

# **E and DK**

## Rotary Piston Vacuum Pumps

Single- and two-stage, oil-sealed,  
200 - 250 m<sup>3</sup> x h<sup>-1</sup> (118 - 147 cfm)

172.01.02

Excerpt from the Oerlikon Leybold Vacuum Full Line Catalog

Product Section C06

Edition May 2007

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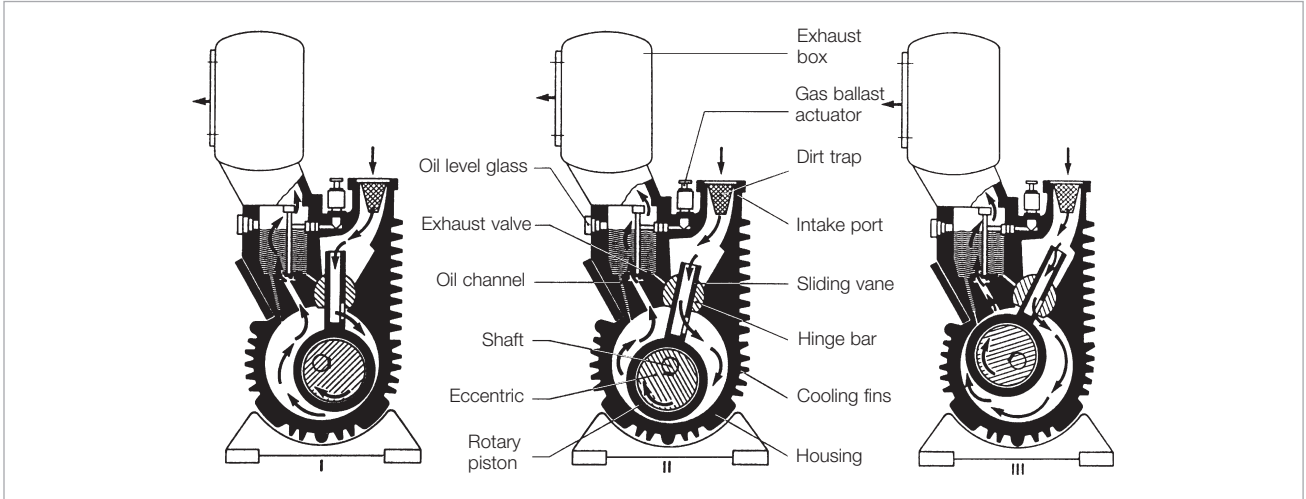
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## Applications and Operation



Functional diagram of a rotary piston vacuum pump

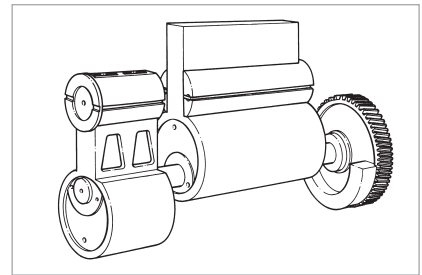
### Advantages to the User

- 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

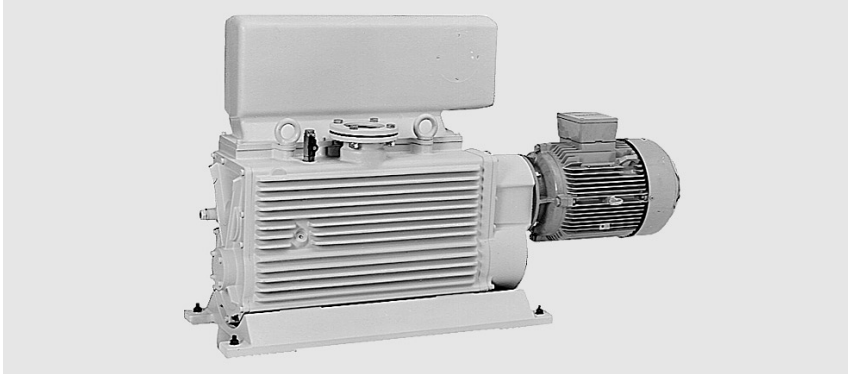


Balancing the masses within a rotary piston vacuum pump: Eccentric shaft, 2 pistons and toothed wheel

Pumps	E-250	DK-200
<b>Application</b>		
Manufacture of semiconductors	■	■
Coating	■	■
Chemistry	■	■
Metallurgy	■	■
Electrical engineering	■	■
Mechanical engineering	■	■
Backing pump for a Roots vacuum pump in diffusion pump systems	■	■
<b>Accessories</b>		
	Page	
AFK Exhaust Filter Box	C06.09	■
Oil Filter Unit	C06.10	■
Oil Control Unit	C06.10	■
AK Condensate Separator	C06.11/22	■
AF Exhaust Filter	C06.12/23	■
FS Dust Filter	C06.13	■
AS Dust Separator	C06.14	■
Oil Filtering System OF1000	C06.16	■
Oil Filtering System OF3000	C06.20	■
Vibration Absorber	C06.19	■

# Products

## Single-Stage Rotary Piston Vacuum Pump E 250



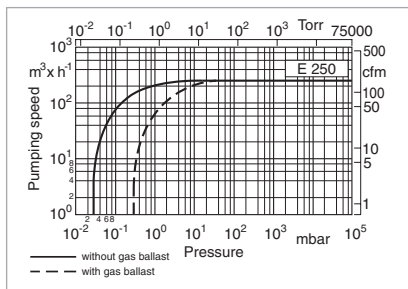
### Typical Applications

- Chemical, metallurgical and electronic vacuum processes
- Impregnating, degassing and drying processes in experimentation systems, in drying cabinets, extrusion etc.

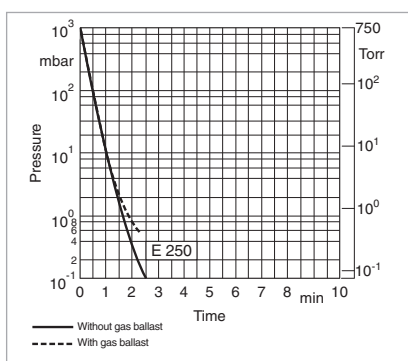
- Pressure range down to  $4 \times 10^{-2}$  mbar ( $2.4 \times 10^{-2}$  Torr) without gas ballast or to  $5 \times 10^{-1}$  mbar ( $3 \times 10^{-1}$  Torr) with gas ballast
- Backing pump for Roots vacuum pumps at intake pressure down to  $10^{-3}$  mbar ( $0.75 \times 10^{-3}$  Torr)

### Supplied Equipment

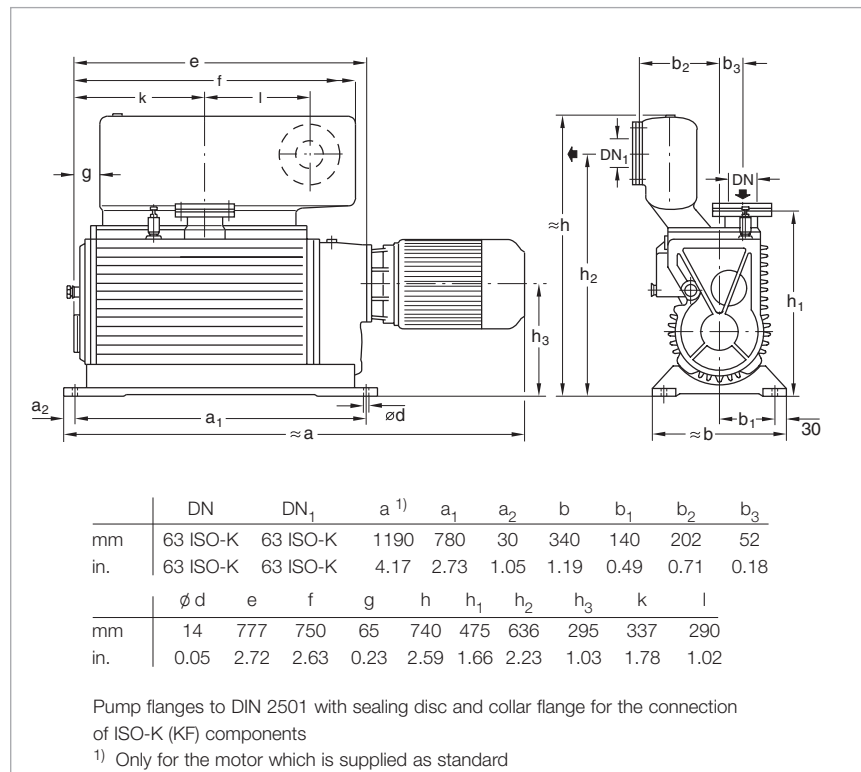
- With DN 65 DIN flanges on the intake and exhaust sides for direct connection of DN 63 ISO-K flange components
- Ready for operation, complete with oil filling
- Special models for different motor voltages, motor frequencies and other protection class ratings are available. Details on these upon request.



Pumping speed characteristic of the E 250 rotary piston vacuum pump (60 Hz curves at the end of the section)



Pumpdown characteristic of a 1000 l vessel for the E 250 rotary piston vacuum pump (60 Hz curves at the end of the section)



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

## Technical Data

## E 250

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

## Ordering Information

## E 250

	50 Hz	60 Hz
Single-stage rotary piston vacuum pump		
E 250, with 50 Hz-motor <sup>3)</sup> (220 / 380 V +/- 10%)	<b>Part No. 105 36</b>	-
E 250, with 460 V/50 Hz motor <sup>3)</sup> (220-230 V / 460 V +/- 10%)	<b>Part No. 895 08</b>	-
E 250, with 460 V/60 Hz motor <sup>3), 4), 5)</sup> (200-230 V / 460 V +/- 10%) USA version	-	<b>Part No. 895 09</b>
E 250, without motor, with 50 Hz gear <sup>3), 6)</sup>	<b>Part No. 166 37</b>	-
Sealing kit, pump	<b>Part No. 192 63</b>	<b>Part No. 192 63</b>
Vibration absorbing metal feet	<b>Part No. 101 55</b>	<b>Part No. 101 55</b>
SECUVAC valve		
200-230 V, 50/60 Hz	<b>Part No. 215 207</b>	<b>Part No. 215 207</b>
100 - 115 V, 50/60 Hz	<b>Part No. 215 206</b>	<b>Part No. 215 206</b>
ANSI adaptor	<b>Upon request</b>	<b>Upon request</b>

<sup>1)</sup> To DIN 28 400 and following numbers

<sup>2)</sup> 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)

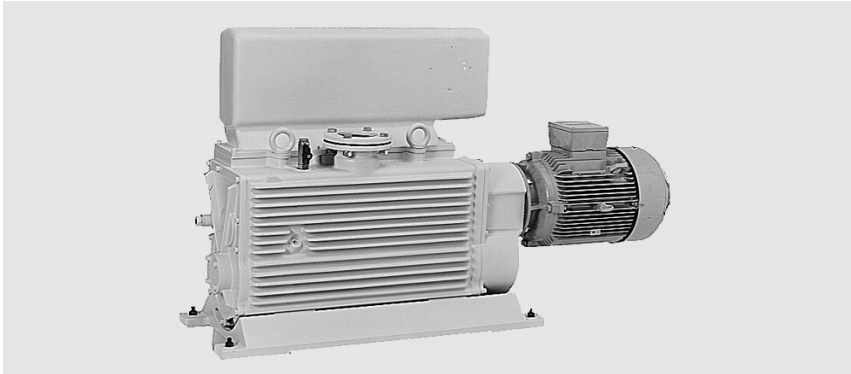
<sup>3)</sup> For operation at a different frequency, the gear will have to be exchanged. Please state the main frequency and connection (star or delta) in your order

<sup>4)</sup> Continuous operation from 60 mbar (45 Torr)

<sup>5)</sup> USA version supplied with 3" ANSI flanges

<sup>6)</sup> The maximum speed must not exceed 1,500 rpm at 50 Hz. The motor rating must be at least 5 kW (6.8 hp)

# Two-stage Rotary Piston Vacuum Pump DK 200



## Typical Applications

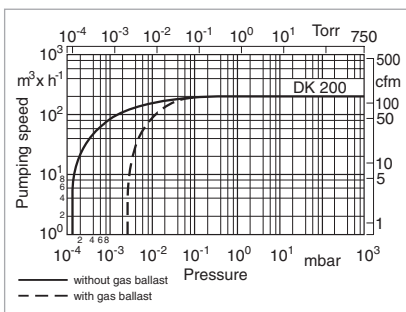
- For particularly low ultimate pressures
- High vacuum stage with degassed oil from a separate oil reservoir
- For all chemical, metallurgical and electronic vacuum processes in the pressure range down to  $5 \times 10^{-4}$  mbar ( $3 \times 10^{-4}$  Torr) without gas ballast and

$4 \times 10^{-3}$  mbar ( $2.4 \times 10^{-3}$  Torr) with gas ballast

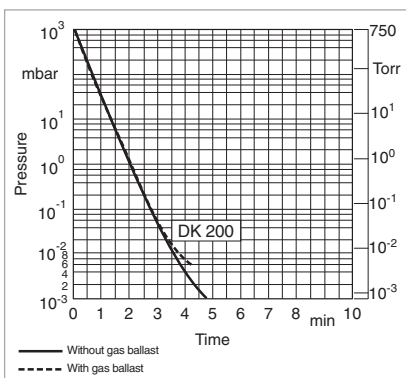
- Backing pump for Roots vacuum pumps
- Use as backing pump in pump systems in connection with diffusion, booster-type diffusion and vapor pumps

## Supplied Equipment

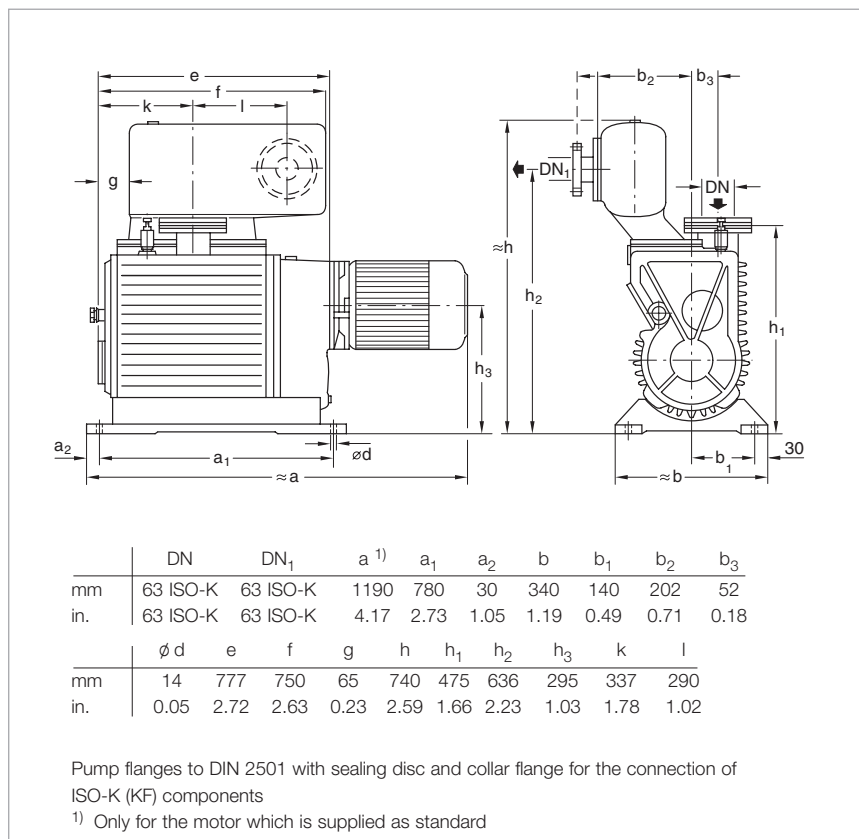
- With DN 65 DIN flanges on the intake and exhaust sides for direct connection of DN 63 ISO-K flange components
- Ready for operation, complete with oil filling
- Special models for different motor voltages, motor frequencies and other protection class ratings are available



Pumping speed characteristic of the DK rotary piston vacuum pump (60 Hz curves at the end of the section)



Pumpdown characteristics of a 1000 l vessel for the DK type rotary piston vacuum pump (60 Hz curves at the end of the section)



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

## Technical Data

## DK 200

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

## Ordering Information

## DK 200

	50 Hz	60 Hz
Two-stage rotary piston vacuum pump DK 200, with 50 Hz motor <sup>3)</sup> (220 / 380 V +/- 10%)	<b>Part No. 111 16</b>	-
DK 200, with 60 Hz motor <sup>3), 4), 5)</sup> (200-230 V / 460 V +/- 10%) USA version	-	<b>Part No. 895 10</b>
DK 200, without motor, 50 Hz gear <sup>3), 6)</sup>	<b>Part No. 166 17</b>	-
Sealing kit, pump	<b>Part No. 192 63</b>	<b>Part No. 192 63</b>
Vibration absorbing metal feet	<b>Part No. 101 55</b>	<b>Part No. 101 55</b>
SECUVAC valve 200-230 V, 50/60 Hz	<b>Part No. 215 207</b>	<b>Part No. 215 207</b>
100 - 115 V, 50/60 Hz	<b>Part No. 215 206</b>	<b>Part No. 215 206</b>
ANSI adaptor	<b>Upon request</b>	<b>Upon request</b>

<sup>1)</sup> To DIN 28 400 and following numbers

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

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

<sup>4)</sup> Continuous operation from 30 mbar (22.5 Torr)

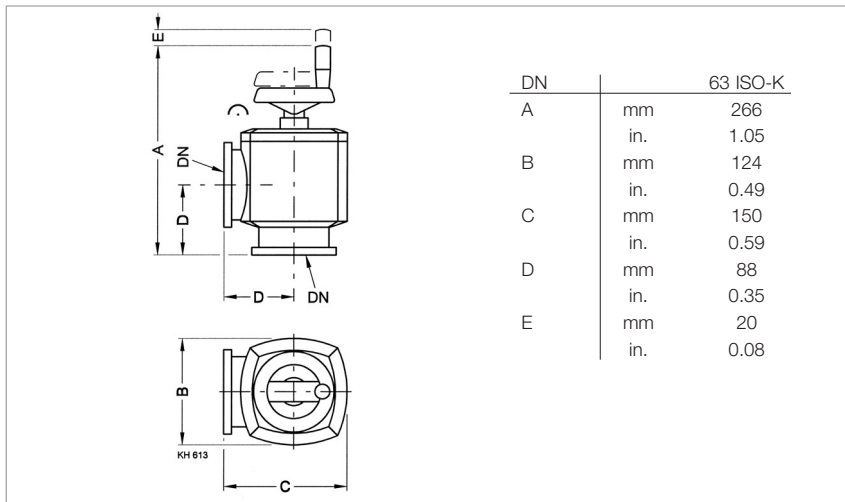
<sup>5)</sup> USA version supplied with 3" ANSI flanges

<sup>6)</sup> The maximum speed must not exceed 1,500 rpm at 50 Hz. The motor rating must be at least 5 kW (6.8 hp)

# Accessories

## 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.



Dimensional drawing for the right-angle valve, bellows-sealed, manually operated

### Advantages to the User

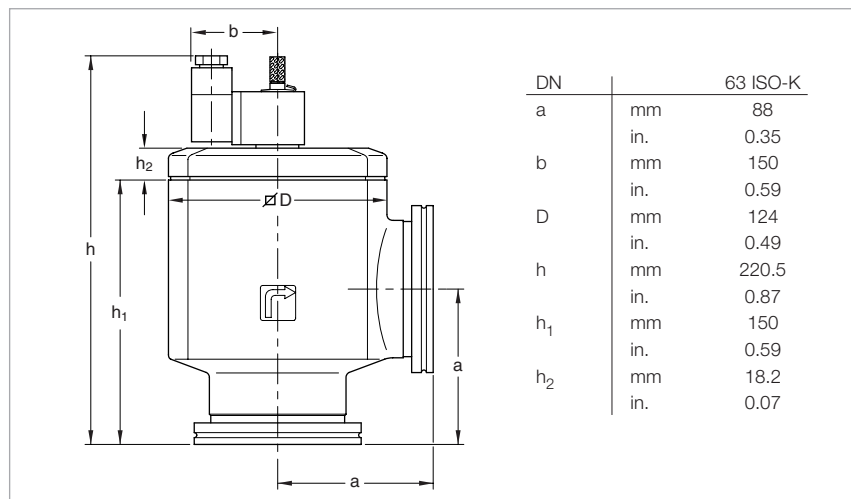
- The pump may warm up while the intake line is isolated
- Energy-conserving and environmentally friendly operation at ultimate pressure
- The pump may continue to operate while the vacuum chamber is vented for brief periods
- After completion of a process the pump may continue to operate so as to regenerate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

### Ordering Information

### Right Angle Valve

Right angle valve DN 63 ISO-K, Aluminium, manually operated

**Part No. 107 80**



Dimensional drawing for the SECUVAC valves with ISO-K clamp flanges

### 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

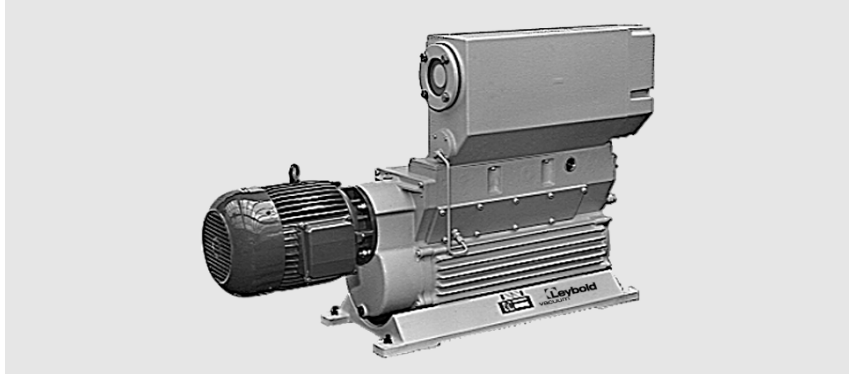
### SECUVAC Valve

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 with Oil Return Line



The oil mists entrained in the exhaust gas from the pump are cleaned in the exhaust filter box.

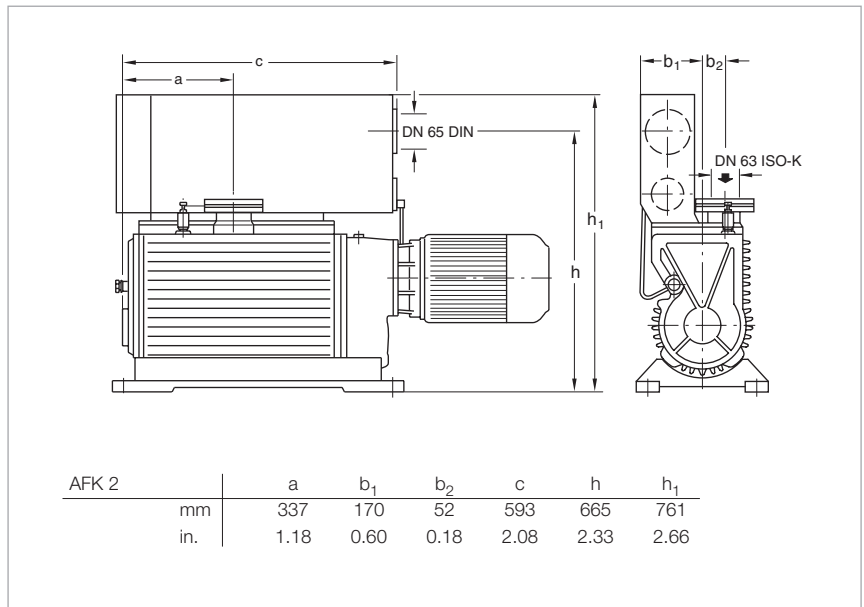
The exhaust filter box is installed instead of the standard filter box on the rotary piston vacuum pump.

## 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 over-pressure 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.



Dimensional drawing for the exhaust filter box AFK 2 with oil return line

## Technical Data

## Exhaust Filter Box AFK 2

Weight	kg (lbs)	10 (22.1)
Connection for collar flange	DN	63 ISO-K

## Ordering Information

## Exhaust Filter Box AFK 2

Exhaust filter box AFK 2 for E 250, DK 200	<b>Part No. 189 47</b>
Replacement filter element (FE) (2 are required)	<b>Part No. 390 26 144</b>

# 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 (1.37 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.

# Oil Control Unit



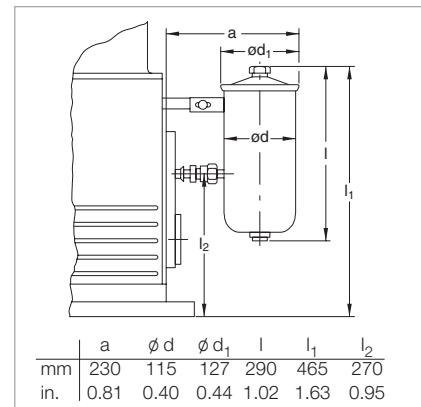
Adding the oil can be automated through the oil control unit without having to interrupt operation. For this purpose, an additional oil reservoir holding 7 liters (7.4 qt) is connected to the pump.

### Advantages to the User

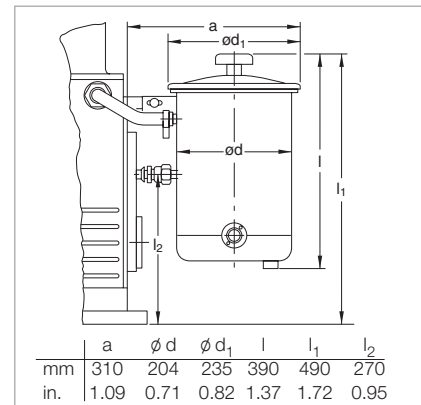
- Optimum oil level over long periods of operation
- Reduction of oil losses
- Visual function check (transparent connecting hose)
- Simple installation of the unit without the need to disassemble the pump
- Closed circuit by connection of oil reservoir, vessel and pump
- Built-in filter insert separates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



Dimensional drawing for the oil filter unit



Dimensional drawing for the oil control unit

### Ordering Information

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

Replacement filter

### Oil Filter Unit

**Part No. 101 31**

**Part No. 101 32**

### Ordering Information

Oil control unit

Replacement filter

### Oil Control Unit

**Part No. 101 37**

**Part No. 101 32**

# Condensate Separator AK 100-250



Welded condensate collecting vessels.

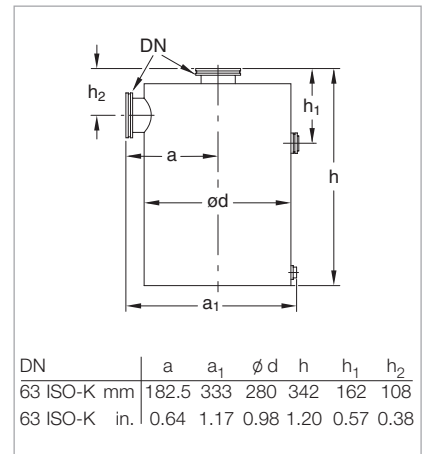
## Advantages to the User

- 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.



Dimensional drawing for the condensate separator AK 100-250

## Technical Data

Capacity for condensate	l (qt)	10 (10.57)
Weight	kg (lbs)	12 (26.5)
Connection	DN	63 ISO-K

## Condensate Separator

### AK 100-250

## Ordering Information

Condensate separator AK 100-250	<b>Part No. 188 45</b>
Drain cock, vacuum-tight	<b>Part No. 190 90</b>
Connection components Connection to the intake side of the E 250, DK 200 Elbow Centering ring	<b>Part No. 887 25</b> <b>Part No. 268 05</b>

## Condensate Separator

### AK 100-250

# Exhaust Filter AF 100-250 A



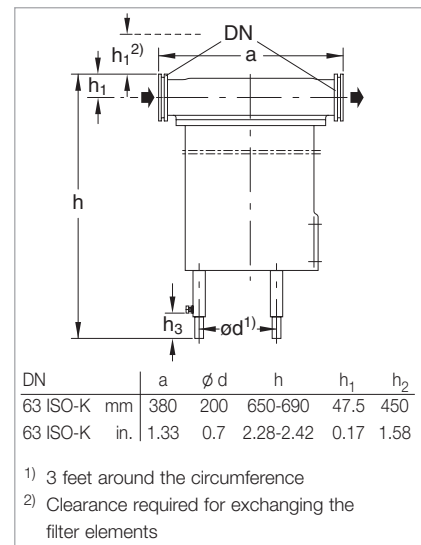
To remove oil mists entrained in the exhaust gas.

## Advantages to the User

- Over 99% effective
- Optimally matched to our rotary piston vacuum pumps
- Exchangeable filter insert
- Built-in over-pressure 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.



Dimensional drawing for the exhaust filter AF 100-250 A

## Technical Data

## AF 100-250 A

Weight	kg (lbs)	12 (26.5)
Connection	DN	63 ISO-K

## Ordering Information

## AF 100-250 A

Exhaust filter AF 100-250 A	<b>Part No. 189 45</b>
Replacement filter element (2 are required)	<b>Part No. 390-261-44</b>
Drain cock, vacuum-tight	<b>Part No. 190 90</b>
Connection components	
Connection to the E 250, DK 200	
Bellows	<b>Part No. 887 70</b>
Centering ring ISO-K	<b>Part No. 268 05</b>

# Dust Filter FS 100-250



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  $\mu\text{m}$

## Technical Notes

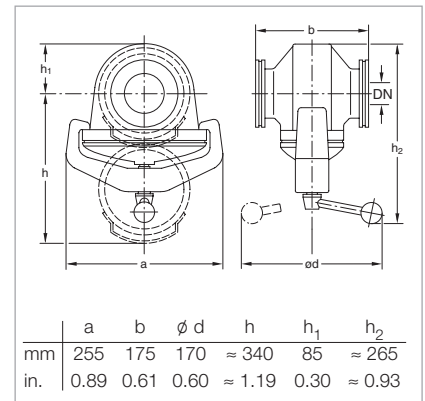
Install horizontally so that the filter insert may be removed from below.

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.



Dimensional drawing for the dust filter FS 100-250

## Technical Data

## FS 100-250

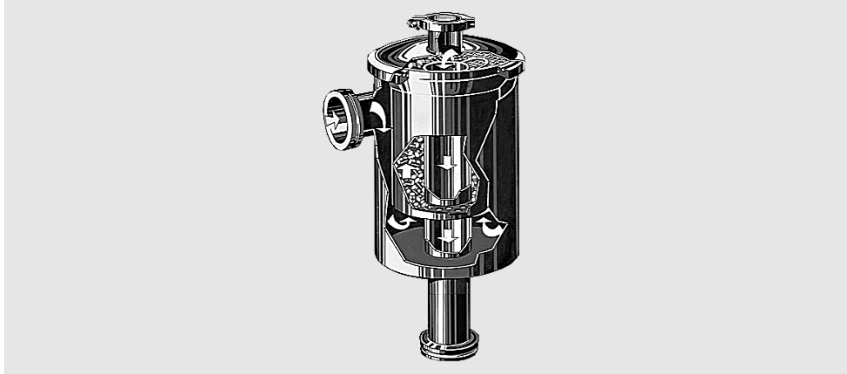
Connection to pump		E 250, DK 200
Throttling of pumping speed		
at an intake pressure of 13 mbar (9.8 Torr) approx.	%	28
at an intake pressure of 1.3 mbar (0.98 Torr) approx.	%	38
Weight	kg (lbs)	11 (24.3)
Connection	DN	63 ISO-K

## Ordering Information

## FS 100-250

Dust filter FS 100-250	<b>Part No. 278 17</b>
Filter insert	<b>Part No. 178 37</b>
Replacement cotton wadding cartridges (1 set = 10 pieces)	<b>Part No. 178 27</b>
Connection components	
Connection to the E 250, DK 200	
Elbow	<b>Part No. 887 25</b>
Centering ring	<b>Part No. 268 05</b>
ANSI adaptor	<b>Upon request</b>

# Dust Separator AS 100-250



Dust separators protect the pumps against being contaminated by dust.

## Advantages to the user

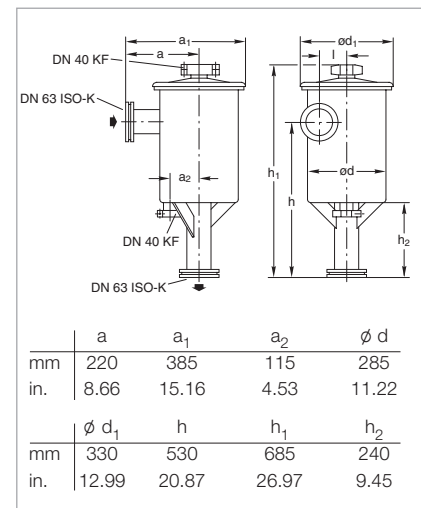
- Dust separator for large quantities of dust
- Dual-stage, thus low throttling effect
- Cyclone and wet filter
- Replacement inserts for both filters
- Dust of a grain size of 2 µm and more are separated in a cyclone
- Finer dust is separated in an insert moistened with oil

## 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.



Dimensional drawing for the dust separator AS 100-250

## 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

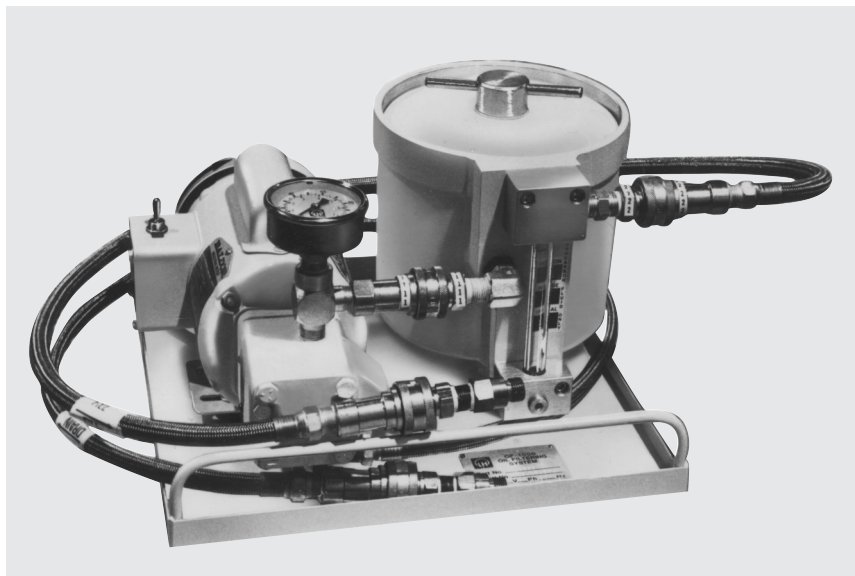
## AS 100-250

Dust separator AS 100-250	<b>Part No. 178 02</b>
Filter insert	<b>Part No. 178 06</b>



# Only available for purchase in North and South America

## Oil Filtering System OF1000



Oil filtering system OF1000

OF1000 Oil Filtering Systems are designed to remove acids and particulates from the lubricating fluid used in Oerlikon Leybold Vacuum 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 hydrolized 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.

## Technical Data

### Single-Canister Systems

### Dual-Canister Systems

Gear pump motor	1/6 HP, 115/208/220 V, single phase, 50/60 Hz, wired for 115 V, with on/off switch <sup>1)</sup>	1/6 HP, 115/208/220 V, single phase, 50/60 Hz, wired for 115 V, with on/off switch <sup>1)</sup>
Gear pump	0.7 gpm @ 1800 RPM	0.7 gpm @ 1800 RPM
Pressure gauge	0 to 100 psig (0 to 70 kPa)	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 <sup>2)</sup>	3/8 in. I.D. teflon/carbon black with stainless steel braid – 4 ft lengths <sup>2)</sup>
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 <sup>3)</sup>
Weight (Dry)	lbs (kg) 45 (20.39)	60 (27.18)

## Ordering Information

### Single-Canister Systems

### Dual-Canister Systems

Oil filtering system OF1000 less filtering element and oil OF1000 prepared for PFPE, less filtering element and oil OF1000C chemically severe service, prepared for PFPE fluid	<b>Part No. 898 550</b>	<b>Part No. 898 552</b>
	<b>Part No. 898 551</b>	<b>Part No. 898 553</b>
	<b>Part No. 898 561</b>	<b>Part No. 898 554</b>

## Accessories

Spare filter canister assembly with quick disconnect prepared for PFPE, with quick disconnect chemically severe service	<b>Part No. 898 555</b>	<b>Part No. 898 557 (front), Part No. 898 555 (rear)</b>
	<b>Part No. 898 556</b>	<b>Part No. 898 558 (front), Part No. 898 556 (rear)</b>
	<b>Part No. 898 566</b>	<b>Part No. 898 559 (front), Part No. 898 566 (rear)</b>

## Filtering Elements

Aluminum Oxide High capacity for reagent grade HCl; removes lewis acids and polar compounds; 10 micron particulate retention	<b>Part No. 898 504</b>	<b>Part No. 898 504</b>
Fullers Earth Acid and particulate filter with capacity of 34 ml reagent grade HCl; 10 micron particulate retention	<b>Part No. 898 505</b>	<b>Part No. 898 505</b>
Hydrophilic Water and HCl acid absorbing capabilities; 1 micron particulate retention	<b>Part No. 898 506</b>	<b>Part No. 898 506</b>
Particulate Fiberglass element with 10 micron particulate retention	<b>Part No. 898 507</b>	<b>Part No. 898 507</b>

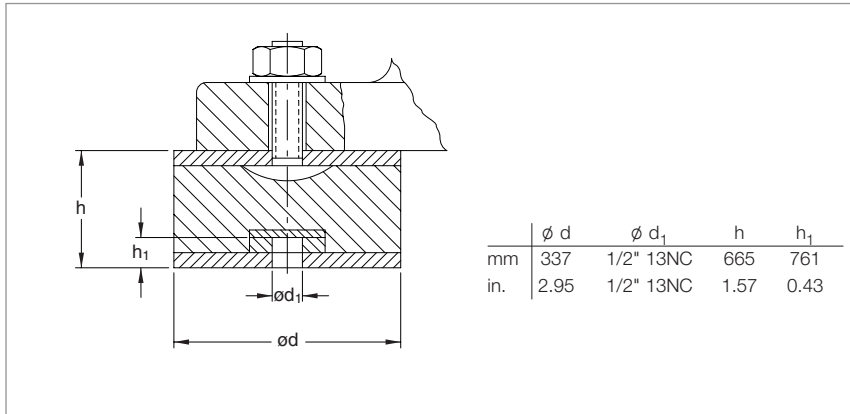
<sup>1)</sup> Hazardous duty models and special voltages also available

<sup>2)</sup> Optional 6, 10 and 15 feet hoses available

<sup>3)</sup> Optional parallel flow arrangement also available

# Only available for purchase in North and South America

## 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.

Dimensional drawing for the vibration absorber

### 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**

# Only available for purchase in North and South America

## Oil Filtering System OF3000



Oil filtering system OF3000

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.

**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.

**Technical Data****OF3000**

Gear pump motor		1/6 HP, 115/208/220 V, single phase, 50/60 Hz, wired for 115 V, with on/off switch
Gear pump		0.7 gpm @ 1800 rpm
Pressure gauge		0 to 100 psig (0 to 70 kPa)
Fluid capacity (approx.)	gal	3
Flexible hoses	in. I.D.	78 teflon/carbon black with stainless steel braid - 6 ft lengths
Dimensions	in. (mm)	18 x 14 x 26 (457 x 355 x 661)
Weight (dry)	lbs (kg)	65 (29.4)

**Ordering Information****OF3000**

Oil filtering system		
OF3000, less element and oil (standard)		<b>Part No. 898 625</b>
OF3000C, coated, prepared for PFPE		<b>Part No. 898 450</b>
OF3000, prepared for PFPE		<b>Part No. 898 455</b>

**Accessories**

Aluminum Oxide		<b>Part No. 898 523</b>
Hydrophilic		<b>Part No. 898 525</b>
Fullers Earth		<b>Part No. 99 171 159</b>
Particulate (paper)		<b>Part No. 898 599</b>
Particulate (fiberglass)		<b>Part No. 99 171 158</b>

# Only available for purchase in North and South America

## Condensate Separator AK 100-250



Welded condensate collecting vessels.

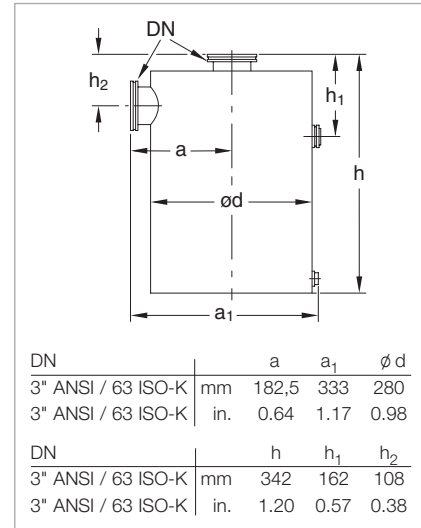
### Advantages to the User

- 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.



Dimensional drawing for the condensate separator AK 100-250

### Technical Data

### Condensate Separator AK 100-250

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

### Ordering Information

### Condensate Separator AK 100-250

Condensate separator AK 100-250 DN 63 ISO-K ASA	<b>Part No. 188 45</b> <b>Part No. 188 45-M</b>
Vacuum-tight draining tap (pump inlet)	<b>Part No. 190 90</b>
Inlet position (E 150, E 250, DK 100, DK 200) 3" elbow (1 is required) 3" ANSI rotatable flanges (2 are required) 3" ANSI seal disc (2 are required)	<b>Part No. 982-780-347</b> <b>Part No. 982 780-700</b> <b>Part No. 910-181-605</b>
Exhaust position (E 250, DK 200) 3" ANSI seal disc (2 are required)	<b>Part No. 910-181-605</b>

# Only available for purchase in North and South America

## Exhaust Filter AF 100-250 A



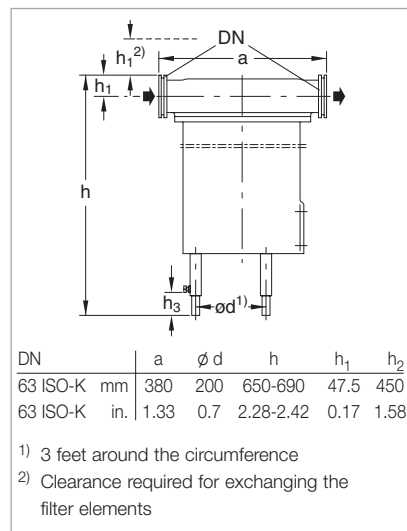
To remove oil mists entrained in the exhaust gas.

### Advantages to the User

- Over 99% effective
- Optimally matched to our rotary piston vacuum pumps
- Exchangeable filter insert
- Built-in over-pressure 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.



Dimensional drawing for the exhaust filter AF 100-250 A

### Technical Data

### Exhaust Filter AF 100-250 A

Weight	kg (lbs)	12 (26.5)
Connection	DN	63 ISO-K

### Ordering Information

### Exhaust Filter AF 100-250 A

Exhaust filter AF 100-250 A DN 63 ISO-K ASA	<b>Part No. 189 45</b> <b>Part No. 189 45 V001</b>
Kit includes Exhaust filter ANSI bellows ANSI sealing disc (2 are required) ANSI rotatable flange	<b>Part No. 189 45</b> <b>Part No. 991-051-013</b> <b>Part No. 910-181-605</b> <b>Part No. 982-780-700</b>
Spare filter elements for E 250, DK 200 (2 are required)	<b>Part No. 390-261-44</b>
Drain tap	<b>Part No. 188 90</b>

**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 and Feedthroughs" 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 Oerlikon Leybold Vacuum so as to ensure optimum performance of the Oerlikon 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.

PFPE is non-flammable. Oerlikon Leybold Vacuum NC 1/14 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 (O<sub>2</sub>), fluorine (F<sub>2</sub>) and uranium hexafluoride (UF<sub>6</sub>). Regarding Lewis acids (for example, boron trifluoride (BF<sub>3</sub>), aluminum trichloride (AlCl<sub>3</sub>)) 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 (COF<sub>2</sub>). 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.

Material safety data sheets are available upon request for professional users from: Email „documentation.vacuum@oerlikon.com“ or from the Internet „www.oerlikon.com“.

# Overview Oils

## Application Data

## Special Oil N62

## NC 1/14

Type of oil	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 <sub>2</sub> , ozone O <sub>3</sub> , nitrogen oxides NO <sub>x</sub> and sulphur oxides (SO <sub>2</sub> , SO <sub>3</sub> ) as well as reactive substances like halogens (for example fluorine F <sub>2</sub> , chlorine Cl <sub>2</sub> ), hydrogen halides (for example hydrogen chloride HCl, hydrogen bromide HBr), uranium hexafluoride UF <sub>6</sub> , and conditionally. Lewis acids (for example boron trichloride BCl <sub>3</sub> )  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 vapor, in particular in connection with corrosive media (see above) In ingress of water vapor must be avoided  The use of an oil filter is strongly recommended
Elastomer compatibility FPM (Viton) NBR (Perbunan) <sup>1)</sup> EPDM	Suited Conditionally suited Not suited	Suited Suited Suited

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

**Technical Data****Special Oil N62****NC 1/14**

Viscosity			
at 40 °C	mm <sup>2</sup> /s	90	47
at 100 °C	mm <sup>2</sup> /s	10	5
Flash point	°C (°F)	> 255 (> 491)	- 1)
Vapor pressure			
at 20 °C	mbar (Torr)	< 1 x 10 <sup>-5</sup> (< 0.75 x 10 <sup>-5</sup> )	3 x 10 <sup>-7</sup> (2.25 x 10 <sup>-7</sup> )
at 100 °C	mbar (Torr)	< 3 x 10 <sup>-3</sup> (< 2.25 x 10 <sup>-3</sup> )	6 x 10 <sup>-4</sup> (4.5 x 10 <sup>-4</sup> )
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)	<b>Part No. 177 01</b>	<b>Part No. 177 38</b>
5 litres (5.29 qt)	<b>Part No. 177 02</b>	-
20 litres (21.14 qt)	<b>Part No. 177 03</b>	-
180 kg (397.4 lbs)	<b>Part No. 177 05</b>	-

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) **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

# Only available for purchase in North and South America

## Application Data

### HE-200

### HE-2700

Type of oil	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 Oerlikon Leybold Vacuum 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 <sub>2</sub> , ozone O <sub>3</sub> , nitrogen oxides NO <sub>x</sub> and sulphur oxides (SO <sub>2</sub> , SO <sub>3</sub> ) as well as reactive substances like halogens (for example fluorine F <sub>2</sub> , chlorine Cl <sub>2</sub> ), hydrogen halides (for example hydrogen chloride HCl, hydrogen bromide HBr), uranium hexafluoride UF <sub>6</sub> , and conditionally. Lewis acids (for example boron trichloride BCl <sub>3</sub> )
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) NBR (Perbunan) 1) EPDM	Suited Conditionally suited Not suited	Suited Suited Suited

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

**Technical Data****HE-200****HE-2700**

Viscosity			
at 20 °C ( 68 °F)	mm <sup>2</sup> /s (= cSt)	–	250
at 40 °C (104 °F)	mm <sup>2</sup> /s (= cSt)	58	–
at 100 °C (212 °F)	mm <sup>2</sup> /s (= cSt)	9.1	10
Flash point	°C (°F)	224 (435)	– <sup>1)</sup>
Vapor pressure			
at 20 °C ( 68 °F)	mbar (Torr)	–	$6.7 \times 10^{-7}$ ( $5 \times 10^{-7}$ )
at 25 °C ( 77 °F)	mbar (Torr)	$4.7 \times 10^{-6}$ ( $3.5 \times 10^{-6}$ )	–
at 100 °C (212 °F)	mbar (Torr)	$3.9 \times 10^{-4}$ ( $2.9 \times 10^{-4}$ )	$6.7 \times 10^{-5}$ ( $5 \times 10^{-5}$ )
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**

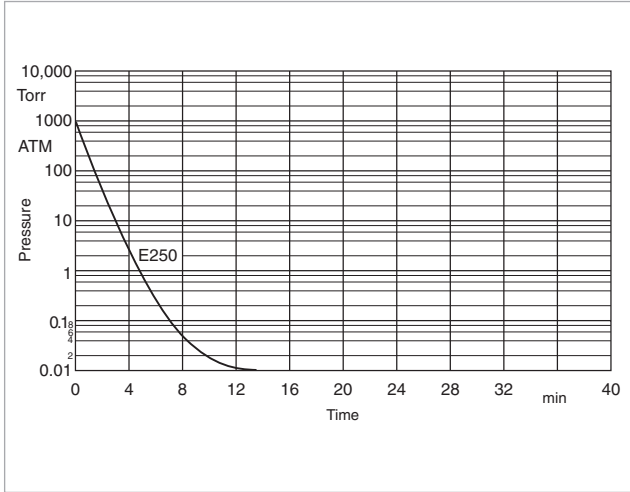
1 qt (1 l)	<b>Part No. 98 198 006</b>	–
1 gal (3.8 l)	<b>Part No. 98 198 007</b>	–
5 gal (18.9 l)	<b>Part No. 98 198 008</b>	–
55 gal (208 l)	<b>Part No. 98 198 010</b>	–
Bottle 2 lb (0.91 kg)	–	<b>Part No. E 190 999 051</b>
Bottle 4 lb (1.81 kg)	–	<b>Part No. 898 565-2</b>
Bottle 16 lb (7.25 kg)	–	<b>Part No. E 190 999 052</b>

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

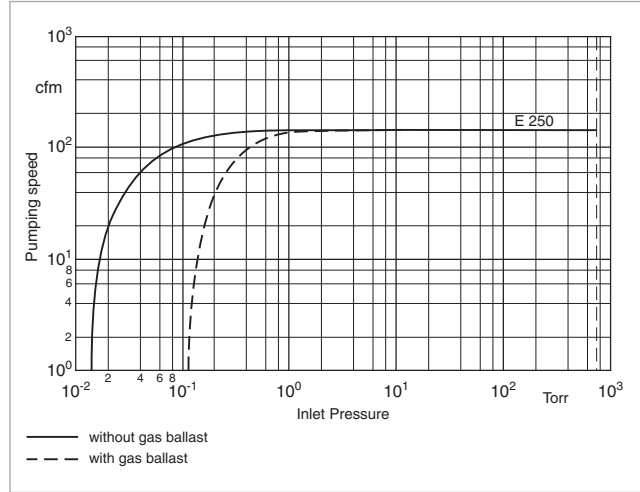
- <sup>1)</sup> **Caution:** Perfluorinated polyether will, when being decomposed at temperatures over 290 °C (554 °F), release toxic and corrosive gases.  
For this reason open fires must be avoided in the workspace where PFPE is being used.  
Do not smoke in the workspace where PFPE is being used

# Only available for purchase in North and South America

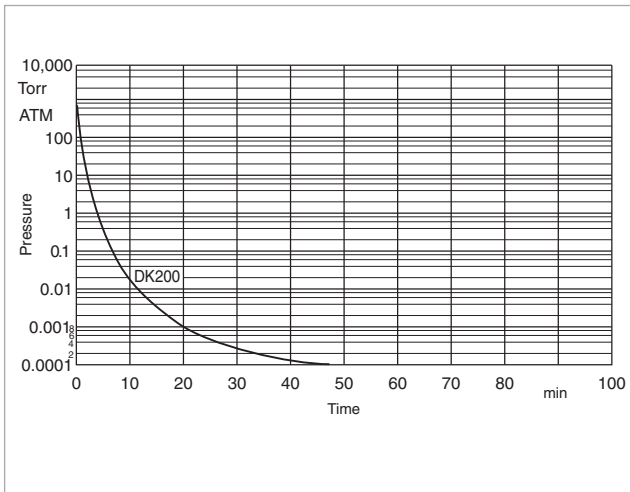
## 60 Hz Curves



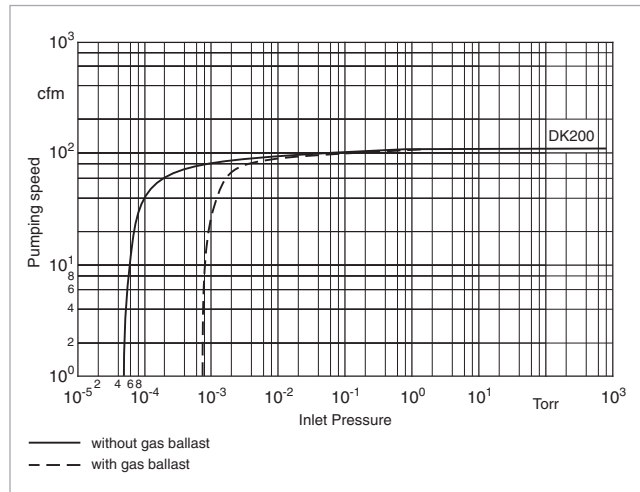
Pumpdown characteristic of a 1000 l vessel for the E type rotary piston vacuum pump (60 Hz)



Pumping speed characteristic of the E type rotary piston vacuum pump (60 Hz)



Pumpdown characteristic of a 1000 l vessel for the DK type rotary piston vacuum pump (60 Hz)



Pumping speed characteristic of the DK type rotary piston vacuum pump (60 Hz)



# Sales and Service

## Germany

**Oerlikon**  
**Leybold Vacuum GmbH**  
Bonner Strasse 498  
D-50968 Cologne  
Phone: +49-(0)221-347 1234  
Fax: +49-(0)221-347 1245  
sales.vacuum@oerlikon.com  
www.oerlikon.com

**Oerlikon**  
**Leybold Vacuum GmbH**  
**Sales Area North/Northeast**  
Branch Office Berlin  
Buschkrugallee 33  
1. Obergeschoss  
D-12359 Berlin  
Phone: +49-(0)30-435 609 0  
Fax: +49-(0)30-435 609 10  
sales.vacuum.bn@oerlikon.com

**Oerlikon**  
**Leybold Vacuum GmbH**  
**Sales Area South/Southwest**  
Branch Office Munich  
Sendlinger Strasse 7  
D-80331 Munich  
Phone: +49-(0)89-357 33 9-10  
Fax: +49-(0)89-357 33 9-33  
sales.vacuum.mn@oerlikon.com  
service.vacuum.mn@oerlikon.com

**Oerlikon**  
**Leybold Vacuum GmbH**  
**Sales Area West & Benelux**  
Branch Office Cologne  
Bonner Strasse 498  
D-50968 Cologne  
Phone: +49-(0)221-347 1270  
Fax: +49-(0)221-347 1291  
sales.vacuum.kn@oerlikon.com

**Oerlikon**  
**Leybold Vacuum GmbH**  
**Service Competence Center**  
Emil-Hoffmann-Strasse 43  
D-50996 Cologne-Suerth  
Phone: +49-(0)221-347 1439  
Fax: +49-(0)221-347 1945  
service.vacuum.kn@oerlikon.com

**Oerlikon**  
**Leybold Vacuum GmbH**  
**Mobil Customer Service**  
Emil-Hoffmann-Strasse 43  
D-50996 Cologne-Suerth  
Phone: +49-(0)221-347 1765  
Fax: +49-(0)221-347 1944  
service.vacuum.kn@oerlikon.com

**Oerlikon**  
**Leybold Vacuum GmbH**  
**Dresden**  
Zur Wetterwarte 50, Haus 304  
D-01109 Dresden  
Service:  
Phone: +49-(0)351-88 55 00  
Fax: +49-(0)351-88 55 041  
info.vacuum.dr@oerlikon.com

**Oerlikon**  
**Leybold Vacuum USA Inc.**  
5700 Mellon Road  
USA-Export, PA 15632  
Phone: +1-724-327-5700  
Fax: +1-724-325-3577  
info.vacuum.ex@oerlikon.com

## Europe

Belgium  
**Oerlikon**  
**Leybold Vacuum Nederland B.V.**  
**Belgisch bijkantoor**  
Leuvensesteenweg 542-9A  
B-1930 Zaventem  
Sales:  
Phone: +32-2-711 00 83  
Fax: +32-2-720 83 38  
sales.vacuum.zv@oerlikon.com

France  
**Oerlikon**  
**Leybold Vacuum France S.A.**  
7, Avenue du Québec  
Z.A. Courtaboef 1 - B.P. 42  
F-91942 Courtaboeuf Cedex  
Sales and Service:  
Phone: +33-1-69 82 48 00  
Fax: +33-1-69 07 57 38  
sales.vacuum.or@oerlikon.com

**Oerlikon**  
**Leybold Vacuum France S.A.**  
**Valence Factory**  
640, Rue A. Bergès - B.P. 107  
F-26501 Bourg-lès-Valence Cedex  
Phone: +33-4-75 82 33 00  
Fax: +33-4-75 82 92 69  
info.vacuum.vc@oerlikon.com

Great Britain

**Oerlikon**  
**Leybold Vacuum UK Ltd.**  
Unit 2  
Silverglade Business Park  
Leatherhead Road  
UK-Chessington, Surrey KT9 2QL  
Sales:  
Phone: +44-13-7273 7300  
Fax: +44-13-7273 7301  
sales.vacuum.ln@oerlikon.com

Italy  
**Oerlikon**  
**Leybold Vacuum Italia S.p.A.**  
8, Via Trasimeno  
I-20128 Milano  
Sales:  
Phone: +39-02-27 22 31  
Fax: +39-02-27 20 96 41  
sales.vacuum.mi@oerlikon.com

**Oerlikon**  
**Leybold Vacuum Italia S.p.A.**  
Field Service Base  
Z.I. Le Capanne  
I-05021 Acquasparta (TR)  
Phone: +39-0744-93 03 93  
Fax: +39-0744-94 42 87  
service.vacuum.mi@oerlikon.com

Netherlands  
**Oerlikon**  
**Leybold Vacuum Nederland B.V.**  
Proostvetering 24N  
NL-3543 AE Utrecht  
Sales and Service:  
Phone: +31-(30) 242 6330  
Fax: +31-(30) 242 6331  
sales.vacuum.ut@oerlikon.com  
service.vacuum.ut@oerlikon.com

Spain

**Oerlikon**  
**Leybold Vacuum Spain, S.A.**  
C/. Huelva, 7  
E-08940 Cornellà de Llobregat  
(Barcelona)  
Sales:  
Phone: +34-93-666 46 16  
Fax: +34-93-666 43 70  
sales.vacuum.ba@oerlikon.com

Sweden

**Oerlikon**  
**Leybold Vacuum Scandinavia AB**  
Box 9084  
SE-40092 Göteborg  
Sales and Service:  
Phone: +46-31-68 84 70  
Fax: +46-31-68 39 39  
info.vacuum.gt@oerlikon.com  
Visiting/delivery address:  
Datavägen 57B  
SE-43632 Askim

Switzerland

**Oerlikon**  
**Leybold Vacuum Schweiz AG**  
Leutschenbachstrasse 55  
CH-8050 Zürich  
Sales:  
Phone: +41-044-308 40 50  
Fax: +41-044-302 43 73  
sales.vacuum.zh@oerlikon.com

## America

USA  
**Oerlikon**  
**Leybold Vacuum USA Inc.**  
5700 Mellon Road  
USA-Export, PA 15632  
Phone: +1-724-327-5700  
Fax: +1-724-325-3577  
info.vacuum.ex@oerlikon.com

Sales:  
Eastern & Central time zones  
Phone: +1-724-327-5700  
Fax: +1-724-333-1217  
Pacific, Mountain, Alaskan &  
Hawaiian time zones  
Phone: +1-480-752-9191  
Fax: +1-480-752-9494  
Service:  
Phone: +1-724-327-5700  
Fax: +1-724-325-3577

**Oerlikon**  
**Leybold Vacuum GmbH**  
Bonner Strasse 498  
D-50968 Cologne  
Phone: +49-(0)221-347 0  
Fax: +49-(0)221-347 1250  
info.vacuum.ex@oerlikon.com

## Asia

P.R. China  
**Oerlikon**  
**Leybold Vacuum (Tianjin)**  
**International Trade Co. Ltd.**  
Beichen Economic  
Development Area (BEDA),  
Shanghai Road  
Tianjin 300400  
China  
Sales and Service:  
Phone: +86-22-2697 0808  
Fax: +86-22-2697 4061  
Fax: +86-22-2697 2017  
sales.vacuum.tj@oerlikon.com  
service.vacuum.tj@oerlikon.com

**Oerlikon**  
**Leybold Vacuum**  
**(Tianjin) Co. Ltd.**  
Beichen Economic  
Development Area (BEDA),  
Shanghai Road  
Tianjin 300400  
China  
Sales and Service:  
Phone: +86-22-2697 0808  
Fax: +86-22-2697 4061  
Fax: +86-22-2697 2017  
info.vacuum.tj@oerlikon.com  
service.vacuum.tj@oerlikon.com

**Oerlikon**  
**Leybold Vacuum (Tianjin)**  
**International Trade Co. Ltd.**  
Shanghai Branch:  
Add: No.33  
76 Futedong San Rd.  
Waigaoqiao FTZ  
Shanghai 200131  
China  
Sales and Service:  
Phone: +86-21-5064-4666  
Fax: +86-21-5064-4668  
info.vacuum.sh@oerlikon.com  
service.vacuum.tj@oerlikon.com

**Oerlikon**  
**Leybold Vacuum (Tianjin)**  
**International Trade Co. Ltd.**  
Guangzhou Office and  
Service Center  
1st F, Main Building  
Science City Plaza,  
No.111 Science Revenue,  
Guangzhou Science City  
(GZSC) 510663, Guangzhou,  
China  
Sales:  
Phone: +86-20-8723-7873  
Phone: +86-20-8723-7597  
Fax: +86-20-8723-7875  
info.vacuum.gz@oerlikon.com  
service.vacuum.tj@oerlikon.com

**Oerlikon**  
**Leybold Vacuum (Tianjin)**  
**International Trade Co. Ltd.**  
Beijing Branch:  
1-908, Beijing Landmark Towers  
8 North Dongsanhuan Road  
Chaoyang District  
Beijing 100004  
China  
Sales:  
Phone: +86-10-6590-7622  
Fax: +86-10-6590-7607  
sales.vacuum.bj@oerlikon.com

India

**Oerlikon**  
**Leybold Vacuum India Pvt Ltd.**  
EL-22, J Block  
MIDC Bhosari  
Pune 411026  
India  
Sales and Service:  
Phone: +91-20-3061 60000  
Fax: +91-20-2712 1571  
sales.vacuum.pu@oerlikon.com  
service.vacuum.pu@oerlikon.com

Japan  
**Oerlikon**  
**Leybold Vacuum**  
**Japan Co., Ltd.**  
Headquarter  
23-3, Shin-Yokohama  
3-chome  
Tobu A.K. Bldg. 4th Floor  
Kohoku-ku  
Yokohama-shi 222-0033  
Sales:  
Phone: +81-45-471-3330  
Fax: +81-45-471-3323  
info.vacuum.yh@oerlikon.com  
sales.vacuum.yh@oerlikon.com

**Oerlikon**  
**Leybold Vacuum**  
**Japan Co., Ltd.**  
Osaka Sales Office  
5-13, Kawagishi-machi  
Suita-chi  
Osaka 564-0037  
Phone: +81-6-6393-5211  
Fax: +81-6-6393-5215  
info.vacuum.os@oerlikon.com  
sales.vacuum.os@oerlikon.com

**Oerlikon**  
**Leybold Vacuum**  
**Japan Co., Ltd.**  
Tsukuba Technical Service Center  
Kogyo Danchi  
21, Kasuminosato,  
Ami-machi, Inashiki-gun  
Ibaraki-ken, 300-0315  
Service:  
Phone: +81-298 89 2841  
Fax: +81-298 89 2838  
info.vacuum.iik@oerlikon.com  
sales.vacuum.iik@oerlikon.com

Korea

**Oerlikon**  
**Leybold Vacuum Korea Ltd.**  
3F, Jellzone 2 Tower, 159-4  
Jeongja-Dong, Bundang-Gu  
Sungnam-Si, Gyeonggi-Do  
Korea 463-384  
Sales:  
Phone: +82-31 785 1367  
Fax: +82-31 785 1359  
  
623-7, Upsung-Dong  
Cheonan-Si  
Chungcheongnam-Do  
Korea 330-290  
Service:  
Phone: +82-41 589 3035  
Fax: +82-41 588 0166

Singapore

**Oerlikon**  
**Leybold Vacuum**  
**Singapore Pte Ltd.**  
No.1, International Business Park  
B1-20B, The Synergy  
Singapore 609917

Sales and Service:  
Phone: +65-6303 7000  
Fax: +65-67730 039  
sales.vacuum.sg@oerlikon.com  
service.vacuum.sg@oerlikon.com

Taiwan

**Oerlikon**  
**Leybold Vacuum Taiwan Ltd.**  
No 416-1, Sec. 3  
Chung-Hsin Rd., Chu-Tung  
Hsin-Chu, Taiwan, R.O.C.  
Sales and Service:  
Phone: +886-3-500 1688  
Fax: +886-3-583 3999  
sales.vacuum.hc@oerlikon.com  
service.vacuum.hc@oerlikon.com

**oerlikon**  
**leybold vacuum**

www.oerlikon.com