
- ◆ Beam guidance systems
- ◆ Micro balances
- ◆ Sputtering and evaporation systems
- ◆ Surface physics
- ◆ Laboratory pump systems
- ◆ Production of gas Lasers

PT 50 KIT



Unpacking, 15 minutes, approx.



After further 20 minutes



After further 20 minutes



After further 30 minutes

PT 151 KIT / PT 361 KIT



Unpacking, 15 minutes, approx.



After further 30 minutes



After further 30 minutes



After further 50 minutes

Ordering Information	PT 50 KIT	PT 151 KIT	PT 361 KIT
PT 50 KIT turbomolecular pump system DN 40 KF DN 63 ISO-K DN 63 CF	Part No. 128 70 Part No. 128 71 Part No. 128 73	– – –	– – –
PT 151 KIT turbomolecular pump system, water-cooled DN 100 ISO-K DN 100 CF	– –	Part No. 128 74 Part No. 128 75	– –
PT 361 KIT turbomolecular pump system, water-cooled DN 100 ISO-K DN 100 CF DN 160 ISO-K DN 160 CF	– – – –	– – – –	Part No. 128 76 Part No. 128 78 upon request upon request
Air cooling unit, 230 V 115 V	Part No. 854 05 Part No. 854 06	Part No. 855 31 Part No. 894 08	Part No. 855 31 Part No. 894 08
Flange heater DN 63 CF, 230 V DN 63 CF, 115 V DN 100 CF, 230 V DN 100 CF, 115 V	Part No. 854 04 Part No. 854 07 – –	– – Part No. 854 27 –	– – Part No. 854 27 Part No. 854 28
Adsorption trap DN 16 KF DN 25 KF	Part No. 854 14 –	Part No. 854 14 –	– Part No. 854 15
Adsorbent	Part No. 854 10	Part No. 854 10	Part No. 854 10
Exhaust filter AF 4-8 AF 8 AF 16-25	– Part No. 190 05 –	Part No. 189 06 – –	– – Part No. 189 11
Delayed venting unit ^{*)}	Part No. 500 441	Part No. 500 441	Part No. 500 441
Venting valve, DN 10 KF manually operated	Part No. 173 24	Part No. 173 24	Part No. 173 24
Purge gas and venting valve, 230 V	–	Part No. 855 19	Part No. 855 19
Power failure venting valve, DN 10 KF 24 V DC 115 V, 60 Hz 230 V, 50/60 Hz	Part No. 174 46 Part No. 174 26 Part No. 200 06 420	Part No. 174 46 Part No. 174 26 –	Part No. 174 46 Part No. 174 26 –
Water cooling unit for the TURBOVAC	Part No. 854 08	–	–
Mains cord USA/JAP, 115 V, 50/60 Hz USA/JAP, 230 V, 50/60 Hz CH, 230 V, 50/60 Hz UK, 230 V, 50/60 Hz	Part No. 200 81 090 Part No. 200 81 141 Part No. 200 81 099 Part No. 200 81 097	– Part No. 200 81 141 Part No. 200 81 099 Part No. 200 81 097	– Part No. 200 81 141 Part No. 200 81 099 Part No. 200 81 097
Connecting cable for operating the TURBOVAC outside the pump system 3 m (10.0 ft) 5 m (17.5 ft) 10 m (35.0 ft)	Part No. 121 08 Part No. 121 09 –	– Part No. 857 66 Part No. 857 67	– Part No. 857 66 Part No. 857 67

^{*)} for 24 V DC valves

PT 300 Dry Turbomolecular Pump System



The PT 300 Dry turbomolecular pump system is a fully assembled, ready-to-operate and mobile high vacuum pump system which is based on a column design.

Advantages to the User

- ◆ Absolutely oil-free
- ◆ Low ultimate pressure free of hydrocarbons (10^{-8} mbar)
- ◆ High effective pumping speed
- ◆ Compact and mobile unit
- ◆ Simple operation
- ◆ High level of reliability
- ◆ Maintenance-friendly design
- ◆ Installation in any orientation for TW 300
- ◆ Air cooling
- ◆ Installation of standard vacuum components in an open frame with installation column and castors
- ◆ Components such as the diaphragm backing pump and turbomolecular pump as well as venting or degassing are controlled via a single rotary switch
- ◆ Service-friendly assembly for maintenance without the need to disassemble backing or high vacuum pump
- ◆ Pump systems prepared for installation of larger backing pumps
- ◆ Additional mains sockets for accessories
- ◆ The pump systems are subjected to a full functional test and a leak test before delivery

The turbomolecular pump system consists of the following principal components:

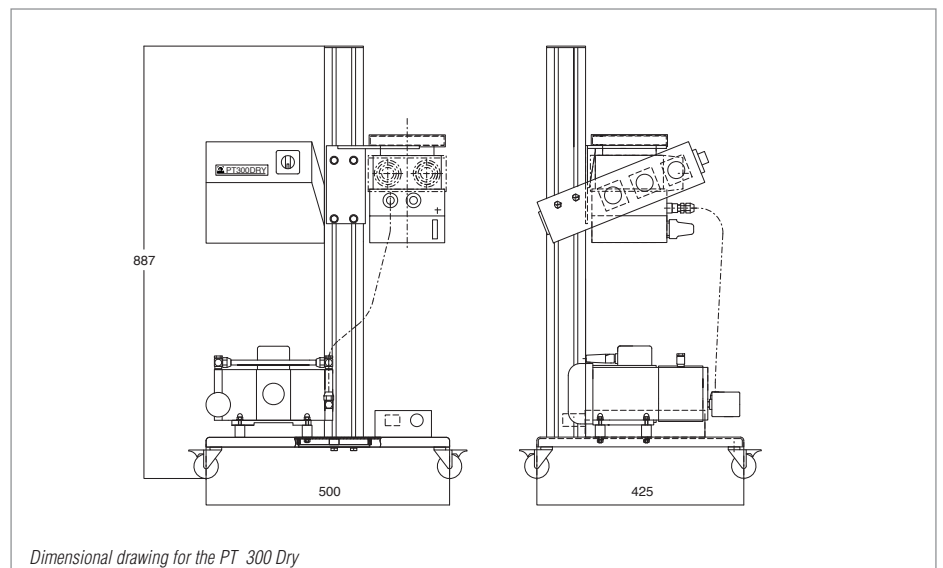
- ◆ TW 300 hybrid turbomolecular pump
- ◆ Dual-stage, absolutely oil-free DIVAC 2,5 VT diaphragm vacuum pump used as the backing pump
- ◆ Switchbox for driving and interlocking of the two vacuum pumps.
- ◆ Mobile base plate with column
- ◆ All required connection and sealing components are located within the pump system assembly

The pump systems are prepared for installation of further components.

- ◆ Vacuum gauges
- ◆ Flange heater
- ◆ Venting valve

Typical Applications

- ◆ Spectroscopy
- ◆ Valve manufacturing
- ◆ Beam guidance systems
- ◆ Micro balances
- ◆ Sputtering and evaporation systems
- ◆ Surface physics
- ◆ Laboratory pump systems



Dimensional drawing for the PT 300 Dry

Technical Data		PT 300 Dry	
Hybrid turbomolecular pump			
High vacuum connection	DN	100 ISO-K	TW 300
Pumping speed for nitrogen	$l \times s^{-1}$		100 CF
			240
Diaphragm pump			DIVAC 2,5 VT
Pumping speed, approx.	$m^3 \times h^{-1}$ (cfm)		2.5 (1.5)
Ultimate pressure, approx.	mbar (Torr)		3 (2.25)
Attainable ultimate pressure with rotary vane pump	mbar (Torr)		10^{-9} (0.75 x 10^{-9})
with diaphragm pump	mbar (Torr)		10^{-8} (0.75 x 10^{-8})
Mains connection, 50/60 Hz	V		230 / 115
Power consumption, approx.	W		600
Dimensions (W x H x D)	mm (in.)	500 x 887 x 425 (19.68 x 34.92 x 16.73)	
Weight, approx.	kg (lbs)	44 (97.13)	
Ordering Information		PT 300 Dry	
PT 300 Dry turbomolecular pump system			
DN 100 ISO-K, 230 V, 50 Hz		Part No. 500 687	-
DN 100 ISO-K, 115 V, 60 Hz		Part No. 500 693	-
DN 100 CF, 230 V, 50 Hz		-	Part No. 500 688
DN 100 CF, 115 V, 60 Hz		-	Part No. 500 694
Mains adapter Schuko/US		Part No. 200 11 119	
Mains cable for junction box			
EURO, 230 V, 50 Hz		Part No. 200 81 091	
CH, 230 V, 50/60 Hz		Part No. 200 81 099	
UK, 230 V, 50/60 Hz		Part No. 200 81 097	
USA/Japan, 230 V, 50/60 Hz		Part No. 200 81 141	
USA/Japan, 115 V, 60 Hz		Part No. 200 81 090	
Power failure airing valve, 230 V, 50/60 Hz		Part No. 174 26	
Flange heater for flange DN 100 CF, 230 V		Part No. 854 27	
24 V DC mains cable			
3 m		Part No. 800094V0300	
5 m		Part No. 800094V0500	
10 m		Part No. 800094V1000	
20 m		Part No. 800094V2000	

PT 301 Dry Turbomolecular Pump System



The PT 301 Dry turbomolecular pump system is a fully assembled and ready-to-operate high vacuum system designed as a table top unit.

Advantages to the User

- ◆ Absolutely oil-free
- ◆ Low ultimate pressure free of hydrocarbons (10^{-8} mbar)
- ◆ High effective pumping speed
- ◆ Compact and small unit
- ◆ Simple operation
- ◆ High level of reliability
- ◆ Maintenance-friendly design
- ◆ Installation in any orientation for TW 300
- ◆ Air cooling
- ◆ Installation of standard vacuum components in an open frame
- ◆ Components such as the diaphragm backing pump and turbomolecular pump are controlled via switches
- ◆ Service-friendly assembly for maintenance without the need to disassemble backing or high vacuum pump
- ◆ The high vacuum pump can be removed
- ◆ The pump systems are subjected to a full functional test and a leak test before delivery

The turbomolecular pump system consists of the following principal components:

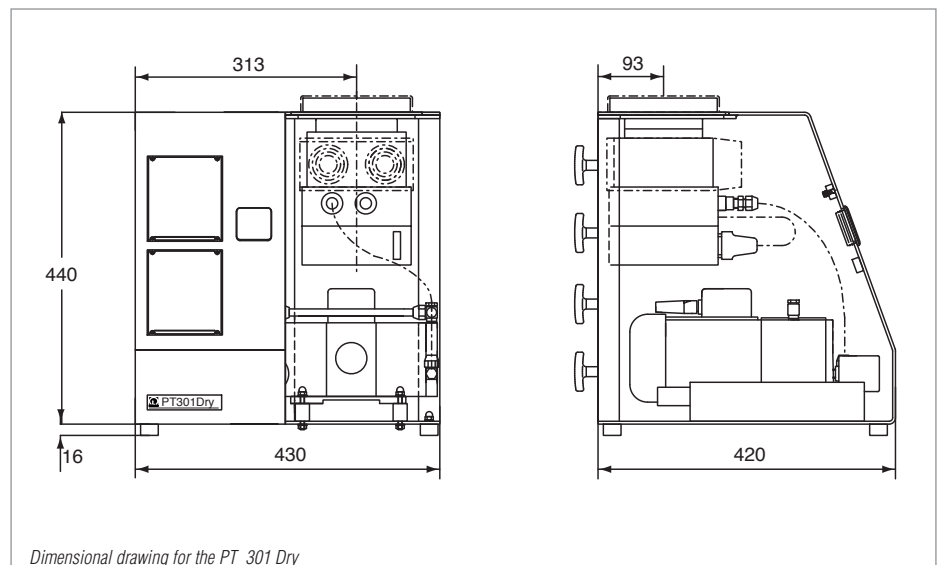
- ◆ TW 300 hybrid turbomolecular pump system
- ◆ TURBO.POWER 300 power supply
- ◆ Dual-stage, absolutely oil-free DIVAC 2,5 VT diaphragm vacuum pump used as the backing pump
- ◆ All required connection and sealing components are located within the pump system assembly

The pump systems are prepared for installation of further components.

- ◆ Vacuum gauges
- ◆ Venting valve / Power failure venting valve
- ◆ Junction box

Typical Applications

- ◆ Spectroscopy
- ◆ Valve manufacturing
- ◆ Beam guidance systems
- ◆ Micro balances
- ◆ Sputtering and evaporation systems
- ◆ Surface physics
- ◆ Laboratory pump systems

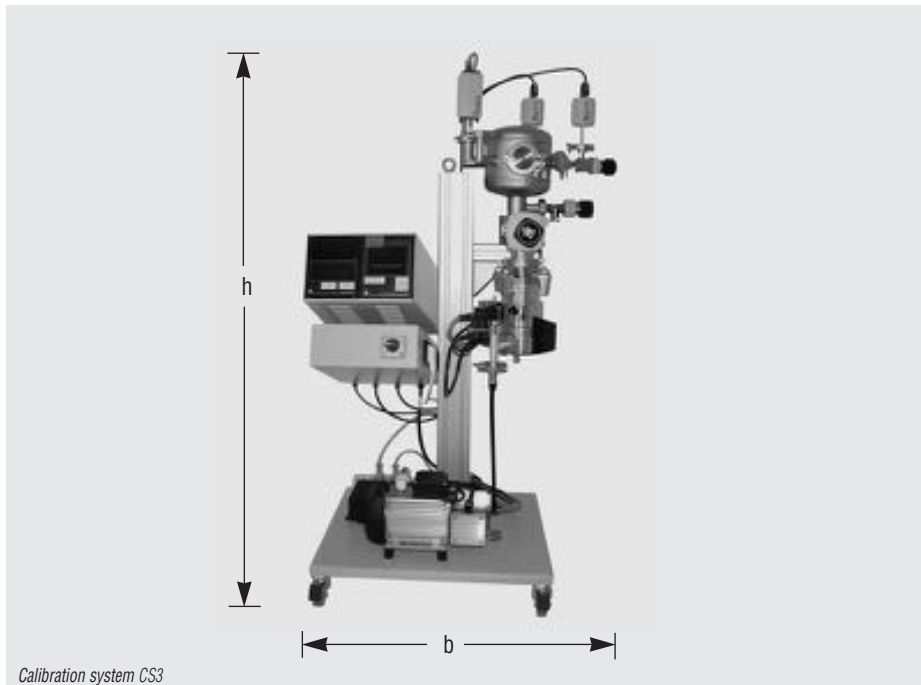


Dimensional drawing for the PT 301 Dry

Technical Data		PT 301 Dry		
Hybrid turbomolecular pump			TW 300	
High vacuum connection	DN	100 ISO-K	1	100 CF
Pumping speed for nitrogen	$l \times s^{-1}$		240	
Diaphragm pump			DIVAC 2,5 VT	
Pumping speed, approx.	$m^3 \times h^{-1}$ (cfm)		2.5 (1.5)	
Ultimate pressure, approx.	mbar (Torr)		3 (2.25)	
Attainable ultimate pressure	mbar (Torr)		10^{-8} (0.75×10^{-8})	
Mains connection, 50/60 Hz	V		230 / 115	
Power consumption, approx.	W		600	
Dimensions (W x H x D)	mm (in.)		430 x 456 x 420 (16.93 x 17.95 x 16.54)	
Weight, approx.	kg (lbs)		31 (68.43)	

Ordering Information		PT 301 Dry		
PT 300 Dry turbomolecular pump system				
DN 100 ISO-K, 230 V, 50 Hz		Part No. 500 685		-
DN 100 ISO-K, 115 V, 60 Hz		Part No. 500 691		-
DN 100 CF, 230 V, 50 Hz		-		Part No. 500 686
DN 100 CF, 115 V, 60 Hz		-		Part No. 500 692
Junction box			Part No. 200 06 393	
Mains adapter Schuko/US			Part No. 200 11 119	
Mains cable for junction box				
EURO, 230 V, 50 Hz			Part No. 200 81 091	
CH, 230 V, 50/60 Hz			Part No. 200 81 099	
UK, 230 V, 50/60 Hz			Part No. 200 81 097	
USA/Japan, 230 V, 50/60 Hz			Part No. 200 81 141	
USA/Japan, 115 V, 60 Hz			Part No. 200 81 090	
Power failure venting valve, 230 V, 50/60 Hz			Part No. 174 26	
24 V DC mains cable				
3 m			Part No. 800094V0300	
5 m			Part No. 800094V0500	
10 m			Part No. 800094V1000	
20 m			Part No. 800094V2000	

CS Calibration Systems



Calibration system CS3

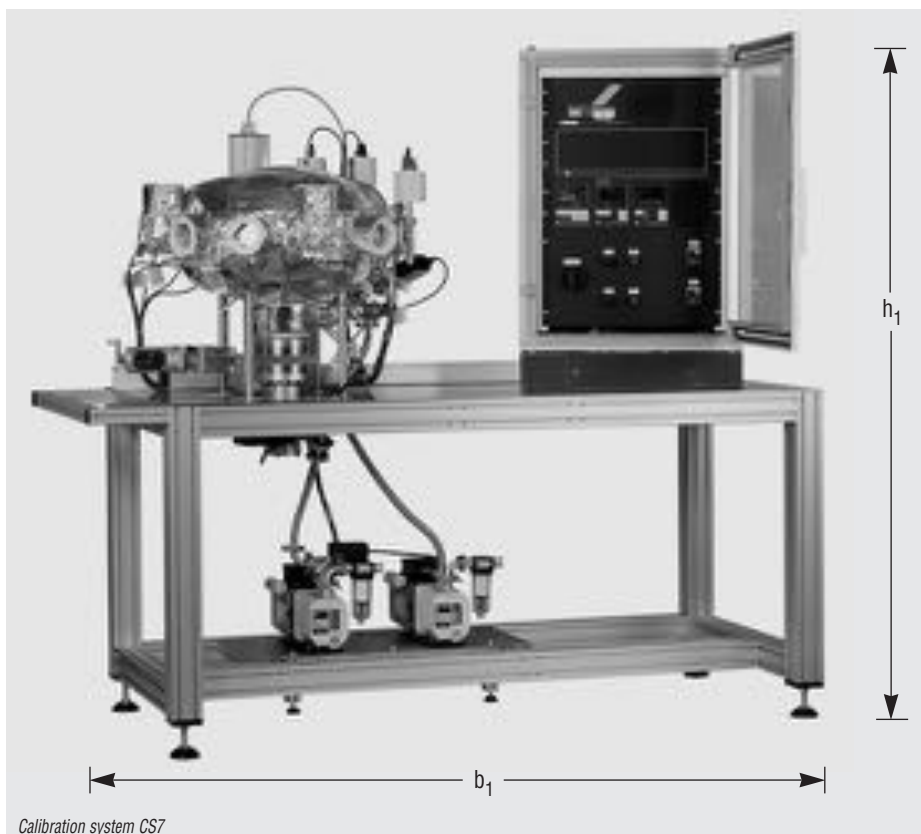
The requirements imposed on vacuum engineering with regard to accuracy of the measurements, reproducibility and unambiguity of the determined vacuum pressures have increased significantly over the last years. Routine calibrations of vacuum gauges are an important component of quality assurance schemes. 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 3×10^{-7} mbar (750 to 2.3×10^{-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 with TRIVAC rotary vane or DIVAC diaphragm pumps are used. A variable leak valve is used to admit the gas into the calibration chamber. Moreover, in calibration systems CS5 and CS7 the gas inlet line is equipped with its own pump system.

Calibration systems CS5 and CS7 are equipped with heating collars for the calibration chamber so that low chamber pressures may be attained within a shorter time. The temperature of the heating collars can be controlled whereby the maximum degassing temperature will depend on the components installed (flanges, pressure sensors, valves).

Advantages to the User

- ◆ Vacuum gauges and measurement systems of any make may be calibrated
- ◆ Designed in accordance with DIN 28 418/ISO/DIS 3567
- ◆ Transfer standards with PTB-, DKD- or factory certificate
- ◆ Easier DIN/ISO 9000 approval
- ◆ Reliable and reproducible measurements
- ◆ Quick start-up
- ◆ Measurement system free of hydrocarbons when using dry compressing vacuum pumps
- ◆ Simple operation
- ◆ CE approval



Calibration system CS7

	h	h ₁	b	b ₁
mm	1200	1700	600	2000
in.	47.24	66.93	23.62	78.74

Technical Data		CS3	CS5	CS7
Calibration range	mbar (Torr)	1000 to 1×10^{-3} (750 to 0.75×10^{-3})	1000 to 1×10^{-5} (750 to 0.75×10^{-5})	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^{-7} (750 to 1.5×10^{-7})	1000 to 2×10^{-9} (750 to 1.5×10^{-9})
Vacuum chamber connections (in brackets: qty. available on the side of the customer's system)		5 (3) x DN 16 KF 1 (0) x DN 25 KF 1 (1) x DN 40 KF	5 (3) x DN 16 KF 1 (0) x DN 25 KF 3 (2) x DN 40 KF	6 (3) x DN 16 CF 6 (4) x DN 40 CF
Admitting gas		via variable leak valve	via variable leak valve	via variable leak valve
Extra pump system for admitting gas		no	yes	yes
Heater for the vacuum chamber		no	yes	yes

Ordering Information and options upon request

Application examples: Which pressure sensors may be calibrated with which system?

Typ of Sensor	CS3	CS5	CS7
Diaphragm sensors			
BOURDONVAC	X	X	X
Capsule vacuum gauges	X	X	X
DIAVAC DV 1000	X	X	X
DI 200, DI 2000	X	X	X
CTR90 and CTR91 (1000 - 1 Torr full scale)	X	X	X
CTR91 (0.1 Torr full scale)	-	X	X
THERMOVAC sensors			
TR 301, TR 306	X	X	X
TR 211, TR 216, TTR 211, TTR 216, TTR 90	X	X	X
VISCOVAC sensor (spinning rotor viscosity gauge)			
VK 201	-	X	X
PENNINGVAC sensors			
PR 25, PR 26, PR 27, PR 35, PR 36, PR 37, PTR 225	-	-	X
IONIVAC sensors			
ITR 90, ITR 100	-	-	X
IE 414, IE 514	-	-	X

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

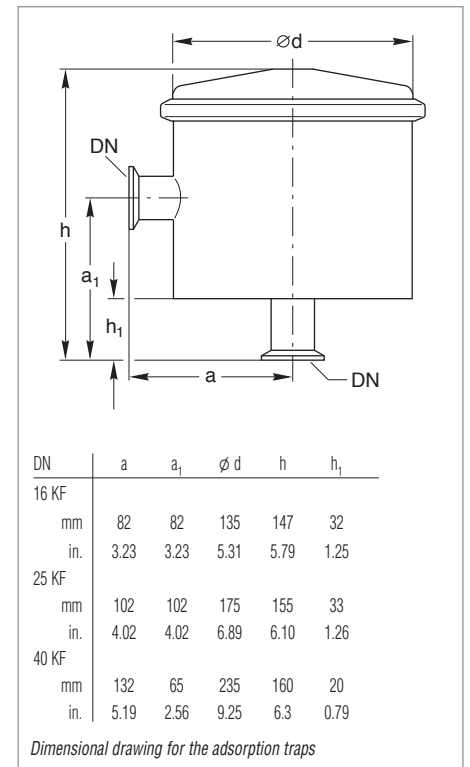
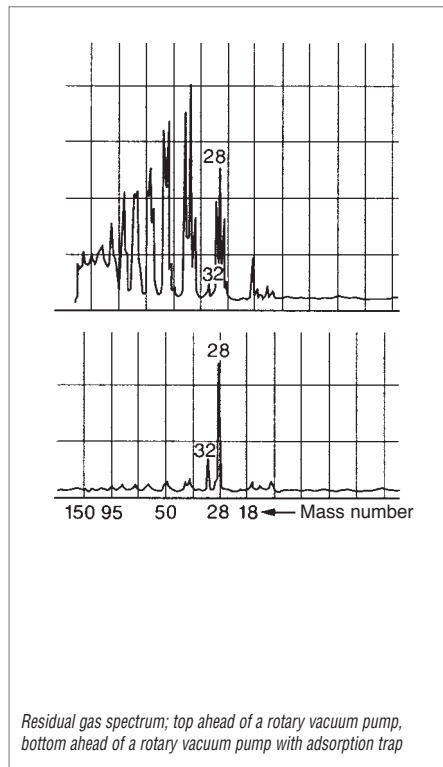
- ◆ Backstreaming of oil is reduced by 99 %
- ◆ Longer service life
- ◆ High conductance
- ◆ Filling can be easily exchanged
- ◆ Improvement in the ultimate pressure attained by backing pumps by one order of magnitude
- ◆ Stainless steel housing and insert
- ◆ NBR seal

Typical Applications

- ◆ Product of an oil-free vacuum

Supplied Equipment

- ◆ Complete with insert
- ◆ Without adsorbent



Technical Data		16 KF	25 KF	40 KF
Conductance at 10 ⁻² mbar (Torr)	mbar x l x s ⁻¹ (Torr x l x sec)	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 (8.8)
Ordering Information		16 KF	25 KF	40 KF
Adsorption trap		Part No. 854 14	Part No. 854 15	Part No. 854 16
Activated aluminum oxide, 2 l (approx. 1.3 kg (2.8 lbs))		Part No. 854 10		

Delayed Venting Unit



The delayed venting unit serves the purpose of venting vacuum systems with a delay in that it bridges power failures.

The unit is equipped with rechargeable batteries. Any unwanted venting of the turbomolecular pump can thus be reliably prevented in the event of short power blackouts.

Both normally open valves (power failure venting valves) and normally closed valves (venting valves) may be connected.

The unit is equally suited for benchtop use and rack mounting.

The present operating condition is showed by different displays and controls:

- ◆ “Delay Time”
Displays the entered delay time (when mains powered) and the delay time counting to 0 (in case of power failure).
- ◆ “Venting Time”
Displays the entered venting time (when mains powered and during delay time in case of power failure) and, after elapsed delay time, the venting time counting to 0.
- ◆ “Battery status”
 - LED “loading” battery charges
 - LED “empty” battery is flat or defective
 - LED “ok”
battery has been recharged sufficiently
- ◆ LED “POWER”
the unit is mains powered

C10

Technical Data		Delayed Venting Unit
Mains connection		Mains socket
Power supply	V AC / Hz	100 - 240 / 50/60
Output	V DC / mA	24 - 26.4 / 400 max.
Rechargeable lead battery	V / Ah	2 x 12 / 1.3
Rated battery service life, approx.	years	5 (depending on utilization)
Max. number of venting cycles with fully charged battery		4 times after each other
Controls		Foil key pad
Display		numerical, 2 x 3 digits, 4x LED
Delay time	s	0 - 999, adjustable
Venting time	s	0 - 999, adjustable
Dimensions (W x H x D)	mm (in.)	106.5 x 128.5 x 220 (4.19 x 5.06 x 8.66)
Housing		1/4 19", for rack mounting or as benchtop unit
Weight, approx.	kg (lbs)	2.5 (5.58)

Ordering Information		Delayed Venting Unit
Delayed venting unit		Part No. 500 441
Power failure venting valve, DN 10 KF, 24 V DC		Part No. 174 46
Mains cord with German style mains plug (Schuko)		Part No. 200 27 549

Advantages to the User

- ◆ Adjustable venting time for power failure venting valve: 0 to 999 seconds
- ◆ Adjustable venting time for venting valve: 0 to 999 seconds
- ◆ Automatic driving of failure venting valve and venting valve in case of short power failures
- ◆ Manual venting
- ◆ Remote controlled venting

Version for the North and South American Continents

Turbomolecular Pump System TOSS 50

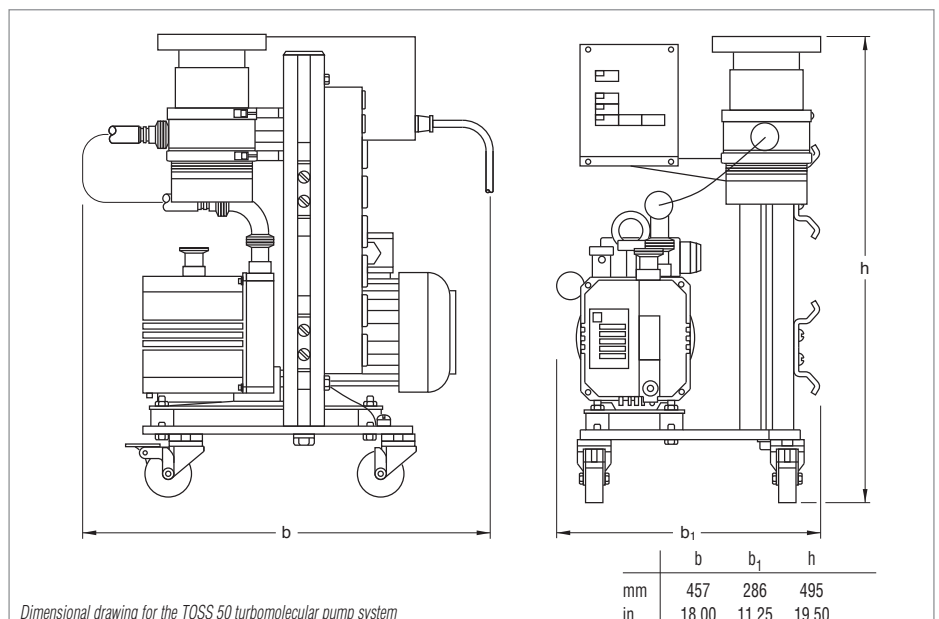
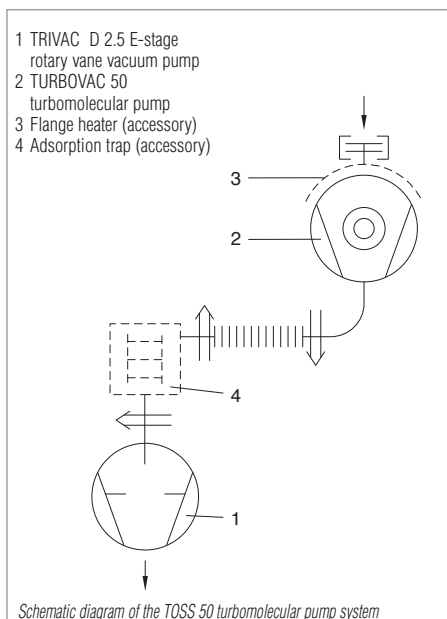


Standard Equipment

- ◆ TURBOVAC 50 ceramic bearing standard proven turbomolecular vacuum pump
- ◆ High effective pumping speed
- ◆ Compact portable tabletop construction base with support rail
- ◆ Simple operation, high reliability, easy maintenance

Options

- ◆ Adjustable inlet height of the TURBOVAC 50
- ◆ Complete package with backing pump and frequency converter
- ◆ Wired for 115 V, single phase, 60 Hz operation
- ◆ Base caster wheels
- ◆ Foreline trap
- ◆ TRIVAC pump accessories
- ◆ Complete line of vacuum gauges for monitoring of pressure
- ◆ Air cooling option
- ◆ Vent valve kits



Version for the North and South American Continents

Technical Data		TOSS 50	
Turbomolecular pump		TURBOVAC 50	
High vacuum connection	DN	40 KF	63 ISO-K/63 CF
Pumping speed for N ₂	l x s ⁻¹	33	55
Pumping speed for H ₂	l x s ⁻¹	28	30
Compression for N ₂		2 x 10 ⁷	
Compression for H ₂		10 ²	
Speed of the TURBOVAC	rpm	72 000	
Dual-stage rotary vane vacuum pump		TRIVAC D 2.5 E	
Nominal pumping speed acc. to PNEUROP	m ³ x h ⁻¹ (cfm)	3.3 (1.9)	
Exhaust connection	DN	16 KF	
Attainable ultimate pressure	mbar (Torr)	≤ 2 x 10 ⁻³ (≤ 1.5 x 10 ⁻³)	
Attainable ultimate pressure with FPM gasket	mbar (Torr)	< 10 ⁻⁶ (< 0.75 x 10 ⁻⁶)	
Attainable ultimate pressure with aluminum or Cu gasket	mbar (Torr)	< 10 ⁻⁸ (< 0.75 x 10 ⁻⁸)	
Mains supply, 50/60 Hz	V	115	
Rated power consumption, approx.	VA	400	
Dimensions (W x H x D)	mm (in.)	286 x 495 x 451 (11.25 x 19.5 x 18)	
Weight, approx.	kg (lbs)	22.1 (56)	

Ordering Information		TOSS 50
TOSS 50 (includes TURBOVAC 50 / NT 10 solid state converter / D 2.5 E rotary vane vacuum pump / pump stand / fittings)		
DN 40 KF		Part No. 899 213
DN 63 ISO-K		Part No. 899 214
DN 63 CF		Part No. 899 215
Air cooling unit, 115 V		Part No. 854 06-1
Flange heater DN 63 CF, 115 V		Part No. 854 07
Vent kits		
CF flanges		
Normally open		Part No. 899 838
Normally closed		Part No. 720-53-191
KF 40 flange		
Normally open		Part No. 720-53-186
Normally closed		Part No. 720-53-187
KF 63 flange		
Normally open		Part No. 720-53-188
Normally closed		Part No. 720-53-189
AK condensate trap kit		Part No. 720-53-105
AF exhaust filter kit		Part No. 720-53-104
Adsorption trap, Al ₂ O ₃		Part No. 854 14
Activated Al ₂ O ₃ media, 2 litres (2.11 qt)		Part No. 854 10
Other accessories such as valves and gauges		See appropriate catalog section

Version for the North and South American Continents

Turbomolecular Pump System MINI-TOPS 50

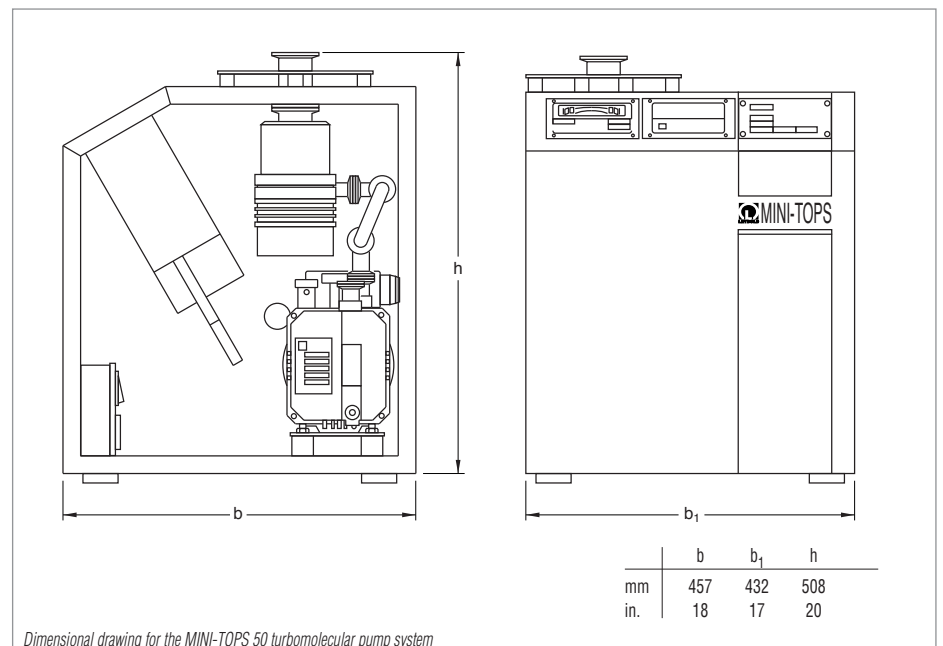
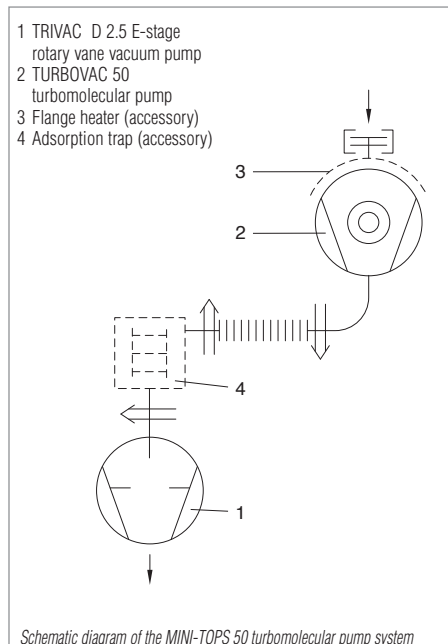


Standard Equipment

- ◆ TURBOVAC 50 ceramic bearing standard proven turbomolecular vacuum pump
- ◆ High effective pumping speed
- ◆ Compact portable tabletop construction frame
- ◆ Vibration-absorbing mounting plate for stress free mounting of the TURBOVAC 50
- ◆ Simple operation, high reliability, easy maintenance
- ◆ Complete package with backing pump and frequency converter
- ◆ Integration with Gauge controller
- ◆ Wired for 115 V, single phase, 60 Hz operation

Options

- ◆ Frame caster wheels
- ◆ Foreline trap
- ◆ TRIVAC pump accessories
- ◆ Complete line of vacuum gauges for monitoring of pressure
- ◆ Air cooling option
- ◆ Vent valve kits
- ◆ Conflat® flange heater



Version for the North and South American Continents

Technical Data		MINI-TOPS 50	
Turbomolecular pump		TURBOVAC 50	
High vacuum connection	DN	40 KF	63 ISO-K/63 CF
Pumping speed for N ₂	l x s ⁻¹	33	55
Pumping speed for H ₂	l x s ⁻¹	28	30
Compression for N ₂		2 x 10 ⁷	
Compression for H ₂		10 ²	
Speed of the TURBOVAC	rpm	72 000	
Dual-stage rotary vane vacuum pump		TRIVAC D 2.5 E	
Nominal pumping speed acc. to PNEUROP	m ³ x h ⁻¹ (cfm)	3.3 (1.9)	
Exhaust connection	DN	16 KF	
Attainable ultimate pressure	mbar (Torr)	≤ 2 x 10 ⁻³ (≤ 1.5 x 10 ⁻³)	
Attainable ultimate pressure with FPM gasket	mbar (Torr)	< 10 ⁻⁶ (< 0.75 x 10 ⁻⁶)	
Attainable ultimate pressure with aluminum or Cu gasket	mbar (Torr)	< 10 ⁻⁸ (< 0.75 x 10 ⁻⁸)	
Mains supply, 50/60 Hz	V	115	
Rated power consumption, approx.	VA	400	
Dimensions (W x H x D)	mm (in.)	406 x 483 x 432 (16 x 19 x 17)	
Weight, approx.	kg (lbs)	30.0 (66)	
NT 10 frequency converter (TMP power supply)			
Voltage (two ranges)	V AC	90-140 or 180-265, single phase	
Input power			
Maximum	W	45	
Continuous	W	18	
Relay I/O			
Input		Remote Start/Stop	
Output		System status relay NO/NC contacts (contacts 4 amp/250 V AC)	
Available sensors and controllers		Sensor type	Pressure range
THERMOVAC TM 22, dual station		PIRANI	760 to 5 x 10 ⁻⁴ Torr
CAPACITRON DM 22, dual station		Capacitance diaphragm	1000 to 1 x 10 ⁻⁴ Torr
COMBIVAC CM 31			
Dual station pirani		PIRANI	760 to 5 x 10 ⁻⁴ Torr
Single station PENNINGVAC cold cathode		PENNINGVAC cold cathode	2 x 10 ⁻² to 1 x 10 ⁻⁸ Torr
COMBIVAC IT23, ionization		PENNINGVAC or PIRANI	1500 to 1 x 10 ⁻¹⁰ Torr
Smart sensor controller		Absolute pressure transducer and one channel hot ionization	
Ordering Information		MINI-TOPS 50	
MINI-TOPS 50 turbomolecular vacuum pump system (includes TURBOVAC 50 / NT 10 / D 2.5 E / appropriate frame / foreline bellows)		See Price List for the "North American Continent" for Ordering Information	

Version for the North and South American Continents

Turbomolecular Pump System TOPS 151/361

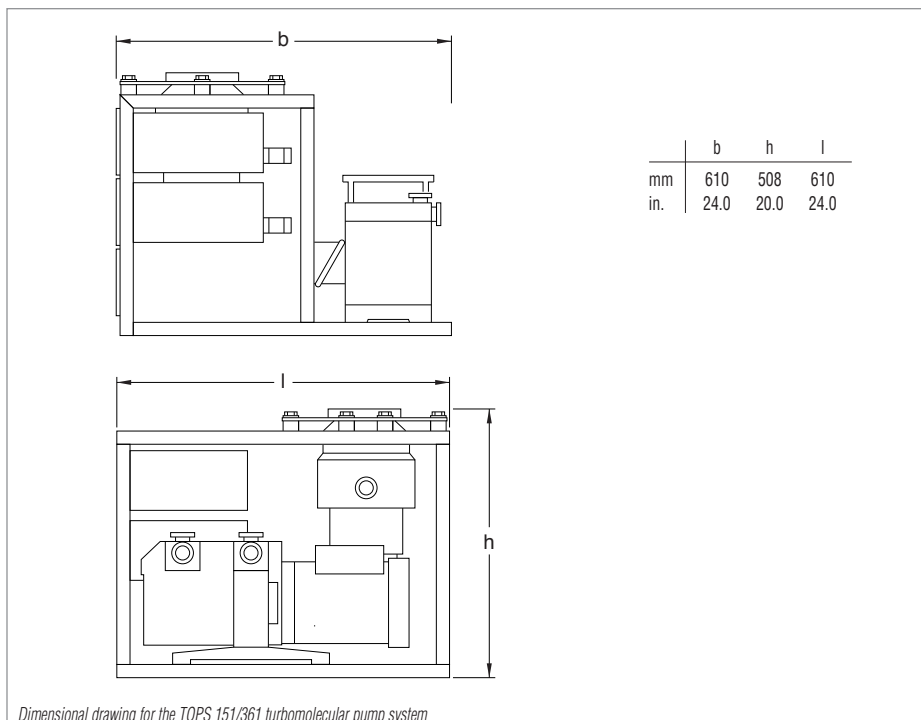


Standard Equipment

- ◆ TURBOVAC 151 or 361 ceramic bearing standard proven turbomolecular vacuum pump
- ◆ High effective pumping speed
- ◆ Compact tabletop construction frame
- ◆ Vibration-absorbing mounting plate for stress free mounting of turbomolecular pump
- ◆ Simple operation, high reliability, easy maintenance
- ◆ Complete package with backing pump, frequency converter and Start/Stop controls
- ◆ Integration with Gauge controller

Options

- ◆ Air and water cooling options
- ◆ Frame caster wheels
- ◆ Foreline trap
- ◆ TRIVAC pump accessories
- ◆ Complete line of vacuum gauges for monitoring of pressure
- ◆ Vent valve kits
- ◆ Conflat® flange heaters
- ◆ Larger backing pumps
- ◆ Purge valve for corrosive applications.
- ◆ Inlet accessories – Gate valves, bell jar assemblies, special spools
- ◆ Special design controls



Dimensional drawing for the TOPS 151/361 turbomolecular pump system

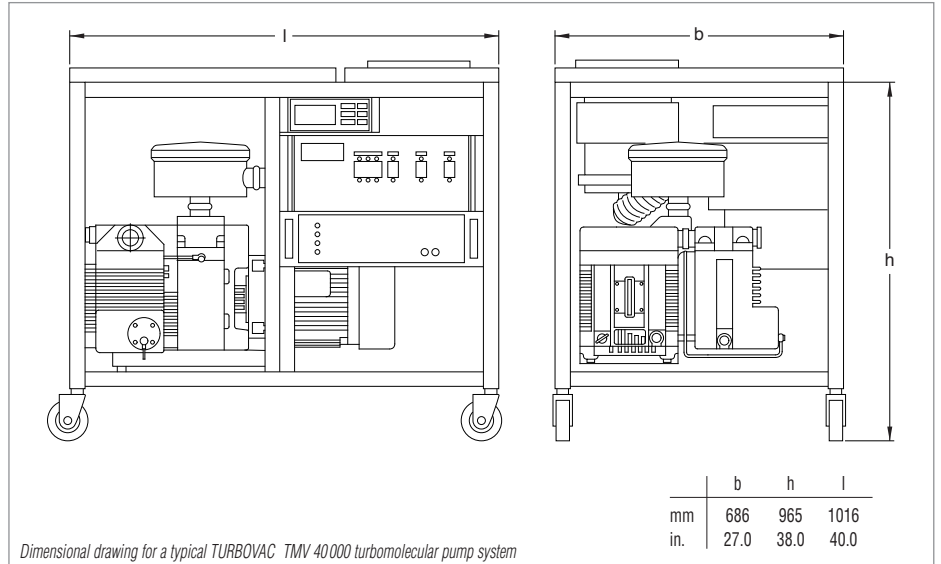
Version for the North and South American Continents

Technical Data		TOPS 151/361	
Turbomolecular pump		TURBOVAC 151	TURBOVAC 361
High vacuum connection	DN	100 ISO-K / 100 CF	100 ISO-K / 160 ISO-K / 100 CF / 160 CF
Backing pumps			
Standard	Model m ³ /hr (cfm)	TRIVAC D 4 B (5.1 / 3.0) TRIVAC D 8 B (10.2 / 6.0)	TRIVAC D 16 B (19.7 / 11.6)
for use with purge option	Model m ³ /hr (cfm)	TRIVAC D 16 B (19.7 / 11.6)	TRIVAC D 25 B (35.7 / 21.0)
Cooling		Water (air optional)	Water (air optional)
Max. power requirements (Backing pump determines actual requirements)		110 V AC, 1 phase, 50/60 Hz, 30 Amps 220 V AC, 1 phase, 50/60 Hz, 20 Amps	
Electrical panel controls			
Vane pump		Start/Stop	
TMP control panel		Start/Stop / Gauge On/Off	
Gate valve		Open/Close	
Flange heater		On/Off	
NT 20 frequency converter (TMP power supply)			
Relay I/O			
Input		Remote Start/Stop	
Output		System status relay NO/NC contacts	
Gauge controller (optional)		Integrated into system	
Available sensors and controllers		Sensor type	Pressure range
THERMOVAC TM 22, dual station		PIRANI	760 to 5 x 10 ⁻⁴ Torr
CAPACITRON DM 22, dual station		Capacitance diaphragm	1000 to 1 x 10 ⁻⁴ Torr
COMBIVAC CM 31			
Dual station pirani		PIRANI	760 to 5 x 10 ⁻⁴ Torr
Single station PENNINGVAC cold cathode		PENNINGVAC cold cathode	2 x 10 ⁻² to 1 x 10 ⁻⁸ Torr
COMBIVAC IT23, ionization		PENNINGVAC or PIRANI	1500 to 1 x 10 ⁻¹⁰ Torr
Smart sensor controller		Absolute pressure transducer and one channel hot ionization	
Ordering Information		TOPS 151/361	
TOPS 151/361 turbomolecular vacuum pump system (supplied with hydrocarbon oil)		See Price List for the "North American Continent" for Ordering Information	



Version for the North and South American Continents

Turbomolecular Pump System TURBOVAC TMV 40 000



Standard Equipment

- ◆ Open frame construction for use with larger pumps
- ◆ Flexible configuration
- ◆ Vibration-absorbing mounting plate for stress free mounting of Turbomolecular pump
- ◆ Simple operation, high reliability, easy maintenance
- ◆ Complete package with backing pump frequency converter, and Start/Stop controls
- ◆ Integration with Gauge controller

Options

- ◆ Air cooling options
- ◆ Frame caster wheels
- ◆ Foreline trap
- ◆ TRIVAC pump accessories
- ◆ Complete line of vacuum gauges for monitoring of pressure
- ◆ Vent valve kits
- ◆ Larger backing pumps
- ◆ Purge valve for corrosive applications
- ◆ Inlet accessories – Gate valves, bell jar assemblies, special spools
- ◆ Removable enclosure panels
- ◆ Special design controls
- ◆ Levellers

Technical Data

		TURBOVAC TMV 40 000		
		TURBOVAC TW 700	TURBOVAC 1000C	TURBOVAC T 1600
Turbomolecular pump		160 ISO-K	160 ISO-K	250 ISO-F
High vacuum connection	DN	160 CF	250 ISO-K	250 ISO-K
			160 CF	
			200 CF	
			6" ANSI	
Backing pumps	Model m ³ /hr (cfm)	TRIVAC D 16 B (19.7 / 11.6) TRIVAC D 25 B (30.9 / 18.2)	TRIVAC D 40 B (48.1 / 28.3.) TRIVAC D 65 B (78.0 / 45.9)	TRIVAC D 65 B (78.0 / 45.9)
Cooling		Water (air optional)	Water (air optional)	Water

Ordering Information

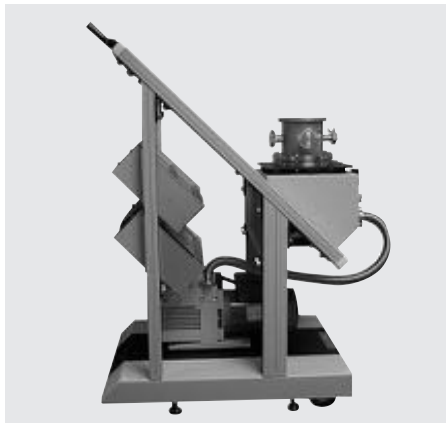
TURBOVAC TMV 40 000

TMV 40 000 turbomolecular pump system (supplied with hydrocarbon oil)

See Price List for the "North American Continent" for Ordering Information

Version for the North and South American Continents

Turbomolecular Pump System TOPIX



Standard Equipment

- ◆ Compact free-standing mobile system
- ◆ Flexible platform for customer process vacuum systems
- ◆ Frame base caster wheels and levelers
- ◆ Flexible configuration accepting any Turbomolecular pump
- ◆ Vibration-absorbing mounting plate
- ◆ Simple operation, high reliability, easy maintenance
- ◆ Manually adjustable inlet height for precise connections
- ◆ Complete package with backing pump, frequency converter, and Start/Stop controls
- ◆ Integration with Gauge controller

Options

- ◆ Air and water cooling options
- ◆ Electrically controlled height adjustment
- ◆ Foreline trap
- ◆ TRIVAC pump accessories
- ◆ Complete line of vacuum gauges for monitoring of pressure
- ◆ Vent valve kits
- ◆ Larger backing pumps
- ◆ Inlet accessories – Gate valves, bell jar assemblies, special spools
- ◆ Special design controls for automation into custom processes
- ◆ “One-button” operation controls

C10

Technical Data	TOPIX
TOPIX turbomolecular pump system	Contact Factory, for Complete Product Offering
Ordering Information	TOPIX
TOPIX turbomolecular pump system	See Price List for the “North American Continent” for Ordering Information

Version for the North and South American Continents

Turbomolecular Pump System TIPS

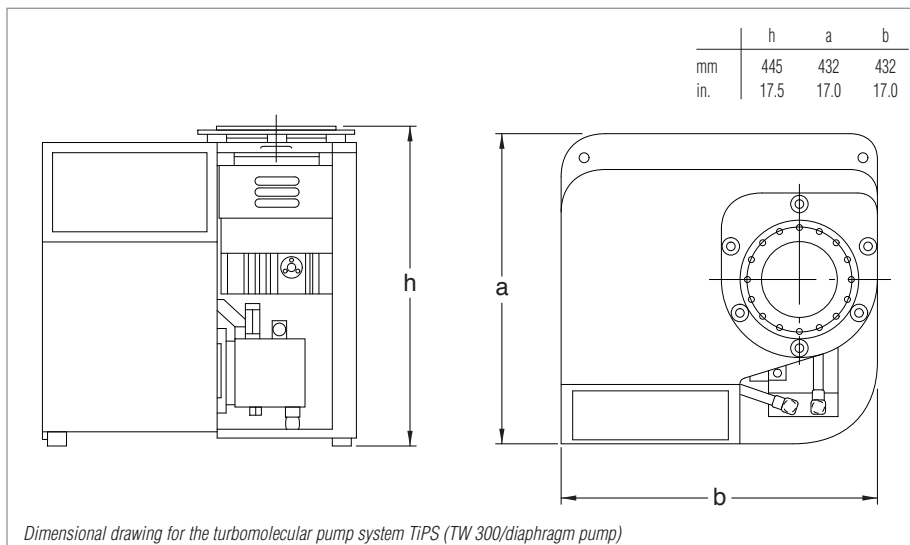


Standard Equipment

- ◆ All new LEYBOLD Wide-Range and Classic turbomolecular pumps
- ◆ High effective pumping speed
- ◆ Compact tabletop construction frame
- ◆ Vibration-absorbing mounting plate for stress free mounting of turbomolecular pumps
- ◆ Simple operation, high reliability, easy maintenance
- ◆ Complete universal integrated package with supply, controls and display for backing pump, valves and gauging
- ◆ TSC integrated Turbomolecular System Controller provides "All-in-one" vacuum system control and information

Options

- ◆ Water cooling options
- ◆ Frame caster wheels
- ◆ Conflat® flange heaters
- ◆ Complete line of vacuum sensors for monitoring of pressure
- ◆ Vent valve or purge valve for corrosive applications
- ◆ TRIVAC backing pumps for higher gas loads
Including all standard TRIVAC pump accessories:
foreline traps; inlet, exhaust and oil filtration
- ◆ Inlet accessories - gate valves, bell jar assemblies, special spools
- ◆ Special design controls



Version for the North and South American Continents

Technical Data		TiPS		
Turbomolecular pump		TURBOVAC TW 70	TURBOVAC TW 300	TURBOVAC TW 700
High vacuum connection	DN DN	63 ISO-K 63 CF	100 ISO-K 100 CF	160 ISO-K 160 CF
Backing pumps		Diaphragm, EcoDry or TRIVAC (up to D 16 B)		
Cooling		Air	Air (water optional)	Air (water optional)
Max. power requirements (Backing pump determines actual requirements)		110 V AC, 1 phase, 50/60 Hz, 15 Amps 220 V AC, 1 phase, 50/60 Hz, 7.5 Amps		
TSC Turbomolecular System Controller provides One-button automatic pumpdown or manually controls Diaphragm/vane pump Turbomolecular pump Inlet, foreline and roughing valve Vent/purge valve Inlet, foreline and roughing vacuum sensors Flange heater Ion sensor degas		Start/Stop On/Off Start/Stop Open/Close Open/Close or Vent/Purge flow Displays pressure readings On/Off On/Off		
Turbomolecular System Controller provides Operating Info Turbomolecular rotational speed (rpm & Hz) Turbomolecular bearing temperature Turbomolecular motor current Turbomolecular heatsink temperature Turbomolecular supply voltage Turbomolecular cumulative operating hours Operating mode (Auto or Manual)		Plus Backing pump cumulative operating hours Current turbomolecular pump status (Start, Accel, Norm. Op., Decel, Stop) Current valve status Pressure readings for all sensors (Torr, mbar or Pa) Flange heater status Current operating mode Last failure reason (due to improper operation)		
Available sensors ITR 90 combination hot cathode Ion/Pirani PTR 225 cold cathode Ion TTR 90 /Pirani CTR90 ceramic diaphragm Others		760 to 3.8×10^{-10} Torr 7.5×10^{-3} to 7.5×10^{-10} Torr 760 to 10^{-4} Torr 1, 10, 100, 1000 Torr full-range (each covers 4 decades) Upon request		
Ordering Information		TiPS		
TiPS integrated turbomolecular pump system		See Price List for the "North American Continent" for Ordering Information		



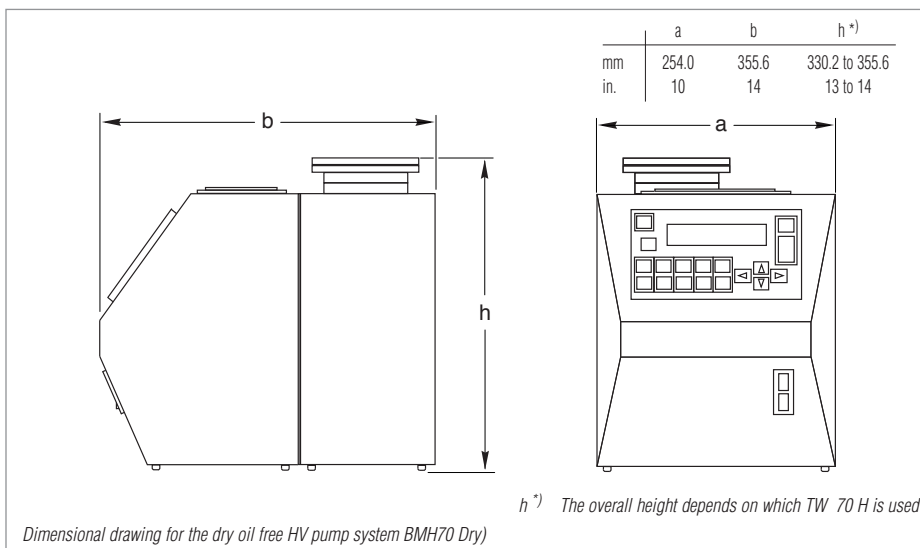
Version for the North and South American Continents

Dry Oil Free HV Pump System BMH70 Dry



Standard Equipment

- ◆ Portable HV station for TW 70 H and DIVAC 0.8 T
- ◆ 60 l/s, pumping speed for N₂, ultimate of < 5 x 10⁻⁹ Torr
- ◆ Automated one-button operation for full featured model
- ◆ Power supply for operation of pumps, gauges and valves
- ◆ Display of TW 70 H Turbo operation parameters include:
 - Rotation frequency (Hz)
 - Rotation speed (rpm)
 - Bearing temperature (deg C)
 - Motor current (amps)
 - Motor temperature (deg C)
 - Supply voltage (V)
 - Head sink temperature (deg C)
 - Cumulative operating time (hours)
- ◆ Standard air cooling
- ◆ Small footprint of 14" x 10" x 14" (W x H x D)
- ◆ 32 lbs
- ◆ Full-featured and basic versions available
- ◆ Optional 230/1/50/60 operation



Version for the North and South American Continents

Technical Data	BMH70 Dry	
	Basic Version	Full-featured Version
Integrated gauge display	No	Yes
Standard inlet sensor	(optional, see below)	Power ITR 90 inlet sensor (atm - 10^{-10} Torr) with display on system controller
Optional inlet sensor	Power ITR 90 inlet sensor (atm - 10^{-10} Torr) with integral LCD display	NA
Optional foreline sensor	N/A	Power TTR 90 sensor (atm - 5×10^{-4} Torr) with display on system controller
System control	Manual	Automatic control (one button) or manual
Vent valve control	Vent valve control ¹⁾	Vent valve control ¹⁾
TW main status display	Start, Accel., Norm. Op., Decel., Stop	Start, Accel., Norm. Op., Decel., Stop
TW operating parameters display	Speed, Temps, Current Draw, etc.	Speed, Temps, Current Draw, etc.

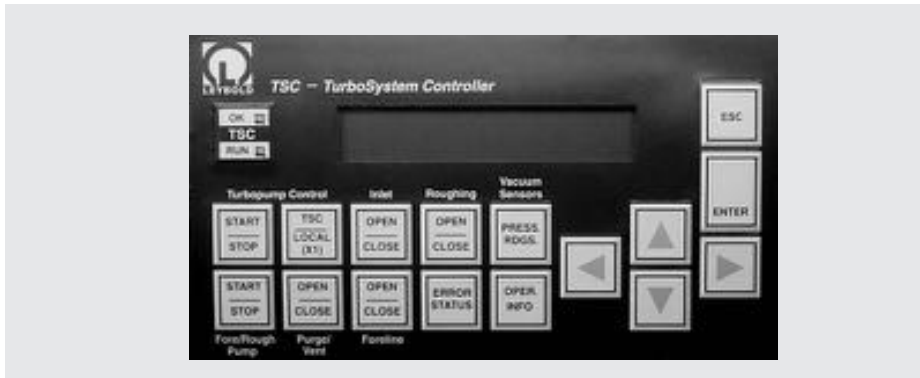
Ordering Information	BMH70 Dry	
	Basic Version ^{2), 3)}	Full-featured Version ^{2), 4)}
BMH70 Dry with inlet flange DN 63 CF with inlet flange DN 63 ISO-K	Part No. 180000V2000 Part No. 180000V1000	Part No. 180000V2400 Part No. 180000V1200

- ¹⁾ The vent valve is optional on a basic and a full-featured system
- ²⁾ An ITR 90 sensor shipped with a BMH70 Dry system will have a flange compatible with the turbomolecular pumps flange type unless otherwise requested. (i.e., DN 63 CF turbomolecular pump = CF 40-flanged ITR 90; DN 63 ISO-K turbomolecular pump = KF 25-flanged ITR 90)
- ³⁾ An optional ITR 90 sensor when ordered with a basic BMH70 Dry system will include an integrated display on the sensor for the pressure readout
- ⁴⁾ The standard ITR 90 sensor shipped with the full-featured BMH70 Dry system does not include an integrated display on the sensor for the pressure readout. (It is available as an option)



Version for the North and South American Continents

TSC - TurboSystem Controller



The TSC controller will:

- ◆ Display all relevant turbo information:
 - Connected pump model
 - Rotation frequency (Hz)
 - Rotation speed (rpm)
 - Bearing temperature (°C)
 - Motor current (Amps)
 - Motor temperature (°C)
 - Supply voltage (V)
 - Heatsink temperature (°C)
 - Cumulative operating time (hours)
- ◆ Power the turbomolecular pump
- ◆ Power the fore/rough pump (up to TRIVAC D 16 B or EcoDry M15, 115 V single phase)
- ◆ Power and display up to three of any manufacturer's smart gauges (must have 0 - 10 V or 4 - 20 mA output capability)
- ◆ Provide degas capability for a hot-cathode ion gauge sensor
- ◆ Power up to three system valves (electro pneumatic with 24 V DC coils) – typically an inlet valve, foreline valve and roughing valve
- ◆ Power a turbomolecular pump vent or purge/vent valve
- ◆ Power an inlet flange heater (CF flanged pumps only)
- ◆ Control the turbomolecular pump, fore/rough pump and all valves

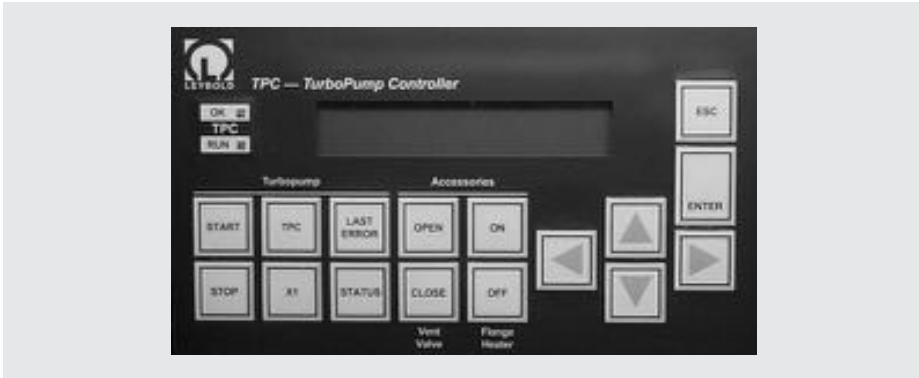
Technical Data	TSC - TurboSystem Controller	
For operating turbomolecular pump TSC-S TurboSystem Controller TSC-L TurboSystem Controller	TURBOVAC TW 300 / TW 70 H -	- TURBOVAC TW 700
Ordering Information	TSC - TurboSystem Controller	
TSC - TurboSystem Controller 110 V, RS 485 C TSC-S TSC-L 110 V, RS 232 C TSC-S TSC-L	Part No. 899 287 -	- Part No. 899 288 - Part No. 899 290
Venting valve 24 V DC, normally open 24 V DC, normally closed	Part No. 899 813 Part No. 899 814	Part No. 899 813 Part No. 899 814

Note:

- All controllers include:
 - 15 ft. (5 m) long cables between TSC controller and turbomolecular pump (power & communication)
 - 6 ft. (2 m) power cord
 - Mating connectors for all accessorizing outlets
 - Operating manual ~ / electrical schematic and spare parts list

Version for the North and South American Continents

TPC - TurboPump Controller



The TPC controller will:

- ◆ Display all relevant turbo information:
 - Connected pump model
 - Rotation frequency (Hz)
 - Rotation speed (rpm)
 - Bearing temperature (°C)
 - Motor current (Amps)
 - Motor temperature (°C)
 - Supply voltage (V)
 - Heatsink temperature (°C)
 - Cumulative operating time (hours)
- ◆ Power the turbomolecular pump
- ◆ Power a turbomolecular pump vent or purge/vent valve
- ◆ Power an inlet flange heater (CF flanged pumps only)
- ◆ Control the turbomolecular pump, flange heater and purge/vent valve

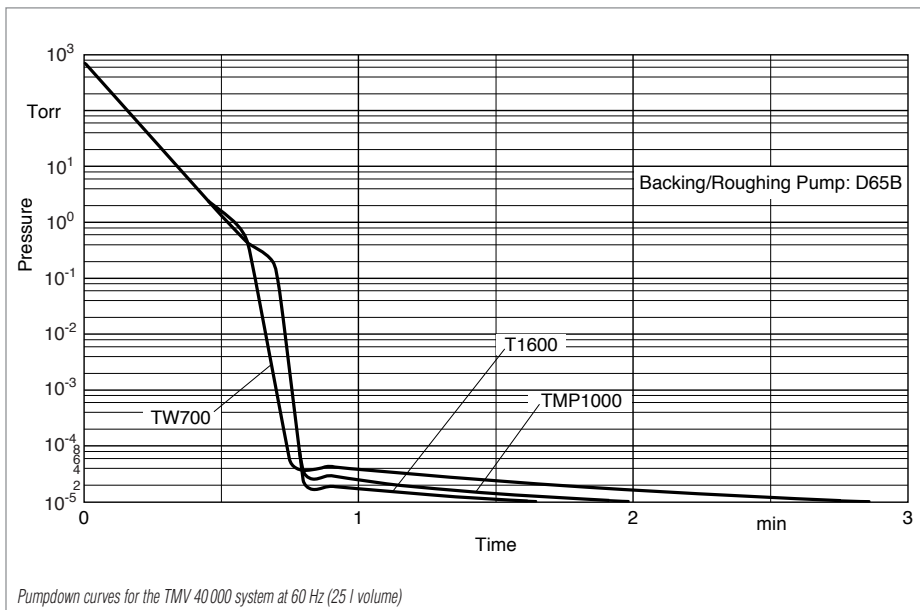
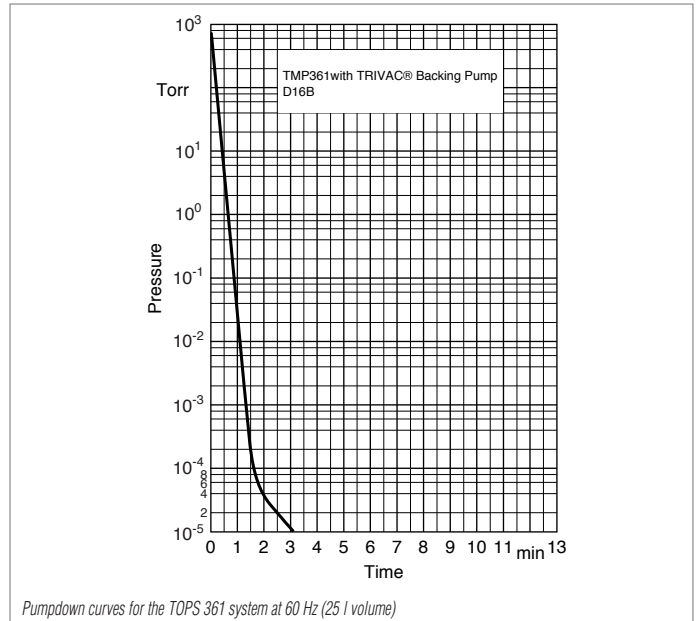
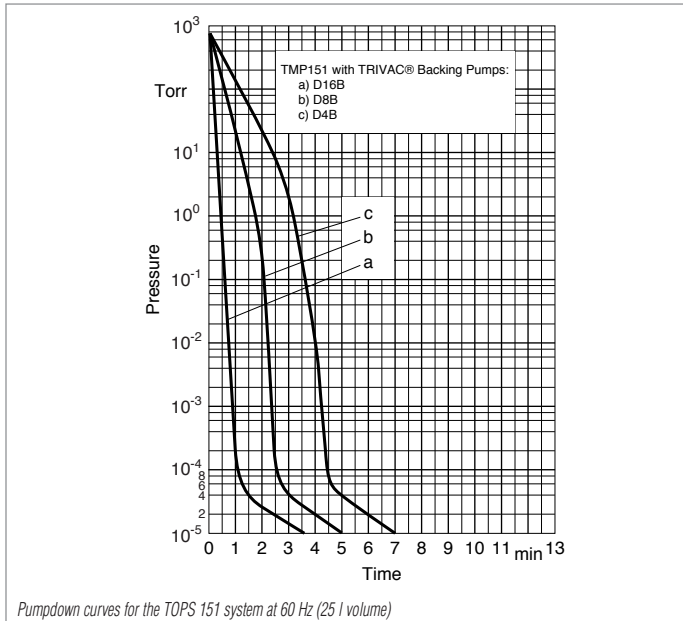


Technical Data	TPC - TurboPump Controller	
For operating turbomolecular pump TPC-S TurboPump Controller TPC-L TurboPump Controller	TURBOVAC TW 300 / TW 70 H –	– TURBOVAC TW 700
Ordering Information	TPC - TurboPump Controller	
TPC - TurboPump Controller 110 V, RS 485 C TPC-S TPC-L 110 V, RS 232 C TPC-S TPC-L	Part No. 899 281 – Part No. 899 283 –	– Part No. 899 282 – Part No. 899 284
Venting valve 24 V DC, normally open 24 V DC, normally closed	Part No. 899 813 Part No. 899 814	Part No. 899 813 Part No. 899 814

Note:

- All controllers include:
- 15 ft. (5 m) long cables between TSC controller and turbomolecular pump (power & communication)
 - 6 ft. (2 m) power cord
 - Mating connectors for all accessorizing outlets
 - Operating manual ~ / electrical schematic and spare parts list

Version for the North and South American Continents

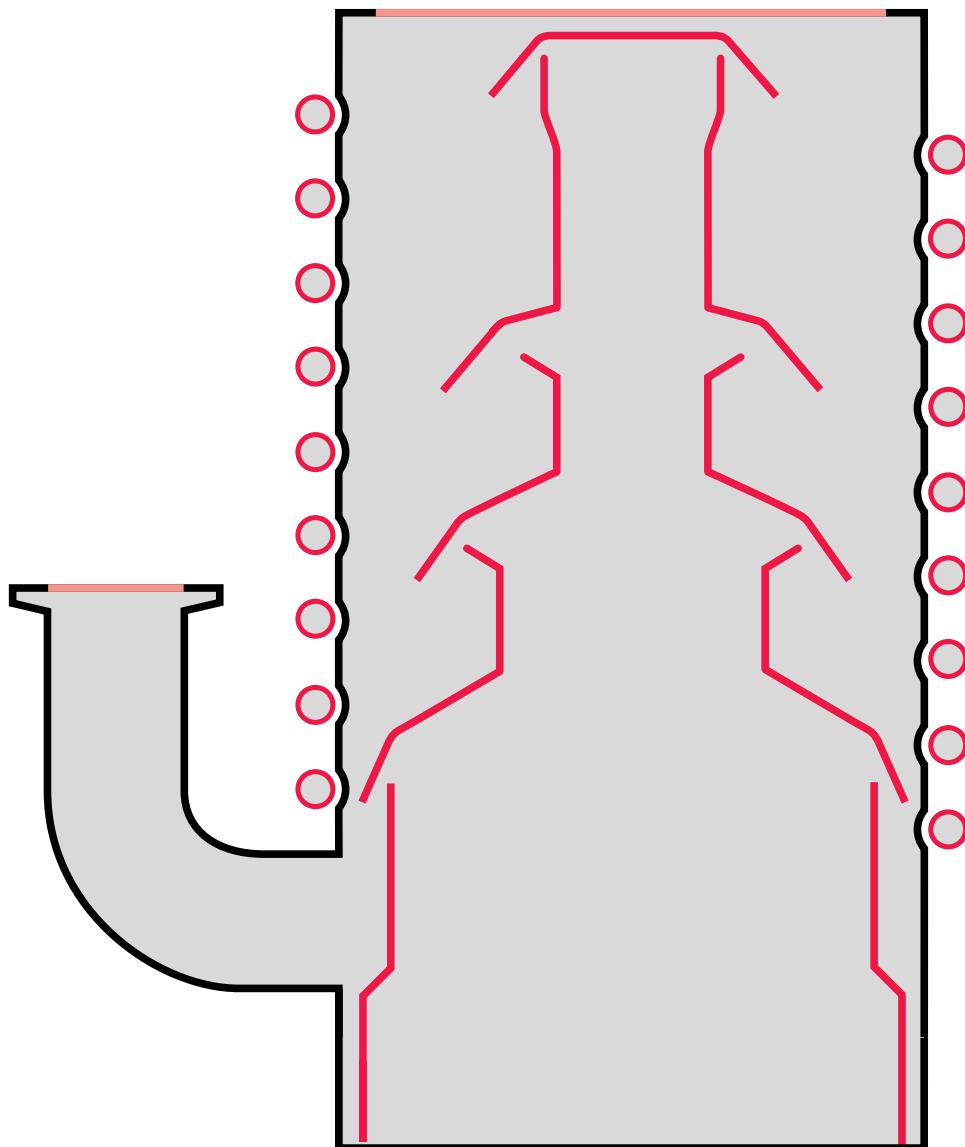


DIP

DIP Oil Diffusion Pumps

3000 - 50000 l x s⁻¹

Oils, Baffles, Accessories,
Adsorption Traps



General

Operating Principle of Fluid Entrainment Vacuum Pumps C11.02
 Applications and Accessories C11.02
 Diffusion Pumps C11.03
 Operating Oil Diffusion Pumps C11.03
 Program Range of Diffusion Pumps C11.04
 Pump Fluids for Diffusion Pumps C11.05

Products

DIP Pumps, Water-Cooled C11.06

Accessories

Astrotorus Baffles C11.09
 Monitoring Instruments C11.10
 Adsorption Traps with Aluminium Oxide Insert C11.12

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 forevacuum port so that it can be pumped out by a backing pump.

Applications and Accessories

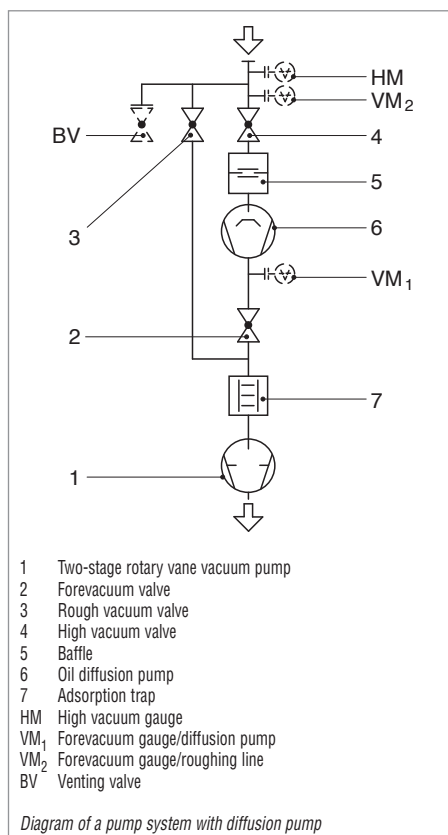
Pumps		DIP 3 000	DIP 8 000	DIP 12 000	DIP 20 000	DIP 30 000	DIP 50 000
Application							
Vacuum coating		◆	◆	◆	◆	◆	◆
Research and development		◆	◆	◆	◆	◆	◆
Metallurgy/furnaces		◆	◆	◆	◆	◆	◆
Mechanical engineering		◆	◆	◆	◆	◆	◆
Accessories							
	Page						
Pump fluids	C11.05	◆	◆	◆	◆	◆	◆
Astrotorus baffle	C11.09	◆	◆	◆	◆	◆	◆
Water flow monitor	C11.10	◆	◆	◆	◆	◆	◆
Overtemperature protection switch	C11.11	◆	◆	◆	◆	◆	◆
Contact thermometer	C11.11	◆	◆	◆	◆	◆	◆
Adsorption trap	C11.12	For generating an oil-free vacuum with oil-sealed backing pumps					

General

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 a pressure of approximately 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
($T = 10 \text{ }^\circ\text{C}$ ($50 \text{ }^\circ\text{F}$))
approx. $1 \times 10^{-5} \text{ mg} \times \text{cm}^{-2} \times \text{min}^{-1}$

The values stated were measured at the ultimate pressure and apply to DIFFELEN normal. When using DC 705 the values may improve on average by one order of magnitude.

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 section "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 (FPM = 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 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 pipes of the pump and the baffle in series, the cooling water must 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 (DIP)

Attainable Ultimate Pressure ¹⁾		DIFFELEN light	DIFFELEN normal	DIFFELEN ultra or DC 704	DC 705
Without baffle	mbar (Torr)	1.5×10^{-5} (1.1×10^{-5})	1.5×10^{-6} (1.1×10^{-6})	6.0×10^{-7} (4.5×10^{-7})	4.0×10^{-7} (3.0×10^{-7})
With cold cap baffle	mbar (Torr)	6×10^{-6} (4.5×10^{-6})	6×10^{-7} (4.5×10^{-7})	3.0×10^{-7} (2.3×10^{-7})	1.5×10^{-7} (1.1×10^{-7})
With Astrotorus baffle	mbar (Torr)	1.5×10^{-6} (1.1×10^{-6})	1.5×10^{-7} (1.1×10^{-7})	3.0×10^{-8} (2.3×10^{-8})	1.5×10^{-8} (1.1×10^{-8})

¹⁾ Attained in consideration of the notes given under "Sealing Methods" in the section "General" and after degassing the connected vacuum chamber for several hours at 200 °C (392 °F)

Program Range of Diffusion Pumps

Technical Data		DIP 3 000	DIP 8 000	DIP 12 000	DIP 20 000	DIP 30 000	DIP 50 000
Pumping speed for air (in range $< 10^{-4}$ mbar)	$l \times s^{-1}$	3 000	8 000	12 000	20 000	30 000	50 000
Operating range	mbar (Torr)	$< 10^{-2}$ ($0.75 \times < 10^{-2}$)					
Ult. total press. with DC 705 and baffle, approx.	mbar (Torr)	$< 10^{-8}$ ($0.75 \times < 10^{-8}$)					
Max. permissible forevacuum pressure	mbar (Torr)	0.6 (0.45)	0.6 (0.45)	0.6 (0.45)	0.6 (0.45)	0.6 (0.45)	0.6 (0.45)
Heating power	kW	2.4	4.8	7.2	12	18	24
Heating up time	min	< 25	< 25	< 25	< 25	< 30	< 30
Cooling water (minimum throughput)							
Pump	$l \times h^{-1}$ (gal/min)	160 (10)	290 (18.3)	500 (31.5)	600 (37.8)	900 (56.7)	1500 (94.5)
Cold cap baffle	$l \times h^{-1}$ (gal/min)	20 (1.3)	40 (2.5)	50 (3.2)	80 (5.0)	80 (5.0)	150 (9.5)
Weight, approx.	kg (lbs)	29 (64.0)	70 (154.5)	102 (225.2)	172 (379.7)	296 (653.4)	560 (1236.2)
Recommended backing pump ²⁾							
at operating pressures $> 10^{-4}$ mbar ($> 0.75 \times 10^{-4}$ Torr)		TRIVAC D 65 B + W 251	DK 200 + W 251	DK 200 + W 501	SV 200 + W 501	SV 300 + W 1001	SV 630 + W 2001
at operating pressures $< 10^{-4}$ mbar ($< 0.75 \times 10^{-4}$ Torr)		TRIVAC D 25 B	TRIVAC D 65 B + W 251	TRIVAC D 65 B + W 251	TRIVAC D 65 B + W 251	DK 200 + W 251	DK 200 + W 501
Ordering Information		DIP 3 000	DIP 8 000	DIP 12 000	DIP 20 000	DIP 30 000	DIP 50 000
Diffusion pump		Part No. 222 10	Part No. 222 20	Part No. 222 25	Part No. 222 30	Part No. 222 35	Part No. 222 40

²⁾ Single- or two-stage rotary vane (TRIVAC; SV) or rotary piston vacuum pumps (E/DK) from our range of backing pumps jointly with Roots vacuum pumps (RUVAC) in pump systems

Pump Fluids for Diffusion Pumps

Pump fluids for oil diffusion pumps must exhibit a low vapor pressure at room temperature and must be able to resist thermal decomposition and oxidization 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 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.

The pump fluids given below are subjected to an extensive series of tests in our factory laboratories under conditions commonly encountered in practice by diffusion pumps.

We recommend the use of the pump fluids specifically qualified by Leybold, since only this will ensure that the specifications will be met by our

diffusion pumps in practice. Equally we recommend the use of qualified pump fluids to attain the optimum oil change intervals and prevent the accumulation of unwanted deposits.

Mineral Oil Pump Fluid DIFFELEN

The various types of this kind of pump fluid are closely tolerated fractions of a high quality base product distilled with particular care. During the distillation process the pressure and temperature conditions are maintained continuously within close limits, so that individual fractions are obtained which are of consistent quality.

- ◆ **DIFFELEN light** is the lightest fraction. It even provides full pumping speed at high pressures. It is the ideal pump fluid for pressures down to 10^{-5} mbar. The attainable ultimate pressure is 10^{-7} mbar.
- ◆ **DIFFELEN normal** is the most frequently used pump fluid. It is the ideal pump fluid for high vacuum applications. The attainable ultimate pressure is below 10^{-7} mbar (0.75×10^{-7} Torr).

- ◆ **DIFFELEN ultra** is used in connection with ultrahigh vacuum pump systems. With a water-cooled baffle the attainable ultimate pressure is about 10^{-8} mbar (0.75×10^{-8} Torr).

Silicone Oil

Silicone oil differs from DIFFELEN oil in that silicone oil is a defined chemical compound which is extremely resistant to decomposition. Because of the extremely low vapor pressure, silicone oil is especially well suited as a pump fluid in diffusion pumps. Even after a great number of air inrushes, silicone oil will remain unaffected by aging even when subjected to mass spectrometric analysis.

DC 704 is a pump fluid for high vacuum and ultra high vacuum applications with stringent requirements concerning resistance against oxidization and decomposition.

DC 705 is a special pump fluid (an organic silicon compound) for ultrahigh vacuum applications which require an extremely low vapor pressure together with stringent requirements concerning resistance against oxidization and decomposition.

Overview Pump Fluids

Technical Data		Mineral Oil/DIFFELEN			Silicone Oil		
		light	normal	ultra	DC 704	DC 705	
Vapor pressure	at 20 °C (68 °F)	mbar (Torr)	2×10^{-8} (1.5×10^{-8})	4×10^{-9} (3×10^{-9})	4×10^{-11} (3×10^{-11})	3×10^{-8} (2.3×10^{-8})	4×10^{-10} (3×10^{-10})
	at 25 °C (77 °F)	mbar (Torr)	–	–	–	–	–
Middle molecular weight	g/mol	500	510	600	485	545	
Flash point	°C (°F)	> 240 (> 464)	> 258 (> 496)	> 270 (> 518)	221 (430)	243 (469)	
Dyn. viscosity at 25 °C (77 °F)	mPas	115	200	220	47	190	
Kin. viscosity at 40 °C (104 °F)	mm ² /s	60	100	110	24	66	
Density at 20 °C (68 °F)	g/ml	0.86	0.87	0.87	1.07 ¹⁾	1.09 ¹⁾	
Ordering Information *)		Mineral Oil/DIFFELEN			Silicone Oil		
		light	normal	ultra	DC 704	DC 705	
0.5 l (0.47 qts)		Part No. 176 69	Part No. 176 73	Part No. 176 71	Part No. 176 94	Part No. 176 96	
5.0 l (4.7 qts)		Part No. 176 68	Part No. 176 72	–	Part No. 500 600 ²⁾	–	
1.0 gal (DC 704 CA)		–	–	–	Part No. 981 98 069	–	
5.0 gal (DC 704 CP)		–	–	–	Part No. 981 98 070	–	

¹⁾ At 25 °C (77 °F)

²⁾ 5 kg (11.04 lbs)

*) Oil must be purchased separately

Please note that the technical data stated are only typical data. Slight variations from batch to batch must be expected. The technical data given here can not be taken as assured data

For all lubricants in our line of products you may obtain Safety Data Sheets from the Dept. Technical Support in Cologne.

DIP Pumps, Water-Cooled



DIP 12000

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 DIP 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 temperature monitor which is built-in as standard acts as a 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

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.

Technical Data		DIP 3 000	DIP 8 000	DIP 12 000	DIP 20 000	DIP 30 000	DIP 50 000
High vacuum/forevacuum connection	DN	250 ISO-K/63 ISO-K	400 ISO-K/63 ISO-K	500 ISO-K/100 ISO-K	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 x s ⁻¹	3 000	8 000	12 000	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 ²⁾	mbar (Torr)	< 5×10^{-7} (6.7×10^{-7})					
Max. permissible forevacuum pressure	mbar (Torr)	6×10^{-1} (4.5×10^{-1})					
Pump fluid filling, min./max.	l (qts)	1.0 / 1.4 (1.1 / 1.5)	2.0 / 3.4 (2.1 / 3.6)	3.0 / 5.5 (3.2 / 5.8)	6.0 / 9.0 (6.3 / 9.5)	10 / 15 (10.6 / 15.9)	15 / 25 (15.9 / 26.4)
Main connection							
Standard, 50/60 Hz	V	230 ~ 1 Ph	230/400 ~ 3 Ph Δ/Y	400 ~ 3 Ph Y	230/400 ~ 3 Ph Δ/Y	230/400 ~ 3 Ph Δ/Y	230/400 ~ 3 Ph Δ/Y
Special, 50/60 Hz	V		460 ~ 3 Ph Δ		460 ~ 3 Ph Δ	460 ~ 3 Ph Δ	460 ~ 3 Ph Δ
Heating power	kW	2.4	4.8	7.2	12	18	24
Number of heating cartridges		2	6	9	12	18	24
Heating up time	min	< 25	< 25	< 25	< 25	< 30	< 30
Cooling water (minimum) for pump ³⁾	l x h ⁻¹ (gal/min)	160 (10)	290 (18.3)	500 (31.5)	600 (37.8)	900 (56.7)	1500 (94.5)
for cold cap baffle	l x h ⁻¹ (gal/min)	20 (1.3)	40 (2.5)	50 (3.2)	80 (5.0)	80 (5.0)	150 (9.5)
Max. supply pressure	bar (psig)	6 (87)	6 (87)	6 (87)	6 (87)	6 (87)	6 (87)
Number of cooling circuits (including cold cap baffle)		2	2	2	2	3	3
Cooling water connection for pump	G (BPS)	3/8"	1/2"	1/2"	1/2"	1/2"	1/2"
for cold cap baffle	G (BPS)	1/4"	3/8"	3/8"	3/8"	3/8"	3/8"
Weight, approx.	kg (lbs)	29 (64)	70 (154)	102 (225)	172 (379)	296 (653)	560 (1235)
Recommended backing pump ⁴⁾ at operating pressures > 10^{-4} mbar (> 0.75×10^{-4} Torr)		TRIVAC D 65 B + W 251	DK 200 + W 251	DK 200 + W 501	SV 200 + W 501	SV 300 + W 1001	SV 630 + W 2001
at operating pressures < 10^{-4} mbar (< 0.75×10^{-4} Torr)		TRIVAC D 25 B	TRIVAC D 65 B + W 251	TRIVAC D 65 B + W 251	TRIVAC D 65 B + W 251	DK 200 + W 251	DK 200 + W 501
Ordering Information		DIP 3 000	DIP 8 000	DIP 12 000	DIP 20 000	DIP 30 000	DIP 50 000
Oil diffusion pump		Part No. 222 10	Part No. 222 20	Part No. 222 25	Part No. 222 30	Part No. 222 35	Part No. 222 40
Astrotorus baffle		Part No. 227 50	Part No. 227 60	Part No. 227 65	Part No. 227 70	Part No. 227 75	Part No. 227 80
Water flow monitor							
LR 10		Part No. 122 82	Part No. 122 82	–	–	–	–
LR 20		–	–	Part No. 122 83	Part No. 122 83	Part No. 122 83	Part No. 122 83
Over-temperature protection switch		Part No. 122 84					
Contact thermometer		Part No. 218 81					
Resistance thermometer PT 100 sensor		Part No. 200 02 958					
Pump fluid ⁵⁾		see "Pump Fluids for Diffusion Pumps" in section "General"					

Version for the North and South American Continents

Oil diffusion pump	–	Part No. 222 20-460 V	Part No. 222 25-460 V	Part No. 222 30-460 V	Part No. 222 35-460 V	Part No. 222 40-460 V
Special connection flange	upon request					

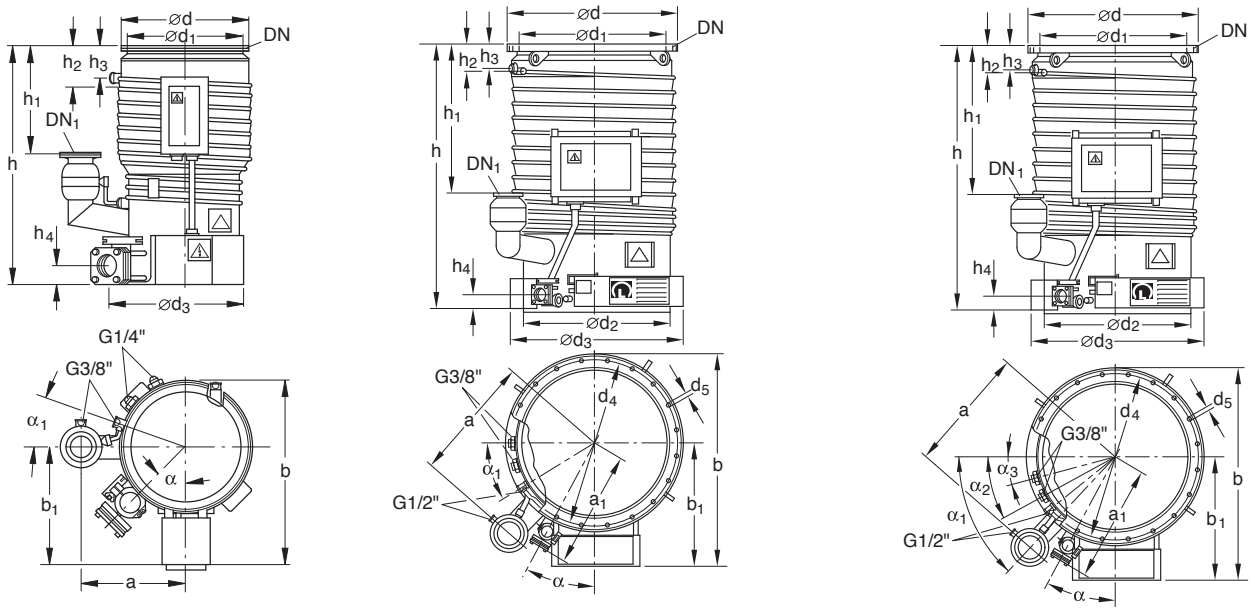
¹⁾ Measured to DIN 28 427 with **DIFFELEN normal** as the pump fluid

²⁾ Measured to DIN 28 427 with **DIFFELEN normal** as the pump fluid. With pump fluids DC 705 and FPM gaskets the DIP pumps - when equipped with water-cooled baffles and after running a suitable degassing processes - are capable of attaining pressures below 1×10^{-8} mbar (0.75×10^{-8} Torr)

³⁾ The required quantity of cooling water refers to $\Delta T = 10$ °C (50 °F). The discharge temperature should not exceed 30 °C (86 °F)

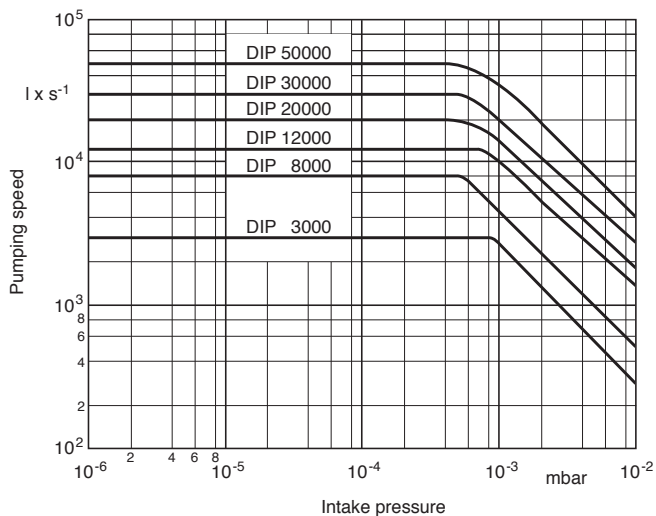
⁴⁾ Single- or two-stage rotary vane (TRIVAC; SV) or rotary piston vacuum pumps (E/DK) from our range of forevacuum pumps jointly with Roots vacuum pumps (RUVAC) in pump systems

⁵⁾ Oil must be purchased separately



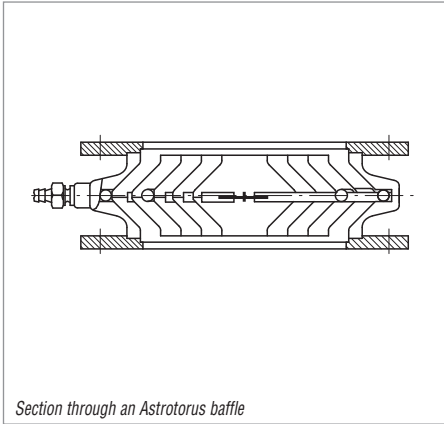
DIP	3 000	8 000	12 000	20 000	30 000	50 000
DN	250 ISO-K	400 ISO-K	500 ISO-K	630 ISO-F	800 ISO-F	1000 ISO-F
DN ₁	63 ISO-K	63 ISO-K	100 ISO-K	100 ISO-K	160 ISO-K	160 ISO-K
a	240 (9.45)	350 (13.78)	420 (16.54)	540 (21.26)	600 (23.62)	800 (31.5)
a ₁	250.5 (9.86)	375.5 (14.78)	432 (17)	496 (19.53)	536 (21.10)	636 (25.04)
b	443 (17.44)	643 (25.41)	775 (30.51)	920 (36.22)	1090 (42.91)	1290 (50.79)
b ₁	276 (10.87)	373 (14.69)	460 (18.11)	540 (21.26)	630 (24.8)	730 (28.74)
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 ₃	68 (2.68)	88 (3.46)	92 (3.62)	97 (3.82)	102 (4.02)	102 (4.02)
h ₂	75 (2.95)	102 (4.02)	106 (4.17)	110 (4.33)	116 (4.57)	116 (4.57)
h ₄	45 (1.77)	68 (2.68)	68 (2.68)	74 (2.91)	70 (2.76)	70 (2.76)
α	45°	30°	30°	30°	20°	25°
α ₁	20°	30°	30°	30°	30°	45°
α ₂	-	-	-	-	-	25°
α ₃	-	-	-	-	-	15°

Dimensional drawing for the DIP 3000 [left], DIP 8000 to DIP 30 000 [middle] and DIP 50 000 [right]; dimensions in brackets () are in inch



Pumping speed characteristics of the DIP pumps as a function of intake pressure

Astrotorus Baffles



The cooling inserts of the astrotorus baffles are made of copper, whereas the housing and the connection flange are made of standard steel.

DN	a	b	∅ d	∅ d ₁	∅ d ₂	Quantity	h	h ₁	α	α ₁
250 ISO-K	mm	265	30	416	290	-	195	97	-	-
	in.	10.4	0.18	16.4	11.4	-	7.68	3.82	-	-
400 ISO-K	mm	362	120	512	450	-	193	96	-	-
	in.	14.25	4.72	20.2	17.7	-	7.6	3.78	-	-
500 ISO-K	mm	412	120	612	550	-	193	96	-	-
	in.	16.22	4.72	24.1	21.7	-	7.6	3.78	-	-
630 ISO-F	mm	440	-	750	720	14	20	-	18°	9°
	in.	17.32	-	29.53	28.35	0.55	20	-	18°	9°
800 ISO-F	mm	546	-	920	890	14	24	-	15°	7.5°
	in.	21.5	-	36.22	35.04	0.55	24	-	15°	7.5°
1000 ISO-F	mm	599	-	1120	1090	14	32	-	11.25°	5.625°
	in.	23.58	-	44.09	42.91	0.55	32	-	11.25°	5.625°

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	20 000	30 000	50 000
HV connection flanges	DN	250 ISO-K	400 ISO-K	500 ISO-K	630 ISO-F	800 ISO-F	1000 ISO-F
Throttling of the pumping speed, approx.	%	30					
Conductance	l x s ⁻¹	3000	9000	12 000	18 000	28 000	50 000
Weight	kg (lbs)	25 (55.2)	30 (66.2)	65 (143.5)	120 (264.9)	170 (375.3)	190 (419.4)

Ordering Information		Astrotorus Baffles					
Astrotorus baffle							
250 ISO-K	Part No. 227 50	-	-	-	-	-	-
400 ISO-K	-	Part No. 227 60	-	-	-	-	-
500 ISO-K	-	-	Part No. 227 65	-	-	-	-
630 ISO-F	-	-	-	Part No. 227 70	-	-	-
800 ISO-F	-	-	-	-	Part No. 227 75	-	-
1000 ISO-F	-	-	-	-	-	Part No. 227 80	-

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.

Type LR 10 for 60 to 600 l x h⁻¹
(3.78 to 37.8 gal/min)

Type LR 20 for 600 to 2400 l x h⁻¹
(37.8 to 151.2 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.

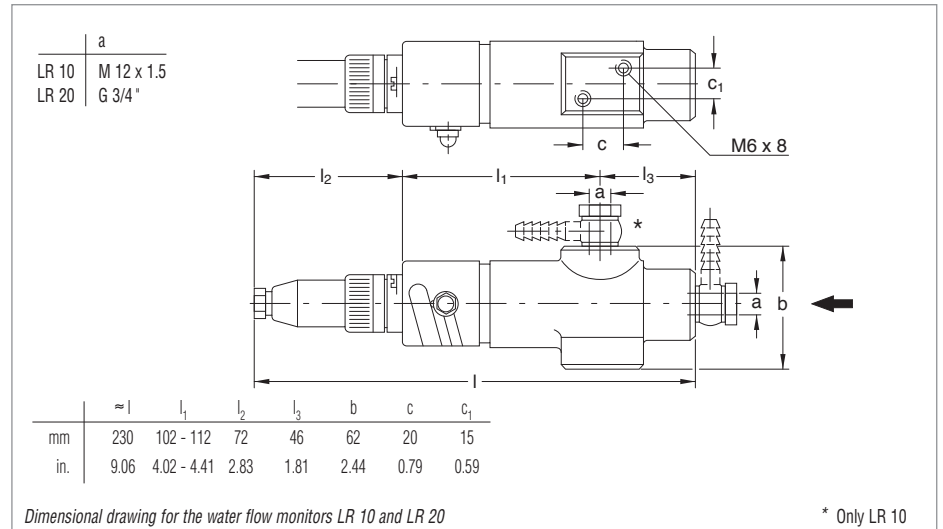
Max. switching capacity:
100 VA (230 V, 50/60 Hz).

Protection against Power Failure

A SECUVAC valve (see Product Section C14 "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 safety 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 C16 "Total Pressure Gauges").



Ordering Information

Water flow monitor
LR 10
LR 20

Monitoring Instruments

Part No. 122 82
Part No. 122 83

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.

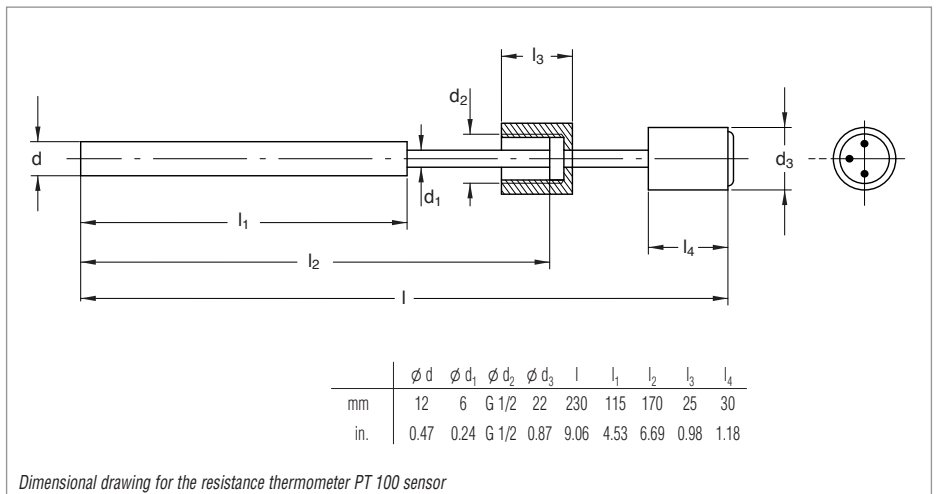
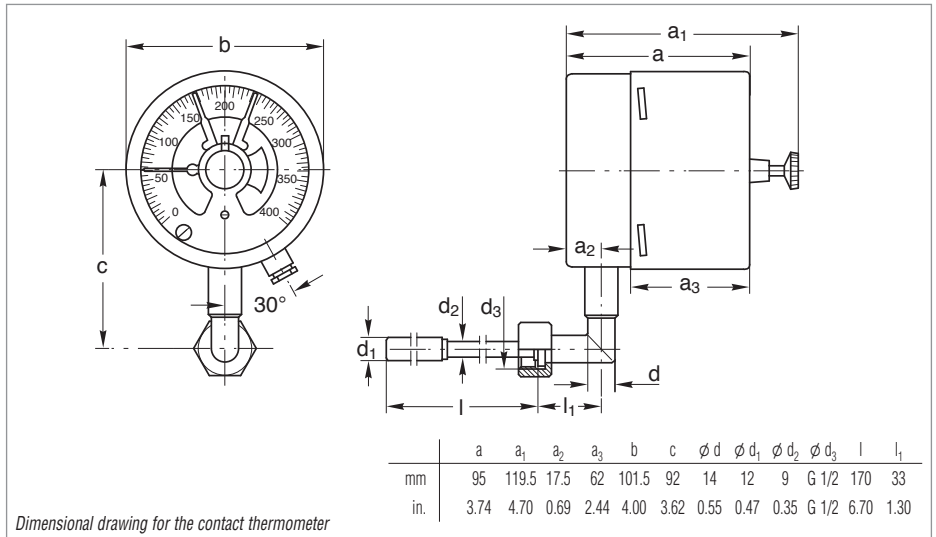
The lower threshold indicates that the diffusion pump has cooled down to such an extent that the backing pump and the cooling water supply may be switched off.

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 pump's body.

Max. switching current: 5 A (230 V, 50/60 Hz)

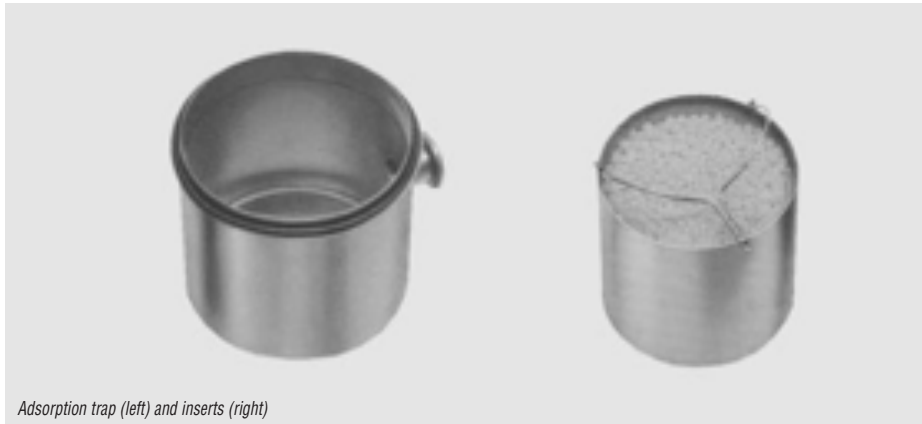
Contact thermometer with a range from 0 to 400 °C (752 °F). Through a trailing pointer two switching thresholds may be set up independently. The current oil temperature and the thresholds which have been set up can be read off at the location of the diffusion pump. The contacting thermometer is not suited for remote signalling of temperatures.

Resistance thermometer PT 100 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 PT 100 sensor is ideal for remote signalling of temperatures.



Ordering Information	Monitoring Instruments
Over-temperature protection switch	Part No. 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))	Part No. 218 81
Resistance thermometer PT 100 sensor	Part No. 200 02 958

Adsorption Traps with Aluminum Oxide Insert



Adsorption trap (left) and inserts (right)

Adsorption traps are used in all those cases where a vacuum free of oil is to be produced with the aid of oil-sealed vacuum pumps.

Advantages to the User

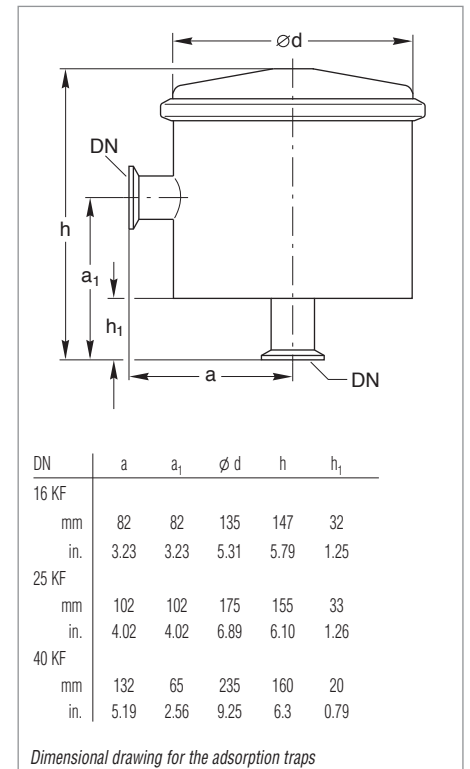
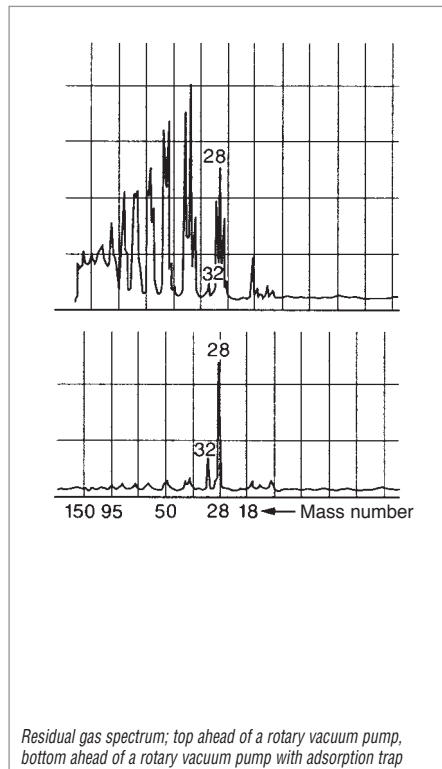
- ◆ Backstreaming of oil is reduced by 99 %
- ◆ Long service life
- ◆ High conductance
- ◆ Filling can be easily exchanged
- ◆ Improvement in the ultimate pressure attained by backing pumps by one order of magnitude
- ◆ Stainless steel housing and insert
- ◆ NBR gasket

Typical Applications

- ◆ Product of an oil-free vacuum

Supplied Equipment

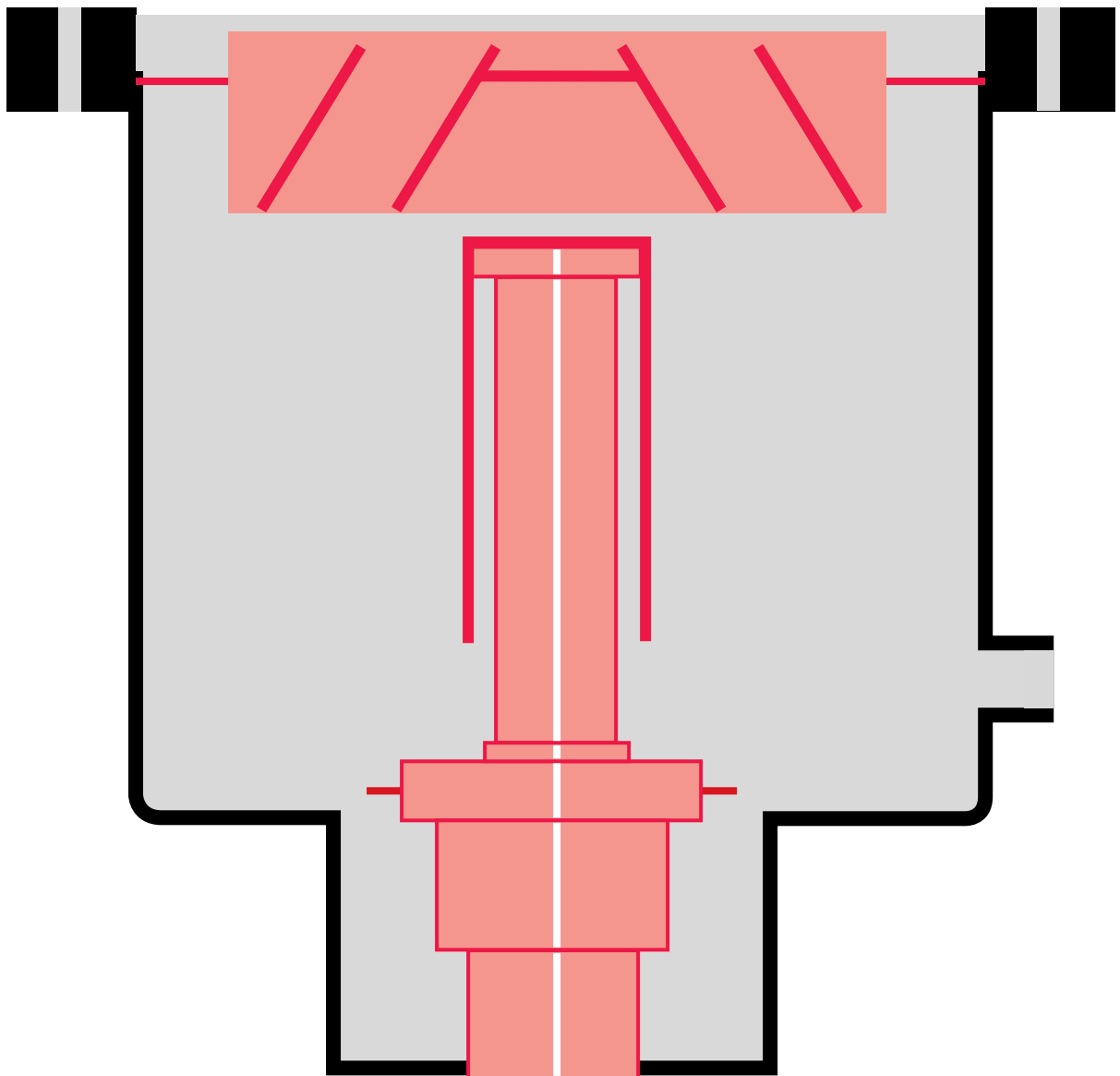
- ◆ Complete with insert
- ◆ Without adsorbent



Technical Data		16 KF	25 KF	40 KF
Conductance at 10 ⁻² mbar (Torr)	mbar x l x s ⁻¹ (Torr x l x sec)	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 (8.8)
Ordering Information		16 KF	25 KF	40 KF
Adsorption trap		Part No. 854 14	Part No. 854 15	Part No. 854 16
Activated aluminum oxide, 2 l (approx. 1.3 kg (2.8 lbs))		Part No. 854 10		

C12

Cryopumps, Cryogenics



General

Applications and Accessories
 Cryopumps **C12.03**
 Cold Heads **C12.04**
 General
 Cryopumps **C12.05**
 Multiple-Operation of Refrigerator Cryopumps **C12.06**
 Regenerating Cryopumps **C12.06**
 Refrigerating Capacity of Cold Heads **C12.07**
 Cold Heads **C12.07**
 Compressor Units **C12.09**

Products

Cryopumps

Standard Cryopumps
 COOLVAC 800 **C12.10**
 Cryopumps with Fully Automatic Control
 ClassicLine
 COOLVAC 1.500 CL, 2.000 CL, 3.000 CL **C12.12**
 COOLVAC 5.000 CL, 10.000 CL **C12.18**
 COOLVAC 18.000 CL, 30.000 CL **C12.22**
 SemiLine
 COOLVAC 1500 SL **C12.24**
 System Controller SC / Power Supply PS **C12.25**

Conversion of Units

Celsius, Fahrenheit, Kelvin

Kelvin (abbreviated as K) is the unit of temperature.

Temperatures on the Kelvin scale are converted into temperatures on the Celsius scale as follows:

$$n \text{ } ^\circ\text{C} \cong (n + 273.15) \text{ K.}$$

Since the following equation applies between Celsius scale and Fahrenheit scale

$$n \text{ } ^\circ\text{F} \cong 5/9 (n - 32) \text{ } ^\circ\text{C}$$

it follows that

$$n \text{ } ^\circ\text{F} \cong 5/9 (n + 459.67) \text{ K.}$$

The inverse equations are as follows:

$$m \text{ K} \cong (m - 273.15) \text{ } ^\circ\text{C}$$

$$m \text{ } ^\circ\text{C} \cong (1.8 m + 32) \text{ } ^\circ\text{F}$$

$$m \text{ K} \cong (1.8 m - 459.67) \text{ } ^\circ\text{F.}$$

The following applies in particular to absolute Zero:

$$0 \text{ K} \cong -273.15 \text{ } ^\circ\text{C} \cong -459.67 \text{ } ^\circ\text{F.}$$

$$1 \text{ bar} = 14.5 \text{ psi}$$

$$1 \text{ MPa} = 10 \text{ bar}$$

Cryogenics

Cold Heads
 Single Stage Cold Head COOLPOWER 120 T **C12.28**
 Dual Stage Cold Heads
 COOLPOWER 7/25, 5/100 and 5/100 T **C12.30**
 Compressor Units COOLPAK 4000/4200, COOLPAK 6000/6200. **C12.32**
 General Accessories for Compressor Units COOLPAK **C12.34**
 Refrigerator Cryostats
 Based on RDK 6-320 **C12.35**
 Optical, based on RDK 6-320 **C12.36**

Accessories

Cryopumps / Cryogenics

Controllers and Monitoring Units for Cryopumps **C12.38**
 COOLVAC ClassicLine, System Configuration
 Single Operation **C12.39**
 Dual Operation **C12.40**
 Dual and Multiple Operation **C12.41**
 Modell 9700 Low Temperature Controller **C12.42**
 MODEL 1901 Low Temperature Measuring Instrument **C12.43**
 Temperature Sensors (Silicon Diode) **C12.44**
 Safety Valve **C12.45**
 Precision Manometer **C12.45**

Cryo pumps		COOLVAC 800	COOLVAC 1.500 CL	COOLVAC 2.000 CL	COOLVAC 3.000 CL	COOLVAC 5.000 CL	COOLVAC 10.000 CL	COOLVAC 18.000 CL	COOLVAC 30.000 CL	COOLVAC 1.500 SL	
Application											
UHV systems		◆	◆	◆						◆	
Beam tubes in particle accelerators		◆									
Transfer chambers / Loadlock		◆	◆	◆	(◆)					◆	
General research		◆	◆	◆	◆	◆	◆	◆	◆	◆	
Evaporation coating systems			◆	◆	◆	◆	◆	◆	◆	◆	
Sputtering systems			◆	◆	◆					◆	
Ion implanters			◆	◆	◆	(◆)				◆	
Metallization systems			◆	◆	◆	◆	◆			◆	
Space simulation chambers					◆	◆	◆	◆			
Electron beam welding systems						◆	◆	◆			
Accessories											
	Page										
COOLPAK 4000/4200 compressor unit	C12.32	◆	◆	◆	◆					◆	
COOLPAK 6000/6200 compressor unit	C12.32				[◆]	◆	◆	◆	◆		
MODEL 1901 low temperature measuring instrument	C12.43	◆									
Temperature sensors (silicon diode)	C12.44	◆									
GD 2 gas manifold	C12.34	◆	◆	◆	◆	◆				◆	
GD 4 gas manifold	C12.34	◆	◆	◆						◆	

(◆) = Only conditionally suited

[◆] = For dual operation only

Cold Heads		COOLPOWER 120 T				COOLPOWER 725				COOLPOWER 5/100				COOLPOWER 5/100 T			
		Application															
Cooling of samples and detectors		♦		♦		♦		♦		♦		♦		♦			
Cooling of superconductors				♦		♦		♦		♦		♦		♦			
Cooling of cryopanel		♦		♦		♦		♦		♦		♦		♦			
Cleaning of gases		♦		♦		♦		♦		♦		♦		♦			
Calibration of sensors				♦													
Optical spectroscopy				♦		♦		♦		♦		♦		♦			
Infrared spectroscopy				♦		♦		♦		♦		♦		♦			
Matrix spectroscopy				♦								♦		♦			
Testing of superconductors				♦													
Cooling of superconducting magnets, coils and components $HT_c + LT_c$								♦		♦		♦		♦			
Accessories		Page															
COOLPAK 4000/4200 compressor unit		C12.32				♦											
COOLPAK 6000/6200 compressor unit		C12.32		♦				♦		♦		♦		♦			
Modell 9700 low temperature controller		C12.42				♦		♦		♦		♦		♦			
MODEL 1901 low temperature measuring instrument		C12.43		♦		♦		♦		♦		♦		♦			
Temperature sensors (silicon diode)		C12.44		♦		♦		♦		♦		♦		♦			

Cryopumps

Cryopumps 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 difference is made between refrigerator cryopumps, bath cryopumps and evaporator cryopumps.

LEYBOLD manufactures only cryopumps which are cooled by means of a refrigerator.

Advantages to the User

Advantages offered by the Pumping Principle

- ◆ High effective pumping speed for all gases
- ◆ Extremely high pumping speed for water vapor

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 (mechanically suspended turbomolecular pumps, for example), cryopumps 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

- ◆ Much more compact than comparable pump systems offering a pumping speed of over $1500 \text{ l} \times \text{s}^{-1}$
- ◆ Backing pump is only required during start-up and during regeneration

- ◆ Easy process control and pump control via computer
- ◆ Favorable price-to-performance ratio and low running costs especially at higher pumping speeds

The cryopumps are cooled by the well-proven two-stage cold heads 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 (9) cools the thermal radiation shield (5) and the baffle (6) of the pump. Depending on the type of pump and the operating conditions operating temperatures of 45 to 80 K are attained.

Correspondingly water vapor condenses at this temperature.

The thermal shield and baffle are made of copper which conducts heat very well so as to optimally utilize the refrigerating capacity which is available.

Moreover, the thermal shield is metallized so that reflective losses will be minimal.

The second stage of the cold head (7) is used to cool the cryopanel (8). Depending on the operating conditions, operating temperatures of 10 to 20 K are attained.

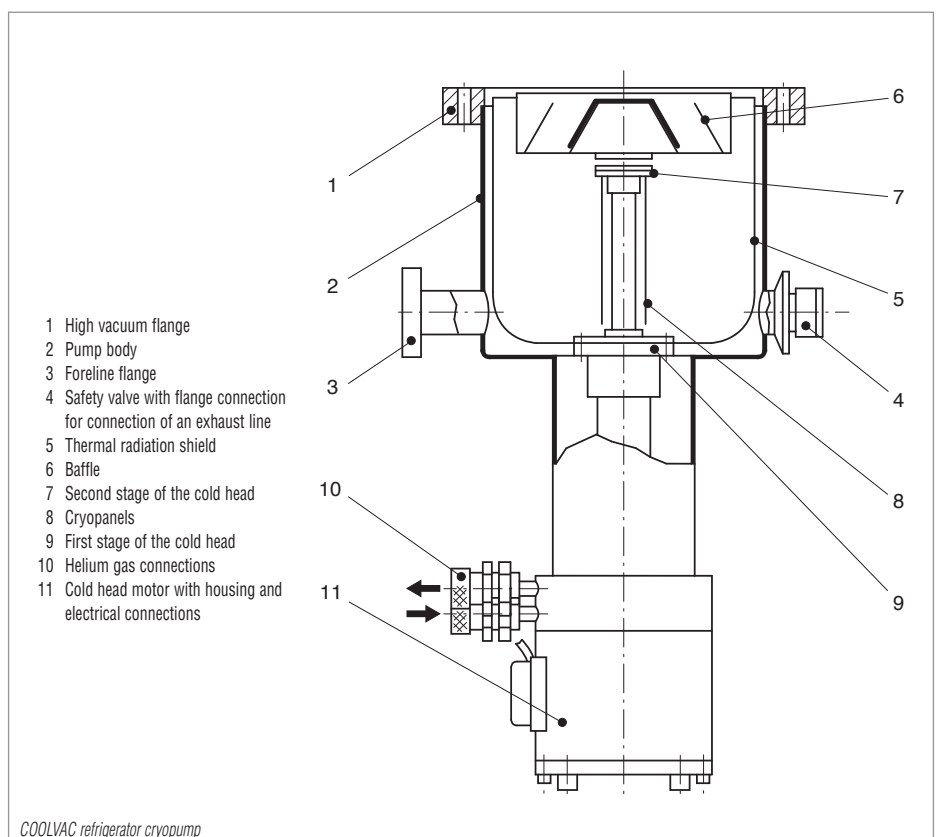
Here the process of cryocondensation of N_2 , O_2 and argon will take place.

The active pumping surfaces are made of copper of high thermal conductivity and they are tightly linked thermally to the second stage of the cold head. H_2 , Ne and He are also adsorbed on to these surfaces which are partly covered with activated charcoal.

All cryopumps from the COOLVAC range are equipped with a safety valve which is set in the factory so that it will open at an overpressure of 150 mbar (113 Torr). In order to be able to safely remove any gases which may present a health hazard when the safety valve responds, the valve is equipped with an additional DN 40 KF flange where an exhaust line is connected.

The pump's body, all flanges and the safety valve are made of high-quality stainless steel.

Upon request we will be pleased to mail you our special publication SO 182.04.02 "Benefits of modern refrigerator cryopumps in industrial processes and research".



Multiple Operation of Refrigerator Cryopumps

The powerful LEYBOLD compressor units COOLPAK 4000 D and 6000 D open up the possibility of operating two cold heads or refrigerator cryopumps simultaneously.

Multiple operation means operation of several cryopumps with one compressor unit.

Regenerating Cryopumps

An important aspect in the operation of cryopumps is that of regeneration. Since a cryopump is a gas entrapment pump, the gasses which have accumulated in the pump during the "pumping" mode must from time to time be removed from the pump. This is done by switching the compressor unit off and by warming up the cryopanel to room temperature or slightly higher so that the released substances can be pumped out by a forevacuum pump.

Cryopumps without Electric Regeneration System

The cryopump is warmed up to room temperature by purging the inside of the pump with a dry, pre-warmed inert gas (such as nitrogen). In this case it is not possible to set up defined and controlled temperatures within the cryopump. Thus the simultaneous presence of gases such as hydrogen and oxygen in the pump can not be entirely excluded. The formation of ignitable gas mixtures is only prevented by the diluting effect of the dry inert gas.

Advantages to the User

- ◆ Significantly reduced investment and operating costs
- ◆ Small footprint

Cryopumps with Fully Automatic Electric Regeneration System from LEYBOLD

The cryopump is warmed up to room temperature by heating the 1st and 2nd stages of the cold head with electric heaters. In this case, a defined and controlled temperature distribution within the cryopump can be set up. This controlled warming process ensures that the pumped gases are removed sequentially, i.e. 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 electric method of regeneration from LEYBOLD prevents gases such as hydrogen and oxygen from being present in the pump at the same time. This excludes the formation of ignitable gas mixtures right from the start.

The warming up process is fully automatic. Pressure and temperature distribution within the pump are set up and controlled by the control system at all times. The sequential regeneration of pumped gases prevents the formation of ignitable gases right from the start. This ensures the utmost safety during the regeneration of cryopumps from LEYBOLD.

In the case of cryogenic pumps with fully automatic control there exist two cryo pump lines.

1. The COOLVAC ClassicLine (COOLVAC CL) offering the following pumping speed classes for nitrogen in l/s: 1500, 2000, 3000, 5000, 10.000, 18.0000 and 30.000; COOLVAC 1500 CL, for example.
2. The COOLVAC SemiLine (COOLVAC SL) offering a pumping speed for nitrogen of 1500 l/s: COOLVAC 1500 SL.

The pumps of the ClassicLine offer total regeneration as standard and the COOLVAC 1500 SL offers in addition the possibility of fast regeneration.

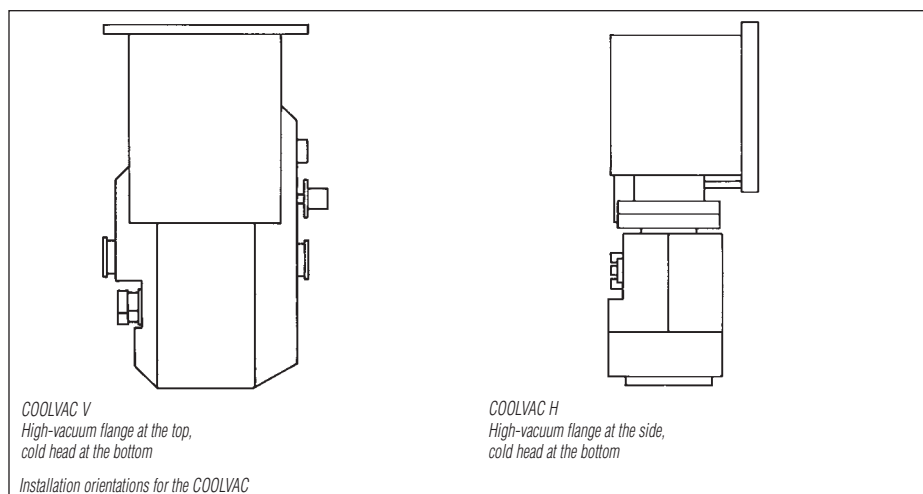
In the price list the designators "V" and "H" appear in connection with the pump designations.

"H":

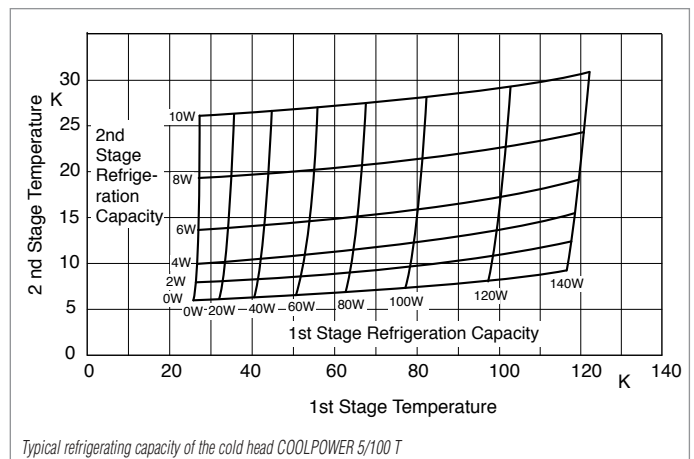
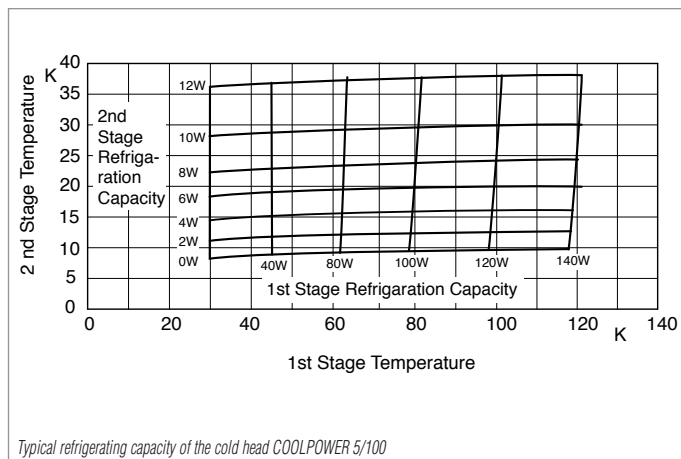
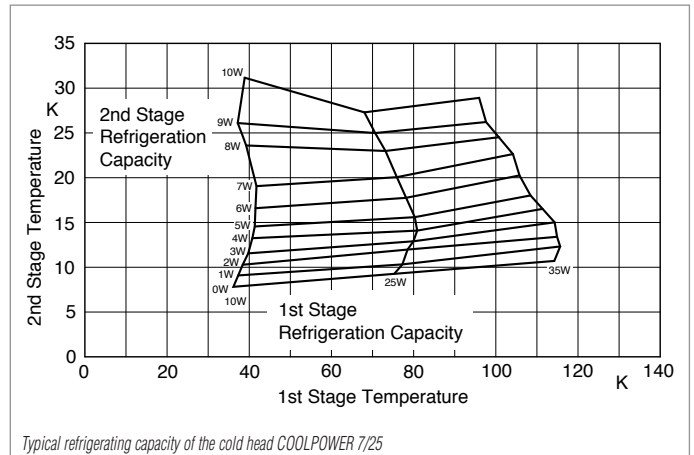
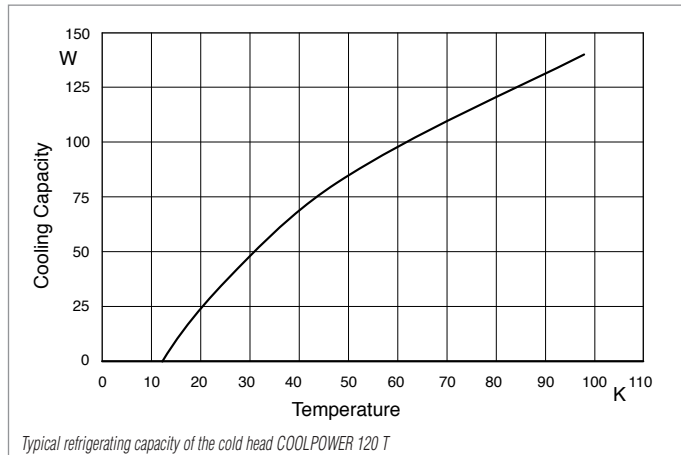
The high-vacuum flange is located at the side and the cold head below, as is the case for the COOLVAC 1500 SL-H, DN 200 CF.

"V":

The high-vacuum flange is located at the top and the cold head below, as is the case for the COOLVAC 1500 CL-V, DN 200 CF.



Refrigerating Capacity of Cryogenic Cold Heads



The refrigerating capacities stated apply to vertical operation with the cold end at the bottom.

Cold Heads

A refrigerator (cold head) is a gas cooling machine which operates on the basis of a thermodynamic cycle to produce cryogenic temperatures ($T < 120$ K).

Refrigerators operating according to the Gifford/McMahon principle have succeeded over other methods of cooling cryopumps and cryostats. It is thus employed exclusively by LEYBOLD.

In order to account for individual requirements from customers, LEYBOLD offers customized cryostats as well.

Gifford/McMahon-Refrigerators

Advantages to the User

- ◆ Low temperatures on a single key press
- ◆ No liquid helium and no liquid nitrogen are required
- ◆ Very simple to operate
- ◆ High refrigerating capacity from a small volume
- ◆ Easy process control and temperature control via a computer

Advantages by Design

- ◆ 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 cryopumps thereby producing high or ultra high vacuum
- ◆ Cooling of superconducting magnets; in magnetic resonance tomographs, for example
- ◆ Cooling of samples and detectors; especially for cooling of
 - samples for spectroscopic analysis in the areas of solid state and surface physics
 - high temperature superconductors
 - superconductors and semiconductors
 - infrared and gamma detectors
- ◆ Calibration of sensors

Cold Heads from the COOLPOWER Range

The standard range of single-stage and two-stage cold heads matches a wide range of applications.

LEYBOLD is offering refrigerators with usable refrigerating powers of 120 W at 80 K (COOLPOWER 120, single-stage) and down to 3.5 W at 10 K (COOLPOWER 5/100 T; dual-stage).

The cold heads basically consist of three sub-assemblies:

- ◆ Drive and control unit for the displacer
- ◆ Displacer
- ◆ First stage of the cold head (and second stage in the case of two-stage cold heads).

Pneumatically driven Cold Heads

Advantages

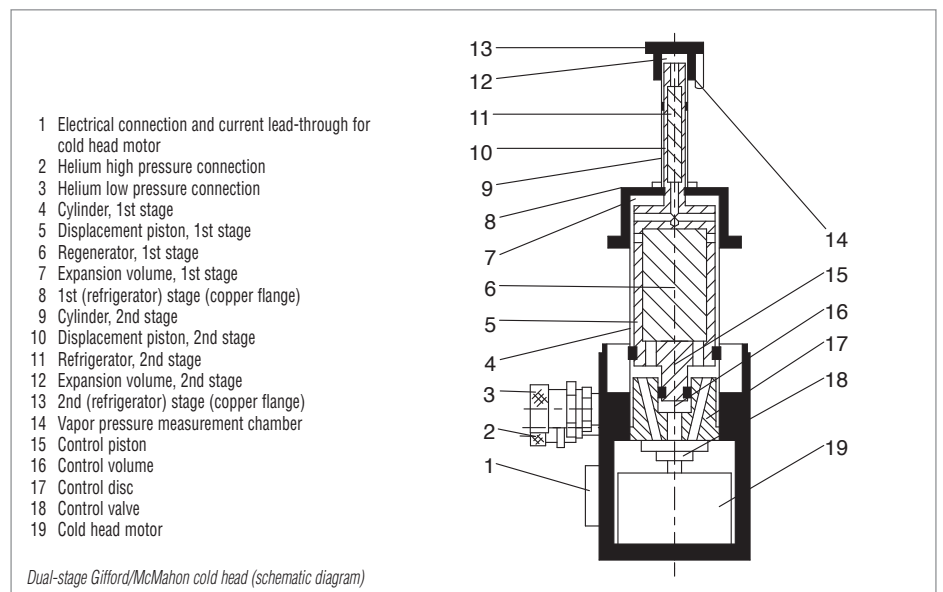
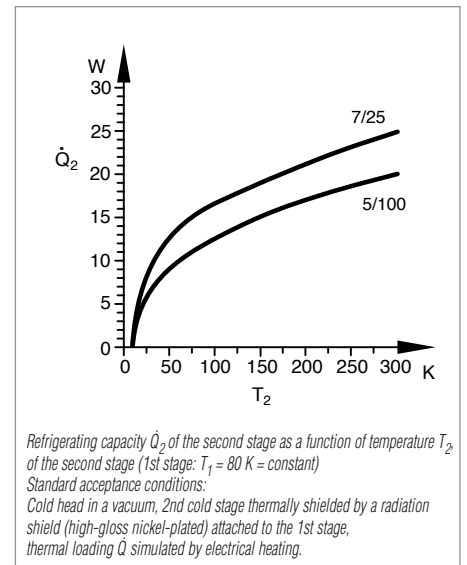
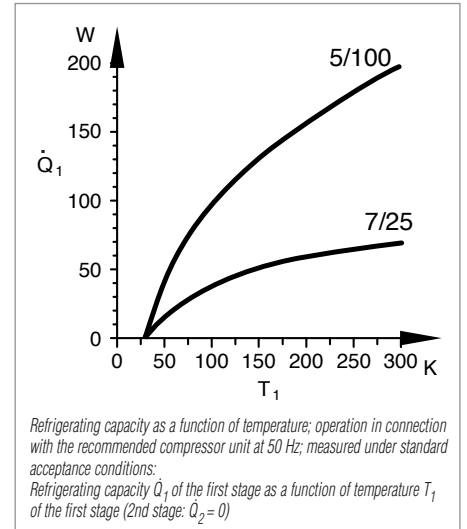
- ◆ **Simple Design**
The pneumatic drive system for the displacer of these cold heads from LEYBOLD consists of only two mechanically moving components: the rotating control valve and the synchronous motor driving the control valve.
- ◆ **Easy and quick maintenance**
All LEYBOLD cryopumps from the COOLVAC range are equipped with pneumatically driven LEYBOLD cold heads. Owing to the simple design of the built-in cold heads, maintenance is easy. Maintenance can be performed in place without detaching the cryopump from the vacuum chamber.

Advantages Through High Reliability

As to reliability, LEYBOLD cold heads are top performers.

Especially high reliability is required for medical instrumentation, specifically in connection with nuclear spin tomographs. In this application cold heads are used to cool superconducting magnets and they are thus exposed to strong magnetic fields.

The leading manufacturers of nuclear spin tomographs have therefore decided to use LEYBOLD cold heads to cool the superconducting magnets.



Refrigerator Cryostats (Basic Units)

Advantages to the User

- ◆ Can be installed basically in any orientation thereby offering a high degree of flexibility in experimental arrangements
- ◆ Can be set to any temperature within 10 and 320 K
- ◆ High refrigerating capacity, constant temperatures
- ◆ No liquid refrigerants are required

- ◆ Very simple to operate
- ◆ Temperature control without problems through standardized control- and connecting components
- ◆ Possible high throughput of samples due to short cooldown and warming-up periods

Typical Applications

- ◆ Cooling of
 - high temperature superconductors
 - superconductors and semiconductors
 - infrared and gamma detectors

- ◆ Measurement of electric and thermal transport quantities, as a function of the temperature, such as
 - electric and thermal conductance
 - electromotive force

Especially in connection with:

- ◆ Spectroscopic investigations in the infrared, visible and ultraviolet spectral ranges
- ◆ Matrix spectroscopy
- ◆ Moessbauer spectroscopy
- ◆ Magneto-optic experiments

Compressor Units

COOLPAK 4000 to 6000 compressors are available for single operation of the remaining cold heads from the COOLPOWER line as well as for multiple operation of cryopumps and cryostats.

The period during which no maintenance will be required on the LEYBOLD compressor units depends on the service life of the adsorber. If the

values for the ambient temperature and the cooling water entry temperature remain within the specified range, LEYBOLD guarantees a service life for the adsorber – and thus a period during which no maintenance will be required – of 18 000 operating hours.

The possibilities for multiple operation of refrigerator cryo pumps are given in the following table:

Compressor unit	For the operation of Cold heads	Cryopumps
COOLPAK 4000 D	2 x COOLPOWER 7/25	2 x COOLVAC 800/1500/2000
COOLPAK 4000/4200	–	2 x COOLVAC 1500/2000
COOLPAK 6000 D	2 x COOLPOWER 7/25 up to 2 x COOLPOWER 5/100 ¹⁾	2 x COOLVAC 1500/2000 2 x COOLVAC 3000
COOLPAK 6000/6200	–	up to 3 x COOLVAC 1500/2000 2 x COOLVAC 3000

¹⁾ at reduced power

UL Approval

The LEYBOLD refrigerators in this catalog (consisting of compressor unit COOLPAK (4000/4200, 6000/6200, flex lines FL and the cold head COOLPOWER ²⁾) meet – as complete systems – the requirements of the Underwriter Laboratories (UL) as Recognised Components (Urus) as well as the approval cUR performed through the Underwriter Laboratories for the Canadian Standards Association.

LEYBOLD refrigerators are listed under the UL/cUL reference number SA 8676. The marks as shown on the right for the entire system can only be found on the name plate of the compressor unit.



CE Approval

The LEYBOLD compressor units RW and COOLPAK meet the basic requirements regarding safety and health of the relevant EC directives. They carry on the name plates of the compressor units the following mark.



²⁾ resp. formerly RGD

COOLVAC 800

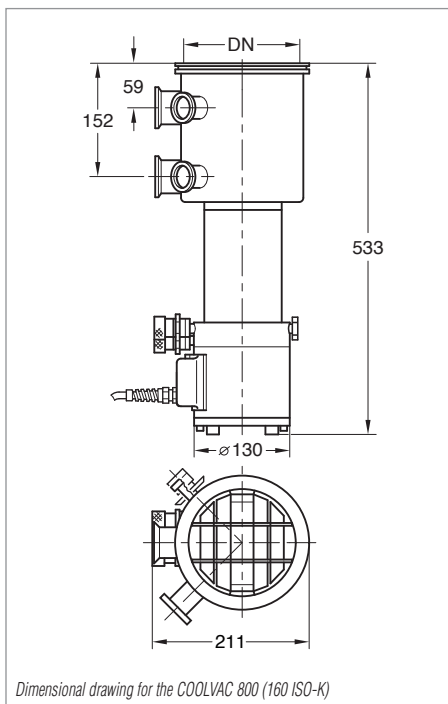


Advantages to the User

- ◆ Hydrocarbon-free high vacuum
- ◆ High capacity for argon and hydrogen
- ◆ High pumping speed for water vapor, argon and hydrogen
- ◆ Fast, safe and efficient regeneration with an electric regeneration system

Typical Applications

- ◆ Lamps and tubes manufacture
- ◆ Transfer chambers / Loadlock
- ◆ General research

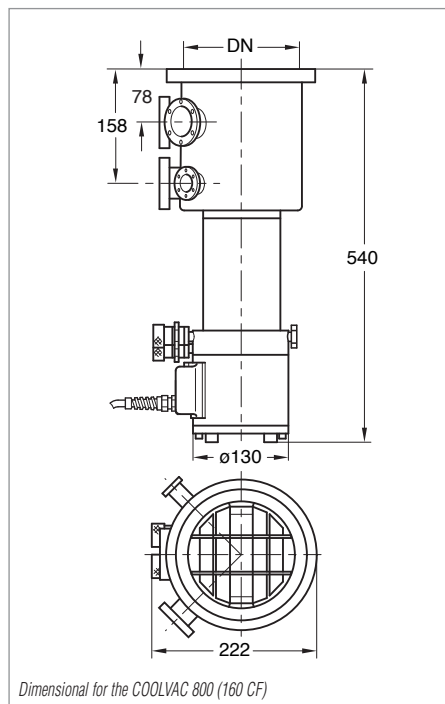


Advantages to the User

- ◆ Hydrocarbon-free ultrahigh vacuum
- ◆ High pumping speed for water vapor, nitrogen and hydrogen

Typical Applications

- ◆ Beam tubes in particle accelerators
- ◆ UHV systems



Technical Data		COOLVAC 800 (ISO-K)	COOLVAC 800 (CF)
High vacuum flange	DN	160 ISO-K	160 CF
Fore vacuum flange	DN	40 KF	40 CF
Flange for other purposes	DN	16 KF (1x), 25 KF (1x), 40 KF (1x)	40 CF (2x)
Safety valve with DN 40 FK flange connection for gas exhaust line		welded-in	burst disk mounted on DN 16 CF
Pumping speed			
H ₂ O	l x s ⁻¹	2600	
Ar/N ₂	l x s ⁻¹	640/800	
H ₂ /He	l x s ⁻¹	1000/300	
Capacity			
Ar/N ₂	bar x l (Torr x l)	270 (270 000)	
H ₂ at 10 ⁻⁶ mbar	bar x l (Torr x l)	4.3 (3225)	
He	bar x l (Torr x l)	0.5 (375)	
Built-in cold head	COOLPOWER	7/25	
Max. throughput			
Ar/N ₂	mbar x l x s ⁻¹ (Torr x l x s ⁻¹)	4 (3)	
H ₂	mbar x l x s ⁻¹ (Torr x l x s ⁻¹)	2 (1.5)	
Crossover value	mbar x l (Torr x l)	60 (45)	
Cool down time to 20 K	min	70	
Overall height	mm	503	508
Weight	kg (lbs)	12 (26.5)	14 (30.9)
Silicon diode for temperature measurements at second stage of the cold head		built-in to a DN 25 KF with two-way HV current feedthrough	built-in to a DN 16 CF with UHV feedthrough
Ordering Information		COOLVAC 800 (ISO-K)	COOLVAC 800 (CF)
COOLVAC 800		Part No. 844160V1006	Part No. 844160V1002
Accessories			
compressor unit			
COOLPAK 4000		Part No. 892 31	Part No. 892 31
COOLPAK 4200		Part No. 892 33	Part No. 892 33
Power supply cable		see Ordering Information for the Compressor Units COOLPAK	
Connecting cable Compressor – cold head, 4,5 m		Part No. 400 000 323	Part No. 400 000 323
Flexlines			
FL 4.5 (1/2", 1/2")		Part No. 892 87	Part No. 892 87
or FL 9.0 (1/2", 1/2")		Part No. 892 88	Part No. 892 88
and EL 4.5 (electric extension cable)		Part No. 893 74	Part No. 893 74
MODEL 1901 low temperature measuring instrument		Part No. 136 45	Part No. 136 45
Cable for the silicon diode, 10 m long		Part No. 500 085	Part No. 500 201

COOLVAC 1.500 CL



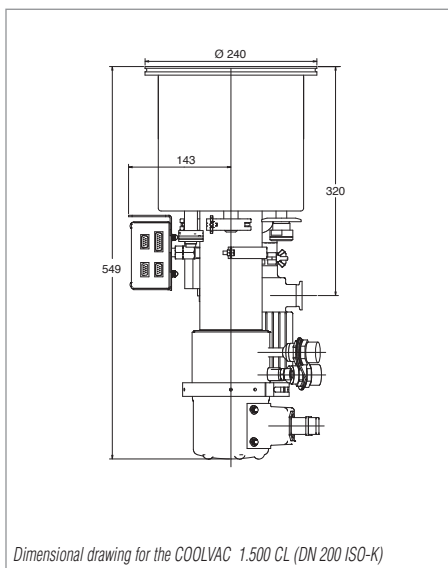
COOLVAC 1.500 CL

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
- ◆ Easy servicing

Typical Applications

- ◆ Evaporators
- ◆ Sputtering systems
- ◆ Ion implanters
- ◆ Optical coating systems
- ◆ Metallization systems



Dimensional drawing for the COOLVAC 1.500 CL (DN 200 ISO-K)

COOLVAC 2.000 CL



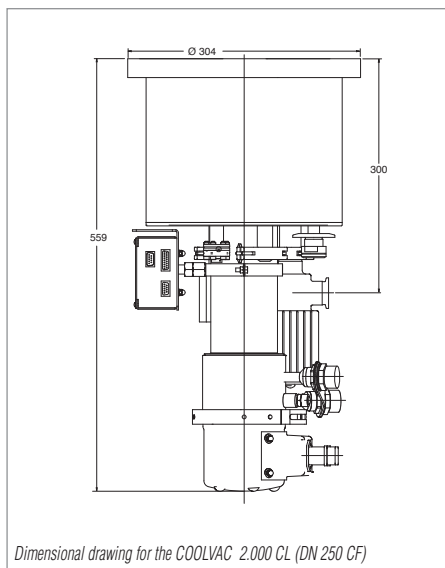
COOLVAC 2.000 CL similar

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
- ◆ Easy servicing

Typical Applications

- ◆ Evaporators
- ◆ Sputtering systems
- ◆ Ion implanters
- ◆ Optical coating systems
- ◆ Metallization systems



Dimensional drawing for the COOLVAC 2.000 CL (DN 250 CF)

COOLVAC 3.000 CL



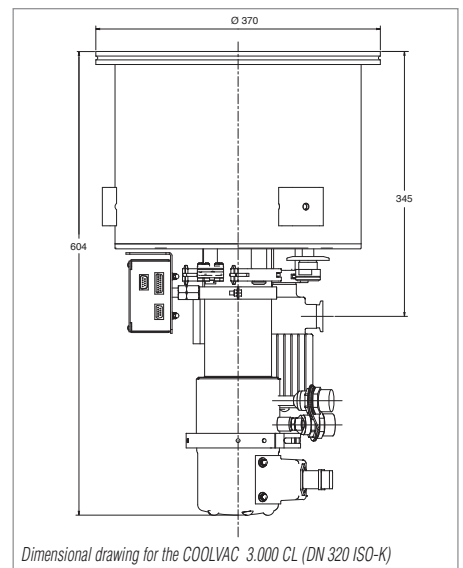
COOLVAC 3.000 CL similar

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
- ◆ Easy servicing

Typical Applications

- ◆ Evaporators
- ◆ Sputtering systems
- ◆ Ion implanters
- ◆ Optical coating systems
- ◆ Metallization systems



Dimensional drawing for the COOLVAC 3.000 CL (DN 320 ISO-K)

Technical Data		COOLVAC 1.500 CL	COOLVAC 2.000 CL	COOLVAC 3.000 CL
High vacuum (HV) flange	DN	200 ISO-K / 200 CF / 6" ANSI	250 ISO-K / 250 CF / 8" ANSI	320 ISO-K / 10" ANSI
Fore vacuum flange	DN	25 KF		
Flange for connection a gauge head	DN	16 KF		
Flange for the electrical connection	DN	40 KF		
Safety valve with flange connection for gas exhaust line	DN	40 KF		
4-way current feedthrough for Si diode on a flange	DN	16 KF		
Heaters				
1st stage	W	160	160	160
	V AC	35	35	35
2nd stage	W	90	90	90
	V AC	35	35	35
Temperature sensor				
1st stage		Pt 100		
2nd stage		Si diode		
Built-in cold head	COOLPOWER	7/25		
Weight	kg (lbs)	25 (55.2)	25 (55.2)	35 (77.3)
Cooldown time to T ₂ = 20 K	min	90	60	80
Crossover value	mbar x l (Torr x l)	180 (135)	250 (187)	250 (187)
Pumping speed				
H ₂ O	l x s ⁻¹	4600	7000	10 500
Ar / N ₂	l x s ⁻¹	1000 / 1300	1600 / 2100	2400 / 2800
H ₂	l x s ⁻¹	2300	3200	4500
Capacity				
Ar/N ₂	bar x l	1600	1400	2500
H ₂ at 10 ⁻⁶ mbar	bar x l	12	12	12
H ₂ O	bar x l	not applicable	190	460
Max. throughput				
Ar/N ₂	mbar x l x s ⁻¹ (Torr x l x s ⁻¹)	14 (10.5)	12 (9)	15 (11.2)
H ₂ O	mbar x l x s ⁻¹ (Torr x l x s ⁻¹)	8 (6)	6.5 (4.8)	10 (7.5)
Helium connections (Self-sealing couplings: outside thread, type 5400-S2-8)	DN	1/2"	1/2"	1/2"

Ordering Information	Single Operation		COOLVAC 1.500 CL Dual Operation			Multiple Operation	
	Europe	USA/Japan	Europe	Europe	USA/Japan	Europe	USA/Japan
COOLVAC 1.500 CL DN 200 CF DN 6" ANSI DN 200 ISO-K	Part No. 844200V0002 844200V0004 844200V0006		Part No. 844200V0002 (2x) 844200V0004 (2x) 844200V0006 (2x)			Part No. 844200V0002 (3x) 844200V0004 (3x) 844200V0006 (3x)	
Electronics and cables							
System Controller SC	844 230		844 230			844 230	
Power Supply PS 230 V, 1 ph. 200 V, 3 ph.	844 135 -		844 135 -	- 844 235	- 844 235	- 844 235	
Network communication cable – System Controller to the pump(s) 10 m 20 m	844 261 844 262			844 261 844 262		844 261 844 262	
Network PM cable for the link between the pumps 3 m 10 m	- -			844 256 844 258		844 256 (2x) 844 258 (2x)	
Power supply cable from power supply to pump 10 m 20 m	- -		- -	844 251 (2x) 844 252 (2x)	844 251 (2x) 844 252 (2x)	844 251 (3x) 844 252 (3x)	
Remote control cable CP, 1 m	-		-	844 265	844 265	844 265	
Cable compressor – Power Supply 10 m 20 m	844 129 844 139		844 129 844 139	- -	- -	- -	
Cable System Controller – Power Supply, 1 m	844 141		844 141	-	-	-	
Cable pump module PM – Power Supply 10 m 20 m	844 128 844 138		844 128 (2x) 844 138 (2x)	- -	- -	- -	
Connecting cable compressor – pump, 4.5 m	400 000 323		400 000 323 (2x)	-	-	-	
Compressors and flexlines							
Compressor CP 4000 D CP 4000 CP 4200 CP 6000 CP 6200	- 892 31 - - -	- - 892 33 - -	892 3000 - - -	- 892 31 - -	- - 892 33 -	- - - 892 36 -	- - - - 892 37
Accessories Water cooling discharge throttle	840 000 133			840 000 133		840 000 133	
Power supply cable for compressor	see Ordering Information for the Compressor Units COOLPAK						
Set of flexlines FL 4.5 (1/2", 1/2") or FL 9.0 (1/2", 1/2") and EL 4.5 (electric extension cable)	892 87 892 88 893 74		892 87 (2x) 892 88 (2x) 893 74 (2x)	892 87 (2x) 892 88 (2x) -	892 87 (2x) 892 88 (2x) -	892 87 (3x) 892 88 (3x) -	
Gas manifold GD 2 GD 4	- -		891 02 -	891 02 -	891 02 -	- 891 03	

The arrangement of the components is shown in the section "Accessories" under the heading "COOLVAC ClassicLine, System Components"

Ordering Information	Single Operation		COOLVAC 2000 CL Dual Operation			Multiple Operation	
	Europe	USA/Japan	Europe	Europe	USA/Japan	Europe	USA/Japan
COOLVAC 2000 CL DN 250 CF DN 8" ANSI DN 250 ISO-K	Part No. 844250V0002 844250V0004 844250V0006		Part No. 844250V0002 (2x) 844250V0004 (2x) 844250V0006 (2x)			Part No. 844250V0002 (3x) 844250V0004 (3x) 844250V0006 (3x)	
Electronics and cables							
System Controller SC	844 230		844 230			844 230	
Power Supply PS 230 V, 1 ph. 200 V, 3 ph.	844 135 -		844 135 -	- 844 235	- 844 235	- 844 235	
Network communication cable – System Controller to the pump(s) 10 m 20 m	844 261 844 262			844 261 844 262		844 261 844 262	
Network PM cable for the link between the pumps 3 m 10 m	- -			844 256 844 258		844 256 (2x) 844 258 (2x)	
Power supply cable from power supply to pump 10 m 20 m	- -		- -	844 251 (2x) 844 252 (2x)	844 251 (2x) 844 252 (2x)	844 251 (3x) 844 252 (3x)	
Remote control cable CP, 1 m	-		-	844 265	844 265	844 265	
Cable compressor – Power Supply 10 m 20 m	844 129 844 139		844 129 844 139	- -	- -	- -	
Cable System Controller – Power Supply, 1 m	844 141		844 141	-	-	-	
Cable pump module PM – Power Supply 10 m 20 m	844 128 844 138		844 128 (2x) 844 138 (2x)	- -	- -	- -	
Connecting cable compressor – pump, 4.5 m	400 000 323		400 000 323 (2x)	-	-	-	
Compressors and flexlines							
Compressor CP 4000 D CP 4000 CP 4200 CP 6000 CP 6200	- 892 31 - - -	- - 892 33 -	892 3000 - - -	- 892 31 - -	- - 892 33 -	- - - 892 36 -	- - - - 892 37
Accessories Water cooling discharge throttle	840 000 133			840 000 133		840 000 133	
Power supply cable for compressor	see Ordering Information for the Compressor Units COOLPAK						
Set of flexlines FL 4.5 (1/2", 1/2") or FL 9.0 (1/2", 1/2") and EL 4.5 (electric extension cable)	892 87 892 88 893 74		892 87 (2x) 892 88 (2x) 893 74 (2x)	892 87 (2x) 892 88 (2x) -	892 87 (2x) 892 88 (2x) -	892 87 (3x) 892 88 (3x) -	
Gas manifold GD 2 GD 4	- -		891 02 -	891 02 -	891 02 -	- 891 03	

The arrangement of the components is shown in the section "Accessories" under the heading "COOLVAC ClassicLine, System Components"

C12

Ordering Information	COOLVAC 3000 CL				
	Single Operation		Dual Operation		
	Europe	USA/Japan	Europe	Europe	USA/Japan
COOLVAC 3000 CL DN 10" ANSI DN 320 ISO-K	Part No. 844320V0004 844320V0006		Part No. 844320V0004 (2x) 844320V0006 (2x)		
Electronics and cables					
System Controller SC	844 230		844 230		
Power Supply PS 230 V, 1 ph. 200 V, 3 ph.	844 135 -		844 135 -	- 844 235	- 844 235
Network communication cable – System Controller to the pump(s)					
10 m	844 261		844 261		
20 m	844 262		844 262		
Network PM cable for the link between the pumps					
3 m	-		844 256		
10 m	-		844 258		
Power supply cable from power supply to pump					
10 m	-		-	844 251 (2x)	844 251 (2x)
20 m	-		-	844 252 (2x)	844 252 (2x)
Remote control cable CP, 1 m	-		-	844 265	844 265
Cable compressor – Power Supply					
10 m	844 129		844 129		
20 m	844 139		844 139		
Cable System Controller – Power Supply, 1 m	844 141		844 141		
Cable pump module PM – Power Supply					
10 m	844 128		844 128 (2x)		
20 m	844 138		844 138 (2x)		
Connecting cable compressor – pump, 4.5 m	400 000 323		400 000 323 (2x)		
Compressors and flexlines					
Compressor					
CP 4000	892 31	-	-	-	-
CP 4200	-	892 33	-	-	-
CP 6000 D	-	-	892 46	-	-
CP 6000	-	-	-	892 36	-
CP 6200	-	-	-	-	892 37
Accessories					
Water cooling discharge throttle	840 000 133		840 000 133		
Power supply cable for compressor	see Ordering Information for the Compressor Units COOLPAK				
Set of flexlines					
FL 4.5 (1/2", 1/2") or FL 9.0 (1/2", 1/2") and EL 4.5 (electric extension cable)	892 87 892 88 893 74		892 87 (2x) 892 88 (2x) 893 74 (2x)	892 87 (2x) 892 88 (2x) -	892 87 (2x) 892 88 (2x) -
Gas manifold GD 2	-		891 02	891 02	891 02

The arrangement of the components is shown in the section "Accessories" under the heading "COOLVAC ClassicLine, System Components"

COOLVAC 5.000 CL



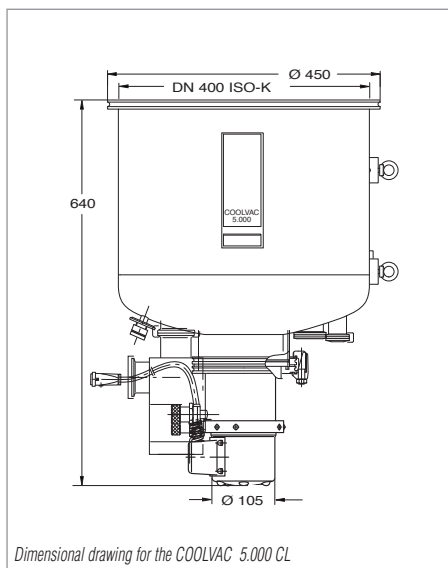
COOLVAC 5.000 CL

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
- ◆ Easy servicing

Typical Applications

- ◆ Evaporators
- ◆ Ion implanters
- ◆ Electron beam welding systems
- ◆ Optical coating systems
- ◆ Metallization systems



Dimensional drawing for the COOLVAC 5.000 CL

COOLVAC 10.000 CL



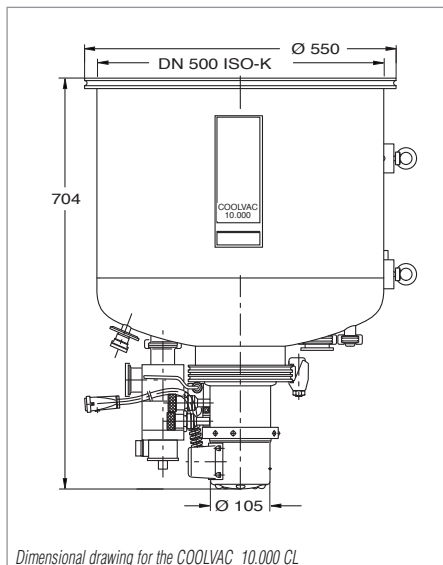
COOLVAC 10.000 CL

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
- ◆ Easy servicing

Typical Applications

- ◆ Evaporators
- ◆ Space simulation chambers
- ◆ Electron beam welding systems
- ◆ Optical coating systems
- ◆ Metallization systems



Dimensional drawing for the COOLVAC 10.000 CL

Technical Data		COOLVAC 5.000 CL	COOLVAC 10.000 CL
High vacuum (HV) flange	DN	400 ISO-K	500 ISO-K
Fore vacuum flange	DN		40 KF
Flange for connection of a gauge head	DN		16 KF
Flange for the electrical connection	DN		40 KF
Safety valve with flange connection for gas exhaust line	DN		40 KF
4-way current feedthrough for Si diode on a flange	DN		16 KF
Heaters			
1st stage	W		160
	V AC		35
2nd stage	W		90
	V AC		35
Temperature sensor			
1st stage			Pt 100
2nd stage			Si diode
Built-in cold head	COOLPOWER		5/100
Weight	kg (lbs)	42 (92.7)	50 (110.4)
Cooldown time to T ₂ = 20 K	min	120	160
Crossover value	mbar x l (Torr x l)	700 (525)	800 (600)
Pumping speed			
H ₂ O	l x s ⁻¹	18 000	30 000
Ar / N ₂	l x s ⁻¹	3 700 / 5 000	8 400 / 10 000
H ₂	l x s ⁻¹	5 200	12 000
Capacity			
Ar/N ₂	bar x l	3 000	5 000
H ₂ at 10 ⁻⁶ mbar	bar x l	32	40
H ₂ O	bar x l	790	not applicable
Max. throughput			
Ar/N ₂	mbar x l x s ⁻¹ (Torr x l x s ⁻¹)		10 (7.5)
H ₂	mbar x l x s ⁻¹ (Torr x l x s ⁻¹)		7 (5.3)

Ordering Information	COOLVAC 5.000 CL		COOLVAC 10.000 CL	
	Europe	USA/Japan	Europe	USA/Japan
COOLVAC 5.000 CL, DN 400 ISO-K 10.000 CL, DN 500 ISO-K	Part No. 844 410 –		– Part No. 844 610	
Electronics and cables				
System Controller SC	Part No. 844 230		Part No. 844 230	
Power Supply PS 230 V, 1 ph.	Part No. 844 135		Part No. 844 135	
Network communication cable – System Controller to the pump(s) 10 m 20 m	Part No. 844 261 Part No. 844 262		Part No. 844 261 Part No. 844 262	
Cable compressor – Power Supply PS 10 m 20 m	Part No. 844 129 Part No. 844 139		Part No. 844 129 Part No. 844 139	
Cable System Controller – Power Supply, 1 m	Part No. 844 141		Part No. 844 141	
Cable pump module PM – Power Supply 10 m 20 m	Part No. 844 128 Part No. 844 138		Part No. 844 128 Part No. 844 138	
Compressors and flexlines				
Compressor CP 6000 CP 6200	Part No. 892 36 –	– Part No. 892 37	Part No. 892 36 –	– Part No. 892 37
Accessories Water cooling discharge throttle	Part No. 840 000 133		Part No. 840 000 133	
Power supply cable for compressor	see Ordering Information for the Compressor Units COOLPAK			
Set of flexlines FL 4.5 (1/2", 1/2") or FL 9.0 (1/2", 1/2") and EL 4.5 (electric extension cable)	Part No. 892 87 Part No. 892 88 Part No. 893 74		Part No. 892 87 Part No. 892 88 Part No. 893 74	

The arrangement of the components is shown in the section "Accessories" under the heading "COOLVAC ClassicLine, System Components"

COOLVAC 18.000 CL



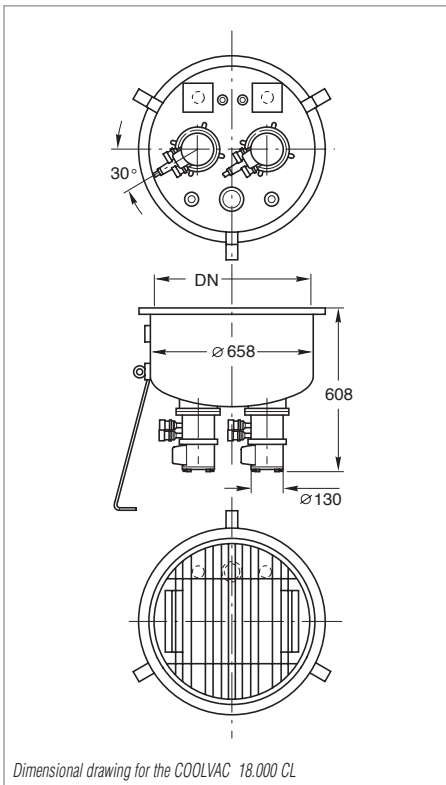
COOLVAC 18.000 CL with special flanges

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
- ◆ Simple operation

Typical Applications

- ◆ Space simulation chambers
- ◆ Evaporators
- ◆ Electron beam welding systems
- ◆ Optical coating systems
- ◆ Metallization systems



Dimensional drawing for the COOLVAC 18.000 CL

COOLVAC 30.000 CL



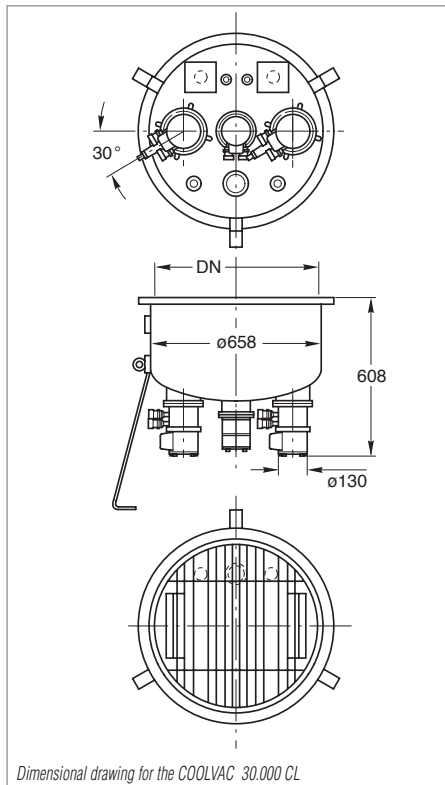
COOLVAC 30.000 CL

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
- ◆ Simple operation

Typical Applications

- ◆ Space simulation chambers
- ◆ Evaporators
- ◆ General research
- ◆ Optical coating systems



Dimensional drawing for the COOLVAC 30.000 CL

Technical Data		COOLVAC 18.000 CL	COOLVAC 30.000 CL
High vacuum flange	DN	630 ISO-F	35" ANSI (892 mm)
Fore vacuum flange	DN	63 ISO-K	63 ISO-K
Flange with current feedthrough *) for silicon diode	DN	25 KF (2x)	25 KF (2x), *) 2 way
Flange for other purposes	DN	40 KF	40 KF
Safety valve with DN 40 KF flange connection for gas exhaust line		welded-in	welded-in (2x)
Pumping speed			
H ₂ O	l x s ⁻¹	46 000	93 000
Ar/N ₂	l x s ⁻¹	13 500/18 000	25 000/30 000
H ₂ /He	l x s ⁻¹	14 000/4 000	30 000/7 000
Capacity			
Ar/N ₂	bar x l	5 000	6 500
H ₂ at 10 ⁻⁶ mbar	bar x l	65	120
H ₂ O	bar x l	945	–
Built-in cold head	COOLPOWER	5/100 (2x)	5/100 (2x) + 120
Max. throughput			
Ar/N ₂	mbar x l x s ⁻¹ (Torr x l x s ⁻¹)	14 (10.5)	14 (10.5)
H ₂	mbar x l x s ⁻¹ (Torr x l x s ⁻¹)	7 (5.25)	7 (5.25)
Crossover value	mbar x l (Torr x l)	850 (638)	1200 (900)
Cool down time to 20 K	min	180	260
Overall height	min	606	711
Weight	kg (lbs)	65 (143)	245 (540)
Silicon diode for temperature measurements at the second stage of the cold head		built-in (2x)	built-in (2x)
Regeneration heaters at the first and second stage of the cold head		built-in (2x)	built-in (2x)
Ordering Information		COOLVAC 18.000 CL	COOLVAC 30.000 CL
Cryopump			
COOLVAC 18.000 CL, 630 ISO-F		upon request	–
COOLVAC 30.000 CL, 35" ANSI		–	upon request
Accessories			
Compressor unit			
COOLPAK 6000		upon request (2x)	upon request (3x)
COOLPAK 6200		upon request (2x)	upon request (3x)
Power supply cable		see Ordering Information for the Compressor Units COOLPAK	
Set of flexlines			
FL 4.5 (1/2", 1/2")		Part No. 892 87 (2x)	Part No. 892 87 (3x)
or FL 9.0 (1/2", 1/2")		Part No. 892 88 (2x)	Part No. 893 74 (3x)
and EL 4.5 (electric extension cable)		Part No. 893 74 (2x)	Part No. 893 74 (3x)
Compact Controller and cable kit		upon request	

COOLVAC 1500 SemiLine



LEYBOLD, world-wide leader in vacuum and cryo technology has added a new cryopump system to meet the needs for current and future demands in state-of-the-art cryopump applications: COOLVAC 1500 SemiLine. This system is the unique cryopump technology that cuts "cold to cold" regeneration from several hours to 45 minutes or less.

This significant reduction of regeneration time has been achieved by combining the COOLVAC 1500 SL cryopumps with a compact and intelligent control system that allows control and monitoring of up to 30 cryopumps by only a single control unit.

COOLVAC 1500 SemiLine system is designed for a high level of tool integration. The cryopumps can easily be adapted to the process chambers because of their proven drop-in compatibility.

For remote control the cryopump system can be fully integrated to the equipment's host computer via the standard RS 232 C interface of the System Controller SC.

Existing tools can be upgraded fast and without any modifications because the system has proven their "plug and play" compatibility to other cryopump systems.

COOLVAC 1500 SemiLine system is uniquely designed for a simple and fast entire service and maintenance procedure direct on the process chamber.

A complete displacer change is done within 20 minutes without breaking the vacuum connection. After cryopump maintenance no leak check and no vacuum or process requalification is required.

Advantages to the User

- ◆ Qualified at all major OEM's
- ◆ Drop-in compatible to all major equipments
- ◆ Higher flexibility and availability of the process system
- ◆ Increased productivity and improved yield
- ◆ No extra tool downtime caused by regeneration
- ◆ Lowest Cost of Ownership

Typical Applications

COOLVAC 1500 SemiLine system should be used wherever production time, optimized quality, higher tool availability and improved CoO are important issues.

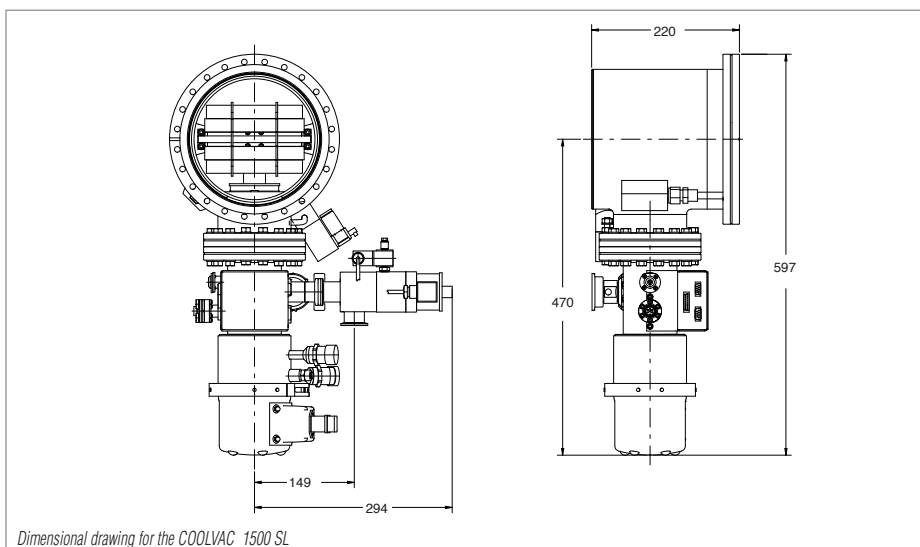
In particular, the overall equipment performance of

- ◆ Sputtering (PVD) Systems
- ◆ Ion Implanters
- ◆ Vacuum Coating Systems
- ◆ Transfer Chambers
- ◆ Load Lock Chambers

can be increased significantly.

Design Features

- ◆ "Fast Regeneration" capability from "cold to cold" in 45 minutes or less. During the fast regeneration of the COOLVAC 1500 SL only the second stage of the pump is regenerated. Consequently, "Fast Regeneration" is synonymous with the regeneration of all gases pumped by the cryo's second stage, e.g. H₂, Ar, N₂, O₂.
- ◆ "Total Regeneration" capability from "cold to cold" in about 2.5 hours. During the total regeneration of the COOLVAC 1500 SL the second stage as well as the first stage of the pump are regenerated and all gases are released, e.g. H₂, Ar, N₂, O₂ as well as H₂O and other easily condensable gases.
- ◆ The fast as well as the total regeneration cycle is optimized with respect to
 - time
 - safety
 - cleanness of the pump.
 Only with clean pumping surfaces can a low base pressure, maximum pumping speeds and capacities be attained.
- ◆ Easy to operate
 - only one compact control unit for up to 30 pumps
 - simple push button operation
 - fully automatic regeneration
 - complete monitoring of pump operation



- ◆ Easy to integrate
 - compatible pump sizes and connectors to replace other cryopumps
 - drop-in tool compatibility at all major equipments
 - designed to be fully integrated to the equipment's host computer via the standard RS 232 C interface
 - optional network and 24 V DC interface capabilities
- ◆ Electrical heaters for regeneration only
 - no expensive and complex purge gas system
 - sequential regeneration of all pumped gases
- better control of the regeneration cycles
- highest safety standards during regeneration
- ◆ Suitable for multiple operation
 - up to 30 COOLVAC 1500 SL cryopumps can be operated by one compact System Controller SC.
 - up to 3 COOLVAC 1500 SL cryopumps can be supported by one multiple Power Supply PS.
 - up to 3 COOLVAC 1500 SL cryopumps can be supported by one Compressor Unit CP.
- ◆ Easy to service
 - displacer exchange is possible without removing the COOLVAC from the production system.
 - back-up pool needs just displacer rather than expensive pumps
 - Extended service and maintenance intervals
 - data collection for service and trend analysis
- ◆ All known features of cryopumps are maintained:
 - high pumping speeds and capacity for H₂O, H₂, Ar, N₂
 - high crossover values
 - hydrocarbon-free vacuum

System Controller SC



System Controller SC for COOLVAC 1500 SL

Design Features

- ◆ 1/4 19" rack module
- ◆ 3 height units
- ◆ Dimensions (W x H x W)
106 x 129 x 178 mm

The intelligent COOLVAC System Controller SC automatically controls and monitors up to 30 COOLVAC pumps.

Online monitoring, help functions and a service interface for easy diagnostic are just a few user friendly features.

It can be installed as a "stand alone system" or remote controlled via an interface.

Power Supply PS



Power Supply PS for COOLVAC 1500 SL

Design Features

- ◆ 19" rack module
- ◆ 4 height units
- ◆ Dimensions (W x H x W)
435 x 190 x 440 mm

The COOLVAC Power Supply PS provides the power for the cold head motor, the electrical heaters and the supplies voltage to the electronics for up to 3 COOLVAC pumps.

Controlled via the System Controller SC the PS turns the compressor unit on and off if required by the connected pumps.

Technical Data		COOLVAC 1500 SL	
High vacuum (HV) flange	DN		DN 200 CF
Fore vacuum flange			DN 25 KF
Regeneration valve			DN 40 KF
Pumping speed			
H ₂ O / Ar / H ₂	l x s ⁻¹		4600 / 1300 / 2500
O ₂	l x s ⁻¹		1600
Ultimate pressure	mbar		≤ 5 x 10 ⁻¹⁰
Capacity for			
Ar	bar x l		1800
H ₂ at 10 ⁻⁶ mbar	bar x l		16
H ₂ O	bar x l		190
Max. pumping speed for			
Ar / N ₂	mbar x l x s ⁻¹ (sccm)		14 (840)
H ₂	mbar x l x s ⁻¹ (sccm)		6 (360)
Crossover value	mbar x l (Torr x)		210 (160)
Recovery time from 10 mTorr to ≤ 5 x 10 ⁻⁷ Torr	s		< 4
Regeneration times			
Fast regeneration (cold to cold, 2nd stage at 20 K)	min		< 50
Total regeneration (cold to cold, 2nd stage at 20 K)	min		< 170
Warm-up from operating temperature to 300 K	min		< 30
Cool-down from 300 K up to operating temperature	min		< 80
Fast regeneration cycles between total regeneration			> 50
Noise, measured at 1 m (3 ft.) radius from the pump	dB(A)		< 70
Heaters			
1. stage	W		160
	V AC		35
2. stage	W		90
	V AC		35
Temperature measurement			
1. stage			Pt 100
2. stage			Si diode
Built-in coldhead	COOLPOWER		7/25
Weight	kg (lbs)		25 (55.2)

Ordering Information	Single Operation		COOLVAC 1.500 SL Dual Operation			Multiple Operation	
	Europe	USA/Japan	Europe	Europe	USA/Japan	Europe	USA/Japan
COOLVAC 1.500 SL DN 200 CF other flanges	Part No. 844 212 upon request		Part No. 844 212 (2x) upon request (2x)			Part No. 844 212 (3x) upon request (3x)	
Solenoid fore-vacuum valve, DN 25 KF with electric valve position indicator and for 24 V DC supplies	287 46		287 46 (2x)			287 46 (3x)	
Electronics and cables							
System Controller SC	844 230		844 230			844 230	
Power Supply PS 230 V, 1 ph. 200 V, 3 ph.	844 135 -		844 135 -	- 844 235	- 844 235	- 844 235	
Network communication cable – System Controller to the pump(s)							
10 m	844 261		844 261			844 261	
20 m	844 262		844 262			844 262	
Network-PM cable between the pumps							
3 m	-		844 256			844 256 (2x)	
10 m	-		844 258			844 258 (2x)	
Power supply cable for the pump							
10 m	-		-	844 251 (2x)	844 251 (2x)	844 251 (3x)	
20 m	-		-	844 252 (2x)	844 252 (2x)	844 252 (3x)	
Remote control cable CP, 1 m	-		-	844 265	844 265	844 265	
Cable compressor – Power Supply							
10 m	844 129		844 129	-	-	-	
20 m	844 139		844 139	-	-	-	
Cable System Controller – Power Supply, 1 m	844 141		844 141	-	-	-	
Cable pump module PM – Power Supply							
10 m	844 128		844 128 (2x)	-	-	-	
20 m	844 138		844 138 (2x)	-	-	-	
Connecting cable compressor – pump, 4.5 m	400 000 323		400 000 323 (2x)	-	-	-	
Compressors and flexlines							
Compressor							
CP 4000 D	-		892 3000	-	-	-	
CP 4000	892 31	-	-	892 31	-	-	
CP 4200	-	892 33	-	-	892 33	-	
CP 6000	-		-			892 36	-
CP 6200	-		-			-	892 37
Accessories							
Water cooling discharge throttle	840 000 133		840 000 133			840 000 133	
Power supply cable for compressor	see Ordering Information for the Compressor Units COOLPAK						
Set of flexlines							
FL 4.5 (1/2", 1/2") or FL 9.0 (1/2", 1/2") and EL 4.5 (electric extension cable)	892 87 892 88 893 74		892 87 (2x) 892 88 (2x) 893 74 (2x)	892 87 (2x) 892 88 (2x) -	892 87 (2x) 892 88 (2x) -	892 87 (3x) 892 88 (3x) -	
Gas manifold							
GD 2	-		891 02	891 02	891 02	-	
GD 4	-		-	-	-	891 03	

The arrangement of the components is shown in the section "Accessories" under the heading "COOLVAC ClassicLine, System Components"

COOLPOWER 120 T Single Stage Cold Heads



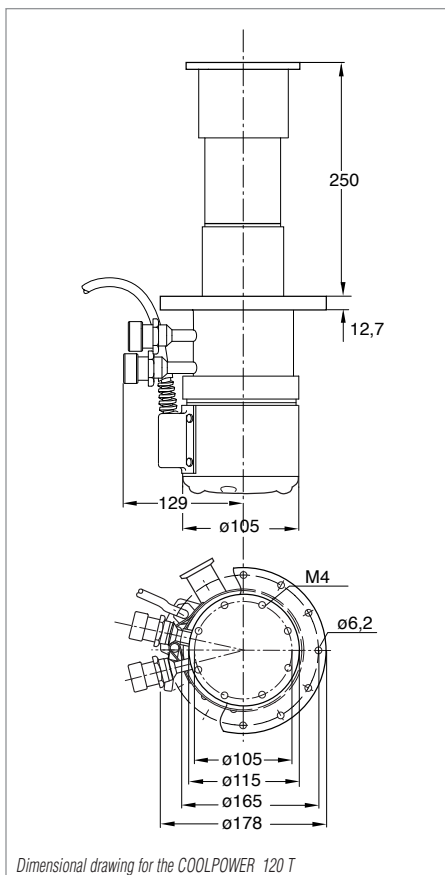
COOLPOWER 120 T single stage cold head

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 cryopanel in cryopumps and thus generation of high vacuum and ultra high vacuum pressures
- ◆ Cooling of samples and detectors; especially for cooling of
 - samples for spectroscopic investigations in solid state and surface physics
 - high temperature superconductor and semiconductor conditions
 - infrared and gamma detectors
- ◆ Calibration of sensors



Dimensional drawing for the COOLPOWER 120 T

Technical Data		COOLPOWER 120 T	
Refrigeration capacity at 50/60 Hz ¹⁾			
1st stage at 80 K, approx.	W		120
2nd stage at 20 K, approx.	W		25
Lowest attainable temperature ¹⁾	K		≤ 15
Cooldown time down to 20 K	min		≤ 55
Permissible ambient temperature	°C		10 to 40
He filling pressure at room temperature	bar		16
He connections			
Self-sealing screwed connections			
High pressure connection			1/2" (#8 ²⁾)
Low pressure connection			1/2" (#8)
Weight	kg (lbs)		13 (29)
Length of the electrical connection line to the compressor unit	m		15

Ordering Information		COOLPOWER 120 T	
Cold head COOLPOWER 120 T		Part No. 103 59	
Accessories			
Compressor unit (for operation of one cold head)			
COOLPAK 6000, 400 V/50 Hz; 470 V/60 Hz			Part No. 892 36
COOLPAK 6200, 200 V/50 Hz; 200 V, 230 V/60 Hz			Part No. 892 37
Power supply cable		see Ordering Information for the Compressor Units COOLPAK	
Set of flexlines			
FL 4.5 (1/2", 1/2")			Part No. 892 87
or FL 9.0 (1/2", 1/2")			Part No. 892 88
Options			
Temperature measurement			
Silicon diode			Part No. 890 89
MODEL 1901 low temperature measuring instrument			Part No. 136 45
Measuring cable		see Ordering Information for the MODEL 1901 low temperature measuring instrument	

¹⁾ The refrigerating capacities and temperatures stated apply to vertical operation with the cold end at the bottom

²⁾ Series 8 from Aeroquip

COOLPOWER 7/25, 5/100 and 5/100 T Dual Stage Cold Heads



COOLPOWER 7/25 dual stage cold head



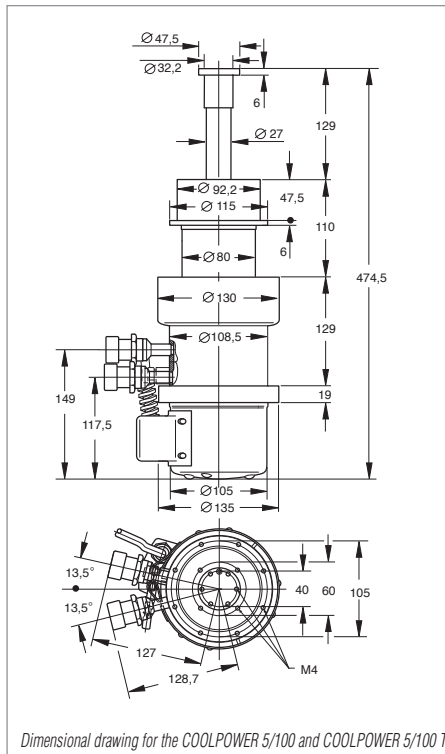
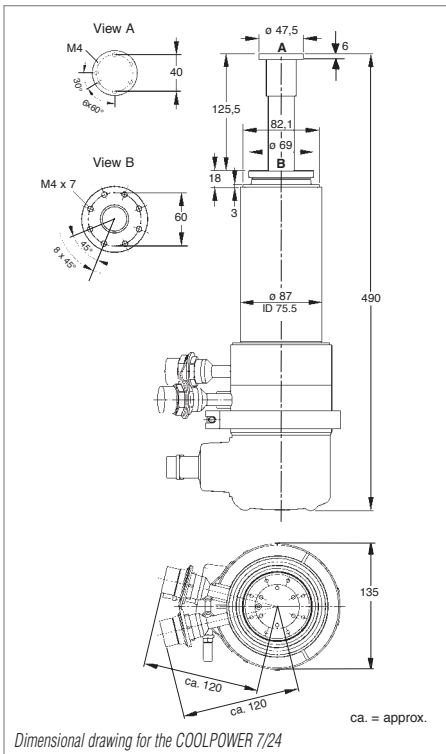
COOLPOWER 5/100 dual stage cold head, COOLPOWER 5/100 T similar

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 cryopanel in cryopumps and thus generation of high vacuum and ultra high vacuum pressures
- ◆ Cooling of samples and detectors; especially for cooling of
 - samples for spectroscopic investigations in solid state and surface physics
 - high temperature superconductors
 - superconductors and semiconductors
 - infrared and gamma detectors
- ◆ Calibration of sensors
- ◆ Cooling of accelerator components in the area of high energy physics
- ◆ Cooling of superconducting magnets; in nuclear magnetic resonance tomographs, for example (only COOLPOWER 5/100 and 5/100 T)



Technical Data		7/25	COOLPOWER 5/100	5/100 T
Refrigeration capacity at 50/60 Hz ¹⁾				
1st stage at 80 K, approx.	W	25	100	100
2st stage at 20 K, approx.	W	7	5	7.5
1st stage at 10 K, approx.	W	–	–	3.5
2st stage at 40 K, approx.	W	–	–	35
Lowest attainable temperature ¹⁾				
1st stage, approx.	K	≤ 35	≤ 35	28
2nd stage, approx.	K	≤ 10	≤ 10	6
Cooldown time of the				
2nd stage to 20 K, approx.	min	20	20	20
1st stage to 80 K, approx.	min	20	20	20
2nd stage to 10 K, approx.	min	–	–	35
1st stage to 40 K, approx.	min	–	–	30
2nd stage to 6 K, approx.	min	–	–	45
1st stage to 30 K, approx.	min	–	–	40
Permissible ambient temperature	°C	5 to 40		
He filling pressure at room temperature	bar	16		
He connections				
Self-sealing screwed connections				
High pressure connection		1/2" (#8 ²⁾)		
Low pressure connection		1/2" (#8)		
Weight	kg (lbs)	11 (24.3)		
Length of the electrical connection line to the compressor unit (included with cold head)	m	4.5		

Ordering Information		7/25	COOLPOWER 5/100	5/100 T
Cold head				
COOLPOWER 7/25		Part No. 842 040	–	–
COOLPOWER 5/100		–	Part No. 893 05	–
COOLPOWER 5/100 T		–	–	Part No. 129 78
Accessories				
Connecting cable				
Compressor – cold head, 4.5 m		Part No. 400 000 323	included with the cold head	included with the cold head
Compressor unit (for operation of one cold head)				
COOLPAK 4000		Part No. 892 31	–	–
COOLPAK 4200		Part No. 892 33	–	–
COOLPAK 6000		–	Part No. 892 36	Part No. 892 36
COOLPAK 6200		–	Part No. 892 37	Part No. 892 37
Power supply cable		see Ordering Information for the Compressor Units COOLPAK		
Set of flexlines				
FL 4.5 (1/2", 1/2")			Part No. 892 87	
or FL 9.0 (1/2", 1/2")			Part No. 892 88	
and EL 4.5 (electric extension cable)			Part No. 893 74	
Options				
Temperature measurement / control				
Silicon diode			Part No. 890 89	
MODEL 1901 low temperature measuring instrument			Part No. 136 45	
Measuring cable		see Ordering Information for the MODEL 1901 low temperature measuring instrument		
Electrical heaters			upon request	
Modell 9700 low temperature controller			Part No. 842 400	
Measuring cable, 3 m long			Part No. 842 401	

¹⁾ The refrigerating capacities and temperatures stated apply to vertical operation with the cold end at the bottom

²⁾ Series 8 from Aeroquip

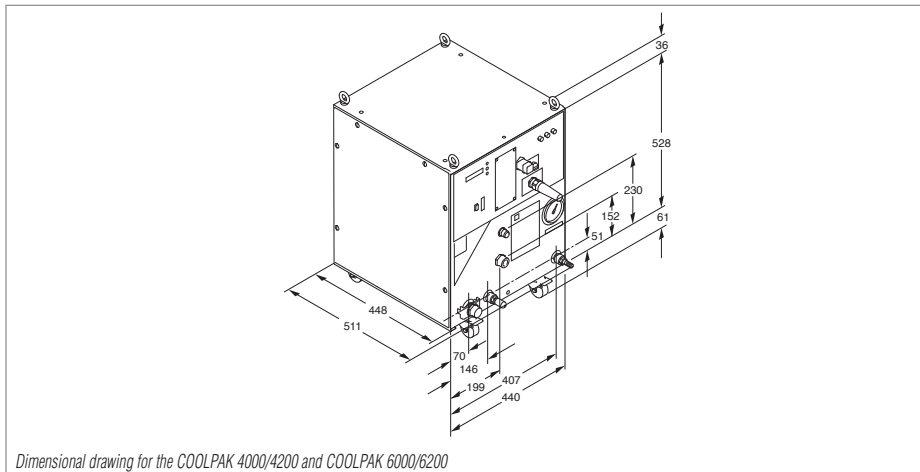
COOLPAK 4000/4200, COOLPAK 6000/6200



Compressor units COOLPAK 4000/4200/(COOLPAK 6000/6200, COOLPAK 6000 MD/6200 MD similar)

Advantages to the User

- ◆ Highly effective and even more powerful when connected with LEYBOLD cryopumps and refrigerators
- ◆ Excellent long-term reliability owing to the modular design and the longlife components
- ◆ Silent and low vibration operation through scroll compressors
- ◆ Easy to install and operate
- ◆ 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



Technical Data	COOLPAK 4000		COOLPAK 4200		COOLPAK 6000		COOLPAK 6200	
	50 Hz	60 Hz	50 Hz	60 Hz	50 Hz	60 Hz	50 Hz	60 Hz
Number of electrical connections for cold heads	1		1		1		1	
Helium system filling pressure at room temperature bar	14	13	14	13	15	14	14	13
Ambient temperature °C	5 to 40		5 to 40		5 to 40		5 to 40	
Cooling-water consumption ¹⁾ l/min	3.5		3.5		5.0		5.0	
Cooling-water entry temperature °C	5 to 25		5 to 25		5 to 25		5 to 25	
Main voltage (3 phase) upon delivery V	400 ± 10%	–	200 ± 10%	200 ²⁾ + 10% - 5%	400 ± 10%	–	230 ³⁾ - 10%	230 ± 10%
alternative setting V	–	470 ± 10%	230 ³⁾ - 10%	230 ± 10%	–	470 ± 10%	200 ± 10%	200 ± 10%
Operating currents with the cold head cool A	6.4 to 7.4	6,2 to 7,3	14.6 to 16.5	13.8 to 17.0	9.5 to 10.5	9.0 to 10.0	15.5 to 22.0	16.0 to 23.0
with the cold head warm A	8.5	8.1	18.3	19.5	13.7	12.0	25.0	25.0
Electrical power consumption with the cold head cool kW	3.8 to 4.5	4.2 to 5.3	4.0 to 4.6	4.4 to 5.3	6.0 to 6.5	6.5 to 6.9	5.5 to 6.2	5.9 to 6.7
with the cold head warm kW	5.3	5.8	5.3	5.9	8.2	8.7	7.6	7.8
Remote control via interface	24 V DC or RS 232 C		24 V DC or RS 232 C		24 V DC or RS 232 C		24 V DC or RS 232 C	
Helium connections								
Self-sealing couplings								
High pressure side	1/2"		1/2"		1/2"		1/2"	
Low pressure side	1/2"		1/2"		1/2"		1/2"	
Water connections	Hose nozzle DN 12 / G 1/2" outside thread				Hose nozzle DN 12 / G 1/2" outside thread			
Sound level (at 1 m distance) dB(A)	53		53		53		53	
Dimensions (W x H x D) mm	440 x 589 x 511		440 x 589 x 511		440 x 589 x 511		440 x 589 x 511	
Weight kg (lbs)	93 (205)		93 (205)		94 (207)		94 (207)	
Ordering Information	COOLPAK 4000		COOLPAK 4200		COOLPAK 6000		COOLPAK 6200	
	Europe	USA/Japan	USA/Japan		Europe	USA/Japan	USA/Japan	
Compressor unit without power supply cable								
Single cold head operation	Part No. 892 31		Part No. 892 33		Part No. 892 36		Part No. 892 37	
Dual cold head operation	Part No. 892 3000 ⁴⁾		–		Part No. 892 46 ⁵⁾		–	
Power supply cable								
3.5 m, CEE plug, 32 A/6h, 3 pole + N + PE	Part No. 893 95	–	–		Part No. 893 95	–	–	
3.5 m, NEMA plug, L 16-20 P, 20 A/480 V, 3 pole + PE (AWG 12)	–	Part No. 893 96	–		–	Part No. 893 96	–	
3.5 m, NEMA plug, L 15-20 P, 20 A/250 V, 4 pole - PE (AWG 12)	–		Part No. 840 110		–		–	
10 m, with end splice (AWG 10)	–		Part No. 840 111		–		Part No. 840 111	
Spare part								
Adsorber CACP 4000 / 6000	Part No. 893 52		Part No. 893 52		Part No. 893 52		Part No. 893 52	

¹⁾ At a cooling water entry temperature of 25 °C

²⁾ ± 10% at 12 bar filling pressure

³⁾ At 13 bar filling pressure

⁴⁾ COOLPAK 4000 D

⁵⁾ COOLPAK 6000 D

General Accessories for Compressor Units COOLPAK

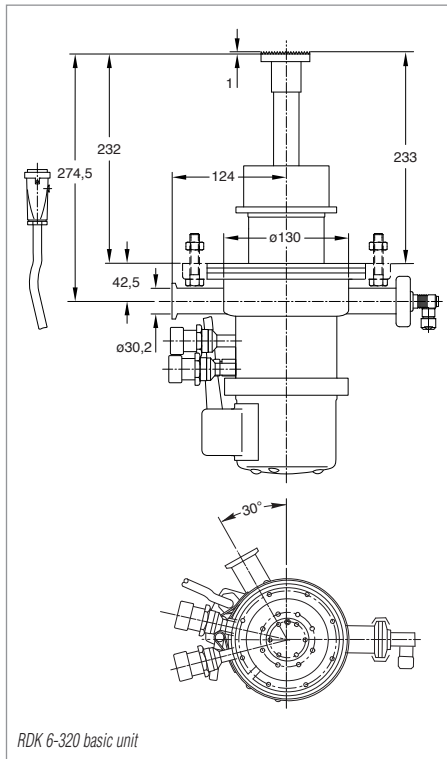
Technical Data	Length	Connections on both sides (inside thread)	
		High pressure line	Low pressure line
Flexlines ^{1), 2)} FL 4.5 (1/2", 1/2") FL 9.0 (1/2", 1/2")	4.5 m 9.0 m	1/2" 1/2"	1/2" 1/2"
Adaptor			
Accessories for Flexlines	Outside thread (m)	Inside thread (f)	
Adapter for flexlines AD (1/2" m, 3/4" f) AD (1/2" f, 3/4" m)	1/2" 3/4"	3/4" 1/2"	
Connections			
	Outside thread (m)	Inside thread (f)	
Elbow 1/2" for flexlines Isolating piece 1/2" for flexlines	1/2" 1/2"	1/2" 1/2"	
Connections on both sides			
	Outside thread (m)		
Coupling 1/2" for interconnecting two 1/2" flexlines	1/2"		
	Number of gas distributors	Gas manifold - Connections	
		At the compressor (inside thread)	At the cold head (outside thread)
Gas manifold for dual operation ²⁾ (consisting of two Tees) GD 2 (for dual operation) GD 4 (for up to quad operation)	2 4	1/2" 1/2"	2 x 1/2" 4 x 1/2"
Length			
EL 4.5 extension cable for linking cold head and compressor unit	4.5 m		
Ordering Information			
Flexlines ^{1), 2)} FL 4.5 (1/2", 1/2") FL 9.0 (1/2", 1/2")	Part No. 892 87 Part No. 892 88		
Adaptor AD (1/2" m, 3/4" f) AD (1/2" f, 3/4" m)	Part No. 892 89 Part No. 892 90		
Elbow 1/2"	Part No. 891 73		
Coupling 1/2"	Part No. 891 71		
Gas manifold GD 2 (for dual operation) ²⁾ GD 4 (for dual operation) ²⁾	Part No. 891 02 Part No. 891 03		
EL 4.5 extension cable for linking cold head and compressor unit ²⁾	Part No. 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 bar

¹⁾ Minimum bending radius: 30 cm

²⁾ Only suited for pneumatically driven cold heads and cryopumps

Refrigerator Cryostats based on the RDK 6-320



The RDK 6-320 basic unit includes the COOLPOWER 5/100 T two-stage cold head. Its high refrigerating capacity at low temperatures permits experiments which previously could not be performed by relying on refrigerators and which required the use of liquid helium.

The RDK 6-320 basic unit is a complete system for measurements in the temperature range between 6 and 320 K.

The COOLPOWER 5/100 cold head is augmented by:

- ◆ Silicon diode for measuring the temperatures at the second stage of the cold head
- ◆ Heater at the second stage of the cold head provided with overheating protection
- ◆ 11-way current feedthrough with matching external connector
- ◆ DN 25 KF pumpdown port
- ◆ DN 160 ISO-K vacuum flange

Advantages to the User

- ◆ Compact
- ◆ Very reliable
- ◆ Comprehensive range of accessories from one source
- ◆ For installation in any orientation
- ◆ Simple to operate
- ◆ Short cooldown time
- ◆ Cost-effective in long-term experiments since no liquid helium is required
- ◆ Simple and rapid servicing through the use of the standard COOLPOWER 5/100 cold head with pneumatic drive system for the displacer

Typical Applications

- ◆ Cooling of samples and detectors
- ◆ Material research and testing
- ◆ Spectroscopic applications
- ◆ Matrix isolation spectroscopy with neon and argon

General Remarks on Refrigerator Cryostats

Isolating Vacuum

A two-stage rotary vacuum pump will normally be adequate to produce an isolating vacuum. However, this pump should be equipped on the suction side with an adsorption trap and a isolation valve.

If the application requires that the cold surfaces remain free of hydrocarbons, we recommend the use of our small turbomolecular pump system PT 50 (see Product Section C10).

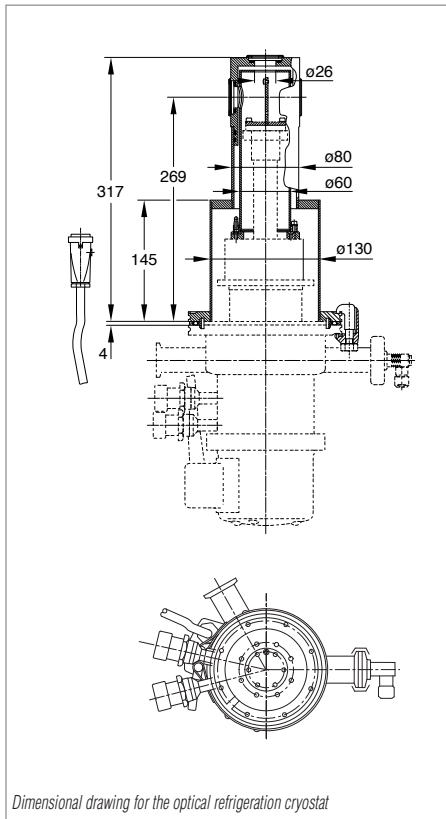
Temperature Measurement

In order to avoid measurement errors due to thermal resistances, the temperature at the sample should preferably be measured by a second optional silicon diode which is installed as close to the sample as possible. If possible it should be maintained at the same temperature level as that of the probe.

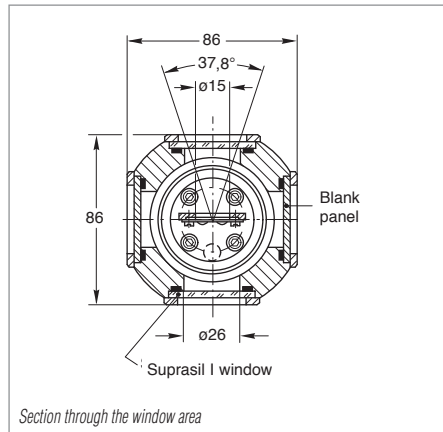
Temperature Control

The temperature at the second stage of the cold head (or that of the probe) is controlled by heating against the cooling effect produced by the refrigerator (while the cold head is running).

Optical Refrigerator Cryostat based on the RDK 6-320



Upgraded as an optical cryostat (option) the RDK 6-320 is tailor-made for experiments involving temperatures down to about 7 K.



Supplied Equipment

- ◆ Basic unit RDK 6-320
- ◆ Temperature attenuation disk out of Pb Sn
- ◆ Sample holder out of Al 99.5
- ◆ Thermal radiation shield out of E-Cu
- ◆ Vacuum jacket out of aluminum / stainless steel
- ◆ Five exchangeable windows (four windows on the sides, one window in the longitudinal axis of the cryostat); two windows on the sides and the window in the longitudinal axis are made of SUPRASIL I, the two other windows are blanked off and are made of brass

Technical Data		RDK 6-320	
Temperature range			
2nd stage of the cold head	K		6 to 320
1st stage of the cold head	K		28 to 320
Silicon diode for temperature measurements at the 2nd stage of the cold head			built-in
Heater at the 2nd stage of the cold head			built-in
Heating power	W		50
Heating current	A		1
Heating voltage	V DC		50
Permissible ambient temperature	°C		5 to 40
He filling pressure at room temperature	bar		16
He connections			
Self-sealing screwed connections			
High pressure connection (outside thread)			1/2"
Low pressure connection (outside thread)			1/2"
Length of the connection cable to the compressor unit	m		4.5 (included)
Weight	kg (lbs)		13 (28.7)
Ordering Information		RDK 6-320	
Basic unit RDK 6-320		Part No. 842 403	
Optical cryostat consisting of RDK 6-320 and Expansion Kit ROK		Part No. 842 404	
Accessories			
Compressor unit			
COOLPAK 6000, 400 V/50 Hz; 470 V/60 Hz		Part No. 892 36	
COOLPAK 6200, 200 V/50 Hz; 200 V, 230 V/60 Hz		Part No. 892 37	
Power supply cable		see Ordering Information for the Compressor Units COOLPAK	
Flexlines			
FL 4.5 (1/2", 1/2")		Part No. 892 87	
Temperature measurement at 2nd stage with			
Modell 9700 low temperature controller		Part No. 842 400	
Measuring cable, 3 m long		Part No. 842 401	

Controllers and Monitoring Units for Cryopumps

System Controller COOLVAC SC



System Controller COOLVAC SC

Design Features

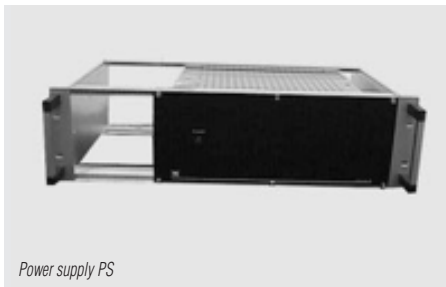
- ◆ 1/4 19" rack module
- ◆ 3 height units
- ◆ Dimensions (W x H x D)
106 x 129 x 178 mm
- ◆ Operation through pushbuttons

The intelligent COOLVAC System Controller SC automatically controls and monitors up to 30 COOLVAC pumps.

Online monitoring, help functions and a service interface for easy diagnostic are just a few user friendly features.

It can be installed as a "stand alone system" or remote controlled via an interface.

Power Supply PS for up to Two Cryopumps



Power supply PS

Design Features

- ◆ 19" rack module
- ◆ 3 height units
- ◆ Dimensions (W x H x D)
485 x 135 x 320 mm

The COOLVAC Power Supply PS provides the power for the cold head motor, the electrical heaters and the supplies voltage to the electronics for up to 2 COOLVAC pumps.

Controlled via the System Controller SC the PS turns the compressor unit on and off if required by the connected pumps.

The System Controller COOLVAC SC (not included) will fit into the empty space.

Power Supply PS for up to Three Cryopumps



Power supply PS

Design Features

- ◆ 19" rack module
- ◆ 4 height units
- ◆ Dimensions (W x H x D)
435 x 190 x 440 mm
- ◆ Single LED indicates correct direction of rotation for the rotating field

The COOLVAC Power Supply PS provides the power for the cold head motor, the electrical heaters and the supplies voltage to the electronics for up to 3 COOLVAC pumps.

Controlled via the System Controller SC the PS turns the compressor unit on and off if required by the connected pumps.

Advantages to the User

- ◆ Interface to external system controller
- ◆ For easy integration with external system controllers
- ◆ For safe pumping of hydrogen

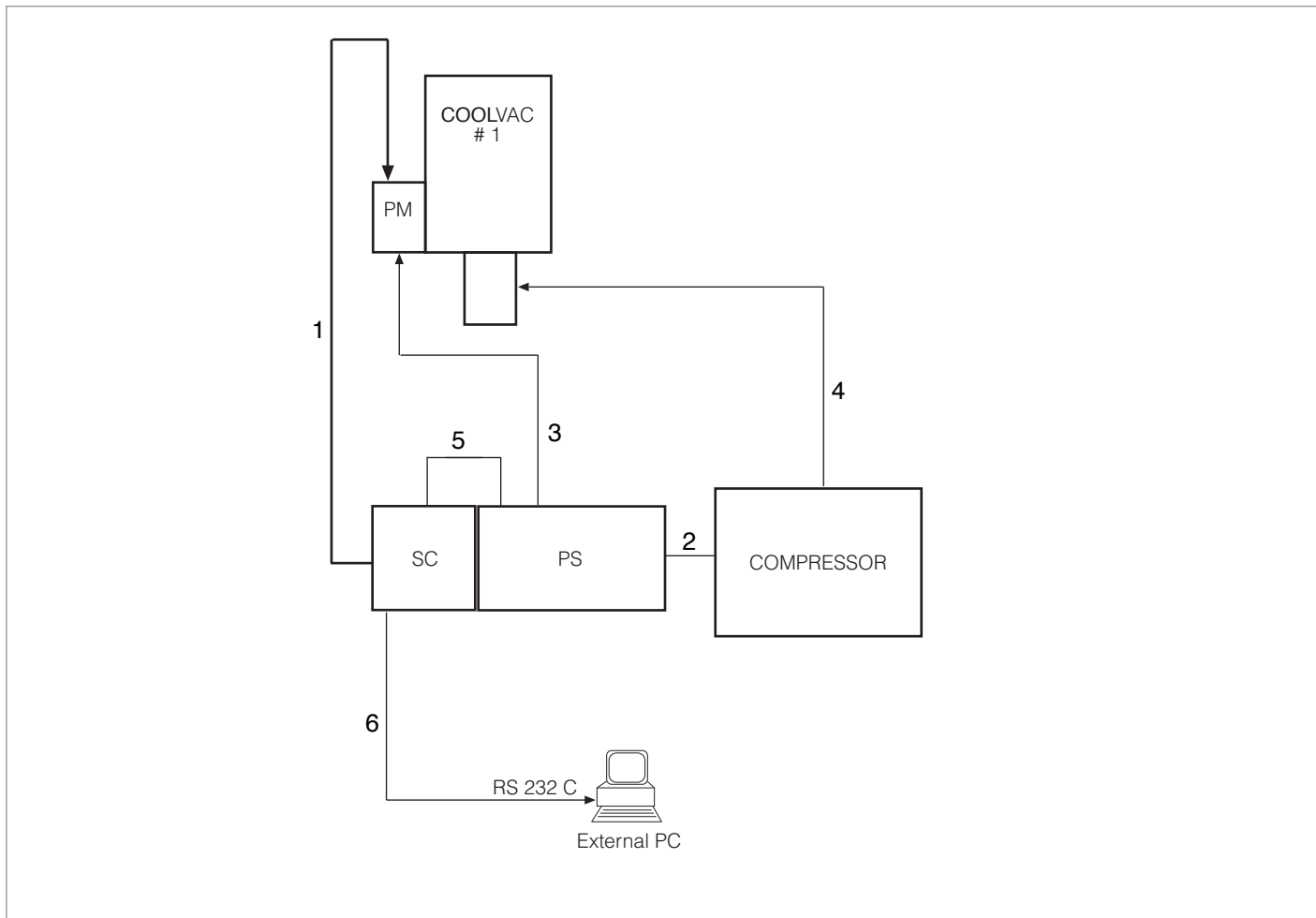
Typical Applications

- ◆ For automated operation of the COOLVAC cryopumps of the ClassicLine and the SemiLine

Ordering Information

System Controller	Part No. 844 230
Power Supply PS for up to 2 Cryo pumps for up to 3 Cryo pumps	Part No. 844 135 Part No. 844 235

COOLVAC ClassicLine, Single System Configuration



Key to the diagram "Single System Configuration"

PM = Pump Module (included with the pump)

SC = System Controller

PS = Power Supply

1 = e.g. Part No. 844 262

2 = e.g. Part No. 844 139

3 = e.g. Part No. 844 138

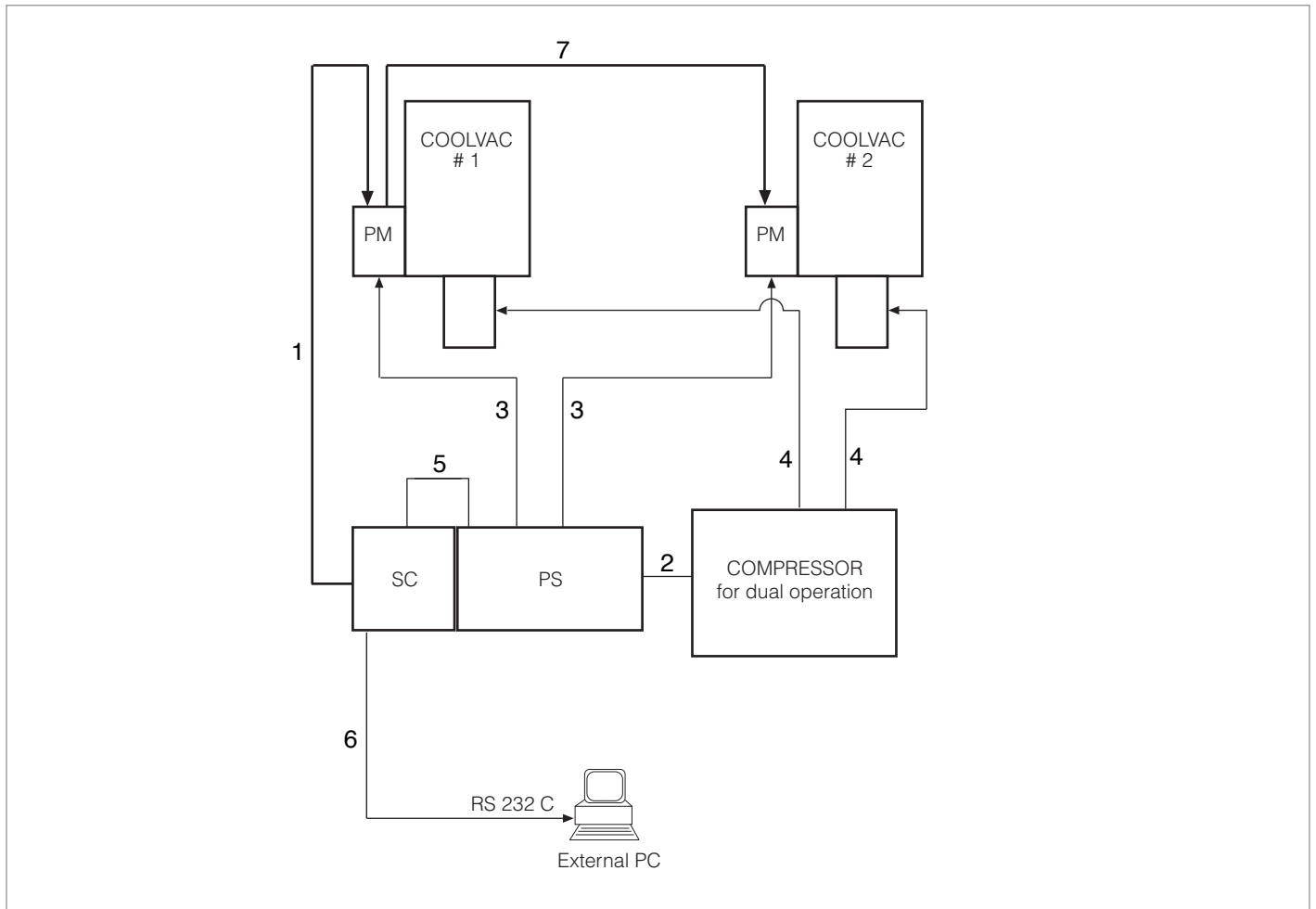
4 = Part No. 400 000 323

5 = Part No. 844 141

6 = to be provided by the customer

COOLVAC ClassicLine, Dual System Configuration

Only for European mains voltages and for compressors suited for dual operation



Key to the diagram "Dual System Configuration"

PM = Pump Module (included with the pump)

SC = System Controller

PS = Power Supply

1 = e. g. Part No. 844 262

2 = e. g. Part No. 844 139

3 = e. g. Part No. 844 138

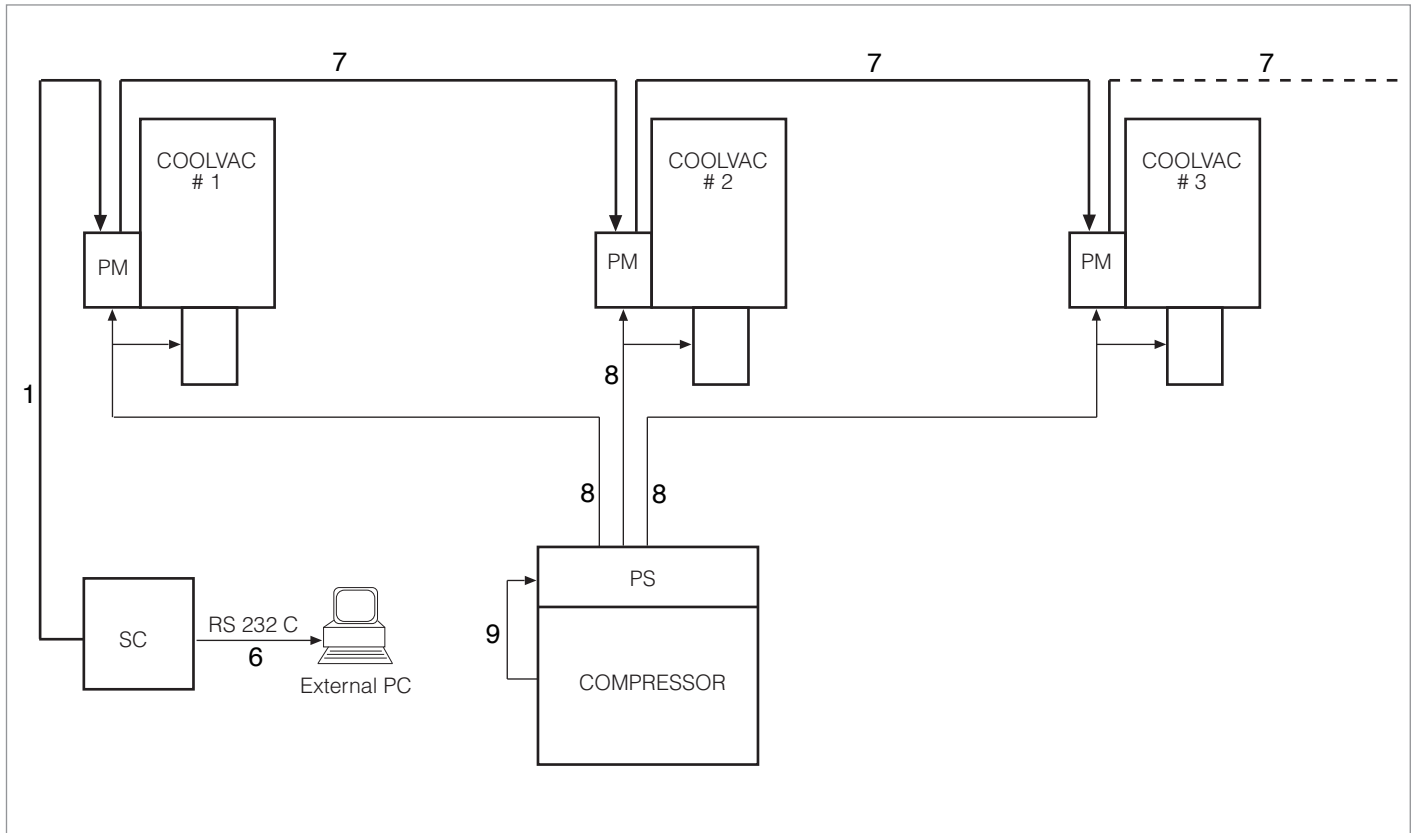
4 = Part No. 400 000 323

5 = Part No. 844 141

6 = to be provided by the customer

7 = e. g. Part No. 844 256

COOLVAC ClassicLine, Dual and Multiple System Configuration



Key to the diagram "Dual and Multiple System Configuration"

- PM = Pump Module (included with the pump)
- SC = System Controller
- PS = Power Supply
- 1 = e. g. Part No. 844 262
- 6 = to be provided by the customer
- 7 = e. g. Part No. 844 256
- 8 = e. g. Part No. 844 252
- 9 = Part No. 844 265

Modell 9700 Low Temperature Controller



Advantages to the User

- ◆ Microprocessor controlled PID controller
- ◆ Digital temperature readout in Kelvin
- ◆ Control by means of counter heating
- ◆ High control accuracy over the entire temperature range (1.5 to 450 K)
- ◆ Electric heating power up to 50 W
- ◆ Programmable heater power limit
- ◆ Generation of linear temperature ramps
- ◆ Up to 50 program steps are programmable
- ◆ Standard interface RS 232 C and IEEE-488
- ◆ Data from two sensors can be displayed
- ◆ Analogue temperature outputs for both channels
- ◆ Can be used in three operating modes
 - Manual
 - Program
 - External computer control

Typical Applications

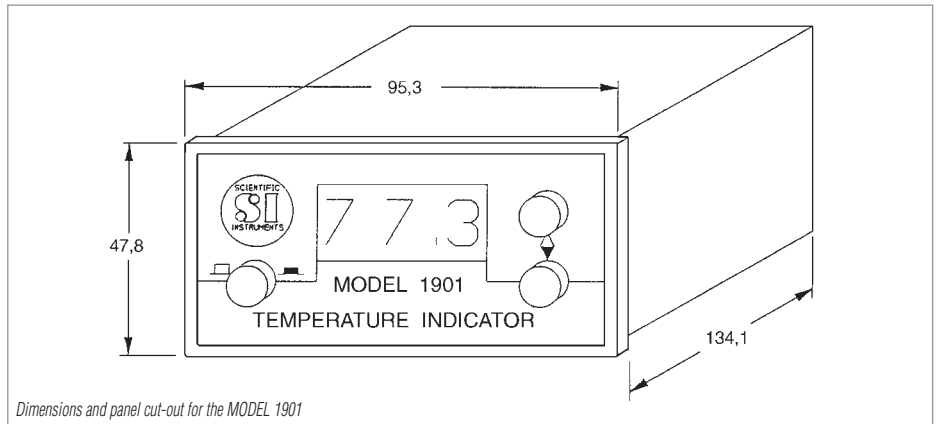
- ◆ Temperature control at refrigerator cryostats

Technical Data		Modell 9700
Mains connection, 50/60 Hz	V AC	85-240
Power consumption, max.	W	150
Entry of data		3 x 4 membrane key pad
Data memory		EPROM
Display		Two line, 20 digit LED digital display
Temperature measurement		
Sensors		2 x silicon diodes type D or 2 x silicon diodes with standard temperature resistance characteristics
Measurement current	µA	10
Measurement range	K	1.5 to 450
Measurement range of the silicon diode type D	K	1.4 to 325 K
Number of channels		2
Resolution		Simultaneous display of both channels
A/D converter resolution	bit	24
Switching outputs		2 relays (n.o. and n.c. contacts)
Temperature resolution	K	0.1
Temperature control		PID controller
Heating power, max.	W	50
Heating current, max.	A	1
Heating voltage, max.	V DC	0 to 50
Computer interface		RS 232 C and IEEE-488
Permissible ambient temperature	°C	+ 10 to + 30
Mechanical design/cabinet		Table-top unit (8.5" x 3.5" x 12")
Dimensions (W x H x D) [high H without feet]	mm	215.9 x 88 x 304.8
Weight	kg (lbs)	2.3 (5)
Dimensions of the packaging (W x H x D)	mm	360 x 230 x 450
Weight (including packaging, approx.)	kg (lbs)	4.2 (9.3)
Length of mains cord	m	2.5
Ordering Information		Modell 9700
Modell 9700 low temperature controller		Part No. 842 400
Sensor cable, 3 m long		Part No. 842 401
Silicon diode type D with connection cable and miniature plugs		Part No. 890 89

MODEL 1901 Low Temperature Measuring Instrument



MODEL 1901 low temperature measuring instrument



Dimensions and panel cut-out for the MODEL 1901

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

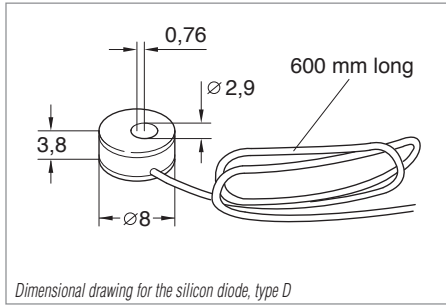
- ◆ Temperature measurements on cryostats
- ◆ Temperature measurements on cryopumps for monitoring their operation and to control pump systems

Technical Data		MODEL 1901
Measurement current	μA	10
Display		LED, 3-digits
Temperature range	K	1.5 to 450
Resolution		0.1 K from 1.5 to 99.9 K 1.0 K from 100 to 450 K
Accuracy		±0.1 K from 1.5 to 99.9 K ±1.0 K from 100 to 450 K
Power supply voltage		9 V DC @ 500 mA through the supplied 220 V AC / 9 V DC power adaptor
Trigger thresholds		2
Switched output		2 relays (n.c. and n.o.)
RS 232 C interface		a) Temperature output b) External adjustment of switching thresholds
Admissible ambient temperature	°C	+10 to +35
Mechanical design/housing		Benchtop unit
Dimensions (W x H x D)	mm	95.3 x 47.8 x 134.1
Packaging dimensions (W x H x D)	mm	320 x 180 x 120
Weight (including packaging)	kg (lbs)	1.5 (3.3)

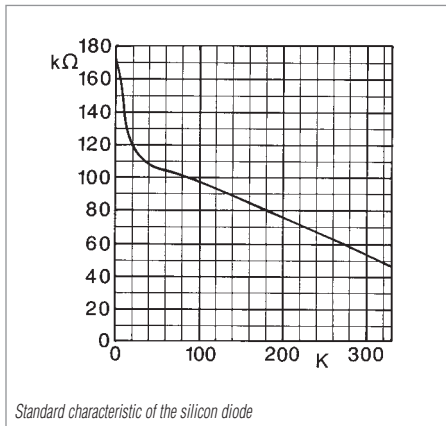
Ordering Information		MODEL 1901
MODEL 1901 low temperature measurement instrument		Part No. 136 45
HV cable with plug, 10 m long *)		Part No. 500 085
UHV cable with plug, 10 m long *)		Part No. 500 201
Silicon diode, type D, with connecting cable and micro plugs - without current feedthrough		Part No. 890 89
HV current feedthrough on a flange DN 25 KF, 2 way		Part No. 200 19 256
UHV current feedthrough on a flange DN 16 KF, 2 way		Part No. 500 217

*) for COOLPOWER and COOLVAC pumps

Temperature Sensors



Dimensional drawing for the silicon diode, type D



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.

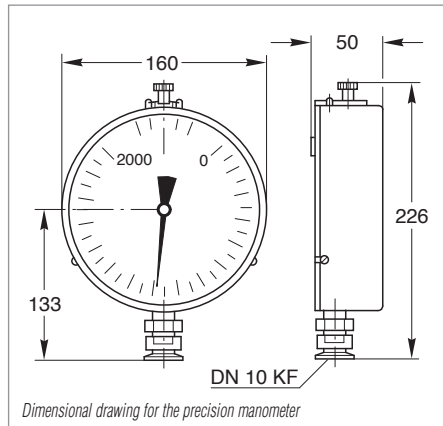
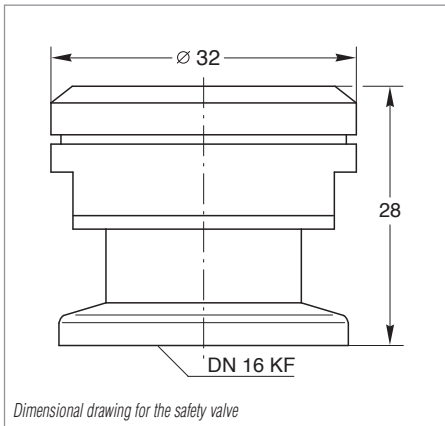
Silicon diodes offer a negative temperature coefficient of resistance, i.e. their resistance drops as the temperature increases. The slope of the temperature/resistance characteristic and the absolute resistance are decisive regarding the suitability of these diodes. The slope determines the sensitivity 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 type D silicon diode is compatible to the MODEL 1901 low temperature display unit.

Technical Data		Type D Silicon Diode
Temperature range	K	1.4 to 325
Temperature coefficient (dR/dT)		Negative in the entire temperature range
qualitative		Non-linear characteristic
quantitative	Ω/K	
Measurement current	μA	10
Bakeable to	°C	60
Ordering Information		Type D Silicon Diode
Temperature Sensors		Part No. 890 89

Safety Valve / Precision Manometer



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

Typical Applications

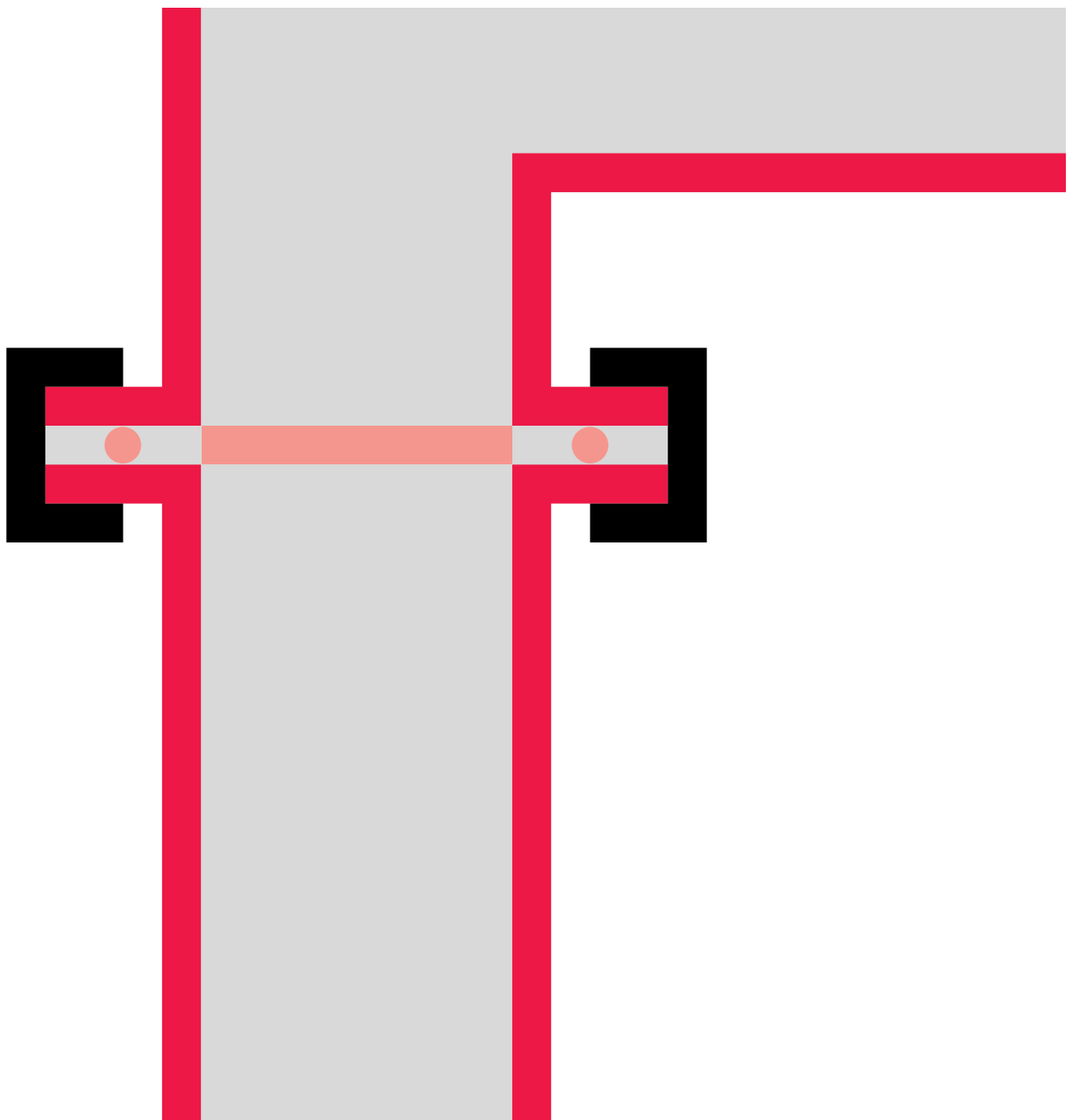
- ◆ Pressure readout for vapor pressure thermometers

Technical Information

For operation and measurements at pressures exceeding 1013 mbar the small flange seal must be equipped with an outer centering ring Part No. 183 53.

Technical Data		Safety Valve	Precision Manometer
Responding pressure	mbar	120 to 160, over-pressure	–
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 x s ⁻¹ (Torr x l x s ⁻¹)	< 1 x 10 ⁻⁸ (< 0.75 x 10 ⁻⁸)	–
Connection	DN	16 KF	10 KF
Measurement range	mbar (Torr)	–	0 to 2000 (0 to 1500)
Accuracy		–	1 % of full scale
Diameter	mm	32	160
Length of the dial	mm	–	320
Internal volume, approx.	cm ³	–	20
Overall height	mm	28	226
Weight	kg (lbs)	0.3 (0.7)	1.4 (3.1)
Ordering Information		Safety Valve	Precision Manometer
Safety valve on DN 16 KF flange		Part No. 890 39	–
Precision manometer		–	Part No. 890 50

Vacuum Fittings and Feedthroughs



General

Materials C13.03
 The Right Connection from LEYBOLD C13.04
 Flange Connections C13.05

Products

Global Versions

ISO-KF Flange Fittings and Components C13.06
 Adaptors C13.16
 (ISO-K) Clamp Flange Fittings and Components C13.18
 ISO-F and DIN 2501 Fixed Flange Fittings, ND6 C13.26
 ISO-F Fixed Flange Fittings C13.27
 DIN 2501 Fixed Flange Fittings C13.28
 Vacuum Greases C13.29
 Observation Windows C13.30
 Electrical Feedthroughs C13.32
 High Current Feedthroughs C13.35
 Rotary Feedthroughs C13.36
 Rotary / Linear Motion Feedthroughs C13.37
 Liquid Feedthroughs C13.38

Versions for the North and South American Continents

ISO-KF Flange Fittings and Components C13.39
 Adaptors C13.41
 (ISO-K) Clamp Flange Fittings and Components C13.42
 ISO-F and DIN 2501 Fixed Flange Fittings C13.43
 ANSI Fittings C13.44

These arguments should convince you in favor of flange components from LEYBOLD:

- ◆ Availability of all components at short notice
- ◆ World-wide 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 x s⁻¹; 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

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 KF flange connection was developed by LEYBOLD many years ago and has been widely accepted by all users of vacuum equipment. This product section 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.

Ultra High Vacuum Components are described in Product Section C15.

Flange Designations

The designations used by LEYBOLD 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.

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.

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

Aluminum

German Material No.	AISI	DIN Designation
3.0255.10	AA 150 1-0	Al 99.5w
3.0615.71	AA 6012-T6	AlMgSiPb
3.1655.53	AA 2011-T352	AlCuBiPb
3.2162.05	380.0 (AA)	GD-AISi8Cu8
3.2315.08	6082-F (AA)	AlMgSi1
3.2315.71	6082-T6	AlMgSi1
3.2315.72	6063 (AA)	Al Mg Si1
3.2381.02	520.0 (AA)	GK AISi 10 Mg
3.2381.62	520.0 (AA)	GK AISi 10 Mgwa
3.2582.05	160 X	GD-AISi 12

Steel

German Material No.	AISI	DIN Designation
1.0037	–	St 37-2
1.0308.07	–	St 35
1.1141	–	CK 15
1.1181	–	CK 35

Gaskets

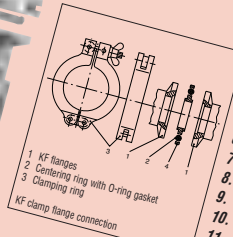
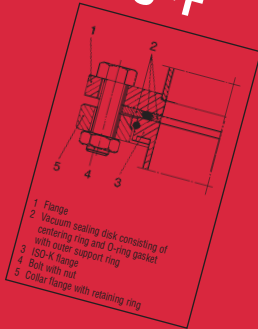
Code Designation	Chemical Designation	Typical Trade Name
CR	Chloroprenecaoutchouc	Neoprene
FPM	Fluorocaoutchouc	Viton®
NBR	Acrylonitrile-butadienrubber	Perbunan®
PTFE	Polytetrafluorethylene	Teflon®
EPDM	Ethylene propylene dien rubber	–

Hoses and Tubes

Code Designation	Chemical Designation	Typical Trade Name
NR	Natural rubber	–
PVC	Polyvinylchloride	–

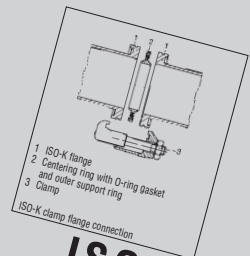
THE RIGHT CONNECTION FROM LEYBOLD

ISO-F



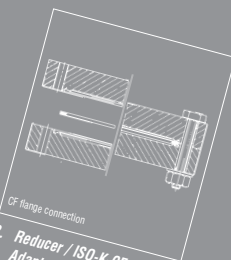
KF

2. Adaptor reducer ISO-K - KF
3. Centering ring with O-ring gasket
4. Flexible vacuum tubing
5. Clamping quick-release ring
6. Tee
7. Clamp
8. Elbow
9. PVC coiled vacuum tubing
10. Cross
11. Blank flange
12. Small flange with hose nozzle



ISO-K

CF



2. Reducer / ISO-K-CF
3. Adaptor CF-ISO-K/KF
4. Double cross
5. Adjustment piece
6. Elbow
7. Ceramic intermediate piece
8. Tee
9. UHV observation window
10. Blank flange

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 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 KF flanges (1), a centering ring with O-ring gasket (2) and a clamping ring (3). High vacuum tight KF connections can be made without the use of tools simply by turning the wing nut of the clamping ring.

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-F / DIN

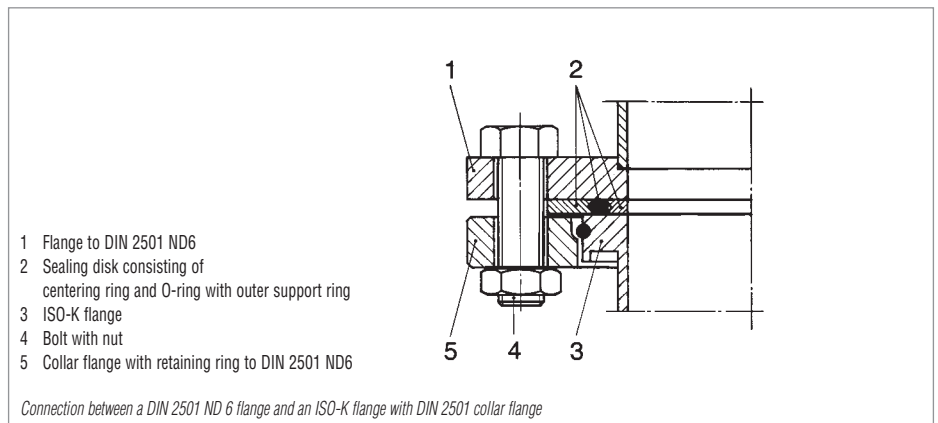
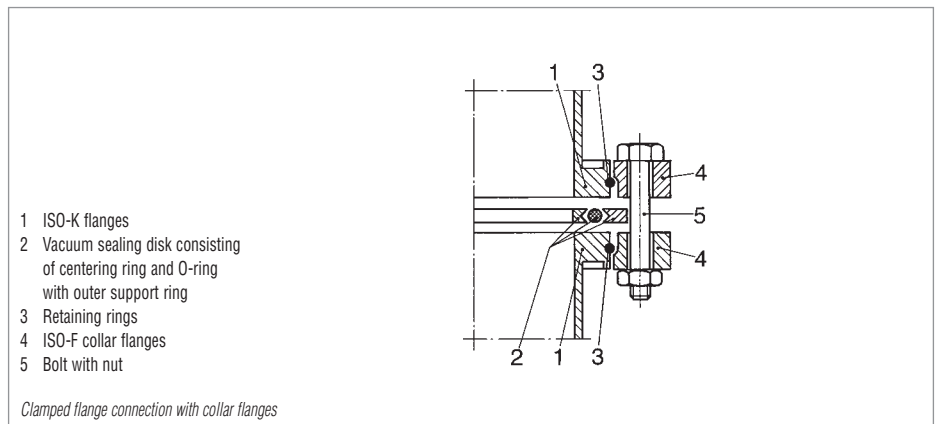
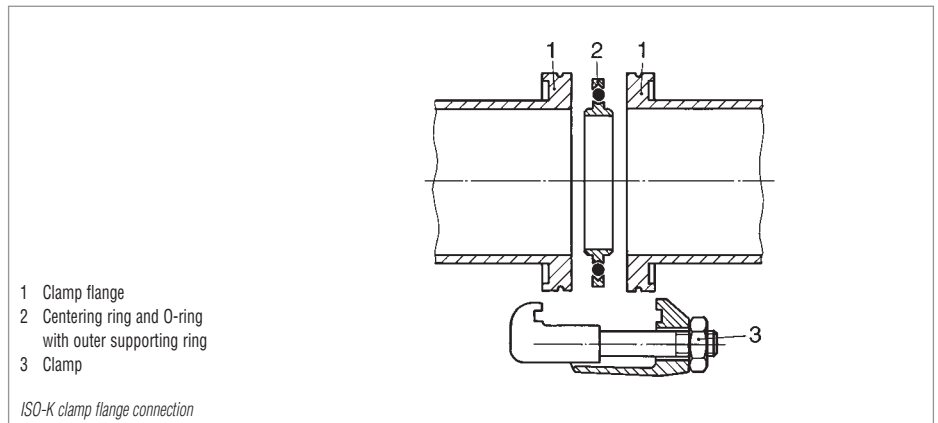
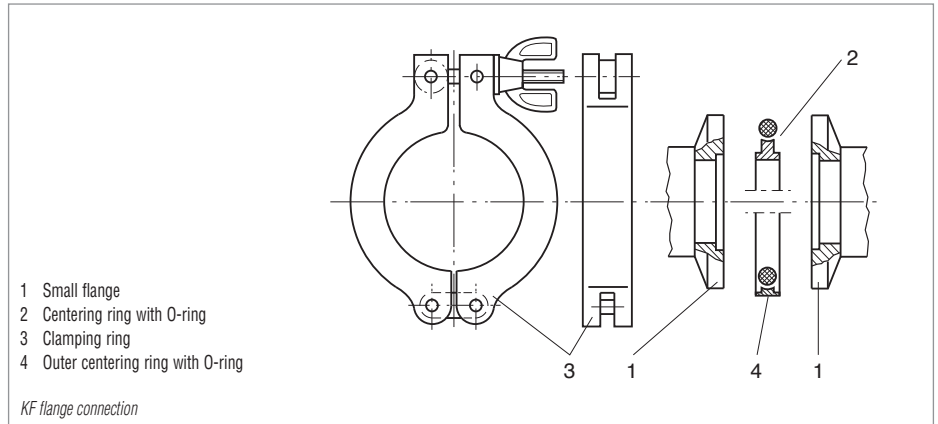
Fixed Bolted Flange Fittings

With the appropriate collar flanges, the clamp flange can be connected to various fixed bolted flange systems (ISO-F, DN 2501, etc.) see figures in section "ISO-F and DIN 2501 Fixed Flange Fittings".

Bake Out Temperatures for the Gaskets

CR and FPM gaskets can be inserted in all listed flange types, while aluminum 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 gaskets from -15 °C to +150 °C [+5 °F to +302 °F] (max. bakeout temperature). Aluminum gaskets from -196 °C to +200 °C [-321 °F to +392 °F] (max. bakeout temperature gradient; ΔT max. 2.5 °/min).



DN 16 KF to DN 50 KF

Aluminum 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

- ◆ 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)
- ◆ 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.

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

DN 16 KF to 50 KF

Stainless Steel Design

(to DIN 28 403)

[Tubes similar DIN 28 403]

Advantages to the User

- ◆ Quick, safe and reliable
- ◆ Can be baked out up to 200 °C (392 °F) when using metal seals
- ◆ Can be degassed up to 150 °C (302 °F) with FPM gaskets
- ◆ With metal seals suitable for pressures down to 10^{-9} mbar (0.75×10^{-9} Torr)
- ◆ Corrosion resistant
- ◆ Low degassing rate
- ◆ For standard applications involving pressures up to 2.5 bar (1.9×10^3 Torr) abs.
- ◆ Can be degassed up to 200 °C (392 °F) with UHV aluminum rings or disks

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

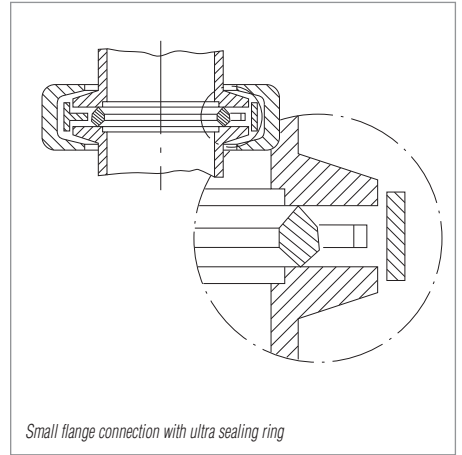
- ◆ Easy and quick to install
- ◆ Safe and reliable
- ◆ Tubes may be turned in any direction
- ◆ No centering and sealing ring required
- ◆ Capable of withstanding temperatures up to 80 °C (176 °F)
- ◆ Suitable for pressures down to 10^{-5} mbar (0.75×10^{-5} Torr)



Fitting a centering ring to a KF component



Quick clamping ring



Small flange connection with ultra sealing ring



Fitting an elbow



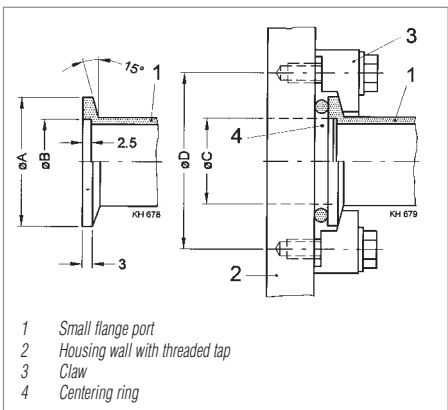
Clamping ring for ultra sealing disk



Small flange connection with clamping ring

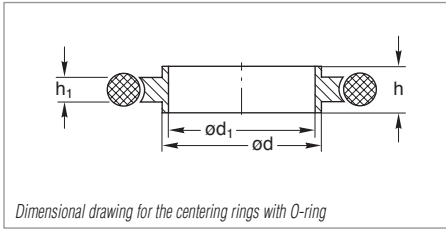


Small flange components made of stainless steel



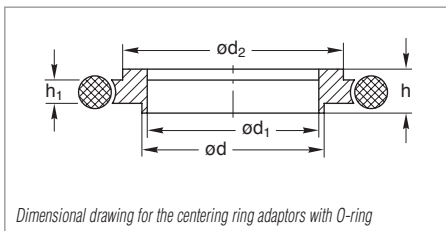
Nominal diameter	A	B	C	D	Number of claws
DN 10 ISO-KF	30	12.2	12.2	45	4
DN 16 ISO-KF	30	17.2	17.2	45	4
DN 25 ISO-KF	40	26.2	26.2	55	4
DN 40 ISO-KF	55	41.2	41.2	71	4
DN 50 ISO-KF	75	52.4	52.4	91	4

Centering Rings (Aluminum 3.1655.53/Stainless Steel 1.4305) with O-Ring (CR/FPM)



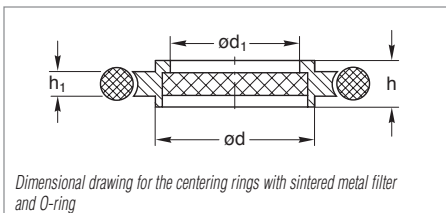
DN	KF	10	16	20	25	32	40	50
d	mm	12	17	22	26	34	41	52
	in.	0.47	0.67	0.87	1.02	1.34	1.61	2.05
d ₁	mm	10	16	20	25	32	40	50
	in.	0.40	0.63	0.79	0.98	1.26	1.57	1.97
h	mm	8	8	8	8	8	8	8
	in.	0.31	0.31	0.31	0.31	0.31	0.31	0.31
h ₁	mm	3.9	3.9	3.9	3.9	3.9	3.9	3.9
	in.	0.15	0.15	0.15	0.15	0.15	0.15	0.15
Aluminum/CR	Part No.	183 21	183 26	183 22	183 27	183 23	183 28	183 25
Aluminum/FPM	Part No.	182 01	182 06	182 02	182 07	182 03	182 08	182 05
Stainless steel/FPM	Part No.	883 21	883 46	883 22	883 47	883 23	883 48	883 25

Centering Ring Adaptors (Aluminum 3.1655.53/Stainless Steel 1.4301) with O-ring (CR/FPM)



DN	KF	10/16	20/25	32/40
d	mm	12	22	34
	in.	0.47	0.87	1.34
d ₁	mm	10	20	32
	in.	0.40	0.79	1.26
d ₂	mm	17	26	41
	in.	0.67	1.02	1.61
h	mm	8	8	8
	in.	0.31	0.31	0.31
h ₁	mm	3.9	3.9	3.9
	in.	0.15	0.15	0.15
Aluminum/FPM	Part No.	182 56	182 57	182 58
Aluminum/CR	Part No.	183 56	183 57	183 58
Stainless steel/FPM	Part No.	883 56	883 57	883 58

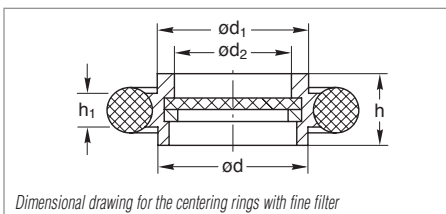
Centering Rings (Stainless Steel) with Sintered Metal Filter (Stainless Steel 1.4404 and O-Ring (FPM)



DN	KF	10	16	25	40	50
d	mm	12	17	26	41	52
	in.	0.47	0.67	1.02	1.61	2.05
d ₁	mm	8	14	23	38	48
	in.	0.31	0.55	0.91	1.50	1.89
h	mm	8	8	8	8	8
	in.	0.31	0.31	0.31	0.31	0.31
h ₁	mm	3.9	3.9	3.9	3.9	3.9
	in.	0.15	0.15	0.15	0.15	0.15
Stainless steel	Part No.	883 50	883 51	883 52	883 53	883 54

Air throughput at 20 °C and 200 mbar differential pressure approx. 1m³ x h⁻¹ x cm²; pore size: 20 µm

Centering Rings with Fine Filter (Stainless Steel 1.4305), O-Ring (FPM)

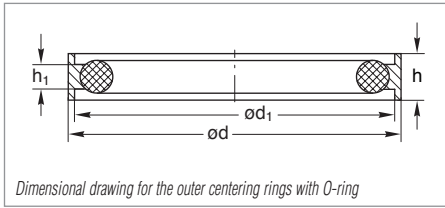


DN	KF	10	16	25	40	50
d	mm	12	17	26	41	52
	in.	0.47	0.67	1.02	1.61	2.05
d ₁	mm	12	17	26	41	52
	in.	0.47	0.67	1.02	1.61	2.05
d ₂	mm	9	13.5	22	35.5	46
	in.	0.35	0.53	0.87	1.4	1.81
h	mm	8	8	8	8	8
	in.	0.31	0.31	0.31	0.31	0.31
h ₁	mm	3.9	3.9	3.9	3.9	3.9
	in.	0.15	0.15	0.15	0.15	0.15
Stainless Steel	Part No.	883 95	883 96	883 97	883 98	883 99

Filter material: Stainless steel mesh 1.4404, size of pore: 4 µm, separation grade: 1 µm particles to 98 %

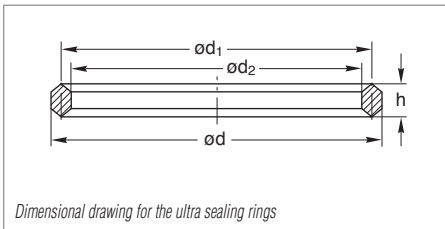
Important: In the table of Section "General" the German designation for the type of steel is also stated in accordance with AISI.

Outer Centering Rings (Aluminum 3.1655.53) with O-Ring (CR/FPM)



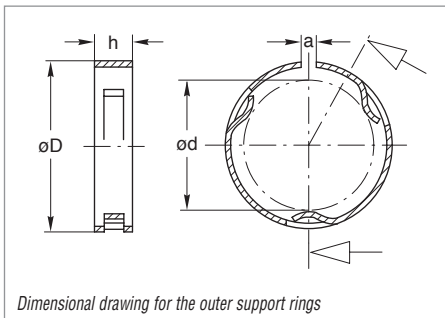
DN	KF	10/16	20/25	32/40	50
d	mm	32	42	57	77
	in.	1.26	1.65	2.24	3.03
d ₁	mm	30.2	40.2	55.2	75.2
	in.	1.19	1.58	2.17	2.96
h	mm	7	7	7	7
	in.	0.28	0.28	0.28	0.28
h ₁	mm	3.9	3.9	3.9	3.9
	in.	0.15	0.15	0.15	0.15
Aluminum/CR	Part No.	183 50	183 51	183 52	183 59
Aluminum/FPM	Part No.	183 53	183 54	183 55	183 60

Ultra Sealing Rings (Aluminum 3.2315.71)



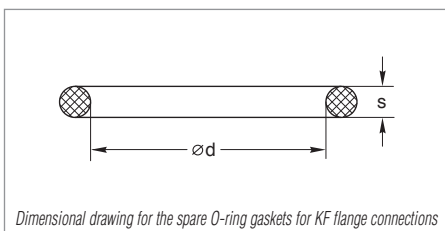
DN	KF	10/16	20/25	32/40	50
d	mm	25.6	35.6	50.6	65.6
	in.	1.01	1.40	1.99	2.58
d ₁	mm	22.6	32.6	47.6	62.6
	in.	0.89	1.38	1.87	2.46
d ₂	mm	19.6	29.6	44.6	59.6
	in.	0.77	1.17	1.76	2.35
h	mm	4.5	4.5	4.5	4.5
	in.	0.18	0.18	0.18	0.18
Aluminum (set of 3 pieces)	Part No.	883 73	883 75	883 77	883 79

Outer Support Rings (Stainless Steel 1.4310) for Ultra Sealing Rings



DN	KF	10/16	20/25	32/40	50
a	mm	3	3	3	3
	in.	0.12	0.12	0.12	0.12
D	mm	32	42	57	77
	in.	1.26	1.65	2.24	3.03
d	mm	25	35	50	65
	in.	0.98	1.38	1.97	2.56
h	mm	7	7	7	7
	in.	0.28	0.28	0.28	0.28
Stainless steel	Part No.	883 74	883 76	883 78	883 69

Spare O-Ring Gaskets for KF Flange Connections

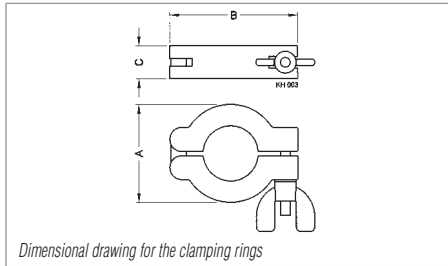


DN	KF	10	16 ¹⁾	20	25 ¹⁾	32	40 ¹⁾	50
d	mm	15	18	25	28	40	42	55
	in.	0.59	0.71	0.98	1.10	1.57	1.65	2.17
s	mm	5	5	5	5	5	5	5
	in.	0.20	0.20	0.20	0.20	0.20	0.20	0.20
FPM (set of 10 pieces)	Part No.	210 600	210 605	210 610	210 615	210 620	210 625	210 630

¹⁾ Also for adaptor/centering rings

Important: In the table of Section "General" the German designation for the type of steel is also stated in accordance with AISI.

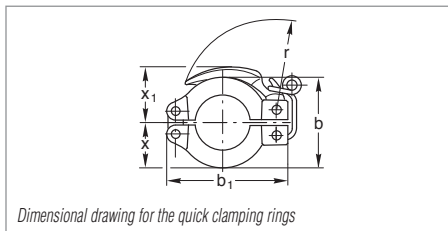
Clamping Rings (Aluminum 3.2582.05)



DN	KF	10/16	20/25	32/40	50
A	mm	45	55	70	95
	in.	1.77	2.17	2.76	3.74
B	mm	61	72	90	123
	in.	2.40	2.83	3.54	4.84
C	mm	16	16	18	25
	in.	0.63	0.63	0.71	0.98
Aluminum	Part No.	183 41	183 42	183 43	183 45

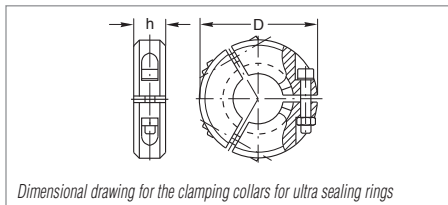
Max. torque at the wing nut: 2 Nm

Quick Clamping Rings (Aluminum 3.2582.05)



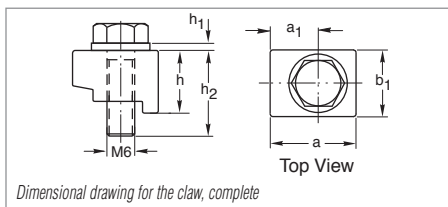
DN	KF	10/16	20/25	32/40
b	mm	45	55	70
	in.	1.77	2.17	2.76
b ₁	mm	61	72	90
	in.	2.40	2.83	3.54
r	mm	48	56	74
	in.	1.89	2.20	2.91
x	mm	22	27	35
	in.	0.87	1.06	1.38
x ₁	mm	30	34	44
	in.	1.18	1.34	1.73
Aluminum	Part No.	183 46	183 47	183 48

Clamping Collars (Aluminum 3.2162.05) for Ultra Sealing Rings



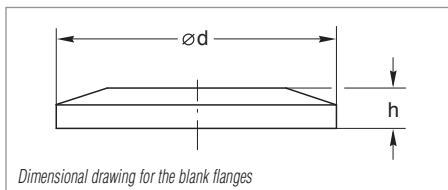
DN	KF	10/16	20/25	32/40	50
D	mm	52	75	90	115
	in.	2.05	2.95	3.54	4.52
h	mm	18	20	23	28
	in.	0.71	0.79	0.90	1.10
Hexagon socket screw to DIN 912	mm	M 4 x 30	M 6 x 30	M 8 x 35	M 8 x 50
	in.	M 4 x 1.18	M 6 x 1.18	M 8 x 1.38	M 8 x 1.97
Aluminum	Part No.	882 75	882 77	882 78	882 79

Claw, complete (Aluminum 3.2315.08)



DN	KF	10 - 50
a	mm	19.5
	in.	0.77
a ₁	mm	11.5
	in.	0.45
b ₁	mm	14.0
	in.	0.55
h	mm	12.5
	in.	0.49
h ₁	mm	1.6
	in.	0.06
h ₂	mm	20.0
	in.	0.79
Aluminum (1 set = 4 claws)	Part No.	885 00

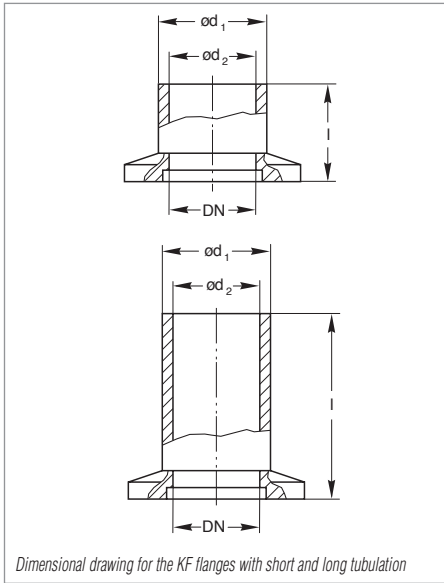
Blank Flanges (Aluminum 3.2315.71 / Stainless Steel 1.4301)



DN	KF	10	16	25	40	50
d	mm	30	30	40	55	75
	in.	1.18	1.18	1.57	2.17	2.95
h	mm	5	5	5	5	6
	in.	0.20	0.20	0.20	0.20	0.24
Aluminum	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

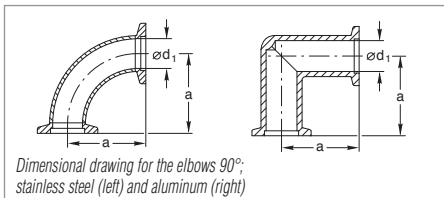
Important: In the table of Section "General" the German designation for the type of steel is also stated in accordance with AISI.

KF Flanges with Short / Long Tubulation (Steel 1.0037 / Stainless Steel 1.4301)



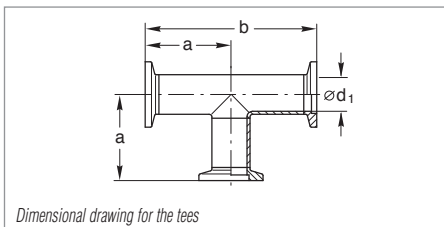
DN (short tubulation)	KF	10	16	25	40	50
d_1	mm	16	20	30	45	55
	in.	0.63	0.79	1.18	1.77	2.17
d_2	mm	12	16	26	41	51
	in.	0.47	0.63	1.02	1.61	2.01
l	mm	20	20	20	20	20
	in.	0.79	0.79	0.79	0.79	0.79
Steel	Part No.	182 31	182 32	182 33	182 34	182 35
d_1	mm	16	20	30	45	54
	in.	0.63	0.79	1.18	1.77	2.13
d_2	mm	12	16	26	41	50
	in.	0.47	0.63	1.02	1.61	1.97
l	mm	20	20	20	20	20
	in.	0.79	0.79	0.79	0.79	0.79
Stainless steel	Part No.	866 31	866 32	866 33	866 34	866 35
DN (long tubulation)		10 KF	16 KF	25 KF	40 KF	50 KF
d_1	mm	16	20	30	45	55
	in.	0.63	0.79	1.18	1.77	2.17
d_2	mm	12	16	26	41	51
	in.	0.47	0.63	1.02	1.61	2.01
l	mm	70	70	70	70	70
	in.	2.76	2.76	2.76	2.76	2.76
Steel	Part No.	182 81	182 82	182 83	182 84	182 85
d_1	mm	16	20	30	45	54
	in.	0.63	0.79	1.18	1.77	2.13
d_2	mm	12	16	26	41	50
	in.	0.47	0.63	1.02	1.61	1.97
l	mm	70	70	70	70	70
	in.	2.76	2.76	2.76	2.76	2.76
Stainless steel	Part No.	866 81	866 82	866 83	866 84	866 85

Elbows 90° (Aluminum 3.2315.08 / Stainless Steel 1.4301)



DN	KF	16	25	40	50			
a	mm	40	50	65	70			
	in.	1.57	1.97	2.56	2.76			
d_1	mm	16	15	25	39	40.5	49	
	in.	0.63	0.59	0.98	1.34	1.59	1.93	
Conductance	l/s	6.5	-	18.9	-	56.5	-	
Aluminum	Part No.	184 36	-	184 37	-	184 38	-	
Stainless steel	Part No.	-	884 61	-	884 62	-	884 64	884 65

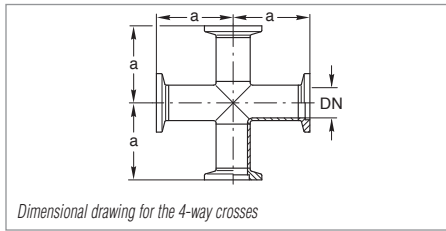
Tees (Aluminum 3.2315.08 / Stainless steel 1.4301)



DN	KF	16	25	40	50			
a	mm	40	50	65	70			
	in.	1.57	1.97	2.56	2.76			
b	mm	80	100	130	140			
	in.	3.15	3.94	5.12	5.51			
d_1 (Aluminum)	mm	16	25	39	-			
	in.	0.63	0.98	1.54	-			
d_1 (Stainless steel)	mm	16	25	40.5	53			
	in.	0.63	0.98	1.59	2.09			
Conductance	l/s	6.5	-	18.9	-	56.5	-	
Aluminum	Part No.	184 06	-	184 07	-	184 08	-	
Stainless steel	Part No.	-	884 71	-	884 72	-	884 74	884 75

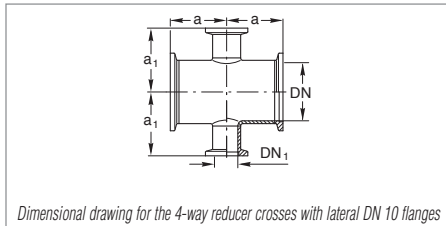
Important: In the table of Section "General" the German designation for the type of steel is also stated in accordance with AISI.

4-Way Crosses (Aluminum 3.2315.08 / Stainless 1.4301)



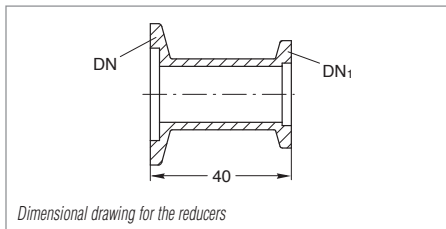
DN	KF	16	25	40	50
a	mm	40	50	65	70
	in.	1.57	1.97	2.56	2.67
Conductance	l/s	6.5	18.9	56.5	-
Aluminum	Part No.	184 71	184 74	184 75	-
Stainless steel	Part No.	- 884 85	- 884 86	- 884 87	884 88

4-Way Reducer Crosses with DN 10 Flanges (Aluminum 3.2315.08 / Stainless steel 1.4301)



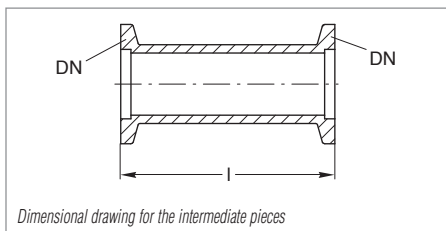
DN/DN ₁	KF	25/16	40/16	50/16
a	mm	35	40	50
	in.	1.38	1.57	1.97
a ₁	mm	35	45	50
	in.	1.38	1.77	1.97
Aluminum	Part No.	184 57	184 58	-
Stainless steel	Part No.	884 96	884 97	884 98

Reducers (Aluminum 3.2315.72 / Stainless Steel 1.4305)



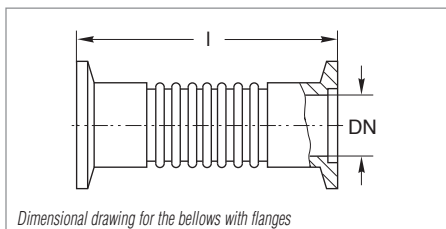
DN/DN ₁	KF	25/16	40/16	40/25	50/40
Aluminum	Part No.	183 86	183 89	183 87	183 88
Stainless steel	Part No.	885 04	885 07	885 05	885 06

Intermediate Pieces (Aluminum 3.2315.72 / Stainless Steel 1.4301)



DN	KF	16	25	40
l	mm	80	100	130
	in.	3.15	3.94	5.12
Aluminum	Part No.	184 80	184 81	184 82
Stainless steel	Part No.	884 17	884 18	884 19

Bellows (Stainless Steel 1.4571) with Flanges (Stainless Steel 1.4301)

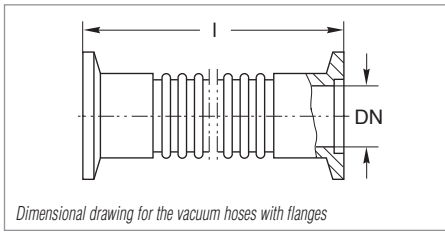


DN	KF	16	25	40	50
l	mm	70	80	100	100
	in.	2.76	3.15	3.94	3.94
Wall thickness	mm	0.13	0.13	0.15	0.2
	in.	0.005	0.005	0.006	0.008
Max. extension, axial	mm	10.5	13	18	16
	in.	0.41	0.51	0.71	0.63
Compression	mm	6.5	8	11	10
	in.	0.26	0.31	0.43	0.39
Tension	mm	4	5	7	6
	in.	0.16	0.20	0.28	0.24
Max. angle	degrees ¹⁾	± 21	± 17	± 15	± 15
Lateral motion	mm	± 4	± 3.5	± 7	± 8
	in.	± 0.16	± 0.14	± 0.28	± 0.31
Stainless steel	Part No.	872 41	872 43	872 45	872 46

¹⁾ When utilizing the maximum bending angle, no extension along the axial axis will be possible!

Important: In the table of Section "General" the German designation for the type of steel is also stated in accordance with AISI.

Vacuum Hoses ¹⁾ with Flanges (Stainless Steel 1.4571)

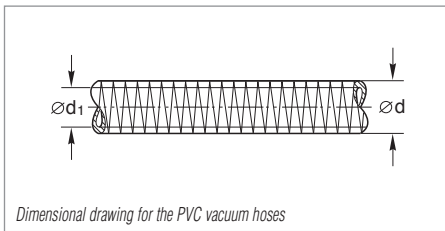


Dimensional drawing for the vacuum hoses with flanges

DN	KF	16	25	40	50	
Max. bending radius (inside)	with multiple bending	mm	68.5	103	129	198
		in.	2.70	4.06	5.08	7.80
	with single bend	mm	50	63	100	130
		in.	1.97	2.48	3.94	5.12
Wall thickness	mm	0.2	0.2	0.2	0.3	
	in.	0.008	0.008	0.008	0.01	
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

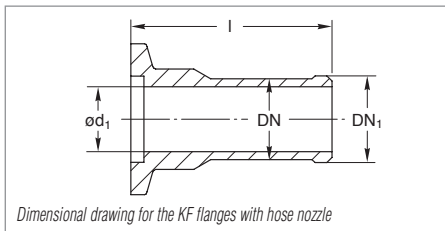
PVC Coiled Vacuum Hoses without Flanges



Dimensional drawing for the PVC vacuum hoses

DN	KF	16	25	40
d	mm	23	33	53
	in.	0.91	1.30	2.09
d ₁	mm	16	25	40
	in.	0.63	0.98	1.57
Length	m	by the metre		
	PVC coiled vacuum hose	Part No.	172 41	172 42

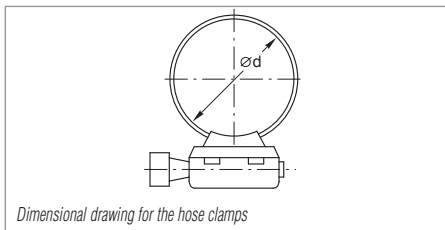
KF Flanges with Hose Nozzle (Aluminum 3.0615.71)



Dimensional drawing for the KF flanges with hose nozzle

DN	KF	16	25	40
DN ₁ (tube)	mm	17	26	41
	in.	0.67	1.02	1.61
l	mm	40	40	40
	in.	1.57	1.57	1.57
d ₁	mm	13	22	37
	in.	0.51	0.87	1.46
Aluminum	Part No.	182 45	182 46	182 47

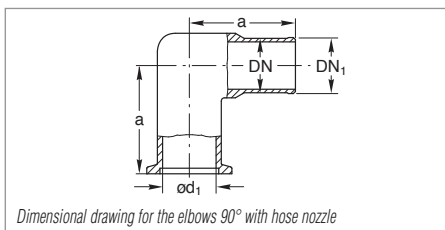
Hose Clamps (Stainless Steel 1.4301)



Dimensional drawing for the hose clamps

DN	KF	16	25	40
d (min/max.)	mm	13/32	19/44	29/76
	in.	0.51/1.26	0.75/1.73	1.14/2.99
Stainless steel	Part No.	866 21	866 22	866 23

Elbows 90° with Hose Nozzle (Aluminum 3.2381.02)

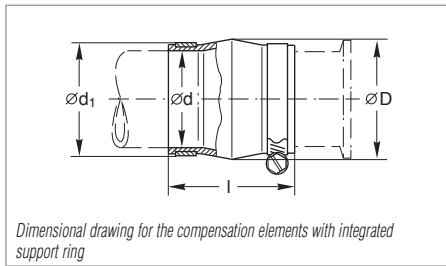


Dimensional drawing for the elbows 90° with hose nozzle

DN	KF	16	25	40
DN ₁ (tube)	mm	17	26	41
	in.	0.67	1.02	1.61
a	mm	40	50	65
	in.	1.57	1.97	2.56
d ₁	mm	16	25	39
	in.	0.63	0.98	1.54
Aluminum	Part No.	182 15	182 16	182 17

Important: In the table of Section "General" the German designation for the type of steel is also stated in accordance with AISI.

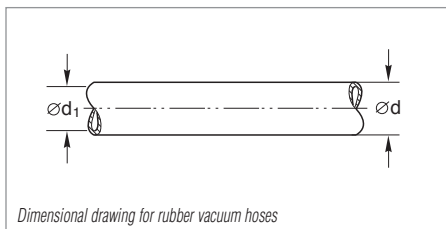
CR Compensation Elements with Integrated Support Ring



DN	KF	16	25	40
D	mm	44	50	68
	in.	1.73	1.97	2.68
d - tube tolerance	mm	16	25	40
	in.	0.63	0.98	1.57
d ₁	mm	24	33	48
	in.	0.94	1.30	1.89
l	mm	58	60	64
	in.	2.28	2.36	2.52
Leak rate	mbar x l x s ⁻¹	≤ 1 x 10 ⁻⁵		
Stainless Steel/CR	Part No.	182 78 ¹⁾	182 79 ¹⁾	182 80 ¹⁾

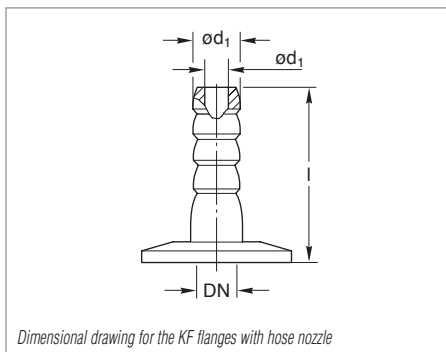
¹⁾ Is supplied complete with stainless steel hose clamps

Rubber Vacuum Hoses (NR) for Hose Nozzles



DN	KF	10	16	20
d	mm	17	25	32
	in.	0.66	0.98	1.26
d ₁	mm	7	10	16
	in.	0.28	0.39	0.63
Length	m	by the metre		
Hardness - Shore A -		55 ± 5		
Temperature range	°C (°F)	-30 to +85 (-22 to +176)		
Rubber vacuum hose	Part No.	172 02	172 03	172 04

KF Flanges with Hose Nozzles (Aluminum 3.0615.71 and Stainless Steel 1.4305)

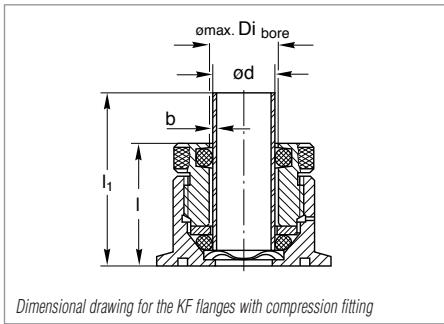


DN	KF	16	25	40
d	mm	12	12	12
	in.	0.47	0.47	0.47
d ₁ ¹⁾	mm	7	7	7
	in.	0.26	0.26	0.26
l	mm	40	40	40
	in.	1.57	1.57	1.57
Aluminum	Part No.	182 90	182 91	182 92
DN	KF	16	25	40
	in.	0.63	0.98	1.57
d	mm	12	12	12
	in.	0.47	0.47	0.47
d ₁ ¹⁾	mm	7	7	7
	in.	0.26	0.26	0.26
l	mm	40	40	40
	in.	1.57	1.57	1.57
Stainless steel	Part No.	885 14	885 08	885 09

¹⁾ Also recommended inside diameter for the hose

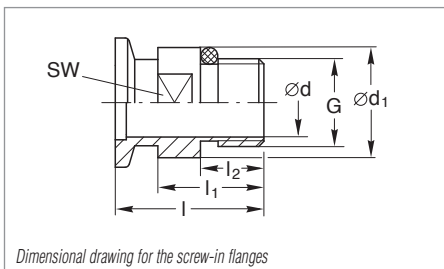
Important: In the table of Section "General" the German designation for the type of steel is also stated in accordance with AISI.

KF Flanges with Compression Fitting for Glass/Metal/Plastic Tubes (Aluminum 3.0615 /



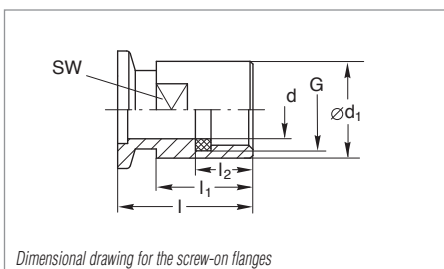
DN	KF	10	40
b	mm	1.5	1.5
	in.	0.06	0.06
d (glass)	mm	10	26
	in.	0.39	1.02
l	mm	30	45
	in.	1.18	1.77
l ₁	mm	50	65
	in.	1.97	2.56
Di _{Bore} -max.	± 0.2 mm	11	27
	± 0.008 in.	0.43	1.06
Compression Fitting	Part No.	184 61	184 66
Sealing set (FPM) for high temperatures (150 °C (302 °F)), set = 10 pieces	Part No.	105 94	210 610
Only for pressure ≤ 1000 mbar (≤ 750 Torr)			

Screw-in Flanges (Stainless Steel 1.4305 / FPM)



DN	KF	10	16	16	25	16	40
l	mm	35	35	42	45	26	50
	in.	1.34	1.34	1.65	1.77	1.02	1.97
l ₁	mm	25	25	-	35	-	40
	in.	0.98	0.98	-	1.34	-	1.57
l ₂	mm	15	15	11,5	25	8	30
	in.	0.59	0.59	0.45	0.98	0.31	1.18
d	mm	12	16	5	25	5	41
	in.	0.47	0.63	0.20	0.98	0.20	1.61
d ₁	mm	22	26	-	39	-	54
	in.	0.87	1.02	-	1.54	-	2.13
G		3/8"	1/2"	M 16 x 1.5	1"	1/8"	1 1/2"
	inch	3/8"	1/2"	M 16 x 0.06	1"	1/8"	1 1/2"
SW (width across flats)	mm	19	22	17	36	13	50
	in.	0.75	0.87	0.67	1.42	0.51	1.97
Stainless steel	Part No.	886 30	886 31	-	886 32	-	886 33
Stainless steel 1.4571	Part No.	-	-	-	-	160 26	-
Nickel-plated steel	Part No.	-	-	168 40	-	-	-

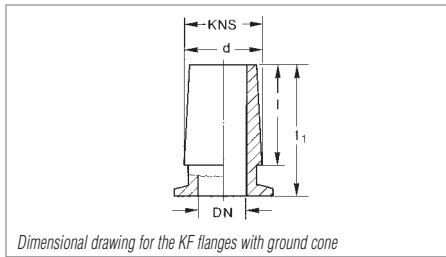
Screw-on Flanges (Stainless Steel 1.4305 / FPM)



DN	KF	10	16	25	40
l	mm	35	35	45	50
l ₁	mm	25	25	35	40
l ₂	mm	15	15	25	30
d	mm	10	15	24	38
d ₁	mm	20	25	39	54
G	inch	3/8"	1/2"	1"	1 1/2"
SW (width across flats)	mm	17	21	36	50
Stainless steel	Part No.	884 25	884 26	884 27	884 28

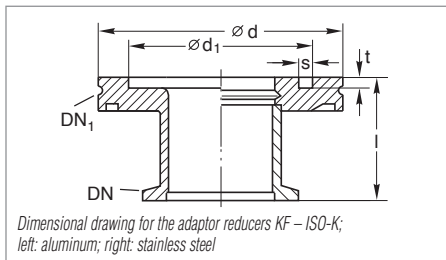
Important: In the table of Section "General" the German designation for the type of steel is also stated in accordance with AISI.

KF Flanges with Ground Cone (Stainless Steel 1.4301)



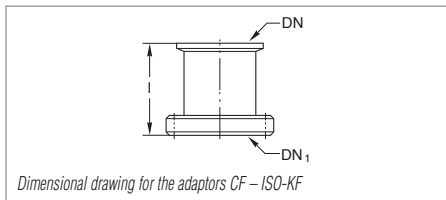
DN	KF	16	25	40
KNS - d / l	mm	19 / 26	29 / 32	45 / 40
	in.	0.75 / 1.02	1.14 / 1.26	1.77 / 1.57
l ₁	mm	40	45	55
	in.	1.57	1.77	2.17
Taper		1 : 10	1 : 10	1 : 10
Stainless steel	Part No.	184 87	184 85	184 86

Adaptors/Reducers KF – ISO-K



DN	KF	40	50	40
DN ₁	ISO-K	63	63	100
d ₁	mm	70	70	102
	in.	2.76	2.76	4.02
l	mm	40	45	40
	in.	1.57	1.77	1.57
s	mm	5	5	5
	in.	0.2	0.2	0.2
t	mm	4.5	4.5	4.5
	in.	0.18	0.18	0.18
Weight	kg	0.5	0.6	0.8
	lbs	1.10	1.32	1.77
Stainless steel 1.4301	Part No.	887 40	887 41	887 42
Aluminum 3.2315.71	Part No.	269 40	269 41	-

Adaptors KF – CF (Stainless Steel 1.4301)



DN	KF	16	16	25	25	40
DN ₁	CF	16	40	16	40	40
or	inch	1 5/16"	2 3/4"	1 5/16"	2 3/4"	2 3/4"
l	mm	35	30	35	30	50
	in.	1.38	1.18	1.38	1.18	2.17
Stainless steel 1.4301	Part No.	837 81	837 82	837 83	837 84	837 36

Copper Gaskets for CF-Flanges (OFHC-Copper - Oxygen-Free)

DN	CF	16	40	63	100	160	200	250
Set of 10		x	x	x	x	x	x	-
Set of 5		-	-	-	-	-	-	x
Inside diameter	mm	16.2	39	63.6	101.8	152.6	203.4	254
	in.	0.64	1.54	2.5	4.0	6.0	8.0	10
OFHC-Copper	Part No.	839 41	839 43	839 44	839 45	839 46	839 47	839 48

FPM Gaskets for CF-Flanges

DN	CF	16	40	63	100	160	200	250
Set of 5		x	x	-	-	-	-	1 FPM O-ring with Support Ring
Profile seal, set of 2		-	-	x	x	x	x	-
Gasket with support ring		-	-	-	-	-	-	x
Degassing temperature	°C	160	160	160	160	160	160	160
	°F	320	320	320	320	320	320	320
FPM	Part No.	839 21	839 23	839 34	839 35	839 36	839 37	839 03

Important: In the table of Section "General" the German designation for the type of steel is also stated in accordance with AISI.

Bolts, Nuts and Washers for CF-Flanges

DN	CF	16	40	63/100	160	200/250
Dimensions (d x l)	mm	M 4 x 20	M 6 x 35	M 8 x 50	M 8 x 55	M 8 x 60
	in.	M 4 x 0.79	M 6 x 1.38	M 8 x 1.97	M 8 x 2.17	M 8 x 2.36
Torque	Nm	4	10	20	20	20
Quantity per set						
	Bolts	25	25	25	25	25
	Nuts	25	25	25	25	25
	Bolts	–	–	–	–	–
	Washers	25	25	25	25	25
Set	Part No.	839 00	839 01	839 04	839 05	839 07

For details on UHV seals and further components, see Product Section C15.



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 2501)
- ◆ Clamp flange components are used with CR or FPM gaskets or with ultra sealing disks made of aluminum
- ◆ Degassing temperatures
 - for CR, max. 100 °C (212 °F)
 - for FPM, max. 150 °C (302 °F)
 - for the ultra sealing disk, max. 200 °C (392 °F)

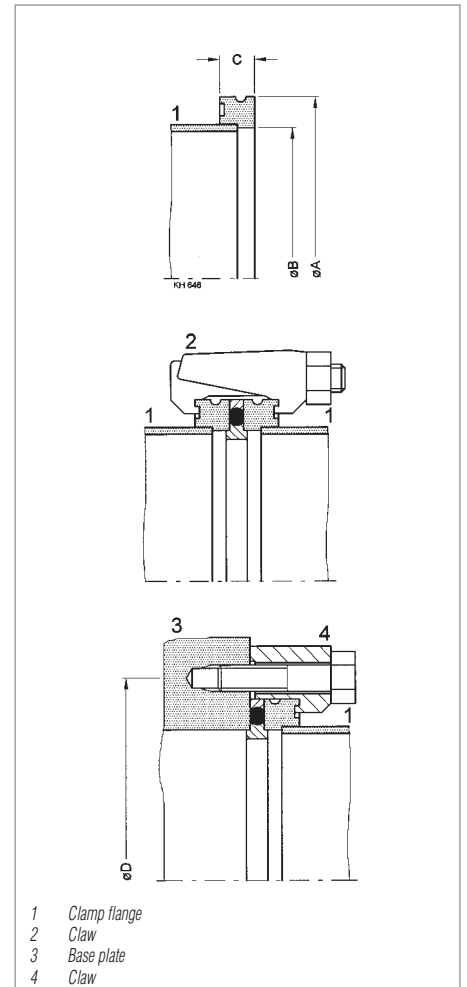
The pressure range for the application depends in each case on the sealing method which is used and is thus limited for ultra sealing disks to 10^{-9} mbar (0.75×10^{-9} Torr), for FPM gaskets to 10^{-8} mbar (0.75×10^{-8} Torr) and for CR sealed components to 10^{-7} mbar (0.75×10^{-7} Torr).

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

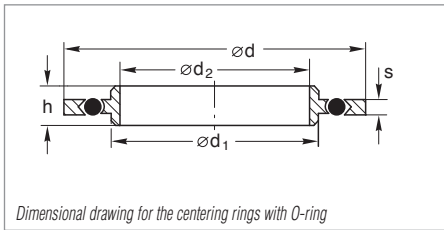
- ◆ Easy and quick to install
- ◆ Safe and reliable
- ◆ Tubes may be turned in any direction
- ◆ No centering ring and sealing ring is needed since the seal is provided by the smooth tube surface
- ◆ Capable of withstanding temperatures up to 100 °C (212 °F)
- ◆ Suitable for pressures down to 10^{-5} mbar (0.75×10^{-5} Torr)



- 1 Clamp flange
- 2 Claw
- 3 Base plate
- 4 Claw

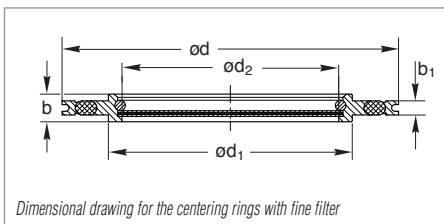
Nominal diameter	A	B	C	Number of clamps	D	Screws for claws	Number of claws
DN 63 ISO-K	95	70	12	4	110	M 8 x 35	4
DN 100 ISO-K	130	102	12	4	145	M 8 x 35	8
DN 160 ISO-K	180	153	12	4	200	M 10 x 35	8
DN 200 ISO-K	240	213	12	6	260	M 10 x 35	12
DN 250 ISO-K	290	261	12	6	310	M 10 x 35	12
DN 320 ISO-K	370	318	17	8	395	M 12 x 50	12
DN 400 ISO-K	450	400	17	8	480	M 12 x 50	16
DN 500 ISO-K	550	501	17	12	580	M 12 x 50	16
DN 630 ISO-K	690	651	22	12	720	M 12 x 55	20

Centering Rings (Aluminum / Stainless Steel) with O-Ring (NBR)



DN	ISO-K	63	100	160	200	250	320	400	500	630	800	1000
d	mm	96	128	179	239	287	358	440	541	691	840	1040
	in.	3.78	5.04	6.93	9.41	11.30	14.09	17.32	21.9	27.2	33.07	40.94
d ₁	mm	70	102	153	213	261	318	400	501	651	800	1000
	in.	2.76	4.02	6.02	8.39	10.28	12.52	15.75	19.72	25.65	31.5	39.37
d ₂	mm	67	99	150	210	258	313	395	496	643	795	995
	in.	2.64	3.9	5.91	8.27	10.16	12.32	15.55	19.53	25.43	31.18	39.17
h	mm	8	8	8	8	8	14	14	14	14	14	14
	in.	0.31	0.31	0.31	0.31	0.31	0.55	0.55	0.55	0.55	0.55	0.55
s	mm	3.9	3.9	3.9	3.9	3.9	5.6	5.6	5.6	5.6	5.6	5.6
	in.	0.15	0.15	0.15	0.15	0.15	0.22	0.22	0.22	0.22	0.22	0.22
Aluminum/FPM	Part No.	268 41	268 42	268 43	268 44	268 45	268 46	268 47	268 48	268 49	268 50	268 51
Aluminum/CR	Part No.	268 05	268 06	268 09	268 19	268 17	268 18	268 14	268 15	268 16	-	-
Stainless Steel/FPM	Part No.	887 03	887 04	887 07	887 02	887 08	-	-	-	-	-	-

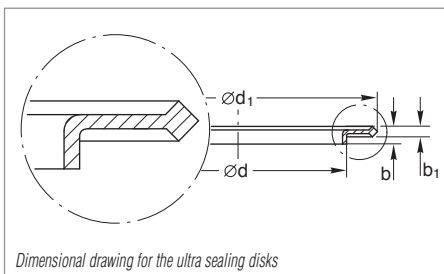
Centering Rings with Fine Filter (Stainless Steel 1.4301), O-Ring (FPM)



DN	ISO-K	63	100
b	mm	8	8
	in.	0.31	0.31
b ₁	mm	4	4
	in.	0.16	0.16
d	mm	96	128
	in.	3.78	5.04
d ₁	mm	70	102
	in.	2.76	4.02
d ₂	mm	62	94
	in.	2.44	3.7
Stainless steel	Part No.	887 20	887 21

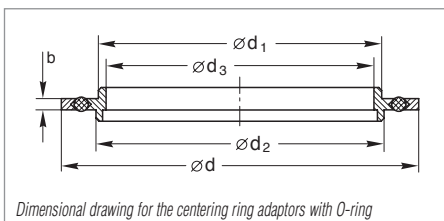
Filter material: Stainless steel 1.4404, size of pores: 4 µm, separation grade: 1 µm particles to 98 %

Ultra Sealing Disks (Aluminum 3.2315.70)



DN	ISO-K / ISO-F	63	100	160	250
b	mm	4.5	4.5	4.5	4.5
	in.	0.18	0.18	0.18	0.18
b ₁	mm	2.6	2.6	2.6	2.6
	in.	0.10	0.10	0.10	0.10
d	mm	69.8	101.8	152.8	260.8
	in.	2.75	4.01	6.02	10.27
d ₁	mm	85.6	116.6	166.6	276.6
	in.	3.37	4.59	6.56	10.89
Aluminum	Part No.	886 24	886 25	886 26	886 27

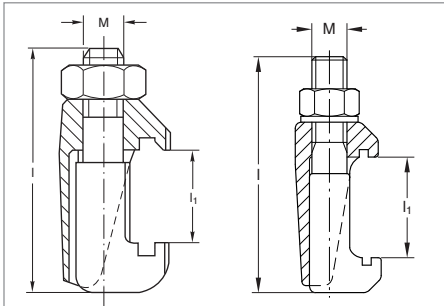
Centering Ring Adaptors (Aluminum) with O-Ring (FPM), ISO-K to LF Standard



DN	ISO-K / LF	100 / 100	160 / 150	250 / 250
b	mm	4	4	4
	in.	0.16	0.16	0.16
d	mm	126	177	285
	in.	4.96	6.97	11.22
d ₁	mm	100	150	250
	in.	3.94	5.91	9.84
d ₂	mm	102	153	261
	in.	4.02	6.02	10.28
d ₃	mm	95	145	244
	in.	3.74	5.71	9.61
Aluminum/FPM	Part No.	105 25	105 35	105 45

Important: In the table of Section "General" the German designation for the type of steel is also stated in accordance with AISI.

Clamps for ISO-K

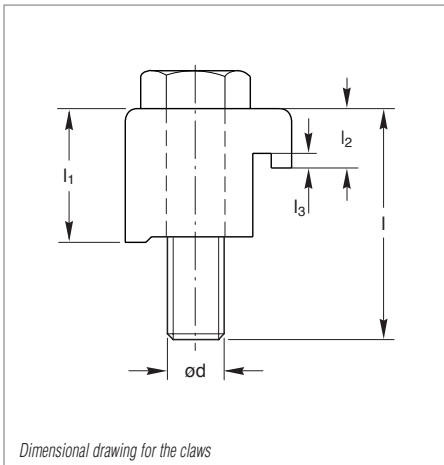


Dimensional drawing for the clamps, right Part No. 210 061

DN	ISO-K	63 / 250	63 / 250	320 / 400	630	320 / 630
Number of required clamps per connection		4 / 6	4 / 6	8 / 12	12	8 / 12
d	thread	M 10	M 10	M 12	M 12	M 12
l	mm	60	68	78	88	82.5
	in.	2.36	2.68	3.07	3.46	3.25
l ₁	mm	17 to 27	25 to 35	27 to 39	31 to 49	29 to 47
	in.	0.67 to 1.06	0.98 to 1.38	1.06 to 1.54	1.22 to 1.93	1.14 to 1.85
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

Exact numbers of clamps see first page of the section "(ISO-K) Clamp Flange Fittings and Components"

Claws



Dimensional drawing for the claws

Claws (Galvanized Steel 1.1181) for ISO-K

DN	ISO-K	63 / 100	160 / 250	320 / 500	630	
Number of required clamps per connection		4 / 8	8 / 12	12 / 16	20	
d	thread	M 8	M 10	M 12	M 12	
l	mm	35	35	50	55	
	in.	1.38	1.38	1.97	2.17	
l ₁	mm	22.5	23	36.5	41.5	
	in.	0.89	0.91	1.44	1.63	
l ₂	mm	8.6	9.1	15.9	16	
	in.	0.34	0.36	0.63	0.63	
l ₃	mm	2.5	2.5	2.5	2.5	
	in.	0.10	0.10	0.10	0.10	
1 set = 4 claws		Part No.	268 25	268 26	268 27	268 28

Exact numbers of claws see first page of the section "(ISO-K) Clamp Flange Fittings and Components"

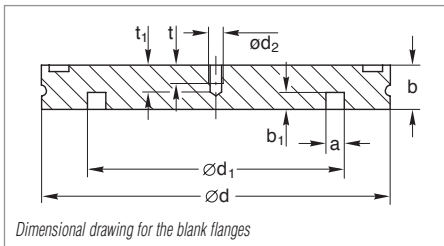
Claws for Sealing Groove in Base Plate (Galvanized Steel 1.1181) for ISO-K

DN	ISO-K	63/100	160/250	320/500	630	
d	thread	M 8	M 10	M 12	M 12	
l	mm	30	35	45	50	
	in.	1.18	1.38	1.77	1.97	
l ₁	mm	18.6	19	31	36.5	
	in.	0.73	0.75	1.22	1.44	
l ₂	mm	8.6	9.0	16.0	15.9	
	in.	0.34	0.35	0.63	0.63	
l ₃	mm	2.5	2.5	2.5	2.5	
	in.	0.10	0.10	0.10	0.10	
1 set = 4 claws		Part No.	268 76	268 77	268 78	268 27

Exact numbers of claws see first page of the section "(ISO-K) Clamp Flange Fittings and Components"

Important: In the table of Section "General" the German designation for the type of steel is also stated in accordance with AISI.

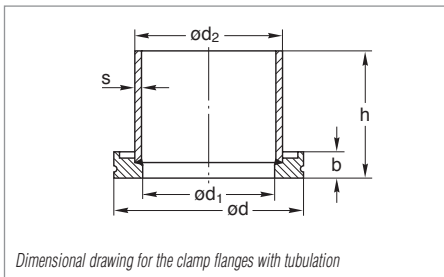
Blank Flanges (Nickel-Plated Steel 1.0037 / Stainless Steel 1.4301)



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	M 8	M 8	M 8	M 8	M 8	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
Nickel-plated steel	Part No.	269 47	269 48	269 49	-	269 56	-	-	-	-
Stainless steel	Part No.	887 55	887 56	887 57	887 54	887 58	887 59	887 60	887 61	887 62

M 8 threaded bore from nominal size DN 500

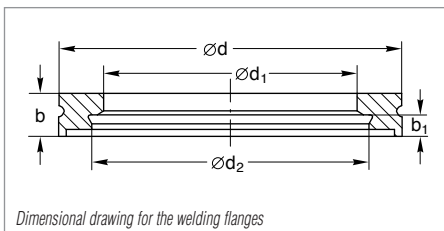
Clamp Flanges with Tubulation (Steel 1.0831, 1.0308 / Stainless Steel 1.4301)



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	4	5
	in.	0.11	0.11	0.11	-	0.12	0.12	0.12	0.16	0.20
s (stainless steel)	mm	2.3	2	2	3	3	3	3	4	5
	in.	0.09	0.08	0.08	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
Steel	Part No.	269 04	269 05	269 06	-	269 17	-	-	-	-
Stainless steel	Part No.	886 40	886 41	886 42	886 43	887 18	887 19	886 46	886 47	886 48

C13

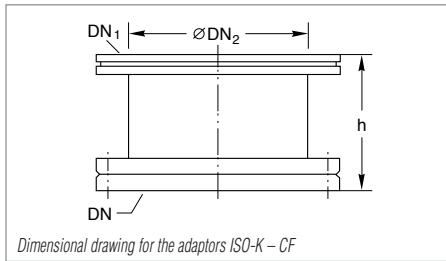
Welding Flanges



DN	ISO-K	63	100	160	200	250
b	mm	12	12	12	12	12
	in.	0.47	0.47	0.47	0.47	0.47
b ₁	mm	6	6	6	6	6
	in.	0.24	0.24	0.24	0.24	0.24
d	mm	95	130	180	240	290
	in.	3.74	5.12	7.09	9.45	11.42
d ₁	mm	70	102	153	213	261
	in.	2.76	4.02	6.02	8.39	10.28
d ₂	mm	76.6	108.7	159.8	219.8	267.8
	in.	3.02	4.28	6.29	8.65	10.54
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

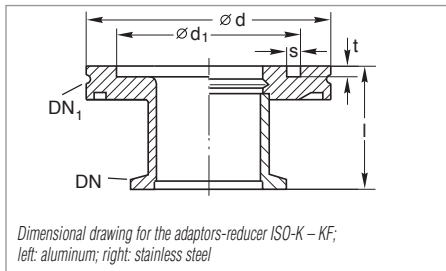
Important: In the table of Section "General" the German designation for the type of steel is also stated in accordance with AISI.

Adaptors ISO-K – CF



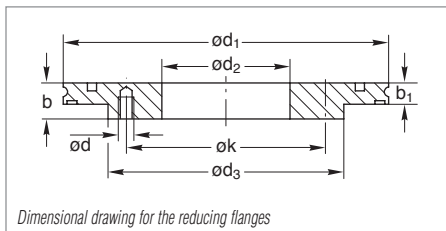
DN	CF	63	100	160
Outside diameter	in.	4 1/2"	6"	8"
DN ₁	ISO-K	63	100	160
DN ₂	mm	63	100	150
	in.	2.48	3.94	5.91
h	mm	90	90	90
	in.	3.54	3.54	3.54
Stainless steel DIN 1.4301	Part No.	837 01	837 02	837 03

Adaptors-Reducers ISO-K – KF



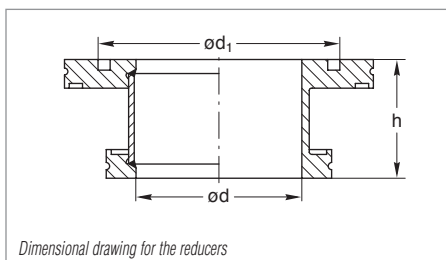
DN	ISO-K / KF	63 / 40	63 / 50	100 / 40
d	mm	95	95	130
	in.	3.74	3.74	5.12
d ₁	mm	70	70	102
	in.	2.76	2.76	4.02
l	mm	40	45	40
	in.	1.57	1.77	1.57
s	mm	5	5	5
	in.	0.2	0.2	0.2
t	mm	4.5	4.5	4.5
	in.	0.16	0.16	0.16
Weight	kg	0.5	0.6	0.8
	lbs	1.1	1.32	1.77
Stainless steel 1.4305	Part No.	887 40	887 41	887 42
Aluminum 3.2315.71	Part No.	269 40	269 41	-

Reducing Flanges (Stainless Steel 1.4301)



DN	ISO-K	160/63	160/100	200/100	200/160	250/160
b	mm	22	25	20	25	22
	in.	0.87	0.98	0.79	0.98	0.87
b ₁	mm	12	12	12	12	12
	in.	0.47	0.47	0.47	0.47	0.47
d	thread	M 8	M 8	M 8	M 10	M 10
d ₁	mm	180	180	240	240	290
	in.	7.09	7.09	9.49	9.49	11.42
d ₂	mm	130	165	165	225	225
	in.	5.12	6.50	6.50	8.86	8.86
d ₃	mm	70	102	102	153	153
	in.	2.76	4.02	4.02	6.02	6.02
k	mm	110	145	145	200	200
	in.	4.33	5.71	5.71	7.87	7.87
Stainless steel	Part No.	886 14	886 15	886 17	886 16	886 50

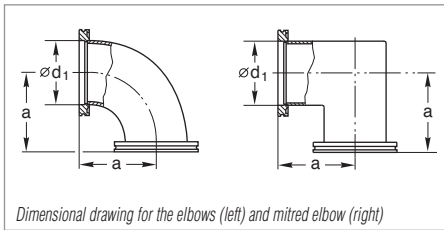
Reducers (Stainless Steel 1.4305)



DN	ISO-K	100/63	250/200
d	mm	70	213
	in.	2.76	8.39
d ₁	mm	102	261
	in.	4.02	10.28
h	mm	50	50
	in.	1.97	1.97
Stainless steel	Part No.	887 89	887 93

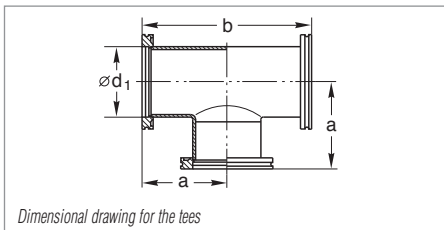
Important: In the table of Section "General" the German designation for the type of steel is also stated in accordance with AISI.

Elbows (Stainless Steel 1.4301); from DN 160 ISO-K Mitred Elbow



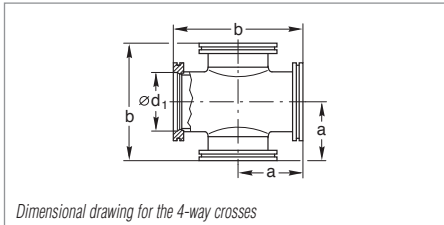
DN	ISO-K	63	100	160	250
a	mm	88	108	138	208
	in.	3.46	4.25	5.43	8.19
d ₁	mm	70	102	153	261
	in.	2.76	4.02	6.02	10.28
Weight	kg	1.1	2.2	5.9	9.9
	lbs	2.43	4.8	13.02	21.85
Conductance	l/s	208	470	1200	3700
Stainless steel	Part No.	887 25	887 26	887 27	887 28

Tees (Stainless Steel 1.4301)



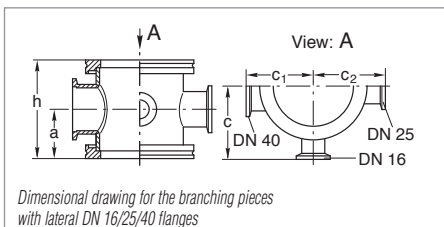
DN	ISO-K	63	100	160	250
a	mm	88	108	138	208
	in.	3.46	4.25	5.43	8.19
b	mm	176	216	276	416
	in.	6.93	8.50	10.87	16.38
d ₁	mm	70	102	153	261
	in.	2.76	4.02	6.02	10.28
Weight	kg	1.6	3.2	7.6	17.0
	lbs	3.53	7.06	16.78	37.53
Stainless steel	Part No.	887 35	887 36	887 37	887 38

4-Way Crosses (Stainless Steel 1.4301)



DN	ISO-K	63	100	160	250
a	mm	88	108	138	208
	in.	3.46	4.25	5.43	8.19
b	mm	176	216	276	416
	in.	6.93	8.50	10.87	16.38
d ₁	mm	70	102	153	261
	in.	2.76	4.02	6.02	10.28
Stainless steel	Part No.	887 45	887 46	887 47	887 48

Branching Pieces with Lateral DN 16/25/40 KF Flanges (Stainless Steel 1.4301)

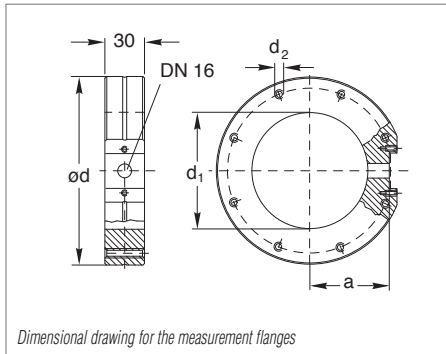


DN	ISO-K	63	100	160
a	mm	44	50	50
	in.	1.73	1.97	1.97
h	mm	88	100	100
	in.	3.46	3.94	3.94
c	mm	66	82	107
	in.	2.60	3.23	4.21
c ₁	mm	59	77	105
	in.	2.32	3.03	4.13
c ₂	mm	64	80	107
	in.	2.52	3.15	4.21
Stainless steel	Part No.	886 71	886 72	886 73

Can not be used with collar flanges ISO-F and DIN 2501

Important: In the table of Section "General" the German designation for the type of steel is also stated in accordance with AISI.

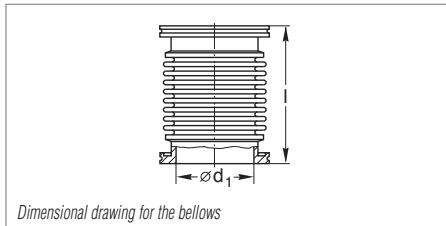
Measurement Flanges



DN	ISO-K	63	100	160
a	mm	52.3	71.3	102.3
	in.	2.06	2.81	4.03
b	mm	30	30	30
	in.	1.18	1.18	1.18
d	mm	130	165	225
	in.	5.12	6.50	8.86
d ₁	mm	70	102	153
	in.	2.76	4.02	6.02
d ₂	thread	M 8	M 8	M 10
Number of threaded holes		4	8	8
Stainless steel 1.4301	Part No.	286 60	286 61	286 62
Aluminum 3.2315.62	Part No.	-	272 61	272 62
Recommended centering ring	Part No.	2 x 887 03	2 x 887 04	2 x 887 07
Required claws kits	Part No. 268 25	2 kits	4 kits	-
Required claws kits	Part No. 268 26	-	-	4 kits

Claws, complete for DN 16 KF are included

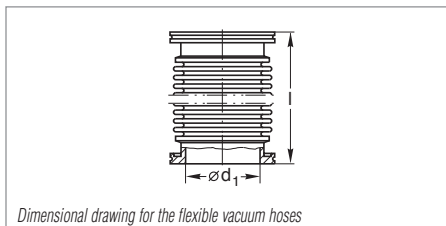
Bellows (Stainless Steel 1.4571) with Flanges (Stainless Steel 1.4391)



DN	ISO-K	63	100	160	250
d ₁	mm	70	102	153	261
	in.	2.76	4.02	6.02	10.78
l	mm	132	132	150	200
	in.	5.20	5.20	5.91	7.87
Weight	kg	1.0	3.9	6.2	9.3
	lbs	2.21	8.61	13.69	20.53
Max. extension, axial	mm	40	56	44	60
	in.	1.57	2.20	1.73	2.36
Compression	mm	20	28	22	30
	in.	0.79	1.10	0.87	1.18
Tension	mm	20	28	22	30
	in.	0.79	1.10	0.87	1.18
Max. bending angle	Degress ¹⁾	± 30°	± 30°	± 14°	± 13°
Lateral displacement	mm	7	9	3.5	4.5
	in.	0.28	0.35	0.14	0.18
Stainless steel	Part No.	887 70	887 71	887 72	887 68

¹⁾ When utilizing the maximum bend, no extension along the axial axis will be possible!

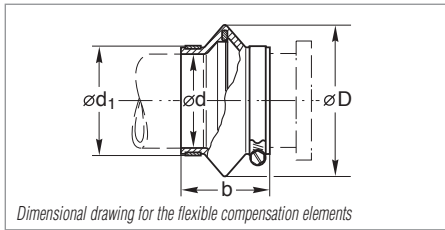
Flexible Vacuum Hoses (Stainless Steel 1.4571) with Flanges (Stainless Steel 1.4301)



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	2.76	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
Stainless steel	Part No.	868 37	867 97	868 34	868 07	868 38	867 98	868 35	868 08

Important: In the table of Section "General" the German designation for the type of steel is also stated in accordance with AISI.

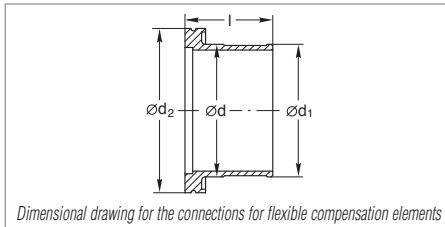
Flexible Compensation Elements (CR)



DN	ISO-K	63	100	160
D	mm	120	150	200
	in.	4.72	5.91	7.87
d	mm	75	106	155
	in.	2.95	4.17	6.10
d ₁	mm	85	116	165
	in.	3.35	4.57	6.50
b	mm	70	72	72
	in.	2.76	2.83	2.83
CR	Part No.	272 23 ¹⁾	272 24 ¹⁾	272 25 ¹⁾

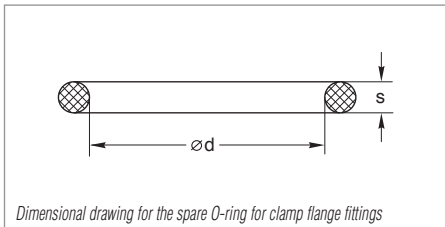
¹⁾ Is supplied complete with stainless steel hose clamps

Connections for Flexible Compensation Elements (Aluminum 3.2315.71)



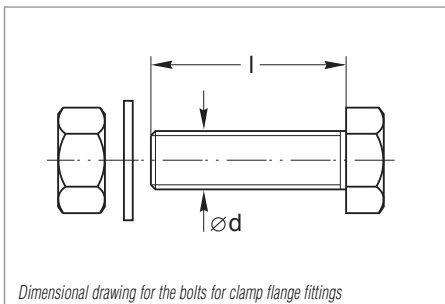
DN	ISO-K	63	100	160
d	mm	70	102	150
	in.	2.76	4.02	5.91
d ₁	mm	76	107	156
	in.	2.99	4.21	6.14
d ₂	mm	95	130	180
	in.	3.74	5.12	7.09
l	mm	51	56	56
	in.	2.01	2.20	2.20
Aluminum	Part No.	272 35	272 36	272 37

Spare O-Ring Gaskets for Clamp Flange Fittings



DN	ISO-K	63	100	160	200	250	320	400	500	630	800	1000
d	mm	75	107	158	208	253	329	405	506	658	808	1006
	in.	2.95	4.21	6.22	8.19	9.96	12.95	15.94	19.92	25.90	31.80	39.61
s	mm	5	5	5	5	5	7	7	7	7	7	7
	in.	0.20	0.20	0.20	0.20	0.20	0.28	0.28	0.28	0.28	0.28	0.28
Quantity per set		5	5	5	5	5	1	1	1	1	1	1
FPM	Part No.	210 635	210 645	210 650	210 655	210 660	210 665	210 670	210 675	210 680	210 685	210 690

Bolts for Clamp Flange Fittings (Steel 8.8, zinc coated)

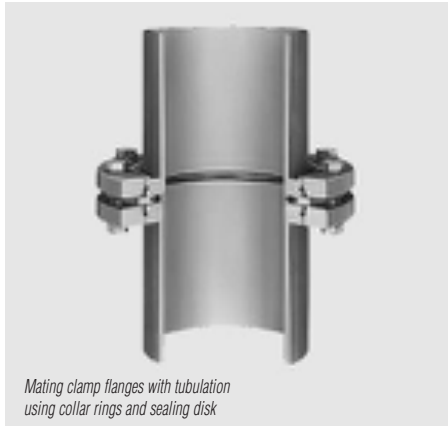


DN	ISO-K	63 - 100	160 - 250	320 - 500	630
Dimensions					
d	thread	M 8	M 10	M 12	M 12
l	mm	40	50	70	80
	in.	1.57	1.97	2.76	3.15
Quantity per set					
Bolts		8	12	16	20
Nuts		8	12	16	20
Washers		8	12	16	20
Set	Part No.	887 81	887 82	887 83	887 84

Important: In the table of Section "General" the German designation for the type of steel is also stated in accordance with AISI.

ISO-F and DIN 2501 Fixed Flange Fittings, ND 6

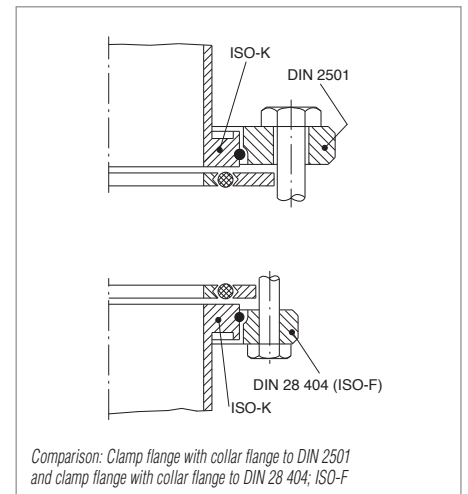
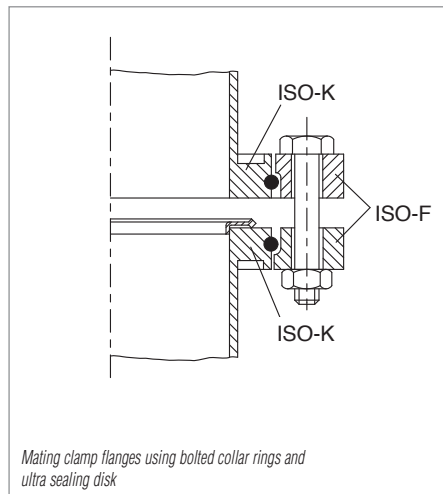
Note: ND 6 states a dimension and does not refer to an operating pressure of 6 bar!



In addition to clamp flange connections, fixed welded flanges (ISO-F or to DIN 2501) are used in the area of vacuum engineering to interconnect valves, pumps and other components.

Advantages to the User

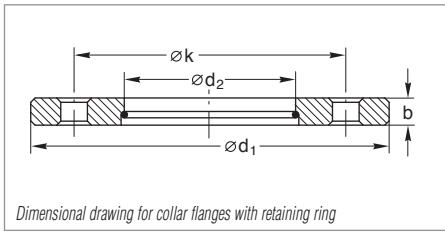
- ◆ A high vacuum seal is maintained also at large nominal width and high mechanical loads
- ◆ Evenly distributed sealing force through a large number of bolts
- ◆ Can be easily adapted to other flange systems
- ◆ Vacuum sealing disks consist of a CR O-ring seal with inner and outer aluminum ring
- ◆ Fixed flanges and collar flanges may also be constructed as all-metal seals by using ultra sealing disks



Collar Flange	Steel	Stainless Steel
Bolts and nuts	Galvanized 8.8 steel	1.4401
Retaining ring	Steel	1.4310

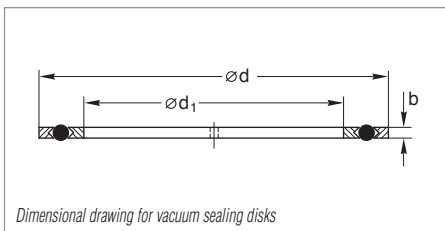
Important: In the table of Section "General" the German designation for the type of steel is also stated in accordance with AISI.

ISO-F Collar Flanges with Retaining Ring for use with Clamp Flange Fittings (Steel 1.0037)



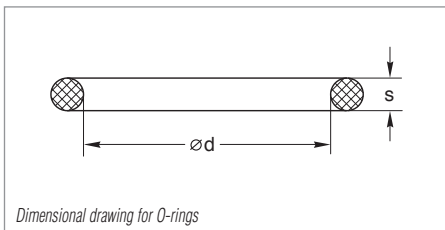
DN	ISO-F	63	100	160	200	250	320	400	500	630
d ₁	mm	130	165	225	285	335	425	510	610	750
	in.	5.12	6.50	8.86	11.22	13.19	16.73	20.08	24.02	29.53
d ₂	mm	95.6	130.6	180.9	240.9	290.9	370.8	451	551	691
	in.	3.76	5.14	7.12	9.48	11.45	14.60	17.76	21.69	27.2
k	mm	110	145	200	260	310	395	480	580	720
	in.	4.93	5.71	7.87	10.24	12.20	15.51	18.90	22.83	28.35
b	mm	12	12	16	16	16	20	20	20	24
	in.	0.47	0.47	0.63	0.63	0.63	0.79	0.79	0.79	0.79
Nickel-plated steel										
	Part No.	267 67	267 70	267 71	267 68	267 72	267 76	267 74	267 75	267 77

Vacuum Sealing Disks for ISO-F Flanges (Aluminum/CR)



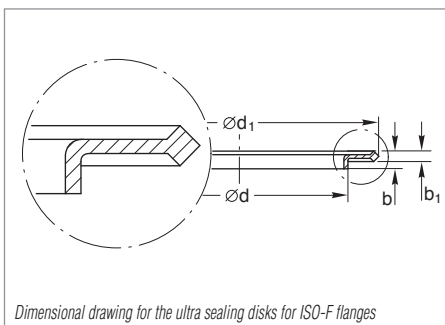
DN	ISO-F	63	100	160	250	320	400	500	630	800	1000
d	mm	98	132	185	295	375	460	560	701	870	1070
	in.	3.86	5.20	7.28	11.61	14.76	18.11	22.05	27.60	34.25	42.13
d ₁	mm	73	107	160	270	330	415	515	656	825	1025
	in.	2.87	4.21	6.3	10.63	12.99	16.34	20.28	25.83	32.48	40.35
b	mm	4	4	4	4	6	6	6	6	6	6
	in.	0.16	0.16	0.16	0.16	0.24	0.24	0.24	0.24	0.24	0.24
Al/CR	Part No.	171 09	171 10	171 11	171 12	171 19	171 14	171 15	171 16	171 17	171 18

Spare O-Ring Gaskets ISO-F Flange Connection



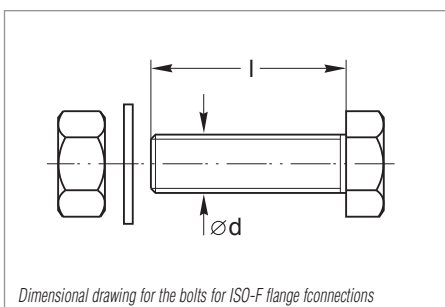
DN	ISO-F	63	100	160	250	320	400	500	630	800	1000
d	mm	80	110	165	265	325	412	510	640	820	1023
	in.	3.15	4.33	6.50	10.43	12.75	16.22	20.08	25.20	32.28	40.28
s	mm	5	5	5	5	8	8	8	8	8	8
	in.	0.20	0.20	0.20	0.20	0.31	0.31	0.31	0.31	0.31	0.31
Quantity per set		5	5	5	5	1	1	1	1	1	1
CR	Part No.	210 701	210 711	210 716	210721	210 726	210 731	210 736	210 741	210 746	210 751

Ultra Sealing Disks (Aluminum 3.2315.71) for ISO-F Flanges



DN	ISO-K / ISO-F	63	100	160	250
b	mm	4.5	4.5	4.5	4.5
	in.	0.18	0.18	0.18	0.18
b ₁	mm	2.6	2.6	2.6	2.6
	in.	0.10	0.10	0.10	0.10
d	mm	69.8	101.8	152.8	260.8
	in.	2.75	4.01	6.02	10.27
d ₁	mm	85.6	116.6	166.6	276.6
	in.	3.37	4.59	6.56	10.89
Aluminum	Part No.	886 24	886 25	886 26	886 27

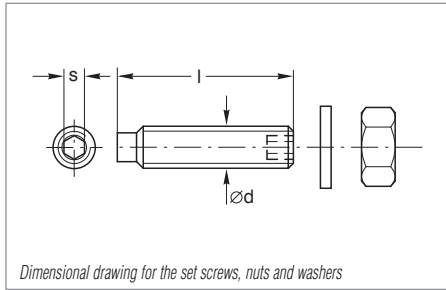
Bolts for ISO-F Flange Connection (Steel 8.8, zinc coated)



DN	ISO-K	63 - 100	160 - 250	320 - 500	630
Dimensions					
d	thread	M 8	M 10	M 12	M 12
		mm	40	50	70
l	mm	1.57	1.97	2.76	3.15
	in.				
Quantity per set					
Bolts		8	12	16	20
Nuts		8	12	16	20
Washers		8	12	16	20
Set	Part No.	887 81	887 82	887 83	887 84

Important: In the table of Section "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

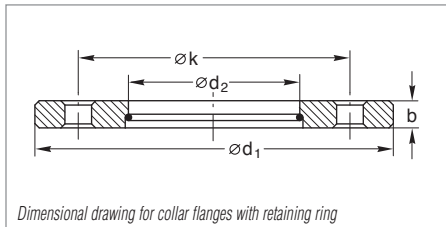


DN		40 CF	63-100 ISO-F / 63-200 CF	160-250 ISO-F
Dimensions (d x l)	mm (in.)	M 6 x 35 (1.38)	M 8 x 45 (1.77)	M 10 x 55 (2.17)
s	mm (in.)	3 (0.12)	4 (0.16)	6 (0.24)
Quantity per set				
Set screws		6	16	12
Nuts		6	16	12
Washers		6	16	12
Set	Part No.	839 11	839 13	210 071

DIN 2501 Fixed Flange Fittings; Dimensions to DIN 2501, ND 6

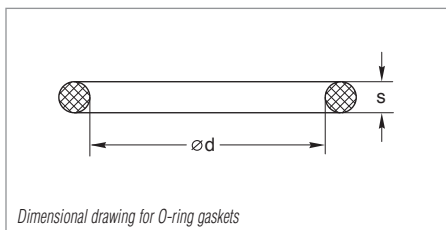
Note: ND 6 states a dimension and does not refer to an operating pressure of 6 bar!

Collar Flanges with Retaining Ring (Steel 1.0037)



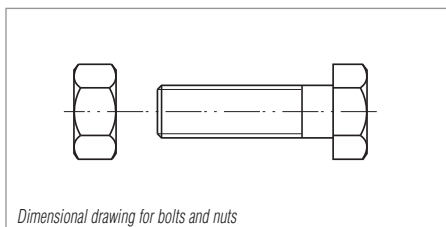
DN	DIN	63	100	160	250
d ₁	mm	160	210	265	375
	in.	6.30	8.27	10.43	14.76
d ₂	mm	95.6	130.6	180.9	290.9
	in.	3.76	5.14	7.12	11.45
k	mm	130	170	225	335
	in.	5.12	6.69	8.86	13.19
b	mm	12	15	15	15
	in.	0.47	0.59	0.59	0.59
	Part No.	267 47	267 50	267 51	267 52

Spare O-Ring Gaskets for Vacuum Sealing Disks DIN 2501



DN	DIN	63	100	160
d	mm	80	110	165
	in.	3.15	4.23	6.50
s	mm	5	5	5
	in.	0.20	0.20	0.20
Quantity per set		5	5	5
CR	Part No.	210 701	210 711	210 716

Bolts and Nuts for DIN Collar Flange



DN	DIN	63	100	160	250
Dimensions					
d	thread	M 12	M 16	M 16	M 15
l	mm	40	50	50	50
	in.	1.57	1.97	1.97	3.15
Number of bolts/nuts required		4	8	8	12
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

For sealing ISO-K flanges see the centering rings described in the section “(ISO-K) Clamp Flange Fittings and Components”.

Important: In the table of Section “General” the German designation for the type of steel is also stated in accordance with AISI.

Vacuum Greases

Ramsay greases for lubricating ground joints and drain valve in fore-vacuum lines consist of special grades of paraffin jelly to which caoutchouc is added for attaining the specific consistency.

Ramsay grease, thick is used to lubricate ground joints. Usable down to 10^{-2} mbar (0.75×10^{-2} Torr).

Ramsay grease, soft is used to lubricate drain valves. Usable down to 10^{-2} mbar (0.75×10^{-2} Torr).

Gleitlen is a special grease used to lubricate stirrer shafts (KPG stirrers, among others) of all sizes in the laboratory. Usable down to 10^{-2} mbar (0.75×10^{-2} Torr).

Lithelen contains lithium compounds, and all components contributing to higher vapor pressures have been removed through high-vacuum pre-processing. It may be used within a wide temperature range (from 0 °C to 150 °C (32 °F to 302 °F)) and in all applications from atmospheric pressure down to 10^{-8} mbar (0.75×10^{-8} Torr).

Silicone high-vacuum grease Dow Corning contains compounds of a high molecular weight together with chain elements containing silicon and oxygen.

At temperatures over 220 °C (428 °F) the silicone grease will polymerise giving off gas. It may be used within a wide temperature range (from -40 °C to 200 °C (-40 °F to 392 °F)) and in all applications from atmospheric pressure down to 10^{-6} mbar (0.75×10^{-6} Torr).

DYNAFAT is used to lubricate gaskets.

For all lubricants in our line of products you may obtain Safety Data Sheets from the Dept. Technical Support in Cologne.

Overview Sealing Greases

Application Data	Ramsay grease, thick	Ramsay grease, soft	Gleitlen	LITHELEN	Silicone high-vacuum grease	DYNAFAT
Purpose	Greasing of ground joints and drain valves, usable down to pressures of 10^{-2} mbar (0.75×10^{-2} Torr)	Greasing of ground joints and drain valves, usable down to pressures of 10^{-2} mbar (0.75×10^{-2} Torr)	Lubrication of stirrer shafts (KPG stirrers)	Greasing of ground joints and drain valves at low pressures and high working temperatures	Greasing of ground joints and drain valves at low pressures and high working temperatures	Lubrication of gaskets
Technical Data	Ramsay grease, thick	Ramsay grease, soft	Gleitlen	LITHELEN	Silicone high-vacuum grease	DYNAFAT
Vapor pressure at 20 °C (68 °F) mbar	10^{-4} (0.75×10^{-4} Torr)	10^{-4} (0.75×10^{-4} Torr)	10^{-4} (0.75×10^{-4} Torr)	10^{-10} (0.75×10^{-10} Torr)	10^{-7} (0.75×10^{-7} Torr)	10^{-3} (0.75×10^{-3} Torr)
Dripping point °C (°F)	> 56 (> 133)	> 56 (> 133)	> 50 (> 122)	> 210 (> 410)	¹⁾	148 (298)
Max. working temperature °C (°F)	30 (86)	30 (86)	30 (86)	150 (302)	200 (392)	110 (230)
Ordering Information	Ramsay grease, thick	Ramsay grease, soft	Gleitlen	LITHELEN	Silicone high-vacuum grease	DYNAFAT
Tin 50 g (0.11 lbs)	Part No. 177 32	Part No. 177 42	Part No. 176 38	-	-	-
Tube 50 g (0.11 lbs)	-	-	-	Part No. 176 44	Part No. 210 502	-
Tube 100 g (0.22 lbs)	-	-	-	-	-	Part No. 210 500

¹⁾ over 220 °C (428 °F) polymerisation



Observation Windows for Vacuum Systems

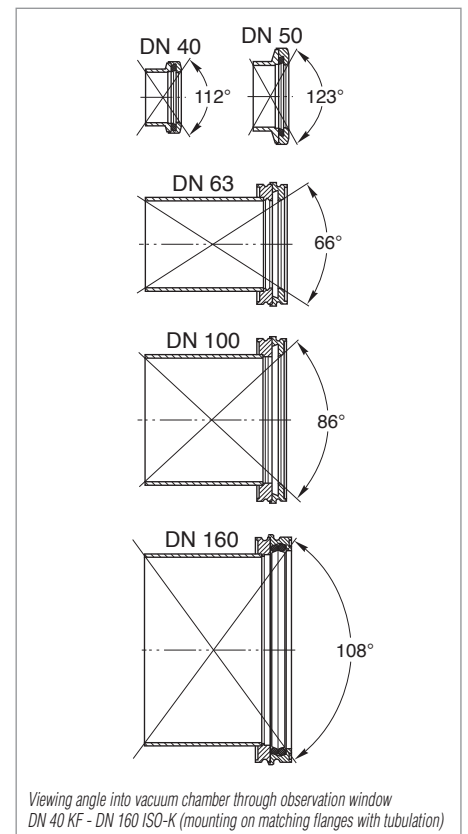
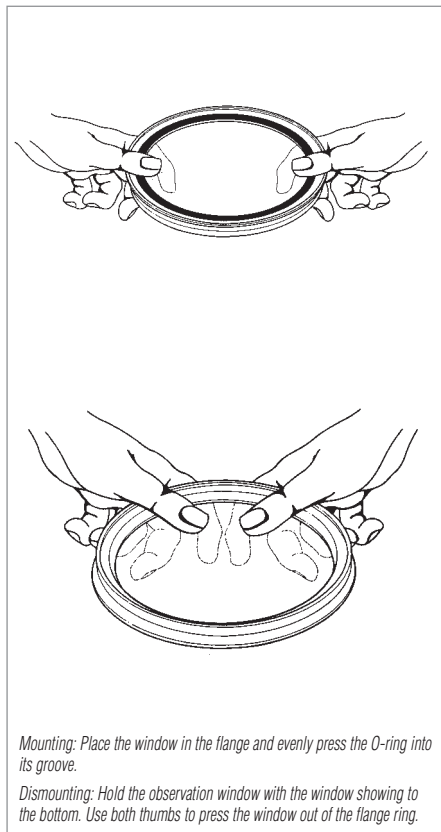


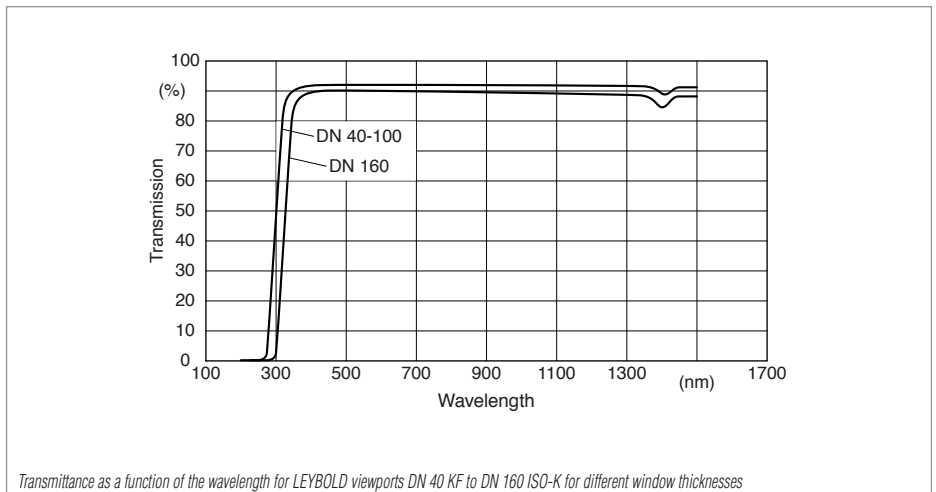
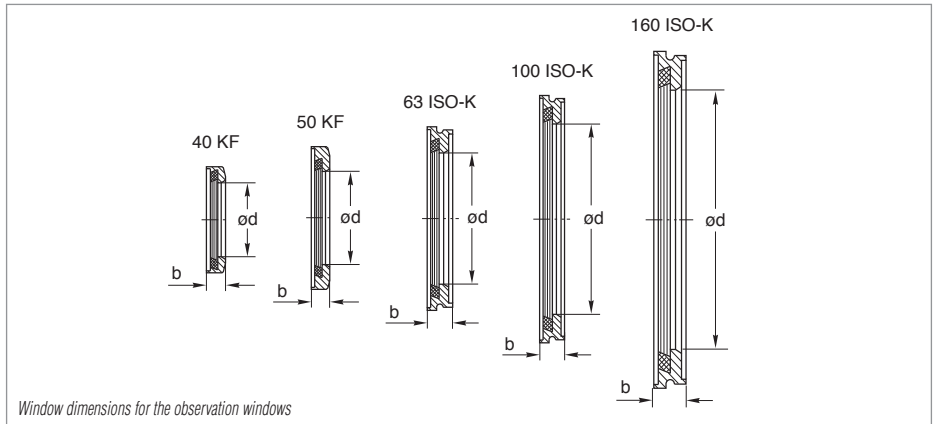
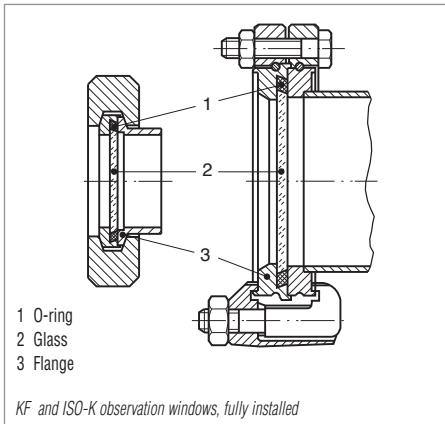
Observation of the phenomena in the vacuum chamber is very important for many vacuum processes. Measurements and monitoring can often be accomplished only by means of external instruments used under normal atmospheric pressure conditions.

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 KF and ISO-K components
- ◆ No special mounting components are required
- ◆ The FPM O-ring seals against the atmosphere (integrated centering ring)
- ◆ Each observation window is subjected to a leak test (thereby ensuring safe operation!)





Technical Data

DN		40 KF	50 KF	63 ISO-K	100 ISO-K	160 ISO-K
Thickness of glass window	mm	4	4	4	5	9
	in.	0.16	0.16	0.16	0.20	0.35
Diameter of glass window	mm	44	54	75	109	160
	in.	1.73	2.13	2.95	4.29	6.30
b	mm	10	10	13.5	13	17
	in.	0.39	0.39	0.53	0.51	0.67
d	mm	40	50	70	102	153
	in.	1.57	1.97	2.76	4.02	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				

Ordering Information

DN		40 KF	50 KF	63 ISO-K	100 ISO-K	160 ISO-K
	Part No.	210 131	210 132	210 133	210 134	210 135

Electrical Feedthroughs

General

Electrical 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 $\leq 1 \times 10^{-4}$ mbar ($\leq 0.75 \times 10^{-4}$ 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:

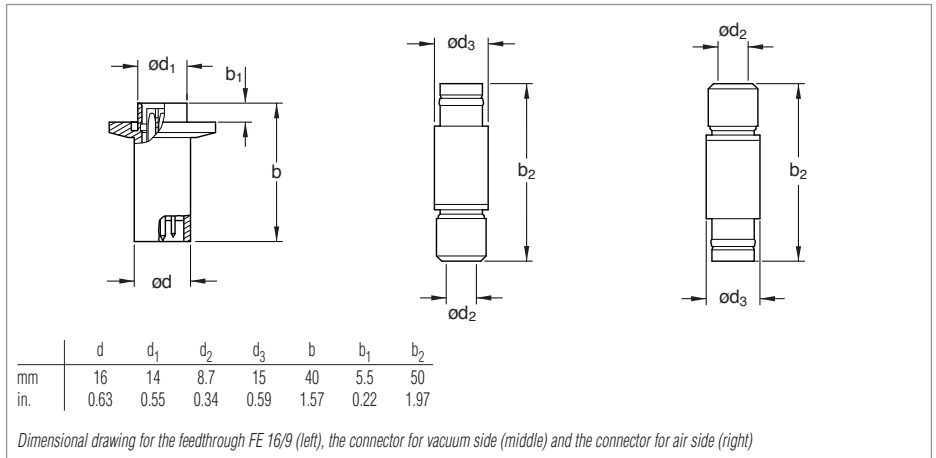
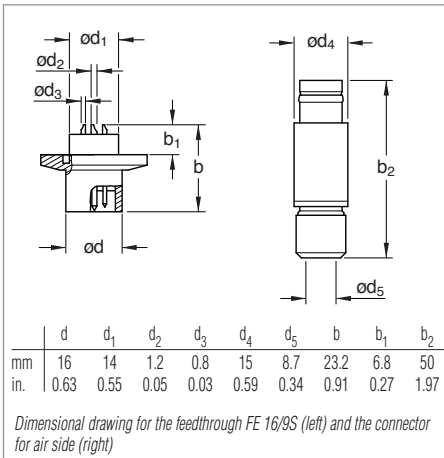
- F** Feedthrough
- E** Electric
- L** Liquid
- N** Normal
- P** Precision
- F** Frequency
- HC** Current
- HV** Voltage
- L** Linear
- R** Rotary

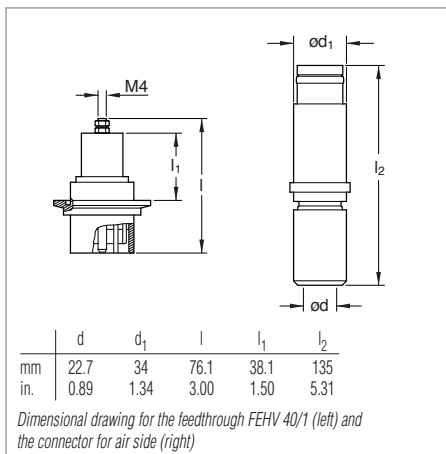
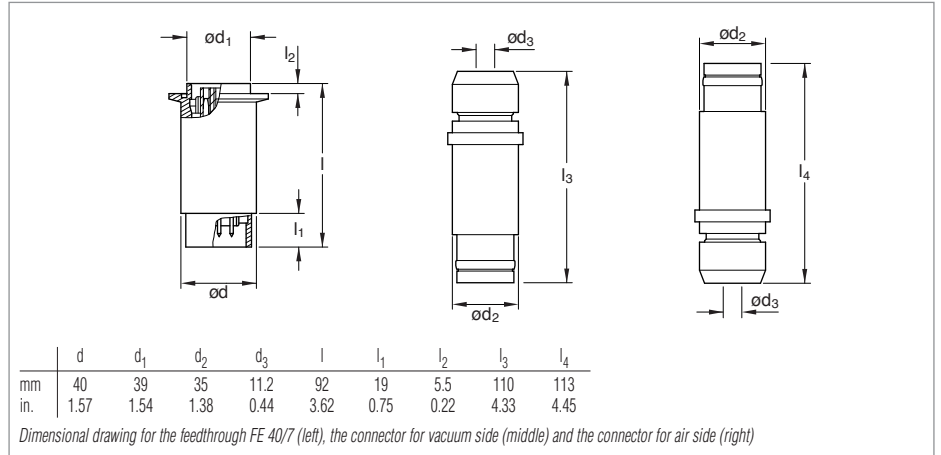
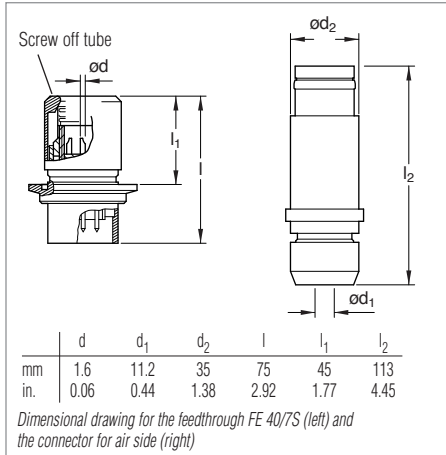
Electrical Feedthroughs

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		connector	
Vacuum side		solder connection	connector
Air side			connector
Diameter of connecting wire	mm (in.)	1.2 (0.05)	
Test voltage	V / Hz	500 / 50	
Tightness	mbar x l x s-1	1 x 10 ⁻⁹	
Pressure (absolute) ²⁾	mbar (Torr)	1 x 10 ⁻⁸ to 2.5 (0.75 x 10 ⁻⁸ to 1.9)	
Bakeout temperature (feedthrough, connector)	°C (°F)	130 (266)	
Housing		nickel-plated brass	
Insulator		PEEK / Araldit	
Seal		FPM	
Contact (feedthrough, connector)		gold-plated brass	

Ordering Information	FE 16 / 9S	FE 16 / 9
Electrical Feedthroughs	Part No. 210 302	Part No. 210 304
Connector: vacuum side	-	Part No. 210 305
Connector: air side	Part No. 210 303	Part No. 210 303

¹⁾ Local regulations concerning use must be followed
²⁾ Pressure max. 10 bar (7.5 Torr) with external centering ring

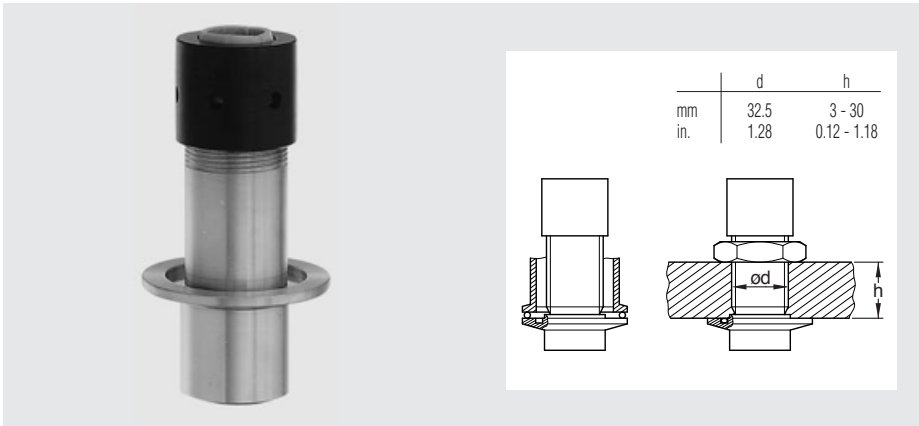




Technical Data		FE 40 / 7S	FE 40 / 7	FEHV 40 / 1
Vacuum connection		DN 40 ISO-KF		
Number of feedthroughs		7		1
Voltage per pole ¹⁾	V	380		6000
Current per pole ¹⁾	A	16		25
Connection				
Vacuum side		solder connection	connector	screw coupling
Air side		connector	connector	connector
Diameter of connecting wire	mm (in.)	∅ 1.6 (∅ 0.06)		∅ 5 (∅ 0.2)
Test voltage	kV / Hz	-		15 / 50
Tightness	mbar x l x s ⁻¹	1 x 10 ⁻⁹		
Pressure (absolute) ²⁾		1 x 10 ⁻⁸ mbar x l x s ⁻¹ to 2.5 bar (1.9 Torr)		
Bakeout temperature (feedthrough, connector)	°C (°F)	130 (266)		
Housing		chrom-plated steel		
Insulator		PTFE / Araldit		
Seal		FPM		
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
Electrical Feedthroughs		Part No. 210 325	Part No. 210 326	Part No. 210 350
Connector: vacuum side		-	Part No. 210 328	-
Connector: air side		Part No. 210 327	Part No. 210 327	Part No. 210 351

¹⁾ Local regulations concerning use must be followed
²⁾ Pressure max. 10 bar (7.5 Torr) with external centering ring

High Current Feedthroughs

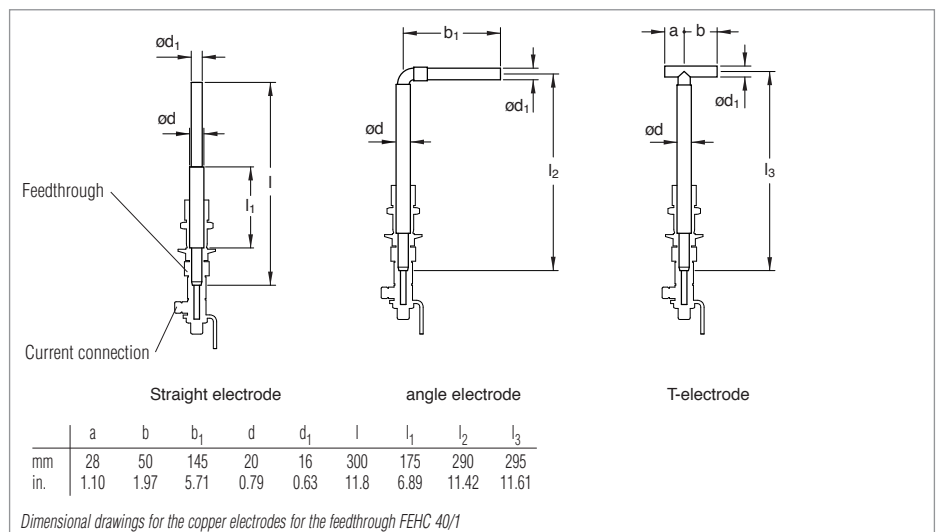
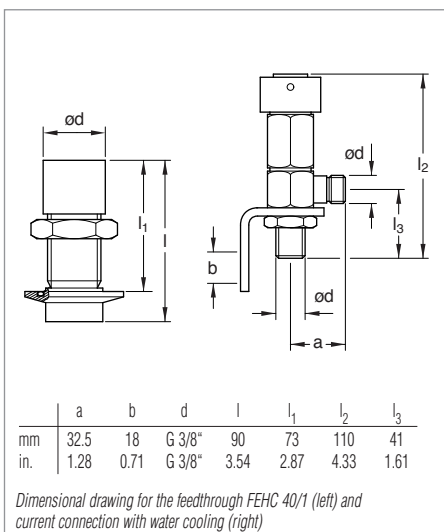


- Selection of electrodes
- Slide into mounted feedthrough
- Current connection with water cooling

Technical Data	FEHC 40/1
Vacuum connection	DN 40 ISO-KF
Number of feedthroughs	1
Voltage	50 V
Current, with water cooling	5000 A
Tightness	1 x 10 ⁻⁹ mbar x l x s ⁻¹
Pressure (absolute)	1 x 10 ⁻⁸ mbar to 2.5 bar (max. 10 bar with external centering ring)
Bakeout temperature	110 (230) °C (°F)
Housing	aluminium
Insulator	thermoplast
Seal	FPM

Ordering Information	FEHC 40/1
High Current Feedthroughs	Part No. 210 352
Current connection with water cooling	Part No. 210 356
Straight electrode	Part No. 210 353
Angle electrode	Part No. 210 354
T-electrode	Part No. 210 355

C13



Rotary Feedthroughs

ISO-KF

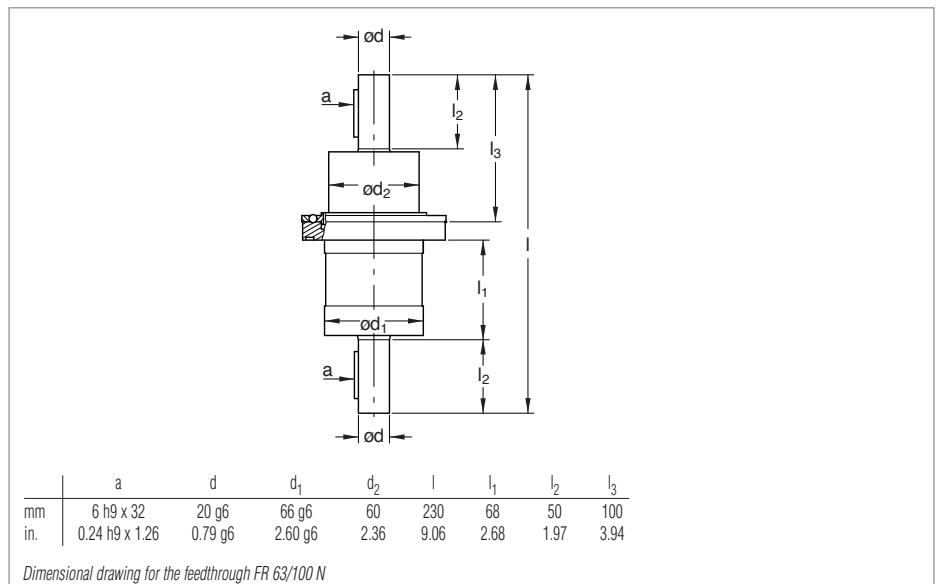
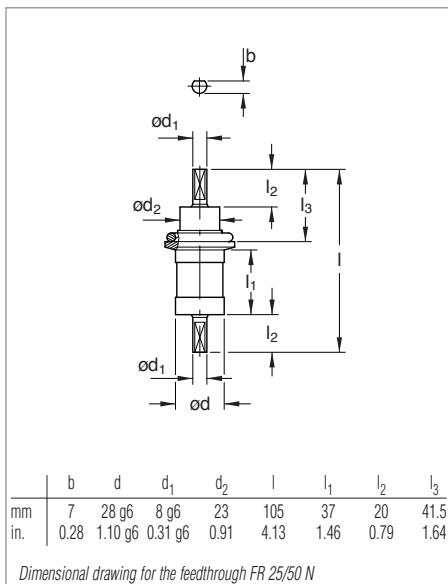
For transmitting high torque

With FPM shaft seal and ball bearings

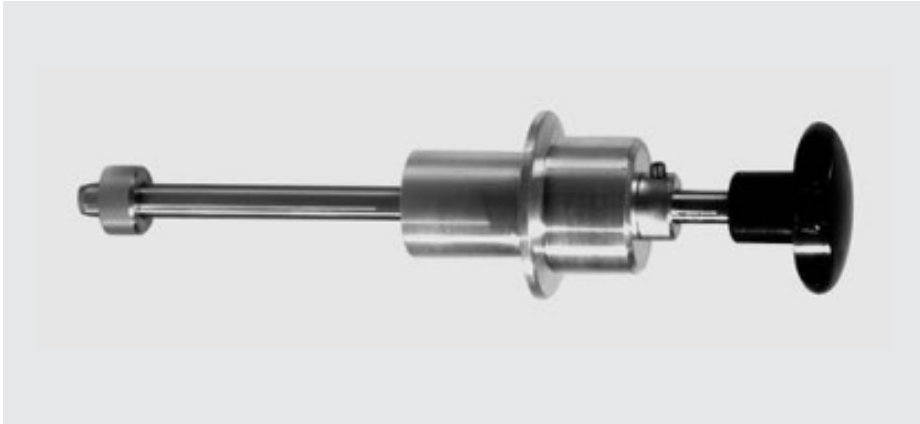
Technical Data		FR 25/50 N	FR 63/100 N
Vacuum connection		DN 25 ISO-KF	DN 63 ISO-KF
Feedthrough / seal		FPM	
Shaft connection	mm (in.)	∅ 8 (0.31)	∅ 20 (0.79)
Transferable torque	Nm	6	100
Rotational speed ¹⁾	1/min	1000	500
Shaft load			
Radial	N	150	500
Axial	N	50	100
Service life (revolutions)		20 000 000	10 000 000
Tightness, static	mbar x l x s ⁻¹	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	
Weight	kg (lbs)	0.2 (0.44)	2 (4.42)
Ordering Information		FR 25/50 N	FR 63/100 N
Rotary Feedthrough		Part No. 210 151	Part No. 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/stainless steel Part No. 887 03



Rotary / Linear Motion Feedthroughs



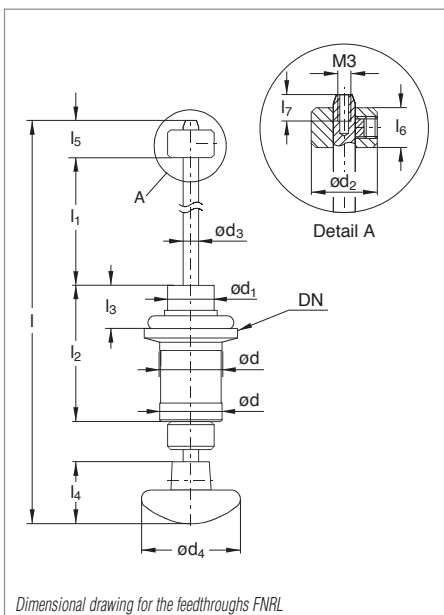
Two FPM shaft seals

Direct push/pull and rotary actuation

With locking ring and optional anti-rotation device

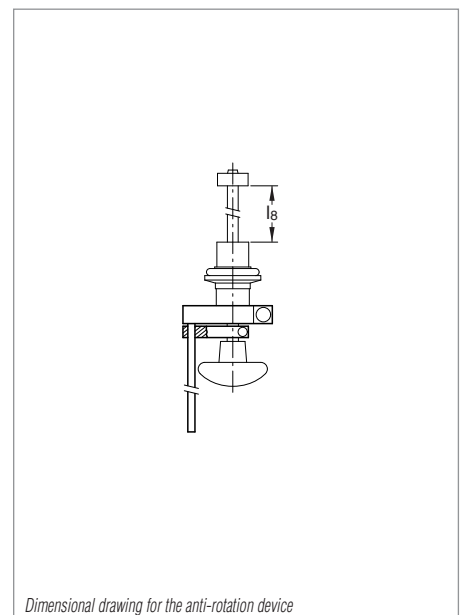
Technical Data		FNRL 16/50	FNRL 25/100
Vacuum connection		DN 16 ISO-KF	DN 25 ISO-KF
Feedthrough / seal		FPM	FPM
Shaft connection	mm (in.)	M 3 x 6 / ϕ 5 (0.2)	M 4 x 8 / ϕ 8 (0.31)
Stroke	mm (in.)	50 (1.97)	100 (3.94)
Shaft load			
Radial, at. max. displacement	N	10	15
Torsion	Nm	2	8
Tightness, static	mbar x l x s ⁻¹	1 x 10 ⁻⁹	
Operating pressure range (absolute)		1 x 10 ⁻⁸ 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	
Weight	kg (lbs)	0.1 (0.22)	0.2 (0.44)

Ordering Information		FNRL 16/50	FNRL 25/100
Rotary / linear feedthrough		Part No. 210 200	Part No. 210 201
Anti-rotation device		Part No. 210 225	Part No. 210 226



		l ₈ = l ₁ from FNRL 16/50 FNRL 25/100	
Anti-rotation device			
Part No. 210 225	mm	50	–
	in.	1.97	–
Part No. 210 226	mm	–	100
	in.	–	3.94

	DN	d	d ₁	d ₂	d ₃	d ₄	l
FNRL 16/50							
mm	16	20 g6	15	15	5 ^{-0.03} _{-0.05}	32	134
in.	0.63	0.79 g6	0.59	0.59	0.20	1.26	5.28
FNRL 25/100							
mm	25	25 g6	23	22	8 ^{-0.03} _{-0.05}	50	210
in.	0.98	0.98 g6	0.91	0.87	0.31	1.97	8.27
		l ₁ max	l ₂	l ₃	l ₄	l ₅	l ₇
FNRL 16/50							
mm		50	44	14	20	10.5	8
in.		1.97	1.73	0.55	0.79	0.41	0.31
FNRL 25/100							
mm		100	58	24	32	11	9
in.		3.94	2.28	0.94	1.26	0.43	0.35



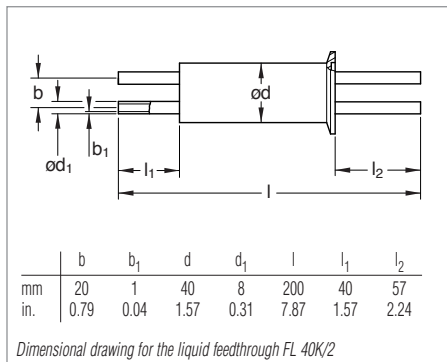
Liquid Feedthroughs

For H₂O and LN₂

Thermally insulated

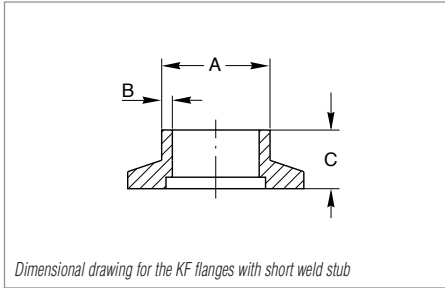
Especially suited for very hot and very cold applications

Technical Data		FL 40K/2
Vacuum connection		DN 40 ISO-KF
Feedthrough / seal		welded
Connection	mm (in.)	∅ 8 x 1 (0.31 x =.04)
Number of tubes		2
Tightness	mbar x l x s ⁻¹	1 x 10 ⁻⁹
Pressure (absolute)		1 x 10 ⁻⁹ mbar to 2.5 bar (0.75 x 10 ⁻⁹ Torr to 1.9 Torr) [max. 10 bar (max. 7.5 Torr) 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
Liquid feedthrough		Part No. 210 275



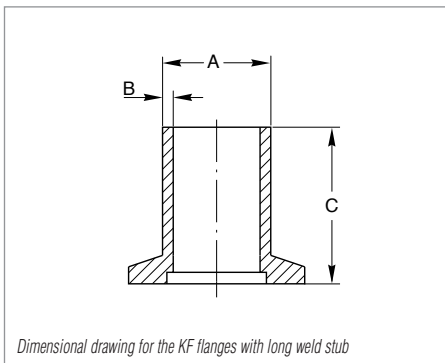
Version for the North and South American Continents

KF Flanges with Short Weld Stub, Standard-Inch Diameters



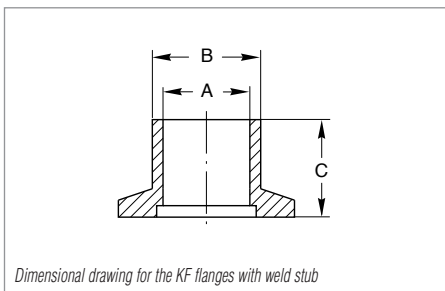
DN	KF	16	25	40	50
∅ A	mm	19	25.4	38.1	50.8
	in.	0.75	1.00	1.50	2.00
B	mm	1.7	1.7	2.1	2.1
	in.	0.065	0.065	0.083	0.083
C	mm	12.7	12.7	19.0	19.0
	in.	0.50	0.50	0.75	0.75
Tube fitting O. D. size		3/4 "	1 "	1 1/2 "	2 "
Stainless steel	Part No.	899 611	899 612	899 614	899 615

KF Flanges with Long Weld Stub, Standard-Inch Diameters



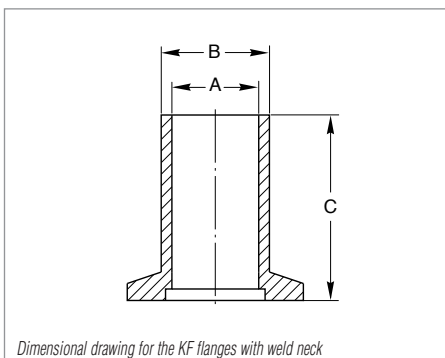
DN	KF	16	25	40	50
∅ A	mm	19	25.4	38.1	50.8
	in.	0.75	1.00	1.50	2.00
B	mm	1.7	1.7	2.1	2.1
	in.	0.065	0.065	0.083	0.083
C	mm	40.0	40.0	40.0	40.0
	in.	1.575	1.575	1.575	1.575
Tube fitting O. D. size		3/4 "	1 "	1 1/2 "	2 "
Stainless steel	Part No.	899 621	899 622	899 624	899 625

KF Flanges with Weld Stub, Metric Diameters



DN	KF	16	25	40	50
∅ A	mm	16	25	40	50
	in.	0.630	0.984	1.575	1.968
∅ B	mm	20	28	45	55
	in.	0.787	1.102	1.772	1.165
C	mm	16	19	25	25
	in.	0.630	0.750	0.984	0.984
Stainless steel	Part No.	884 21	884 22	884 23	883 85

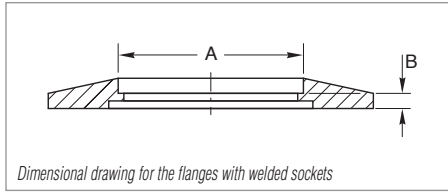
KF Flanges with Weld Neck, Metric Diameters



DN	KF	16	25	40
∅ A	mm	16	25	40
	in.	0.630	0.984	1.575
∅ B	mm	20	28	45
	in.	0.787	1.102	1.772
C	mm	57	57	57
	in.	2.250	2.250	2.250
Stainless steel	Part No.	884 31	884 32	884 33

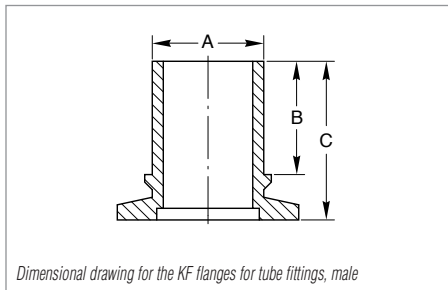
Version for the North and South American Continents

Flanges with Welded Socket



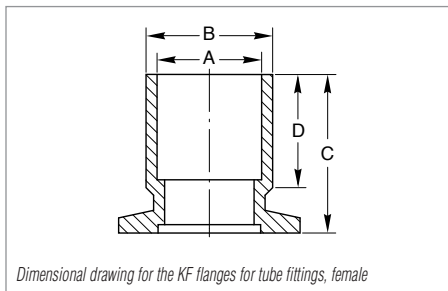
DN	KF	16	25	40	50	
∅ A	mm	17.3	26.2	41.1	52.1	
	in.	0.68	1.03	1.62	2.05	
B	mm	3.0	3.0	3.0	3.0	
	in.	0.12	0.12	0.12	0.12	
Tube fitting O. D. size		3/4 "	1 "	1 1/2 "	2 "	
Stainless steel		Part No.	899 631	899 632	899 634	899 635

KF Flanges for Tube Fittings, Male



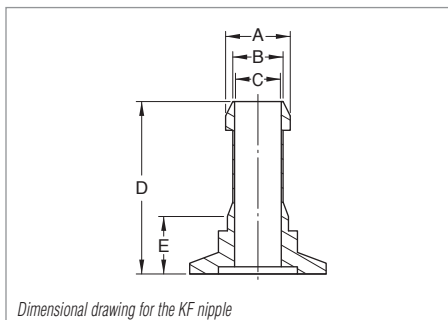
DN	KF	16	25	40	40	
∅ A	mm	19.0	29.0	44.5	41.0	
	in.	0.750	1.125	1.750	1.625	
B	mm	17.5	29.0	29.0	29.0	
	in.	0.688	1.125	1.125	1.125	
C	mm	29.0	35.0	46.0	46.0	
	in.	1.125	1.375	1.812	1.812	
Tube fitting I. D. size		3/4 "	1 1/8 "	1 3/4 "	1 5/8 "	
Stainless steel		Part No.	910280119	910280120	910280126	910280121

KF Flanges for Tube Fittings, Female



DN	KF	16	25	40	40	
∅ A	mm	19.0	29.0	54.0	41.0	
	in.	0.754	1.130	2.130	1.630	
∅ B	mm	22.0	32.0	57.0	44.5	
	in.	0.875	1.250	2.240	1.750	
C	mm	25.4	35.0	35.0	35.0	
	in.	1.000	1.375	1.375	1.375	
D	mm	13.0	17.0	16.0	19.0	
	in.	0.500	0.672	0.625	0.750	
Tube fitting O. D. size		3/4 "	1 1/8 "	2 1/8 "	1 5/8 "	
Stainless steel		Part No.	910280122	910280123	910280124	910280125

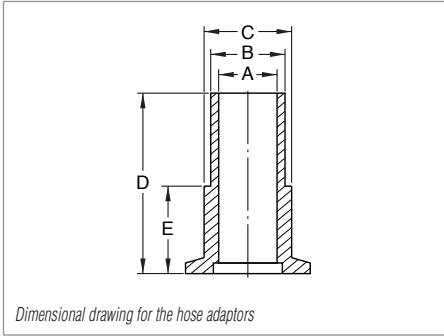
KF Nipple, American Standard



DN	KF	16	16	25	
∅ A	mm	9.5	16.1	16.1	
	in.	0.375	0.635	0.635	
∅ B	mm	7.6	14.3	14.3	
	in.	0.300	0.563	0.563	
∅ C	mm	5.6	11.9	11.9	
	in.	0.219	0.469	0.469	
D	mm	40	40	40	
	in.	1.575	1.575	1.575	
E	mm	12.7	12.7	12.7	
	in.	0.500	0.500	0.500	
Tubing size		1/4 "	1/2 "	1/2 "	
Aluminum		Part No.	899 674	899 675	899 676

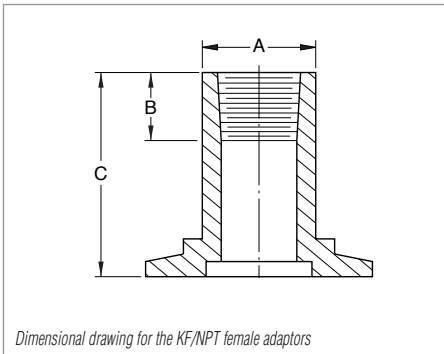
Version for the North and South American Continents

Hose Adapter



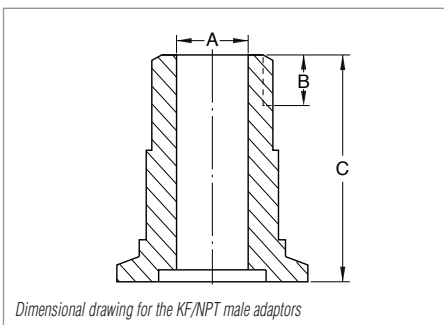
DN	KF	16	25	40	
∅ A	mm	16	21	32	
	in.	0.625	0.813	1.250	
∅ B	mm	19.5	26	39	
	in.	0.770	1.020	1.540	
∅ C	mm	20	28	45	
	in.	0.787	1.102	1.772	
D	mm	29	29	29	
	in.	1.125	1.125	1.125	
E	mm	13	13	13	
	in.	0.500	0.500	0.500	
Nominal I. D. hose			3/4"	1"	1 1/2"
Stainless steel		Part No.	992780668	992780670	992780672

KF/NPT Female Adapter



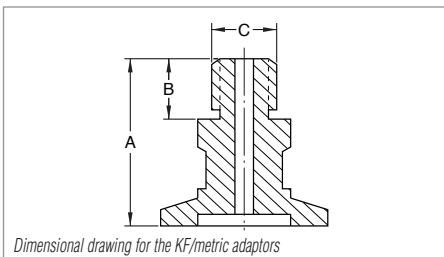
DN	KF	16	25	40	
∅ A	mm	16	25	38	
	in.	0.620	0.995	1.500	
B	mm	10	10	10	
	in.	0.394	0.394	0.394	
C	mm	25.4	25.4	25.4	
	in.	1.000	1.000	1.000	
Pipe size NPT			1/8"	1/8"	1/8"
Stainless steel		Part No.	899 604	899 605	899 606
Pipe size NPT			1/4"	1/4"	1/4"
Stainless steel		Part No.	899 643	899 644	899 645

KF/NPT Male Adapter



DN	KF	16	25	25	40	40	40	40	
∅ A	mm	9.5	16.0	23.8	25.4	31.8	38.1	38.2	
	in.	0.375	0.625	0.937	1.000	1.250	1.500	1.503	
B	mm	10.0	13.5	17.0	17.0	18.0	18.4	19.2	
	in.	0.402	0.534	0.683	0.683	0.707	0.724	0.757	
C	mm	38.0	46.0	63.5	50.8	63.5	63.5	63.5	
	in.	1.500	1.813	2.500	2.000	2.500	2.500	2.500	
Pipe size NPT			1/4"	1/2"	1"	1"	1 1/4"	1 1/2"	2"
Carbon steel		Part No.	992780678	992780679	-	992780680	-	-	899 619
Stainless steel		Part No.	899 601	899 602	899 626	899 603	899 627	899 628	899 629

KF/Metric Adapter

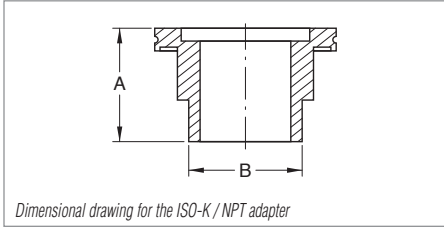


DN	KF	16	
A	mm	50.8	
	in.	2.000	
B	mm	12.7	
	in.	0.500	
∅ D /thread)	mm	M 16 x 1.5	
	in.	M 16 x 0.06	
Carbon steel		Part No.	99258004

C13

Version for the North and South American Continents

ISO-K to NPT Adapter

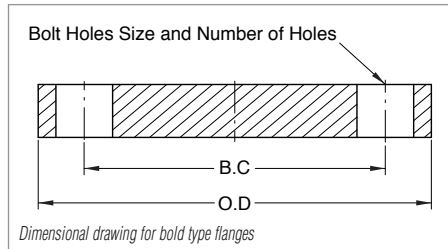


Dimensional drawing for the ISO-K / NPT adapter

DN		63 ISO-K / 2" NPT
A	mm	60
	in.	2.362
∅ B	mm	51
	in.	2" NPT
Stainless steel	Part No.	72103040

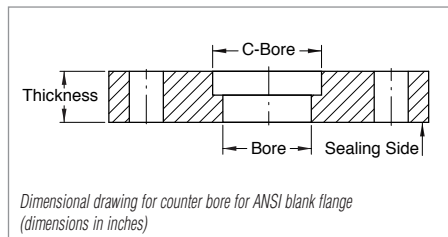
Version for the North and South American Continents

Bold Type Flanges



Size	Bolt circle (B.C.) in in.	Outside diameter (O.D.) in in.	Bolt holes	
			Size	No. of holes
dimensions in brackets () in mm				
DIN 63 ISO-K	5.118 (130)	6.299 (160)	0.551 (14)	4
DIN 100 ISO-K	6.693 (170)	8.268 (210)	0.709 (18)	8
DIN 160 ISO-K	8.858 (225)	10.433 (265)	0.709 (18)	8
DIN 250 ISO-K	13.189 (335)	14.764 (375)	0.709 (18)	12
DIN 350 ISO-K	17.520 (445)	19.291 (490)	0.906 (23)	12
DIN 500 ISO-K	23.622 (600)	25.394 (645)	0.906 (23)	20
ANSI 3 inch	6.000 (152.4)	7.500 (190.5)	0.750 (19)	4
ANSI 4 inch	7.500 (190.5)	9.000 (228.6)	0.750 (19)	8
ANSI 6 inch	9.500 (241)	11.000 (279.4)	0.875 (22)	8
ANSI 8 inch	11.750 (298)	13.500 (343)	0.875 (22)	8
ANSI 10 inch	14.250 (362)	16.000 (406.4)	1.000 (25.4)	12
ANSI 12 inch	17.000 (432)	19.000 (483)	1.000 (25.4)	12
ANSI 16 inch	21.250 (540)	23.500 (597)	1.125 (29)	16
DIN 63 ISO-F	4.311 (110)	5.118 (130)	0.393 (10)	4
DIN 100 ISO-F	5.709 (145)	6.496 (165)	0.393 (10)	8
DIN 160 ISO-F	7.874 (200)	8.858 (225)	0.453 (11.5)	8
DIN 250 ISO-F	12.205 (310)	13.189 (335)	0.453 (11.5)	12
DIN 400 ISO-F	18.890 (480)	20.080 (510)	0.551 (14)	16

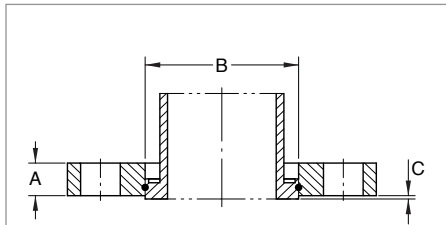
Maximum Recommended Counter Bore for ANSI Blank Flanges (for Carbon or Stainless Steel Pipe)



ANSI size	Outside diameter (O.D.)	Bolt circle (B.C.)	No. of holes	Bolt holes		
				Diameter	Thickness	Max. C-Bore
3	7 1/2	6	4	3/4	7/8	4 1/4
4	9	7 1/2	8	3/4	7/8	5 3/4
6	11	9 1/2	8	7/8	15/16	7 1/2

Version for the North and South American Continents

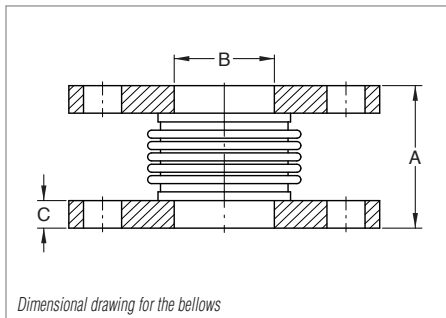
Flanges, Rotatable Bolt Type



Dimensional drawing for the flanges, rotatable type
(tube piece shown in phantom not included)

DN	ISO-K to ANSI	63 3 in.	100 4 in.	160 6 in.	250 10 in.
A	mm	13	13	16	22
	in.	0.500	0.500	0.625	0.875
∅ B	mm	95.5	131	181	291
	in.	3.760	5.140	7.120	11.453
C	mm	1	1	1	1
	in.	0.039	0.039	0.039	0.039
Carbon steel	Part No.	982780700	982780701	982780702	982780703
Spare retaining ring	Part No.	23102401	23102402	23102412	23102413

Bellows

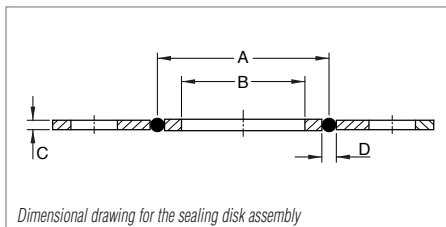


Dimensional drawing for the bellows

DN	ANSI	3 in.	4 in.	6 in.
A	mm	120	120	200
	in.	4.720	4.720	7.870
∅ B	mm	78	102	154
	in.	3.070	4.030	6.070
C	mm	12.7	12.7	12.7
	in.	0.500	0.500	0.500
Rated deflection in axial	mm	15	18	29.5
	in.	0.580	0.700	1.160
Rated deflection in lateral	mm	5	6	8
	in.	0.190	0.220	0.310
Spring rate	lb/in.	263	340	260
Compression / tension	mm	12 / 4	15 / 4	23 / 7
	in.	0.460 / 0.140	0.560 / 0.140	0.900 / 0.260
Stainless steel bellows with carbon steel flanges	Part No.	991051013	991051014	991051016

Combined axial/lateral deflection cannot exceed 100 %. Example: 75 % axial rating - 25 % lateral rating

Sealing Disk Assembly



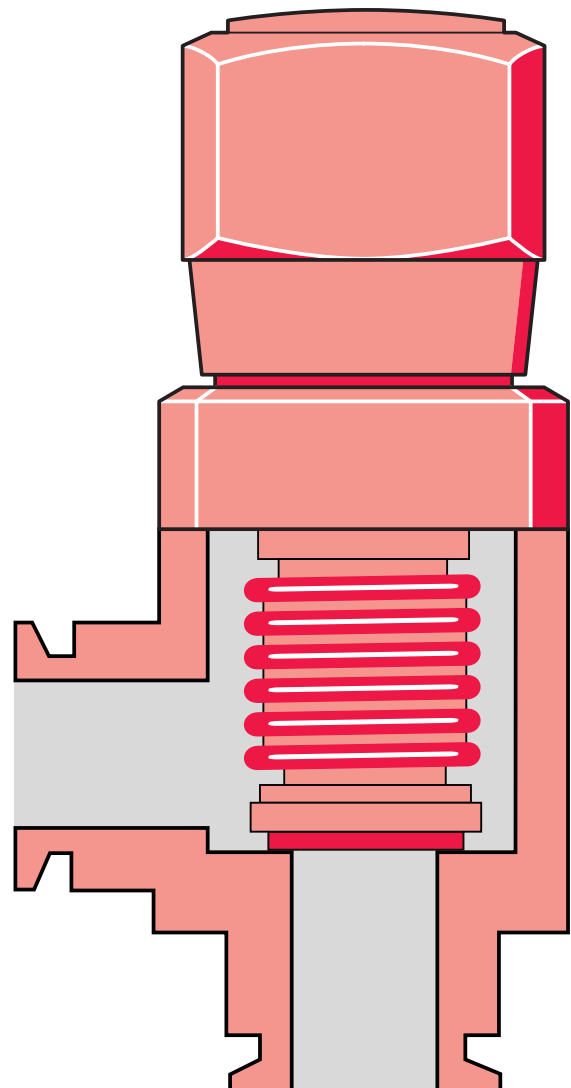
Dimensional drawing for the sealing disk assembly

DN	ANSI	3 in.	4 in.	6 in.
∅ A	mm	91	121	171
	in.	3.600	4.750	6.720
∅ B	mm	78	102	154
	in.	3.070	4.030	6.070
C	mm	3.2	3.2	3.2
	in.	0.125	0.125	0.125
∅ D	mm	4	4	4
	in.	0.157	0.157	0.157
Aluminum	Part No.	910181605	910181606	910181607
Stainless steel	Part No.	910181616	910181617	910181618

C14

Vacuum Valves

Manually Operated
Electropneumatically Operated
Electromagnetically Operated
Special Valves
Gate Valves



General

The LEYBOLD Valve Program	C14.03
-------------------------------------	---------------

Products**Small Valves of the “micro” Range**

Overview	C14.06
Right-Angle and Straight-Through Valves	C14.07

Valves with KF Flanges

Overview	C14.08
Nominal Width DN 16 KF to DN 40 KF	
Right-Angle and Straight-Through Valves, Bellows-Sealed, Manually Operated	C14.09
Right-Angle Valves, Bellows-Sealed, Electropneumatically Operated	C14.10
Straight-Through Valves, Bellows-Sealed, Electropneumatically Operated	C14.11
Right-Angle Valves, Bellows-Sealed, Electromagnetically Operated	C14.12

Valves with ISO-K or ISO-F Flanges

Overview	C14.13
Nominal Width DN 63 ISO-K to DN 160 ISO-K	
Right-Angle Valves, Bellows-Sealed, Manually Operated	C14.14
Right-Angle Valves, Bellows-Sealed, Electropneumatically Operated	C14.15
Nominal Width DN 250	
Right-Angle Valves, Bellows-Sealed, Electropneumatically Operated	C14.16

Special Valves

Overview	C14.17
Nominal Width DN 10 KF to DN 40 KF or ISO-K	
SECUVAC Vacuum Safety Valves	C14.18
Variable-Leak Valves with and without Isolation Valve	C14.20
Venting Valves	C14.21
Power Failure Venting Valves / Ball Valves	C14.22
Vacuum Locks / Sealing Valves	C14.23
Right-Angle Valve for Mobile Systems in Accordance with the Regulations of the Department of Transportation (DOT)	C14.24
Accessories for the Electropneumatically Operated Valves	C14.25

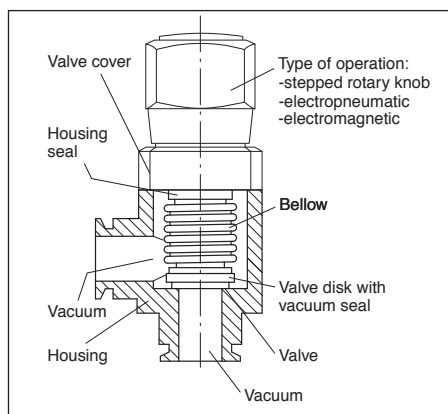
High Vacuum Gate Valves

Overview	C14.26
Miniature HV and UHV Gate Valves, Manually Operated, KF and CF Flange	C14.27
Miniature HV and UHV Gate Valves, Electropneumatically Operated, KF and CF Flange	C14.28
HV Gate Valves, Manually Operated, ISO-F Flange	C14.29
HV Gate Valves, Electropneumatically Operated, ISO-F Flange	C14.30
UHV Gate Valves, Manually Operated, CF Flange	C14.31
UHV Gate Valves, Electropneumatically Operated, ISO-F Flange	C14.32
UHV Gate Valves, Electropneumatically Operated, CF Flange	C14.33

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 vacuum 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 (no slanted seat valve) with a nominal width of DN 16 to DN 40 with 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 a stepped rotary knob manual drive, an electropneumatic drive or an electromagnetic drive system.

Right-angle valves DN 16 to DN 40 KF as well as DN 63 to DN 160 ISO-K are either available with an aluminium 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!

Flange Designations

The flange designations used in this Product Section are in line with the international standards and the nomenclature used in practice:

Flange Type	Standard	Designation with standardized nominal width *) (DN)
Small flanges	ISO 2861/1 DIN 28 403	“KF” e.g. DN 40 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

*) The standardized nominal width (DN) corresponds approximately to the inside diameter, but need not necessarily be identical to the inside diameter.

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.

For further information on flange connections and flange components please refer to Product Section C13 “Vacuum Fittings and Feedthroughs” as well as C15 “Ultra-high Vacuum Components”.

Advantages to the User

- ◆ Compact design
- ◆ Integral leak rate less than 10^{-8} mbar l x s⁻¹
- ◆ FPM sealed
- ◆ For pressures up to 2000 mbar
- ◆ Seal in both directions ¹⁾
- ◆ 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 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 absolutely free of any 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 KF to DN 100 ISO-K)
- ◆ Venting valves / power failure venting valves
- ◆ Vacuum locks / sealing valves
- ◆ Variable leak valves
- ◆ Ball valves (straight-through valve)
- ◆ Right-angle valves for mobile systems which comply with the American standard of the Department of Transportation (DOT)

Accessories

All connecting components like centering rings, clamps or clamping rings needed to connect the valves must be ordered separately (see Product Section C13 "Vacuum 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 section "General".

Gaskets

Shown in the table at the end of the section "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⁾ 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 x s⁻¹ can be measured for the body and the valve seat. In the case of our high vacuum valves with KF and ISO-K flanges a leak rate of less than 10^{-9} mbar x l x s⁻¹ 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.

Aluminum Alloys

Material No. DIN	AA	Brief Designation DIN
3.0615	–	AlMgSiPbF28
3.2153	–	G AlSi7Cu3
3.2315	6081	AlMgSi1F28
3.2341	–	G AlSi5Mg wa
3.2371	–	G AlSi7Mg wa
3.2373	–	G AlSi9Mg
3.2381	–	G AlSi10Mg wa
3.3527	–	AlMg2Mn0,8F20

Stainless Steels

Material No. DIN	AISI	Brief Designation DIN
1.4034	420	X 46 Cr 13
1.4301	304	X5 CrNi 18 10
1.4305	303	X8 CrNiS 18 9
1.4306	304 L	X2 CrNi 18 10
1.4308	–	G-X6 CrNi 18 10
1.4310	301	X10 CrNi 17 7
1.4404	316 L	X2 CrNiMo 17 13 3
1.4435	316 L	X2 CrNiMo 18 14 3
1.4541	321	X6 CrNiTi 18 10
1.4571	316 Ti	X6 CrNiMoTi 17 12 2

Standard Steels

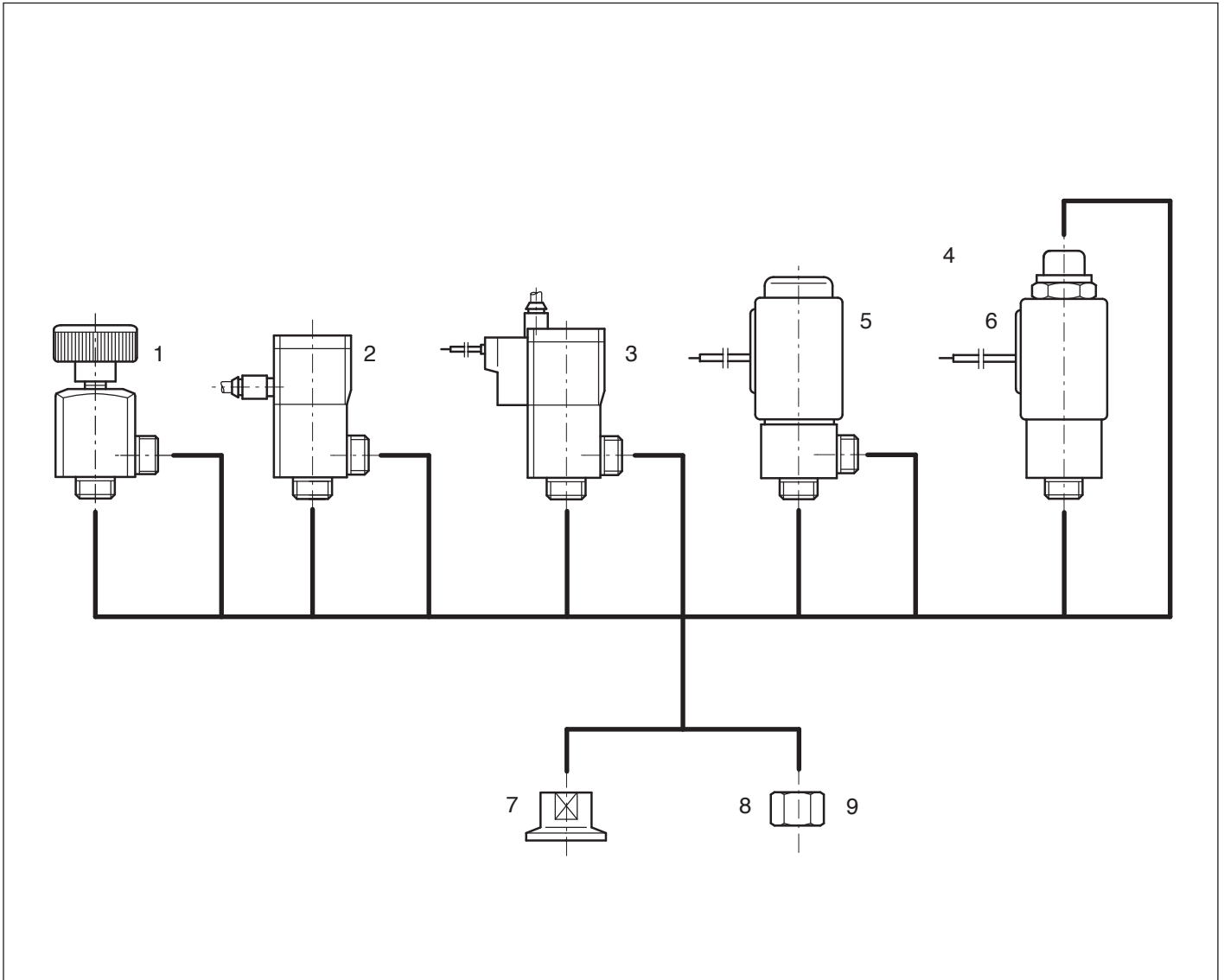
Material No. DIN	Brief Designation DIN
1.0388	St4/St14
1.0425	H II

Materials used for the Gaskets

Brief Designation	Chemical Designation	Typical Trade Name	Degassing Temperature
FPM	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

Abbreviation	Valve type
EMD	Solenoid straight-through valve
EME	Solenoid right-angle valve
EPD	Electro-pneumatic straight-through valve
EPE	Electro-pneumatic right-angle valve
MAN	Manual operation
PD	Pneumatic straight-through valve
PE	Pneumatic right-angle valve



LEYBOLD small valves **micro** are available with any of four drive systems, two types of body and three adaptors.

Types of drive

- ◆ Manual (1)
- ◆ Pneumatic (2)
- ◆ Electropneumatic (3)
- ◆ Electromagnetic (4)

Types of valve body

- ◆ Right-angle valve (5)
- ◆ Straight-through valve (6)

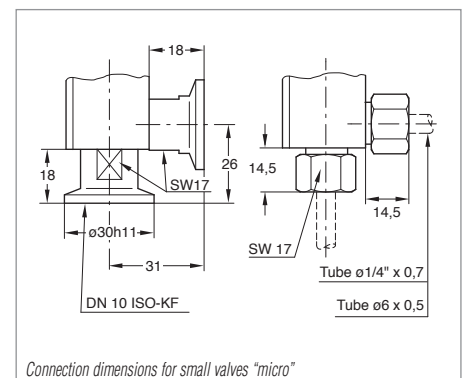
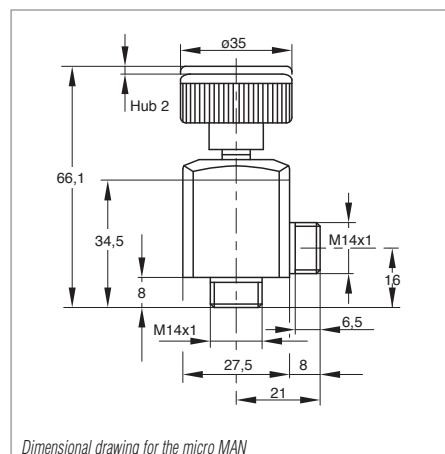
as well as adaptor

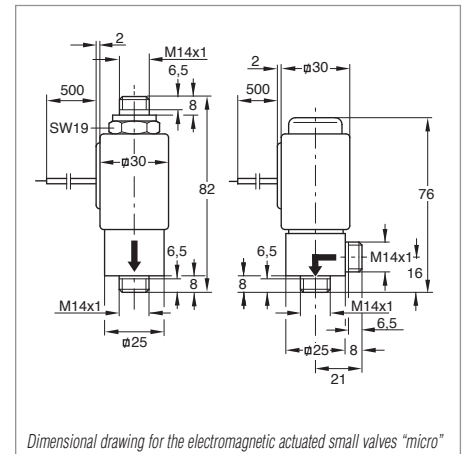
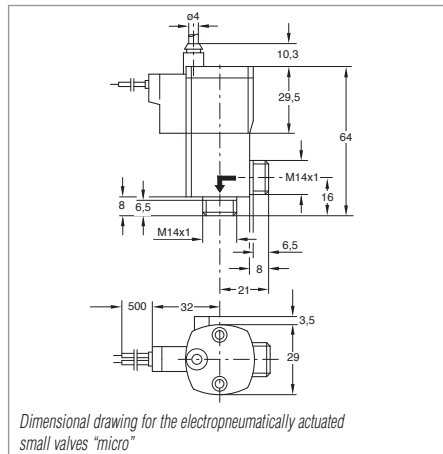
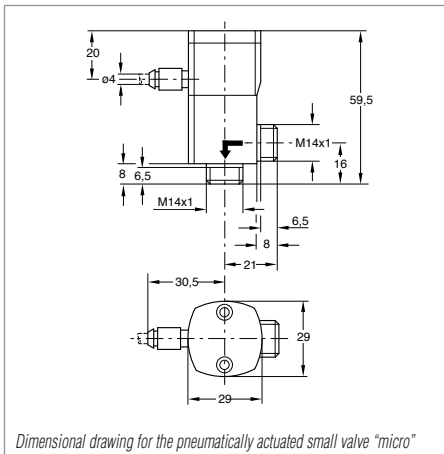
- ◆ DN 10 KF flange (7)
- ◆ 1/4" tube (8)
- ◆ 6 mm tube (9)

Technical Information

micro valves are supplied without adaptor.

The adaptors must be ordered additionally.





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

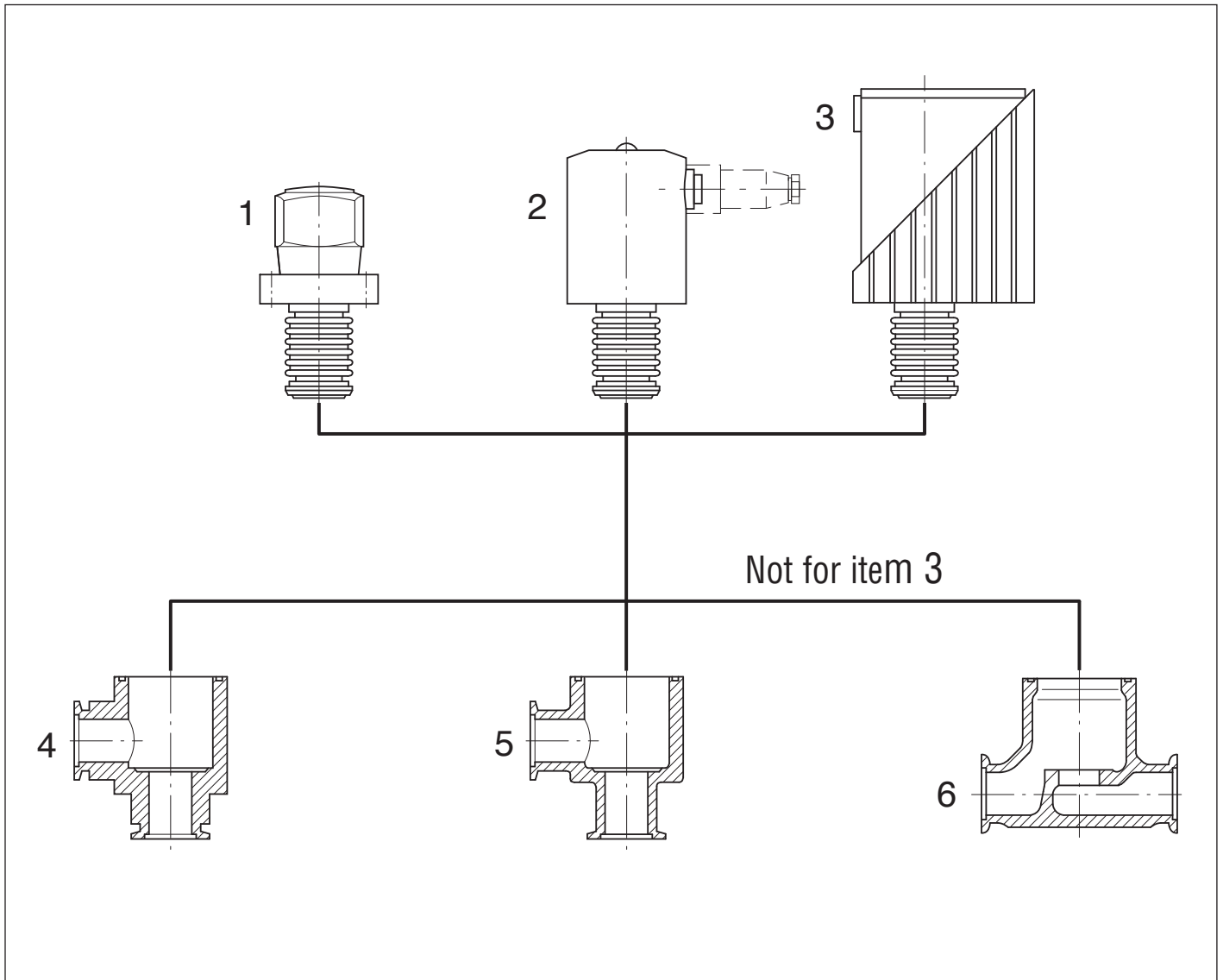
Typical Applications

- ◆ Gas handling systems in production machines
- ◆ Latest generation analytical equipment

Technical Data		Small Valve "micro"			
		Manual	Electropneumatic	Pneumatic	Electromagnetic
Nominal width	mm	5			
Integral leak rate	mbar x l/s	10 ⁻⁹			
Switching cycles		-	5 Mio.		> 2 Mio.
Max. pressure differential	bar abs.	4	3		1
Closure time	ms	-	35		7
Opening time	ms	-	35		30
Max. switching frequency	min ⁻¹	-	150		300
Conductance, molecular	l/s	0.4	0.4		0.3
Supply voltage	VDC	-	24 (with pilot valve)	-	24
Max. power consumption	W	-	1	-	10
Materials		Valve body: Stainless steel (1.4301); Inside section: stainless steel (1.4301); Gaskets: O-rings made of FPM Drive:			
		Aluminum / Plastic	Aluminum anodized	Aluminum anodized	stainless steel 1.4105

Ordering Information		Small Valve "micro"			
		Manual	Electropneumatic	Pneumatic	Electromagnetic
Right-angle valves	Type				
Manual	MAN	Part No. 284 48	-	-	-
Without pilot valve normally closed	PE	-	-	Part No. 284 40	-
With pilot valves normally closed	EPE	-	Part No. 284 41	-	-
With pilot valve normally open	EPE	-	Part No. 284 42	-	-
With pilot valve normally closed, with flanges	PE DN 10 KF	-	-	Part No. 284 47	-
Electromagnetic, normally closed	EME	-	-	-	Part No. 284 44
Straight-through valves					
Electromagnetic, normally closed	EMD	-	-	-	Part No. 284 45
Electromagnetic, normally open	EMD	-	-	-	Part No. 284 46
Adapter (1 piece)					
Flange DN 10 KF					Part No. 284 50
Tube 1/4"					Part No. 284 51
Tube 6 mm					Part No. 284 52
Spare parts					
Seal kit		Part No. 105 80	Part No. 105 81	Part No. 105 81	Part No. 108 82
Inside section		Part No. 105 80	Part No. 105 82	Part No. 105 82	Part No. 105 83/84/89





LEYBOLD KF valves are available with any of three drive systems and three types of body having a nominal width of DN 16, 25 and 40 KF.

Types of drive

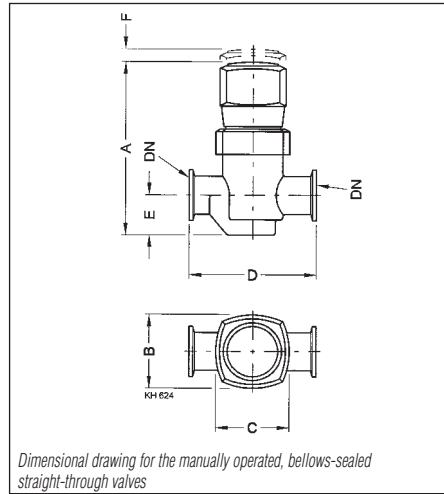
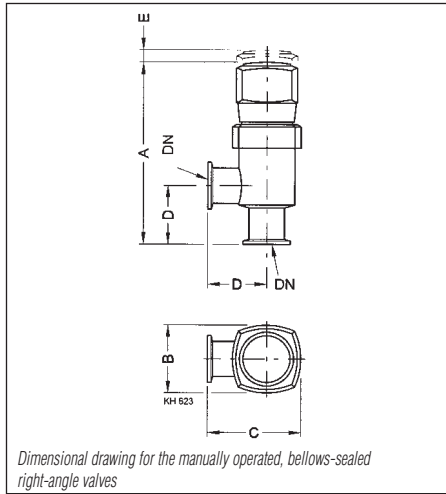
- ◆ Stepped rotary knob (1) with bellows seal
- ◆ Electropneumatic with bellows seal (2)
- ◆ Solenoid with bellows seal (3)

Types of valve body

- ◆ Right-angle valve, aluminum body (4)
- ◆ Right-angle valve, stainless steel body (5)
- ◆ Straight-through valve, stainless steel body (6)

Connection Pictograms

- ⊕ Position indicator connection
- ⊙ Compressed air connection
- ⚡ Power connection
- ⌚ Position indicator



Advantages to the User

Valves with Rotary Knob

Isolation component with handy and easy to operate four position rotary knob

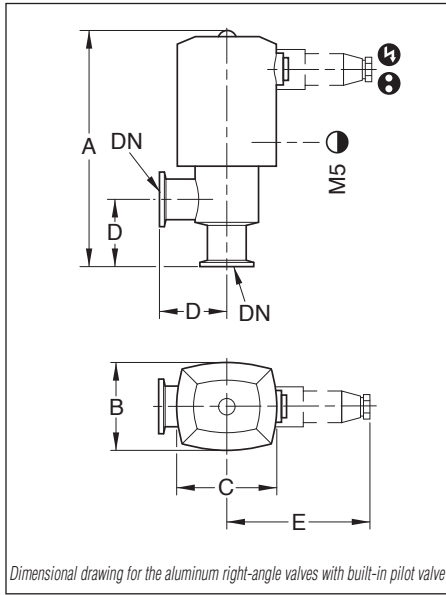
- ◆ Permits careful venting of systems
- ◆ Suited as a manually operated variable leak valve to roughly control gas flows
- ◆ Leak tight in both directions up to a pressure of 2.0 etc. 1.5 bar and easy to open
- ◆ Installation in any orientation

Dimensions for the Right-Angle Valves				
DN	KF	16	25	40
A	mm	118.3	154.5	173.8
B	mm	44	58	82
C	mm	62	79	106
D	mm	40	50	65
E	mm	5	10	12

Dimensions for the Straight-Through Valves				
DN	KF	16	25	40
A	mm	100.3	136	154.3
B	mm	44	58	82
C	mm	44	58	82
D	mm	80	100	130
E	mm	22	31.5	44.5
F	mm	5	10	12

Technical Data	DN 16 KF		DN 25 KF		DN 40 KF	
	Aluminum / Stainless		Aluminum / Stainless		Aluminum / Stainless	
Right-Angle Valves						
Service life	cycles		10000			
Conductance at molecular flow	$l \times s^{-1}$		4.5	4.5	16	16
Leak rate	$mbar \times l \times s^{-1}$		1×10^{-9}			
Operating pressure range	mbar		$10^{-8} - 2000$			$10^{-8} - 1500$
Differential pressure, closing and opening direction	bar		2 / 2	2 / 2	2 / 2	2 / 1.5
Opening against differential pressure	bar		2	2	3	3
Ambient / operating temperature, max.	°C		50	50	50	50
Seal	FPM		FPM	FPM	FPM	FPM
Weight	kg		0.30	0.43	0.40	0.68
Straight-Through Valves						
Service life	cycles		10000			
Conductance at molecular flow	$l \times s^{-1}$		-	2.5	-	8
Leak rate	$mbar \times l \times s^{-1}$		-	1×10^{-9}	-	1×10^{-9}
Operating pressure range	mbar		-	$10^{-8} / 2000$	-	$10^{-8} / 2000$
Differential pressure, closing and opening direction	bar		-	2/2	-	2/2
Opening against differential pressure	bar		-	2	-	3
Ambient / Operating temperature, max.	°C		-	50	-	50
Seal	FPM		-	FPM	-	FPM
Weight	kg		-	0.48	-	0.7

Ordering Information	DN 16 KF		DN 25 KF		DN 40 KF	
	Aluminum / Stainless		Aluminum / Stainless		Aluminum / Stainless	
Right-Angle Valves, rotary knob						
Aluminum body	Part No. 285 30		Part No. 285 31		Part No. 285 32	
Stainless steel body	Part No. 286 30		Part No. 286 31		Part No. 286 32	
Straight-Through Valves, rotary knob						
Stainless steel body	Part No. 286 00		Part No. 286 01		Part No. 286 02	
Spare parts						
Seal kit	Part No. 215 025		Part No. 215 075		Part No. 215 125	
Inside section	Part No. 215 042		Part No. 215 092		Part No. 215 142	



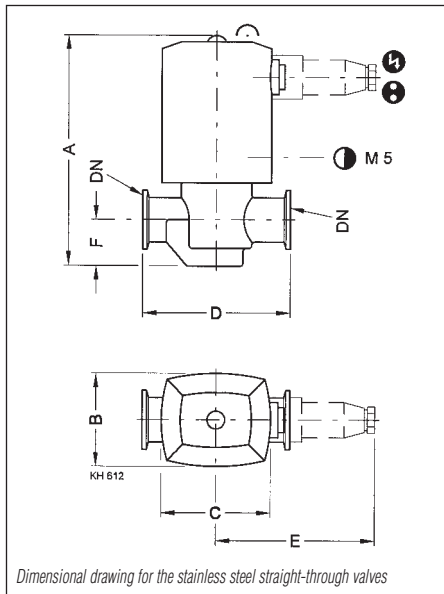
Dimensions				
DN	KF	16	25	40
A	mm	154	176	196.5
B	mm	51	63	83
C	mm	60	74	98
D	mm	40	50	65
E	mm	100	108	120
⊙	mm	∅ 4	∅ 4	∅ 4

Advantages to the User

- ◆ Quiet opening and closing action with very little vibration
- ◆ Short opening and closing times
- ◆ Optical valve position indicator as standard
- ◆ 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 KF		DN 25 KF		DN 40 KF	
		Aluminum / Stainless		Aluminum / Stainless		Aluminum / Stainless	
Service life	cycles	10 Million					
Conductance at molecular flow	$l \times s^{-1}$	4.5		16		40	
Leak rate	$mbar \times l \times s^{-1}$	1×10^{-9}					
Operating pressure range	mbar	$10^{-8} - 2000$		$10^{-8} - 2000$		$10^{-8} - 1500$	
Differential pressure, closing and opening direction	bar	4 / 2		4 / 2		2 / 1.5	
Opening against differential pressure at the valve disk	bar	4		4		2	
Ambient / Operating temperature, max.	°C	50					
Seal		FPM					
Closing time	ms	200		290		250	
Opening time	ms	100		110		150	
Switching frequency	1/min	100		100		75	
Electrical position indicator, load capacity	V AC / A V DC / A	250 / 0.1 50 / 0.25					
Compressed air, overpressure	bar	3 to 5		3 to 5		3 to 6	
Air cylinder, volume	cm ³	5.5		12.1		26.2	
Compressed air connection	mm	4 and 6					
Weight, with pilot valve	kg	0.3	0.4	0.4	0.7	0.9	1.6

Ordering Information	DN 16 KF	DN 25 KF	DN 40 KF
Right-angle valves, bellows sealed, Electropneumatic drive, without pilot valve aluminum body stainless steel body	Part No. 287 15 Part No. 288 15	Part No. 287 16 Part No. 288 16	Part No. 287 17 Part No. 288 17
Right-angle valves, bellows sealed, Electropneumatic drive, with pilot valve 24 V DC aluminum body 24 V DC stainless steel body 24 V AC aluminum body 24 V AC stainless steel body 100 - 115 V AC aluminum body 100 - 115 V AC stainless steel body 200 - 240 V AC aluminum body 200 - 240 V AC stainless steel body	Part No. 287 45 Part No. 288 45 Part No. 287 28 Part No. 288 28 Part No. 287 55 Part No. 288 55 Part No. 287 75 Part No. 288 35	Part No. 287 46 Part No. 288 46 Part No. 287 29 Part No. 288 29 Part No. 287 56 Part No. 288 56 Part No. 287 76 Part No. 288 36	Part No. 287 47 Part No. 288 47 Part No. 287 30 Part No. 288 30 Part No. 287 57 Part No. 288 57 Part No. 287 77 Part No. 288 37
Spare parts Seal kit Inside section	Part No. 215 025 Part No. 215 027	Part No. 215 075 Part No. 215 077	Part No. 215 125 Part No. 215 127



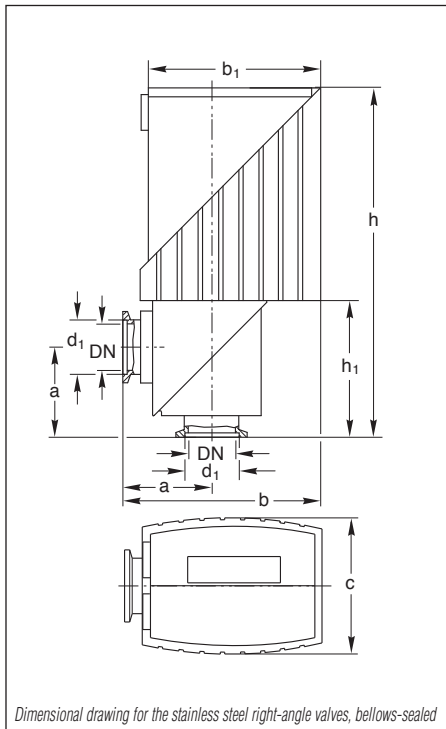
Dimensions		16	25	40
DN	KF	16	25	40
A	mm	139.5	157.5	177
B	mm	51	63	83
C	mm	60	74	98
D	mm	80	100	130
E	mm	100	108	120
F	mm	22	31.5	45.5
●	mm	∅ 4	∅ 4	∅ 4

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 KF	DN 25 KF	DN 40 KF
Service life	cycles		10 Million	
Conductance at molecular flow	$l \times s^{-1}$	2.5	8	20
Leak rate	$mbar \times l \times s^{-1}$		1×10^{-9}	
Operating pressure range	mbar	$10^{-8} - 2000$	$10^{-8} - 2000$	$10^{-8} - 1500$
Differential pressure, closing and opening direction	bar	4 / 2	4 / 2	2 / 1.5
Opening against differential pressure at the valve disk	bar	4	4	2
Ambient / Operating temperature, max.	°C		50	
Seal			FPM	
Closing time	ms	200	290	250
Opening time	ms	100	110	150
Switching frequency	1/min	100	100	75
Electrical position indicator, load capacity	V AC / A V DC / A		250 / 0.1 50 / 0.25	
Compressed air, overpressure	bar	3 to 5	3 to 5	3 to 6
Air cylinder, volume	cm^3	5.5	12.1	26.2
Compressed air connection	mm		4 and 6	
Weight, with pilot valve	kg	0.5	1.0	1.5

Ordering Information	DN 16 KF	DN 25 KF	DN 40 KF
Straight-through valve, bellows sealed, Electropneumatic drive, without pilot valve, stainless steel body	Part No. 289 15	Part No. 289 16	Part No. 289 17
Straight-through valve, bellows sealed, Electropneumatic drive, with pilot valve, stainless steel body			
24 V DC	Part No. 289 45	Part No. 289 46	Part No. 289 47
24 V AC	Part No. 289 28	Part No. 289 29	Part No. 289 30
100 - 115 V AC	Part No. 289 55	Part No. 289 56	Part No. 289 57
200 - 240 V AC	Part No. 289 35	Part No. 289 36	Part No. 289 37
Spare parts			
Seal kit	Part No. 215 025	Part No. 215 075	Part No. 215 125
Inside section	Part No. 215 027	Part No. 215 077	Part No. 215 127



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 (red LED)
- ◆ Integrated electrically floating position indicator (opto-coupler for 24 V DC)
- ◆ Optical overload indicator (red flashing LED)
- ◆ Protection class IP 54
- ◆ Spring action closure, thus closed when the power fails
- ◆ Low operating temperature
- ◆ Inverting operation of the remote control logic
- ◆ Installation in any orientation and no restrictions as to the direction of flow

Dimensions

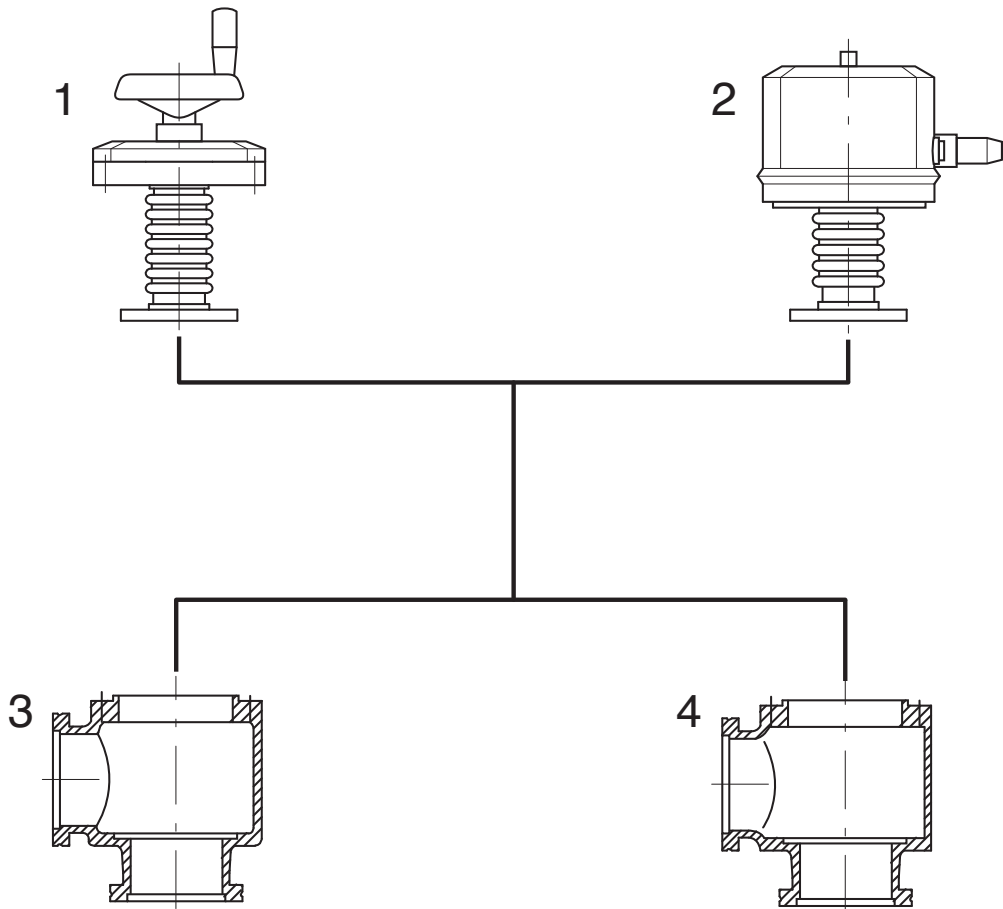
DN	KF	16	25	40
DN	mm	14.5	23.2	38.5
d ₁	mm	18.5	27.5	42.5
a	mm	40	50	65
b	mm	96	111	138
b ₁	mm	84.5	96.5	119.5
c	mm	59	75	96
h	mm	160	194	230
h ₁	mm	58	76	98
Travel	mm	4	6.25	10

Technical Data

	DN 16 KF	DN 25 KF	DN 40 KF
Service life	cycles		
	2 Million		
Conductance at molecular flow	l x s ⁻¹		
	4	16	40
Leak rate	mbar x l x s ⁻¹		
	1 x 10 ⁻⁹		
Operating pressure range	mbar		
	10 ⁻⁹ to 1300		
Differential pressure, closing and opening direction	bar		
	1.3		
Opening against differential pressure at the valve disk	bar		
	1.3		
Ambient / Operating temperature, max.	°C		
	50		
Opening/closing time	ms		
	100 / 240	120 / 240	230 / 700
Switching frequency at ambient temperature	1/min		
	°C		
	30, 20 40, 50		
Switch-off delay	ms		
	50	170	500
Rating for the valve position indicator	V DC / mA		
	15-30 / 100		
Power consumption, max.	W		
	400		
Actuation and holding current	A		
	5.2 / 0.7	5.3 / 0.7	4.8 / 0.7
Supply voltage / Frequency	V AC / Hz		
	100-230. +8 %/-15 %; 50/60 Hz		
Weight	kg		
aluminum body	1.3	2.2	4
stainless steel body	1.5	2.9	5.4
Materials	Valve body: aluminum alloy (G AISi7Mg06) or stainless steel (1.4308); Inside section: stainless steel (1.4301/1.4541); Gaskets: O-rings made of FPM; Lid: high-quality plastic, temperature-resistant to 80 °C		

Ordering Information

	DN 16 KF	DN 25 KF	DN 40 KF
Right-angle valve, bellows-sealed, electromagnetic actuator, microprocessor controlled			
aluminum body	Part No. 287 65	Part No. 287 66	Part No. 287 67
stainless steel body	Part No. 288 65	Part No. 288 66	Part No. 288 67
Spare parts			
Seal kit	Part No. 289 75	Part No. 289 76	Part No. 289 77
Inside section	Part No. 288 88	Part No. 288 89	Part No. 288 90



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, bellows-sealed (2)

Body types

- ◆ Right-angle valve with aluminum body (3)
- ◆ Right-angle valve with stainless steel body (4)

From DN 63 ISO-K only right-angle valves are available.

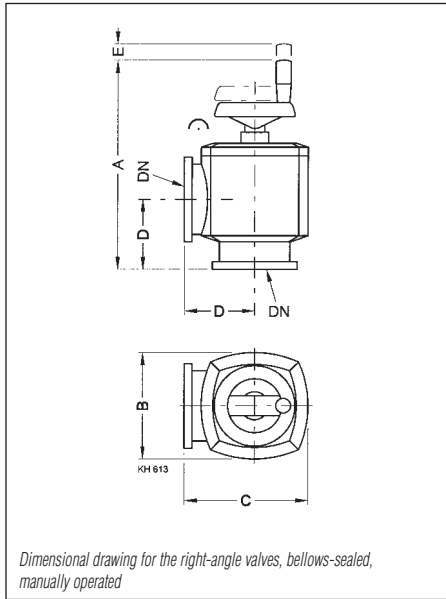
Nominal widths DN 63 ISO-K and DN 100 ISO-K are available in aluminum and stainless steel, DN 160 ISO-K in aluminum only.

Advantages to the User

- ◆ Full exchangeability of the subassemblies
- ◆ Three 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



Dimensions			
DN	ISO-K	63	100
A	mm	266	320
B	mm	124	164
C	mm	150	190
D	mm	88	108
E	mm	20	25

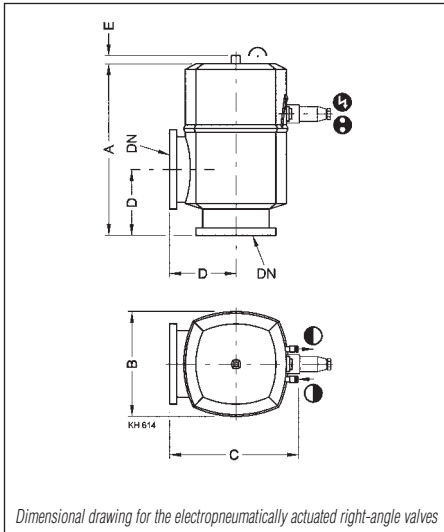
These universal valves are ideal especially for smaller systems, where remote control is not essential. They may be also installed in larger systems, where backing pumps or condensate separators or similar units are to be cut off at longer intervals for maintenance purposes by maintenance personnel.

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

Technical Data		DN 63 ISO-K	DN 100 ISO-K
Service life	cycles	> 1.5 Million	
Conductance at molecular flow	$l \times s^{-1}$	140	330
Leak rate	$mbar \times l \times s^{-1}$	1×10^{-9}	
Operating pressure range	mbar	10^{-8} - 1500	
Differential pressure, closing and opening direction	bar	1.5	
Opening against differential pressure at the valve disk	bar	1.5	
Ambient / Operating temperature, max.	°C	60	
Seal		FPM	
Weight			
aluminum body	kg	3.6	6.1
stainless steel body	kg	6.5	11.1
Materials		Valve body: aluminum alloy (3.2373.63) or stainless steel (1.4305); Inside section: stainless steel (1.4541/1.4301); Lid: grey cast iron (GG 20); Gaskets: O-rings made of FPM	

Ordering Information	DN 63 ISO-K	DN 100 ISO-K
Right-angle valve, bellows-sealed, manually operated		
aluminum body	Part No. 107 80	Part No. 107 81
stainless steel body	Part No. 107 83	Part No. 107 84
Spare parts		
Seal kit	Part No. 215 251	Part No. 215 271
Inside section	Part No. 215 254	Part No. 215 274



Dimensions				
DN	ISO-K	63	100	160
A	mm	250	282	366
B	mm	130	170	221
C	mm	168	208	264
D	mm	88	108	138
E	mm	14	14	14
●	mm	+6	+6	+6

Electropneumatically actuated right-angle valves are used in automated vacuum systems which need to be controlled electrically.

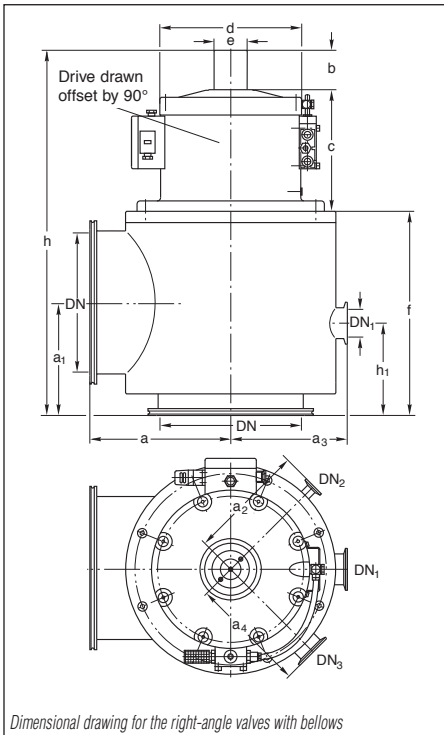
Advantages to the User

- ◆ 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 54
- ◆ The valves are closed by the restoring force of a spring

Technical Data		DN 63 ISO-K	DN 100 ISO-K	DN 160 ISO-K
Service life, cycles	Million		1,5	
Conductance for molecular flow	$l \times s^{-1}$	140	330	800
Leak rate	$mbar \times l \times s^{-1}$		1×10^{-9}	
Operating pressure range	mbar		$1 \times 10^{-8} - 1500$	
Differential pressure, closing and opening direction	bar		1.5	
Opening against differential pressure at the valve disk	bar		1.5	
Ambient / Operating temperature, max.	°C		60	
Seal			FPM	
Closing time	ms	250	300	550
Opening time	ms	300	450	450
Switching frequency	1/min	60	60	40
Position indicator, rating	V AC/A V DC/A		250/0.125 50/0.25	
Compressed air, overpressure	bar		4 to 8	
Compressed air volume	cm ³	75	195	570
Compressed air connection	mm		6	
Weight with pilot valve				
Aluminum housing	kg	4	6.7	11.4
Stainless steel housing	kg	6.8	11.7	-

Ordering Information	DN 63 ISO-K	DN 100 ISO-K	DN 160 ISO-K
Right-angle valve, bellows-sealed, electropneumatic drive, without solenoid coil			
Aluminum housing	Part No. 107 90	Part No. 107 91	Part No. 107 92
Stainless steel housing	Part No. 107 93	Part No. 107 94	-
Valve with pilot valve 24 V DC			
Aluminum housing	Part No. 108 00	Part No. 108 01	Part No. 108 02
Stainless steel housing	Part No. 108 10	Part No. 108 11	-
Valve with pilot valve 24 V AC			
Aluminum housing	Part No. 108 03	Part No. 108 04	Part No. 108 05
Stainless steel housing	Part No. 108 13	Part No. 108 14	-
Valve with pilot valve 100 - 115 V AC			
Aluminum housing	Part No. 108 20	Part No. 108 21	Part No. 108 22
Stainless steel housing	Part No. 108 30	Part No. 108 31	-
Valve with pilot valve 200 - 240 V AC			
Aluminum housing	Part No. 108 25	Part No. 108 26	Part No. 108 27
Stainless steel housing	Part No. 108 35	Part No. 108 36	-
Spare parts			
Seal kit	Part No. 215 251	Part No. 215 271	Part No. 215 291
Inside section	Part No. 215 253	Part No. 215 273	Part No. 215 293

C14



Dimensional drawing for the right-angle valves with bellows

Dimensions		
	DN	250 ISO-K
DN	mm	261
h, approx.	mm	650
a	mm	250
a ₁	mm	200
a ₂ , a ₄	mm	208
a ₃	mm	205
h ₁	mm	163
DN ₁ , for bypass 1		50 KF
DN ₂ , for bypass 2		40 KF
DN ₃ , for meas. conn.		16 KF
b	mm	69.5
c	mm	218
d	mm	250
e	mm	58
f	mm	363
Travel	mm	62.5
Travel/DN*	mm	1/4

* For example travel = 1/4 DN

Right-angle valves of this size are used, for example in metallurgy, large coaters, in the area of space simulation.

Advantages to the User

- ◆ No vibrations when the valve open or closes
- ◆ Low leak rate (< 10⁻⁹ mbar x l x s⁻¹) – drive system basically insensitive to particles
- ◆ Non-contact valve position indicator for reliable indication of the valve's position (open/closed)
- ◆ Wide range of different solenoid coils for all commonly used control voltages
- ◆ Additional flange for bypass lines and for connecting vacuum gauges (see Product Section C16 "Total Pressure Gauges")

Technical Data

DN 250 ISO-K

Service life	cycles	1 x 10 ⁶
Conductance at molecular flow	l x s ⁻¹	2700
Leak rate	mbar x l x s ⁻¹	1 x 10 ⁻⁹
Opening / closing time, at 6 bar compr. air pressure	s	6/6
Compressed air, overpressure	bar	4 to 8
Hose diameter	mm	6 x 1
Compressed air cylinder, volume	cm ³	2100
Max. ambient temperature	°C	40
Weight	kg	66
Supply voltage	V	Various voltages are possible; see Accessoires
Materials		<p>Body, valve disk: stainless steel;</p> <p>Drive/compressed air cylinder: aluminum/cast aluminum (3.2153);</p> <p>Piston rod, intermediate flange: stainless steel (1.4305);</p> <p>Gaskets: FPM; Lid: aluminum (3.2341); Hood: plastic (PA 6)</p>

Ordering Information

DN 250 ISO-K

Right-angle valve, bellows-sealed, electropneumatic drive, without solenoid coil, stainless steel body	Part No. 281 84
Solenoid coil for various supply voltages	X
Interference suppression kits for different voltages	X
Spare parts	
Seal kit	Part No. 105 65
Inner part	Part No. 105 75

X = Part Nos. see section "Accessories for the Electropneumatically Operated Valves, Valves with KF/ISO-K Flanges"

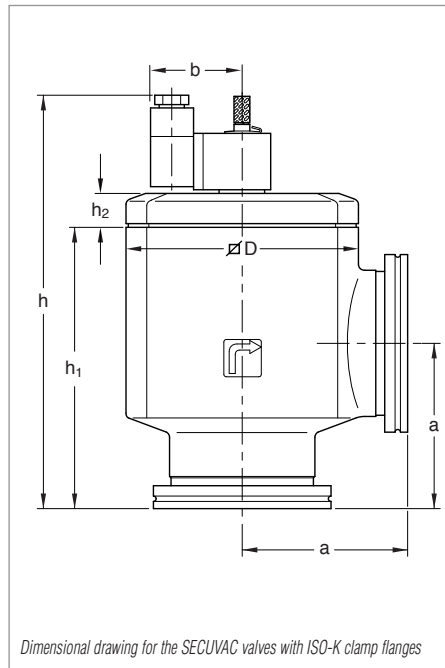
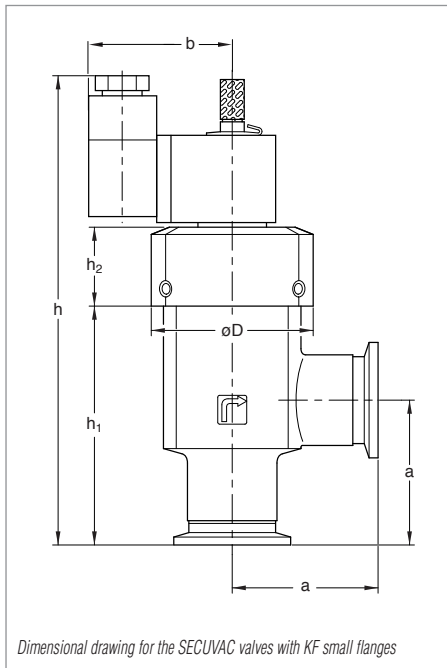


LEYBOLD offers a range of special valves for a variety of different applications and to meet special design requirements of customers.

Among these are:

- ◆ SECUVAC vacuum safety valves ①
(DN 16 KF to DN 100 ISO-K)
- ◆ Venting valves ② /
power failure venting valves ③
- ◆ Vacuum locks / sealing valves ④
- ◆ Variable leak valves ⑤
- ◆ Ball valves ⑥
- ◆ Right-angle valves for mobile systems in
accordance with the American standard of the
Department of Transportation (DOT) ⑦

These valves ideally supplement our range of KF- and ISO-K valves.



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.

Dimensions – SECUVAC valves with KF small flanges				
	DN	16 KF	25 KF	40 KF
a	mm	40	50	65
b	mm	49	49	49
D	mm	44	56	82
h	mm	138.6	161.8	178.3
h ₁	mm	62.3	82.5	100
h ₂	mm	24	27	26

Dimensions – SECUVAC valves with ISO-K clamp flanges			
	DN	63 ISO-K	100 ISO-K
a	mm	88	108
b	mm	150	190
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 intake line has been evacuated
- ♦ Delayed isolation of the vacuum chamber and venting the vacuum pump (negligible "gulp")

Typical Applications

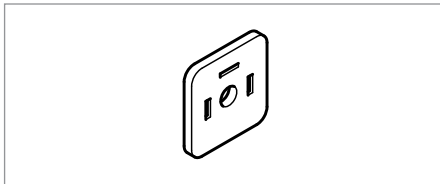
- ♦ Safety isolation valve between backing pump and vacuum chamber or vapour jet pumps (protection of the vacuum chamber against venting in the event of a power failure)

Technical Data		DN 16 KF	DN 25 KF	DN 40 KF	DN 63 ISO-K	DN 100 ISO-K
Conductance at molecular flow	$l \times s^{-1}$	3.8	11	30.5	126	300
Current consumption DC	W		2.5			2.5
Actuation/holding AC	VA		5/3.7			5/3.7
Leak tightness, body	$mbar \times l \times s^{-1}$		$< 1 \times 10^{-9}$			$< 1 \times 10^{-9}$
Leak tightness, valve disk	$mbar \times l \times s^{-1}$		$< 1 \times 10^{-5}$			$< 1 \times 10^{-5}$
Installation orientation			any			any
Operating pressure range	mbar		$1 \cdot 10^{-8} - 1000$			$1 \cdot 10^{-8} - 1000$
Differential pressure Δ_p for opening	mbar		150			150
for closing	mbar		150			150
Opening time	s		< 15			< 30
Closing time/reaction time	ms		$< 100 / < 50$			$< 100 / < 50$
Ambient temperature	°C		5 to 50			5 to 50
Protection	IP		65			65
Weight	kg	0.3	0.5	0.9	2.4	5.1
Materials		Valve body: aluminum; Gaskets FPM			Valve body: aluminum; Gaskets: FPM	

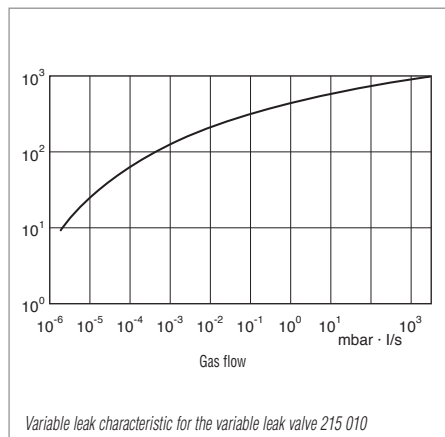
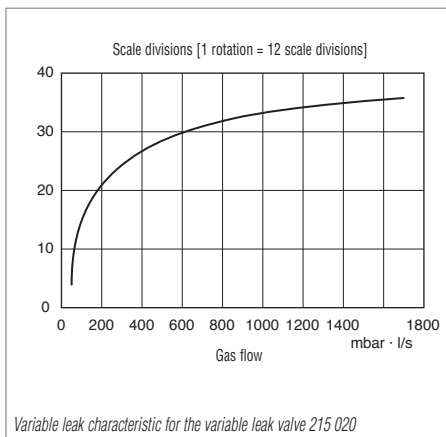
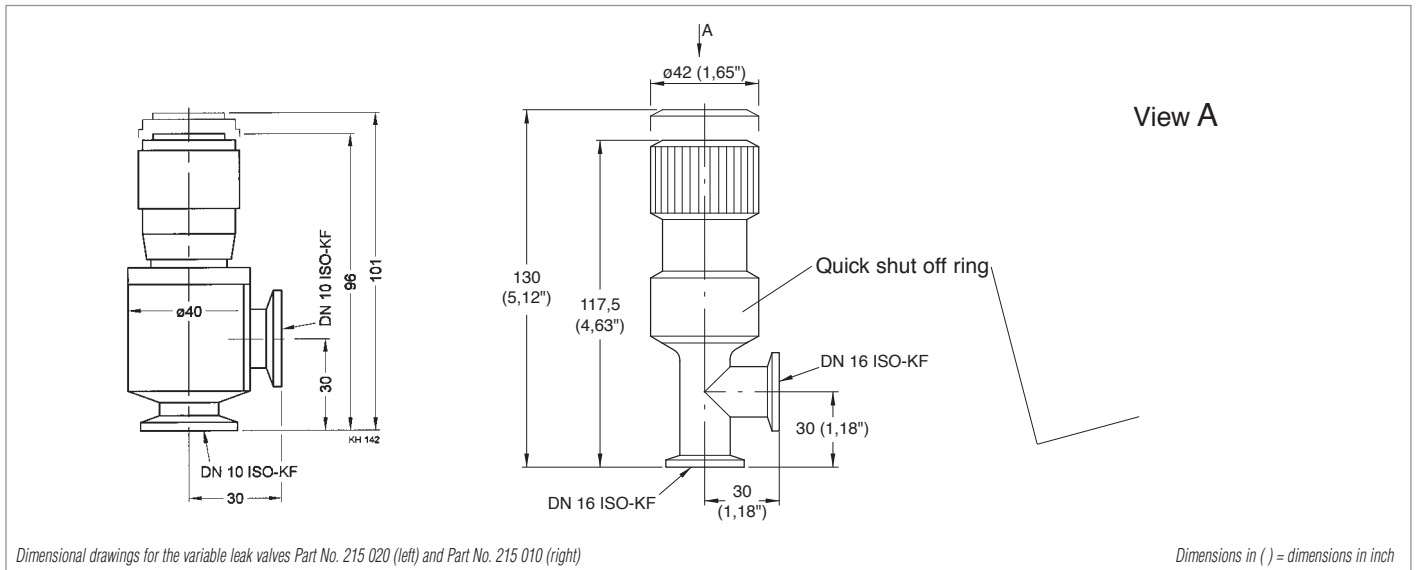
Ordering Information	DN 16 KF	DN 25 KF	DN 40 KF	DN 63 ISO-K	DN 100 ISO-K
SECUVAC valve					
24 V DC	Part No. 215 015	Part No. 215 065	Part No. 215 135	Part No. 215 205	Part No. 215 225
100 - 115 V AC	Part No. 215 016	Part No. 215 066	Part No. 215 136	Part No. 215 206	Part No. 215 226
200 - 230 V AC	Part No. 215 017	Part No. 215 067	Part No. 215 137	Part No. 215 207	Part No. 215 227
Spare parts					
Seal kit	Part No. 105 02	Part No. 105 04	Part No. 105 05	Part No. 105 07	Part No. 105 08
Solenoid coils for SECUVAC valves and power failure venting valves					
24 V DC			Part No. 215 242		
100 - 115 V AC/50-60 Hz			Part No. 215 241		
200 - 230 V AC/50-60 Hz			Part No. 215 240		
Filter for SECUVAC valves and power failure venting valves (set of 5 pcs.)			Part No. 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	Interference Suppression Kit
Interference suppression kit	
24 V DC	Part No. 104 96
110 - 230 V AC	Part No. 104 95



With variable leak valves precisely defined quantities of gas may be admitted within a controllable period of time into evacuated vessels.

Variable leak valves with a isolation valve permit an interruption of the gas supply without changing the gas admission rate setting.

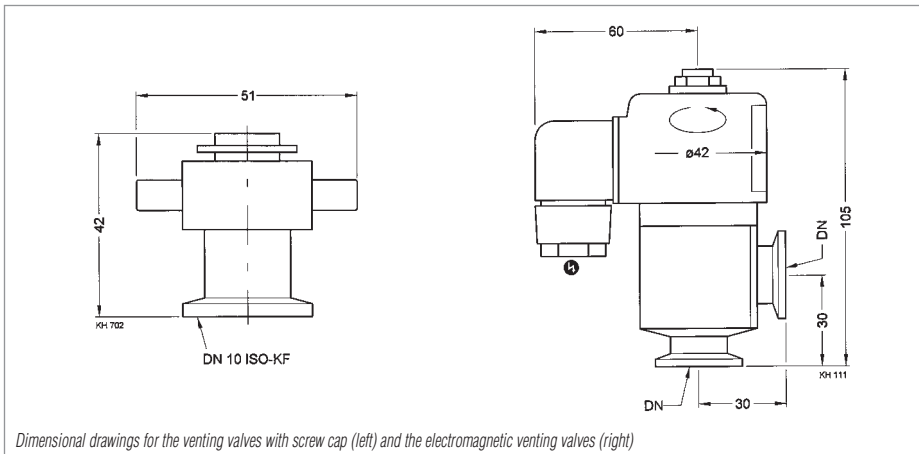
Applications

- ◆ Gas admission rates of 1000 to 5×10^{-6} mbar x l x s⁻¹ allow variable leak valves to be used in almost all applications
- ◆ Through the integrated digital display, the opening point may be accurately set at any time or a certain gas flow may be defined
- ◆ Blocking valve

Technical Note

When using helium as the process gas, it must be taken into account that the needle sleeve made of modified PTFE is to a certain extent permeable to helium.

Technical Data		DN 10 ISO-KF	DN 16 ISO-KF
Gas flow controllable	mbar x l x s ⁻¹	40 - 1700	$5 \cdot 10^{-6}$ - 1000
Tightness	mbar x l x s ⁻¹	1×10^{-9}	1×10^{-9}
Differential pressure	bar	3	2.5
Dead volume	cm ³	-	0.032
Operating temperature	°C	-	80
Bakeout temperature, flanges	°C	100	150
Housing, needle, filter		aluminum	stainless steel
Needle sleeve		-	flourplastomer
Seal		FPM	FPM
Weight	kg	0.2	0.4
Ordering Information		DN 10 ISO-KF	DN 16 ISO-KF
Variable leak valve without isolation valve		Part No. 215 020	-
Variable leak valve with isolation valve		-	Part No. 215 010



Dimensional drawings for the venting valves with screw cap (left) and the electromagnetic venting valves (right)

Venting valves are used to vent small vacuum systems and are closed when no power is applied.

Advantages to the User

Venting valve with screw cap, manual operation

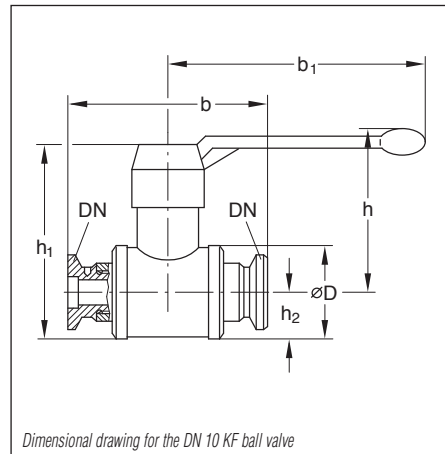
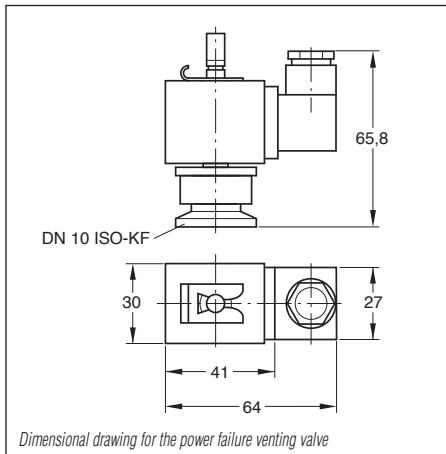
- ◆ Simple opening and closing of the valve by loosening or tightening the screw cap

Venting valve, electromagnetically actuated

- ◆ Open when power is applied, closed with no power
- ◆ Seals on one side against atmospheric pressure
- ◆ Protected against dirt by a filter

Technical Data		DN 10 KF	
		Manual	Electromagnetically
Leak rate	mbar x l x s ⁻¹	< 1 x 10 ⁻⁹	< 1 x 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	VA	–	35 / 15
Differential pressure in closing / opening direction	bar	–	10 / 1
Can be opened to a pressure difference of	bar	–	2
Service life	cycles	–	1.5 million
Switching frequency	1/min	–	50
Opening / closing time	ms	–	60 / 45
Conductance for molecular flow	l x s ⁻¹	–	1
Weight	kg	0.15	0.46
Dimensions (W x H x D)	mm	51 x 42 x 30	105 x 120 x 42
Materials			
Valve body		Aluminum (3.0615) Stainless steel (1.4301)	Aluminum
Inside section		Aluminum (3.0615) Stainless steel (1.4301)	–
Gasket		FPM	FPM
Screw cap		Brass (nickel-plated)	–

Ordering Information	DN 10 KF	
	Manual	Electromagnetically
Venting valve with screw cap		
Aluminum	Part No. 173 24	–
Stainless steel	Part No. 173 37	–
Venting valve, electromagnetic		
24 V DC	–	Part No. 215 021
115 V AC	–	Part No. 215 023
230 V AC	–	Part No. 215 024
Centering ring with sintered metal filter, DN 10 KF	–	Part No. 883 50
Spare parts		
Seal kit	–	Part No. 215 208



Dimensions - Ball Valves					
	DN	10 KF	16 KF	25 KF	40 KF
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

Power Failure Venting Valves

Power failure venting valves are, when deenergized at a pressure below 2.5 bar, open on the vacuum side and are used to automatically vent pumps, systems or vacuum chambers in the event of a power failure.

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

Ball Valves

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

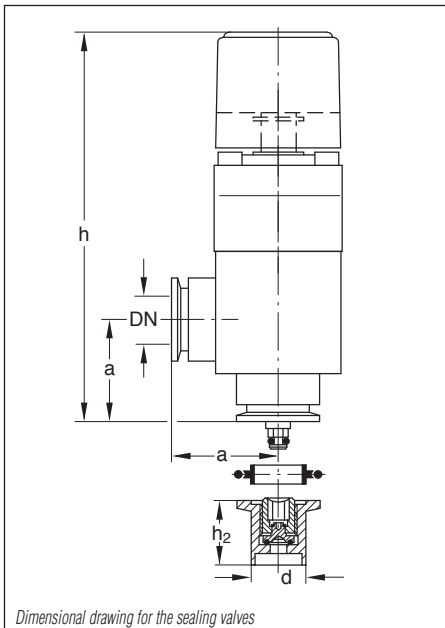
Technical Data		DN 10 KF Power Failure Venting Valve
Leak tightness	mbar x l x s ⁻¹	< 1 x 10 ⁻⁷
Venting time for a 50 l vessel	s	270
Opening time / closing time ¹⁾	ms	30 / 30
Protection class to DIN 40050	IP	65
Permissible ambient temperature	°C	50
Weight	kg	0.1
Dimensions (B x H x T)	mm	64 x 66 x 30
Materials		Valve body: aluminum; Gasket: NBR; Armature: brass; Filter: bronze

Ordering Information		DN 10 KF Power Failure Venting Valve
Power failure venting valve, with inlet filter	230 V / 50-60 Hz	Part No. 174 26
	24 V DC	Part No. 174 46
Centering ring DN 10 KF with sinter filter		Part No. 883 50
Spare solenoid valves		see SECUVAC valves

Technical Data		Ball Valves			
		DN 10 KF	DN 16 KF	DN 25 KF	DN 40 KF
Leak rate	mbar x l x s ⁻¹	< 1 x 10 ⁻⁶			
Conductance for molecular flow	l x s ⁻¹	60	130	350	550
Pressure absolute, min. / max.	mbar / bar	10 ⁻⁵ / 5			
Weight	kg	0.35	0.4	0.75	2.6
Materials		Valve body: brass (nickel-plated); Gaskets: PTFE; Ball: brass (hard chromium-plated); KF flanges: aluminum (3.0615)			

Ordering Information		Ball valves			
		DN 10 KF	DN 16 KF	DN 25 KF	DN 40 KF
Ball valve, brass body (nickel-plated)		Part No. 174 94	Part No. 174 95	Part No. 174 96	Part No. 174 97

¹⁾ at a differential pressure of Δp = 0 bar



Dimensional drawing for the sealing valves

Dimensions		16 KF	25 KF	40 KF
a	mm	40	50	65
d	mm	16	25	38
h	mm	124	160	190
h ₂	mm	30	30	40

Vacuum Locks and Sealing Valves

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 x s⁻¹) and a long service life

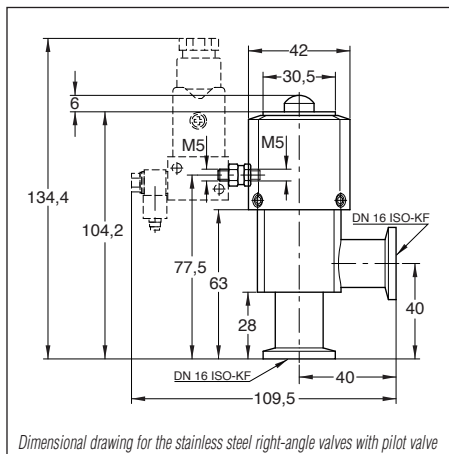
- ◆ May be used in the entire rough and medium vacuum range
- ◆ Long service life
- ◆ Secured against inadvertent opening
- ◆ Temperature resistant
Vacuum lock 60 °C
Blocking valve 100 °C
- ◆ May be protected by a standard blank flange against becoming dirty

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 KF connection and stainless steel tubulation for welding to the chamber

Technical Data		DN 16 KF	DN 25 KF	DN 40 KF
Leak rate (Sealing valve / vacuum lock)	mbar x l x s ⁻¹	1 x 10 ⁻⁷ / 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	0.5	1.0	1.8
sealing valve	kg	0.04	0.1	0.12
Materials		Bearing lid: aluminum Gasket: FPM		

Ordering Information	DN 16 KF	DN 25 KF	DN 40 KF
Vacuum lock, aluminum body	Part No. 283 25	Part No. 283 26	Part No. 283 27
Sealing valve, stainless steel body with tubulation (stainless steel) with KF flanges (stainless steel)	Part No. 283 21 Part No. 283 51	Part No. 283 22 Part No. 283 52	Part No. 283 23 Part No. 283 53
Clamping ring	Part No. 183 41	Part No. 183 42	Part No. 183 43
Centering ring	Part No. 883 46	Part No. 883 47	Part No. 883 48
Repair kit			
sealing valve	Part No. 215 055	Part No. 215 056	Part No. 215 057
vacuum lock	Part No. 107 70	Part No. 107 71	Part No. 107 72



This valve was especially developed for applications which involve brake fluid (in accordance with DOT) and with special attention regarding safety in the presence of increased differential pressures.

Advantages to the User

- ◆ High degree of reliability and safety due to EPDM gaskets at the valve disk as well as within the body
- ◆ Stronger spring action on the valve disk
- ◆ Long service life
- ◆ Pilot valves for adaptation to all common control voltages and the interference suppression kit can be retrofitted
- ◆ Visual valve position indicator is standard
- ◆ Installation in any orientation and no restrictions as to the direction of flow

Technical Data

Service life	cycles	10 million
Conductance at molecular flow	$l \times s^{-1}$	4.5
Leak rate	$mbar \times l \times s^{-1}$	1×10^{-9}
Operating pressure range	mbar	$10^{-8} - 5000$
Differential pressure, closing and opening direction	bar	5 / 5
Opening against differential pressure	bar	5
Ambient / Operating temperature, max.	°C	50
Opening / closing time for compressed air at 6 bar	ms	100 / 100
Switching frequency	1/min	100
Compressed air, overpressure	bar	4 - 8
Compressed air volume	cm^3	5.5
Compressed air connection	mm	4 and 6
Weight with pilot valve		0.3
Materials		<p>Valve body: aluminum alloy (3.2381); Inside section: stainless steel (1.4541 / 1.4301); Gaskets: EPDM</p>

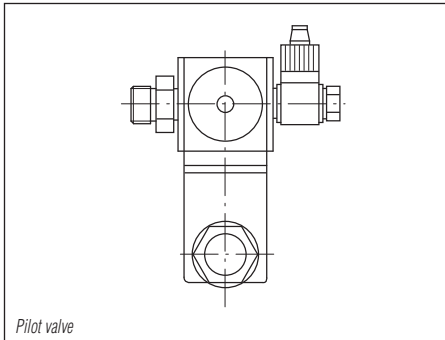
Special valve - DOT DN 16 KF

Ordering Information

Special valve - DOT DN 16 KF

Right-angle valve, without pilot valve, aluminum body	Part No. 215 009
Pilot valves	X
Interference suppression kits for different voltages	X
Spare parts Seal kit EPDM	Part No. 215 012

X = for part numbers see section "Accessories for the electropneumatically operated valves, valves with KF / ISO K flanges"



Pilot valve

Pilot Valves

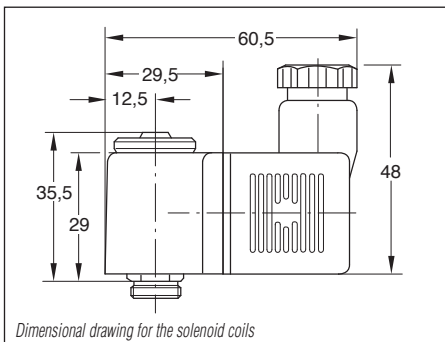
A range of pilot valves is available for actuation of the electropneumatic KF valves, which cover all commonly used control voltages.

Advantages to the User

- ◆ Easy to fit to the pneumatic cylinder, adapter is included with the DOT valve

Supplied Equipment

- ◆ Hose connection and gasket for connection to the compressed air supply



Dimensional drawing for the solenoid coils

Solenoid Coils for DN 250 ISO-K

LEYBOLD is offering a range of solenoid coils for the purpose of adapting the electropneumatically operated valve to different commonly used control voltages.

Advantages to the User

- ◆ Easy to fit (plug on and tighten with a knurled screw)

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.

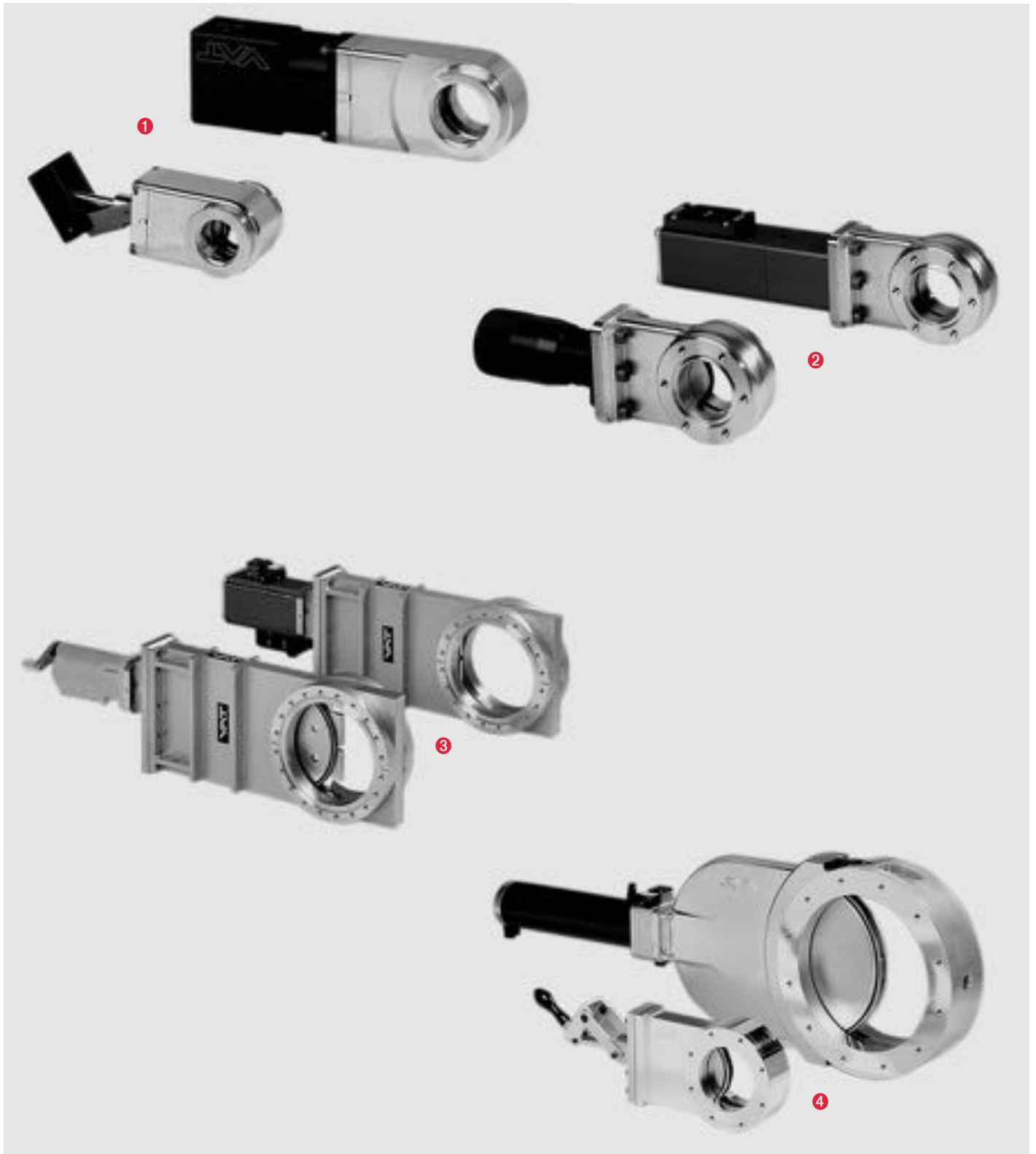
Technical Data		Solenoid Coils for Pilot Valves	
		V DC	V AC
Voltage	V	12/24 DC	24/110/230 AC; 50/60 Hz
Permissible voltage variation	%	± 10	± 10 at nominal frequency
Permissible frequency variation	%	-	± 10 at nominal frequency
Power consumption at nominal operating voltage	W	4.1 at 12 V 4.5 at 24 V	Actuate: 7.5 VA Hold: 6.0 VA
Operating time		100 %	
Type of protection to DIN 0450	IP	65	
Hose connection		Pg 9	
Class of insulation material to VDE 0580		F	
Test mark		VDE	
Max. response time	ms	10	
Weight	kg	0.065	0.055
Torque for the knurled screw, min./max	Ncm	100/150	

Ordering Information	Solenoid Coils for Pilot Valves DN 250 ISO-K or as Spare Part
230 V AC/50-60 Hz	Part No. 280 77
110 - 120 V/50-60 Hz	Part No. 280 78
24 V AC/50-60 Hz	Part No. 280 79
24 V DC	Part No. 280 80

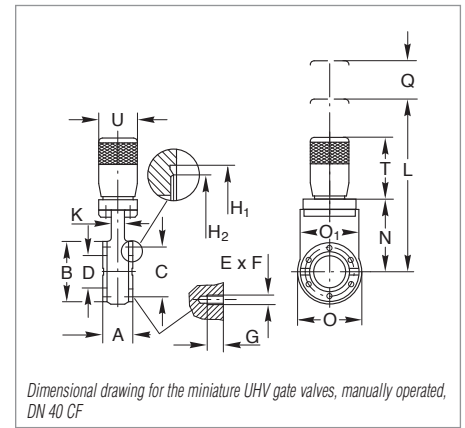
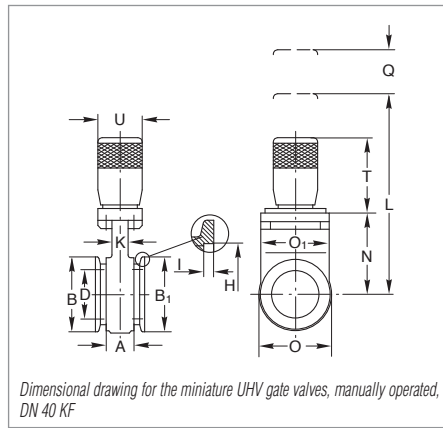
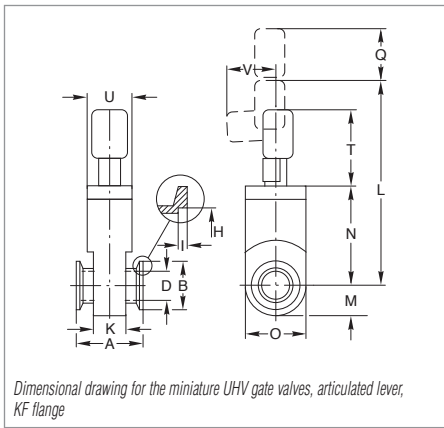
Ordering Information	KF Pilot Valves for DOT valves (incl. Solenoid Coil)
230 V/50-60 Hz (normally closed)	Part No. 280 70
110 - 120 V/50-60 Hz (normally closed)	Part No. 280 72
24 V DC (normally closed)	Part No. 280 74

Ordering Information	Replacement Pilot Valves for ISO-K valves from DN 250, without coil
Pilot valve for DN 250 ISO-K to DN 630 ISO-K	Part No. 200 07 927

Ordering Information	Interference Suppression Kit for different voltages
Interference suppression kit 24 V DC/AC	Part No. 287 84
110 V AC	Part No. 287 82
230 V AC	Part No. 287 83



- ① Miniature UHV gate valves, KF flange
- ② Miniature UHV gate valves, CF flange
- ③ UHV gate valve
- ④ HV gate valve



Dimensions						
DN	KF	16 KF	25 KF Articulated lever	40 KF	40 KF Manually operated	40 CF
A	mm	40	50	51	50	35
B	mm	30	40	55	72	72
B ₁	mm	-	-	-	55	-
C	mm	-	-	-	-	58.7
D	mm	15	24	39	40	40
E x F	mm	-	-	-	-	6 x M6
G	mm	-	-	-	-	7
H	mm	17.2	26.2	41.2	41.2	-
H ₁	mm	-	-	-	-	48.3
H ₂	mm	-	-	-	-	42
I	mm	3	3	3	3	-
K	mm	25	32	31	16	16
L	mm	100	139	208	198	198
M	mm	15	22	32.5	-	-
N	mm	39	59	93	82	82
O	mm	30	44	65	76	76
O ₁	mm	-	-	-	70	70
Q	mm	25	35	55	55	55
T	mm	37	50	85	73	73
U	mm	25	32	40	45	45
V	mm	30	30	50	-	-

Advantages to the User

- ◆ Manually actuated; bellows-sealed push gate feedthrough
- ◆ Valve technology with only one moving part
- ◆ Equipped with a mechanical position indicator
- ◆ Low particle generating and vibration free actuation
- ◆ Compact, light-weight design

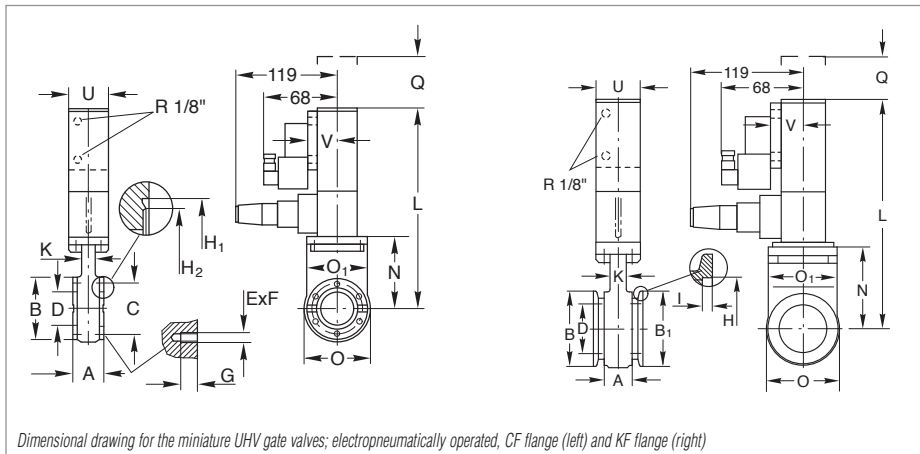
Technical Data	DN 16 KF DN 25 KF DN 40 KF			DN 40 KF DN 40 CF	
	Articulated lever			Manually operated	
Leak tightness: body / valve seat	mbar x l x s ⁻¹			5 x 10 ⁻¹⁰ / < 1 x 10 ⁻⁹	
Pressure range, abs.	1 x 10 ⁻⁷ mbar to 2 bar			1 x 10 ⁻¹⁰ mbar to 2 bar	
High vacuum conductance	l x s ⁻¹			160	220
Differential pressure at the valve disk	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			250 / 200	
manual open / closed	°C			250	
Installation orientation	any			any	
Weight	kg			1.5	
Materials					
Valve body	AlMgSi1 (3.2315)			AISI 304 (1.4301)	
Valve disk	AISI 301 (1.4310)			AISI 304 (1.4301)	
Bellows	-			AISI 316 L (1.44435)	
Seals					
Head	Viton			metal	
Disk	Viton			Viton	

Ordering Information	DN 16 KF DN 25 KF DN 40 KF			DN 40 KF DN 40 CF	
	Articulated lever			Manually operated	
Miniature gate valve, manually operated	Part No. 286 06	Part No. 286 08	Part No. 286 09	Part No. 286 15	Part No. 286 84
6 set screws with nuts and washers *)	-	-	-	-	Part No. 839 11

*) For dimensions E x F see table "Dimensions for CF"

Advantages to the User

- ◆ Double-acting electropneumatic actuator (with position indicator and pilot valve); bellows-sealed push gate 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, light-weight design



Dimensional drawing for the miniature UHV gate valves; electropneumatically operated, CF flange (left) and KF flange (right)

Dimensions		
DN	40 KF	40 CF
A	50	35
B	72	72
B ₁	55	-
C	-	58.7
D	40	40
E x F	-	6 x M6
G	-	7

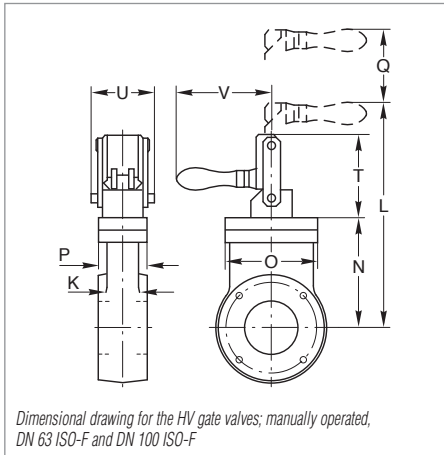
Dimensions		
DN	40 KF	40 CF
H	41.2	-
H ₁	-	48.3
H ₂	-	42
I	3	-
K	16	16
L	198	230
N	82	82

Dimensions		
DN	40 KF	40 CF
O	76	76
O ₁	70	70
Q	55	55
T	73	73
U	45	45
V	-	32.5

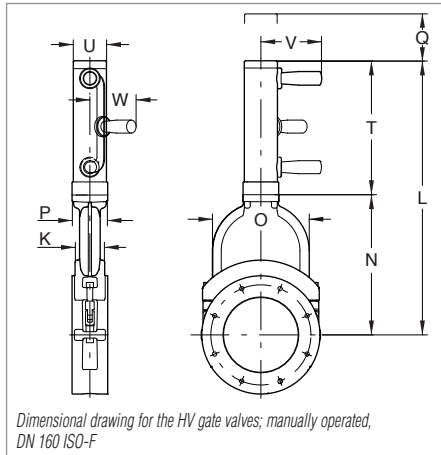
Technical Data	DN 40 KF		DN 40 CF
	Aluminum body	Stainless steel body	Stainless steel body
Leak tightness, valve body valve seat	$< 1 \times 10^{-9}$ $< 1 \times 10^{-9}$		$< 5 \times 10^{-10}$ $< 1 \times 10^{-9}$
Pressure range, abs.	1×10^{-7} mbar to 2 bar		1×10^{-10} mbar to 2 bar
High vacuum conductance	140	160	220
Differential pressure at the valve disk	≤ 2 in both directions		
Max. differential pressure during opening	≤ 30	≤ 30	≤ 30
at reduced service life	1	1	1
Service life until first maintenance	50 000		50 000
Bakeout temperature			
Valve open / closed	$\leq 100 / 100$	$\leq 250 / 200$	$\leq 250 / 200$
pneumatic actuation	≤ 80	≤ 200	≤ 200
Position indicator / pilot valve	$\leq 80 / 50$	80 (optional: 200) / 50	80 (optional: 200) / 50
Warming-up and cooling down speed	80		80
Compressed air min./max.	4.5/7	4.5/7	4.5/7
Closing/opening time	1.1	0.7	0.7
Pilot valve	supply voltage / power consumption - / W 24 V DC / 6 or 230 V AC, 50/60 Hz / 224 V DC / 6 or 230 V AC, 50/60 Hz / 2		
Switching capacity of the pos. indicator, at 80 °C	A 0.5 at 50 V AC; max. 10 W / 0.5 at 75 V DC; max. 10 W	5 at 250 V AC; 3 at 50 V DC	5 at 250 V AC; 3 at 50 V DC
at 200 °C	A -	1 at 48 V AC; 1 at 72 V DC	1 at 48 V AC; 1 at 72 V DC
Installation orientation	any		
Weight	1.2	1.8	1.8
Materials			
Valve body	AlMgSi1 (3.2315)	AISI 304 (1.4301)	AISI 304 (1.4301)
Disk	AISI 301 (1.4310)	AISI 304 (1.4301)	AISI 304 (1.4301)
Bellows	-	AISI 316 L (1.44435)	AISI 316 L (1.44435)
Seals			
Head	Viton	metal	metal
Disk	Viton	Viton	Viton

Ordering Information	DN 40 KF		DN 40 CF
	Aluminum body	Stainless steel body	Stainless steel body
Miniature gate valve, electropneumatically operated 24 V DC / 6 W 230 V AC, 50/60 Hz / 2 W	Part No. 286 54 Part No. 286 44	Part No. 286 36 Part No. 286 35	Part No. 286 99 Part No. 286 94
6 set screws with nuts and washers *)	-	-	Part No. 839 11

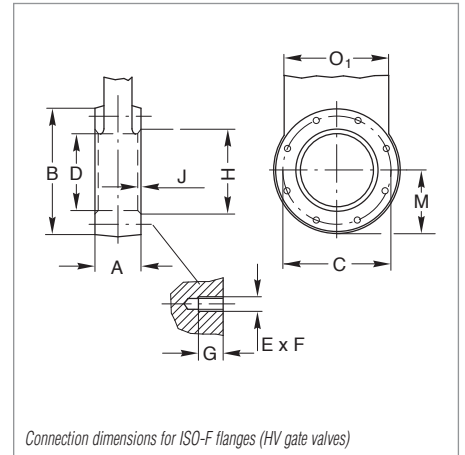
*) For dimensions E x F see table "Dimensions for CF"



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



Connection dimensions for ISO-F flanges (HV gate valves)

Dimensions			
DN	63 ISO-F	100 ISO-F	160 ISO-F
K mm	38	38	58
L mm	277	365	547
N mm	136	191	280
O mm	112	150	192
P mm	60	60	70
Q mm	90	125	60
T mm	100	116	267
U mm	77	77	65
V mm	114	114	122
W mm	-	-	95

Advantages to the User

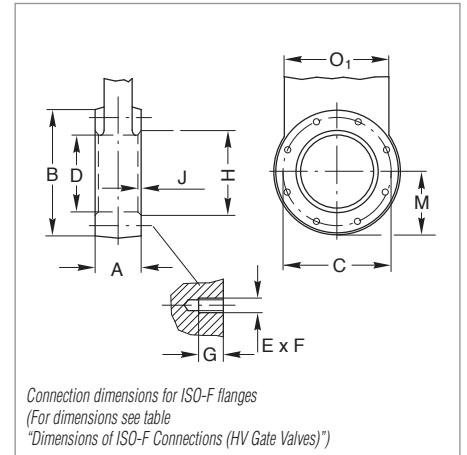
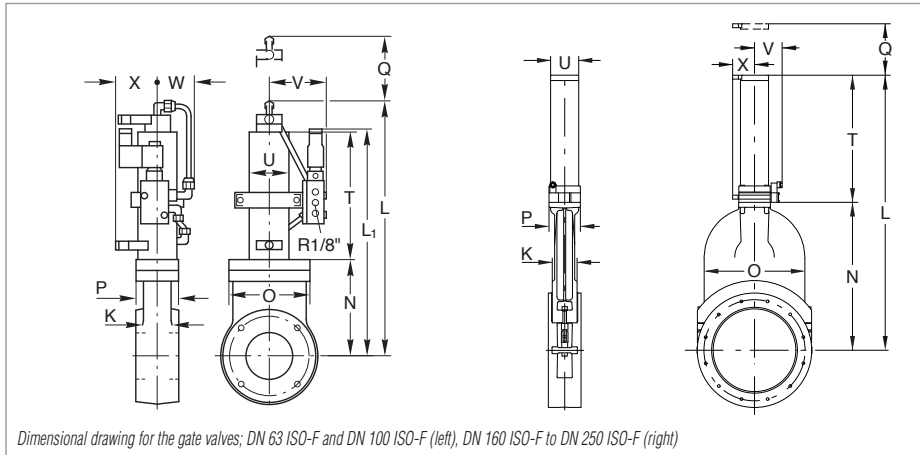
- ◆ Cost-effective gate valve for industrial applications with elastomer-sealed push gate feedthrough
- ◆ Aluminum body
- ◆ Slim and light-weight
- ◆ Low play in the locked state and low wear

Dimensions of ISO-F Connections (HV)					
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		DN 63 ISO-F	DN 100 ISO-F	DN 160 ISO-F
Leak tightness: Body / valve seat	mbar x l x s ⁻¹	< 1 x 10 ⁻⁹		
Pressure range, abs.		1 x 10 ⁻⁷ mbar to 1.2 bar		
High vacuum conductance	l x s ⁻¹	550	2000	6000
Differential pressure at the valve disk	bar	1.2 in both directions		
Max. differential pressure during opening	mbar	≤ 30		
Service life until first maintenance	cycles	50 000		
Degassing temperature				
valve	°C	120		
manual drive	°C	80		
Installation orientation		any		
Weight	kg	3	5	9
Materials				
Valve body		AlMg4.5Mn		G-AISi7Mg
Disk		AISI 304 (1.4301)		AlMgSi1
Bellows		AlMgSi1, AISI 303 (1.4305) AISI 301 (1.4310), AISI 304 (1.4301), AISI 420 (1.4034)		
Seals (head, disk)		Viton		

Ordering Information		DN 63 ISO-F	DN 100 ISO-F	DN 160 ISO-F
HV gate valve, manually operated		Part No. 286 25	Part No. 286 26	Part No. 215 633
Set screws with nuts and washers *)		Part No. 839 13	Part No. 839 13	Part No. 210 071
Package each containing	pieces	16	16	16

*) For dimensions E x F see table "Dimensions for ISO-F (HV)"



Dimensions	DN ISO-F 63	100	160	200	250	
K	mm	38	38	58	66	76
L	mm	351	443	547	688	843
L ₁	mm	311	366	-	-	-
N	mm	136	191	280	363.5	453
O	mm	112	150	192	240	308
P	mm	60	60	70	80	96

Dimensions	DN ISO-F	63	100	160	200	250
Q	mm	90	125	60	80	100
T	mm	174	211	267	324.5	390
U	mm	55	55	65	75	86
V	mm	80	80	71.5	76.5	84.5
W	mm	50	50	-	-	-
X	mm	59	59	57	62	67

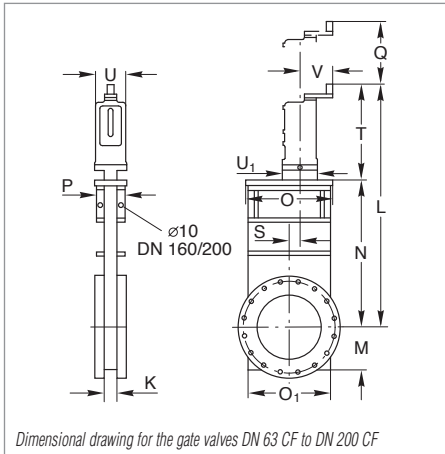
Advantages to the User

- ♦ 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

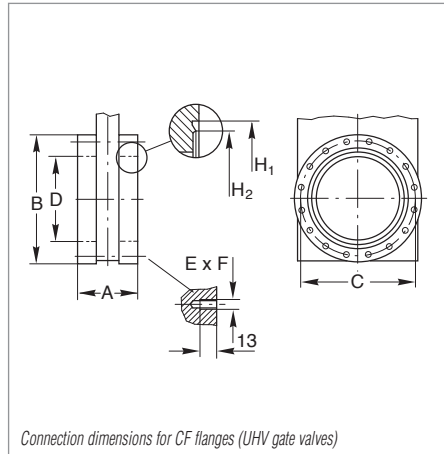
Technical Data		DN 63 ISO-F	DN 100 ISO-F	DN 160 ISO-F	DN 200 ISO-F	DN 250 ISO-F
Leak tightness: Body / valve seat	mbar x l x s ⁻¹	< 1 x 10 ⁻⁹				
Pressure range, abs.		1 x 10 ⁻⁷ mbar to 1.2 bar				
High vacuum conductance	l x s ⁻¹	550	2000	6000	12000	22000
Diff. press. at the valve disk/during opening, max.	mbar	≤ 1000 in both directions / ≤ 30				
Compressed air min./max.	bar	4/7				
Closing/opening time	s	0.7	1	2	3	5
Service life until first maintenance	cycles	50 000			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	4	6	9	18	25
Materials						
Valve body		G-AlSi7Mg				
Disk		AISI 304 (1.4301)				
Bellows		AlMgSi, AISI 303 (1.4305) AISI 301 (1.4310), AISI 304 (1.4301), AISI 420 (1.4034)				
Seals (head, disk)		Viton				

Ordering Information	DN 63 ISO-F	DN 100 ISO-F	DN 160 ISO-F	DN 200 ISO-F	DN 250 ISO-F
HV gate valve, electropneumatically operated					
24 V DC / 2.5 W	Part No. 286 55	Part No. 286 56	-	-	-
24 V DC / 6 W	-	-	Part No. 215 643	Part No. 215 644	Part No. 215 645
230 V AC, 50 Hz / 7.1 W	Part No. 286 45	Part No. 286 46	Part No. 215 653	Part No. 215 654	Part No. 215 655
Set screws with nuts and washers *)	Part No. 839 13	Part No. 839 13	Part No. 210 071	Part No. 210 071	Part No. 210 071
Package each containing	pieces	16	16	12	12

*) For dimensions E x F see table "Dimensions for ISO-F (HV)"



Dimensional drawing for the gate valves DN 63 CF to DN 200 CF



Connection dimensions for CF flanges (UHV gate valves)

Advantages to the User

- ◆ Valve and wheel can be degassed at temperatures up to 250 °C
- ◆ Steel body (non-rusting)
- ◆ Bellows-sealed push gate feedthrough
- ◆ Low play in the locked state and low wear
- ◆ Compact
- ◆ Mechanically locked in the closed state

Dimensions		DN	63 CF	100 CF	160 CF	200 CF
K	mm		27	27	27	35
L	mm		408	462	552	660
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

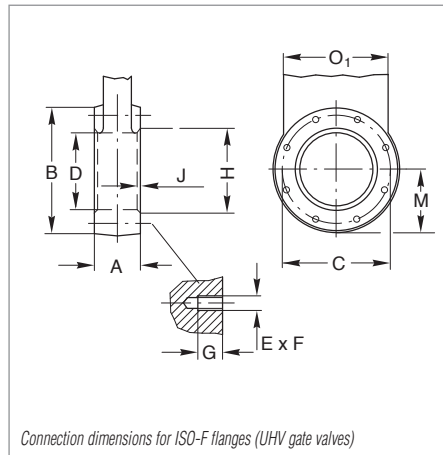
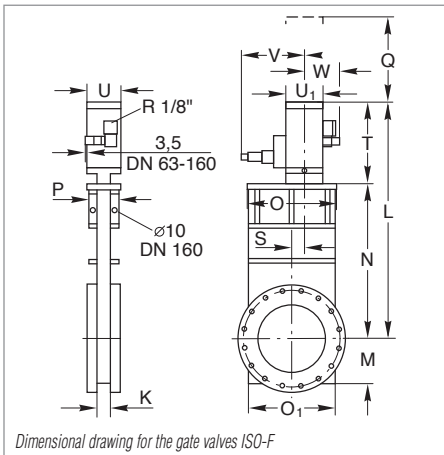
Dimensions		DN	63 CF	100 CF	160 CF	200 CF
Q	mm		180	220	290	350
S	mm		11	9	25	38.5
T	mm		184	184	184	200
U	mm		70	70	70	90
U ₁	mm		83	83	83	103
V	mm		77	77	77	94

Dimensions of CF Connections (UHV)		DN	63 CF	100 CF	160 CF	200 CF
A	mm		70	70	70	80
B	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

Technical Data		DN 63 CF	DN 100 CF	DN 160 CF	DN 200 CF
Leak tightness: Body / valve seat	mbar x l x s ⁻¹	< 5 x 10 ⁻¹⁰ / < 1 x 10 ⁻⁹			
Pressure range, abs.		1 x 10 ⁻¹⁰ mbar to 1.6 bar			
High vacuum conductance	l x s ⁻¹	600	1700	6000	12000
Differential pressure at the valve disk	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			
manual drive	°C	250			
Warming-up and cooling down speed	°C x h ⁻¹	80			
Installation orientation		any			
Weight	kg	9	12	18	28
Materials					
Valve 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)			
Gaskets (head / disk)		metal / Viton			

Ordering Information	DN 63 CF	DN 100 CF	DN 160 CF	DN 200 CF
UHV gate valve, manually operated	Part No. 286 85	Part No. 286 86	Part No. 286 87	Part No. 286 88
16 set screws with nuts and washers *)	Part No. 839 13	Part No. 839 13	2 x Part No. 839 13	2 x Part No. 839 13

*) For dimensions E x F see table "Dimensions for CF"



Advantages to the User

- ◆ Valve and pneumatic drive can be degassed at temperatures up to 250 °C and 200 °C respectively
- ◆ Steel body (non-rusting)
- ◆ Double-acting electropneumatic actuator (with position indicator and pilot valve)
- ◆ Bellows-sealed push gate feedthrough
- ◆ Low play in the locked state and low wear
- ◆ Compact
- ◆ Mechanically locked in the closed state

Dimensions		DN 63 ISO-F	100 ISO-F	160 ISO-F	250 ISO-F
K	mm	27	27	27	41
L	mm	346	418	523	800
M	mm	57	73	99	161
N	mm	192	247	336	560
O	mm	115	145	200	345
O ₁	mm	112	142	192	322
P	mm	70	70	70	80

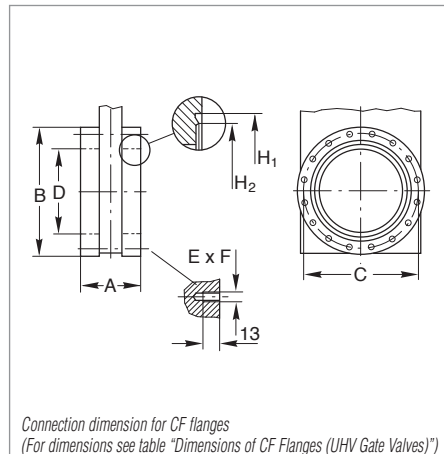
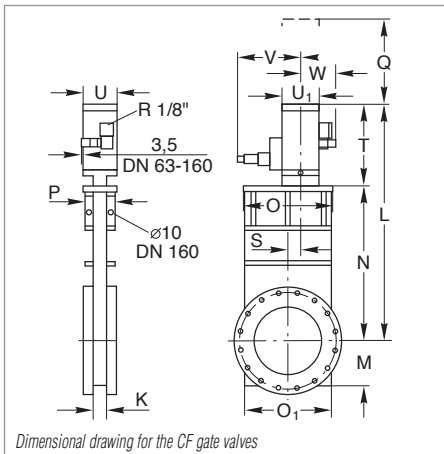
Dimensions		DN 63 ISO-F	100 ISO-F	160 ISO-F	250 ISO-F
Q	mm	180	220	290	450
S	mm	11	9	25	65
T	mm	154	171	187	240
U	mm	70	70	70	90
U ₁	mm	83	83	83	103
V	mm	145	145	145	155
W	mm	77	77	77	87

Dimensions of ISO-F Connections (UHV)		DN 63 ISO-F	100 ISO-F	160 ISO-F	250 ISO-F
A	mm	70	70	70	100
B	mm	130	165	225	350
C	mm	110	145	200	310
D	mm	70	100	150	261
E x F		4 x M8	8 x M8	8 x M10	12 x M10
G	mm	13	13	15	15
H	mm	-	102	153	-
J	mm	-	3	5	-

Technical Data		DN 63 ISO-F	DN 100 ISO-F	DN 160 ISO-F	DN 250 ISO-F
Leak tightness: Body / valve seat	mbar x l x s ⁻¹	< 5 x 10 ⁻¹⁰ / < 1 x 10 ⁻⁹			
Pressure range, abs.		1 x 10 ⁻¹⁰ mbar to 1 bar			
High vacuum conductance	l x s ⁻¹	600	1700	6000	26000
Differential pressure at the valve disk	bar	1 in both directions			
Max. differential pressure during opening	mbar	30			
Compressed air min./max.	bar	4/7	4/7	4/7	5/7
Closing/opening time	s	1	1.2	1.5	4
Compressed air cylinder, volume	m ³	0.08	0.11	0.14	0.35
Service life until first maintenance	cycles	50 000			
Degassing temperature		250/200 / 200			
valve open/closed / pneumatic drive	°C	80 (optional: 200) / 50			
position indicator / pilot valve	°C				
Warming-up and cooling down speed	°C x h ⁻¹	80			
Pilot valve		24 V DC / 6 or 230 V AC, 50 Hz / 7.1			
supply voltage / power consumption	- / W				
Switching capacity for position indicator, at 80 °C	A	5 at 250 V AC; 3 at 50 V DC			
at 200 °C	A	1 at 48 V AC; 1 at 72 V DC			
Installation orientation		any			
Weight	kg	9	12	18	42
Materials		AISI 304 (1.4301)			
Valve body		AISI 316 L (1.4435)			
Bellows		AISI 304 (1.4301), AISI 316 L (1.4404) AISI 301 (1.4310), AISI 420 (1.4034)			
Mechanism		metal / Viton			
Gaskets (head / disk)					

Ordering Information		DN 63 ISO-F	DN 100 ISO-F	DN 160 ISO-F	DN 250 ISO-F
UHV gate valve, electropneumatically operated		Part No. 286 72	Part No. 286 73	Part No. 286 74	Part No. 286 81
24 V DC / 6 W		Part No. 286 75	Part No. 286 76	Part No. 286 77	-
230 V AC, 50 Hz / 7.1 W					
Set screws with nuts and washers *)		Part No. 839 13	Part No. 839 13	Part No. 210 071	Part No. 210 071
Package each containing	pieces	16	16	12	12

*) For dimensions E x F see table "Dimensions for ISO-F (UHV)"



Advantages to the User

- ◆ Double-acting electropneumatic actuator (with position indicator and pilot valve)
- ◆ Bellows-sealed push gate feedthrough
- ◆ Valve and pneumatic drive can be degassed at temperatures up to 250 °C and 200 °C respectively
- ◆ Steel body (non-rusting)
- ◆ Low play in the locked state and low wear
- ◆ Compact
- ◆ Mechanically locked in the closed state

Dimensions		DN	63 CF	100 CF	160 CF	200 CF
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

Dimensions		DN	63 CF	100 CF	160 CF	200 CF
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

Dimensions		DN	63 CF	100 CF	160 CF	200 CF
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

Technical Data

		DN 63 CF	DN 100 CF	DN 160 CF	DN 200 CF
Leak tightness: Body / valve seat	mbar x l x s ⁻¹	< 5 x 10 ⁻¹⁰ / < 1 x 10 ⁻⁹			
Pressure range, abs.		1 x 10 ⁻¹⁰ mbar to 1 bar			
High vacuum conductance	l x s ⁻¹	600	1700	6000	12000
Differential pressure at the valve disk	bar	1 in both directions			
Max. differential pressure during opening	mbar	30			
Compressed air min./max.	bar	4/7	4/7	4/7	5/7
Closing/opening time	s	1	1.2	1,5	4
Compressed air cylinder, volume	m ³	0.08	0.11	0.14	0.35
Service life until first maintenance	cycles	50 000			
Degassing temperature		250/200 / 200			
valve open/closed / pneumatic drive	°C	80 (optional: 200) / 50			
position indicator / pilot valve	°C				
Warming-up and cooling down speed	°C x h ⁻¹	80			
Pilot valve		24 V DC / 6 or 230 V AC, 50 Hz / 7.1			
supply voltage / power consumption	- / W				
Switching capacity for position indicator		5 at 250 V AC; 3 at 50 V DC			
at 80 °C	A	1 at 48 V AC; 1 at 72 V DC			
at 250 °C	A				
Installation orientation		any			
Weight	kg	9	12	18	28
Materials		AISI 304 (1.4301)			
Valve body		AISI 316 L (1.4435)			
Bellows		AISI 304 (1.4301), AISI 316 L (1.4404) AISI 301 (1.4310), AISI 420 (1.4034)			
Mechanism		metal / Viton			
Gaskets (head / disk)					

Ordering Information

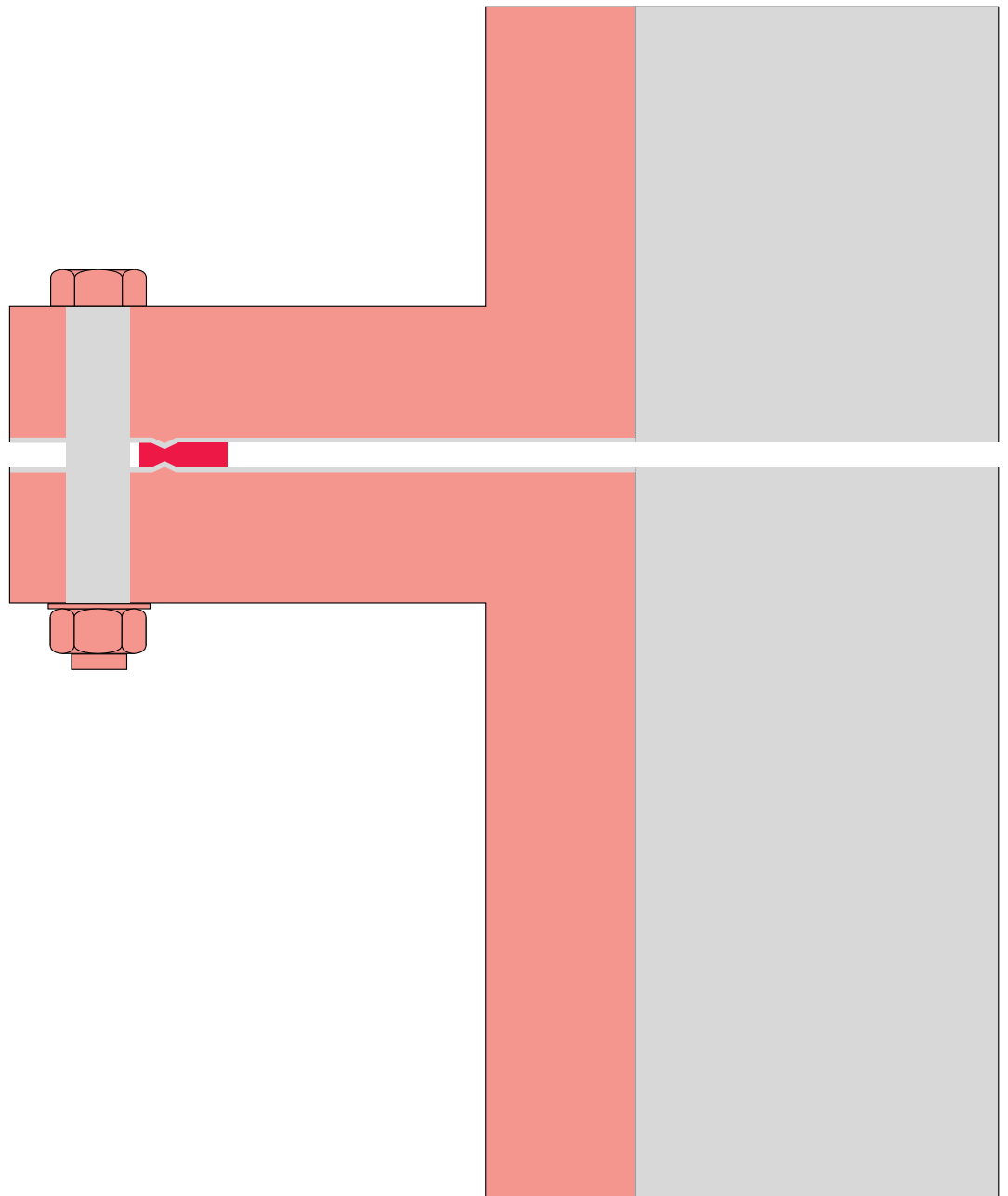
	DN 63 CF	DN 100 CF	DN 160 CF	DN 200 CF
UHV gate valve, electropneumatically operated				
24 V DC / 6 W	Part No. 286 89	Part No. 286 90	Part No. 286 91	Part No. 286 92
230 V AC, 50 Hz / 7.1 W	Part No. 286 95	Part No. 286 96	Part No. 286 97	Part No. 286 98
Set screws with nuts and washers *)	Part No. 839 13	Part No. 839 13	2 x Part No. 839 13	2 x Part No. 839 13

*) For dimensions E x F see table "Dimensions for CF"

C15

Ultra-high Vacuum Components

Flange Components, Valves
and Feedthroughs



General C15.02**Products**

CF Flanges	C15.03
UHV Components	C15.07
Accessories for UHV Components	C15.10
UHV Observation Windows	C15.12
UHV Sapphire Observation Windows	C15.12
UHV All-Metal Right-Angle Valves	C15.13
UHV All-Metal Variable Leak Valves	C15.14
UHV Feedthroughs, Mechanical	C15.15
UHV Feedthroughs, Electric	C15.17
Connectors	C15.19
UHV Liquid Feedthroughs	C15.21

Introduction

According to DIN 28400, 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 for a longer period of time. It is only under these conditions that the monolayers 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 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
- ◆ 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 O-ring
- ◆ Self-centering
- ◆ Fixed and rotary flanges in almost any size

CF Flanges



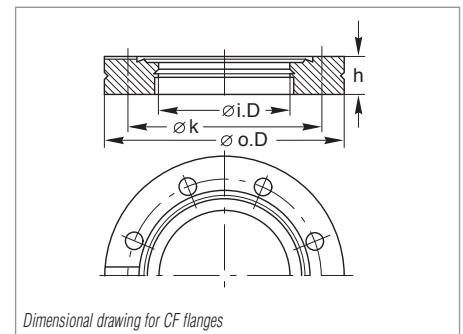
The CF flange connection consists of two identical flanges with a flat gasket made of **OFHC copper**, bolts, nuts and washers.

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 itself optimally to the microstructure 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 gasket or a supporting ring with FPM O-ring, which may be baked up to 150 °C (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.	inch	1 5/16"	2 3/4"	4 1/2"	6"	8"	10"	12"
Outside diameter o. D.	mm	34	69.5	113.5	152	202.5	253.0	305.0
Inside diameter i. D.	inch	5/8"	1 3/8"	2 1/2"	4"	6"	8"	10"
Inside diameter i. D.	mm	16	36.8	66	104	155	200	250
Bolt circle diameter k	mm	27	58.7	92.2	130.3	181	231.8	284.0
High h	mm	7.5	13	17.5	20	22	24.5	24.5
Number of holes		6	6	8	16	20	24	32
Hole diameter	mm	4.3	6.6	8.4	8.4	8.4	8.4	8.4

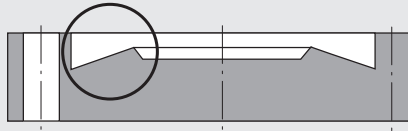
Conversion Factors

1. Magnetizing field H, unit:	$A \times m^{-1}$
Previously used unit: Oersted (Oe)	$1 Oe = 79.577 (A \times m^{-1})$
2. Strength of the magnetic field B, unit:	$Vs \times m^{-2} = Tesla (T)$
Previously used unit: Gauß (G)	$1 G = 10^{-4} Vs \times m^{-2} = 10^{-4} T$

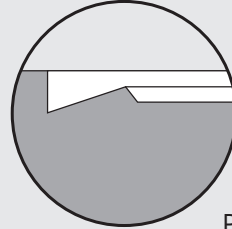
These Arguments Prove LEYBOLD's QUALITY

- ◆ The well-proven LEYBOLD geometry for the cutting edges

The stabilized LEYBOLD profile for the cutting edges



Diagrammatic view

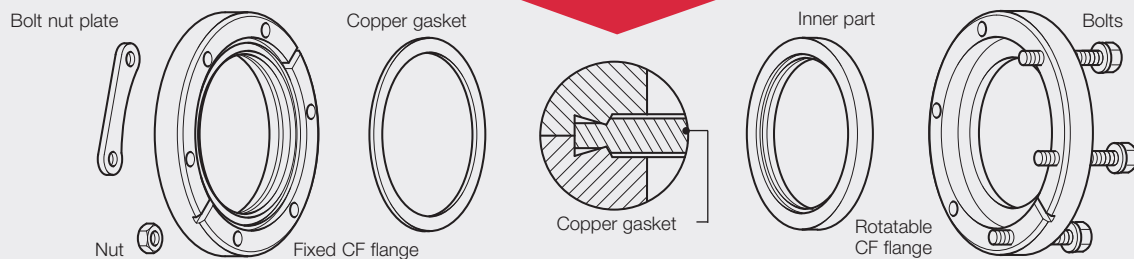


Partial view

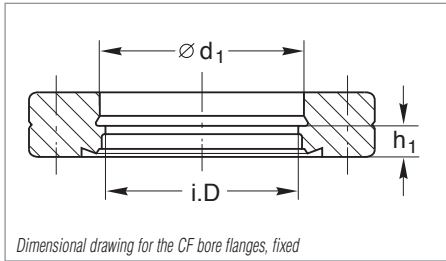
- ◆ Forged steel materials of high tensile strength and density
- ◆ Material quality for standard applications **DIN 1.4301 corresponds to AISI 304**
- ◆ Tightly checked, **close dimensional tolerances** for the entire sealing geometry
- ◆ **Low degassing rates** of the tube material used

Advantages

*Reliable sealing of UHV connections
over hundreds of
heating cycles*

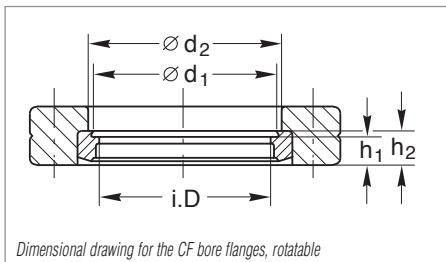


CF Bore Flanges, Fixed



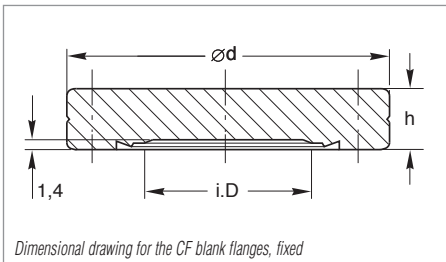
DN	CF	16	40	63	100	160	200	250
Outside diameter	inch	1 5/16"	2 3/4"	4 1/2"	6"	8"	10"	12"
Inside diameter	mm	16	36.8	66	104	155	200	250
d_1	mm	18.3	40.3	70.3	108.5	159.5	205.5	256.5
h_1	mm	4.2	5.5	9.5	11	12	12.5	12.5
For dimensions not given, see Technical Data								
Material								
DIN 1.4301	Part No.	835 41	835 37	835 38	835 39	835 40	835 47	835 49

CF Bore Flanges, Rotatable



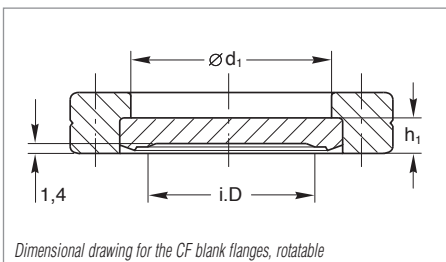
DN	CF	16	40	63	100	160	200	250
Outside diameter	inch	1 5/16"	2 3/4"	4 1/2"	6"	8"	10"	12"
Inside diameter	mm	16	36.8	66	104	155	200	250
d_1	mm	18.3	40.3	70.3	108.5	159.5	205.5	256.5
d_2	mm	18.6	41	71	109	160	206	257
h_1	mm	4.2	5.5	9.5	11	12	12.5	12.5
h_2	mm	5.8	7.6	12.6	14.3	15.8	17.1	18
For dimensions not given, see Technical Data								
Material								
DIN 1.4301	Part No.	835 61	835 58	835 59	835 60	835 69	835 67	835 78

CF Blank Flanges, Fixed



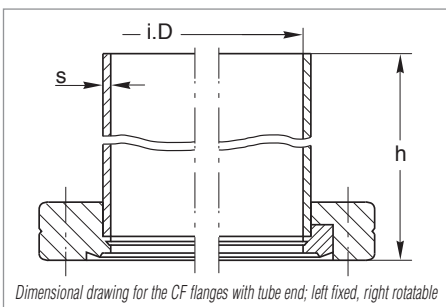
DN	CF	16	40	63	100	160	200	250
Outside diameter	inch	1 5/16"	2 3/4"	4 1/2"	6"	8"	10"	12"
Inside diameter	mm	14	38	66	104	155	205	256
d	mm	34	69.5	113.5	152	202.5	253	305
h	mm	7.5	13	17.5	20	22	24.5	24.5
For dimensions not given, see Technical Data								
Material								
DIN 1.4301	Part No.	835 01	835 03	835 04	835 05	835 06	835 07	835 09

CF Blank Flanges, Rotatable



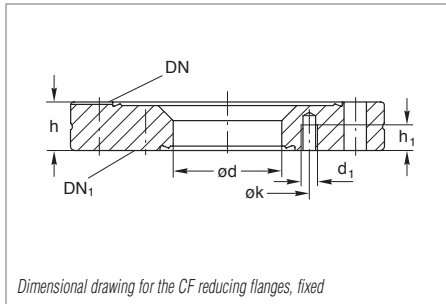
DN	CF	16	40	63	100	160	200	250
Outside diameter	inch	1 5/16"	2 3/4"	4 1/2"	6"	8"	10"	12"
Inside diameter	mm	14	38	66	104	155	205	256
d_1	mm	18.6	41	71	109	160	206	257
h_1	mm	5.8	7.6	12.6	14.3	15.8	17.1	18
For dimensions not given, see Technical Data								
Material								
DIN 1.4301	Part No.	835 21	835 23	835 24	835 25	835 26	835 27	835 29

CF Flanges with Tube End



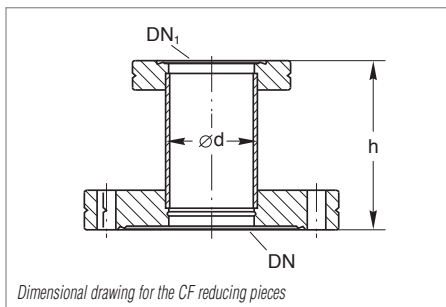
DN	CF	16	40	63	100	160
Outside diameter	inch	1 5/16"	2 3/4"	4 1/2"	6"	8"
Inside diameter	mm	16	36.8	66	104	155
s	mm	1	1.6	2	2	2
h	mm	38	63	105	135	167
For dimensions not given, see Technical Data						
Material						
Tube end, fixed						
DIN 1.4301	Part No.	835 51	835 31	835 32	835 33	835 34
Tube end, rotatable						
DIN 1.4301	Part No.	835 71	835 82	835 74	835 75	835 76

CF Reducing Flanges



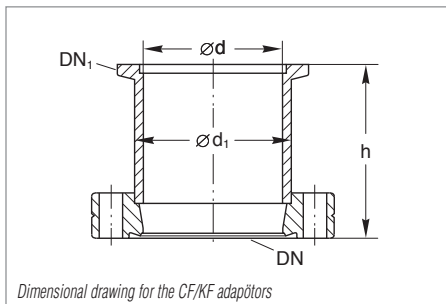
DN	CF	40	63	100	100	160	160
Outside diameter	inch	2 3/4"	4 1/2"	6"	6"	8"	8"
DN ₁	CF	16	40	40	63	40	100
k	mm	27	58.7	58.7	92.15	58.7	130
h	mm	13	17.5	20	20	22	22
h ₁	mm	5.5	9	9	11	9	11
d		16	39	39	66	39	104
d ₁		M 4	M 6	M 6	M 8	M 6	M 8
For dimensions not given, see Technical Data							
Material							
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



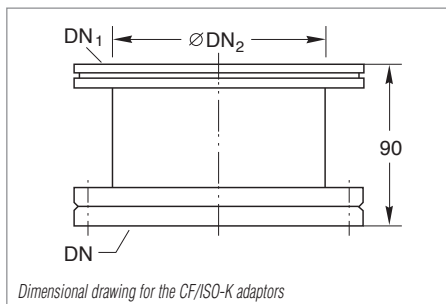
DN	CF	40	63	100	100	160
Outside diameter	inch	2 3/4"	4 1/2"	6"	6"	8"
DN ₁	CF	16	40	40	63	100
h	mm	45	75	75	95	105
d (tube)	mm	18	40	40	70	108
For dimensions not given, see Technical Data						
Material						
DIN 1.4301	Part No.	837 10	837 15	837 16	837 19	837 22

UHV CF/KF Adaptors



DN	CF	16	16	40	40	40	63
Outside diameter	inch	1 5/16"	1 5/16"	2 3/4"	2 3/4"	2 3/4"	4 1/2"
DN ₁	KF	16	25	16	25	40	40
d	mm	16	16	16	26	37	41
h	mm	35	35	30	30	50	35
d ₁ (tube)	mm	20	20	20	30	41	45
Material							
DIN 1.4301	Part No.	837 81	837 83	837 82	837 84	837 36	837 86

UHV CF/ISO-K Adaptors



DN	CF	63	100	160
Outside diameter	inch	4 1/2"	6"	8"
DN ₁	ISO-K	63	100	160
DN ₂	mm	66	104	157
Material				
DIN 1.4301	Part No.	837 01	837 02	837 03

UHV Components



UHV 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.

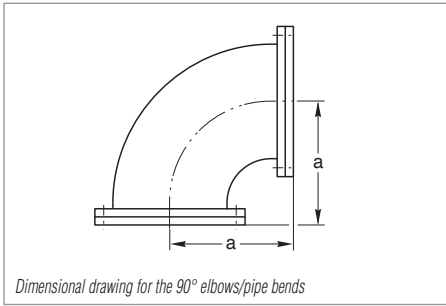
A carefully implemented cleaning process and suitable packaging for the components are essential pre-requisites for obtaining pressures in the UHV range within reasonably short pump down times after assembly (providing the remainder of the apparatus is clean too).

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

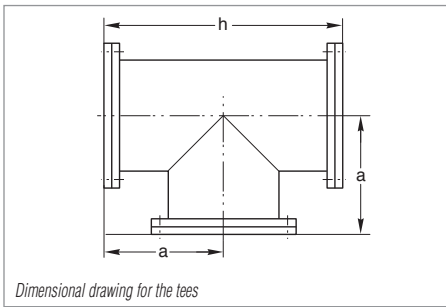
- ◆ Low degassing rates
- ◆ High degassing temperature
- ◆ Leak rates below 1×10^{-11} mbar \times l \times s⁻¹
- ◆ Basic dimensions correspond to those of the components from other international manufacturers
- ◆ Bolts may be inserted from the side of the body

Elbows 90°; from DN 160 CF Pipe Bend



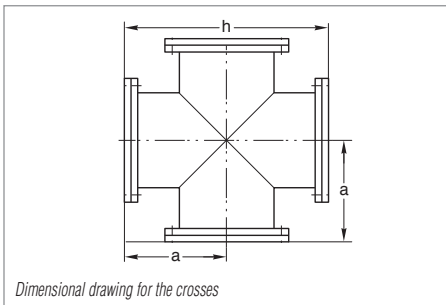
DN	CF	16	40	63	100	160
Outside diameter	inch	1 5/16"	2 3/4"	4 1/2"	6"	8"
a	mm	38	63	105	135	167
For dimensions not given, see Technical Data						
Elbow 90° with a rotatable flange	Part No.	836 04	836 05	836 06	836 07	836 08

Tees



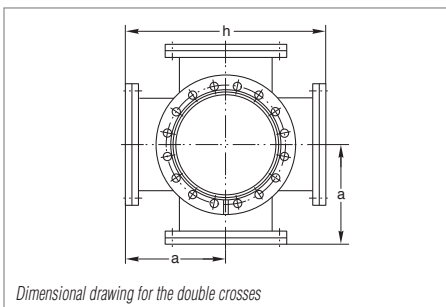
DN	CF	16	40	63	100	160
Outside diameter	inch	1 5/16"	2 3/4"	4 1/2"	6"	8"
a	mm	38	63	105	135	167
h	mm	76	126	210	270	334
For dimensions not given, see Technical Data						
Tee with a rotatable flange on each axis	Part No.	836 14	836 15	836 16	836 17	836 18

Crosses



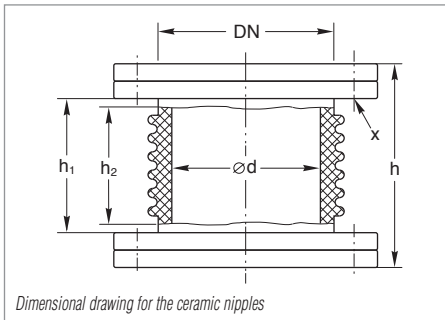
DN	CF	16	40	63	100	160
Outside diameter	inch	1 5/16"	2 3/4"	4 1/2"	6"	8"
a	mm	38	63	105	135	167
h	mm	76	126	210	270	334
For dimensions not given, see Technical Data						
Cross with a rotatable flange on each axis	Part No.	836 34	836 35	836 36	836 37	836 38

Double Crosses



DN	CF	40	63	100	160
Outside diameter	inch	2 3/4"	4 1/2"	6"	8"
a	mm	63	105	135	167
h	mm	126	210	270	334
For dimensions not given, see Technical Data					
Double cross with a rotatable flange on each axis	Part No.	836 45	836 46	836 47	836 48

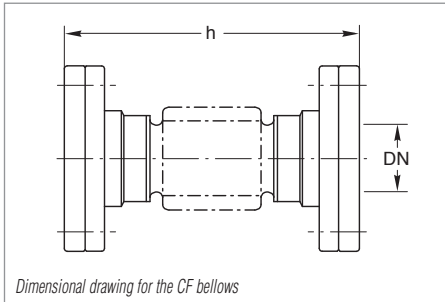
Ceramic Nipples (1 rotatable Flange)



DN	CF	40	63
Outside diameter	inch	2 3/4"	4 1/2"
Breakdown voltage ^{*)}	kV	90	140
d	mm	25	53
h	mm	70	90
h ₁	mm	44	55
h ₂ (length of the ceramic piece)	mm	30	45
x (allowed length for the screws)	mm	35	45
Ceramic nipple with one rotatable flange	Part No.	836 71	836 70

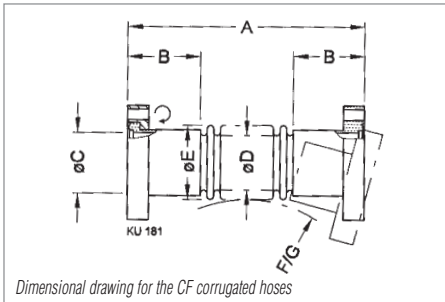
^{*)} With reference to the wall thickness of the ceramic material

Flexible Connecting Components



CF Bellows

DN	CF	16	40	63	100	160
o. D.	inch	1 5/16"	2 3/4"	1 1/2"	6"	8"
h	mm	76 ±1,5	126 ±2	139 ±2	142 ±2	250 ±3
CF bellows with one rotatable flange	Part No.	880 01	880 02	880 03	880 04	880 05



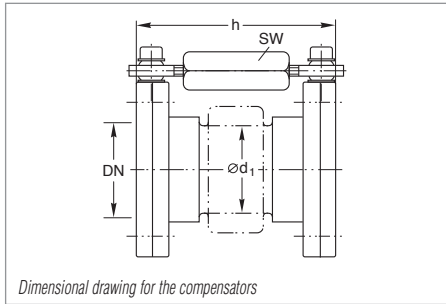
CF Corrugated Hoses

DN	CF	16	16	16	16	40	40	40	40
o. D.	inch	1 5/16"	1 5/16"	1 5/16"	1 5/16"	2 3/4"	2 3/4"	2 3/4"	2 3/4"
A = length	mm	250	500	750	1000	250	500	750	1000
CF corrugated hose with one rotatable flange	Part No.	885 56	885 68	885 65	885 73	885 57	885 69	885 66	885 75

Dimensions

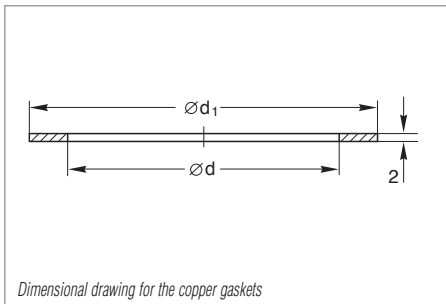
DN	CF	16	40
B	mm	23	46
C	mm	16	36.8
D	mm	15	40.5
E	mm	22.5	53
F	mm	70	130
G	mm	50	100

Compensators



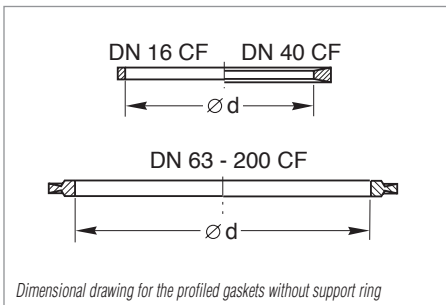
DN (both flanges fixed)	CF	40	63	100
Outside diameter	inch	2 3/4"	4 1/2"	6"
Type		bellows	bellows	bellows
d ₁ (inside dia.)	mm	36.8	62	92
h _{max.}	mm	130	150	157
h _{min.}	mm	120	130	127
sw	mm	10	13	13
3 joints individually adjustable				
Max. angular deviation, approx.	°C	10	12	12
Permissible temperature of the hinges	°C	200	200	200
Bakeout temperature of the bellows without hinges	°C	400	400	400
	Part No.	880 11	880 12	880 13

Copper Gaskets for CF Flanges (OFHC Copper – Oxygen-Free)



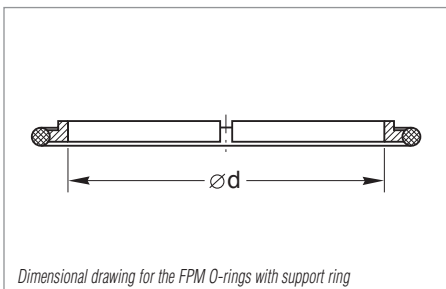
DN	CF	16	40	63	100	160	200	250
Outside diameter	inch	1 5/16"	2 3/4"	4 1/2"	6"	8"	10"	12"
d	mm	16.2	39	63.6	101.8	152.6	203.4	254
d ₁	mm	21.3	48.1	82.4	120.5	171.3	222.1	272.7
Set of 5		-	-	-	-	-	-	x
Set of 10		x	x	x	x	x	x	-
Quality								
Standard	Part No.	839 41	839 43	839 44	839 45	839 46	839 47	839 48

FPM Profiled Gasket without Support Ring



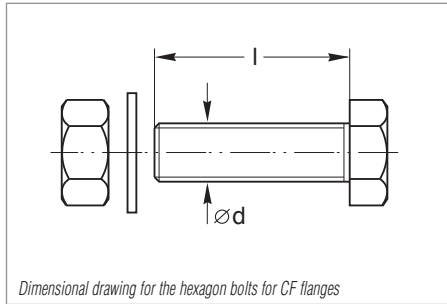
DN	CF	16	40	63	100	160	200
Outside diameter	inch	1 5/16"	2 3/4"	4 1/2"	6"	8"	10"
d	mm	16	42	69.7	107.8	156	1206
Bakeout temperature	°C	160	160	160	160	160	160
Set of 2		-	-	x	x	x	x
Set of 5		x	x	-	-	-	-
	Part No.	839 21	839 23	839 34	839 35	839 36	839 37

FPM O-ring with Support Ring



DN	CF	250
Outside diameter	inch	12"
d	mm	248.3
Bakeout temperature	°C	160
	Part No.	839 03

Hexagon Bolts, Set for CF Flanges

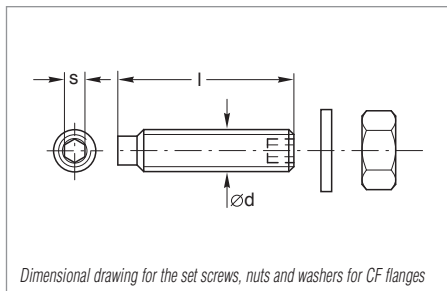


DN	CF	16	40	63	100	160	200	250
Outside diameter	inch	1 5/16"	2 3/4"	4 1/2"	6"	8"	10"	12"
Dimensions (d x l)	mm	M 4 x 20	M 6 x 35	M 8 x 45	M 8 x 50	M 8 x 55	M 8 x 60	M 8 x 60
Sealing torque ¹⁾	Nm	4	10	20	20	20	20	20
Quantity per set								
Bolts		25	25	25	25	25	25	25
Nuts		25	25	25	25	25	25	25
Washers		25	25	25	25	25	25	25
Set	Part No.	839 00	839 01	838 81	839 04	839 05	839 07	839 07 ²⁾

¹⁾ With separating agent

²⁾ 2 sets are required

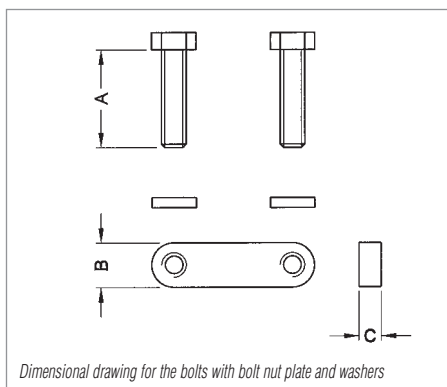
Set Screws, Nuts and Washers for CF Flanges



DN	CF	16	40	63-100
Dimensions (d x l)	mm	M 4 x 20	M 6 x 35	M 8 x 45
s	mm	2	3	4
Torque ¹⁾	Nm	4	10	20
Quantity per set				
Set screws		6	6	16
Nuts		6	6	16
Washers		6	6	16
Set	Part No.	839 10	839 11	839 13

¹⁾ With separating agent

Bolts with Bolt Nut Plate and Washers



DN	CF	16	40	63	100/160
Outside diameter	inch	1 5/16"	2 3/4"	4 1/2"	6"/8"
Dimensions (d x l)	mm	M 4 x 20	M 6 x 35	M 8 x 50	M 8 x 55
A	mm	20	35	45	55
B	mm	7	10	12	12
C	mm	4	5	8	8
Torque ¹⁾	Nm	4	10	20	20
Quantity per set					
Bolts		6	6	8	20
Bolt nut plate		3	3	4	10
Washers		6	6	8	20
Set	Part No.	838 87	838 88	838 89	838 91

¹⁾ With separating agent

Lubricant for Threads

This thread lubricant is preferably applied to stainless steel joints and is used to prevent bolts from seizing due to high temperatures or high mechanical stresses.

Temperature	up to 1000 °C
Lubricant for threads, 28 g tube	Part No. 839 99

UHV Observation Windows



UHV Observation Windows

All UHV observation windows with CF flanges are of a flat and embedded design (Zero-length design). This design provides a much wider viewing angle compared to observation windows manufactured according to a pot-type design.

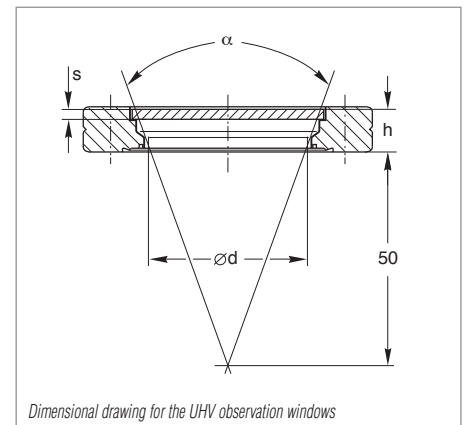
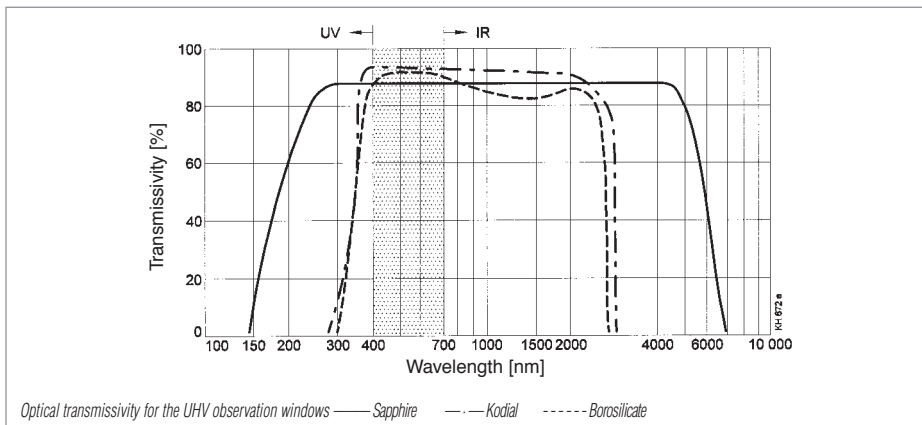
UHV Sapphire Observation Windows

The transmission range of sapphire lies between 250 nm and 5500 nm. The infrared limit is shifted far into the infrared range. Therefore these observation windows are used, for example, in solar simulation tests, laser experiments, high-temperature plasma research and spectrophotometric measurements.

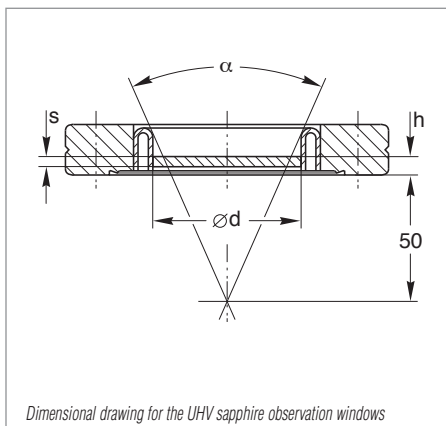
Standard types of glass are normally used for visual observations, for taking photographs of experimental details and, among other things, for pyrometric measurements.

Advantages to the User

- ◆ Embedded design
- ◆ Optically plane-parallel almost up to the glass/metal seal
- ◆ Flange offering a wide viewing angle



Observation windows



DN	CF	40	40	63	100	160
Thickness of the glass (s)	mm	3,0	3.0	3.5	6	8.0
Diameter of viewing area (d)	mm	23	38	65	90	135
Viewing angle (α)	°	23	38	57	71	92
Spacing of the glass (h), approx.	mm	10	11	16.4	8	10
Viewing distance	mm	50	50	50	50	50
Wavelength range	nm	250 to 5500	400 to 3000			
Material		Vacon (compensation ring)				
Mean transmission ratio	%	> 80	93 in the visible range			
Type of glass		Sapphire		Kodial		
Max. heating rate	min	5	5			
Max. bakeout temperature	°C	400	400			
UHV observation window	Part No.	-	210 112	210 114	210 115	210 116
UHVUHV sapphire observation windows	Part No.	210 122	-	-	-	-

UHV All-Metal Right-Angle Valves



The all-metal right-angle valves are of a fully welded design. The valve disk may be exchanged through the side flange.

Due to the selection of suitable materials, the valve stem need not be lubricated after every bake-out cycle.

The drive spindle of the valves transfers the motion via a pressure plate onto the sleeve-guided valve stem carrying the screwed-on valve disk. The valve disk consists of a copper plate.

Due to the specific properties of copper (ductility) this design offers great advantages over other materials: long service life and low closing forces when operating the valve.

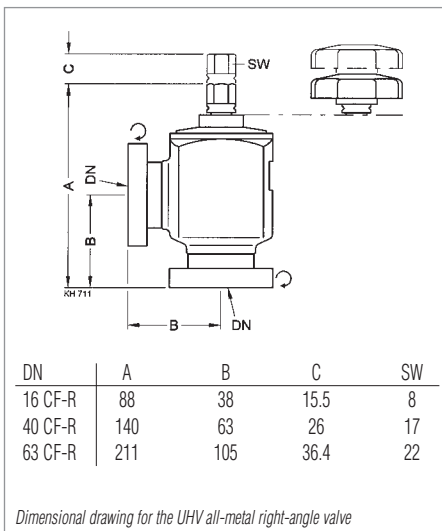
A very high leak tightness achieved, even with a low closing force.

The compact design offers good operational characteristics also in view of temperature changes, offers a short flow path and hence improved conductance.

Advantages to the User

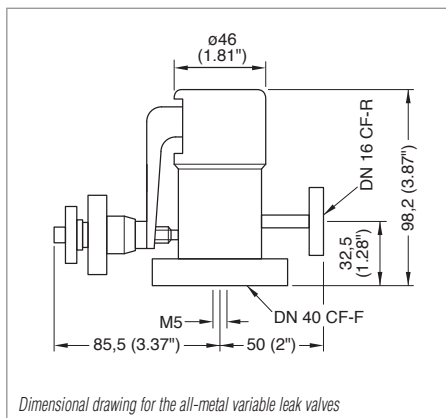
- ◆ Leak rate at the valve seat below 10^{-11} mbar x l x s⁻¹
- ◆ Absolutely reliable sealing of valve seat
- ◆ Simplest operation
- ◆ No lubrication of the spindle is necessary after bakeout
- ◆ Large removable handwheel for easy operation

UHV All-Metal Right-Angle Valves, with Rotatable Flanges on Both Sides



DN	16	40	63
Connection flange rotatable	DN 16 CF-R	40 CF-R	63 CF-R
Service life	cycles	1000	
Conductance for molecularflow	l/s	3	38
Pressure, absolute			
min.	mbar	1×10^{-11}	
max.	bar	4	
Mounting orientation	mm	any	
Bake out temperature without handwheel	°C	300	
Bake out temperature with handwheel	°C	80	
Max. heating and cooling rate	°C/min	4	4
Bellows	stainless steel 1.4541		
Housing	stainless steel 1.4301 welded		
Valve disk	copper		
Valve disk seal	copper		
Weight	kg	0.4	2.0
UHV All-Metal Right-angle Valves	Part No.	289 80	289 81
Spare valve disk, 2 pieces	Part No.	215 410	215 440
Spare hand wheel, plastic	Part No.	215 412	215 442

UHV All-Metal Variable Leak Valves



UHV All-Metal Variable Leak Valves

Connection flanges		
Input	DN	16 CF-R
Output	DN	40 CF-R
Gas flow, min. for		
Pure gas	mbar x l x s ⁻¹	10 ⁻¹⁰
Air	mbar x l x s ⁻¹	10 ⁻⁹
Gas flow		
max.	mbar x l x s ⁻¹	600
adjustable, max.	mbar x l x s ⁻¹	100
Tightness	mbar x l x s ⁻¹	1 x 10 ⁻¹¹
Pressure absolute		
min.	mbar	1 x 10 ⁻¹⁰
max.	bar	30
Conductance for molecular flow	l x s ⁻¹	0.7
Operating temperature	°C	200
Bakeout temperature	°C	350
Valve seat		copper alloy
Valve plate		sapphire
Housing		stainless steel
Weight	kg	1.4
UHV All-Metal variable Leak Valve	Part No.	289 90
Spare valve plate	Part No.	289 87
Spare valve seat	Part No.	289 88
Tool kit for valve seat	Part No.	290 97

UHV Feedthroughs

UHV feedthroughs are available in a variety of field-proven designs, specifically:

- ◆ Linear motion mechanical feedthroughs,
- ◆ Rotary motion mechanical feedthroughs,

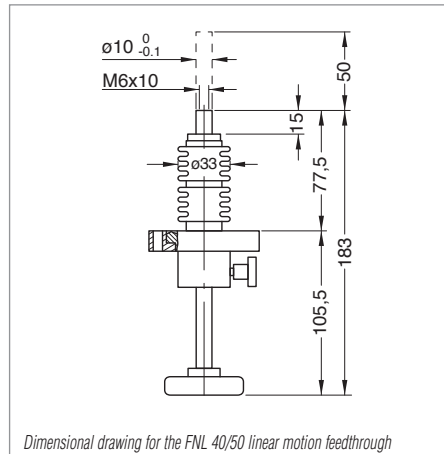
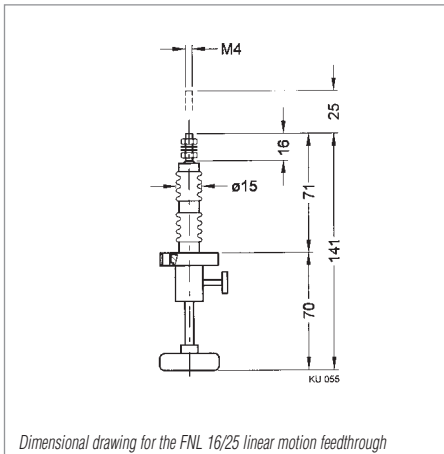
A stainless steel bellows is used to seal off the UHV linear, rotary and multi-motion feedthroughs against the atmosphere.

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

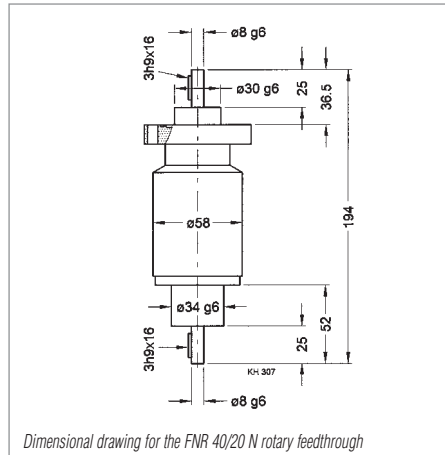
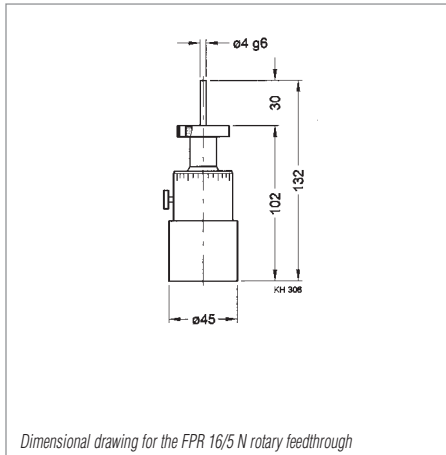
Linear Motion Mechanical Feedthroughs



Technical Data and Ordering Information

Feedthrough		FNL 16/25	FNL 40/50
Nominal width	DN	16 CF-R	40 CF-R
Shaft connection	mm	M 4 x 16	M 6 x 10, ∅ 10
Feedthrough/seal		bellow	bellow
Actuator		manually	manually
Travel	mm	25	50
Scale division	mm	5	10
Shaft load			
Radial at max. displacement	N	20	200
Axial, against vacuum	N	85	140
Axial, against atmosphere	N	100	200
Torsion	Nm	0.2	0.5
Tightness	mbar x l x s ⁻¹	1 x 10 ⁻¹⁰	1 x 10 ⁻¹⁰
Pressure absolute		1 x 10 ⁻⁹ mbar – 2 bar	1 x 10 ⁻⁹ mbar – 2 bar
Bakeout temperature			
Feedthrough	°C	300	300
Weight	kg	0.15	0.75
Materials exposed to process media		stainless steel	stainless steel
Linear motion feedthrough	Part No.	210 250	210 251

Linear Motion Mechanical Feedthroughs

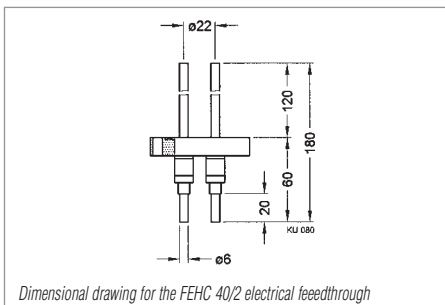
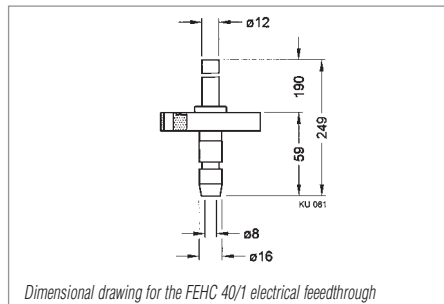
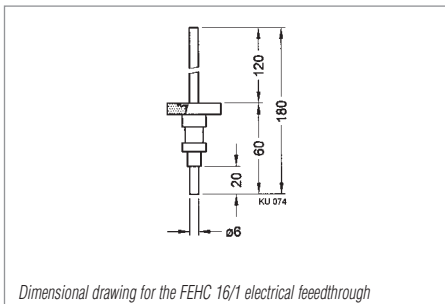
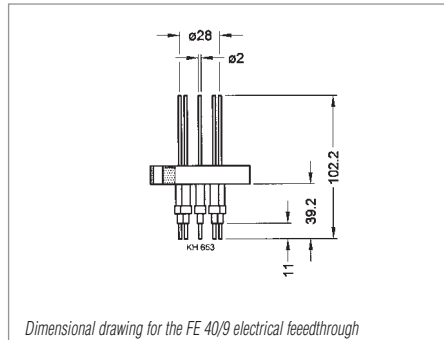
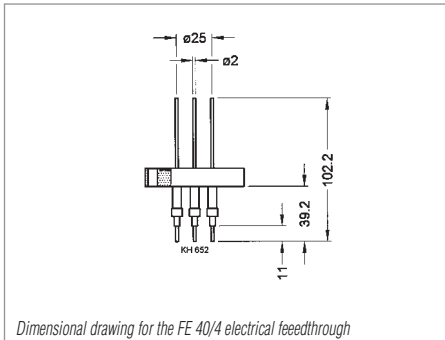


The rotation of the drive knob is translated via a gearless drive system to the shaft on the vacuum side. This shaft runs on ball bearings which do not require any maintenance during the entire service life.

Technical Data and Ordering Information

Feedthrough		FPR 16/5 N	FNR 40/20 N
Nominal width	DN	16 CF-F	40 CF-F
Shaft connection	mm	∅ 4	∅ 8
Feedthrough/seal		bellow	bellow
Transferable torque			
Dynamic	Nm	0.4	4
Dynamic, at 300 °C	Nm	0.2	2
Static	Nm	0.2	3
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 x s ⁻¹	1 x 10 ⁻¹⁰	1 x 10 ⁻¹⁰
Pressure absolute		1 x 10 ⁻⁹ mbar – 2 bar	1 x 10 ⁻⁹ mbar – 2 bar
Operating temperature	°C	300	300
Bakeout temperature	°C	300	300
Weight	kg	0.3	1.5
Materials exposed to process media		stainless steel	stainless steel
Rotary feedthrough	Part No.	210 154	210 155

Electrical Feedthroughs



The electric UHV feedthroughs comply with the relevant VDE regulations.

Concerning the air gaps and creepage paths, they have been designed in accordance with VDE 0100, i.e. both sides of the feedthrough are tested under atmospheric pressure conditions.

Technical Note

All electric specifications of the described voltage and current feedthroughs are rated in accordance with overvoltage class 1 and contamination grade 2.

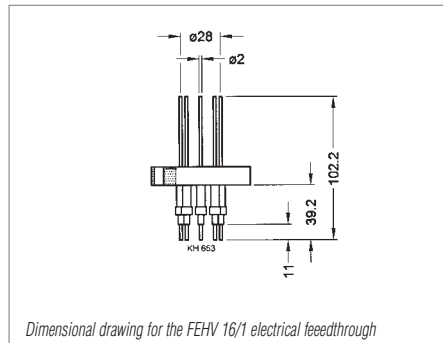
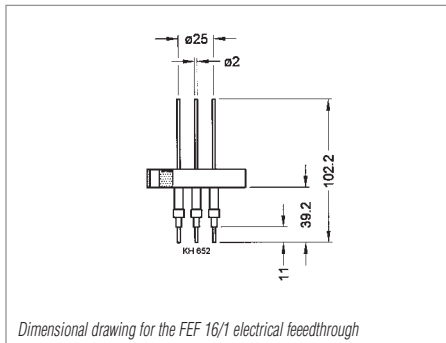
Technical Data and Ordering Information

Feedthrough		FE 40/4	FE 40/9	FEHC 16/1	FEHC 40/1	FEHC 40/2
Nominal width	DN	CF 40-F	CF 40-F	CF 16-F	CF 40-F	CF 40-F
Number of feedthroughs		4	9	1	1	2
Number of connection pieces						
vacuum side (set)		5	10	2	1	2
atmospheric side (set)		5	10	2	1	2
Voltage per pole ¹⁾	kV	1	1	4	1	4
Current per pole ¹⁾	A	8	1	150	250/1000 ²⁾	150
Bakeout temperature	°C			400		
Temperature rise at max. current	°C/min	5	5	5	4	4
Tightness	mbar x l x s ⁻¹			1 x 10 ⁻¹⁰		
Pressure absolute				1 x 10 ⁻¹⁰ mbar – 2 bar		
Flange				stainless steel		
Conductor		stainless steel	stainless steel	copper	copper	copper
Insulator				Al ₂ O ₃		
Weight	kg	0.3	0.4	0.15	0.5	0.45
Current feedthrough	Part No.	210 310	210 313	210 335	210 338	210 342
Connection piece, vacuum side (set)	Part No.	210 312	2x 210 312	210 337	210 340	210 337
Connector, atmospheric side (set)	Part No.	210 311	2x 210 311	210 336	210 339	210 336
Connector, atmospheric side, H ₂ O cooled	Part No.	–	–	–	210 341	–

¹⁾ Local safety regulations must be met

²⁾ with water-cooling

Electrical Feedthroughs

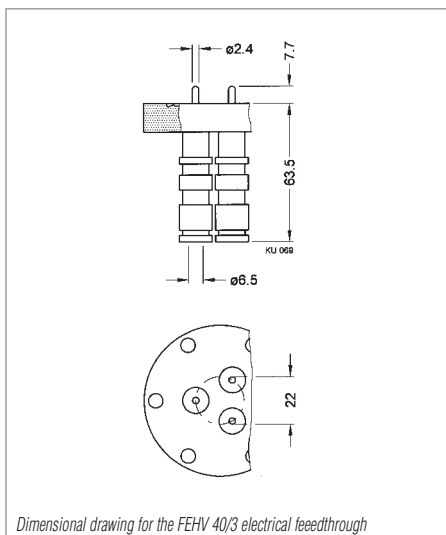


The electric UHV feedthroughs comply with the relevant VDE regulations.

Concerning the air gaps and creepage paths, they have been designed in accordance with VDE 0100, i.e. both sides of the feedthrough are tested under atmospheric pressure conditions.

Technical Note

All electric specifications of the described voltage and current feedthroughs are rated in accordance with overvoltage class 1 and contamination grade 2.

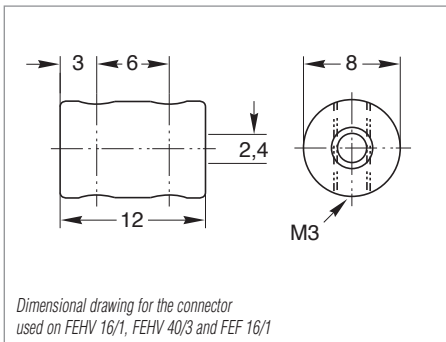
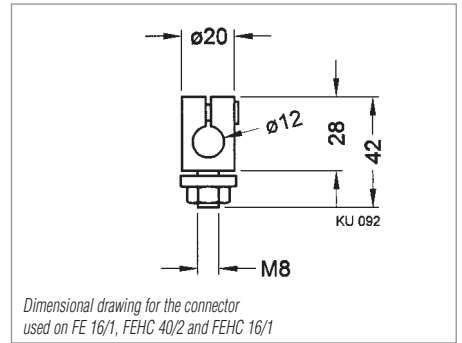
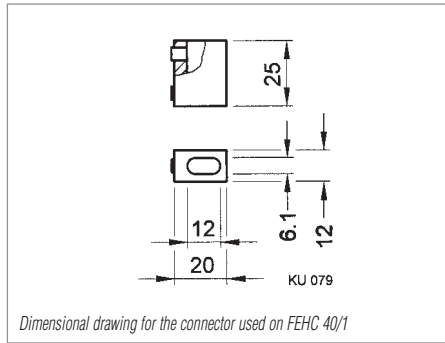
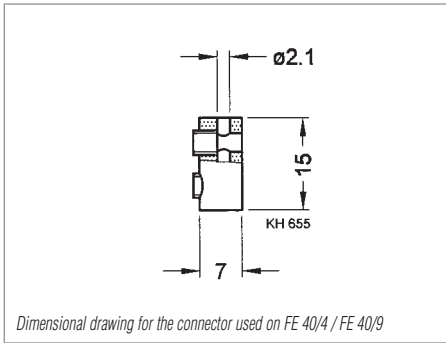


Technical Data and Ordering Information

Feedthrough		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	3	3
Frequency	MHz	150	-	-
Impedance	Ω	50 - 60	-	-
Insulation resistance at 20 °C	Ω	10 ⁻¹⁰	10 ⁻¹⁰	10 ⁻¹⁰
Bakeout temperature				
with connector	°C	50	50	50
without connector	°C	400	400	400
Temperature rise at max. current	°C/min	5	5	5
Tightness	mbar x l x s ⁻¹	1 x 10 ⁻¹⁰	1 x 10 ⁻¹⁰	1 x 10 ⁻¹⁰
Pressure absolute		1 x 10 ⁻⁸ mbar – 10 bar	1 x 10 ⁻⁸ mbar – 10 bar	1 x 10 ⁻⁸ mbar – 10 bar
Housing, flange, conductor		stainless steel	stainless steel	stainless steel
Feedthrough, seal		Al ₂ O ₃	Al ₂ O ₃	Al ₂ O ₃
Weight	kg	0.14	0.14	0.5
Current feedthrough	Part No.	210 404	210 402	210 403
Inside plug	Part No.	846 47	846 47	846 47
Outside plug		BNC	MHV	MHV
		U6 88/U	U6 932/U	U6 932/U

¹⁾ with elastomer seal up to 150 °C

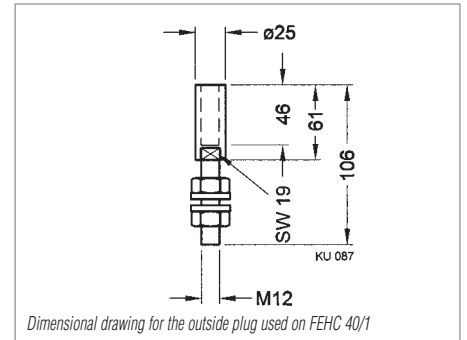
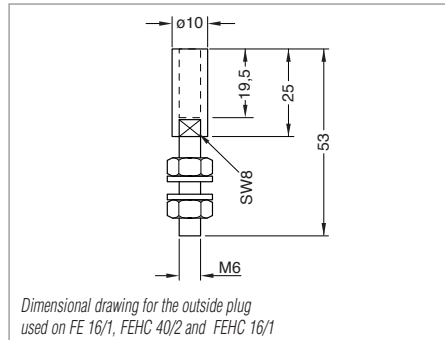
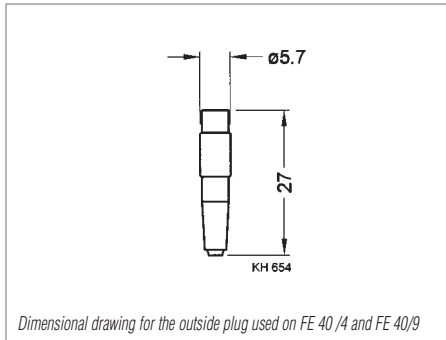
Connectors, vacuum side



Technical Data and Ordering Information

Connector for feedthrough		FE 40/4 / FE 40/9	FE 16/1 / FEHC 40/2 / FEHC 16/1	FEHC 40/1	FEHV 16/1 / FEHV 40/3 FEF 16/1
Current max.	A	12	90	1000	3
Bakeout temperature	°C	400	400	400	350
Material		stainless steel	stainless steel	copper	copper
Connector, vacuum side	Part No.	210 312 (set of 5)	210 337 (set of 2)	210 340	846 47

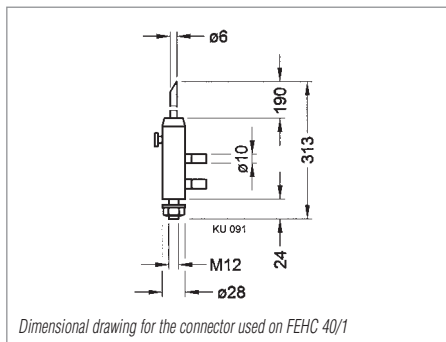
Connectors, atmospheric side



Technical Data and Ordering Information

Connector for feedthrough		FE 40/4 / FE 40/9	FE 16/1 / FEHC 40/2 / FEHC 16/1	FEHC 40/1
Current max.	A	12	90	250
Not insulated, for use up to	V	50	50	50
Bakeout temperature	°C	50	150	150
Material		gold-plated brass	silver-plated brass	silver-plated brass
Connector, atmospheric side	Part No.	2 x 210 311 (set of 5)	210 336 (set of 2)	210 339

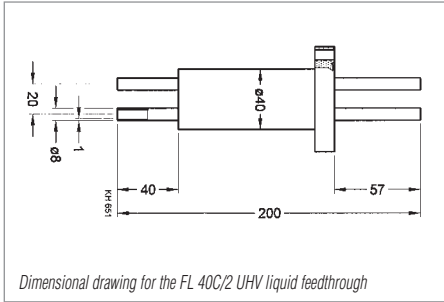
Connectors, atmospheric side, H₂O cooled



Technical Data and Ordering Information

Connector for feedthrough		FEHC 40/1
Current max.	A	1000
Not insulated, for use up to	V	24
Bakeout temperature	°C	120
Material		silver-plated brass
Connector, atmospheric side, with water-cooling	Part No.	210 341

UHV Liquid Feedthroughs



The thermally insulated UHV liquid feedthroughs are used to convey cold or hot gases, liquids or liquid nitrogen.

Technical Note

The ends of the tubes are long enough that they may be bent apart so that an UHV compatible connection can be provided.

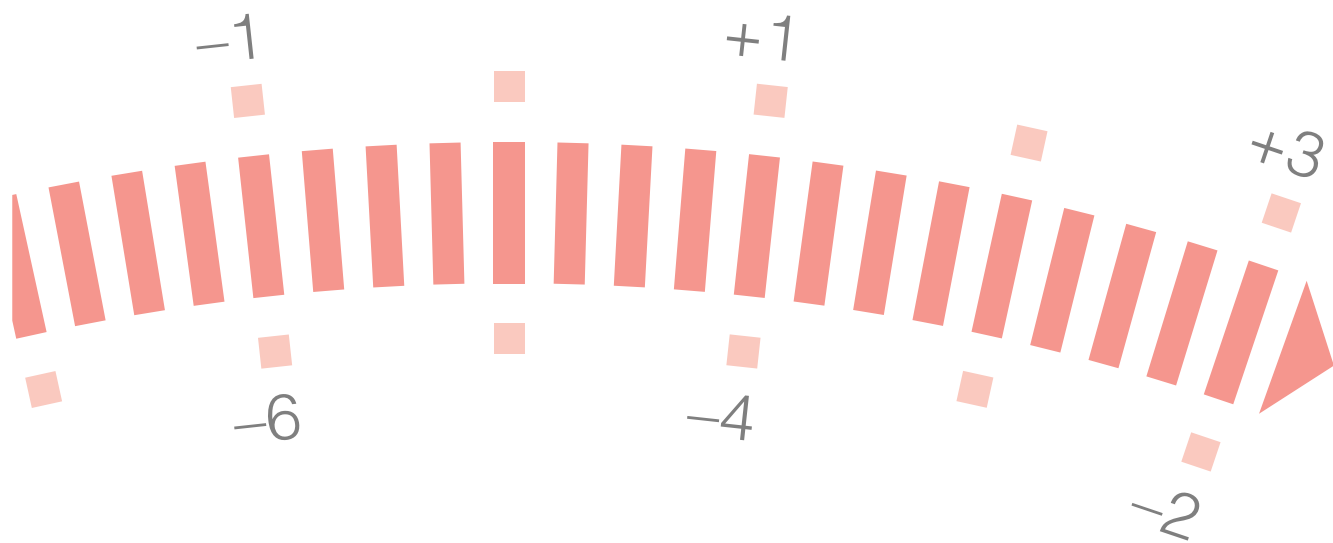
Technical Data and Ordering Information

Feedthrough		FL 40C/2
Nominal width	DN	40 CF-F
Feedthrough / seal		welded / brazed
Connection	mm	∅ 8 x 1
Number of tubes		2
Tightness	mbar x l x s ⁻¹	1 x 10 ⁻¹⁰
Pressure absolute		10 ⁻⁹ mbar – 10 bar (at 400 °C max. 2 bar)
Temperature range	°C	-400 – +400
Material		stainless steel
Weight	kg	0.4
	Part No.	210 276

Total Pressure Gauges

Vacuum Gauges and Control Instruments
 10^{-12} – 2000 mbar (10^{-12} – 1500 Torr),
Calibration Service

10⁻²



General

Basic Terms of Vacuum Metrology	C16.03
Connection Accessories for Small Flanges	C16.04

Products**Rough Vacuum Gauges, Mechanical Instruments**

Bourdon Vacuum Gauges	C16.05
Capsule Vacuum Gauges	C16.06
DIAVAC DV 1000	C16.07

Active Sensors

CTR90/CTR91 CERAVAC Transmitters	C16.08
TTR 90/TTR 90S THERMOVAC Transmitters	C16.10
TTR 211/TTR 216 S THERMOVAC Transmitters	C16.12
PTR 225/PTR 225 S/PTR 237 PENNINGVAC Transmitters	C16.14
ITR 90 IONIVAC Transmitter	C16.16
ITR 100 IONIVAC Transmitter	C16.18

Connection Cable for Active Sensors	C16.20
--	---------------

Operating Units for Active Sensors

DISPLAY ONE	C16.22
CENTER ONE	C16.24
CENTER TWO / THREE	C16.26
COMBIVAC 2T	C16.28

Operating Units for Passive Sensors

PIEZOVAC PV 20	C16.30
MEMBRANOVAC DM 11/DM 12	C16.32

Fine Vacuum Gauges

THERMOVAC TM 21/TM 22/TM 23	C16.34
-----------------------------------	---------------

High and Ultra High Vacuum Gauges

PENNINGVAC PM 31	C16.36
COMBIVAC CM 31/CM 32/CM 33	C16.38

Sensors

DI 200/DI 201/DI 2000/DI 2001/DI 2001 rel Linear Pressure Sensors	C16.40
Series 200 THERMOVAC Sensor	C16.42
PR 25/PR 26/PR 27/PR 37 PENNINGVAC Sensors	C16.43
IE 414/IE 514 IONIVAC Sensors	C16.44
Spare Sensors for Older Operating Units	C16.45

Pressures Switches and Control Instruments

PS 113 A Low Pressure Safety Switch	C16.46
PS 115 Pressure Switches	C16.47
SV 110 Switching Amplifier	C16.48
MR 16/MR 50 Diaphragm Pressure Regulators	C16.49

Miscellaneous

LEYBOLD Calibration Service	C16.50
-----------------------------------	---------------

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, thin-walled 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 (Penning)

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 after Penning 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 KF	DN 16 KF	DN 25 KF	DN 32 KF	DN 40 KF	DN 16 CF	DN 40 CF
Outer centering ring with O-ring Aluminium / FPM (Viton)	Part No. 183 53		Part No. 183 54	Part No. 183 55		-	-
Fine filter on centering ring with O-ring Stainless steel / FPM (Viton)	Part No. 883 95	Part No. 883 96	Part No. 883 97	-	Part No. 883 98	-	-
Connection accessories for metal seals or degassing room up to 150 °C							
Ultra sealing ring, aluminum (Set of 3)	Part No. 883 73		Part No. 883 75	-	Part No. 883 75	-	-
Outer support ring	Part No. 883 74		Part No. 883 76	-	Part No. 883 78	-	-
Clamping ring	Part No. 882 75		Part No. 882 77	-	Part No. 882 78	-	-
Connection accessories for CF connections							
Copper seals, (set of 10 pieces)	-	-	-	-	-	Part No. 839 41	Part No. 839 43
Screw (set of 25 pieces)	-	-	-	-	-	Part No. 839 40	Part No. 839 01

Bourdon Vacuum Gauges



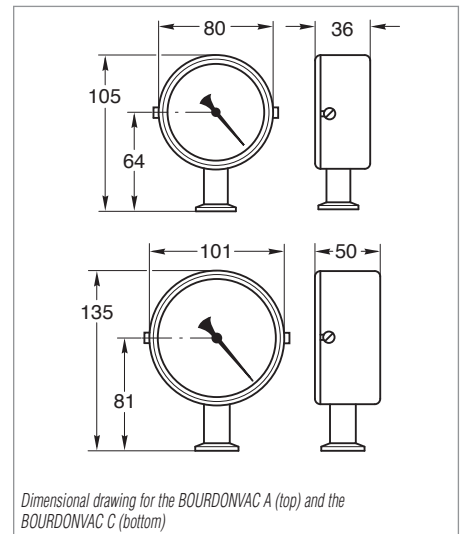
Rugged vacuum gauges based on the Bourdon principle covering the pressure range from 1 to 1020 mbar (0.75 to 765 Torr).

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)
- ◆ Safety gauge which complies with UW-VBG 61 § 16 (BOURDONVAC C)

Typical Applications

- ◆ Vacuum distillation
- ◆ Drying processes
- ◆ For explosion hazard applications
- ◆ Vacuum conveying systems



Technical Data		BOURDONVAC A	BOURDONVAC C
Measurement range	mbar	1 to 1020	
Measurement uncertainty	% 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	10 to 100 (max.)
Flange connection	DN	16 KF	
Length of scale	mm	140	207
Diameter	mm	79	101
Overall height	mm	105	136
Weight	kg (lbs)	0.25 (0.55)	0.6 (1.3)
Materials in contact with the medium		Nickel plated standard steel, bronze, soft solder	Stainless steel 1.4571
Ordering Information		Part No. 160 40	Part No. 161 20

Capsule Vacuum Gauges



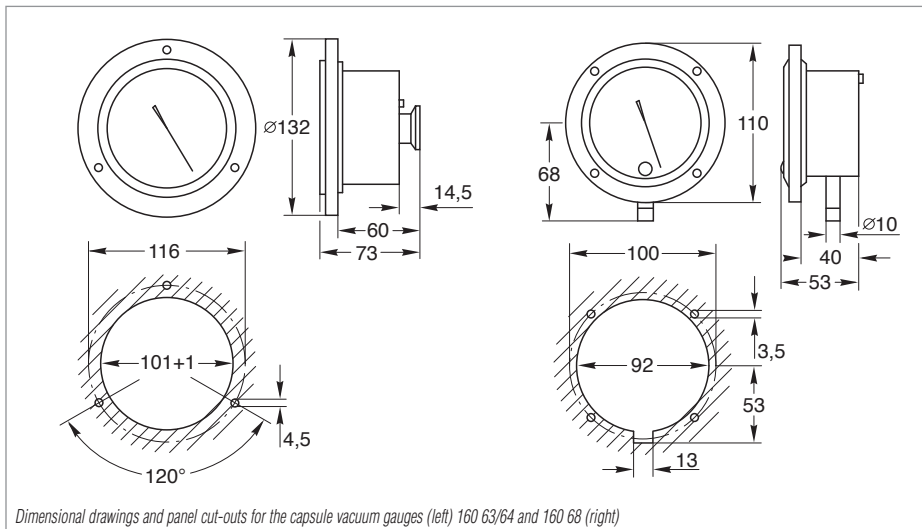
Rugged absolute pressure gauges for the pressure range from 1 to 1000 mbar (0.75 to 765 Torr).

Advantages to the User

- ◆ Rugged and insensitive to vibrations
- ◆ Models available for two measurement ranges (1 to 100 mbar/Torr and 1 to 1000 mbar/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

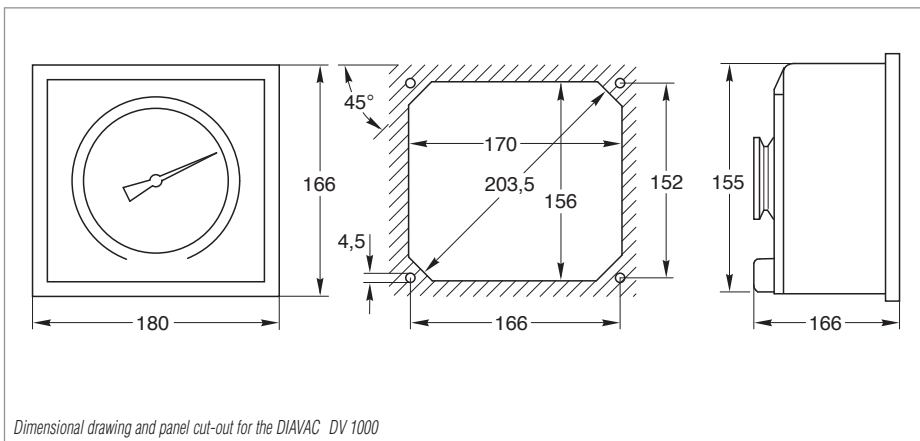


Technical Data		Capsule Vacuum Gauges		
Measurement range	mbar	1 to 100	1 to 100	1 to 1000
Measurement uncertainty	% FS	1.0	2.5	1.6
Overload range (abs.)	bar	1.5		
Storage temperature range	°C	-25 to +60		
Nominal temperature range	°C	10 to 50		
Length of scale	mm	205	180	205
Dead volume, approx.	cm³	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 KF	10 mm dia. hose nozzle with integrated isolation valve	16 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		Part No. 160 63	Part No. 160 68	Part No. 160 64

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).



Dimensional drawing and panel cut-out for the DIAVAC DV 1000

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; with factory certificate
- ◆ 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

Technical Data		DIAVAC DV 1000
Measurement range	mbar (Torr)	1 to 1000 (1 to 750)
Measurement uncertainty	1 x 10 mbar (Torr) / 10 x 1000 mbar (Torr)	± 1 mbar (Torr) / ± 10 % of meas. value
Storage / nominal temperature range	°C	-25 to +60 / 0 to 60
Permissible overload (abs.)	bar	3
Length of scale / dead volume	mm / cm ³	270 / 130
Vacuum connection	DN	40 KF
Dimensions (W x H x D)	mm	180 x 166 x 100
Weight	kg (lbs)	2.7 (5.95)
Materials in contact with the medium		Stainless steel 1.4301, 1.4310 (diaphragm), FPM

Ordering Information		DIAVAC DV 1000
DIAVAC DV 1000, mbar readout		Part No. 160 67 *)
DIAVAC DV 1000, Torr readout		Part No. 896 06 *)
DKD calibration		Part No. 157 12
Replacement sintered filter with DN 40 KF centering ring		Part No. 231 93 515
Replacement housing, complete		Part No. 240 000

*) Complete with centering ring and sintered filter

Typical Applications

- ◆ Chemical processes
- ◆ Vacuum distillation
- ◆ Absolute pressure measurements for gas mixtures
- ◆ For use in explosion hazard rated areas
- ◆ Drying processes
- ◆ Lamp manufacture



CTR90/CTR91 CERAVAC Transmitters



The CERAVAC Transmitter with its diaphragm made of pure aluminium oxide ceramics offers excellent accuracy and reproducibility.

Advantages to the User

- ◆ Excellent accuracy
- ◆ Corrosion resistant
- ◆ High resolution
- ◆ Very good temperature stability
- ◆ Electrically and mechanically compatible with the conventional capacitance manometers with stainless steel diaphragm
- ◆ Heated and unheated types are available

Typical Applications

- ◆ General purpose pressure measurements in the medium and rough vacuum range, also for corrosive process gases
- ◆ Chemical process engineering
- ◆ Semiconductor production processes
- ◆ Suited as a reference sensor for monitoring test instruments in accordance with DIN/ISO 9000

The Ceramics Diaphragm

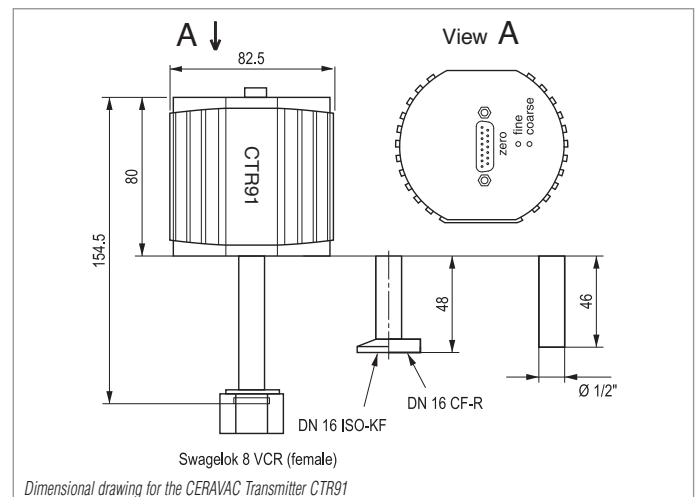
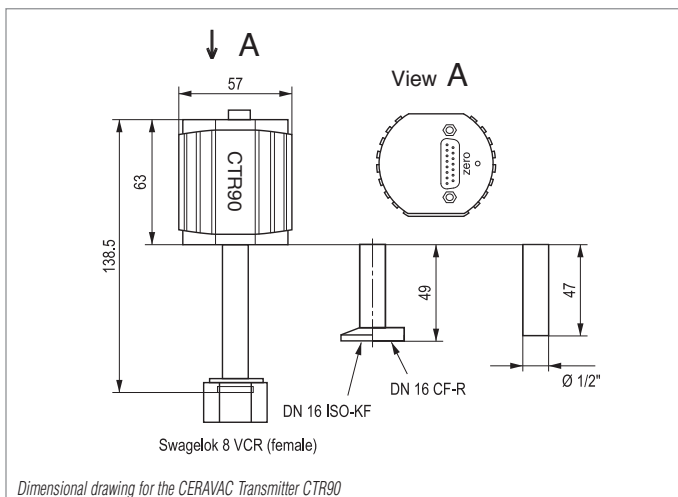
The stiffness of aluminium oxide ceramics is greater than that of metal so that the ceramics material will offer improved long term stability characteristics when exposed to frequent pressure changes or overpressures. For this reason the aluminium oxide ceramics diaphragm of the CERAVAC sensors is capable of returning precisely to its initial position with respect to a certain pressure so that the measurements will be highly

reproducible. Since the diaphragm is not impaired by overpressures or frequent pressure changes, no blocking valves will be required – a significant contribution towards reducing costs.

Moreover, aluminium oxide ceramics diaphragms return faster to their initial position compared to metal diaphragms; the time need between the processes for the measurement to stabilise is reduced. This is particularly important in the case of measurements close to Zero where metal

diaphragms will take several minutes to return to their resting position.

Whereas metal diaphragms suffer from residual tensions and unavoidable irregularities due to their production process, diaphragms made of aluminium oxide ceramics are exceptionally homogeneous, and owing to the firing process at 2500 °C entirely free of tensions. This considerably helps to reduce part to part variations in the sensors.



Technical Data	CTR90 (Temperature Compensated)		CTR91 (45 °C Heated)	
Full scale (FS) 1000 Torr 100 Torr 10 Torr 1 Torr 0.1 Torr	Measurement range 0.1 - 1000 Torr 0.01 - 100 Torr 1 · 10 ⁻³ - 10 Torr 1 · 10 ⁻⁴ - 1 Torr -		Measurement range 0.1 - 1000 Torr 0.01 - 100 Torr 1 · 10 ⁻³ - 10 Torr 1 · 10 ⁻⁴ - 1 Torr 1 · 10 ⁻⁵ - 0.1 Torr	
	Pressure units: 1 Torr = 1.33 mbar = 133 Pascal			
Materials exposed to gases	Ceramic (Al ₂ O ₃), stainless steel 316, Vacon 70			
Max. overrange pressure	1000 Torr for 0.1 Torr sensors, 2000 Torr for 1/10/100 Torr sensors 3000 Torr for 1000 Torr sensors			
Measurement uncertainty	0.2% of reading ± temperature effects		0.15% of reading ± temperature effects	
Resolution	0.0025% of FS for 0.1/1 Torr sensors 0.0015% of FS for 10/100/1000 Torr sensors			
Temperature effects				
Zero coefficient	1 Torr sensor 0.015 of FS		10/100/1000 Torr sensor 0.005 of FS	
Span coefficient			0.1 Torr sensor 0.005 of FS	
			1/10/100/1000 Torr sensor 0.0025 of FS	
	%/°C		%/°C	
			0.01 of reading	
Reaction time	ms		≤ 30	
Nominal temperature range	°C		5 to 50	
			15 to 40	
Supply voltage	V DC		either ± 15 or +24	
Current consumption	mA		23	
			300	
Signal output	V		0 - 10; linear	
			0 - 10; linear	
Weight, approx	kg (lbs)		0.26 (0.57)	
			0.485 (1.07)	
Dead volume	cm ³		6	
			7	
Connection cable	see section "Connection Cable for active Sensors"			
Calibration	see section "Miscellaneous", para. "LEYBOLD Calibration Service"			

Ordering information	Part No.	159 -	Ordering information	Part No.	159 -
CTR90 (temperature compensated)			CTR91 (45 °C heated)		
Vacuum fitting			Vacuum fitting		
DN KF 16	2		DN KF 16	2	
DN CF 16	3		DN CF 16	3	
Cajon 8 VCR	4		Cajon 8 VCR	4	
1/2" tube	5		1/2" tube	5	
Measurement range			Measurement range		
1000 Torr	1		1000 Torr	5	
100 Torr	2		100 Torr	6	
10 Torr	3		10 Torr	7	
1 Torr	4		1 Torr	8	
			0.1 Torr	9	



TTR 90/TTR 90 S THERMOVAC Transmitters



The further developed THERMOVAC transmitter with improved temperature compensation, reduced size and optimized price-to-performance ratio.

The value of the trigger point can be switched easily on the analog output and be shown on the display of the operating unit.

Advantages to the User

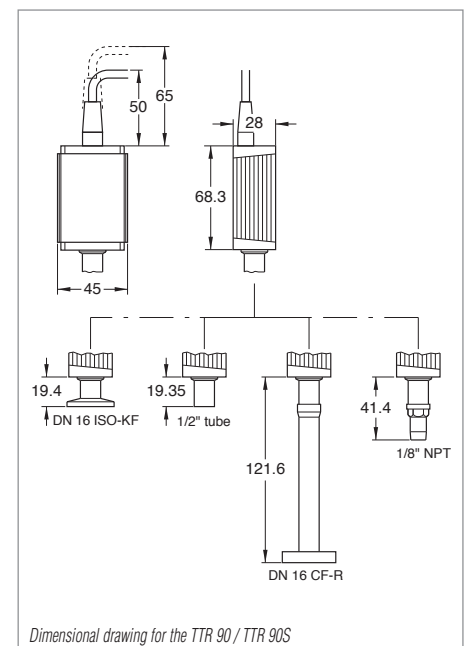
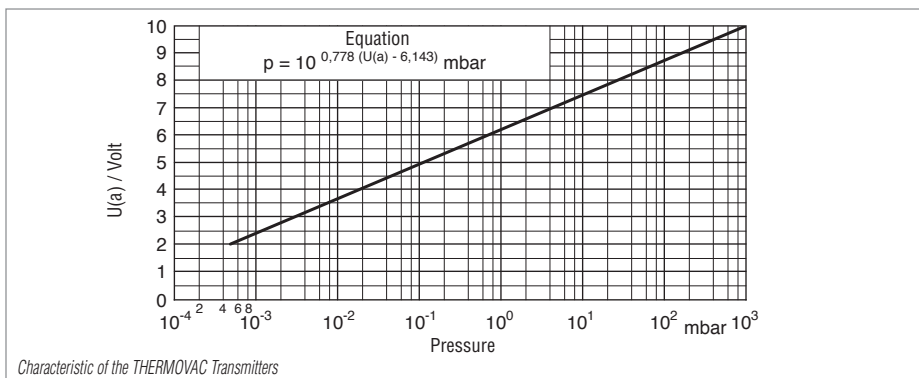
- ◆ Rugged sensing cells made of stainless steel
- ◆ Compact design
- ◆ Stable measurements owing to optimized temperature compensation
- ◆ Highly resistant to overpressures
- ◆ Exchangeable sensing cells
- ◆ Extremely fast response
- ◆ Upon request also available with integrated switching relay

Typical Applications

- ◆ Analytical engineering
- ◆ Safety circuits in vacuum systems
- ◆ Controlling ionization gauges
- ◆ General pressure measurement and control on systems in the fine and rough vacuum range which have the following requirements:
 - ◆ Immediate data transfer to a programmable control/computer via analog interface
 - ◆ Coverage of greater distances between the point of the measurement and processing location
 - ◆ Several locations which are to be monitored continuously
 - ◆ Low voltage supply
 - ◆ Simple, cost and space saving installation
 - ◆ Increased reliability
 - ◆ Simple operation

Sensor

The highly compact sensing cell is equipped with two filaments. Whereas one filament is used to measure the pressure, the second filament serves the purpose of temperature compensation by directly detecting the gas temperature.



Technical Data		TTR-Transmitter
Display range	mbar (Torr)	5×10^{-4} to 1 000 (3.75×10^{-4} to 750)
Measurement uncertainty		15 % in the Range 1×10^{-3} to 100 mbar
Principle of measurement		Thermal conductivity acc. to Pirani
Supply voltage		14 to 32 V DC Hum voltage $\leq 1 V_{SS}$
Power consumption	VA	≤ 1
Storage/nominal temperature range	°C	-20 to +65 / 5 to 60
Max. rel. humidity	% n.c.	≤ 80
Protection class		IP 40
Weight, approx.	kg (lbs)	0.15 (0.34)
Sensor		Exchangeable sensing cell
Degassing temperature, max	°C	KF: 80 / CF: 250
Dead volume, approx.	cm ³	KF: 2 / CF: 10
Materials in contact with the medium		Stainless steel, tungsten, nickel, glass, copper
Over-pressure rating, abs.	bar	10
Signal output ($R_a > 10 \text{ k}\Omega$)		0 to 10.3 V
Measurement signal		1.9 to 10 V, corresp. 5×10^{-4} to 1×10^3 mbar 1.286 V/decade Error: $\leq 0.5 \text{ V}$
Status signal		
Trigger (only TTR 90 S)		Normally open relay contact
Adjustment range	mbar (Torr)	2×10^{-3} to 500 (1.5×10^{-3} to 375)
Hysteresis		30 %
Reaction time	ms	50
Rating		60 V, 0.5 A DC
Error status		Relay contact open
Status indicators (only TTR 90 S)		Trigger (active): Green LED
Electrical connection		FCC-68 socket, 8 way with shield
Cable length, max.	m	100

Ordering Information	TTR-Transmitter
Without switching threshold	
TTR 90, DN 16 KF	Part No. 128 10
TTR 90, 1/8" NPT	Part No. 128 11
TTR 90, DN 16 CF	Part No. 128 12
TTR 90, 1/2" Tube	Part No. 128 13
With switching threshold	
TTR 90 S, DN 16 KF	Part No. 128 20
TTR 90 S, 1/8" NP,	Part No. 128 21
TTR 90 S, DN 16 CF	Part No. 128 22
TTR 90 S, 1/2" Tube	Part No. 128 23
Replacement sensing cell	
DN 16 KF	Part No. 128 15
1/8" NPT	Part No. 128 16
DN 16 CF	Part No. 128 17
1/2" Tube	Part No. 128 18
Calibration	see section "Miscellaneous", para. "LEYBOLD Calibration Service"
Connecting cable, FCC 68 on both ends, 8 way with shield	Type A Part No. 124 26 Part No. 230 012 Part No. 124 27 Part No. 124 28 Part No. 124 29 Part No. 124 30 Part No. 124 31 Part No. 124 32
5 m	
10 m	
15 m	
20 m	
30 m	
40 m	
50 m	
75 m	
100 m	

TTR 211/TTR 216 S THERMOVAC Transmitters



The THERMOVAC transmitters have been developed especially for integration into vacuum systems. Being active sensors (pressure to voltage converters) with a well-proven Pirani sensing cell and new operating and processing electronics these units offer a measurement range which spans 5×10^{-4} to 1000 mbar (3.75×10^{-4} to 750 Torr).

Advantages to the User

- ◆ Rugged Pirani sensing cells also for corrosive media
- ◆ Logarithmic signal output (algorithm supplied)
- ◆ High reproducibility
- ◆ Easily exchangeable sensing cells
- ◆ Switching threshold adjustable over a wide range (1×10^{-3} to 500 mbar (1×10^{-3} to 375 Torr)) and relay contact
- ◆ LED indicator for operation and trigger active
- ◆ Easily accessible monitoring connection to check the measurement signal and the trigger setting (voltmeter)
- ◆ High EMI compatibility through screened housing, FCC-68 connector and cables
- ◆ Computer interface
- ◆ Field bus: Profibus DP/DeviceNet
- ◆ CE mark

Typical Applications

- ◆ Analytical engineering
- ◆ Safety circuits in vacuum systems
- ◆ Controlling ionization gauges
- ◆ Vacuum furnaces
- ◆ General pressure measurement and control on systems in the fine and rough vacuum range which have the following requirements:
 - ◆ Immediate data transfer to a programmable control/computer via analog interface
 - ◆ Coverage of greater distances between the point of the measurement and processing location
 - ◆ Several locations which are to be monitored continuously
 - ◆ Low voltage supply
 - ◆ Simple, cost and space saving installation
 - ◆ Increased reliability
 - ◆ Simple operation
 - ◆ Increased requirements concerning electromagnetic compatibility (EMI)

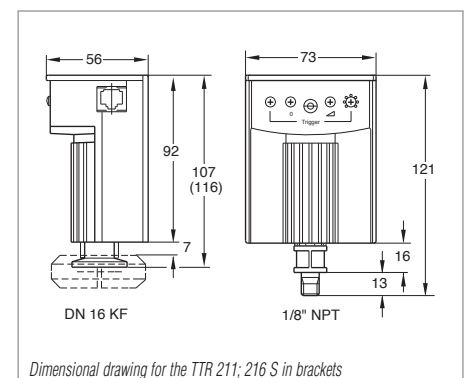
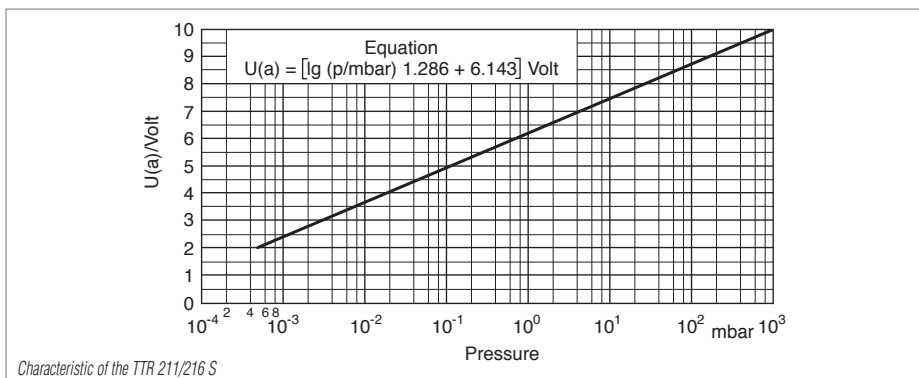
Sensor

The well-proven Pirani sensing cells with tungsten filament and a DN 16 KF flange are built into the TTR 211 THERMOVAC transmitters. The TTR 216 S transmitter is equipped with a stainless steel sensing cell, with a platinum filament and an Al_2O_3 ceramics current feedthrough for use in connection with corrosive media or where much water vapor is present. The sensing cells can be easily exchanged on all transmitters.

If required, the sensing cell can easily be aligned at atmospheric pressure and "Zero" pressure through two potentiometers.

Integration of the transmitter in programmable control systems is facilitated by the straight characteristic which may be defined by entering a simple equation into the computer.

Through the built-in relays it is possible to perform important switching functions directly through the transmitter without the need of a programmable control.



Technical Data		TTR Transmitter	Ordering Information	TTR Transmitter
Display range	mbar (Torr)	5×10^{-4} to 1000 (3.75×10^{-4} to 750)	TTR 211 D, DN 16 KF Tungsten filament (1 trigger) DeviceNet interface Replacement sensing cell	Part No. 896 51 Part No. 157 75
Measurement uncertainty		20 % in the range 1×10^{-3} to 1×10^{-2} mbar (0.75×10^{-3} to 0.75×10^{-2} Torr) 15 % in the range 1×10^{-2} to 30 mbar (0.75×10^{-2} to 22.5 Torr)	TTR 211 PB, DN 16 KF Tungsten filament (1 trigger) Profibus DP interface Replacement sensing cell	Part No. 896 50 Part No. 157 75
Principle of measurement		Thermal conductivity acc. to Pirani	TTR 216 S, DN 16 KF, Platinum filament (1 trigger) Replacement sensing cell	Part No. 157 31 Part No. 157 77
Supply voltage		14.5 to 36 V DC, typ. 24 V DC Hum voltage $\leq 2 V_{pp}$	TTR 216 D, DN 16 KF Platinum filament (1 trigger) DeviceNet interface Replacement sensing cell	Part No. 896 53 Part No. 157 77
Power consumption	VA	< 2	TTR 216 PB, DN 16 KF Platinum filament (1 trigger) Profibus PB interface Replacement sensing cell	Part No. 896 52 Part No. 157 77
Storage/nominal temperature range	°C	-20 to +70/10 to 50	Calibration	see section "Miscellaneous", para. "LEYBOLD Calibration Service"
Max. rel. humidity (climatic class F) % n.c.		95	Connecting cable, FCC 68 on both ends, 8 way with shield	Type A Part No. 124 26 Part No. 230 012 Part No. 124 27 Part No. 124 28 Part No. 124 29 Part No. 124 30 Part No. 124 31 Part No. 124 32 Part No. 124 33
Protection class		IP 40	5 m 10 m 15 m 20 m 30 m 40 m 50 m 75 m 100 m	
Dimensions (H x W x D)	mm	106 x 73 x 56		
Weight, approx.	kg (lbs)	0.29 (0.64)		
Inflammability		UL 94 - V 2		
Sensor		Exchangeable sensing cell		
Filament		Tungsten (TTR 211)/platinum (TTR 216)		
Vacuum connection	DN	16 KF		
Degassing temperature, max	°C	80 at the flange		
Dead volume, max.	cm ³	11		
Materials in contact with the medium		TTR 211: Aluminum, nickel-plated steel, Vacon, tungsten, CrNi8020, glass, epoxy cement; TTR 216 S: Stainless steel, CrNi, Al ₂ O ₃ ceramics, NiFe, Mo, Ni, platinum		
Over-pressure rating, abs.		TTR 211: 3 bar, TTR 216: 10 bar		
Signal output ($R_a > 10 \text{ k}\Omega$)		0 to 10.6 V		
Measurement signal		1.9 to 10 V, corresp. 5×10^{-4} to 1×10^3 mbar logarithmic divisions 1.286 V/decade		
Status signal		broken filament 10.5 V		
Trigger		n.o./changeover relay contact		
Adjustment range	mbar (Torr)	1×10^{-3} to 500 (0.75 to 375)		
Hysteresis		about 30 % of the adjusted pressure		
Reaction time	ms	≤ 50		
Rating		60 V, 0.5 A DC		
Error status		contact open in case of broken filament or supply off		
Status indicators		Operation (Power): Orange LED Trigger (active): Green LED		
Monitor output ($R_a \geq 100 \text{ k}\Omega$)		Jack socket (3.5 mm) at which the measurement signal and the trigger setting is available		
Electrical connection		FCC-68 socket, 8 way with shield		
Cable length, max.	m	100		
Interface				
TTR 211 D		DeviceNet		
TTR 211 PB		Profibus DP		

PTR 225/PTR 225 S/PTR 237 PENNINGVAC Transmitters



The PENNINGVAC transmitters have been developed especially for integration into systems. Being active sensors (pressure to voltage converters) equipped with a rugged cold cathode sensing cell and matching operating and processing electronics these units offer a wide measurement range of 1×10^{-9} to 1×10^{-2} mbar (0.75×10^{-9} to 0.75×10^{-2} Torr). The measurement signal may be transmitted over great distances without problems.

Advantages to the User

- ◆ All-metal cold cathode sensors (inverted Penning)
- ◆ High reproducibility
- ◆ Good ignition characteristics through the new design for the electrodes
- ◆ Low tendency to collect contamination (also during argon operation) due dropping of the high voltage after the plasma has been ignited and through the use of titanium cathodes
- ◆ Switching threshold adjustable over a wide range (1×10^{-9} to 1×10^{-3} mbar (0.75×10^{-9} to 0.75×10^{-2} Torr)) and relay contact (PTR 225 S)
- ◆ Low stray magnetic field
- ◆ High EMI compatibility through screened housing, FCC-68 connector and cables
- ◆ LED indicator for operation
- ◆ Logarithmic signal output (algorithm supplied)
- ◆ Intelligent interface (in preparation)
- ◆ CE mark
- ◆ High resistance against sputtering due to titanium cathode plates

Typical Applications

- ◆ Evaporation and sputtering systems
- ◆ Analytical engineering
- ◆ Vacuum furnaces
- ◆ High vacuum systems
- ◆ General pressure measurement and control on systems in the fine and rough vacuum range which have the following requirements:
 - ◆ Immediate data transfer to a programmable control/computer via analog interface
 - ◆ Coverage of greater distances between the point of the measurement and processing location
 - ◆ Several locations which are to be monitored continuously
 - ◆ Low voltage supply
 - ◆ Simple, cost and space saving installation
 - ◆ Increased reliability (sputtering)
 - ◆ Simple operation
 - ◆ Increased requirements concerning electromagnetic compatibility (EMI)

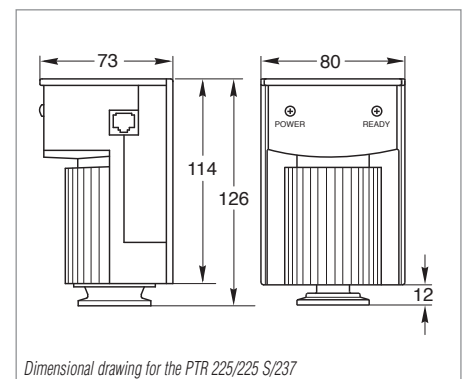
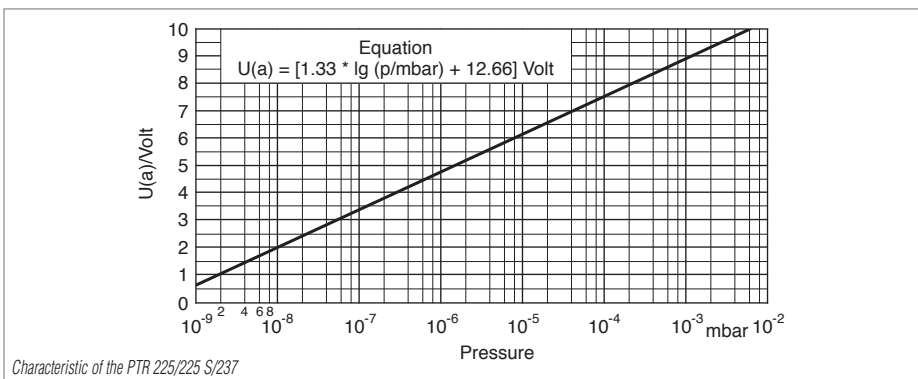
Sensor

Cold cathode sensors based on the well proven principle of the inverted PENNINGVAC having a DN 25 KF or DN 40 CF flange are built into the PENNINGVAC transmitters PTR 225/225 S/237 S. For degassing of the all-metal sensor with Al_2O_3 current feedthrough the housing of the transmitter with its electronics as well as the magnet may easily be removed. The magnet used offers a closed magnetic field so that its stray field is negligible. Thus the PTR 225/225 S/237 may also be installed close to sensitive parts within a system.

The anode ring and the titanium cathode plates may be exchanged easily for quick maintenance of the sensors should they be contaminated. The shape of the newly designed cathode plates is such that they also act as a baffle for the sensors.

Integration of the transmitter in programmable control systems is facilitated by the straight characteristic which may be defined by entering a simple equation into the computer.

Through the built-in relay (PTR 225 S) it is possible to perform important switching functions directly through the transmitter without the need of a programmable control.



Technical Data		PTR Transmitter	Ordering Information	PTR Transmitter
Display range	mbar (Torr)	1×10^{-9} to 1×10^{-2} (0.75×10^{-9} to 0.75×10^{-2})	PTR 225, DN 25 KF	Part No. 157 34
Measurement uncertainty		30 % in the range 1×10^{-8} to 1×10^{-4} mbar (0.75×10^{-8} to 0.75×10^{-4} Torr)	PTR 225 S, DN 25 KF	Part No. 164 34
Principle of measurement		Cold cathode ionization after Penning	PTR 225 PB, DN 25 KF Profibus interface	Part No. 896 41
Supply voltage		14.5 to 36 V DC typ. 24 V DC hum voltage $\leq 2 V_{pp}$	PTR 237, DN 40 CF	Part No. 157 36
Power consumption	VA	< 2	PTR 237 D, DN 40 CF DeviceNet interface	Part No. 896 42
Storage/nominal temperature range	°C	-20 to +70/10 to 50	Replacement cathode plates, titanium (set of 5 pieces)	Part No. 162 91
Max. rel. humidity (climatic-class F)	% n.c.	95	Replacement anode ring	Part No. 240 002
Protection class		IP 40	Calibration	see section "Miscellaneous", para. "LEYBOLD Calibration Service"
Dimensions (H x W x D)	mm	125 x 80 x 73	Connecting cable, FCC 68 on both ends, 8 way with shield	Type A Part No. 124 26 Part No. 230 012 Part No. 124 27 Part No. 124 28 Part No. 124 29 Part No. 124 30 Part No. 124 31 Part No. 124 32 Part No. 124 33
Weight, approx.	kg (lbs)	0.5 (1.1)	5 m	
Inflammability		UL 94 - V 2	10 m	
Sensor		Detachable for cleaning	15 m	
Vacuum connection	DN	25 KF or 40 CF	20 m	
Degassing temperature, max.	°C	350 with electronics detached	30 m	
Dead volume, max.	cm ³	21	40 m	
Materials in contact with the medium		Stainless steel, CrNi, Al ₂ O ₃ ceramics, NiFe, Mo, Cu, Ni, titanium	50 m	
Over-pressure rating (abs.)	bar	10	75 m	
Signal output ($R_a > 10 \text{ k}\Omega$) Measurement signal		0 to 10.6 V 0.66 to 10 V, corresponds to 1×10^{-9} to 1×10^{-2} mbar logarithm. divisions 1.333 V/decade	100 m	
Trigger (PTR 225 S) Adjustment range	mbar (Torr)	Changeover relay contact 1×10^{-9} to 1×10^{-3} (0.75×10^{-9} to 0.75×10^{-3})		
Hysteresis		about 30 % of the adjusted pressure		
Rating		60 V, 0.5 A DC		
Error status		Contact in its rest position when "no ignition" / "HT off"		
High voltage control input		ON: At U < 2.9 V, or U > 12 V OFF: At U > 3 V, or U < 7 V		
Status output Ready to measure Error (no ignition)		Voltage level HIGH (typ. 24 V DC) LOW (0 V)		
Status indicators		Operation: Orange LED Ready to measure (ignited): Green LED Trigger (active): Green LED		
Monitor output ($R_a \geq 100 \text{ k}\Omega$)		Jack socket (3.5 mm) at which the trigger setting is available		
Electrical connection		FCC-68 socket, 8 way with shield		
Cable length, max.	m	100		
Interface PTR 225 PB PTR 237 D		Profibus DP DeviceNet		

ITR 90 IONIVAC Transmitter



The ITR 90 is a new type of combination transmitter. The combination of a hot cathode ionisation sensor after Bayard-Alpert and a Pirani sensor permits vacuum pressure measurements on non-ignitable gases and gas mixtures in the pressure range from 5×10^{-10} to 1000 mbar.

If needed, the pressure can be displayed via the integrated display.

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 optimises 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 degassing temperatures during the measurements
- ◆ Insertable baffle for potentially contaminating applications and for protection against charged particles.
- ◆ 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

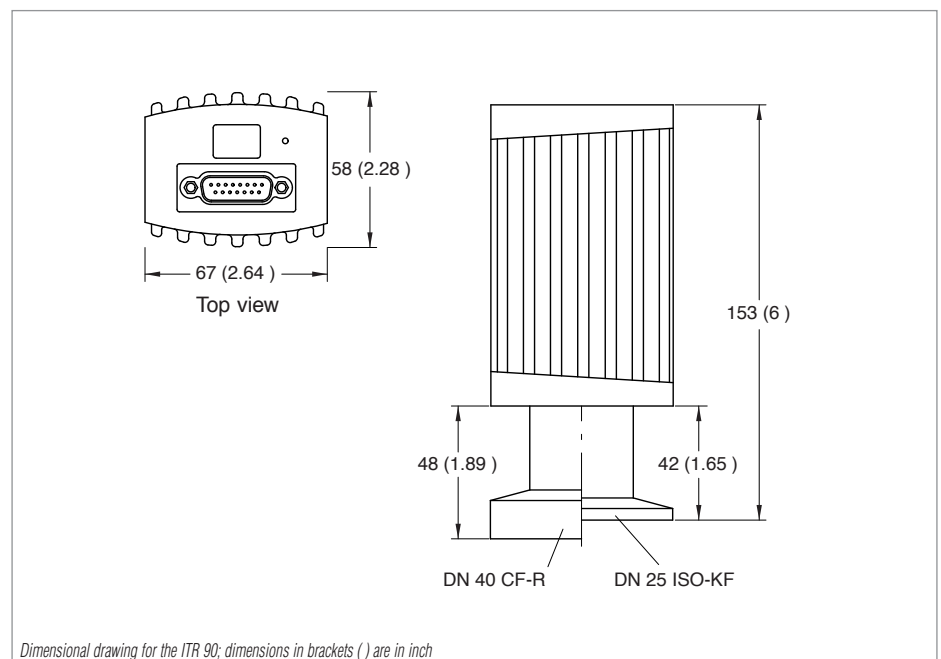
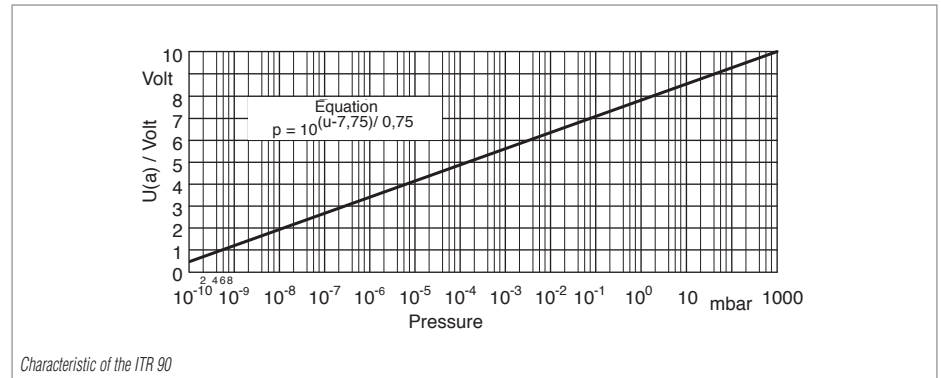
Typical Applications

- ◆ Analytical
- ◆ Evaporation and coating
- ◆ Vacuum furnaces
- ◆ General purpose pressure measurements in the medium 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 degassing extension, measurements will be possible also at flange temperatures up to 150 °C.

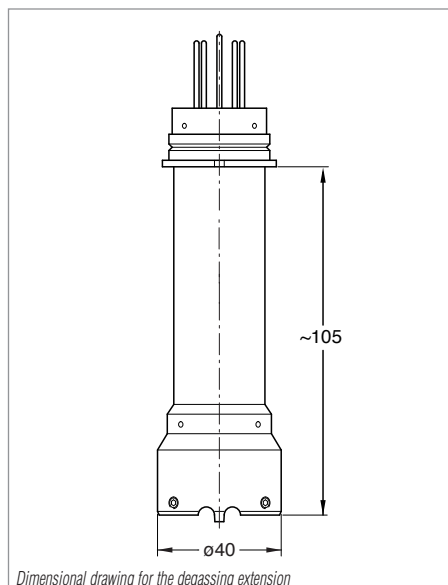


Technical Data		ITR-Transmitter
Display range	mbar (Torr)	5×10^{-10} to 1000 (3.75×10^{-10} to 750)
Measurement uncertainty, 10^{-8} - 10^{-2} mbar		15 % of the meas. value
Reproducibility, 10^{-8} - 10^{-2} mbar		5 % of the meas. value
Principles of measurement		Thermal conductivity after Pirani Hot cathode ionization vacuum gauge after Bayard-Alpert
Degas		Electron bombardment 3 minutes, max.
Supply voltage		20 to 28 V DC, typ. 24 V DC
Power consumption, max.	W	16
Storage / nominal temperature range	°C	-20 to +70 / 0 to +50
Protection class		IP 30
Weight, approx.		
	ITR 90, DN 25 KF	kg (lbs)
	ITR 90, DN 40 CF	kg (lbs)
		0.285 (0.64)
		0.550 (1.24)
Sensor		Fully sealed, exchangeable
Degassing temperature, max.	°C	150 *)
Dead volume, max.	cm ³	24 at DN 25 KF 34 at DN 40 CF
Materials in contact with the medium		Cu, W, Glas, NiFe, Mo, Stainl. steel, Al, Iridium, Yttrium, NiCr,
Over-pressure rating (abs.)	bar	2
Signal output ($R_a \geq 10 \text{ k}\Omega$)		
Measurement signal		0 - 10 V, 0.774 - 10 V, 0.75 V pro decade
Error signal		< 0,5 V
Interface		RS 232 C
Electrical connection		15 way Sub-D male connector/ Pin contacts
Cable length, max.	m	100 / 30 at RS 232 C

*) Flange temperature when using the degassing extension

Ordering Information	ITR-Transmitter	
ITR 90, DN 25 ISO KF	Without display Part No. 120 90	With display Part No. 120 91
ITR 90, DN 40 CF-R, rotatable CF flange	Part No. 120 92	Part No. 120 94
Options		
Power supply for IONIVAC transmitter 100 V - 240 V AC / 24 V DC incl. 5 m connection cable and 5 m RS 232 C cable Degassing extension (100 mm, approx.) Baffle	Part No. 121 06 Part No. 127 06 Part No. 121 07	
Replacement sensor IE 90, DN 25 ISO KF **) IE 90, DN 40 CF-R **)	Part No. 121 02 Part No. 121 03	
Calibration	see section "Miscellaneous", para. "LEYBOLD Calibration Service"	
Connection cable	see section "Connection Cable for active Sensors"	

**) including hex. socket screw key



ITR 100 IONIVAC Transmitter



These IONI transmitters have been developed especially for integration into vacuum systems. Being active sensors (pressure to voltage converters) with the newly developed wide-range Bayard-Alpert sensing system, this type of gauge offers a measurement range which spans 2×10^{-10} to 1×10^{-1} mbar (1.5×10^{-10} to 0.75×10^{-1} Torr) and IP 54 protection.

Advantages to the User

- ◆ Wide measurement range of 2×10^{-10} to 1×10^{-1} mbar (1.5×10^{-10} to 0.75×10^{-1} Torr) with a single sensor
- ◆ High reproducibility of $\pm 10\%$ of the meas. value within the process pressure range
- ◆ Fully encapsulated sensor with a very stable geometry for the electrodes
- ◆ Increased service life through dual cathodes – automatic switchover in case of failure
- ◆ Long-life iridium cathodes with yttriumoxide coating
- ◆ Uninterrupted measurements in the degas mode through electron bombardment
- ◆ Easy to exchange sensors with automatic self-calibration
- ◆ Switching threshold adjustable over a wide range (1×10^{-9} to 1×10^{-1} mbar (0.75×10^{-9} to 0.75×10^{-1} Torr)) and relay contact
- ◆ Standardized measurement and control signals
- ◆ 0 to 10 V analog output with selectable logarithmic/linear characteristic (algorithm supplied)
- ◆ Computer interfaces:
 - RS 232 C
 - Field bus: Profibus DP/DeviceNet
- ◆ LEDs to indicate operating modes, and for selfdiagnosis
- ◆ Rugged IP 54 metal enclosure
- ◆ High EMI compatibility through screened enclosure, screened sensor and electric interference suppression on all inputs and outputs
- ◆ CE mark

Typical Applications

- ◆ Analytical engineering
- ◆ Evaporation and coating systems
- ◆ Vacuum furnaces
- ◆ General pressure measurement and control on systems in the fine and rough vacuum range which have the following requirements:
 - ◆ Immediate data transfer to a programmable control/computer via analog interface
 - ◆ Coverage of greater distances between the point of the measurement and processing location
 - ◆ Several locations which are to be monitored continuously
 - ◆ Low voltage supply
 - ◆ Simple, cost and space saving installation
 - ◆ Increased reliability
 - ◆ Simple operation
 - ◆ Increased requirements concerning electromagnetic compatibility (EMI)

Sensor

The wide range Bayard-Alpert sensing system is mechanically protected by the metal tube which surrounds it. The rugged arrangement of the electrodes ensures highly reproducible measurements over the entire range.

Each sensor is individually calibrated in the factory. The calibration data is stored in an EEPROM and is fully integrated into the sensor.

When exchanging the sensor, the electronics of the transmitter are automatically adjusted to the connected sensor, so that the specified reproducibility can be guaranteed.

The sensor with a CF flange is equipped with a welded current feedthrough which enables degassing of the sensor at a temperature of $150\text{ }^{\circ}\text{C}$ with the electronics in place.

Sensor supply and processing of the measurement data is performed by microprocessor controlled electronics, which require a 24 V power supply and draw a very low current.

The microcontroller also controls the ITR 100 in that it monitors the emission, converts and corrects the measurement data (automatic correction of the sensor's sensitivity, matching of the unit etc.) and monitoring of the trigger thresholds for the relay.

The selectable signal output characteristics (linear/logarithmic) as well as the digital computer interfaces permits easy integration in existing or future system concepts.

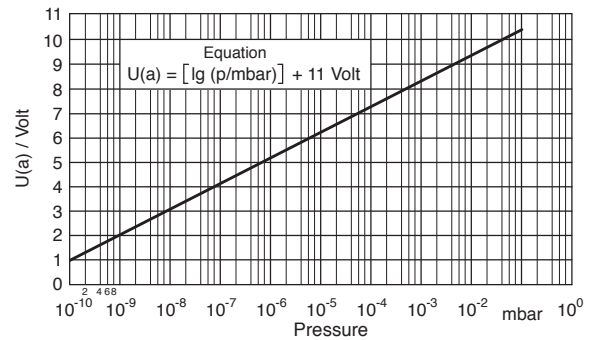
ITR 100 with tungsten filament is available upon request.

Technical Data		ITR Transmitter
Display range	mbar (Torr)	2×10^{-10} to 1×10^{-1} (1.5×10^{-10} to 0.75×10^{-1}) Threshold 1×10^{-10} (0.75×10^{-10})
Reproducibility (standard deviation to DIN 1319-1)		± 10 % of the meas. value, in proc. press. range 1×10^{-7} to 1×10^{-2} mbar
Principle of measurement		Wide range Bayard-Alpert ionization gauge
Degas		Electron bombardment 3 minutes, max.
Emission current (automatic switching)		5 mA to about 5×10^{-5} mbar $25 \mu\text{A}$ from about 5×10^{-5} to 1×10^{-1} mbar
Supply voltage		20 to 28 V DC, typ. 24 V DC Hum voltage $\leq 2 V_{pp}$
Current consumption	A	0.5 in the measurement mode
	A	0.8 in the degassing mode
	A	1.4 during start-up (about 1 s.)
Storage / nominal temperature range	°C	-20 to +70 / 0 to +50
Max. rel. humidity (climatic class F)	% n.c.	95
Protection class		IP 54
Dimensions (H x W x D)	mm	See dimensional drawing
Weight, approx.		
ITR 100, DN 25 KF	kg (lbs)	0.98 (2.2)
ITR 100, DN 40 CF	kg (lbs)	1.28 (2.8)
Sensor		Fully sealed, exchangeable, with automatic self-calibration
Cathode		2 x yttriumoxide coated iridium cathode, capable of withstanding air inrushes, automatic switch off in case of overpressures
Vacuum connection	DN	25 KF or 40 CF-R
Degassing temperature, max.	°C	80 (DN 25 KF flange), 150 (DN 40 CF flange)
Dead volume, max.	cm ³	24 at DN 25 KF 34 at DN 40 CF-R
Materials in contact with the medium		Stainl. steel, yttriumoxide, glass, NiFe, NiCr, tungsten
Over-pressure rating (abs.)	bar	2
Signal output ($R_a \geq 10 \text{ k}\Omega$) Measurement signal (selectable)		0 to 10 V, 1 V/decade, logarithm. divisions or 3 decades selectable out of 9 decades; linear over 9 decades, mantissa 0.8 to 10 V with extra output for the exponent: 1 V increments/decade
Signal rise time	ms	< 100 (at $p > 1 \times 10^{-6}$ mbar)
Trigger		1 normally open relay contact
Adjustment range	mbar (Torr)	1×10^{-9} to 1×10^{-1} (0.75×10^{-9} to 0.75×10^{-1})
Hysteresis		about 10 % of the value
Reaction time	ms	≤ 100 (at $p > 1 \times 10^{-6}$ mbar)
Contact rating		60 V, 0.5 A DC
Control input ($R_E = 11 \text{ k}\Omega$) Programmable control compatible, 24 V logic		Emission: ON/OFF; DEGAS: ON/OFF Switchover between measurement signal/trigger level
Electrical connection		15 way Sub-D male connector
Cable length, max.	m	100 / 30 at RS 232 C

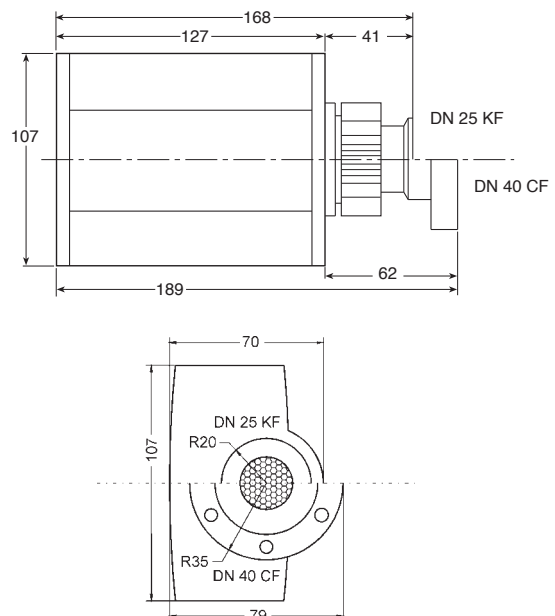
Ordering Information

ITR Transmitter

ITR 100, DN 25 KF (RS 232 C interface) Replacement sensor IE 100, DN 25 KF	Part No. 163 60 Part No. 163 61
ITR 100, DN 40 CF (RS 232 C interface) and rotatable CF flange Replacement sensor IE 100, DN 40 CF	Part No. 163 66 Part No. 163 67
ITR 100, DN 25 KF, with Profibus DP	Part No. 163 70
ITR 100, DN 40 CF, with Profibus DP	Part No. 163 72
ITR 100, DN 25 KF, with DeviceNet	Part No. 163 74
ITR 100, DN 40 CF, with DeviceNet	Part No. 163 75
Calibration	see section "Miscellaneous", para. "LEYBOLD Calibration Service"
Connection cable	see section "Connection Cable for active Sensors"



Characteristic of the ITR 100



Dimensional drawing for the ITR 100

Connection Cable for Active Sensors

Operating Units for Active Sensors

Active Sensors	DISPLAY ONE	CENTER ONE CENTER TWO CENTER THREE	COMBIVAC IT 23 COMBIVAC IT 2	CAPACITRON DM 21 CAPACITRON DM 22 COMBIVAC CM 33	Bare wire ends
	THERMOVAC TTR 90, TTR 90S, TTR 211 S, TTR 216 S	Type A	Type A	Type A	–
PENNINGVAC PTR 225, PTR 225 S, PTR 237	–	Type A	Type A	–	–
CERAVAC CTR90, CTR91	–	Type B	Type B	Type D	–
IONIVAC ITR 90 ITR 100	– –	Type C Type C ¹⁾	Type C Type C	– –	Type E Type E

¹⁾ Not in CENTER TWO and THREE

Technical Data

Connection Cable

Cables

- Type A
- Type B
- Type C
- Type D
- Type E

- FCC 68 (RJ45) on both ends, 8 way, shielded
- Sub-D 15 way female to FCC 68 (RJ45), 8 way, shielded
- Sub-D 15 way female to Sub-D 15 way male, shielded
- Sub-D 15 way female to MAS 70 S, shielded
- Sub-D 15 way female to bare wire ends, shielded

Ordering Information

Connection Cable

	Type A	Type B	Type C	Type D	Type E
Cable length					
5 m	Part No. 124 26	Part No. 230 013	Part No. 124 55	Part No. 157 64	Part No. 124 63
10 m	Part No. 230 012	Part No. 230 014	Part No. 230 022	Part No. 124 41	Part No. 230 023
15 m	Part No. 124 27	Part No. 230 015	Part No. 124 56	Part No. 124 42	Part No. 124 64
20 m	Part No. 124 28	Part No. 230 016	Part No. 124 57	Part No. 124 43	Part No. 124 65
30 m	Part No. 124 29	Part No. 230 017	Part No. 124 58	Part No. 124 44	Part No. 124 66
40 m	Part No. 124 30	Part No. 230 018	*	Part No. 124 45	Part No. 124 67
50 m	Part No. 124 31	Part No. 230 019	*	Part No. 124 46	Part No. 124 68
75 m	Part No. 124 32	Part No. 230 020	*	Part No. 124 47	Part No. 124 69
100 m	Part No. 124 33	Part No. 230 021	*	Part No. 124 48	Part No. 124 70

^{*)} Longer cable runs are not specified because of the RS 232 C connection

DISPLAY ONE



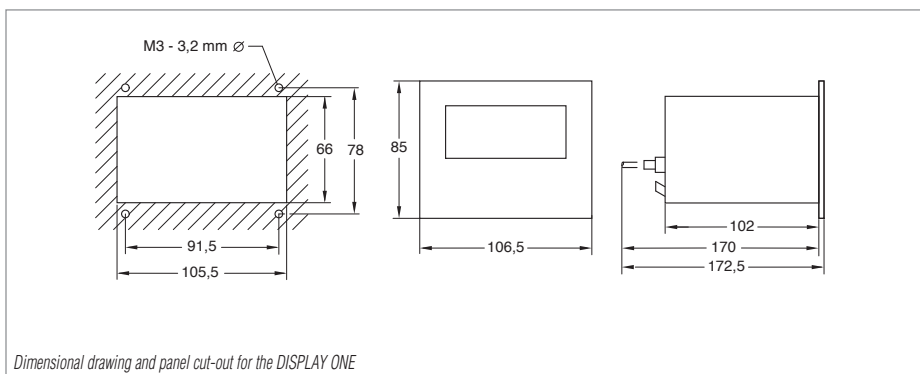
Cost-effective, compact single channel and display unit for the transmitters from the THERMOVAC line.

Advantages to the User

- ◆ Power supply voltage for the transmitters
- ◆ Two-digit mantissa in the range from 5×10^{-4} to 1×10^3 mbar
- ◆ Readout selectable between mbar, Torr or Pascal
- ◆ 0 to 10 V chart recorder output via plug-in screw terminals
- ◆ The switching thresholds of the transmitters have been looped through to plug-in terminals
- ◆ Transmitter threshold settings can be displayed by a single key press on the transmitter
- ◆ Compact bench top enclosure (1/4 19 in., 2 HU)
- ◆ For fitting into 19 in., 3 HU racks

Connectable Sensors

- ◆ TTR 211
- ◆ TTR 216
- ◆ TTR 90
- ◆ TTR 90 S



Technical Data	DISPLAY ONE	Ordering Information	DISPLAY ONE
Number of measurement channels	1	EU version, including mains cord US version, including mains cord	Part No. 230 001 Part No. 235 001
Display for measured values	Digital, 7 segment LED		
Display range mbar (Torr)	5×10^{-4} to 1×10^3 (3.8×10^{-4} to 7.5×10^2)	THERMOVAC Transmitter	
Unit of measurement (selectable)	mbar, Torr, Pascal	TTR 90, DN 16 KF	Part No. 128 10
Switching thresholds	from the transmitter are run to a terminal strip	TTR 90, 1/8" NPT	Part No. 128 11
Chart recorder output ($R_a > 2.5 \text{ k}\Omega$)	0 - 10 Volt, characteristic corresponds to the connected transmitter	TTR 90, DN 16 CF-R	Part No. 128 12
		TTR 90, 1/2" Tube	Part No. 128 13
		TTR 90 S, DN 16 KF	Part No. 128 20
		TTR 90 S, 1/8" NPT	Part No. 128 21
		TTR 90 S, DN 16 CF-R	Part No. 128 22
		TTR 90 S, 1/2" Tube	Part No. 128 23
Main connection EU version US version	180 V - 250 V / 50-60 Hz 90 V - 130 V / 50-60 Hz	Connecting cable, FCC 68 on both ends, 8 way, shielded	Type A
		5 m	Part No. 124 26
		10 m	Part No. 157 33
		15 m	Part No. 124 27
		20 m	Part No. 124 28
		30 m	Part No. 124 29
		40 m	Part No. 124 30
		50 m	Part No. 124 31
		75 m	Part No. 124 32
		100 m	Part No. 124 33
		Adapter panel for installation in a 3 HU, 19 in. rack	Part No. 230 005

CENTER ONE



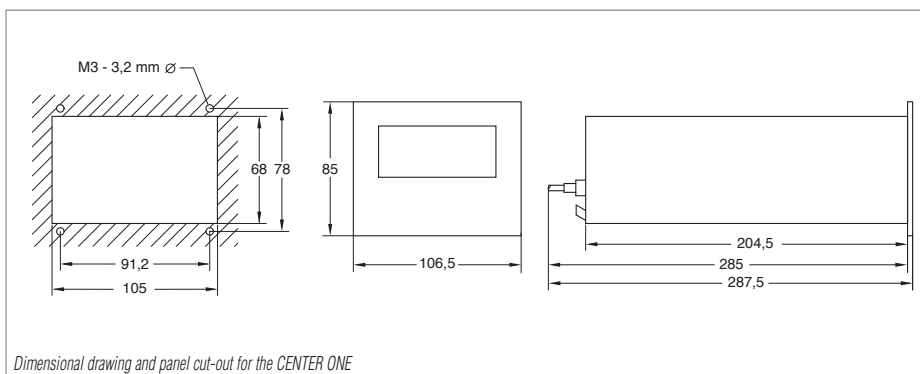
Universal and compact display and operating unit for operating the active sensors from the CERAVAC, THERMOVAC, PENNINGVAC and IONIVAC series.

Advantages to the User

- ◆ Power supply voltage for the transmitters
- ◆ Display range from 1×10^{-10} to 1330 mbar
- ◆ Automatic switchover to exponential readout of the measured data depending on the pressure range
- ◆ Readout selectable between mbar, Torr or Pascal
- ◆ Adjustable switching threshold with variable hysteresis, floating changeover contact and visual indication of the switching status on the display
- ◆ Zero correction for both display and chart recorder output through a key when using CERAVAC transmitters
- ◆ Option of entering gas correction factors
- ◆ Chart recorder output 0 - 10 Volt
- ◆ RS 232 C interface with adjustable baud rate
- ◆ Relay output for error signalling
- ◆ Compact bench top enclosure (1/4 19 in., 2 HU)
- ◆ For fitting into 19 in., 3 HU racks

Connectable Sensors

- ◆ THERMOVAC TTR 90, TTR 90 S, TTR 216
- ◆ PENNINGVAC PTR 225 and PTR 237
- ◆ CERAVAC CTR90 and CTR91
- ◆ IONIVAC ITR 90 and ITR 100



Technical Data		CENTER ONE	Ordering Information	CENTER ONE
Number of measurement channels		1	EU version with 2 m EURO mains cord US-Version with 2 m US mains cord	Part No. 230 002 Part No. 235 002
Display for measured values		Digital, 7 segment LED, 5 digits		
Display range	mbar (Torr)	1×10^{-10} to 1330 (0.75×10^{-10} to 1000)	Connecting cable THERMOVAC and PENNINGVAC	Type A
Unit of measurement (selectable)		mbar, Torr, Pascal, Micron	5 m	Part No. 124 26
Gas type correction		Factor adjustable	10 m	Part No. 230 012
Sensor connection		15 way Sub-D socket FCC68 (RJ45)	15 m	Part No. 124 27
Sensor power supply	V DC	24	20 m	Part No. 124 28
Electrical inputs and outputs		9 way Sub-D plug	30 m	Part No. 124 29
Switching threshold			40 m	Part No. 124 30
Number		1	50 m	Part No. 124 31
Adjustment range		sensor dependent	75 m	Part No. 124 32
Hysteresis		adjustable	100 m	Part No. 124 33
Relay contact		Floating changeover contact	Connecting cable CERAVAC	Type B
Load rating		60 V, 0.5 A DC / 30 V, 0.5 A AC	5 m	Part No. 230 013
Error message			10 m	Part No. 230 014
Relay contact		Floating normally open contact	15 m	Part No. 230 015
Load rating		60 V, 0.5 A DC / 30 V, 0.5 A AC	20 m	Part No. 230 016
Chart recorder output ($R_a > 10 \text{ k}\Omega$)		0 - 10 Volt, characteristic corresponds to the connected transmitter	30 m	Part No. 230 017
Control input		PTR: high voltage on / ITR 100: emission on	40 m	Part No. 230 018
Interface RS 232 C		9 way Sub-D socket	50 m	Part No. 230 019
Mains connection	V AC / Hz	85 V - 264 / 50-60	75 m	Part No. 230 020
Power consumption	W	< 30	100 m	Part No. 230 021
Weight	kg (lbs)	0.85 (1.9)	Connecting cable IONIVAC	Type C
Protection class	IP	30	5 m	Part No. 124 55
			10 m	Part No. 230 022
			15 m	Part No. 124 56
			20 m	Part No. 124 57
			30 m	Part No. 124 58
			Adapter panel for installation in a 3 HU, 19 in. rack	Part No. 230 005
			Screw terminal for the 25 way output socket	Part No. 230 006

CENTER TWO / THREE



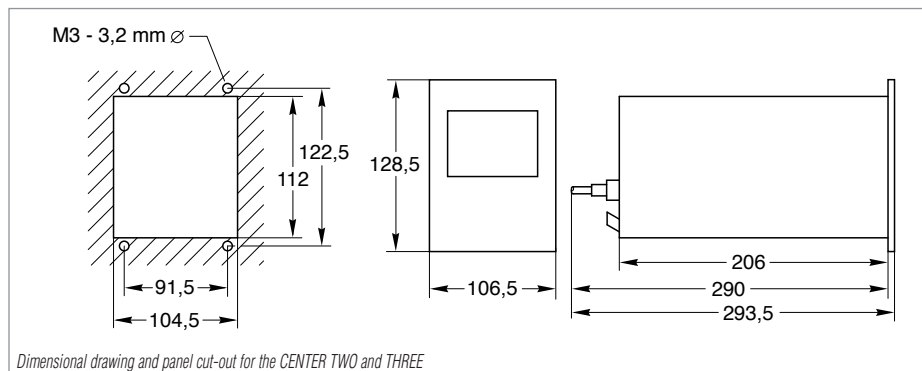
Universal display and operating units for operating the active sensors from the CERAVAC, THERMOVAC, PENNINGVAC and IONIVAC series. all channels are displayed simultaneously.

Advantages to the User

- ◆ Power supply voltage for the transmitters
- ◆ Display range from 1×10^{-10} to 1330 mbar
- ◆ Automatic switchover to exponential readout of the measured data depending on the pressure range
- ◆ Readout selectable between mbar, Torr, Micron or Pascal
- ◆ Adjustable switching thresholds with variable hysteresis, floating changeover contacts and visual indication of the switching status in the display, freely assignable to the individual measurement channels
- ◆ Zero correction for both display and chart recorder output through a key when using CERAVAC transmitters
- ◆ Option of entering gas correction factors
- ◆ Separate chart recorder outputs 0-10 V for each measurement channel
- ◆ Additional chart recorder output 0-10 V programmable to several measurement channels
- ◆ RS 232 C interface with adjustable baud rate
- ◆ Relay output for error signalling
- ◆ Compact bench top enclosure (1/4 19 in., 2 HU)
- ◆ For fitting into 19 in., 3 HU racks

Connectable Sensors

- ◆ THERMOVAC TTR 90, TTR 90 S, TTR 211 S, TTR 216 S
- ◆ PENNINGVAC PTR 225 und PTR 237
- ◆ CERAVAC CTR90 und CTR91
- ◆ IONIVAC ITR 90



Technical Data		CENTER TWO	CENTER THREE	Ordering Information		CENTER TWO	CENTER THREE
Number of measurement channels		2	3	EU-Version with 2 m EURO mains cord		Part No. 230 004	Part No. 230 003
Display for measured values		Digital, 7 segment LED, 5 digits		US-Version with 2 m US mains cord		Part No. 235 004	Part No. 235 003
Display range	mbar	1 x 10 ⁻¹⁰ to 1330 (0.75 x 10 ⁻¹⁰ to 1000)		Connecting cable			
Unit of measurement (selectable)		mbar, Torr, Pascal, Micron		THERMOVAC and PENNINGVAC		Type A	
Gas type correction		Factor adjustable		5 m		Part No. 124 26	
Sensor connection		15 way Sub-D socket FCC68 (RJ45)		10 m		Part No. 230 012	
Sensor power supply	V DC	24		15 m		Part No. 124 27	
Relaisausgänge		25 way Sub-D socket		20 m		Part No. 124 28	
Switching threshold		independently assignable		30 m		Part No. 124 29	
Number		4	6	40 m		Part No. 124 30	
Adjustment range		sensor dependent		50 m		Part No. 124 31	
Hysteresis		adjustable		75 m		Part No. 124 32	
Relay contact		Floating changeover contact		100 m		Part No. 124 33	
Load rating		60 V, 0.5 A DC / 30 V, 0.5 A AC		Connecting cable		Type B	
Error message				CERAVAC			
Relay contact		Floating normally open contact		5 m		Part No. 230 013	
Load rating		60 V, 0.5 A DC / 30 V, 0.5 A AC		10 m		Part No. 230 014	
Chart recorder output (R _a > 10 kΩ)		0 - 10 V per measurement channel, output characteristic corresponds to the connected sensor, in addition one chart recorder output can be programmed		15 m		Part No. 230 015	
Control input		PENNINGVAC PTR: high voltage on		20 m		Part No. 230 016	
Interface RS 232 C		9 way Sub-D socket		30 m		Part No. 230 017	
Mains connection	V AC / Hz	90 - 250 / 50 - 60		40 m		Part No. 230 018	
Power consumption	W	< 45	< 65	50 m		Part No. 230 019	
Nominal temperature range	°C	+ 5 to + 50		75 m		Part No. 230 020	
Weight	kg (lbs)	1.1 (2.43)	1.2 (2.65)	100 m		Part No. 230 021	
Protection class	IP	20		Connecting cable		Type C	
				IONIVAC			
				5 m		Part No. 124 55	
				10 m		Part No. 230 022	
				15 m		Part No. 124 56	
				20 m		Part No. 124 57	
				30 m		Part No. 124 58	
				Screwed connection for 9 way Sub-D socket		Part No. 230 006	

COMBIVAC 2T



The COMBIVAC 2T covers through its combination of up to two transmitter types the entire range of vacuum pressures from 10^{-10} mbar to 2000 bar.

Moreover, the unit offers a manually or pressure controlled switching function to START and STOP the high-vacuum pumps from the TW line. The pump status "normal operation", "run-up", "standby" and "fail" is indicated on the display.

Advantages to the User

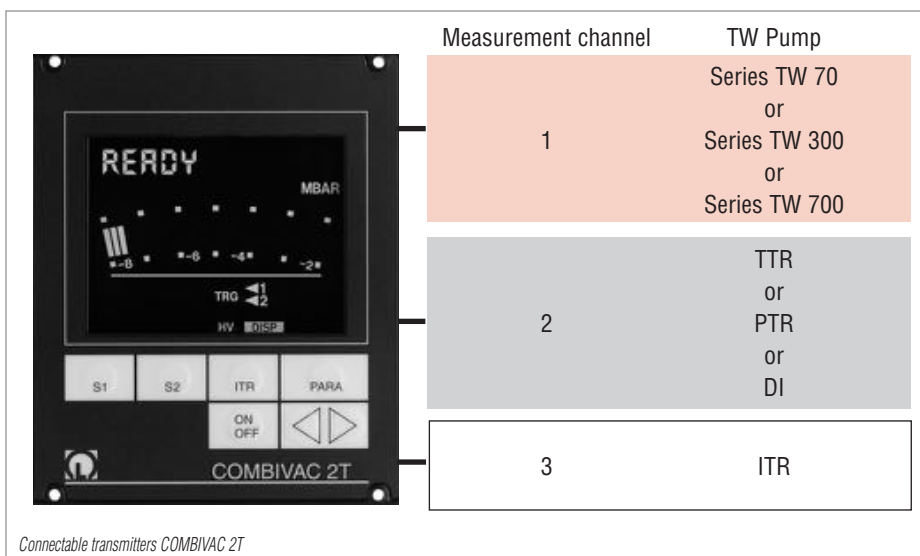
- ◆ Wide measurement and display range from 2000 to 1×10^{-10} mbar (1500 to 0.75×10^{-10} Torr) by combining two transmitters max. with automatic switchover of the display
- ◆ Analog baragraph display runs simultaneously with digital readouts
- ◆ Three adjustable thresholds with relay contacts and adjustable hysteresis, assignable to each channel
- ◆ Userfriendly adjustment to each application, e. g. by
 - selectable measurement unit
 - automatic switch on of emission with IONI transmitter
 - automatic switch on of the ignition voltage with the Penning transmitter
- ◆ Separate 0 to 10 V chart recorder outputs for each measurement channel
- ◆ Additional 0 to 10 V chart recorder output, programmable for coverage of several measurement channels
- ◆ Full remote control via RS 232 C interface
- ◆ Compact bench-top unit (1/4 19 in., 3 HU) which can also be installed in panel cutouts and 19 in. racks
- ◆ CE mark

Connectable Sensors

- ◆ THERMOVAC TTR 90, TTR 90S, TTR 216
- ◆ PENNINGVAC PTR 225 and PTR 237
- ◆ IONIVAC ITR 90 and ITR 100
- ◆ DI 200 and DI 2000

Typical Applications

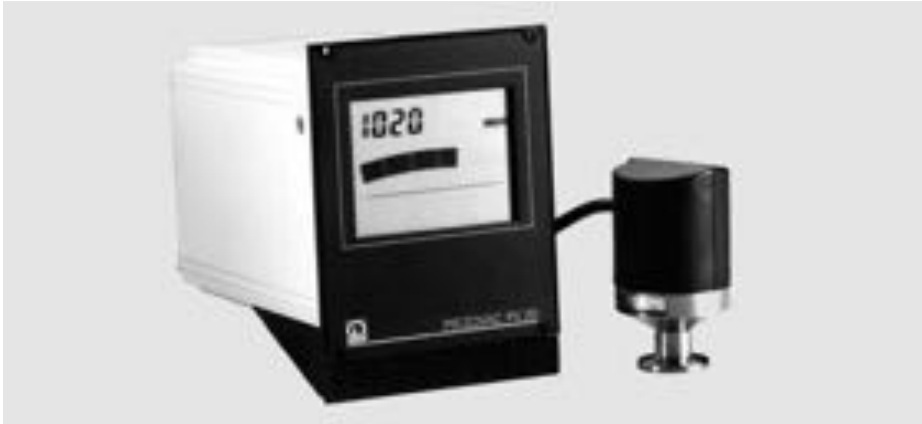
- ◆ General pressure measurements on high vacuum pump systems
- ◆ Vacuum furnaces
- ◆ Coating systems
- ◆ Analytical instruments



Technical Data		2T
Number of measurement channels		2
Measurement display (backlit)		digital, 7-segments LCD analog LCD-bargraph display can be switched over by hand or automatically to the connected sensors
Display range	mbar (Torr)	2 000 to 2×10^{-10} (1500 to 1.5×10^{-10})
Connectable transmitters with display range		
DI 200	mbar (Torr)	1 to 200 (0.75 to 150)
DI 2000	mbar (Torr)	1 to 2000 (0.75 to 1500)
TTR 90	mbar (Torr)	5×10^{-4} to 1000 (3.75×10^{-4} to 750)
PTR 225	mbar (Torr)	1×10^{-9} to 1×10^{-2} (0.75×10^{-9} to 0.75×10^{-2})
ITR 90	mbar (Torr)	5×10^{-10} to 1000 (3.75×10^{-10} to 750)
ITR 100	mbar (Torr)	1×10^{-10} to 1×10^{-1} (0.75×10^{-10} to 0.75×10^{-1})
Unit of measurement (selectable)		mbar, Torr, Pascal, Micron
Type of gas (selectable)		Air, Ar, N ₂ (only ITR 100)
Switching thresholds adjustment range		3, independently assignable according to the assigned sensor
hysteresis		adjustable
relay contact capacity		potential free changeover contact 60 V, 0.5 A DC
Ready indication		1 relay contact 60 V, 0.5 A DC for all channels
Chart recorder output (Ra > 10 kΩ)		4, each 0 to 10 V per channel: initial characteristics dependent on connected transmitters one 0 to 10 V analog output per one or several linear or logarithmic channels
Electric outputs		relay contacts and chart recorder outputs over 25 pin Sub-D-socket
Interface		RS 232 C
Main supply		90 - 250 V AC
Power consumption	VA	40
Nominal temperature range	°C	0 to 50
Max. rel. humidity	% n. c.	85
Weight	kg (lbs)	1.5 (3.31)
Dimensions (W x H x D)	mm	106.5 x 128.5 x 240

Ordering Information	2T
COMBIVAC 2T, 90 - 250 V AC	Part No. 230 000
Calibration	see section "Miscellaneous", para. "LEYBOLD Calibration Service"
Connecting cable THERMOVAC and PENNINGVAC	Type A
5 m	Part No. 124 26
10 m	Part No. 230 012
15 m	Part No. 124 27
20 m	Part No. 124 28
30 m	Part No. 124 29
40 m	Part No. 124 30
50 m	Part No. 124 31
75 m	Part No. 124 32
100 m	Part No. 124 33
Connecting cable IONIVAC	Type C
5 m	Part No. 124 55
10 m	Part No. 230 022
15 m	Part No. 124 56
20 m	Part No. 124 57
30 m	Part No. 124 58
Connecting cable DI-Sensor IT23, 5 m	Part No. 163 84
Connecting cable TW 70, TW 300 and TW 700	
5 m	Part No. 230 007
10 m	Part No. 230 008
15 m	Part No. 230 009
20 m	Part No. 230 010

PIEZOVAC PV 20



This complete vacuum gauge offers accurate and cost-effective measurements in the range between 1 and 2000 mbar (0.75 and 1500 Torr) or 0.1 and 200 mbar (0.075 and 150 Torr).

Advantages to the User

- ◆ Complete instrument: Sensor and sensor cable included
- ◆ Dual LCD display – combines the advantages of analog and digital readouts
- ◆ Clear display of pressure and operating status with analog trend indication, can also be read from a great distance.
- ◆ Logarithmic/linear 0 to 10 V chart recorder output
- ◆ Compact bench-top unit (1/4 19 in., 3 HU), which may also be installed in panel cut-outs and 19 in. racks
- ◆ Ceramic absolute pressure sensor which is highly corrosion resistant
- ◆ THERMOVAC or absolute pressure sensors may be alternatively connected
- ◆ CE mark

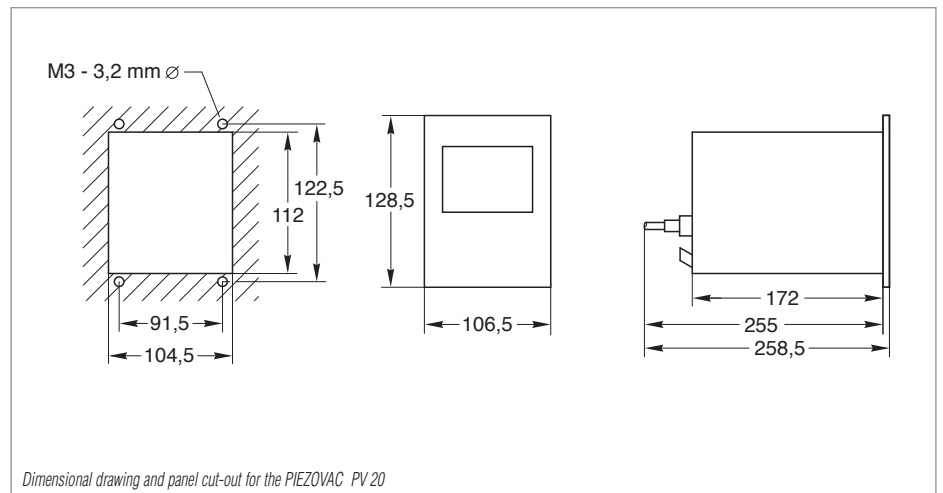
Typical Applications

- ◆ General pressure measurements in the fine and rough vacuum range, in connection with vacuum furnaces and analytical instruments
- ◆ Monitoring the operation of backing pumps and vacuum systems
- ◆ Replacement of mercury manometers in the lab and in production lines

Sensors

The PIEZOVAC PV 20 is delivered complete with a DI 2000 or DI 200 sensor. The sensor is supplied fully aligned for operation.

For information on the THERMOVAC sensors, see the chapter "Sensors".



Technical Data		PIEZOVAC PV 20	Ordering Information	PIEZOVAC PV 20
Display range	mbar (Torr)	0.1 to 2000 (0.075 to 1500)	Complete with 2 m long main cord DI 2000 sensor, with 5 m long cable, 230 V AC, measurement range 1 - 2000 mbar (0.75 - 1500 Torr)	Part No. 157 96
Display		Digital: 7-segment LCD, Analog: LCD bar		
Measurement uncertainty with DI 200/201/2000 Sensor	% FS	0.2	Complete with 2 m long main cord DI 200 sensor, with 5 m long sensor cable, 230 V AC, measurement range 0.1 - 200 mbar (0.075 - 150 Torr)	Part No. 157 97
Unit of measurement (selectable)		mbar, Torr, Pa, Micron		
Chart recorder output (R _a > 2,5 kΩ)		0 to 10 V, linear divisions for absolute pressure sensors, about 10.5 V during faults 0 to 10 V, logarithmic divisions for THERMOVAC sensors (1.67 V/decade)	Calibration	see section "Miscellaneous", para. "LEYBOLD Calibration Service"
Main connection 50/60 Hz (selectable)	V	90 to 130 / 180 to 250	Options	
Power consumption	VA	9	19" installation frame	Part No. 161 00
Storage temperature range	°C	-40 to +60	1/4 19" blank panel	Part No. 161 02
Nominal temperature range	°C	0 to 40		
Max. rel. humidity	% n.c.	80		
Weight, approx.	kg (lbs)	2 (4.4)		
Dimensions (W x H x D)	mm	106.5 x 128.5 x 172		
Cable length, max.	m	100		
Connectable sensors		TR 211/212/216, DI 200/201/2000/2001		

MEMBRANOVAC DM 11/DM 12



Compact general purpose measurement and control instruments for absolute, relative and differential pressure measurements, measurements in the vacuum and over-pressure ranges, with a wide measurement and display range.

Advantages to the User

- ◆ Illuminated dual LCD display combining the advantages of analog and digital readouts
- ◆ Clear display of pressure and operating status with analog trend indication, can also be read from a great distance
- ◆ Simple trend indication through analog bar-graph
- ◆ Locking of the keypad via softlock keylock
- ◆ Two adjustable switching thresholds with relay contacts per measurement channel; can also be operated as a three-position controller
- ◆ Logarithmic/linear 0 to 10 V chart recorder output
- ◆ Full remote control via RS 232 C interface
- ◆ Compact bench-top unit (1/4 19 in., 3 HU), which may also be installed in panel cut-outs and 19 in. racks
- ◆ Wide measurement and display range, freely adjustable from -1000 mbar up to 20 bar depending on the type of pressure sensor delivering an output signal of 4 to 20 mA
- ◆ Universal connection for linear absolute, relative and differential pressure sensors with a typical 24 V supply voltage requirement and a measurement signal output of 4 to 20 mA (2 wire connection)
- ◆ THERMOVAC sensors (TR 300 series) can be connected for measurements in the fine vacuum range
- ◆ Single or two channel instrument with automatic channel switching
- ◆ CE mark

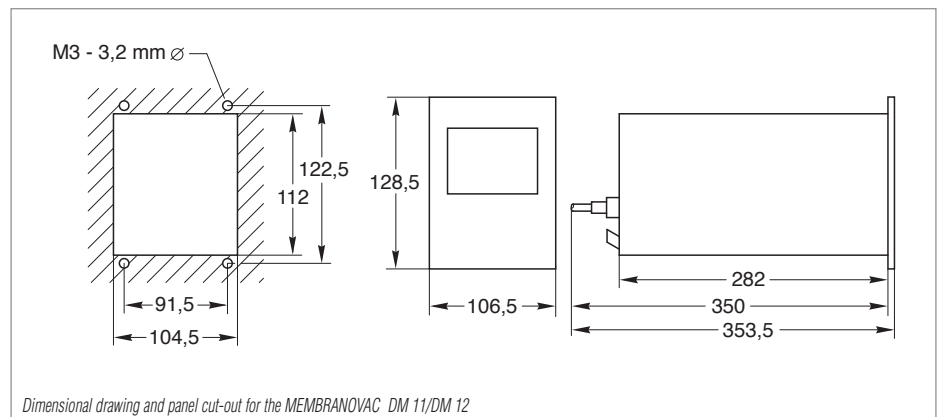
Typical Applications

- ◆ General pressure measurement and control in the rough and fine vacuum ranges, in connection with vacuum furnaces
- ◆ Measurement of operating and filling pressure during the production of lamps
- ◆ Vacuum packaging
- ◆ Chemical process engineering
- ◆ Drying processes

Sensors

These operating units have been universally designed to accommodate the capacitive pressure sensors DI 200, DI 201, DI 2000, DI 2001 and DI 2001 rel are equipped with a ceramic diaphragm (see chapter "Sensors").

Moreover, the thermal conductivity sensors from the THERMOVAC series TR 300 can be connected (see chapter "Sensors").



Technical Data		DM 11	DM 12	Ordering Information		DM 11	DM 12
Number of measurement channels		1	2	MEMBRANOVAC DM 11 (single channel) Euro model, with 2 m long main cord, mbar readout, 230 V AC US model, with 2 m long main cord, Torr readout, 120 V AC		Part No. 157 91	–
Display range	mbar (Torr)	-1 000 to +20 000 (-750 to +15 000), freely adjustable for linear sensors, 10 ⁻³ to 1 000 (10 ⁻³ to 750) for THERMOVAC		MEMBRANOVAC DM 12 (two-channel) Euro model, with 2 m long main cord, mbar readout, 230 V AC US model, with 2 m long main cord, Torr readout, 120 V AC		Part No. 896 91	–
Display (backlit)		Digital: 7 segment LCD, analog: LCD bar graph				–	Part No. 157 92
Unit of measurement (selectable)		mbar, Torr, Pa, Micron				–	Part No. 896 92
Display rate		4 x s ⁻¹					
Type of gas (selectable)		Linear sensors independent of the type of gas, THERMOVAC sensors air/argon		Calibration		see section "Miscellaneous", para. "LEYBOLD Calibration Service"	
Switching thresholds		2 floating changeover contacts per channel single/interval/3 position controller		Options			
Operating mode		Linear sensors: Sensor range, THERMOVAC sensors: 1 x 10 ⁻³ to 500 mbar (0.75 x 10 ⁻³ to 375 Torr)		19" installation frame		Part No. 161 00	
Adjustment range		0.1 to 9.9 % of sensor fullscale		1/4 19" blank panel		Part No. 161 02	
Hysteresis (adjustable)		< 50		Linear pressure sensors			
Reaction time	ms	Floating contact, Closed when ready		DI 200, 0.1 - 200 mbar (0.075 - 150 Torr) (incl. 5 m long connection cable)		Part No. 158 12	
Ready relay		AC 240 V/5 A, DC 60 V/0.7 A		DI 201, 0.1 - 200 mbar (0.075 - 150 Torr) (incl. 5 m long connection cable)		Part No. 158 14	
Rating of the relay contacts		≥ 6 x 10 ⁴ cycles		DI 2000, 1 - 2000 mbar (0.75 - 1500 Torr) (incl. 5 m long connection cable)		Part No. 158 13	
Contact life at 5 A		1 x per measurement channel, 0 to 10 V linear for linear sensors, 0 to 10 V logarithmic for TM sensors, about 10.5 V in case of a fault		DI 2001, 1 - 2000 mbar (0.75 - 1500 Torr) (incl. 5 m long connection cable)		Part No. 158 15	
Chart recorder output (R _a < 2.5 kΩ)		Control signal for external setting of the reference pressure for 3 position control		DI 2001 rel, -1000 – +1000 mbar (-750 - +750 Torr) (incl. 5 m long connection cable)		Part No. 245 000	
	V	0 to 10		THERMOVAC sensors *)			
Interface		RS 232 C		TR 301, tungsten filament		Part No. 157 40	
Main connection 50/60 Hz (selectable)	V	100/120/200/230 V +10/-15 %		Connection cable for TR 301/306,			
Power consumption	VA	25		5 m long		Part No. 157 63	
Storage temperature range	°C	-20 to +60		10 m long		Part No. 124 71	
Nominal temperature range	°C	0 to 40		15 m long		Part No. 124 72	
Max. rel. humidity	% n.c.	80		20 m long		Part No. 124 73	
Weight, approx.	kg (lbs)	2.1 (4.6)		30 m long		Part No. 124 74	
Dimensions (W x H x D)	mm	106.5 x 128.5 x 282		40 m long		Part No. 124 75	
Sensor supply		24 to 30 V DC, Signal current 4 to 20 mA or 8 to 48 mA for THERMOVAC sensors		50 m long		Part No. 124 76	
Sensors (see chapter "Sensors")		DI 200/201/2000/2001/2001 rel, THERMOVAC TR 301/306, all common sensors on the market having a supply voltage requirement of 24 V and a measurement signal of 4 to 20 mA					

*) to be discontinued

THERMOVAC TM 21/TM 22/TM 23



Instruments for operating thermal conductivity sensors (PIRANI gauges) covering a measuring range of 5×10^{-4} to 1 000 mbar (5×10^{-4} to 750 Torr). The relays built into the TM 21/ TM 22/TM 23 make these instruments the ideal choice for process control systems.

Advantages to the User

- ◆ One, two or three continuously operating measurement channels, with selectable display
- ◆ Dual LCD display combines the advantages of analog and digital readouts
- ◆ Clear display of pressure and operating status with analog trend indication, can also be read from a great distance
- ◆ Aligned and temperature compensated sensors having a low filament temperature
- ◆ Simple to operate
- ◆ Cost-effective sensing cell replacements
- ◆ Fault indication in case of a broken filament
- ◆ Two adjustable switching thresholds with relay contacts per measurement channel)
- ◆ Logarithmic/linear 0 to 10 V chart recorder output
- ◆ Compact bench-top unit (1/4 19 in., 3 HU), which may also be installed in panel cut-outs and 19 in. racks
- ◆ Pirani principle
- ◆ Full remote control via RS 232 C interface (TM 21/TM 22)
- ◆ Locking of the keypad via softlock keylock (TM 21/TM 22/TM 23)
- ◆ CE mark

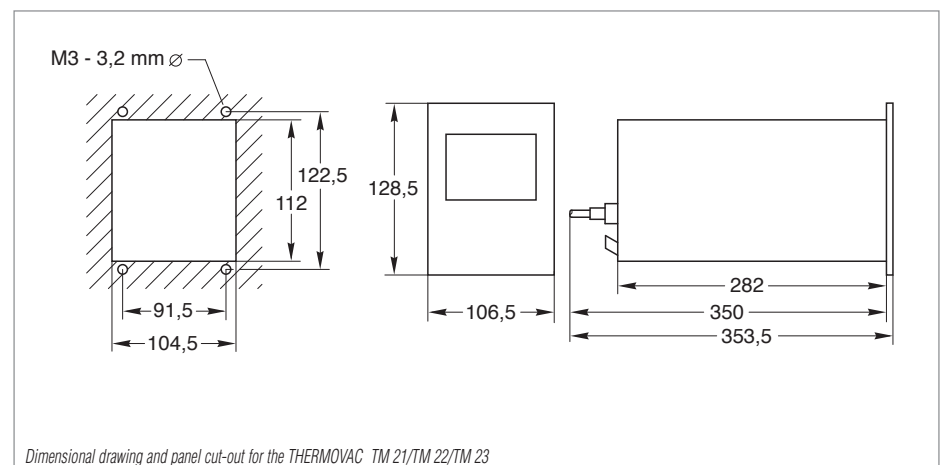
Typical Applications

- ◆ General purpose pressure measurement and control in the fine and rough vacuum ranges, vacuum furnaces and analytical instruments
- ◆ Monitoring the operation of backing pumps and vacuum systems
- ◆ Safety circuits in vacuum systems
- ◆ Control of ionization vacuum gauges

Sensors

Either the TR 211/TR 212 and TR 216 (corrosion protected) may be connected to the THERMOVAC TM 21/TM 22/TM 23 (see chapter "Sensors").

Upon delivery the sensors are supplied fully aligned and ready for operation.



Technical Data	TM 21	TM 22	TM 23
Number of measurement channels	1	2	3
Display range mbar (Torr)	5 x 10 ⁻⁴ to 1000 (3.75 x 10 ⁻⁴ to 750)		
Unit of measurement (selectable)	mbar, Torr, Pa, Micron		
Display	Digital, 7 segment-LCD, analog, LCD bar graph		
Type of gas (selectable)	Air, N ₂ , Ar		
Measurement uncertainty with THERMOVAC sensors (after warming up)	≤ 20 % of the meas. value in the range 10 ⁻³ to 10 ⁻² mbar, ≤ 15 % v. of the meas. value in the range 10 ⁻² to 10 ² mbar		
Switching thresholds	2 floating changeover contacts per measurement channel		
Adjustment range for the switching mbar (Torr)	5 x 10 ⁻³ to 500 (3.75 x 10 ⁻³ to 375)		
Ready relay	Contact closed when ready		
Rating of the relay contacts	AC 240 V/5 A (resistive load) / DC 60 V/0.7 A (resistive load)		
Contact life at 5 A	≥ 6 x 10 ⁴ cycles		
Chart recorder output (R _a ≥ 2.5 kΩ)	0 to 10 V, selectable: logarithmic/linear; logarithmic divisions: 1.67 V/decade, linearly adjustable over 3 decades; 0 V corresponds to 10 ⁻³ mbar, 10.5 V for faults		
Main connection 50/60 Hz (selectable) V	100/120/200/230, +10/-15 %		
Power consumption VA	12		14
Storage temperature range °C	-40 to +60		
Nominal temperature range °C	0 to 40		
Max. rel. humidity % n.c.	80		
Weight, approx. kg (lbs)	2 (4.4)		
Dimensions (W x H x D) mm	106.5 x 128.5 x 282		
Cable length, max. m	100		
Interface	RS 232 C		-

Ordering Information	TM 21	TM 22	TM 23
Euro model, with 2 m long main cord, mbar readout, 230 V AC	Part No. 157 83	Part No. 157 84	Part No. 157 98
US model, with 2 m long main cord, Torr readout, 120 V AC	Part No. 896 83	Part No. 896 84	Part No. 896 98
Calibration	see section "Miscellaneous", para. "LEYBOLD Calibration Service"		
Options			
19" installation frame	Part No. 161 00		
1/4 19" blank panel	Part No. 161 02		
THERMOVACsensors			
TR 211, DN 16 KF	Part No. 157 85		
TR 211, 1/8" NPT	Part No. 896 33		
TR 212, DN 16 KF	Part No. 158 52		
TR 212, DN 16 CF	Part No. 158 86		
TR 216, DN 16 KF	Part No. 157 87		
Connection cables			
5 m	Part No. 162 26		
10 m	Part No. 162 27		
15 m	Part No. 124 34		
20 m	Part No. 162 28		
30 m	Part No. 124 35		
40 m	Part No. 124 36		
50 m	Part No. 124 37		
75 m	Part No. 124 38		
100 m	Part No. 124 39		



PENNINGVAC PM 31



The PENNINGVAC PM 31 offers reliable measurements as well as monitoring and control functions in the vacuum range between 10^{-9} and 10^{-2} mbar/Torr.

Advantages to the User

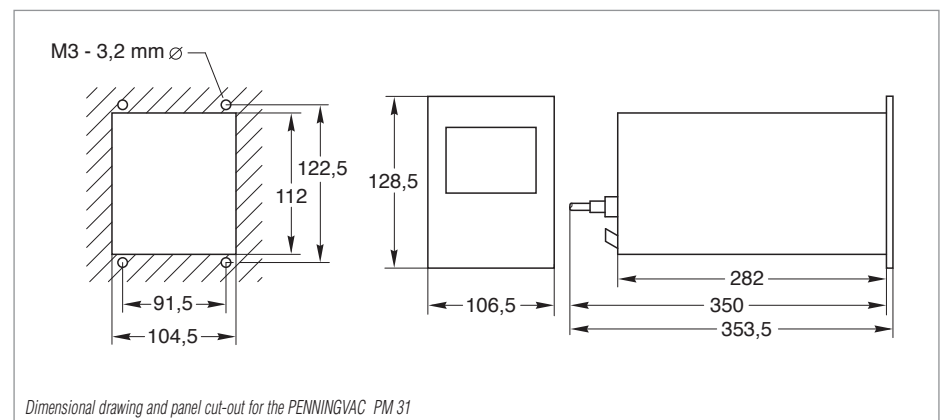
- ◆ Illuminated dual LCD display combining the advantages of analog and digital readouts
- ◆ Clear display of pressure and operating status with analog trend indication, can also be read from a great distance
- ◆ Locking of the keypad via softlock keylock
- ◆ Two adjustable switching thresholds with relay contact
- ◆ Logarithmic/linear 0 to 10 V chart recorder output
- ◆ Easy to operate
- ◆ All-metal sensor with ceramics feedthrough
- ◆ Compact, rugged Penning gauge which is capable of withstanding operation at high pressures
- ◆ Principle of measurement based on cold cathode ionization, thus no gas is emitted by hot electrodes
- ◆ Cost-effective replacement cathodes
- ◆ Fault indication in the event of a broken cable of failed discharge
- ◆ Compact bench-top unit (1/4 19 in., 3 HU), with metal enclosure which may also be installed in panel cut-outs and 19 in. racks
- ◆ Full remote control via RS 232 C interface
- ◆ CE mark

Typical Applications

- ◆ Pressure measurements on pump systems, for example:
 - Diffusion pump systems
 - Turbomolecular pump systems
 - Cryo pump systems
- ◆ Pressure measurements in the high vacuum range, for example on vacuum melting, soldering and annealing furnaces
- ◆ Analytical instruments
- ◆ Coating systems

Sensors

Sensors PR 25, PR 26, PR 27 or PR 37 may be connected to the PENNINGVAC PM 31. For information, see the chapter "Sensors".



Technical Data		PENNINGVAC PM 31		Ordering Information		PENNINGVAC PM 31	
Display range ¹⁾	mbar (Torr)	1 x 10 ⁻⁹ to 10 ⁻² (0.75 x 10 ⁻⁹ to 10 ⁻²)		Euro model, with 2 m long main cord, mbar readout, 230 V AC		Part No. 157 88	
Unit of measurement (selectable)		mbar, Torr, Pa, Micron		US model, with 2 m long main cord, Torr readout, 120 V AC		Part No. 896 88	
Measurement uncertainty		± 30 % of the meas. value in the range 1 x 10 ⁻⁸ to 10 ⁻⁴ mbar (0.75 x 10 ⁻⁸ to 10 ⁻⁴ Torr)		Options			
Measurement display (illuminated)		digital, 7 segment LCD, analog, LCD bargraph with logarithmic divisions		19" installation frame		Part No. 161 00	
Type of gas (selectable)		Air, N ₂ , Ar		1/4 19" blank panel		Part No. 161 02	
Switching thresholds		2 floating changeover contacts		PENNINGVAC sensors			
Operating mode		single, interval		PR 25, DN 25 KF		Part No. 157 52	
Adjustment range	mbar (Torr)	1 x 10 ⁻⁸ to 9.9 x 10 ⁻³ (0.75 x 10 ⁻⁸ to 7.4 x 10 ⁻³)		PR 26, DN 40 KF		Part No. 136 46	
Hysteresis for the switching relay		standard 10 % of trigger value, free adjustable		PR 27, DN 40 CF		Part No. 136 47	
Ready indication		Contact, closed when ready		PR 37, DN 40 CF, bakeable		Part No. 157 54	
Rating of the relay contacts		AC 240 V/5 A (Resistive load), DC 60 V/0.7 A (Resistive load)		Replacement cathode plates, titanium (set of 5 pcs.)		Part No. 162 91	
Contact life at 5 A		≥ 6 x 10 ⁴ cycles		Replacement anode ring		Part No. 240 002	
Chart recorder output (R _a ≥ 2.5 kΩ)		0 to 10 V, selectable: logarithmic/linear; logarithmic divisions: 1.43 V/decade; linearly adjustable over 3 decades; 0 V corresponds to 10 ⁻⁹ mbar/Torr, about 10.5 V in case of a fault		Sensor cables			
High voltage control input		Prog. contr. compatible, digital 24 V input, logic level (LOW) < 7 V, 0 A, logic level (HIGH) > 13 V, 7 mA		5 m		Part No. 162 88	
Interface		RS 232 C		10 m		Part No. 162 89	
Main connection 50/60 Hz (selectable)	V	100/120/200/230, +10/-15 %		15 m		Part No. 124 49	
Power consumption	VA	20		20 m		Part No. 157 56	
Storage temperature range	°C	-40 to +60		30 m		Part No. 124 50	
Nominal temperature range	°C	0 to 40		40 m		Part No. 124 51	
Max. rel. humidity	% n.c.	80		50 m		Part No. 124 52	
Weight, approx.	kg (lbs)	2.1 (4.6)		75 m		Part No. 124 53	
Dimensions (W x H x D)	mm	106.5 x 128.5 x 282		100 m		Part No. 124 54	
Cable length, max.	m	100					

¹⁾ For a cable length of 20 m max.

COMBIVAC CM 31/CM 32/CM 33



By combining two/three principles of measurement – absolute pressure sensor, Pirani and Penning – the COMBIVAC CM 31/CM 32/CM 33 cover the entire pressure range from 10^{-9} to 2000 mbar (10^{-9} to 1500 Torr) while offering monitoring and control functions.

Advantages to the User

- ◆ Selectable dual LCD display combining the advantages of analog and digital readouts (over 12 decades)
- ◆ Automatic switchover from THERMOVAC to Penning (cold cathode) operation
- ◆ Clear display of pressure and operating status with analog trend indication, can also be read from a great distance
- ◆ Easy to operate
- ◆ Locking of the keypad via softlock keylock
- ◆ Two adjustable switching thresholds with relay contact per measurement channel
- ◆ Logarithmic/linear 0 to 10 V chart recorder output
- ◆ Compact, rugged Penning gauge which is capable of withstanding operation at high pressures (see section “Sensors”)
- ◆ Aligned and temperature compensated THERMOVAC sensors (see section “Sensors”)
- ◆ Precision absolute pressure sensors with ceramics or Inconel diaphragm (see section “Sensors”)
- ◆ Cost-effective replacement sensing cells and electrodes
- ◆ Fault indication for each channel in the event of a broken filament, a broken cable or failed plasma discharge
- ◆ Compact bench-top unit (1/4 19 in., 3 HU) with metal enclosure, which may also be installed in panel cut-outs and 19 in. racks
- ◆ Full remote control via RS 232 C interface
- ◆ CE mark

Typical Applications

- ◆ General pressure measurements on pump systems, for example:
 - Turbomolecular pump systems
 - Diffusion pump systems
 - Cryo pump systems
- ◆ Vacuum melting, soldering and annealing furnaces
- ◆ Coating systems
- ◆ Analytical instruments

COMBIVAC CM 32

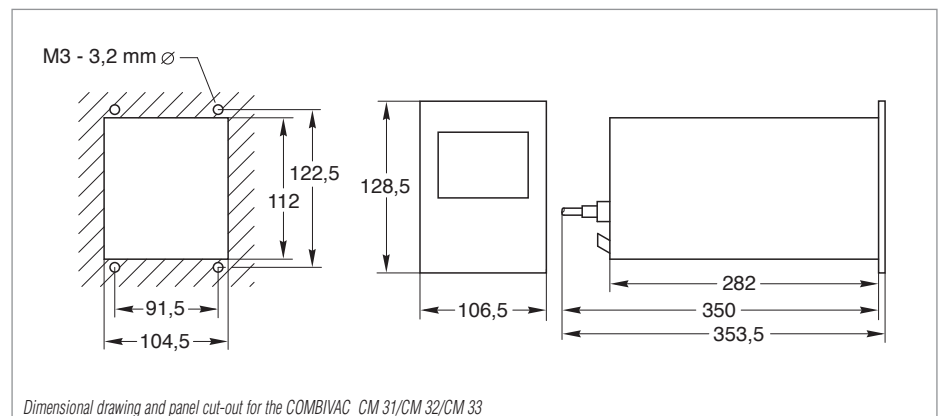
For over-pressure measurements and pressure measurements which do not depend on the type of gas, the CM 32 offers the facility of connecting a linear pressure sensor (DI 200/201/2000/2001/2001 rel – see chapter “Sensors”) in combination with THERMOVAC and PENNINGVAC sensors. Suitable 4 to 20 mA pressure sensors having a range up to 20 000 mbar (15 000 Torr) may be connected.

COMBIVAC CM 33

If the utmost is required regarding accuracy and resolution, then the CM 33 is the right choice. In combination with THERMOVAC and PENNINGVAC sensors, capacitive absolute pressure sensors may be connected (see chapter “Sensors”) which offer, depending on the type, a range of 2×10^{-4} to 13 300 mbar (1.5×10^{-4} to 10 000 Torr).

COMBIVAC CM 31

This combination instrument for standard applications covers with its three measurement channels (2 x THERMOVAC and 1 x PENNINGVAC) the entire range of 12 decades between 1×10^{-9} and 1000 mbar.



Technical Data		COMBIVAC CM 31/32/33		Ordering Information		COMBIVAC CM 31/32/33	
Number of measurement channels		3		Euro version with 2 m long main cord mbar readout, 230 V AC			
Display range, CM 31	mbar (Torr)	1 x 10 ⁻⁹ to 1000 (0.75 x 10 ⁻⁹ to 750)		CM 31		Part No. 157 89	
	CM 32	mbar (Torr)	1 x 10 ⁻⁹ to 2000 (or 20 000 *) (0.75 x 10 ⁻⁹ to 1500 (or 15 000 *))	CM 32		Part No. 157 90	
	CM 33	mbar (Torr)	1 x 10 ⁻⁹ to 1330 (or 13 300 *) (0.75 x 10 ⁻⁹ to 998 (or 9980 *))	CM 33		Part No. 157 95	
Unit of measurement (selectable)		mbar, Torr, Pa, Micron		US version with 2 m long main cord Torr readout, 120 V AC			
Measurement uncertainty				CM 31		Part No. 896 89	
PENNINGVAC		±30 % of the meas. value in the range 10 ⁻⁸ to 10 ⁻⁴ mbar/Torr		CM 32		Part No. 896 90	
THERMOVAC		≤ 20 % of the meas. value in the range 10 ⁻³ to 10 ⁻² mbar/Torr ≤ 15 % of the meas. value in the range 10 ⁻² to 10 ² mbar/Torr		CM 33		Part No. 896 95	
Absolute pressure sensor		Depending on the type of sensor used		Calibration		see para. "LEYBOLD Calibration Service"	
Measurement display (backlit)		digital, 7 segment LCD, analog, LCD bar graph, with logarithmic divisions (selectable)		Options			
Type of gas (selectable)		Air, N ₂ , Ar		19" installation frame		Part No. 161 00	
Switching thresholds		6, 2 per channel, floating changeover contacts		1/4 19" blank panel		Part No. 161 02	
Operating mode		single, interval		THERMOVAC sensors for CM 31/32/33			
Adjustment range				TR 211, DN 16 KF		Part No. 157 85	
PENNINGVAC		mbar (Torr)	1 x 10 ⁻⁸ to 9.9 x 10 ⁻³ (0.75 x 10 ⁻⁸ to 7.4 x 10 ⁻³)	TR 211, 1/8" NPT		Part No. 896 33	
THERMOVAC		mbar (Torr)	5 x 10 ⁻³ to 500 (3.75 x 10 ⁻³ to 375)	TR 212, DN 16 KF		Part No. 158 52	
Hysteresis for the switching relay		standard 10 % of trigger value, free adjustable for THERMOVAC and PENNINGVAC		TR 216, DN 16 KF		Part No. 157 87	
Ready indication		1 contact per channel, closed when ready		Sensor cable for TR sensors		5 m	
Rating of the relay contacts		AC 240 V/5A (Resistive load) DC 60 V/0.7 A (Resistive load)		10 m		Part No. 162 26	
Contact life at 5 A		≥ 6 x 10 ⁴ cycles		15 m		Part No. 162 27	
Chart recorder output (Ra ≥ 2.5 kΩ)		0 to 10 V, log./lin. divisions		20 m		Part No. 124 34	
PENNINGVAC		logarithm.: (0 V ; 1 x 10 ⁻⁹ mbar/Torr), 1.43 V/decade		30 m		Part No. 162 28	
THERMOVAC		linear: 3 decades, about 10.5 V for fault logarithm.: (0 V ; 1 x 10 ⁻³ mbar/Torr), 1.67 V/decade		40 m		Part No. 124 35	
Absolute pressure sensor		linear: 3 decades, about 10.5 V for fault log./lin. 0 to 10 V		50 m		Part No. 124 36	
Control input for PENNINGVAC		Prog. contr. compatible digital 24 V input Logic level (LOW) < 7 V, 0 A; (HIGH) > 13 V, 7 mA		75 m		Part No. 124 37	
Interface		RS 232 C		100 m		Part No. 124 38	
Main connection 50/60 Hz				PENNINGVAC sensors for CM 31/32/33			
CM 31/32 (selectable)		V	100/120/200/230, +10/-15 %	PR 25, DN 25 KF		Part No. 157 52	
CM 33		V	90 to 250	PR 26, DN 40 KF		Part No. 136 46	
Power consumption		VA	35	PR 27, DN 40 CF		Part No. 136 47	
Storage temperature range		°C	-40 to +60	PR 37, DN 40 CF, bakeable		Part No. 157 54	
Nominal temperature range		°C	0 to 40	Sensor cable for PR sensors		5 m	
Max. rel. humidity		% n.c.	80	10 m		Part No. 162 88	
Weight		kg (lbs)	2.3 (5)	15 m		Part No. 162 89	
Dimensions (W x H x D)		mm	106.5 x 128.5 x 282	20 m		Part No. 162 89	
				30 m		Part No. 124 49	
				40 m		Part No. 157 56	
				50 m		Part No. 124 50	
				75 m		Part No. 124 51	
				100 m		Part No. 124 52	
				Pressure sensors for CM 32			
				DI 200, 200 mbar, DN 16 KF, incl. 5 m long cable		Part No. 158 12	
				DI 201, 200 mbar, DN 16 KF, incl. 5 m long cable		Part No. 158.14	
				DI 2000, 2000 mbar, DN 16 KF, incl. 5 m long cable		Part No. 158 13	
				DI 2001, 2000 mbar, DN 16 KF, incl. 5 m long cable		Part No. 158 25	
				DI 2001 rel, 1000 mbar, DN 16 KF, incl. 5 m long cable		Part No. 245 000	
				Absolute pressure sensors for CM 33			
				CTR90, 1 Torr, DN 16 KF		Part No. 159 24	
				CTR90, 10 Torr, DN 16 KF		Part No. 159 23	
				CTR90, 100 Torr, DN 16 KF		Part No. 159 22	
				CTR90, 1000 Torr, DN 16 KF		Part No. 159 21	
				CTR90, 1 Torr, DN 16 CF		Part No. 159 34	
				CTR90, 10 Torr, DN 16 CF		Part No. 159 33	
				CTR90, 100 Torr, DN 16 CF		Part No. 159 32	
				CTR90, 1000 Torr, DN 16 CF		Part No. 159 31	
				Connection cables Type D		5 m	
				10 m		Part No. 157 64	
				15 m		Part No. 124 41	
				20 m		Part No. 124 42	
				30 m		Part No. 124 43	
				40 m		Part No. 124 44	
				50 m		Part No. 124 45	
				75 m		Part No. 124 46	
				100 m		Part No. 124 47	
						Part No. 124 48	

*) When using suitable sensors

DI 200/DI 201/DI 2000/DI 2001/DI 2001 rel Linear Pressure Sensors



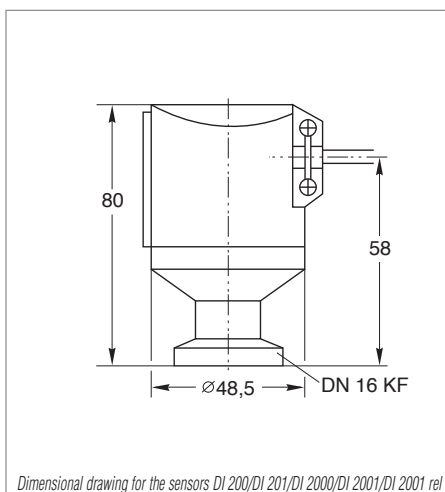
Capacitive pressure sensor based on ceramics technology.
Available as absolute or relative pressure sensor

Advantages to the User

- ◆ Pressure sensor of the two-wire type
- ◆ 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
- ◆ Supply voltage range of 12 to 30 V DC
- ◆ Linear output signal of 4 to 20 mA
- ◆ Compact design

Typical Applications

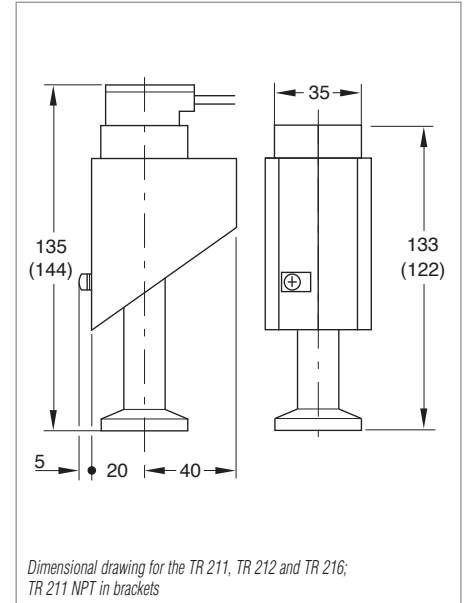
- ◆ Pressure measurements in the rough vacuum range, and for corrosive media
- ◆ Chemical process engineering
- ◆ Vacuum packaging
- ◆ Drying processes
- ◆ Measurement of operating and filling pressure, during the production of lamps
- ◆ Filling systems for brake fluids (DI 201/DI 2001)
- ◆ Filling systems for refrigerants
- ◆ Measurement of pressure relative to atmospheric pressure (DI 2001 rel)



Technical Data		DI 200	DI 201	DI 2000	DI 2001	DI 2001 rel
Measurement range	mbar (Torr)	0.1 to 200 (0.075 to 150)		1 to 2 000 (0.75 to 1500)		- 1000 to + 1000 (- 750 to + 750)
Overload range, max.	bar	5		10		
Nominal temperature range	°C	0 to 60				
Measurement uncertainty ¹⁾ (± temperature error)	% FS	0.2				
Resolution	% FS	0.05				
Reproducibility	% FS	0.1				
Linearity	% FS	0.1				
Temperature error						
Zero drift	% FS/10°K	0.1				
Sensitivity drift	% FS/10°K	0.15				
Principle of measurement		Capacitive				
Sensing head supply		Two-wire system				
Output signal	mA	4 to 20				
Supply voltage	V DC	+ 24 typ.				
Operating range	V	12 to 30, Ripple 1 V _{pp}				
Dead volume	cm ³	3				
Vacuum connection	DN	16 KF				
Weight, approx.	kg	0.55				
Protection class	IP	44				
Materials in contact with the medium		Stainless steel 1.4305, Al ₂ O ₃ (96 %) ceramics, FKM	Stainless steel 1.4305, Al ₂ O ₃ (96 %) ceramics, EPDM	Stainless steel 1.4305, Al ₂ O ₃ (96 %) ceramics, FKM	Stainless steel 1.4305, Al ₂ O ₃ (96 %) ceramics, EPDM	
Operating units		MEMBRANOVAC DM 11, DM 12 / PIEZOVAC PV 20 / COMBIVAC CM 32				MEMBRANOVAC DM 11/12 / COMBIVAC CM 32
Ordering Information		DI 200	DI 201	DI 2000	DI 2001	DI 2001 rel
Linear absolute pressure sensor, complete with 5 m long connection cable and connecting plug		Part No. 158 12	Part No. 158 14	Part No. 158 13	Part No. 158 15	Part No. 245 000

¹⁾ Sum of linearity, hysteresis and reproducibility

Series 200 THERMOVAC Sensor



Advantages to the User

- ◆ Measurement range 5×10^{-4} to 1 000 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 211 NPT/TR 212

- ◆ Stainless steel sensing cell with tungsten filament
- ◆ Overpressure resistant

TR 216

- ◆ Stainless steel sensing cell with platinum/tungsten filament and ceramics feedthrough
- ◆ Well suited for corrosive processes and water vapour atmospheres, for furnace and heat treating application

Technical Data		TR 211	TR 211 NPT	TR 212	TR 216
Measurement range	mbar (Torr)	5×10^{-4} to 1000 (3.75×10^{-4} to 750)			
Operating temperature range (compensated)	°C	0 to 40			
Storage temperature range, max.	°C	80			
Filament		Tungsten			Platinum
Filament temperature	°C	110			
Permissible overload (abs.), max.	bar	3		10	
Volume of the sensing cell, approx.	cm ³	11			
Vacuum connection	DN	16 KF	1/8" NPT	16 KF/CF	16 KF
Materials in contact with the medium		Aluminum, Vacon, glass, tungsten CrNi 8020, epoxy cement	Stainless steel, Vacon, glass, tungsten, CrNi 8020, epoxy cement		Stainless steel 1.4301 (SS 304), Al ₂ O ₃ -ceramics, CrNi 8020
Operating units		THERMOVAC TM 20, 21, 22 / COMBIVAC CM 31, 32, 33 / PIEZOVAC PV 20			

Ordering Information	TR 211	TR 211 NPT	TR 212	TR 216
THERMOVAC sensors Series 200				
DN 16 KF	Part No. 157 85	-	Part No. 158 52	Part No. 157 87
DN 16 CF	-	-	Part No. 158 86	-
DN 1/8" NPT	-	Part No. 896 33	-	-
Replacement sensing cell	Part No. 157 75	Part No. 896 34	-	Part No. 157 77

PR 25/PR 26/PR 27/PR 37 PENNINGVAC Sensors

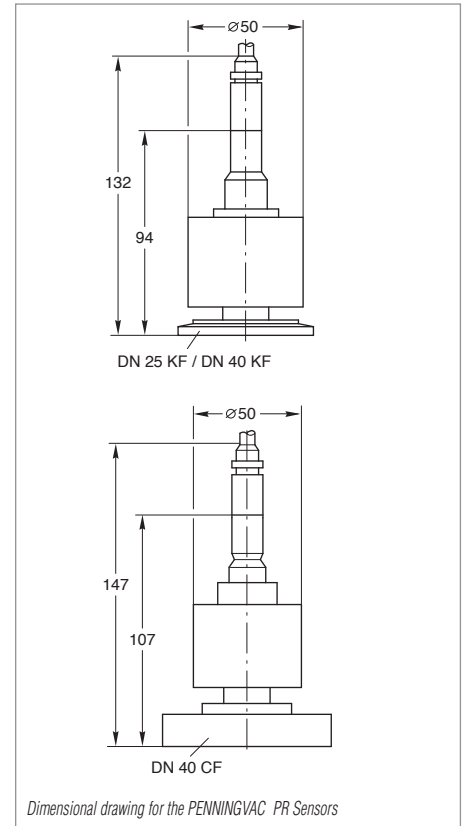


Advantages to the User

- ◆ Rugged
- ◆ Insensitive to air inrushes and vibrations
- ◆ Easy disassembly and cleaning of the measurement system
- ◆ Exchangeable cathode plate
- ◆ Improved ignition characteristic through titanium cathodes

Note

In applications involving significant contamination we recommend the use of a fine filter, see chapter "General", para. "Connection Accessories for Small Flanges".



Technical Data		PR 25	PR 26	PR 27	PR 37
Measurement range	mbar (Torr)	1 x 10 ⁻⁹ bis 10 ⁻² (0.75 x 10 ⁻⁹ to 10 ⁻² ¹⁾)			
High voltage supply (anode potential)	kV	+ 3.3/+1.6			
Storage temperature range	°C	-25 to +80			
Nominal temperature range	°C	0 to 80			0 to 200
Degassing temperature (flange)	°C	-			350
Permissible overload (abs.)	bar	6 ¹⁾			
Dead volume	cm ³	21			
Materials in contact with the medium		Stainless steel, nichrome, ceramics, titanium			
Weight, approx.	kg (lbs)	0.75 (1.7)		0.8 (1.8)	
Vacuum connection	DN	25 KF	40 KF	40 CF	40 CF
Operating units ²⁾		COMBIVAC CM 31, 32, 33 / PENNINGVAC PM 31			
Ordering Information		PR 25	PR 26	PR 27	PR 37
PENNINGVAC sensors		Part No. 157 52	Part No. 136 46	Part No. 136 47	Part No. 157 54
Replacement cathode plate, titanium (5 pcs., incl. 5 ceramics discs)		Part No. 162 91			
Replacement anode ring		Part No. 240 002			

¹⁾ When using an ultra sealing gasket at the vacuum connection

²⁾ For PR 25 also PTR 225

IE 414/IE 514 IONIVAC Sensors



Advantages to the User

- ◆ Exchangeable cathode
- ◆ High accuracy of the measurements due to individually calibrated sensing system

IE 414

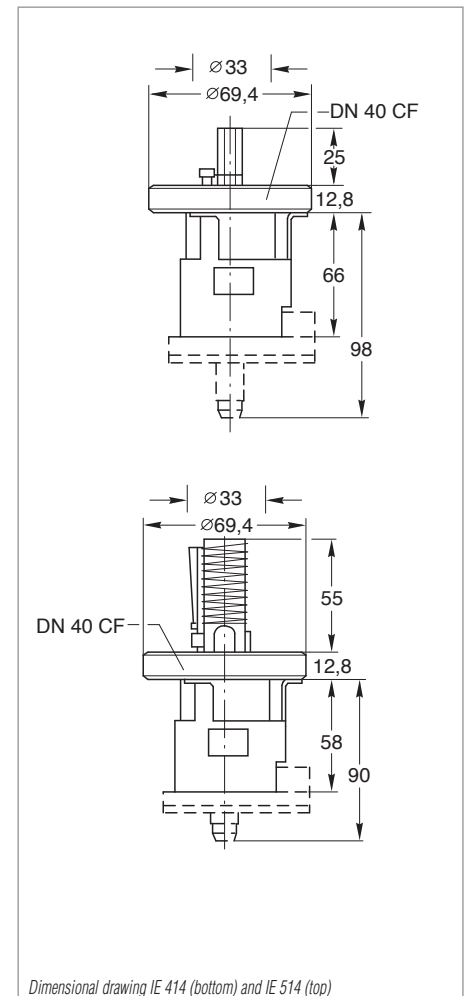
- ◆ Bayard-Alpert sensing system
- ◆ Measurement range to 2×10^{-11} mbar (1.5×10^{-11} Torr)
- ◆ Protection shield welded in place

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

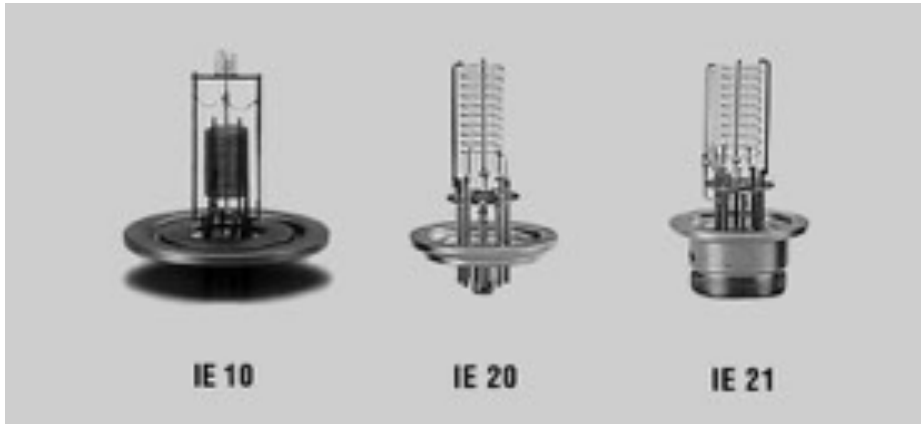
Technical Data		IE 414	IE 514
Measurement range	mbar (Torr)	2×10^{-11} to 10^{-2} (1.5×10^{-11} to 10^{-2})	10^{-12} to 9.98×10^{-5} (10^{-12} to 750×10^{-5})
X-ray limit	mbar (Torr)	$\leq 10^{-11}$ ($\leq 10^{-11}$)	$\leq 10^{-12}$ ($\leq 10^{-12}$)
Operating temperature range	°C	0 to 80	
Degassing temperature at the flange, max.	°C	250 ¹⁾ / 350 ²⁾	
Material, Cathode		Iridium with yttric oxide coating	Iridium with yttric oxide 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	
Cathode potential	V	80	100
Anode potential	V	220	
Emission current	mA	0.06 to 0.6	1.6
Heating current for the hot cathode	A	1.4	
Heating voltage for the hot cathode	V	2.7	3.7
Sensitivity for nitrogen	mbar ⁻¹	17	6.6
Degassing operation / Electron bombardment	V / mA	700 / 30	
Operating units		IM 520, 510	

Ordering Information	IE 414	IE 514
IONIVAC sensors	Part No. 158 66	Part No. 158 67
Replacement cathode	Part No. 158 63	Part No. 158 61



¹⁾ With bakeable gauge head cable
²⁾ With gauge head cable detached

Spare Sensors for Older Operating Units



Part No.	Type	Corresponding Sensors / Operating Units
163 43	IE 10	IM 110, IM 110 D
163 14	IE 20	IM 210, IM 210 D, IT 230
158 58	Cathode	IE 220
896 30	TR 901 KF	IG3 / CM 3
896 31	TR 901 NPT	IG3 / CM 3
162 09 ^{*)}	Sensing cell	TR 201/901 DN 16 KF
896 76 ^{*)}	Sensing cell	TR 201/901 NPT
157 40 ^{*)}	TR 301	TM 320, CM 350, IM 520, DM 11, DM 12, CM 32
157 43 ^{*)}	Sensing cell	TR 301
158 82	VK 201	VISCOVAC VM 212
158 17	IE 21	IM 210, IM 221

^{*)} to be discontinued

PS 113 A Low Pressure Safety Switch



Switch indicating whether or not after venting the pressure has reached the level of the atmospheric pressure.

Preset diaphragm pressure switch set to a pressure 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

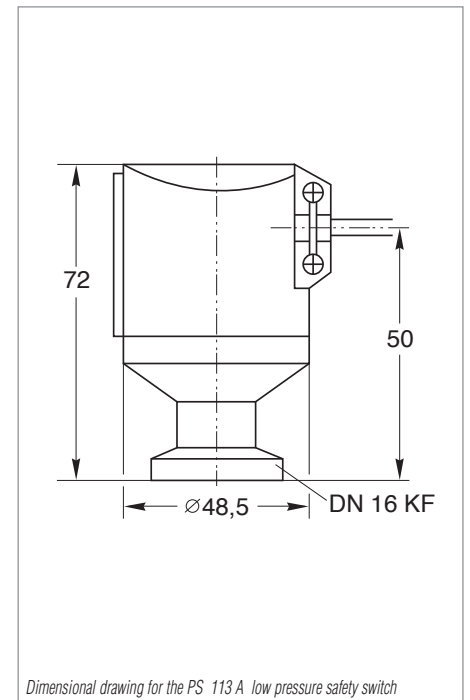
Typical Applications

- ◆ Venting facilities
- ◆ Safety shutdown of vacuum systems
- ◆ Load locks

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 diffusion effects the leak rate of the diaphragm settles at about 1×10^{-6} mbar x l x s⁻¹ for helium.

Technical Data		PS 113 A
Switching pressure	mbar (Torr)	Approx. 6 below atmospheric pressure
Return switching pressure	mbar (Torr)	3 below atmospheric pressure
Switching inaccuracy	mbar (Torr)	2 (1.5)
Max. permissible operating pressure (abs.)	mbar (Torr)	2 000 (1 500)
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 (at 5 A)		> 10 ⁵ switching cycles
Switching capacity		100mA / 24 V AC 30mA / 24 V DC
Electrical connection		6.3 mm flat plug
Vacuum connection	DN	16 KF
Materials in contact with the medium		Stainless steel 1.4305, 1.4310, Stainless steel 1.4300 PTFE coated
Protection class	IP	44



Ordering Information		PS 113 A
PS 113 A, DN 16 KF; complete with 3 m long cable		Part No. 230 011

PS 115 Pressure Switches



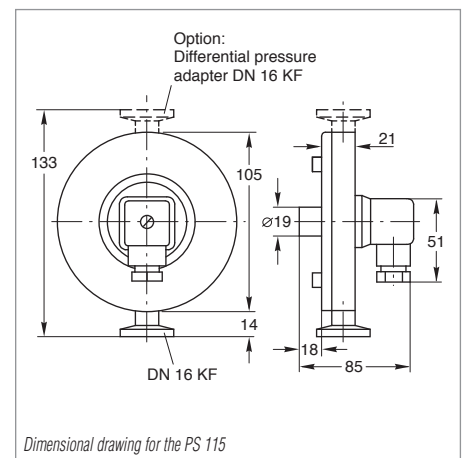
Advantages to the User

- ◆ High switching accuracy (± 0.1 mbar)
- ◆ Stable long term operating characteristics
- ◆ Rugged, corrosion protected design
- ◆ Increased switching capacity (floating) when using the SV 110 switching amplifier
- ◆ 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

Rugged absolute pressure switch with electrical switching contact and a switching pressure between 0.5 and 2 000 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 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 2 000 mbar (1500 Torr). Brief overloading to 3 000 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.

Technical Data		PS 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)/continuous	°C	120 / 0 to 90
Switching contact		Normally closed, gold-plated, for prog. controls
Switching voltage	V	24
Switching current (max.)	mA	10
Contact resistance, max.	k Ω	1
Electrical connection		Plug (DIN 43 650)
Protection class	IP	65
Vacuum connection	DN	16 KF
Materials in contact with the medium		
Measurement chamber		Stainl. steel 1.4301; 1.4401; 1.4310; 1.3541; FPM
Reference chamber		Stainl. steel 1.4301; 1.4401; 1.3541; glass; gold
Volume of the measurement chamber	cm ³	4
Volume of the reference chamber	cm ³	20
Weight	kg (lbs)	1.3 (2.87)



Ordering Information	PS 115
PS 115, DN 16 KF	Part No. 160 04
Pressure switch adjustment	Part No. 160 05
For floating installations without SV 110, Clamping ring DN 16 KF, plastic Centering ring, DN 16 KF, plastic	Part No. 200 28 306 Part No. 200 28 307
Option Differential pressure adapter, DN 16 KF, for connection to the PS 115	Part No. 160 74
Spare parts kit PS 115	Part No. 160 06
SV 110 switching amplifier	Part No. 160 78

SV 110 Switching Amplifier

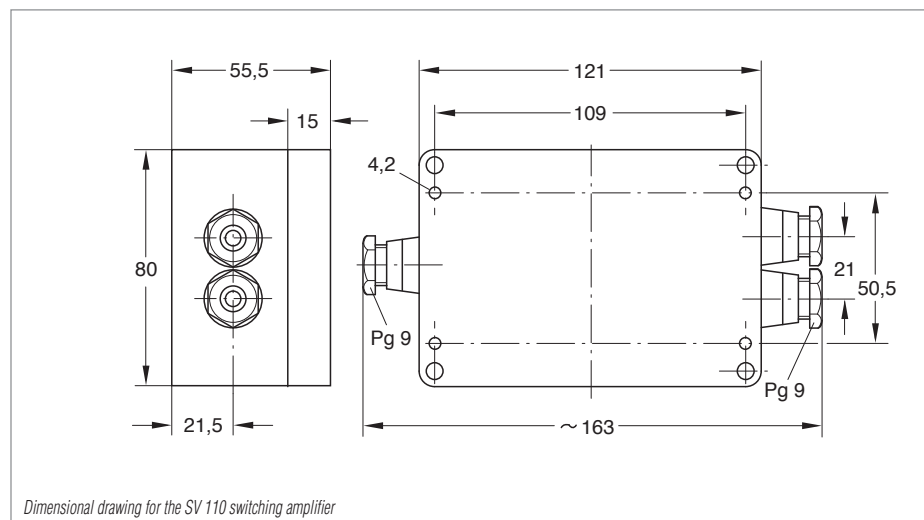
The diaphragm contact of the pressure switches is connected on one side to ground and is rated 24 V / 10 mA max. When wanting to switch higher voltages or currents, a switching amplifier will be needed. The switching amplifier is equipped with powerful floating changeover contacts. The output relay is 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

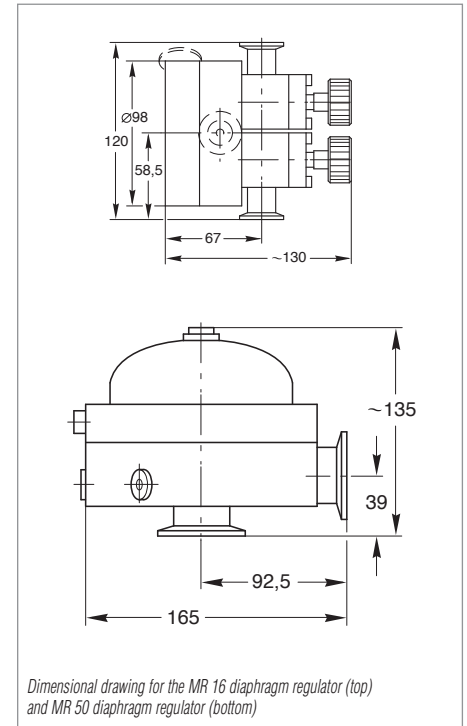
Technical Data		SV 110
Mains supply, 50/60 Hz		110/130/220/240 V, selectable
Power consumption	VA	3
Output relay		
Switching voltage/current	V / A	250 / 5
Switching power, max.	VA	500
Response time	ms	30
Relaise time	ms	7
Control circuit	V / mA	24 / 10
Ambient temperature, max.	°C	50
Weight, approx	kg (lbs)	0.36 (0.79)
Ordering Information		SV 110
Switching Amplifier		Part No. 160 78



MR 16/MR 50 Diaphragm Pressure Regulators



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

Technical Data		MR 16	MR 50
Control range	mbar (Torr)	10 to 1 000 (7.5 to 750)	
Control inaccuracy		± 2 % of the control pressure (10 - 90 % of flow)	
Throughput	m ³ /h	16	50
Nominal temperature range	°C	5 to 100	
Storage temperature range	°C	-25 to +60	
Temperature coefficient	%/K	0.3	
Settling time	ms	5	
Permissible overload for brief periods	bar	3	
Diaphragm material		FPM/EPDM	
Housing material		Stainless steel 1.4571	
Installation orientation		Any	
Dimensions		See dimensional drawing	
Vacuum connection	2x DN	16 KF	40 KF
Measurement connection	3x thread R	1/8"	
Weight, approx.	kg (lbs)	2.7 (6)	8 (17.6)

Ordering Information	MR 16	MR 50
MR 16, DN 16 KF	Part No. 160 25	-
MR 50, DN 40 KF	-	Part No. 160 27
Options		
Stainless steel measurement flange, DN 16 KF for connection to a reference and/or process chamber or pumping stud KALREZ diaphragm	-	Part No. 160 26 Part No. 200 28 597
Spare parts		
EPDM diaphragm and seal kit	Part No. 160 29	-
Viton diaphragm and seal kit	Part No. 160 31	-
Seal kit MR 50, incl. EPDM and Viton diaphragms	-	Part No. 160 32
Adjustment screw of the adjustable valve, complete with seal	Part No. 240 001	



LEYBOLD Calibration Service



Calibration of vacuum gauges in the pressure range from 10^{-9} to 1 000 mbar (10^{-9} to 750 Torr) through two systems.

Note

For US we offer NIST Calibration upon request.

Technical Data		DKD Calibration			Factory Calibration		
Calibration range	mbar	to 10^{-3}	to 10^{-5}	to 10^{-9}	to 10^{-3}	to 10^{-5}	to 10^{-8}
Ordering Information		DKD Calibration			Factory Calibration		
Part No.		157 12	157 13	157 14	157 22	157 23	157 24

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 DKD 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 lamps

DKD Calibration

It is the task of the German Calibration Service (DKD) to ensure traceability of industrial measurements and testing to national standards.

The German Calibration Service is run jointly by the Federal Institution for Physics and Technology (PTB), the industry, the Federal Minister for Economics and the Western European Metrology Club (WEMC).

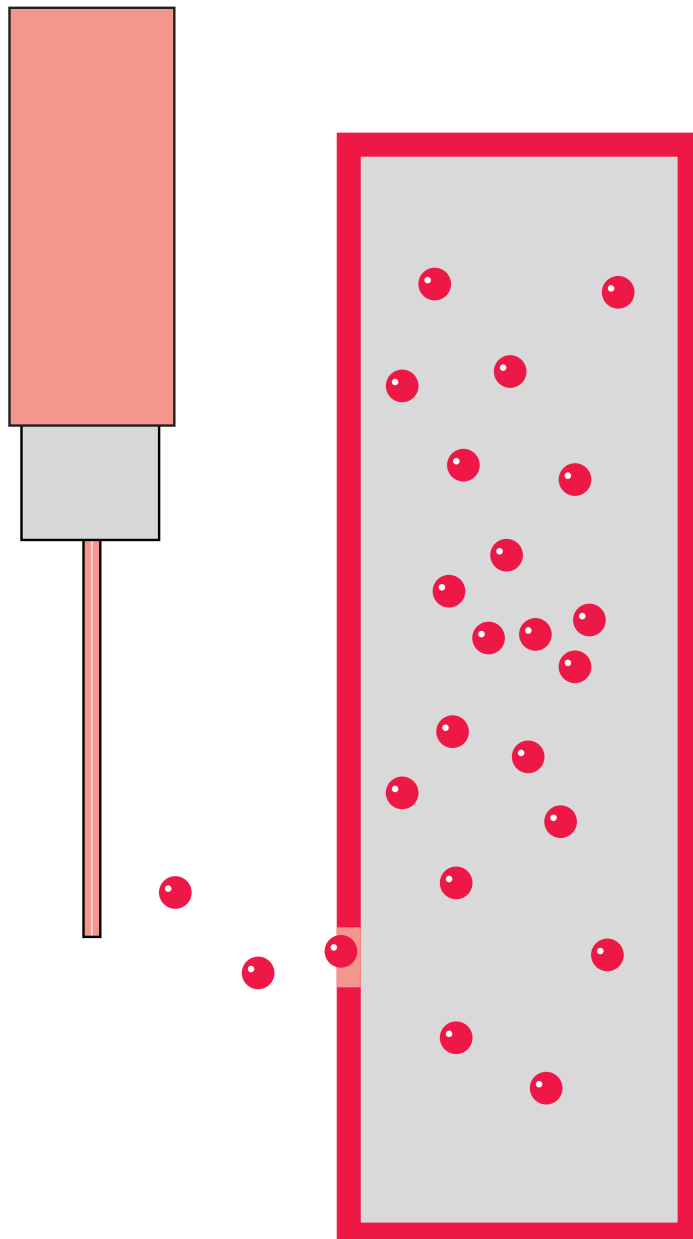
The transfer standards employed in the DKD calibration facility run by LEYBOLD are checked regularly (recalibrated) by the PTB.

Within the framework of the German Calibration Service, the calibration pump system at LEYBOLD has been checked and approved by the PTB and the transfer standards employed have been calibrated by the PTB.

Factory calibrations are run with standards which have not been calibrated directly at the PTB; instead the transfer standards of the in-house DKD calibration service are used. Thus traceability to national standards is ensured in both cases.

Leak Testing Instruments

Helium Leak Detectors



General

Applications and Accessories	C17.03
Leak Detection - Leak Testing	C17.04
Leak Detection Methods	C17.05
Operating Principles of the Helium Leak Detectors	C17.06

Products

Helium Leak Detectors	
L 200 <i>plus</i>	C17.08
L 200 dry	C17.09
Modul L 200 <i>plus</i>	C17.10
Mobile Leak Detection Systems fitted to the CART 200	C17.12

Product-Related Accessories

Calibrated Leaks for Vacuum and Sniffer Applications	C17.14
Screw-in Calibrated Leaks	C17.16
Accessories	
for the L 200 <i>plus</i> , L 200 dry and Modul L 200 <i>plus</i>	C17.18
Helium Sample Probes (Sniffers)	C17.20

Other Accessories

Connection Flanges	C17.21
Connection Components	C17.21

Applications and Accessories

Test Instruments / Leak Detectors		L 200 plus	L 200 dry	Modul L 200 plus, (oil-free)	Modul L 200 plus, (oil-sealed)
Applications					
Semiconductor production		♦	♦	♦	
Vacuum coating		♦			♦
Research and development		♦	♦	♦	
Chemistry/pharmaceutical		♦	♦	♦	♦
Metallurgy/furnaces		♦			♦
Lamps and tube manufacture		♦			♦
Automotive industry		♦			♦
Laser engineering		♦	♦		
Particle accelerators			♦	♦	
Analytical engineering		♦	♦	♦	♦
Systems with cryo pumps		♦	♦	♦	♦
Cooling and air conditioning		♦			♦
Electrical engineering		♦			♦
Mechanical engineering		♦			♦
Power plants		♦			♦
Systems engineering		♦			♦
UHV applications		♦	♦	♦	♦
Accessories					
	Page				
Calibrated leaks	C17.14	♦	♦	♦	♦
Screw-in calibrated leaks	C17.16	♦	♦	♦	♦
Transportation means	C17.18	♦	♦	♦	♦
Partial flow system	C17.18	♦	♦		
PC software LeakWare	C17.18	♦	♦	♦	♦
Helium sniffers	C17.20	♦	♦	♦	♦
Exhaust filter sets		standard	standard		
Interfaces		standard	standard	standard	standard
Gas ballast facilities		standard			
Trigger relay boards		standard	standard	standard	standard
Seal kits		♦	♦	♦	♦

Leak Detection — Leak Testing

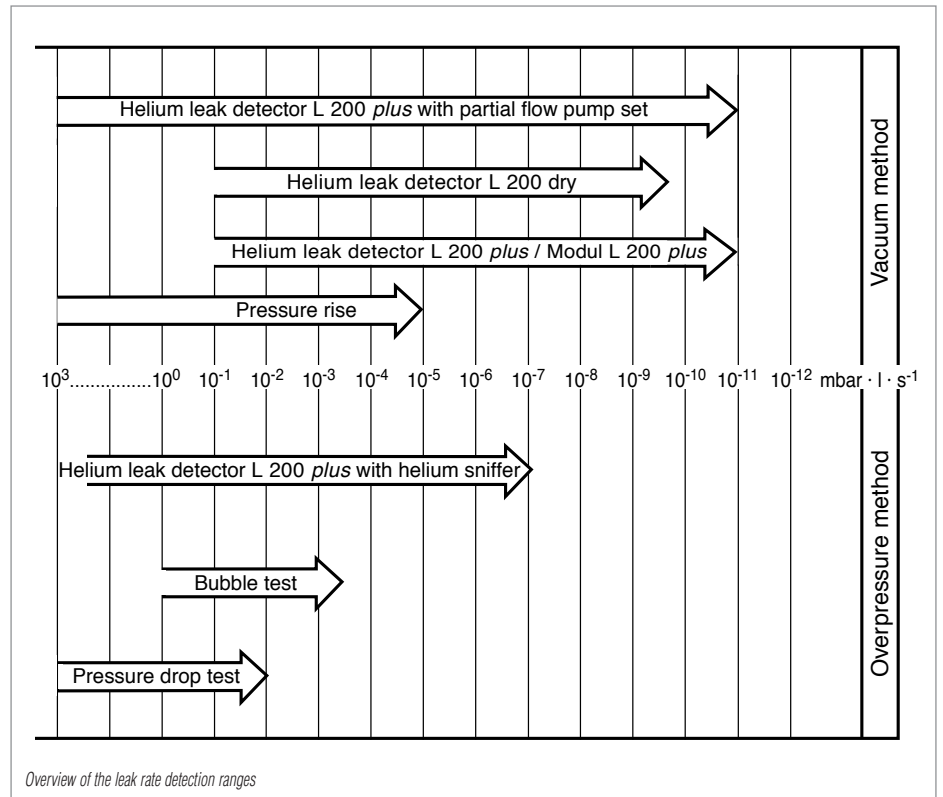
Whether a component or a system is leak-tight depends on the application it is to be used in and the leak rate that is acceptable. Absolutely leak-tight components and systems do not exist. A component is considered technically leak-tight if its leak rate remains below a value defined for this particular component. In order to provide a quantitative measure, the term “leak rate” with the symbol “ q_L ” was introduced. In vacuum technology $\text{mbar} \times \text{l} \times \text{s}^{-1}$ is used as the unit for leak rates.

A leak rate of $1 \text{ mbar} \times \text{l} \times \text{s}^{-1}$ 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.

$$q_L = \frac{V \times \Delta p}{\Delta t} \text{ (mbar} \times \text{l} \times \text{s}^{-1}\text{)}$$

The wide range of leak rates from several $100 \text{ mbar} \times \text{l} \times \text{s}^{-1}$ to below $10^{-11} \text{ mbar} \times \text{l} \times \text{s}^{-1}$ as they occur in practice necessitates the use of different leak 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	atm x cm ³ x s ⁻¹ *				kg x h ⁻¹	g/a
	Pa x m ³ x s ⁻¹	mbar x l x s ⁻¹	cm ³ x s ⁻¹ *	torr x l s ⁻¹ *	air	C ₂ H ₂ F ₄ (R 134a)
Pa x m ³ x s ⁻¹	1	10	9.87	7.5	4.28 x 10 ⁻²	2.28 x 10 ⁶
1 mbar x l x s ⁻¹ (He)	0.1	1	0.99	0.75	4.3 x 10 ⁻³	2.28 x 10 ⁵
1 atm x cm ³ x s ⁻¹ * = cm ³ (STP) x s ⁻¹	0.101	1.01	1	0.76	4.3 x 10 ⁻³	2.3 x 10 ⁵
1 torr x l x s ⁻¹ *	0.133	1.33	1.33	1	5.7 x 10 ⁻³	3.0 x 10 ⁵
1 kg x h ⁻¹ air	23.4	234	234	175	1	–
1 g/a C ₂ H ₂ F ₄ (R 134a)	6.41 x 10 ⁻⁷	7.58 x 10 ⁻⁶	6.3 x 10 ⁻⁶	4.8 x 10 ⁻⁶	–	1

* According to international system of units only Pa x m³ x s⁻¹ 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

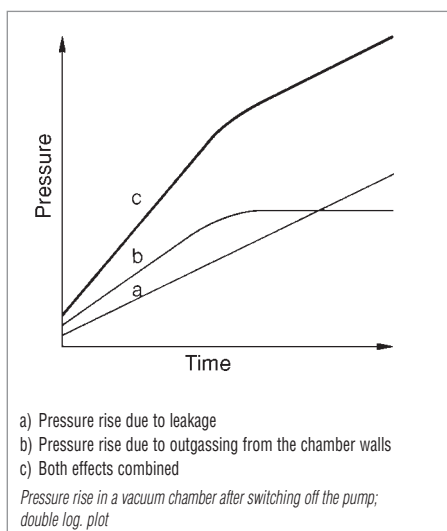
1. The lowest leak rates can only be measured by employing the vacuum method, whereby the following applies: The lower the leak rate, the higher the requirements are concerning cleanliness and ultimate vacuum.
2. If possible the test objects should be tested under the same conditions that will be used 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.

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



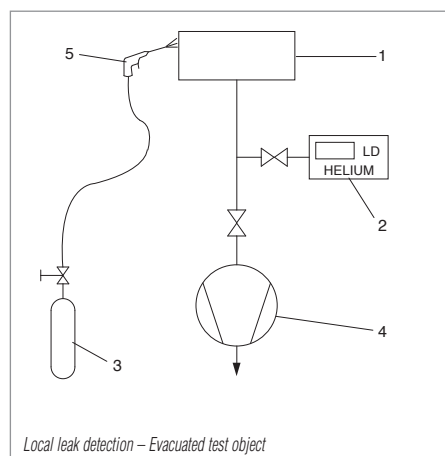
pressure rise if there is only a leak. Curve (b) shows the pressure rise due to outgassing from the surfaces of the test object. This pressure rise tends to tail off in the direction of a saturation level. If in such a case the time allowed for monitoring the pressure rise is too short, a leak will be 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 4). Curve (c) shows the pressure rise as it occurs in practice, where outgassing and leak rate add. The detectable leak rate depends on the volume of the test object, the obtained ultimate pressure and the outgassing 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

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 cham-



ber 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

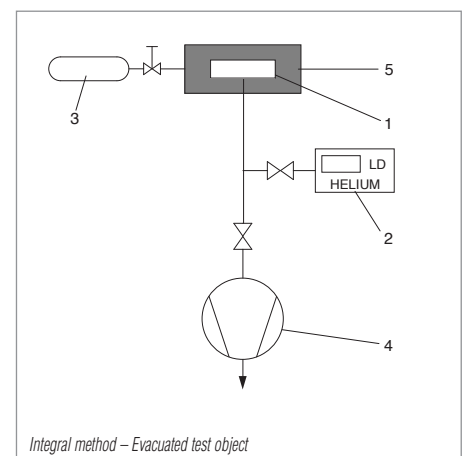
The test object is filled with a gas (for example air or nitrogen) until the testing pressure is reached. Precision vacuum gauges are used to detect a possible pressure drop during the testing period. This method is simple to implement, it is suitable for the determination of gross leaks and can be improved 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

Key to the Figures

- 1 Test object
- 2 Leak detector
- 3 Search gas cylinder
- 4 Vacuum pump
- 5 Hood
- 6 Spray gun for search gas
- 7 Sniffer probe



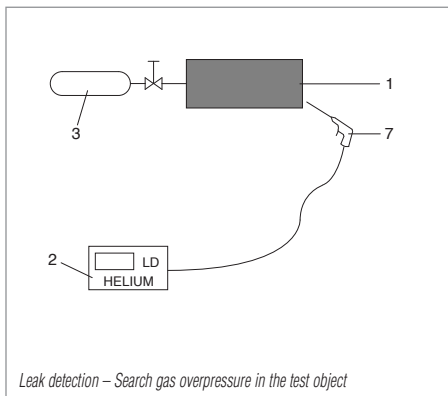
out of the leak is sucked in and transferred to the detection system of the leak detector. After conversion into electrical signals these are displayed optically and acoustically by the leak detector.

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 or 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.

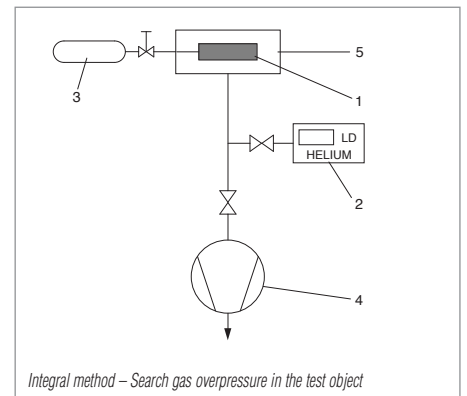
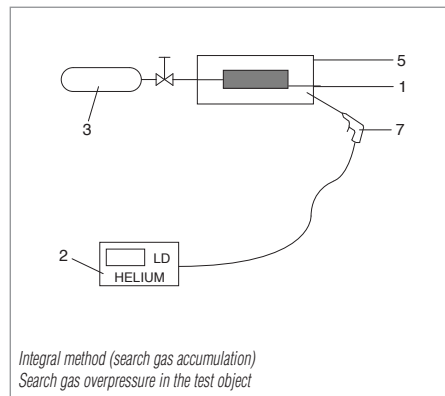
Integral Method – Bombing-Test

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.



Operating Principles of the Helium Leak Detectors

Operating Principle

A helium leak detector permits 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 counter-flow method and partial flow operation (see description below) permit the measurement of very high leak rates even with a sensitive helium

leak detector. In addition the multi-stage switchable high impedance input amplifiers of the leak detectors also permit 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:

$$\text{Response time for helium } t_A = 3 \frac{V}{S_{He}}$$

(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).

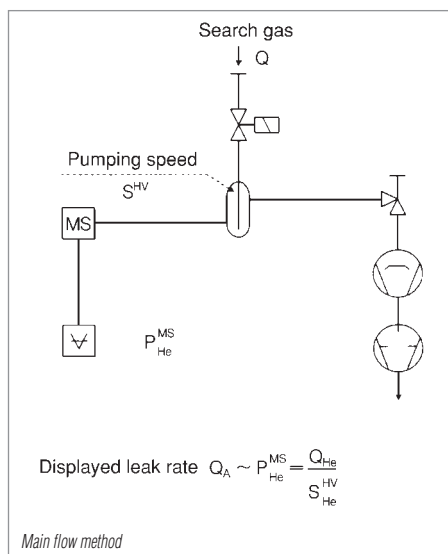
Main Flow Method

The classic operating principle of helium leak detectors is based on the main flow method. 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 permits 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 main flow method is thus especially suitable for stationary leak detection on components. Leak detection on systems having their own pump sets and at higher pressures requires the use of an external throttling valve, i.e. a partial flow with subsequently reduced sensitivity is utilized.



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.

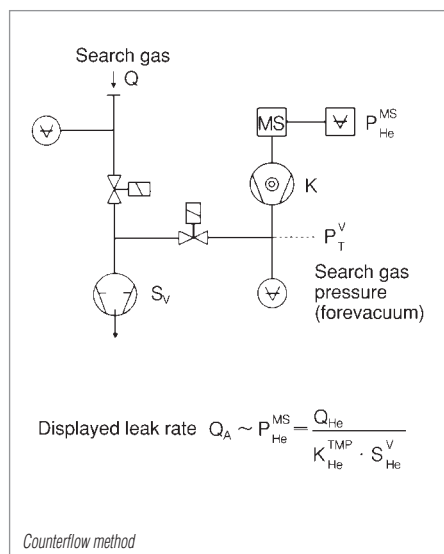
The advantages of the counterflow method are:

- 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.

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.

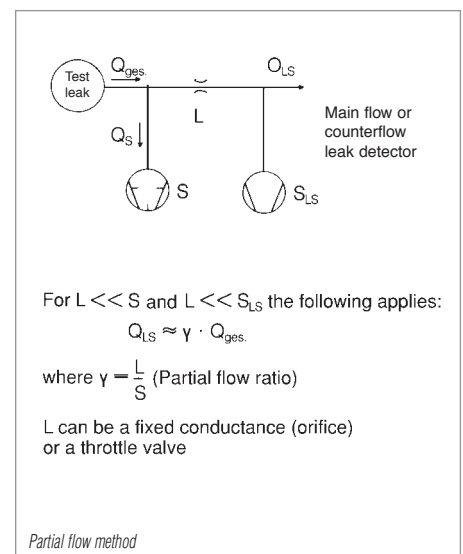
In all leak detectors this is achieved by a partial flow throttle made of ruby with a precisely machined hole. This ensures that the quantitatively determined leak rates are always correct without calibration, even for gross leaks.

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 x s⁻¹ as part of the standard range of products. All leak rates are traceable to the standards of the German 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 German Calibration Service. The calibration itself is performed by the German Calibration Service for Vacuum which is run by LEYBOLD on behalf of the PTB.



Helium Leak Detector L 200 *plus*



The L 200 *plus* is a portable multi-purpose helium leak detector and equally well suited to both service and series production testing.

Its rugged design and its ease of use make the L 200 *plus* to the best selling leak detector in the world.

Advantages to the User

- ◆ Quick start-up
- ◆ Extremely fast response time
- ◆ Oil-free gas admission system
- ◆ One of the smallest helium leak detectors in the world
- ◆ High sensitivity
- ◆ Ergonomically designed
- ◆ Hand unit can be operated with one hand equally well by right and left-handers
- ◆ Fast leak rate readout also at low leak rates

Typical Applications

Leak tests in connection with

- ◆ Quality assurance
- ◆ Automotive industry
- ◆ Analytical instruments
- ◆ Systems manufacture
- ◆ Power station engineering
- ◆ Research and development
- ◆ Semiconductor industry
- ◆ High vacuum and ultra-high vacuum engineering
- ◆ Ideal tool for industrial series production testing – in the cooling and air conditioning industries, for example

In connection with the sniffer lines which are available as accessories the L 200 *plus* may also be used as a sniffer leak detector.

In connection with a partial flow pump set the L 200 may also be used for the detection of leaks on large vessels.

Technical Data		L 200 <i>plus</i>
Smallest detectable helium leak rate (Vacuum mode)	mbar x l x s ⁻¹	< 10 x 10 ⁻¹²
Smallest detectable helium leak rate (Sniffer mode)	mbar x l x s ⁻¹	< 1 x 10 ⁻⁷
Max. detectable helium leak rate (Vacuum mode)	mbar x l x s ⁻¹	1 x 10 ⁻¹
Max. inlet pressure	mbar (Torr)	3 (2.25)
with partial flow pump set	mbar (Torr)	1000 (760)
Pumping speed during the evacuation process		
50 Hz	m ³ x h ⁻¹ (cfm)	2.5 (1.5)
60 Hz	m ³ x h ⁻¹ (cfm)	3.0 (1.8)
Pumping speed for helium at the inlet	l/s	1
Time constant of the leak signal (blanked off, 63 % of final value)	s	< 1
Leak rate measurement range	mbar x l x s ⁻¹	1 x 10 ⁻¹² to 1 x 10 ⁻¹
Units of measurement (selectable)		mbar x l x s ⁻¹ , atm x cc x sec ⁻¹ , Pa x m ³ x s ⁻¹ , ppm, Torr x l x s ⁻¹ , g/a, oz/y
Time until ready for operation	min	< 3
Mass spectrometer		180° magnetic sector field
Ion source		2 yttrium/iridium long-life cathodes
Detectable masses	amu	2, 3 and 4
Test port	DN	1 x 25 KF
Length of the cable on the hand unit	m	4
Dimensions (W x H x D)	mm	490 x 430 x 250
Weight	kg (lbs)	35.5 (78.4)
Ordering Information		L 200 <i>plus</i>
L 200 <i>plus</i>		
230 V / 50/60 Hz, mbar readout, with TL 7		Part No. 140 00 L
230 V / 50/60 Hz, mbar readout, without TL 7		Part No. 140 01 L
PC software LeakWare		Part No. 140 90
Seal kit		Part No. 200 99 150
Calibrated leak TL 7 for fitting into the L 200		Part No. 140 23
For further accessories see Section "Accessories for L 200 <i>plus</i> , L 200 dry and Modul L 200 <i>plus</i> "		

Portable and Dry Helium Leak Detector L 200 dry



The L 200 dry is a compact portable helium leak detector capable of meeting the highest cleanliness requirements.

Based on the well-proven technology of the L 200, but equipped with an oil-free pump system, the L 200 dry meets the highest requirements concerning cleanliness while at the same time being small in size.

Advantages to the User

- ◆ Oil-free “dry” pump system
- ◆ Small footprint
- ◆ Quick start-up
- ◆ Extremely fast response

Typical Applications

Leak tests with stringent requirements concerning cleanliness, for example

- ◆ Semiconductor industry
 - after repairs or maintenance work
- ◆ Semiconductor industry
 - Production of semiconductor components
- ◆ Pharmaceutical/medicine
- ◆ Laser

Technical Data		L 200 dry
Smallest detectable helium leak rate (Vacuum mode)	mbar x l x s ⁻¹	< 3 x 10 ⁻¹⁰
Smallest detectable helium leak rate (Sniffer mode)	mbar x l x s ⁻¹	< 1 x 10 ⁻⁷
Max. detectable helium leak rate (Vacuum mode)	mbar x l x s ⁻¹	1 x 10 ⁻¹
Max. permissible inlet pressure	mbar (Torr)	3.5 (2.63)
Pumping speed during the evacuation process		
50 Hz	m ³ x h ⁻¹ (cfm)	1.6 (0.94)
60 Hz	m ³ x h ⁻¹ (cfm)	1.9 (1.12)
Pumping speed for helium at the inlet	l/s	0.6
Time constant of the leak signal (blanked off, 63 % of final value)	s	< 1
Leak rate measurement range	mbar x l x s ⁻¹	1 x 10 ⁻¹¹ to 1 x 10 ⁻¹
Units of measurement (selectable)		mbar x l x s ⁻¹ , atm x cc x sec ⁻¹ , Pa x m ³ x s ⁻¹ , ppm Torr x l x s ⁻¹ , g/a, oz/y
Time until ready for operation	min	< 3
Mass spectrometer		180° magnetic sector field
Ion source		2 yttrium/iridium long-life cathodes
Detectable masses	amu	2, 3 and 4
Test port	DN	1 x 25 KF
Length of the cable on the hand unit	m	4
Dimensions (W x H x D)	mm	490 x 430 x 250
Weight	kg (lbs)	33 (72.8)
Ordering Information		L 200 dry
L 200 dry	230 V / 50/60 Hz, mbar readout, with TL 7	Part No. 140 15 L
PC software LeakWare		Part No. 140 90
Seal kit		Part No. 200 99 150
For further accessories see Section “Accessories for L 200 plus, L 200 dry and Modul L 200 plus”		

Mobile and Flexible Helium Leak Detector Modul L 200 *plus*



Modul L 200 *plus*

The Modul L 200 *plus* combines the excellent characteristics of the L 200 *plus* with those of the pump system which has been added to the basic leak detector module.

This results in two basic groups:

- ◆ Dry, mobile leak detectors with selectable pumping speed
- ◆ Oil-sealed, mobile leak detectors offering a high pumping speed at an optimum price-to-performance ratio.

Modul L 200 *plus* with Oil-Sealed Backing Pump

This combination represents a powerful leak detector, the pumping speed of which is adapted to the particular application in each case.

Advantages to the User

- ◆ Cost-effective leak detector
- ◆ Pumping speed optimized for the particular application
- ◆ Fast response
- ◆ Quick recovery
- ◆ High sensitivity
- ◆ Fast leak rate readout also at low leak rates

Typical Applications

All applications involving short cycles and/or larger volumes and which require a mobile system, like for example:

- ◆ Automotive industry
- ◆ Cooling and air conditioning
- ◆ Manufacturers of furnaces/machines/systems
- ◆ Packaging

The Modul L 200 *plus* represents the basic unit of an entire family of leak detectors. It is based on the L 200 *plus*, is not equipped with an integrated backing pump and may be easily adapted by adding an external backing pump to suit a wide range of applications.

Modul L 200 *plus* with Dry-Compressing Scroll Pump

This combination represents a dry high-performance leak detector.

Advantages to the User

- ◆ Very high pumping speed which is also acceptable for testing semiconductor production chambers without having to use their own pump systems
- ◆ Fast response
- ◆ Quick recovery (after helium contamination)
- ◆ Absolutely dry
- ◆ High sensitivity

Typical Applications

All applications which demand a clean process, like for example:

- ◆ Semiconductor industry (chip manufacturers)
- ◆ Semiconductor industry (tool manufacturers and subcontractors)
- ◆ High purity gas industry
- ◆ Research and development
- ◆ UHV applications

Technical Data		Modul L 200 <i>plus</i>	
		with Rotary Vane Vacuum Pump	with Scroll Pump
Smallest detectable helium leak rate (Vacuum mode)	mbar x l x s ⁻¹	< 10 x 10 ⁻¹²	
Smallest detectable helium leak rate (Sniffer mode)	mbar x l x s ⁻¹	< 1 x 10 ⁻⁷	
Max. detectable helium leak rate (Vacuum mode)	mbar x l x s ⁻¹	10 ⁻¹	
Max. permissible inlet pressure	mbar (Torr)	3 (2.25)	
Pumping speed during the evacuation process			
Scroll pump / TRIVAC D 25 B pump	m ³ x h ⁻¹ (cfm)	25 (14.7)	25 (14.7)
Pumping speed for helium at the inlet flange	l/s	8	8
Time constant of the leak signal (blanked off, 63 % of final value)	s	< 1	
Leak rate measurement range	mbar x l x s ⁻¹	1 x 10 ⁻¹² to 1 x 10 ⁻¹	
Units of measurement (selectable)		mbar x l x s ⁻¹ , atm x cc x sec ⁻¹ , Pa x m ³ x s ⁻¹ , ppm, Torr x l x s ⁻¹ , g/a, oz/y	
Time until ready for operation	min	< 3	
Mass spectrometer		180° magnetic sector field	
Ion source		2 yttrium/iridium long-life cathodes	
Detectable masses	amu	2, 3 and 4	
Test port	DN	1 x 25 KF	
Length of the cable on the hand unit	m	4	
Dimensions (W x H x D)	mm	490 x 430 x 250	
Weight (without pump)	kg (lbs)	30.5 (67)	

The following Part Nos. contain only the individual components needed for assembly by the customer. For building a portable system we recommend our factory tested and pre-assembled systems (see next page "Mobile Leak Detection Systems fitted to the CART 200").

Ordering Information	Modul L 200 <i>plus</i>
Modul L 200 <i>plus</i> without pump ¹⁾ Euro, 230 V / 50/60 Hz	Part No. 140 34 L
PC software LeakWare	Part No. 140 90
Seal kit	Part No. 200 99 150
Pumps	
TRIVAC D 25 B; 230 V, 50/60 Hz	Part No. 113 35
Scroll, 230 V / 50/60 Hz	Part No. 200 000 214
CART 200	Part No. 140 93
For further accessories see Section "Accessories for L 200 <i>plus</i> , L 200 dry and Modul L 200 <i>plus</i> "	

¹⁾ But without integrated backing pump

Please order cart separately

Mobile Leak Detection Systems fitted to the CART 200



CART 200 with Modul L 200 plus and TRIVAC D 25 B

These mobile systems are accommodated on the CART 200. Placed on these carts are the leak detectors L 200 *plus*, L 200 dry or Modul L 200 *plus*.

Additional backing pumps (depending on the version required) are accommodated on the bottom level of the carts.

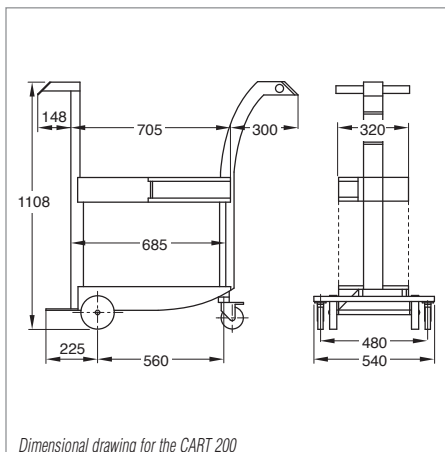
CART 200

The CART 200 is a special transport cart made of painted steel with an integrated holder for gas cylinders and space for small parts and documents. The leak detector and the pump are accommodated on two levels.

The pre-assembled and tested system according to the Part Nos. on the next page include all required connecting components between leak detector and backing pump. Then only the upper section of the system will be packaged separately. The helium cylinder is not part of the delivery.

Advantages to the User

- ◆ Complete, fully operational leak detection system
- ◆ Simple to operate
- ◆ Choice of either oil-sealed or dry compressing backing pump
- ◆ In the case of these systems, the transport cart CART 200 is included



Dimensional drawing for the CART 200

Technical Data		CART L 200 <i>plus</i>	CART L 200 <i>dry</i>	CART Modul L 200 <i>plus</i>
Smallest detectable leak rate for air (Vacuum mode)	mbar x l x s ⁻¹	< 10 x 10 ⁻¹²	< 3 x 10 ⁻¹⁰	< 10 x 10 ⁻¹²
Smallest detectable leak rate for helium (Sniffer mode)	mbar x l x s ⁻¹	< 1 x 10 ⁻⁷		
Max. detectable leak rate for helium (Vacuum mode)	mbar x l x s ⁻¹	10 ⁻¹		
Max. inlet pressure	mbar (Torr)	1000 (752)	3.5 (2.63)	3 (2.25)
Pumping speed during the evacuation process with Scroll	m ³ x h ⁻¹	25		
TRIVAC D 25 B, Euro	m ³ x h ⁻¹	25		
Max. pumping speed for helium at the inlet flange	l/s	8		
Time constant of the leak signal (blanked off, 63 % of final value)	s	< 1		
Leak rate measurement range	mbar x l x s ⁻¹	1 x 10 ⁻¹² to 1 x 10 ⁻¹	1 x 10 ⁻¹¹ to 1 x 10 ⁻¹	1 x 10 ⁻¹² to 1 x 10 ⁻¹
Units of measurement (selectable)		mbar x l x s ⁻¹ , atm x cc x sec ⁻¹ , Pa x m ³ x s ⁻¹ , ppm, Torr x l x s ⁻¹ , g/a, oz/y		
Time until ready for operation	min	< 3		
Mass spectrometer		180° magnetic sector field		
Ion source		2 yttrium/iridium long-life cathodes		
Detectable masses	amu	2, 3 and 4		
Test port	DN	1 x 25 KF		
Cable length for the hand unit	m	4		
Dimensions (W x H x D)	mm	540 x 1350 x 1150		
Weight	kg (lbs)	119 (263)	128 (283)	115 / 125 (254 / 276)
Ordering Information		CART L 200 <i>plus</i>	CART L 200 <i>dry</i>	CART Modul L 200 <i>plus</i>
CART L 200 <i>plus</i> with partial flow pump set TRIVAC D 25 B		Part No. 140 85 L	-	-
CART L 200 <i>dry</i> with partial flow pump set Scroll pump		-	Part No. 140 75 L	-
CART Modul 200 <i>plus</i> ¹⁾ with Scroll pump		-	-	upon request
TRIVAC D 25 B		-	-	upon request

¹⁾ Without integrated backing pump

Calibrated Leaks for Vacuum and Sniffer Applications



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.

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 \times l \times s $^{-1}$ for TL 4 and 10^{-6} mbar \times l \times s $^{-1}$ 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 \times l \times s $^{-1}$, 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 5

Calibrated helium leak (capillary leak) with reservoir which may be refilled and with a leak rate in

the range of 10^{-5} mbar \times l \times s $^{-1}$. Special calibrated leak for use in a vacuum.

TL 7

Helium calibrated leak (capillary leak) with helium reservoir and electromagnetically operated valve, for installation in the ULTRATEST L 200. Leak rate range 10^{-7} mbar \times l \times s $^{-1}$. The electromagnetically operated valve provided permits the opening and closing of the calibrated leak to be controlled by the leak detector's software.

TL 8 and TL 9

Helium calibrated leak calibrated for a leak rate in the range of 10^{-8} mbar \times l \times s $^{-1}$ (helium leak rate) for TL 8 and 10^{-9} mbar \times l \times s $^{-1}$ 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 5 are not suited for use in a vacuum.

Advantages to the User

- ◆ Factory certificate (included) in accordance with DIN 55 350-18-4.2.2
- ◆ Highly accurate
- ◆ Very low temperature dependence
- ◆ Determination of the nominal leak rate by comparison with a calibrated leak having a PTB ¹⁾ certificate
- ◆ DKD 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⁾ 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 \times l \times s $^{-1}$.

Set of Calibrated Leaks for Power Plants

These three calibrated leaks of 1000, 100 and 10 mbar \times l \times s $^{-1}$ allow leak tests under partial flow conditions under the ambient conditions of power plants.

Technical Data	Leak Rate Range	Leak Detection Method	Connection Flange
TL 4, without helium gas reservoir	10^{-4} mbar x l x s ⁻¹	Vacuum and sniffer	DN 16 KF
TL 6, without helium gas reservoir	10^{-6} mbar x l x s ⁻¹	Vacuum and sniffer	DN 16 KF
TL 4-6, with helium gas reservoir	10^{-4} to 10^{-6} mbar x l x s ⁻¹	Vacuum and sniffer	DN 16 KF
TL 5, mit He-Gasvorrat	10^{-5} mbar x l x s ⁻¹	Vacuum	Discharging opening
TL 7, with helium gas reservoir	10^{-7} mbar x l x s ⁻¹	Vacuum (for installation in the L 200 plus)	DN 10 KF
TL 8, with helium gas reservoir	10^{-8} mbar x l x s ⁻¹	Vacuum	DN 10 KF
TL 9, with helium gas reservoir	10^{-9} mbar x l x s ⁻¹	Vacuum	DN 10 KF
S-TL 4, with helium gas reservoir	10^{-4} mbar x l x s ⁻¹	Sniffer	Nozzle
S-TL 5, with helium gas reservoir	10^{-5} mbar x l x s ⁻¹	Sniffer	Nozzle
S-TL 6, with helium gas reservoir	10^{-6} mbar x l x s ⁻¹	Sniffer	Nozzle

Ordering Information	Calibrated Leak
TL 4, without helium gas reservoir *)	Part No. 155 65
TL 6, without helium gas reservoir *)	Part No. 155 66
TL 4-6, with helium gas reservoir *)	Part No. 155 80
TL 5, mit He-Gasvorrat *)	Part No. 122 67
TL 7, with helium gas reservoir, for installation within the L 200 *)	Part No. 140 23
TL 8, with helium gas reservoir *)	Part No. 165 57
TL 9, with helium gas reservoir *)	Part No. 144 08
S-TL 4, with helium gas reservoir *)	Part No. 122 37
S-TL 5, with helium gas reservoir *)	Part No. 122 38
S-TL 6, with helium gas reservoir *)	Part No. 122 39
Set of calibrated leaks for power plants 1000, 100, 10 mbar x l x s ⁻¹	Part No. 115 16
Rubber bladder	Part No. 200 20 218
Hose clamp	Part No. 200 20 217
Helium can; 1 l, 12 bar (for TL 4-6)	Part No. 252 001
DKD calibration for TL 7/8	Part No. 154 15

*) 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 now offering a new 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

Advantages to the User

- ◆ Various types adapted to different customer requirements
- ◆ Simple to operate
- ◆ Easy to install
- ◆ 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



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 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 KF running to the vacuum chamber
- Hose nozzle, 10 mm in diameter or VCO fitting, 10 mm in diameter



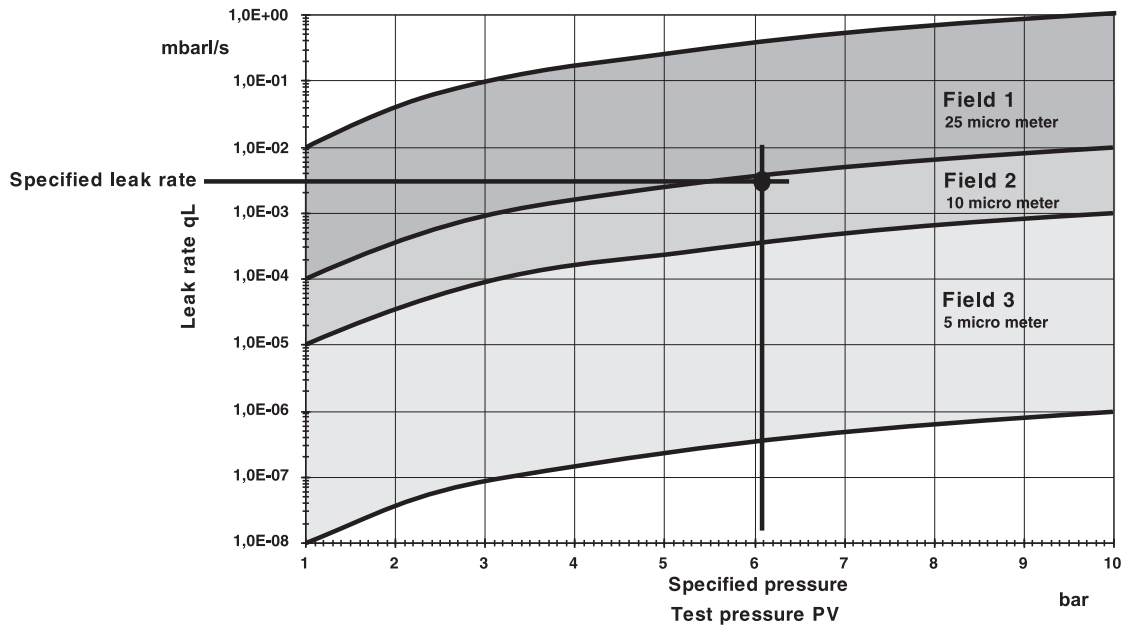
Calibrated leak with cylindrical casing

Calibrated Leak with Cylindrical Casing

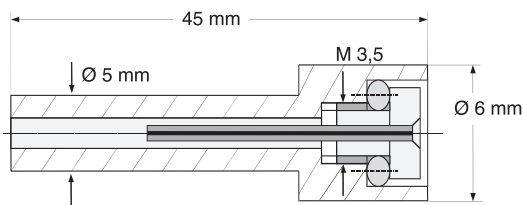
Is used to check the sensitivity of a sniffing facility.

Before and after the actual test, the operator checks the sensitivity of his test facility within the scope of a plausibility check.

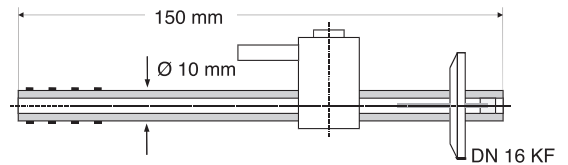
The connection on the side of the customer's system is provided via a VCO fitting for a diameter of 10 mm.



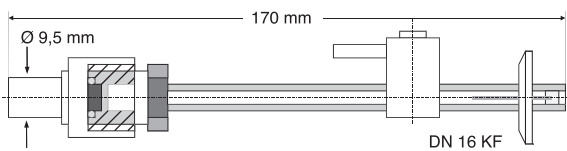
Leak rate as a function of applied test pressure vs. 0 bar



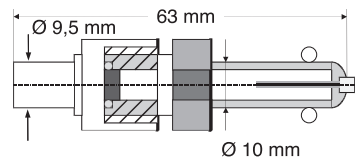
Calibrated leak with screw-in sleeve



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

Technical Data

Calibrated Leak

Leak rate	mbar x l x s ⁻¹	Casing only	Field 1	Field 2	Field 3
			1 · 10 ⁻⁴	10 ⁻² - 10 ⁻⁵	10 ⁻³ - 10 ⁻⁸

Ordering Information *)

Calibrated Leak

Calibrated leak		Part No. 143 00	Part No. 143 01	Part No. 143 02
with screw-in sleeve	-	Part No. 143 04	Part No. 143 05	Part No. 143 06
with pin type casing and VCO fitting	Part No. 143 03	Part No. 143 08	Part No. 143 09	Part No. 143 10
with pin type casing and hose nozzle	Part No. 143 07	Part No. 143 12	Part No. 143 13	Part No. 143 14
with cylindrical casing and VCO fitting	Part No. 143 11			

*) When ordering please always state leak rate, test pressure and helium concentration

Accessories for the L 200 *plus*, L 200 dry and Modul L 200 *plus*



CART 200 (standard steel, painted)

CART 200

For the L 200 *plus*, L 200 dry and Modul L 200 *plus*; including shelf and holder for gas cylinders; made of painted sheet steel.

The CART's are prepared for accommodating the Scroll and the TRIVAC D 25 B pumps.



Transport case

Transport Case

For impact protected transportation of the L 200 *plus*; complete with strong carrying handles and plastic castors. Separate case for accessories.



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.



Partial flow system without pump

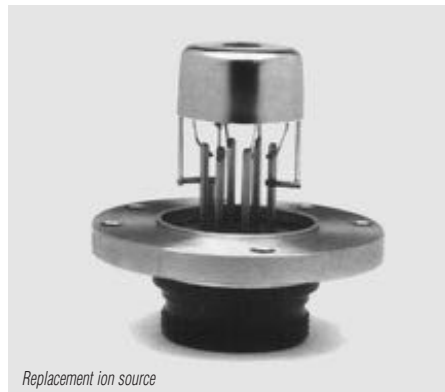
Partial Flow System L 200 *plus* and L 200 dry

For evacuation of test objects up to 100 l. Gross leak detection up to $10 \text{ mbar} \times \text{l} \times \text{s}^{-1}$. Maximum test pressure: 1000 mbar.

Equipment:

Valve block (with inlet valve, venting valve, bypass or purging valve) plus right-angle bellows valve DN 25 KF made of stainless steel, solenoid drives, suited for remote control by the L 200 *plus*, mains power 230 V / 50/60 Hz.

The partial flow systems are available without pumps or in mobile systems with oil-sealed TRIVAC D 25 B rotary vane pumps or dry scroll pumps.



Replacement ion source

Replacement Ion Source

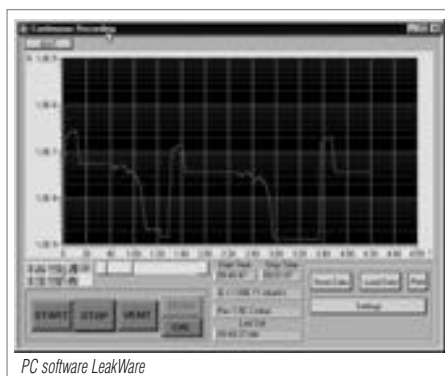
Complete replacement component, including two built-in yttrium coated iridium cathodes



Extension line

8 m Extension Line

The use of extension lines permits operation of the L 200 *plus* up to 30 m away from the test objects. A maximum of three extension lines (of 8 m each) may be connected in series.



PC software LeakWare

PC software LeakWare

The Windows PC software is used for data acquisition, documentation of the measurements and to control the operation of the leak detector.

Hardware > 486 DX and 8 MB Ram
Software Windows 95, 98, NT, 2000.

Technical Data		Accessories
Transport case	kg (lbs)	16.5 (36.4)
Transport cart CART 200	kg (lbs)	39 (86.1)
Partial flow system		
for L 200; 230 V / 50/60 Hz, without pump	kg (lbs)	5.3 (11.7)
for L 200 dry; 230 V / 50/60 Hz, without pump	kg (lbs)	5.8 (12.8)
Ordering Information		Accessories
Transport case		Part No. 140 96
Transport cart CART 200		Part No. 140 93
Partial flow system *)		
for L 200; 230 V / 50/60 Hz, without pump		Part No. 140 20
for L 200 dry; 230 V / 50/60 Hz, without pump		Part No. 140 29
Pumps		
TRIVAC D 25 B, 230 V / 50/60 Hz		Part No. 113 35
Scroll, 230 V / 50/60 Hz		Part No. 200 000 214
AF 16-25 exhaust filter, for partial flow system		Part No. 189 11
Replacement ion source		Part No. 165 04
PC software LeakWare		Part No. 140 90
8 m long extension line		Part No. 140 22
Search gas spray gun		Part No. 165 55

*) 5 centering rings, 5 clamping rings and 1 vacuum hose 1 m with DN 25 KF are included

Helium Sample Probes (Sniffers)



Helium sniffers in connection with the leak detectors are used for leak testing test samples in which a helium overpressure is present. Besides accurate pinpointing of leaks it is also possible to determine the leak rate of the escaping helium.

Advantages to the User

Helium Sniffer Line SL 200 for L 200 plus

- ◆ Sniffer line connects directly at the test connection
- ◆ Very fast response
- ◆ Extremely low detection limit $< 1 \times 10^{-7}$ mbar x l x s⁻¹
- ◆ Rigid sniffer tips 120 mm (included)
- ◆ Very rugged industrial design

Helium Sniffers QUICK-TEST QT 100 for L 200 plus

- ◆ 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 x s⁻¹
- ◆ 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 200	QT 100
Smallest detectable leak rate	mbar x l x s ⁻¹	$< 10^{-7}$	10^{-6}
Supply voltage		–	100-230 V, 50/60 Hz
Signal response time, approx.			
at a length of	5 m s	< 1	1
	20 m s	–	< 6
	50 m s	–	20
Connection flange	DN	25 KF	25 KF
Weight	kg (lbs)	0.6 (1.3)	3.5 (7.7)

Ordering Information	SL 200	QT 100
Helium sniffer line SL 200 4 m long, straight handle with red/green LED for go/no-go indication, rigid and flexible sniffer tip 120 mm	Part No. 140 05	–
Helium sniffer QUICK-TEST QT 100	–	Part No. 155 94
Sniffer line for the QT 100		
5 m	–	Part No. 140 08
20 m	–	Part No. 140 09
50 m	–	Part No. 121 83

Connection Flanges

Leak Detectors		Helium Sniffers		Calibrated Leaks	
L 200 <i>plus</i>	– DN 25 KF	SL 200	– DN 25 KF	TL 4	– DN 16 KF
L 200 <i>dry</i>	– DN 25 KF	QT	– DN 25 KF	TL 6	– DN 16 KF
Modul L 200 <i>plus</i>	– DN 25 KF	ST 100	– DN 25 KF	TL 4-6	– DN 16 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
DN 25 / 16 KF	Part No. 183 86, aluminium or Part No. 885 04, stainless steel	DN 25 KF, DN 16 KF,	Part No. 883 47 Part No. 883 46	DN 20 / 25 KF, Part No. 183 42 DN 10 / 16 KF, Part No. 183 41
DN 40 / 25 KF	Part No. 183 87, aluminium or Part No. 885 05, stainless steel	DN 25 KF, DN 40 KF,	Part No. 883 47 Part No. 883 48	DN 20 / 25 KF, Part No. 183 42 DN 32 / 40 KF, Part No. 183 43
DN 40 / 16 KF	Part No. 183 89, aluminium or Part No. 885 07, stainless steel	DN 16 KF, DN 40 KF,	Part No. 883 46 Part No. 883 48	DN 10 / 16 KF, Part No. 183 41 DN 32 / 40 KF, Part No. 183 43

The following metal hoses are recommended to connect the leak detectors to systems:

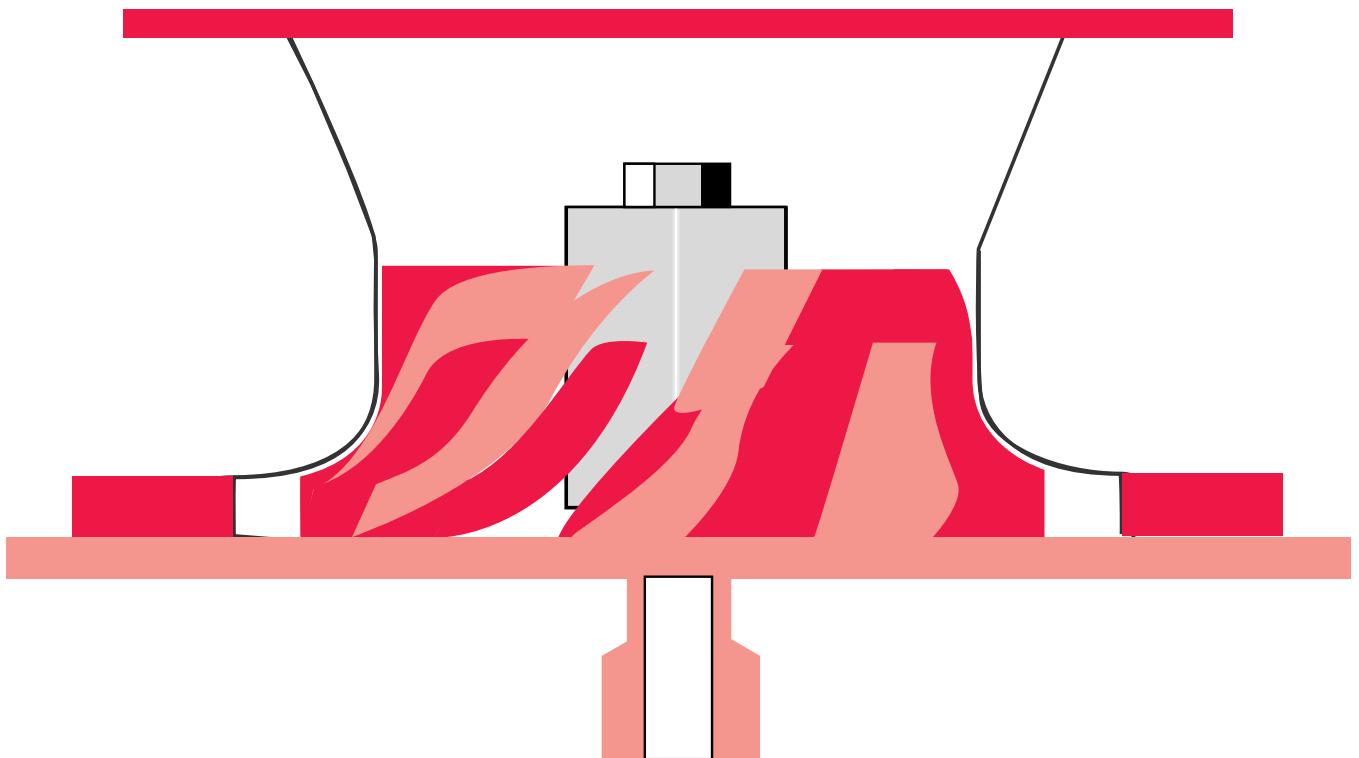
Nominal Width	Length	Ordering Information
DN 16 KF	1.0 m	Part No. 868 01
DN 16 KF	0.5 m	Part No. 867 91
DN 25 KF	1.0 m	Part No. 868 03
DN 25 KF	0.5 m	Part No. 867 93
DN 40 KF	1.0 m	Part No. 868 01
DN 40 KF	0.5 m	Part No. 867 95

Further connecting components, like quick clamping rings and other components are described in Product Section C13 “Vacuum Fittings and Feedthroughs”

C18

TST S und D

Turboradial Blowers
TURBOSTREAM
Single-Stage and Dual-Stage



General

TURBOSTREAM Blowers for the Laser Industry C18.02

Products

Turboradial Blowers
 TURBOSTREAM TST S (single-stage) C18.04
 TURBOSTREAM TST D (dual-stage) C18.08

TURBOSTREAM Blowers for the Laser Industry

Beginning in 1988, the TURBOSTREAM technology was introduced by LEYBOLD VAKUUM GmbH. Since that time improvements have been worked out and implemented together with our customers on a continual basis. This was very much facilitated by the modular concept of the units, which also today puts us in a position where we are able to fulfil your future requirements as to a tailor-made solution.

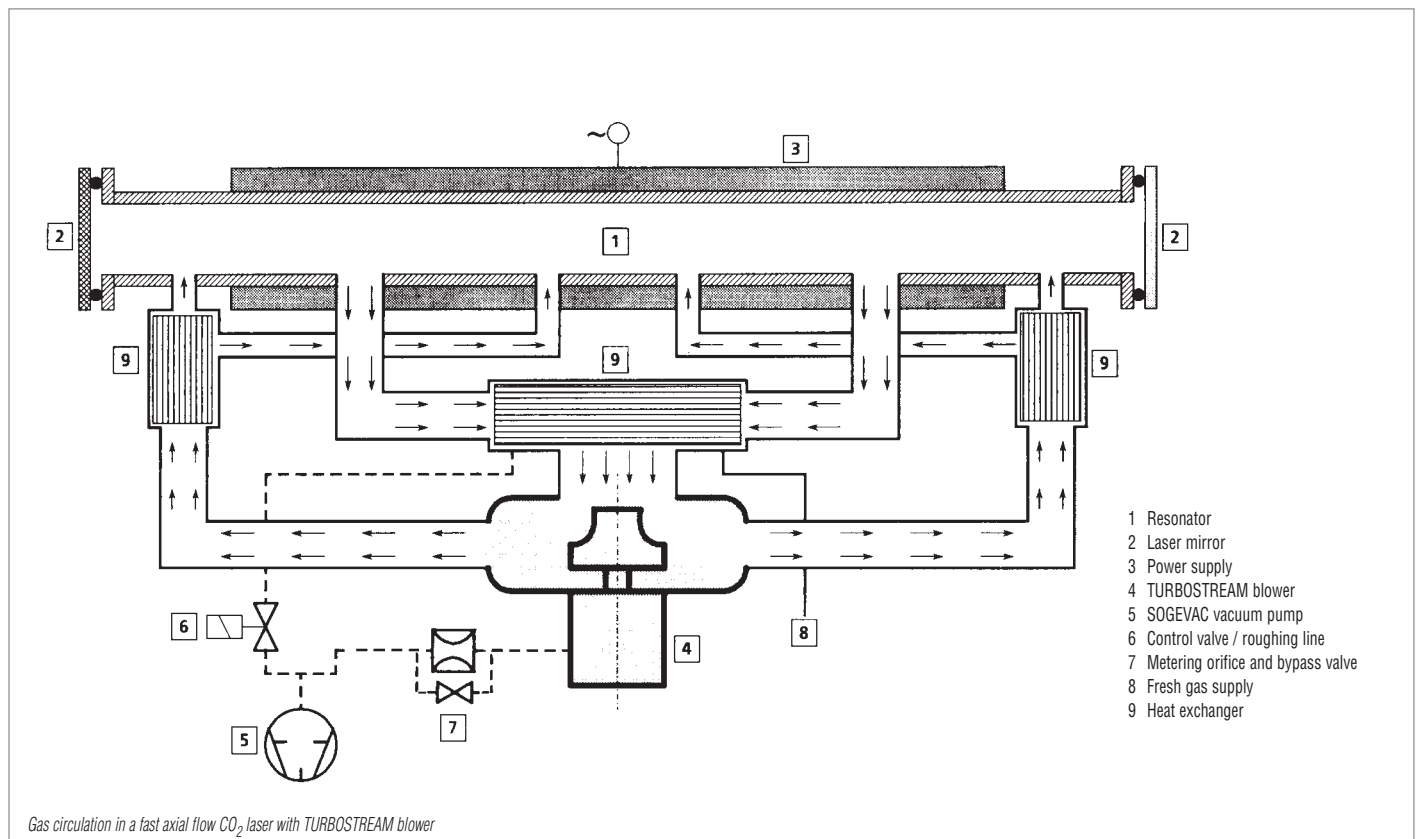
Today the unique TURBOSTREAM range from LEYBOLD is capable of improving the capabilities of your Laser system both at the Laser manufacturer and the end user with regard to:

- ◆ Quality
- ◆ Productivity
- ◆ Compactness
- ◆ Efficiency
- ◆ Reliability and
- ◆ Saving of costs

Just see how this works for you!

TURBOSTREAM Blower and Fast-flow CO₂ Laser

The CO₂ containing gas mixture which maintains in the resonator the laser effect is discharged from the resonator in the hot state and is cooled in the heat exchanger. After the gas has passed through the TURBOSTREAM, the gas is cooled once more in the downstream heat exchanger before it is returned back into the resonator.



Design Principle

The gas flows via the inlet flange (1) into the pump chamber of the blower. There it is radially accelerated by the rotating blade wheel (2) and is deflected via diffuser (4) into the ducts (5).

The gas then leaves the TURBOSTREAM through the outlet flanges (3).

The TURBOSTREAM blower is driven by a medium-frequency 3-phase asynchronous motor (8). Blade wheel (2) and motor rotor are located on one shaft (7). The stator of the motor has been built into the motor housing (13). The two hybrid ball bearings (6) of the shaft are oil-lubricated. An oil pump (10) feeds the oil through the shaft to the bearings. The motor housing of the TURBOSTREAM is water-cooled (9).

Pump chamber housing and motor housing are separated by a wear-free sealing gap.

Pump chamber housing and motor housing are separated by a wear-free sealing gap. To prevent small amounts of oil mist from entering the pump chamber via the gap (14), a small quantity of gas is constantly extracted (12) from the motor housing by the vacuum pump of the laser system. This ensures a steady gas flow from the pump chamber to the motor housing, reliably excluding the entry of oil into the pump chamber.

Supplied Equipment

Depending on customer requirements the mechanical interface to the resonator can be designed either as a pump chamber housing or a shroud. The pump chamber housing completely matches the contour of the blade wheel. Only the intake piping and the two gas discharge pipings need to be provided for integrating this blower flow-wise in the resonator circuit. The shroud version of the blower utilises for a partial section of the blade wheel the matching structures provided by the system. This arrangement of "resonator / TURBOSTREAM with shroud" can thus be more compact.

- ◆ Generally all TURBOSTREAM blowers are equipped with a vibration sensor (GUARD) which monitors the ball bearings. The electrical connection between vibration sensor and frequency converter is provided by a connecting cable which is laid separately.
- ◆ The TURBOSTREAM is equipped with an integrated motor temperature monitoring facility (PTC) which will protect the motor against overheating in case the motor cooling facility fails because of an inadequate supply of cooling water, for example.
- ◆ Some versions of the TURBOSTREAM are equipped with an oil level monitoring facility which automates regular monitoring of the oil level.

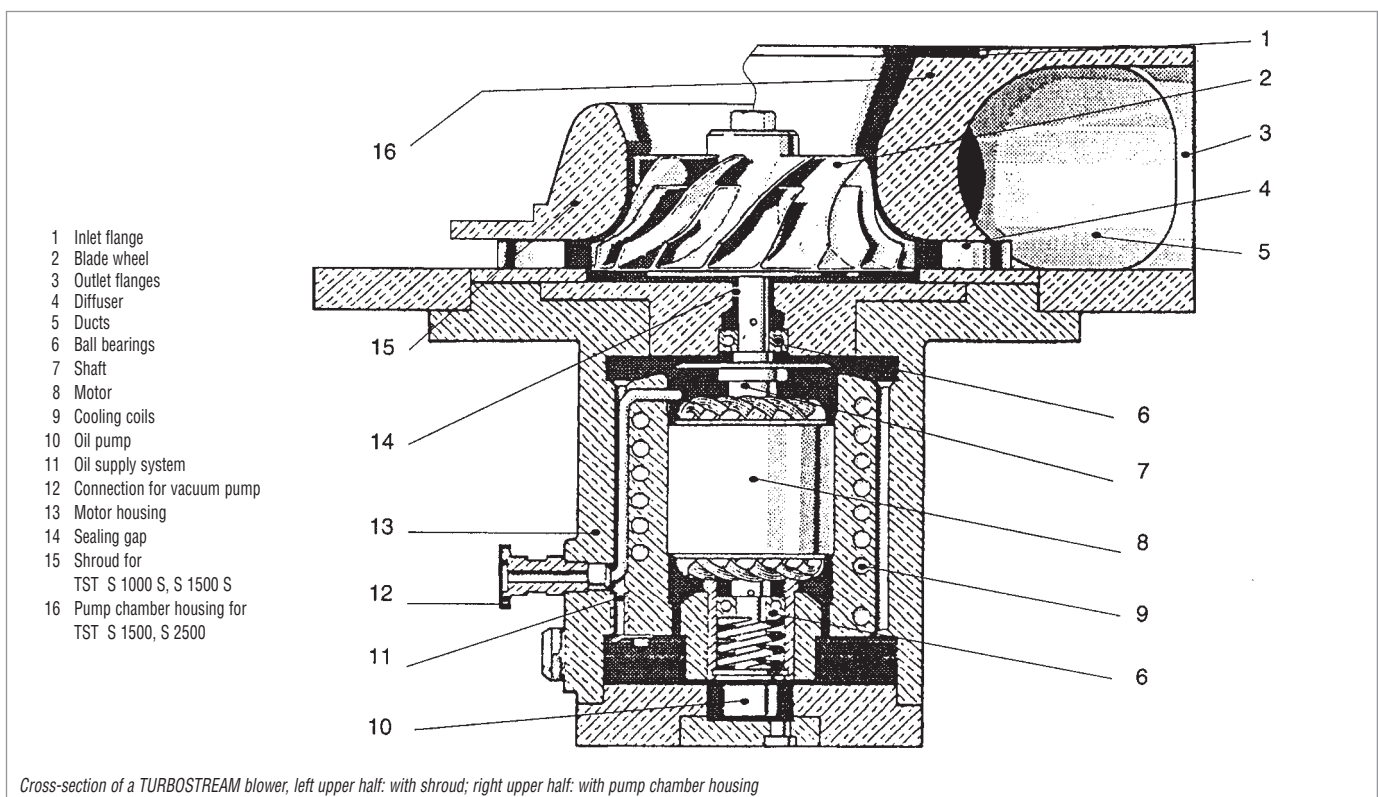
Electric Power Supply

The TURBOSTREAM blower is supplied with power from a separate frequency converter, the COMBIVERT unit. TURBOSTREAM blower and COMBIVERT are connected to each other by a connecting cable and by a PTC monitoring cable.

The COMBIVERT must be installed in an electrical cabinet. It is short-circuit proof, can sustain short circuits to ground and is protected against overloading. It is provided with a 5 digit display for displaying the operating status, has a floating contact for error status and is equipped with a connector for the PTC resistor which monitors the motor temperature.

The GUARD vibration sensor is supplied with power from the frequency converter. The error status generated when the GUARD comes into action is evaluated by the frequency converter and results in an interruption of the power supply to the TURBOSTREAM blower and an error message on the frequency converter.

The drive of the TURBOSTREAM blower and the COMBIVERT are perfectly matched to each other.



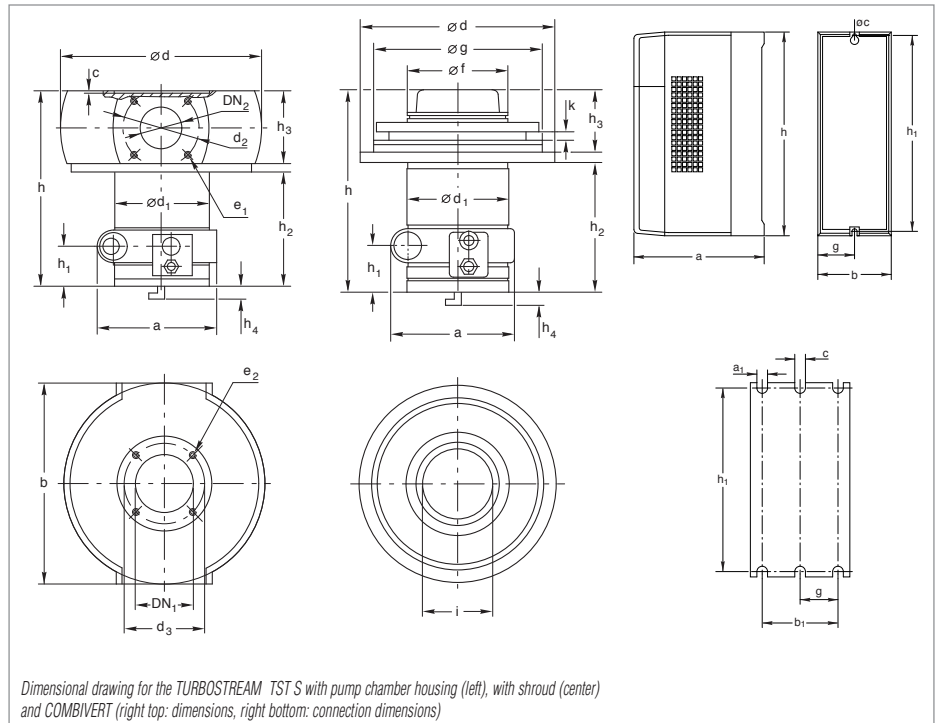
Cross-section of a TURBOSTREAM blower, left upper half: with shroud; right upper half: with pump chamber housing

TURBOSTREAM TST S (single-stage)



Advantages to the User

- ◆ High flow rate at small size
- ◆ Pump chamber free of hydrocarbons
- ◆ Non-wearing seal for the pump chamber
- ◆ Low gas exchange rates
- ◆ Pump sections in contact with the medium are made of a special corrosion resistant aluminium alloy
- ◆ Perfect integration in gas laser systems
- ◆ Simple to operate, minimum maintenance requirements
- ◆ Low-vibration and low-noise operation
- ◆ Gas flow free of pulsations
- ◆ Reliable and rugged owing to oil lubricated hybrid ball bearings
- ◆ Motor protection via built-in PTC resistor
- ◆ Water cooled motor casing
- ◆ Vibration sensor for monitoring the bearings
- ◆ Free of non-ferrous metals, including the cooling water circuit



Dimensions for TURBOSTREAMS with pump chamber

TST	S 1500	S 2500
DN ₁	160 ISO-F	160 ISO-F
DN ₂	100 ISO-F	100 ISO-F
a	mm 200.5 in. 7.89	mm 250 in. 9.84
b	mm 423 in. 16.65	mm 423 in. 16.65
c	mm 5 in. 0.20	mm 5 in. 0.20
∅ d	mm 420 in. 16.54	mm 420 in. 16.54
∅ d ₁	mm 170 in. 6.69	mm 170 in. 6.69
∅ d ₂	mm 145 in. 5.71	mm 145 in. 5.71
∅ d ₃	mm 200 in. 7.87	mm 200 in. 7.87
e ₁	mm M 8 x 15 in. M 8 x 15	mm M 8 x 15 in. M 8 x 15
e ₂	mm M 10 x 18 in. M 10 x 18	mm M 10 x 18 in. M 10 x 18
h	mm 355 in. 13.98	mm 357 in. 14.06
h ₁	mm 77.5 in. 3.05	mm 77.5 in. 3.05
h ₂	mm 210 in. 8.27	mm 210 in. 8.27
h ₃	mm 128.5 in. 5.06	mm 128.5 in. 5.06
h ₄	mm 19 in. 0.75	mm 19 in. 0.75

Dimensions for TURBOSTREAMS with shroud

TST	S 1000 SNG	S 1500 SN/SG/SNX
a	mm 250 in. 9.84	mm 250 in. 9.84
d	mm 320 in. 12.6	mm 320 in. 12.6
∅ d ₁	mm 170 in. 6.69	mm 170 in. 6.69
f	mm 167.5 in. 6.59	mm 167.5 in. 6.59
g	mm 280 in. 11.02	mm 280 in. 11.02
h	mm 322.5 in. 12.7	mm 325 in. 12.7
h ₁	mm 77.5 in. 3.05	mm 77.5 in. 3.05
h ₂	mm 207 in. 8.15	mm 207 in. 8.15
h ₃	mm 97.5 in. 3.84	mm 100 in. 3.94
i	mm 99.5 in. 3.92	mm 111 in. 4.37
k	mm 10.0 in. 0.39	mm 12.5 in. 0.49
h ₄	mm 19 in. 0.75	mm 19 in. 0.75

Technical Data		TURBOSTREAM TST		
		S 1000	S 1500	S 2500
Pumping speed (max. volume flow rate within the specified operating range)	m ³ x h ⁻¹ (cfm)	800 to 1500 (472 to 885)	1400 to 2100 (824 to 1236)	1900 to 3000 (1118 to 1766)
Compression ratio, max. ¹⁾		1 : 1.35	1 : 1.45	1 : 1.35
Permissible intake pressure, max. ¹⁾	mbar (Torr)	120 (90)		
Nominal speed	rpm	41400	44 040	39000
Cooling water connections, inside thread		G 3/8"		
Cooling water consumption, approx. (max. 6 bar (4.5 x 10 ³ Torr))	l x h ⁻¹	80	110 (180 for SNX version)	120
Evacuation connection as an angled fitting for the hose	mm (in.)	Elbow union 8/6 (0.31/0.24)		
Minimum extraction rate at the motor casing ²⁾	l x h ⁻¹	80		
Maximum extraction rate at the motor casing ²⁾	l x h ⁻¹	400		
Noise level at zero throughput ³⁾	dB(A)	≤ 56		
Gas admission flange ⁴⁾	DN	–	160 ISO-F	160 ISO-F
Gas discharge flange (2 pieces) ⁴⁾	DN	–	100 ISO-F	100 ISO-F
Weight				
with pump chamber housing	kg (lbs)	–	56 (123.6)	56 (123.6)
with shroud	kg (lbs)	26 (57.4)	26 (57.4)	–

Technical Data		COMBIVERT		
		6 A	12 A	16,5 A
Main supply voltage, 50/60 Hz	V AC	305 - 500		
Power consumption	kVA	4.1	8.3	11
Main fuse rating max.	A	10	20	25
Permissible ambient temperature	°C (°F)	0 to 45 (32 to 113)		
Cooling		air		
Type of protection to DIN 40 050	IP	20		
Weight	kg (lbs)	14 (30.9)	19 (41.8)	31 (68.4)

¹⁾ For laser gas 70 % He, 25 % H₂, 5 % CO₂

²⁾ Gas consumption referred to operating pressure

³⁾ To DIN 45 635

⁴⁾ Only for the models with pump chamber housing

Ordering Information	TURBOSTREAM TST		
	S 1000	S 1500	S 2500
TURBOSTREAM			
S 1000 SN (with shroud and oil level sensor)	Part No. 858 69	–	–
S 1500 (with pump chamber housing)	–	Part No. 858 70	–
S 1500 SN (with shroud and oil level sensor)	–	Part No. 858 79	–
S 1500 SG (with shroud and vibration sensor)	–	Part No. 858 77	–
S 1500 SNX (with shroud, oil level sensor and stronger motor ¹⁾)	–	Part No. 858 74	–
S 2500 (with pump chamber housing)	–	–	Part No. 858 80
Hybrid bearing sensor			
Guard 2 (retrofit kit) with 2.5 m cable		Part. No. 858 03	
Guard 3 (retrofit kit) without cable		Part. No. 896 201	
cable 2.5 m		Part. No. 870 000 136	
cable 5 m		Part. No. 870 000 137	
Motor/PTC-cable set for COMBIVERT			
2.5 m		Part. No. 858 54	
4 m		Part. No. 858 56	
Metering orifice			
DN 16 KF, approx. 8 NL x h ⁻¹		Part. No. 858 01	
DN 16 KF, approx. 26 NL x h ⁻¹		Part. No. 896 152	
Oil level sensor with 2 m long cable (retrofit kit)		Part. No. 119 99	
TURBOSTREAM oil			
TST oil F 12 600 ml (0.64 qt)		Part. No. 896 102	
SOGEVAC SV 16 SL Rotary vane vacuum pump with Motor for 220 - 240 V / 380 - 415 V, 50 Hz with Motor for 208 - 230 V / 440 - 460 V, 60 Hz		Part. No. 109 01 21	
SOGEVAC SV 25 SL Rotary vane vacuum pump with Motor for 220 - 240 V / 380 - 415 V, 50 Hz with Motor for 208 - 230 V / 440 - 460 V, 60 Hz		Part. No. 09 03 51	

Ordering Information	COMBIVERT		
	10.F4	13.F4	16.F4
COMBIVERT with motor-filter			
6 A	upon request	–	–
12 A	–	Part No. 858 78	Part No. 858 78
16,5 A	–	upon request	upon request

¹⁾ Only in connection with COMBIVERT 16.5 A

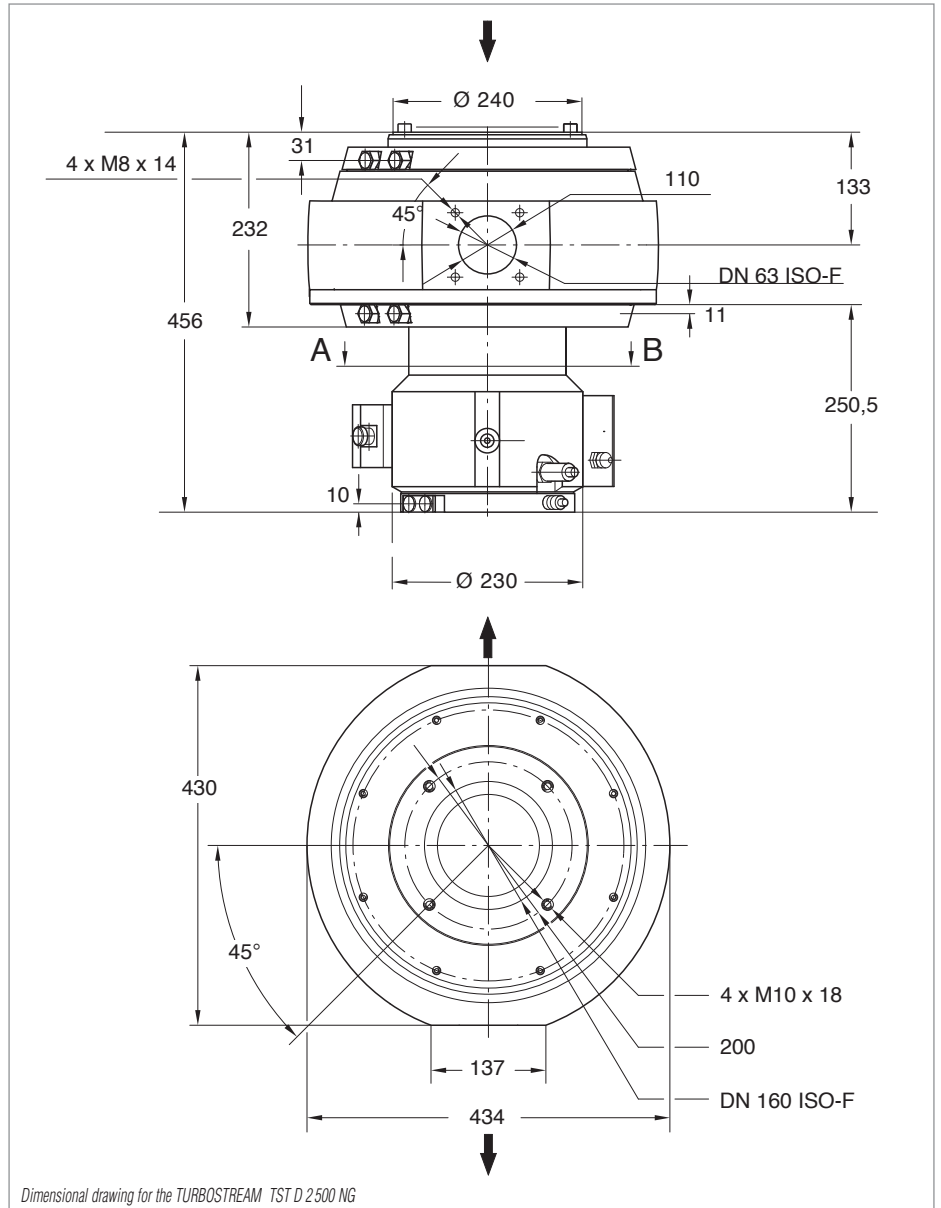
TURBOSTREAM TST D (dual-stage)



The dual-stage TURBOSTREAM D 2500 is a market-orientated development based on our well-proven single-stage series.

Advantages to the User

- ◆ High flow rate at small size
- ◆ Pump chamber free of hydrocarbons
- ◆ Non-wearing seal for the pump chamber
- ◆ Low gas exchange rates
- ◆ Pump sections in contact with the medium are made of a special corrosion resistant aluminium alloy
- ◆ Perfect integration in gas laser systems
- ◆ Simple to operate, minimum maintenance requirements
- ◆ Low-vibration and low-noise operation
- ◆ Gas flow free of pulsations
- ◆ Reliable and rugged owing to oil lubricated hybrid ball bearings
- ◆ Motor protection via built-in PTC resistor
- ◆ Water cooled motor casing
- ◆ Vibration sensor for monitoring the bearings
- ◆ Free of non-ferrous metals, including the cooling water circuit for cooling the motor



Technical Data	TURBOSTREAM TST		
	D 2500 G	D 2500 NG	D 2500 SN
Pumping speed (max. volume flow rate within the specified operating range) $m^3 \times h^{-1}$ (cfm)	1800 to 2800 (1062 to 1648)		
Compression ratio ¹⁾ , max.	1 : 1,8		
Permissible intake pressure, max. ¹⁾ mbar (Torr)	120 (90.0)		
Nominal speed rpm	40 200		
Cooling water connections, inside thread	G 3/8"		
Cooling water flow, min. at a max. admission temperature of 30 °C $l \times h^{-1}$	300		
Extraction connection at the motor housing for connecting a vacuum pump as a small flange as angled fitting for hose link DN mm (in.)	16 KF –	16 KF –	– 8/6
Minimum extraction rate at the motor casing ²⁾ $l \times h^{-1}$	80		
Maximum extraction rate at the motor casing ²⁾ $l \times h^{-1}$	400		
Noise level at zero throughput ³⁾ dB(A)	≤ 60		
Gas admission flange ⁴⁾ DN	160 ISO-F		
Gas discharge flange (2 pcs.) ⁴⁾ DN	63 ISO-F		
Weight kg (lbs)	80 (176.6)	80 (176.6)	50 (110.4)

Technical Data	COMBIVERT 33 A with Motor filter		
	Main supply voltage, 50/60 Hz V AC	305 - 500	
Power consumption kVA	23		
Main fuse rating, max. A	50		
Permissible ambient temperature °C (°F)	0 bis 45 (32 to 113)		
Cooling	water		air
Stype of protection to DIN 40 050 IP	20		
Weight kg (lbs)	43 (94.8)		38 (83.8)

¹⁾ For laser gas 70 % He, 25 % H₂, 5 % CO₂
²⁾ Gas consumption referred to operating pressure
³⁾ To DIN 45 635
⁴⁾ Only for the models with pump chamber housing

Ordering Information	TURBOSTREAM TST		
	D 2500 G	D 2500 NG	D 2500 SN
TURBOSTREAM with pump chamber housing, vibration sensor, metering orifice and motor cable, 2.5 m long with pump chamber housing, oil level sensor and vibration sensor with pump chamber housing and oil level sensor	Part No. 877 011 - -	- Part No. 858 46 -	- - Part No. 858 48
Vibration sensor Guard 2 (retrofit kit) with 2.5 m cable Guard 3 (retrofit kit) without cable cable 2.5 m cable 5.0 m		Part No. 858 03 Part No. 896 201 Part No. 870 000 136 Part No. 870 000 137	
Motor/PTC-cable set for COMBIVERT 2.5 m 4.0 m		Part No. 120 40 Part No. 858 08	
Metering orifice DN 16 KF, ca. 8 NL x h ⁻¹ DN 16 KF, ca. 26 NL x h ⁻¹		Part No. 858 01 Part No. 896 152	
Oil level sensor with 2 m long cable (retrofit kit)		Part No. 119 99	
TURBOSTREAM oil TST oil F 12 300 ml TST oil 22 600 ml	- Part No. 896 112	Part No. 896 101 -	Part No. 896 101 -
SOGEVAC SV 16SL Rotary vane vacuum pump with Motor for 220 - 240 V / 380 - 415 V, 50 Hz with Motor for 208 - 230 V / 440 - 460 V, 60 Hz		Part No. 109 01 21	
SOGEVAC SV 25SL Rotary vane vacuum pump with Motor for 220 - 240 V / 380 - 415 V, 50 Hz with Motor for 208 - 230 V / 440 - 460 V, 60 Hz		Part No. 109 03 21	

Ordering Information	COMBIVERT 16.F4		
	COMBIVERT with motor-filter 33 A, air cooled 33 A, water cooled		Part No. 120 30 Part No. 858 51

C19

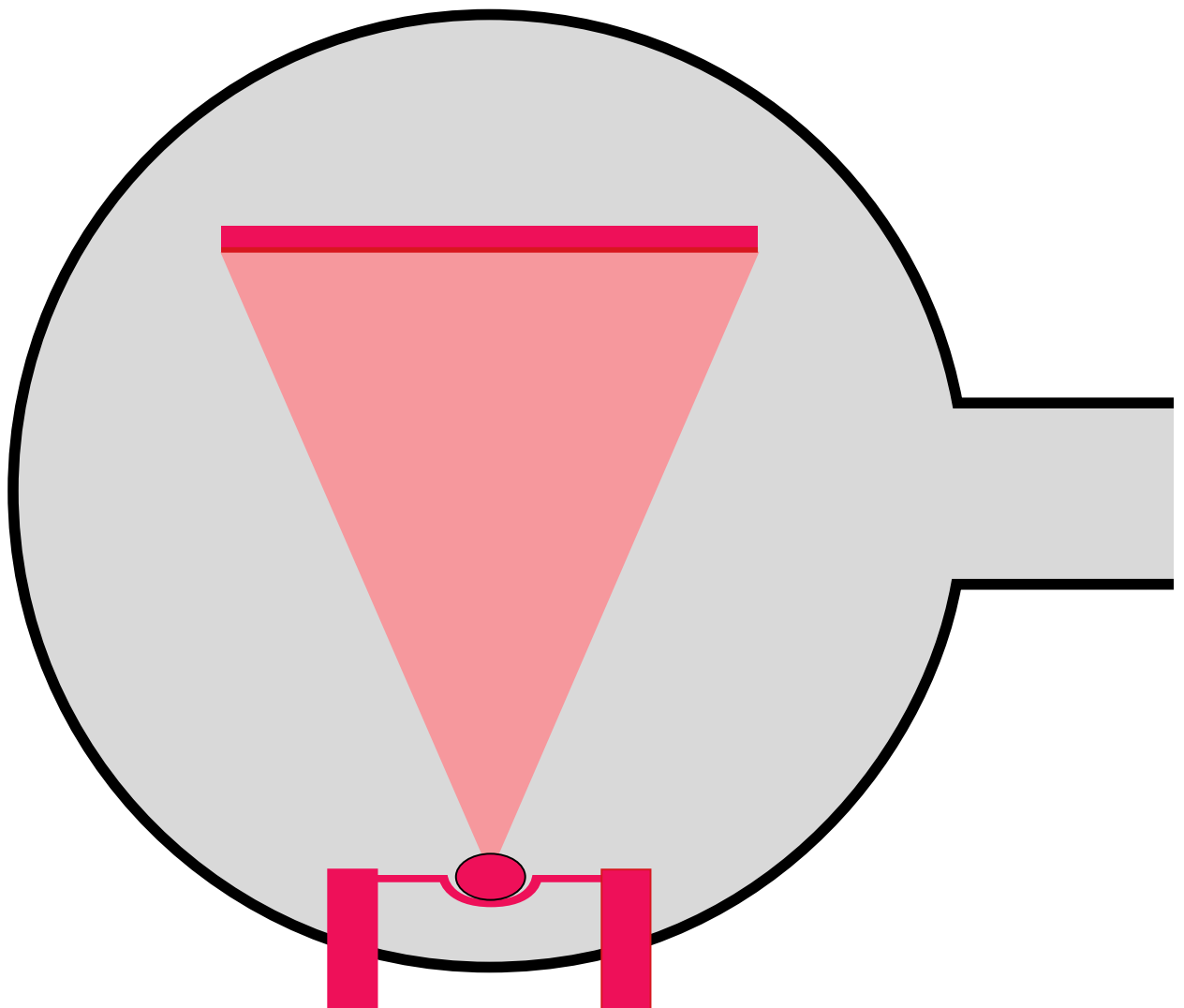
UNIVEX

High Vacuum Experimentation Systems

UNIVEX 300, UNIVEX 450

UNIVEX 350, UNIVEX 450 B

Special plants



General

Applications and Accessories / Process Components C19.02
 General C19.03

Products

Bell Jar System
 UNIVEX 300 C19.04
 UNIVEX 450 C19.06
 Door System
 UNIVEX 350 C19.08

Accessories

Standard Accessories for UNIVEX 300, 350, 450 and 450 B C19.10
 Components
 for Glow Discharge Cleaning C19.11
 for Thermal Evaporation C19.12
 for Electron-Beam Evaporation C19.13
 for High Rate Sputtering C19.14
 for Film Thickness Measurements C19.14

Miscellaneous

Special Units
 UNIVEX 450 B C19.15
 UNIVEX 450 for Daktyloscopy, UNIVEX 450 C, Test systems C19.16

		UNIVEX 300	UNIVEX 450	UNIVEX 350	UNIVEX 450 B Special plants
Applications		Bell jar system		Door system	
Passive components		♦	♦	♦	♦
Sensor technology		♦	♦	♦	♦
Opto-electronics		♦	♦	♦	♦
Tribology		♦	♦	♦	♦
Soldering		♦	♦	♦	♦
Dactyloscopy			♦		
Glove box applications		♦	♦	♦	♦
Special applications		♦	♦	♦	♦
Thermal conduction experiments		♦	♦		
Accessories / Process Components					
Standard accessories	Page				
Base plate and bell jar	C19.05 + 07	♦	♦		
Lifting facility, manually operated	C19.07		♦		
Vacuum chamber with door	C19.09 + 15			♦	♦
Auxiliary operation					
Substrate holder	C19.03	♦	♦	♦	♦
Substrate heater	C19.03	♦	♦	♦	♦
Gas admission	C19.03	♦	♦	♦	♦
Process equipment					
Shutters	C19.12	♦	♦	♦	♦
Thin film measurement	C19.14	♦	♦	♦	♦
Sources					
Custom installations	C19.03	♦	♦	♦	♦
Glow discharge cleaning	C19.11	♦	♦	♦	♦
Thermal evaporation	C19.12	♦	♦	♦	♦
Electron-beam evaporation	C19.13	♦	♦	♦	♦
DC high rate sputtering	C19.14	♦	♦	♦	♦
RF high rate sputtering	C19.14			♦	♦

The UNIVEX multi-purpose experimentation systems were developed by LEYBOLD for applications in research and development, as well as for setting up pilot production systems.

The range of applications for these systems covers primarily vacuum coating as well as experiments in vacuum process engineering.

The multi-purpose experimentation systems from LEYBOLD are based on a modern modular concept. The high vacuum pumps are installed horizontally at the level of the base plate or the vacuum chamber.

Special Accessories for UNIVEX 300, 350, 450 and 450 B

Besides standard process components we can also supply installations according to customers requirements, for example for:

- ◆ Vacuum soldering experiments
- ◆ Metallurgical experiments
- ◆ Thermal conduction experiments
- ◆ Diffusion experiments
- ◆ Dactyloscopy.

Automatic Pressure Control

Various processes require a constant pressure in the UNIVEX vacuum chamber. For this purpose LEYBOLD offers a wide range of different pressure or flow control systems.

Special designs which are manufactured according to customer's specifications are available upon request.

Substrate Heater

For the purpose of heating substrates, LEYBOLD offers a variety of heating facilities (radiation heaters, heaters with quartz lamps, for example). These systems may be combined with different temperature controllers.

Special designs which are manufactured according to customer's specifications are available upon request.

Cooling and Heating Systems

Special experiments require that the temperature of the samples be maintained constant within a wide temperature range for the setpoint.

For this LEYBOLD delivers upon request cooling/heating facilities with LN₂ as the refrigerant and an electric heater, complete with temperature controller.

Special designs which are manufactured according to customer's specifications are also available upon request.

Substrate Holders

Upon request LEYBOLD is able to supply substrate holders according to customer's specifications.

Substrate holders with planetary gear for the UNIVEX 450 and UNIVEX 450 B are available upon request.

UNIVEX 300

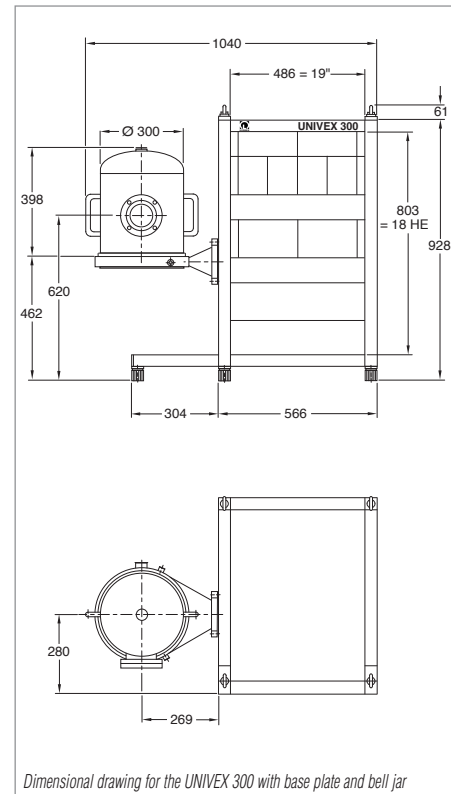


Table-Top System with 300 mm dia. Chamber

Advantages to the User

- ◆ Modular system design
- ◆ Any kind of process component may be installed
- ◆ Process components may be retrofitted without problems
- ◆ Freely accessible vacuum chamber
- ◆ Freely accessible base plate
- ◆ Very simple to operate and use
- ◆ Pump system adapted to the individual process

Typical Applications

- ◆ Vacuum coating in research and development
- ◆ Special experiments

Basic Unit

- ◆ The pump system and the electrical supply system are housed in a 19" rack cabinet.
- ◆ Moreover, the 19" cabinet provides space (max. 6 height units) for a vacuum gauge and a thickness measuring instrument as well as power supply units for the process components.
- ◆ The basic unit may be placed on a bench top.

Vacuum Chamber

- ◆ The base plate is attached to the lateral intake port of the basic unit.
- ◆ Either a vacuum chamber made of stainless steel or glass may be placed on the base plate.

Pump System

- ◆ The standard pumping equipment comprises a TRIVAC D 8 B two-stage rotary vane pump and a TURBOVAC 151 turbomolecular pump.
- ◆ For processes which develop increased quantities of gas or which require low operating pressures, the TURBOVAC 361 may be built-in.
- ◆ For processes which involve pumping of aggressive media, a barrier gas version of the turbomolecular pump and a rotary vane pump with a filling of special oil may be supplied.
- ◆ For especially sensitive processes also a dry compressing vacuum pump like the EcoDry M may be used as the backing pump.

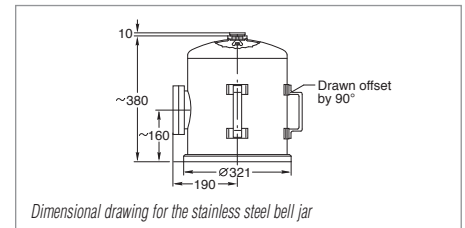
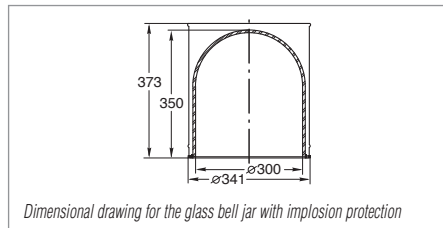
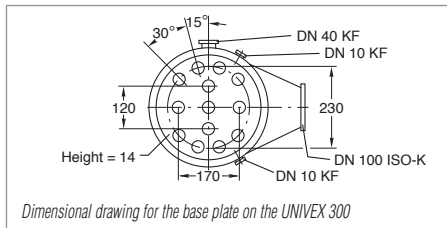
Vacuum Measurement

- ◆ Depending on the type of application, a combination vacuum gauge operating according to the cold cathode or hot cathode principle may be installed.

Technical Data	UNIVEX 300	
	Standard	Special
High vacuum pump	TURBOVAC 151	TURBOVAC 361
Pumping speed for N ₂ l x s ⁻¹	145	345
Backing pump / nominal pumping speed	TRIVAC D 8 B / 9.7 m ³ x h ⁻¹	
Supply unit for high vacuum pump	TURBOTRONIK NT 20	
Control	Power supply with main switch plug-in	
High vacuum connection flange DN	100 ISO-F, lateral	
Electrical connection	230 V, 50 Hz, max. 16 A *)	
Cooling water connection; DN 10 hose bar	4 to 7	
Cooling water consumption l x h ⁻¹	50	
Weight kg	130	
Ordering Information	Standard	Special
Basic unit	Part No. 030 60	upon request

*) Other voltages and frequencies upon request

Special Accessories for UNIVEX 300



Stainless Steel Base Plate

Pyrex Glass Bell Jar (Vacuum Chamber)

Stainless Steel Bell Jar (Vacuum Chamber)

Technical Data and Ordering Information

Lateral high vacuum connection flange	DN 100 ISO-K
Dimensions (H x dia.)	60 x 350 mm
Installation holes	34.5 mm dia. (13 x)
Lateral connections	2 x DN 10 KF, 1 x DN 40 KF
Weight	19 kg
Base plate, stainless steel	Part No. 030 61

Dimensions (H x dia.)	350 x 300 mm
Height, cylindrical section	200 mm
Seal	FPM
Weight	5.6 kg
Bell jar, Pyrex glass	Part No. 030 10 ¹⁾

¹⁾ With punched steel cover for implosion protection

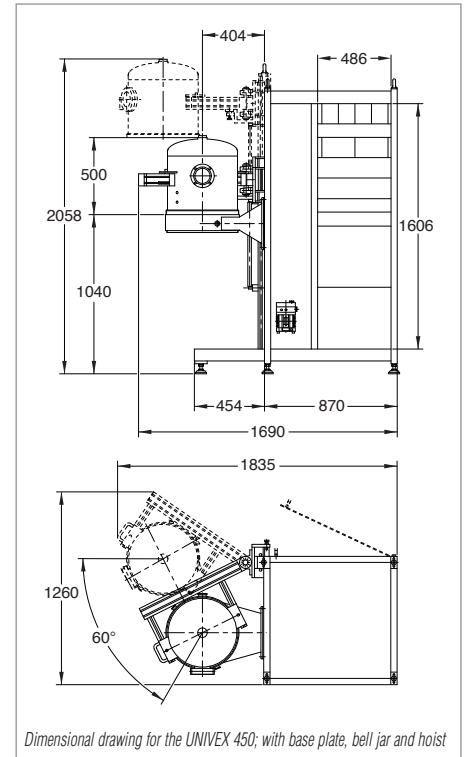
Dimensions (H x dia.)	380 x 300 mm
Height, cylindrical section	300 mm
Seal	FPM
Weight	9.6 kg
Bell jar, stainless steel	Part No. 030 12 ¹⁾

¹⁾ With DN 100 viewing window and 2 carrying handles; hole at the top (34.5 mm dia.)

UNIVEX 450



UNIVEX 450, with turbomolecular pump system and various installations



Dimensional drawing for the UNIVEX 450; with base plate, bell jar and hoist

Cabinet Housed System with 450 mm dia. Vacuum Chamber

Advantages to the User

- ◆ Modular system design
- ◆ Any kind of process component may be installed
- ◆ Process components may be retrofitted without problems
- ◆ Freely accessible vacuum chamber
- ◆ Freely accessible base plate
- ◆ Very simple to operate and use
- ◆ Pump system adapted to the individual process

Typical Applications

- ◆ Vacuum coating in research and development
- ◆ Pre-production trials
- ◆ Dactyloscopy
- ◆ Special experiments

Basic Unit

- ◆ The pump system and the electrical supply system are housed in the UNIVEX 450 cabinet.
- ◆ Moreover, the 19" cabinet provides space (max. 20 height units) for a vacuum gauge and a thickness measuring instrument as well as power supply units for the process components.

Vacuum Chamber

- ◆ The base plate is attached to the lateral intake port of the basic unit.
- ◆ A vacuum chamber made of stainless steel may be placed on this base plate.
- ◆ A water-cooled vacuum chamber can also be supplied.
- ◆ The vacuum chamber is moved by the hoist attached to the basic unit.

Pump System

- ◆ The standard pumping equipment comprises a TRIVAC D 40 B two-stage rotary vane pump and a TURBOVAC 1000 turbomolecular pump.
- ◆ For processes which develop increased quantities of gas or which require low operating pressures, the UNIVEX 450 can also be equipped with cryo pumps.
- ◆ For processes which involve pumping of aggressive media, a barrier gas version of the turbomolecular pump and a rotary vane pump with a filling of special oil may be supplied.
- ◆ For especially sensitive processes also a dry compressing vacuum pump like the EcoDry M may be used as the backing pump.

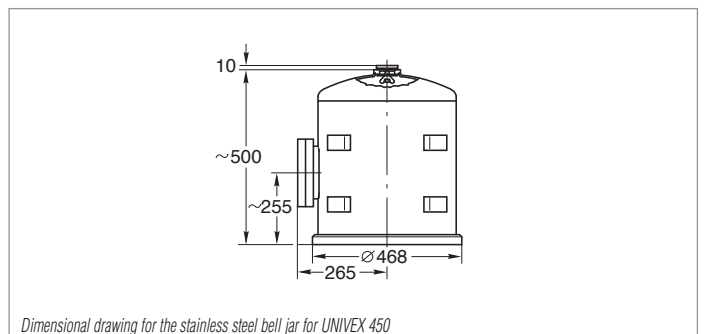
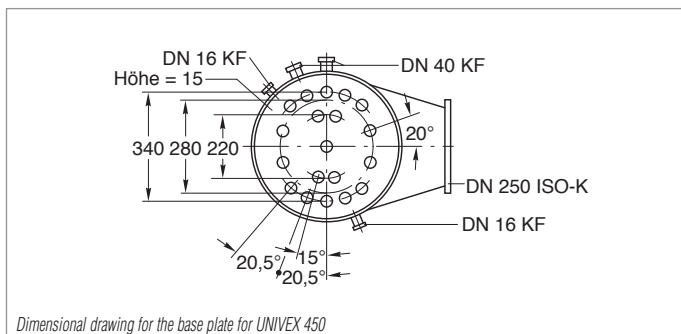
Vacuum Measurement

- ◆ Depending on the type of application, a combination vacuum gauge operating according to the cold cathode or hot cathode principle may be installed.

Technical Data	UNIVEX 450	
	Standard	Special
High vacuum pump	TURBOVAC 1100	COOLVAC 1500 CL
Pumping speed for N ₂ l x s ⁻¹	1150	1500
Backing pump / nominal pumping speed	TRIVAC D 40 B / 46 m ³ x h ⁻¹	
Supply unit for high vacuum pump	TURBOTRONIK NT 20	Compressor unit
Control	Power supply	Power supply with automatic pump system control
Built-in electro-pneumatic valves	–	Push gate valve DN 250 ISO-F, 2 angled valves DN 40 KF
High vacuum connection flange	DN	250 ISO-F, lateral
Electrical connection	400 V, 3 ph., 50 Hz, max. 32 A *)	
Cooling water connection; DN 10 hose	bar	4 to 7
Cooling water consumption l x h ⁻¹	100	140
Compressed air connection, DN 10	bar	6 to 10
Weight kg	225	350
Ordering Information	Standard	Special
Basic unit	Part No. 030 70	upon request

*) Other voltages and frequencies upon request

Specific Accessories for UNIVEX 450



Stainless Steel Base Plate

Stainless Steel Bell Jar (Vacuum Chamber)

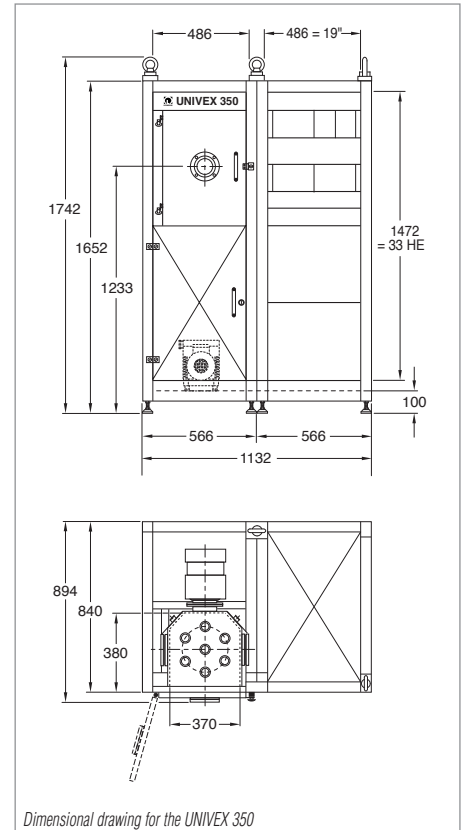
Technical Data and Ordering Information

Lateral high vacuum connection flange	DN 250 ISO-K
Dimensions (H x dia.)	115 x 475 mm
Installation holes	34.5 mm dia. (19 x)
Lateral connections	2 x DN 16 KF, 2 x DN 40 KF
Weight	27 kg
Base plate	Kat.-Nr. 030 71

Dimensions (H x dia.)	500 x 450 mm
Height, cylindrical section	400 mm
Seal	FPM
Weight	23 kg
Bell jar, stainless steel	Part No. 030 16 ¹⁾

¹⁾ With DN 100 viewing window; hole at the top fitted with a blank flange. Upon request the stainless steel bell jar may be supplied with a coiled cooling or heating pipe

UNIVEX 350



Door System with 350 mm dia. Vacuum Chamber

Advantages to the User

- ◆ Modular system design
- ◆ Any kind of process component may be installed
- ◆ Process components may be retrofitted without problems
- ◆ Vacuum chamber with a door
- ◆ Freely accessible base plate
- ◆ Very simple to operate and use via programmable control
- ◆ For installation into clean-room walls
- ◆ For RF sputtering
- ◆ Pump system adapted to the individual process

Typical Applications

- ◆ Vacuum coating in research and development
- ◆ Pre-production trials
- ◆ Special experiments

Basic Unit

- ◆ The UNIVEX 350 consists of two separable 19" rack mount cabinets.
- ◆ The process chamber and the pump system are accommodated in one cabinet.
- ◆ The electric power supply with the pump system controller based on a PLC with display and operating unit is accommodated in the second cabinet. This cabinet also houses the vacuum gauge as well as the power supply units for the process components.

Vacuum Chamber

- ◆ The base plate is attached to the base frame.
- ◆ The door is equipped with a viewing window.
- ◆ Bottom plate and lid are provided with installation holes.
- ◆ Additional lateral flanges for installing process components.
- ◆ A water-cooled vacuum chamber can also be supplied.
- ◆ Evaporation protection plates which may be easily disassembled are available.

Pump System

- ◆ The standard pumping equipment comprises a TRIVAC D 16 B two-stage rotary vane pump and a TURBOVAC TW 700 turbomolecular pump.
- ◆ For processes which develop increased quantities of gas or which require low operating pressures, the UNIVEX 350 can also be equipped with a turbomolecular pump having a higher pumping speed (TURBOVAC 1000, for example) or with cryopumps.
- ◆ For processes which involve pumping of aggressive media, a barrier gas version of the turbomolecular pump and a rotary vane pump with a filling of special oil may be supplied.
- ◆ For especially sensitive processes also a dry compressing vacuum pump like the EcoDry M may be used as the backing pump.

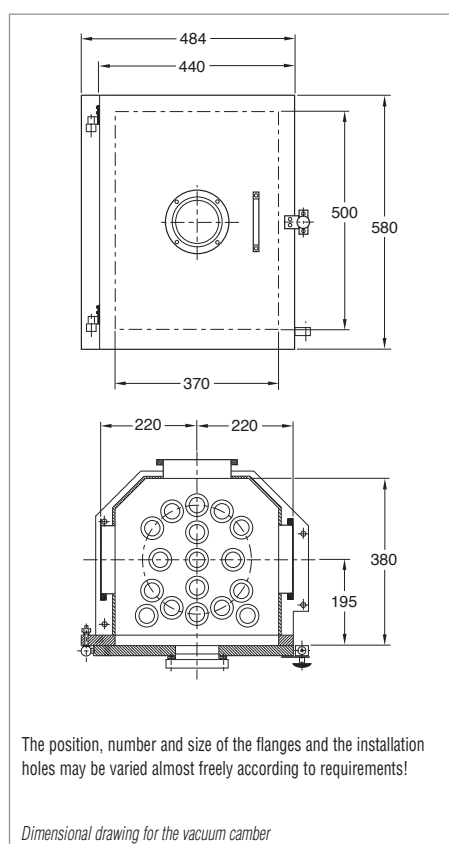
Vacuum Measurement

Depending on the type of application, a combination vacuum gauge operating according to the cold cathode or hot cathode principle may be installed.

Technical Data	UNIVEX 350	
	Standard	Special
High vacuum pump	TURBOVAC TW 700	COOLVAC 1500 CL
Pumping speed for N ₂	680	1500
Backing pump / nominal pumping speed	TRIVAC D 16 B / 18.9 m ³ x h ⁻¹	TRIVAC D 25 B / 29.5 m ³ x h ⁻¹
Supply unit for high vacuum pump	OEM power supply 59 V DC	Compressor unit
Control	Power supply with programmable control	Power supply with programmable control
Built-in electro-pneumatic valves	1 x DN 16 KF	1 x gate valve DN 160, 2 x right-angle valve DN 25, DN 16 KF
High vacuum connection flange	DN	160 ISO-K
Electrical connection	400 V, 3 ph., 50/60 Hz *)	
Cooling water connection; DN 10 hose	bar	4 to 7
Cooling water consumption	l x h ⁻¹	25
Compressed air connection, DN 10	bar	6 to 10
Weight	kg	350
Ordering Information	Standard	Special
Basic unit	upon request	upon request

*) Other voltages and frequencies upon request

Vacuum Chamber



Technical Data	Vacuum Chamber for UNIVEX 350
Material	Stainless steel
Dimensions	
Inside width	mm 370
Inside depth	mm 380
Inside height	mm 500
Connections	
Front side	Door with window
Bottom plate	15 installation holes, 34.5 mm dia.
Lid	7 installation holes, 34.5 mm dia.
Rear	DN 160 ISO-K, 2 x 10 KF, 2 x 40 KF
Left side	DN 160 ISO-K, further flanges optional
Right side	DN 160 ISO-K, further flanges optional
Weight	kg 55
Ordering Information	Vacuum Chamber for UNIVEX 350
Vacuum chamber	Is included with the UNIVEX 350

Standard Accessories for UNIVEX 300, 350, 450 and 450 B



Blank-Off Screw Fitting

For 34.5 mm dia. hole.



Rotary Feedthrough

With mount for substrate holder; for all common bell jar sizes; suitable for 34.5 mm dia. holes.

Motor Drive for Rotary Feedthrough

With connection flange and coupling; is electrically operated through the VS 024 supply unit.

Technical Data and Ordering Information

Material	Stainless steel
Gasket	FPM
Weight	0.1 kg
Blank-off screw fitting Part No. 030 40	

Total length	400 mm
Shaft dia.; atmosphere/vacuum	8/10 mm
Max. rotational speed	150 rpm
Permissible torque	2 Nm
Weight	2 kg
Rotary Feedthrough Part No. 030 63	

Dimensions	70 mm dia., 300 mm long
Speed	0 to 150 rpm, load dependent control
Electrical power supply	24 V/DC
Weight	2 kg
Motor drive for rotary feedthrough Part No. 030 64	

Control Cable, 6-Way

Used to connect the motor to the power supply, complete with plugs.

Supply Unit VS 024

For driving the motor.

Technical Data and Ordering Information

Length	3 m
Weight	0.2 kg
Control cable Part No. 030 56	

Cabinet	1/2 19" rack module, 3 HU
Output	24 V/DC, load dependent control via potentiometer
Connection	230 V, 50/60 Hz
Weight	3 kg
Supply unit VS 024 Part No. 200 02 466	

Components for Glow Discharge Cleaning



Glow Discharge Assembly

With glow discharge electrode, high voltage feedthrough for 34.5 mm dia. hole and connection cable for fitting to the central rotary feedthrough.



C 2000 High Voltage Power Supply Unit

For supplying the glow discharge assembly; with selector switch, meter and timer.



PS 113 Safety Switch

For pressure-dependant locking of the high voltage power supply C 2000.

Connecting the PS 113 to the C 2000 requires the 6-way control cable (Part No. 030 56) (see section "Accessories", paragraph "Standard Accessories").

Technical Data and Ordering Information

Electrode material	Aluminium
Insulation	Ceramics
Max. ratings	2000 V/65 mA
Sealing material of the high voltage feedthrough	FPM
Length of the connection cable	2 m
Weight	1 kg
Glow discharge assembly for UNIVEX 300 and 350 Part No. 030 34	
for UNIVEX 450 and 450 B Part No. 030 35	

Cabinet	19" rack module, 3 HU
Output	2000 V/65 mA, max. continuously adjustable, selectable +/- and 50 Hz AC
Timer	0 to 6 h max.
Connection	230 V, 50/60 Hz, 150 VA
Remote control and locking input	included
C 2000 High voltage power supply unit	Part No. 032 95

Switching pressure	5 mbar below atmospheric pressure
Connection flange	DN 16 KF
Switching capacity	5 A at 250 V/AC
Weight	0.2 kg
PS 113 safety switch	Part No. 160 14

Variable Leak Valve with Isolation Valve

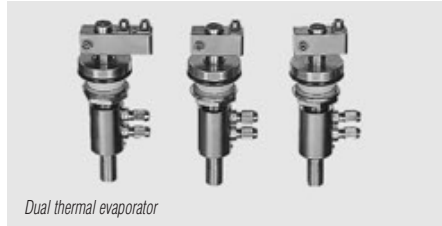
Gas admission rate q_L	5×10^{-6} to 1×10^3 mbar x l x s ⁻¹
Connection flange	DN 16 KF
(see also Product Section C14 "Vacuum Valves")	
Variable leak valve	Part No. 215 010

Components for Thermal Evaporation



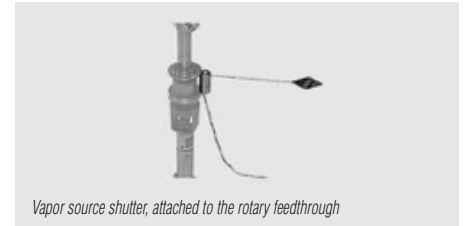
Single Thermal Evaporator

Consisting of two water-cooled high voltage feedthroughs with terminal blocks for 34.5 mm dia. holes.



Dual Thermal Evaporator

Consisting of three water-cooled high voltage feedthroughs with terminal blocks for 34.5 mm dia. holes.



Solenoid Actuated Vapor Source Shutter

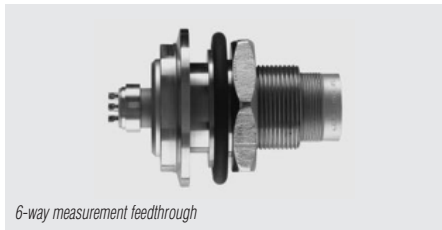
With rotary magnet and shutter screen; for installation to the rotary feedthrough

Technical Data and Ordering Information

Rating per conductor	max. 100 V/500 A
Seals	FPM
Water connection	hose 4/6 mm dia.
Weight	2.5 kg
Single thermal evaporator	Part No. 030 20

Rating per conductor	max. 100 V/500 A
Seals	FPM
Water connection	hose 4/6 mm dia.
Weight	3.9 kg
Dual thermal evaporator	Part No. 030 21

Connection for actuation	24 V = 1 s pulse
Dimensions of the shutter screen	50 x 50 mm
Weight	0.2 kg
Vapor source shutter	Part No. 030 59



Power Supply Cables

For single and dual thermal evaporators, equipped with terminals and clamping pieces.

6-Way Measurement Feedthroughs

For connection of the vapor source shutter; for 34.5 mm holes, plug-in soldered contact on the inside.

Control cable, 6-way

For connection between measurement feedthrough and power supply unit for the vapor source shutter, complete with connection plugs.

Technical Data and Ordering Information

Length	2 m
Rating	max. 100/500 A
Cross section	120 mm ²
Weight	3.5 kg
Power supply cables (set of 2)	Part No. 030 53 *)

Rating per conductor	max. 700 V/16 A
Seal	FPM
Weight	0.3 kg
Measurement feedthrough	Part No. 500 001 543

Length	3 m
Weight	0.2 kg
9 way control cable	Part No. 500 001 549

*) Two sets of power supply cables are needed for the dual thermal evaporator

Components for Thermal Evaporation

AS 053 Power Supply Unit

For supplying thermal evaporators and one solenoid-actuated source shutter.

With LCD display for current read out; with membrane key pad.



AS 053 power supply unit

AS 053-2 Power Supply Unit

For supplying power to two thermal evaporators with vapor source shutters.

With LCD display for current read out; with membrane key pad.

Technical Data and Ordering Information

Cabinet	1/2 19" rack module, 3 HU, 400 mm deep
Outputs	1 x evaporator output, 5 V, 400 A max. can be rewired to 10 V, 200 A max. 1 x shutter output, 24 V DC, 1 s pulse
Inputs	Remote control unit for controlling the evaporation power (0 to 10 V) Remote control for the shutter
Main power supply	230 V, 50/60 Hz, 10 A
Weight	15 kg
AS 053 power supply unit	Part No. 200 23 209

Cabinet	19" rack module, 3 HU, 400 mm deep
Outputs	2 x evaporator output, 5 V, 400 A max. can be rewired to 10 V, 200 A max. 2 x shutter output, 24 V DC, 1 s pulse
Inputs	Remote control unit for controlling the evaporation power (0 to 10 V) Remote control for the shutter Switchover evaporator 1 / 2
Main power supply	230 V, 50/60 Hz, 10 A
Weight	30 kg
AS 053-2 power supply unit	Part No. 200 02 461

Components for Electron-Beam Evaporation

General

Various types of electron-beam evaporators are available for installation in the UNIVEX systems.

For the UNIVEX 300: electron-beam evaporator ESV 4 as well as makes of other manufacturers.
For the UNIVEX 350: electron-beam evaporator ESV 4 and ESV 6 as well as makes of other manufacturers.

For the UNIVEX 450: electron-beam evaporator ESV 4 and ESV 6 as well as makes of other manufacturers.

The selection of a suitable electron-beam evaporator depends mostly on the space available, the demanded evaporation rate, number and type of materials which need to be evaporated.

Electron-beam evaporator ESV 4

The electron-beam evaporator ESV 4 consists of a beam generating system and a beam deflection unit with electromagnetic deflection for the x-axis and a holder for accommodating various evaporation crucibles.

The ESV 4 has been designed to evaporate small to medium amounts of material.

Electron-beam evaporator ESV 6

The electron-beam evaporator ESV 6 consists of a beam generating system and a beam deflection unit with electromagnetic deflection for the x and y-axis, and a holder. Through the system of interchangeable crucibles the ESV 6 may be used to solve almost any evaporation problem. It is suited to evaporate small to large amounts of material.

Electron-beam evaporators of other manufacturers

For the UNIVEX system exclusively evaporators with high tension power supplies are used which comply with EC regulations and directives. However, depending on the kind of application the customer may select the required evaporator from a broad range of different power ratings and crucible variants.

Power supplies

The selection of the power supply unit for the individual electron-beam evaporator depends on the manufacturer and the demanded maximum evaporation power. As a rule, the maximum output power of the power supply unit must not exceed the maximum power specified for the evaporator.

Safety regulations

When installing electron-beam evaporators in UNIVEX bell jar systems only a stainless steel bell jar must be used.

In this application the bell jar must be secured in place by an interlocking kit with a key operated switch.

Interlocking kit with key-operated switch for UNIVEX 300: **Part No. 030 84**

Interlocking kit with key-operated switch for UNIVEX 450: **Part No. 030 85**

Interlocking kit with key-operated switch for UNIVEX 350: included with the basic system.
UNIVEX 450 B: included with the basic system.

As further safety means a water flow monitor is required for each electron-beam evaporation unit so as to ensure intensive cooling of the electron-beam evaporator. This water flow monitor is included with each electron-beam evaporator.

As further safety means a water flow monitor is required for each electron-beam evaporation unit so as to ensure intensive cooling of the electron-beam evaporator.

Components for High Rate Sputtering

DC Sputtering

Various DC sputtering sources may be built into the UNIVEX units. The selection depends on the size of the substrate, the required target material and the available installation space. DC sputtering sources from 50 mm to 200 mm as well as

DC sputtering sources are suited for all UNIVEX systems.

corresponding DC sputtering power supply units from 500 W to 3000 W are available. The power supply units may be built into the basic units.

Further information upon request.

RF Sputtering

Various RF sputtering sources may be built into the UNIVEX 350 and UNIVEX 450 B. The selection depends on the size of the substrate, the required target material and the available installation space. RF sputtering sources from 50 mm to 200 mm as well as corresponding RF sputtering

RF sputtering sources are only suited for the UNIVEX 350 and UNIVEX 450 B.

Sputtering sources can only be operated with gas admission. For this, manually operated variable leak valves up to automatically controlled mass flow controllers are available.

power supply units from 150 W to 1000 W are available. The power supply units may be built into the basic units.

Further information upon request.

Safety regulations:

When installing electron beam evaporators in the UNIVEX 300 the stainless steel ball jar must be used. Moreover, a safety interlocking arrangement is required. For the UNIVEX 300 and 450 a separate interlocking kit is available; in the case of the UNIVEX 350 and 450 B this kit is already included.

Interlocking kit	for	UNIVEX 300	UNIVEX 450	UNIVEX 350	UNIVEX 450 B
	Part No.	030 84	030 85	Included	Included

Components for Film Thickness Measurements

Various thin film thickness measuring instruments may be installed in the UNIVEX units.

The selection depends on the demanded measurements tasks and the required degree of automation.

We especially recommend the thin film thickness measuring instruments which rely on quartz oscillators XTM/2 in the case of simple tasks, and the XTC/2 for complex control tasks.

Further thin film measuring instruments which may be used to check complex multi-layer films are available.

Further information upon request.



UNIVEX 450 B having a chamber diameter of 490 mm and with a 10-fold thermal evaporator



UNIVEX 450 B having a chamber diameter of 490 mm and with RF sputter sources and dry compressing vacuum pump system; with EcoDry L pump



UNIVEX 450 B having a chamber diameter of 490 mm and with electron-beam evaporator with heatable and coolable chamber walls; with COOLVAC 3010 cryopump

UNIVEX 450 B (Chamber systems)

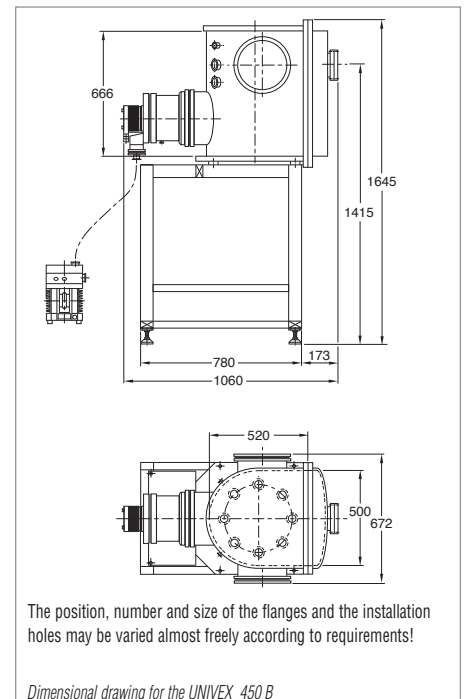
Besides the standard UNIVEX systems we are also prepared to deliver modified systems for special applications.

Besides the standard chamber system UNIVEX 350 we can also supply UNIVEX systems with other chamber sizes. These are then so designed that the chamber containing the processing components and the pump system are mounted to a separate frame. The door flange of the chamber may then easily be integrated in the wall of a clean room. The electric power supply and the system controller are accommodated in a separate 19" electrical cabinet. This will simplify installation and subsequent operation.

All processing components commonly used in thin-film processing may be installed in the chamber.

The scope of the pump system used will in each case depend on the requirements of the desired processes to be run in the chamber.

Design of the entire system in accordance with customer requirements will be undertaken upon request.





UNIVEX 450 for dactyloscopy

UNIVEX 450 for Dactyloscopy

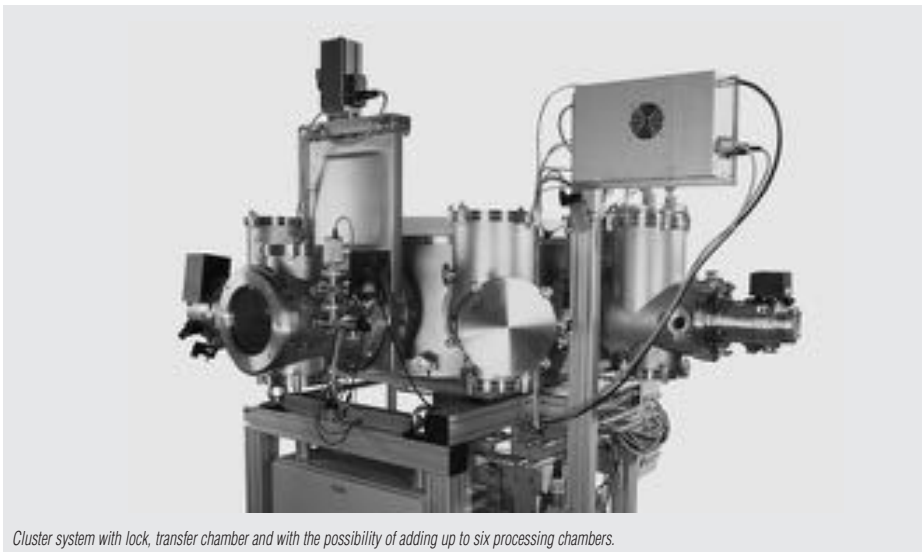
Dactyloscopy is a term from the area of criminal investigation meaning: "Identification of a person through his fingerprints". Depending on the material of the part which was touched, different methods are used to render the fingerprints visible.

In the case of materials like plastic shopping bags, for example, foils, handlebars etc. evaporation methods have been found to be most useful.

The method itself utilises the effect well known from normal evaporation processes where the evaporated material will adhere better (and thicker) on the skin material (water, amino acids, fat and alike) deposited by the finger compared to the surrounding untouched material. An optimum contrast is attained by selecting a suitable evaporation material, usually gold or zinc.

Benefits of this method:

- ◆ No "smearing" of existing traces compared to conventional methods
- ◆ Large surface areas (up to 80 x 40 cm max.) carrying fingerprints can be checked completely in one pass
- ◆ The time needed for one pass is only about 10 minutes (depending on the material carrying the fingerprints)
- ◆ Good contrast also in the case of multicolour surfaces
- ◆ Fixation of the deposited material with the traces is easy – the results may be well documented (can be photographed)
- ◆ The carrier of the fingerprints is not destroyed.



Cluster system with lock, transfer chamber and with the possibility of adding up to six processing chambers.

UNIVEX 450 C

For special applications we can also supply cluster systems based on the UNIVEX concept. These clusters are equipped according to customers requirements and incorporate separate processing and load lock and transfer chambers.

Test systems with a vacuum chamber

We can also supply vacuum chambers with custom pump systems for testing of various components.



Test system with a 700 mm dia. chamber

A

Accessories

for Compressor Units COOLPAK	C12.34
for Serial Interfaces	C09.63
for SOGEVAC	C02.39
for the Electropneumatically Operated Valves	C14.25
for UHV Components	C15.10
for L 200 <i>plus</i> , L 200 dry and Modul L 200 <i>plus</i>	C17.18
for UNIVEX	C19.10
Adaptors	C13.16 + C13.41
Adsorption Traps with Aluminium Oxide Insert	C10.16 + C11.12
Air Cooling Unit	C09.61
ANSI Fittings	C13.44
Astrotorus Baffles	C11.09

B

Ball Valves	C14.22
for SOGEVAC	C02.37
Bourdon Vacuum Gauges	C02.41 + C16.05

C

Calibrated Leaks	C17.14
Calibration Service from LEYBOLD	C16.50
Calibration Systems CS	C10.14
Capsule Vacuum Gauges	C16.06
Cart (for EcoDry L)	C03.14
CENTER ONE	C16.24
CENTER TWO / THREE	C16.26
Central Vacuum Systems	C02.47
CERAVAC Transmitters	C16.08
CF Flanges	C15.03
Checklist for Inquiries (Vacuum Pump Systems)	C08.38
Clamp Flange Fittings and Components (ISO-K)	C13.18 + C13.42
Cold Heads	
COOLPOWER, Single Stage	C12.28
COOLPOWER, Dual Stage	C12.30
Cold Trap TK	C01.47
COMBIVAC	
CM	C16.38
2T	C16.28
Compact Oil Mist Exhaust Filter	C01.50

Components

for Electron-Beam Evaporation	C19.13
for Film Thickness Measurements	C19.14
for Glow Discharge Cleaning	C19.11
for High Rate Sputtering	C19.14
for Leak Testing Instruments	C17.21
for the modular DIVAC System	C04.13
for Thermal Evaporation	C19.12
Compressor Units COOLPAK	C12.32
Condensate Separators AK	
for E and DK Pumps	C06.11 + C11.12
for TRIVAC B	C01.52
Condensate Traps AK	
for TRIVAC E and B	C01.40
Condensate Traps SL	C02.34
Condensers SEPC	C02.35
Connection Cables for Active Sensors	C16.20
Connection Components (for Leak Testing Instruments)	C17.21
Connection Fittings (for SOGEVAC)	C02.42
Connection Flanges (for Leak Testing Instruments)	C17.21
Connectors (for Feedthroughs)	C15.19
Controllers and Monitoring Units for Cryopumps	C12.38
Cryopumps COOLVAC	
Standard	C12.10
with fully automatic Control	
ClassicLine	C12.12
SemiLine	C12.24

D

Delayed Venting Unit	C10.17
Diaphragm Pressure Regulators MR	C16.49
Diaphragm Vacuum Pumps	
DIVAC, Single-Stage	C04.06
DIVAC L	
Dual-Stage	C04.08
Dual-Stage with automatic Drying System	C04.10
DIIVAC DV 1000	C16.07
DISPLAY ONE	C16.22
DIVAC Sub-assemblies	C04.14
Modular Laboratory Pump Concept	C04.12
Dry Compressing Backing Pumps for Turbomolecular Pumps	
DIVAC T	C04.18
MZ D	C04.24

Dry Compressing Piston Vacuum Pump	
EcoDry L	C03.06
EcoDry M	C03.10
Dry Compressing Screw Vacuum Pump	C05.03
Dust Filters FS	
for E and DK Pumps	C06.12
for TRIVAC E and B	C01.46
Dust Filters (Suction Side) for SOGEVAC	C02.32
Dust Separators AS	
for E and DK Pumps	C06.13
for TRIVAC E and B	C01.44

E

Electrical Feedthroughs	C13.32
Electrical Indicator System EIS	C01.60
Electronic Frequency Converters	
for Turbomolecular Pumps	
with Mechanical Rotor Suspension	C09.32
with Magnetic Rotor Suspension	C09.56
Exhaust Filter Box	C06.09
Exhaust Filter Drain Tap	C01.42
Exhaust Filters	
AF for E and DK Pumps	C06.11 + C13.39
AF for TRIVAC E and B	C01.40
with Lubricant Return ARP / AR	C01.54
with Lubricant Return ARS	C01.55
AK for TRIVAC B	C01.53
Exhaust Filter Gauge	C02.40
Exhaust Silencer	C03.17

F

Fine Filter	C09.61
Fine Vacuum Adsorption Traps FA	C01.45
Fixed Flange Fittings	
DIN 2501	C13.28
ISO-F	C13.27
ISO-F and DIN 2501, ND6	C13.26
ISO-F and DIN 2501	C13.43
Flange Components	C01.64
Flange Fittings and Components, ISO-KF	C13.06 + C13.39
Flange Heaters for CF High Vacuum Flanges	C09.61

G

Gas Ballast Valve	C02.36
manually operated (Retrofit Kit)	C03.16

H

Helium Leak Detector	
Mobile and Flexible	
Modul L 200 <i>plus</i>	C17.10
Portable	
L 200 <i>plus</i>	C17.08
L 200 dry	C17.09
Helium Sample Probes (Sniffers)	C17.20
High Current Feedthroughs	C13.35
High Vacuum Experimentation Systems	
Bell Jar System	
UNIVEX 300	C19.04
UNIVEX 450	C19.06
Door System	
UNIVEX 350	C19.08
Special Units	C19.15
High Vacuum Gate Valves	C14.26

I

Inert-Gas-System IGS	C01.58
IONIVAC Transmitter ITR	C16.16
IONIVAC Sensors IE (Extractors)	C16.44

J

K

L

Leak Detection Systems	
mobile, fitted to the CART 200	C17.12
Limit Switch System LSS	C01.59
Linear Pressure Sensors DI	C16.40
Liquid Feedtroughs	C13.38
Low Pressure Safety Switch PS 113 A	C16.46
Low Temperature Controller Modell 970	C12.42
Low Temperature Measuring Instrument MODEL 1901	C12.43

M

MEMBRANOVAC DM	C16.32
Molecular Filters MF	C01.44
Monitoring Instruments	C11.10
Mounting Accessories for SOGEVAC Pumps	C02.40

N

Observation Windows	C13.30
Oil Control Unit	C06.10
Oil Diffusion Pumps DIP, Water-Cooled	C11.06
Oil Drain Kit	C01.42
Oil Drain Tap	C01.42
Oil Filter Unit	C06.10
Oil Filters	
CF, Chemical	C01.56
CFS, Chemical, with Safety Isolation Valve	C01.57
OF, Mechanical	C01.56
Oil Filtering System	
OF1000	C01.62 + C06.14
OF3000	C02.38 + C06.16
Oil Suction Facility	
AR-M, Manually Operated	C01.43
AR-V, Controlled by Solenoid Valve	C01.43

P

PENNINGVAC PM 31	C16.36
PENNINGVAC Sensors PR	C16.43
PENNINGVAC Transmitters PTR	C16.14
PIEZOVAC PV 20	C16.30
Power Failure Venting Valves	C14.22
for Turbomolecular Pumps	C09.62
Power Supply	C12.25 + C12.38
Precision Manometer	C12.45
Pressure Switches	C07.16
PS	C16.47
Purge Gas and Venting Valve	C09.62

Q

R

Refrigerator Cryostats	
Based on RDK 6-320	C12.35
Optical, Based on RDK 6-320	C12.36
Refillable Traps RST	C01.48
Right-Angle Valves for Mobile Systems in Accordance with the Regulations of the Department of Transportation	C14.24

Roots Pump Adaptor	
for EcoDry L	C03.15
for TRIVAC B	C01.61
Roots Vacuum Pumps	
RUVAC RA	
with Flange-Mounted Motors (50 Hz)	C07.12
with Direct-Coupled Motors (60 Hz)	C07.14
RUVAC RAV with Pre-Admission Cooling	C08.18
RUVAC WA/WAU with Flange-Mounted Motors	C07.06
RUVAC WS/WSU/PFPE with Canned Motors	C07.08
RUVAC WSLF for Laser Gas Systems	C07.10
Rotary Feedtroughs	C13.36
Rotary / Linear Motion Feedtroughs	C13.37
Rotary Piston Vacuum Pumps	
DK, Two-stage	C06.06
E, Single-Stage	C06.04
Rotary Vane Vacuum Pumps	
SOGEVAC SV	C02.14
SOGEVAC SV B	C02.04
TRIVAC B, Two-Stage	C01.10
TRIVAC BCS, Two-Stage	C01.26
TRIVAC BCS-PFPE, Two-Stage	C01.32
TRIVAC B-DOT, Two-Stage	C01.22
TRIVAC B-Ex, Two-Stage	C01.24
TRIVAC E, Two-Stage	C01.06

S

Safety Valve	C12.45
Screw-in Calibrated Leaks	C17.16
Sealing Valves	C14.23
Separators SEP	C02.35
Small Compact Pump S 1.5	C01.04
Small Valves micro	C14.06
Smoke Eliminator SE	C01.49
Solenoid Gas Ballast Valve	C03.19
Solenoid Venting Valve	C09.62
Spare Sensors for Older Operating Units (Total Pressure Gauges)	C16.45
Special Oil Sight Glass	C02.36
Special Units (UNIVEX)	C19.15
Special Valves	C14.17
System Controller	C12.25 + C12.38
Switching Amplifier SV 110	C16.48

T

Temperature Sensors (Silicon Diode) C12.44

Thermal Switch C02.36

THERMOVAC Sensors Series 200 C16.42

THERMOVAC TM C16.34

THERMOVAC Transmitters TTR C16.10

Turbomolecular Pump Systems

 BMH70 Dry C10.28

 MINI-TOPS 50 C10.20

 PT C10.04

 PT Dry C10.10

 PT KIT C10.08

 TIPS C10.26

 TOPIX C10.25

 TOPS 151/361 C10.22

 TOSS 50 C10.18

 TURBOVAC TMV 40 000 C10.24

Turbomolecular Pumps

 with Mechanical Rotor Suspension

 without Compound Stage C09.08

 with Compound Stage C09.16

 with Magnetic Rotor Suspension

 without Compound Stage C09.38

 with Compound Stage C09.46

TurboPump Controller C10.31

Turboradial Blowers

 TURBOSTREAM TST D (dual-stage) C18.08

 TURBOSTREAM TST S (single-stage) C18.04

TurboSystem Controller C10.30

U

UHV All-Metal Right-Angle Valves C15.13

UHV All-Metal Variable Leak Valves C15.14

UHV Components C15.07

UHV Feedthroughs

 Electric C15.17

 Mechanical C15.15

UHV Liquid Feedthroughs C15.21

UHV Observation Windows C15.12

UHV Sapphire Observation Windows C15.12

V

Vacuum Greases (for Vacuum Fittings and Feedthroughs) C13.29

Vacuum Locks C14.23

Vacuum Pump Oils C01.65 + C02.53 + C05.07 + C06.19 + C07.17

Vacuum Pump Systems (Checklist for Inquiries) C08.36

Vacuum Pump Systems

 Dry Compressing

 with EcoDry L Backing Pump C08.14 + C08.34

 with SCREWLine Backing Pump C08.16

 RUTA

 with RUVAC RAV Roots Vacuum Pumps C08.20

 with Single- and Two-Stage Rotary Piston Vacuum Pumps
 as Backing Pumps C08.12

 with Single-Stage SOGEVAC Backing Pumps

 Adapter Version C08.08

 Frame Version C08.10

 with Two-Stage TRIVAC Backing Pumps C08.06

 HTS

 with Single-Stage SOGEVAC Backing Pumps

 Close-Coupled C08.28

 Frame Mounted C08.32

 RBS - B/BCS

 with Two-Stage TRIVAC Backing Pumps C08.24

 RM

 with Single- and Two-Stage Rotary Piston Vacuum Pumps
 as Backing Pumps C08.34

 TVD for Drying, Evaporation and Distillation Application . . . C08.22

Vacuum Safety Valves SECUVAC C14.18

Valves C01.64 + C02.37 + C06.08

 with ISO-K or ISO-F Flanges C14.13

 with KF Flanges C14.08

Variable-Leak Valves with and without Isolation Valve C14.20

Venting Valves C14.21

Vibration Absorber C06.17 + C09.61

Vibration Absorbing Feet C03.17

Vibration Absorbing Kit C03.18

W

X

Y

Z