



OPERATING INSTRUCTIONS

EN

Translation of the original instructions

PASCAL SERIES

Rotary vane pumps 33 to 63 m³/h

PFEIFFER  **VACUUM**

Welcome

Rotary vane pumps 2033 - 2063 SD-C1-C2



Dear customer,

You have just bought a Pfeiffer Vacuum rotary vane pump.

We would like to thank you and are proud to count you among our customers.

This product is a result of experience acquired over many years by Pfeiffer Vacuum SAS in the design of rotary vane pumps.

We suggest that you read this manual, particularly the chapter on installation and operation, before you start to use this pump so that you can obtain optimum levels of performance and complete satisfaction from this equipment.

APPLICATIONS:

- RESEARCH AND DEVELOPMENT
- INDUSTRY:
FOODSTUFFS (FREEZE-DRYING), PHARMACEUTICALS,
ELECTRONIC TUBE MANUFACTURE, METALLURGY, DRYING SYSTEMS, REFRIGERATION SYSTEMS,
CHEMICAL INDUSTRY, ETC.
- VARIOUS SEMICONDUCTOR PROCESSES

This product is designed to generate vacuum by pumping on gases, but no liquids neither solids. It is dedicated for running in industrial environments.

The pumps must not be operated in an area with risk of explosion. Consult the nearest support service to study a solution.

The performance and operational safety of this product are guaranteed provided it is used normally in the operating conditions defined in this operating manual.

It is the customer's task to:

- train operators to use the product if they do not speak the language the operating manual is written in,
- ensure operators know the safe practices to apply when using the product.

This product complies with the requirements of European Directives. listed in the Declaration of Conformity contained in page 47 of this manual.

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Specifications and information are subject to change without notice by Pfeiffer Vacuum SAS.

Symbol / Label	Description
	Warning: high temperature hazard
	Warning: electrical shock hazard
	Danger: refer to operating instructions
IN	Pump inlet flange
OUT	Pump exhaust flange

CAUTION

Indicates a potentially hazardous situation which, if not avoided, could result in property damage.

 CAUTION

Indicates a potentially hazardous situation which, if not avoided, could result in moderate or minor injury. It may also be used to alert against unsafe practices.

 WARNING

Indicates a potentially hazardous situation which, if not avoided, could result in death or severe injury.

 DANGER

Indicates an imminently hazardous situation that, if not avoided, will result in death or severe injury (extreme situations).

Before switching on the product, study the user's manual and make sure you follow the safety instructions it gives. You can recognise these by the 'Caution', 'Warning' and 'Danger' symbols.

Good practice tips and manufacturer's recommendations are in a grey box.

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Maintenance instructions available on web site

Presentation of the product range

A wide range Specific solutions adapted to various applications

Oil seal rotary vane pumps are used in all vacuum technology applications.

They can be used on their own to achieve a maximum vacuum of $1 \cdot 10^{-3}$ Torr ($1 \cdot 10^{-3}$ hPa) or in pumping assemblies. e.g. at the exhaust of a diffusion pump or turbomolecular pump.

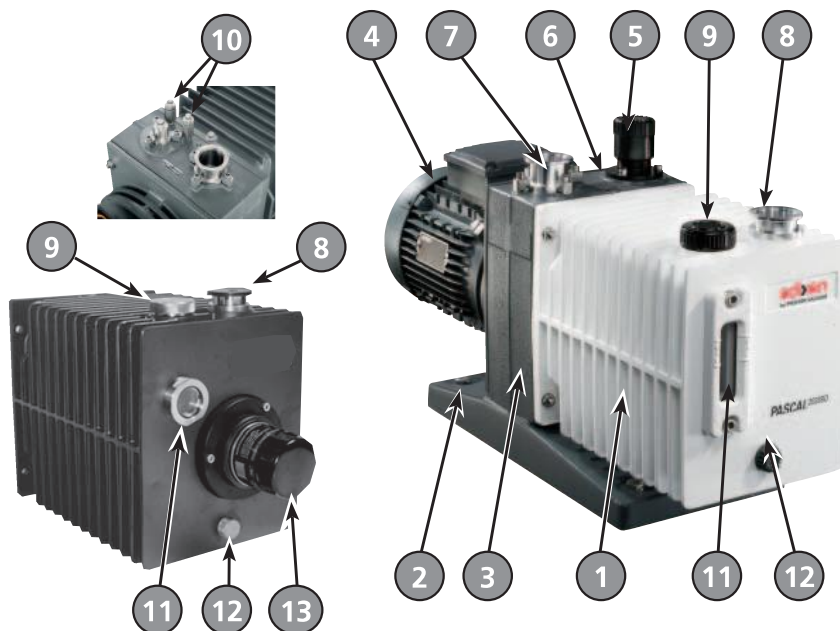
- SD series** **Standard pumps for several purposes (non-corrosive applications).**
Manufacture of light bulbs, production of TV tubes, manufacture of electronic tubes, metallurgy, centrifuges, etc.
- C1 series** **Pumps suited to the pumping of corrosive gases.**
R&D, laboratories, freeze-drying, pumping of solvents, etc.
- C2 series** **Pumps with increased resistance to meet the requirements of the more aggressive processes of the semiconductor industry.**
Ion implantation, sputtering, etc.

Nominal flow rate m ³ /h	30	60
SD Series	2033SD	2063SD
C1 Series	2033C1	2063C1
C2 Series	2033C2	2063C2

2033 - 2063 m³/h rotary vane pumps. SD, C1, C2 Pascal series

The 33 to 63m³/h pump models, have following main characteristics:

- A **direct drive motor** making them very compact.
- An **anti-suckback system** ensures the tightness of the pump during accidental or voluntary shutdowns.
- A **gas ballast** enables the pumping of condensable vapors.
- The universal three-phase **motor** can be **disassembled independently** of the rest of the pump, without the need to drain the oil case.
- On the oil case, a **sight glass** can be used to inspect the oil level easily when filling the oil case and during the operation of the pump.
- A **neutral gas purge** is used to degas oil and dilute pumped gases on C1 and C2 series models.
- An **oil casing purge** is used to dilute the pumped gases on C2 series models.
- Sensor connections for oil pressure or temperature sensors are available on C2 series models.



1. Oil case
2. Base
3. Frame
4. Electric motor
5. Gas ballast control
6. Spring hook (lifting device)
7. Inlet end fitting
8. Exhaust end fitting
9. Oil case filling plug

10. Sensor connections (C2 Series)
11. Oil level sight glass
12. Oil draining plug
13. Oil filter (C1 Series)

The inlet and exhaust end fittings are PNEUROP ISO-KF standardized. They can be used to connect many of our accessories (*see page 14*).

The main replacement parts are interchangeable: This enables easier disassembly-assembly operations and replacement without changing the pump's performance.

Various accessories can be used to adapt the pump to meet the requirements of your application.

Operating principle of the rotary vane pump

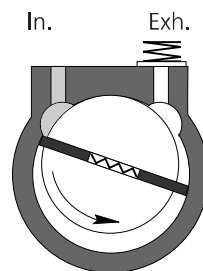
Single-stage rotary vane pump

This is a volumetric pump, with a functional part composed of:

- A hollow cylindrical stator with inlet and exhaust valves.
- A rotor mounted eccentrically inside the stator for pumping.
- Two vanes sliding in the rotor, forced against the stator by centrifugal force and springs.

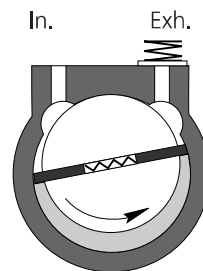
The pumping cycle is
given below:

Inlet



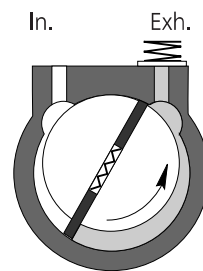
As the vane passes in front of the inlet orifice, an increasing space is formed into which the gas from the chamber to be evacuated expands. When the second vane passes, the space is closed.

Transfer



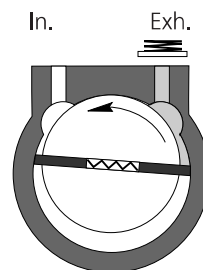
The gas trapped in the space between the two vanes is transferred to the exhaust orifice as the rotor rotates.

Compression



The space communicates with the exhaust, which is fitted with a valve: the gas is compressed until the safety valve is opened.

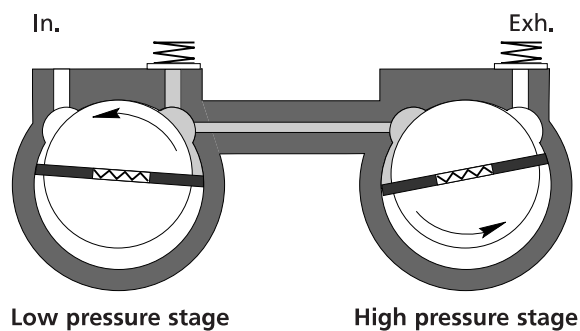
Exhaust



The gas is expelled into the oil casing when the pressure is sufficient to open the valve.

Two-stage rotary vane pump

To improve the backing pressure and flowrate at low pressure, two stages are connected in series. The second is similar to the first both structurally and operationally. The gases pulled in by the first stage (low pressure) are transferred to the second stage (high pressure) and discharged through the high pressure (HP) valve.



Applications

Two stage rotary vane pumps are the best choice for application requiring an ultimate vacuum as low as $5 \cdot 10^{-3}$ hPa.

Note: when operating a two stage vane pump continuously, greater than half an hour

- above 1 hPa,
- or with opened gas ballast,

the unit should be equipped with an oil mist eliminator equipped with an oil return system.

Oil - Noise limiter - Antisuckback

- Oil** Oil has several important functions in the pump:
- It lubricates mechanical components (bearings, seals, rotor, vanes, etc.).
 - It makes moving parts relatively tight by limiting internal leakage.
 - It carries away the heat produced by the compressed gases.

Choosing the right oil Not all oils produce the same ultimate pressure in a given pump. Ultimate pressure depends on the saturated vapor pressure of the oil, its viscosity and its ability to dissolve gases.

Good pumping conditions are related to the type of oil used. The choice depends on:

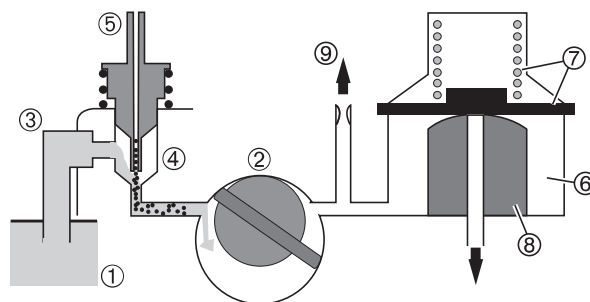
- Expected pump performance.
- Chemical aggression and corrosion of pumped gases.
- Accessories used.
- Desired maintenance intervals and total operating cost.

The manufacturer has selected various types of oil for its pumps (*see page 18*).

Lubrication

The pump is equipped with a **lubrication** system which regulates the oil flow rate required in the vacuum pump. In addition this system also ensures the gassing of the lubrication oil and therefore **the low noise level** of the pump.

When the pump begins to operate, the cooled oil (from the bottom of the oil casing) is pulled in by the oil pump (2) and drawn in through the oil inlet tube (3). It is then agitated by a venturi tube (4) and forced into the chamber (6) which is adjusted by the diaphragm spring system (7).



The discharge pressure of the oil pump (2) lifts the diaphragm off its seat (8) allowing oil to reach the functional block via the oil injection line (through seats) (8). An orifice (9) equipped with a jet located in the oil lubrication systems allows trapped gases to be expelled out of the chamber (6).

C1 series

C1 series pumps are equipped with an automobile type oil filter, which traps particles from the oil pumps exhaust. Due to its construction, its life time is reduced when pumping on corrosive products in large quantities. In this case, an auxiliary oil filtering system is recommended and the filter is replaced by a stainless steel short-circuit stopper (*see accessories page 14*).

Anti-noise

Parallel to the oil flow, there is a small orifice in the venturi tube (5), which reduces the noise level at ultimate pressure. Because of the negative pressure created at the end of the venturi tube (5), gases are entrained into the moving layers of oil dampening pump noise, allowing the fluid to become more compressible. The added gases will affect the ultimate pressure, therefore, a compromise between sound level and ultimate pressure has to be reached as follows:

- Tightening down air intake tube (5) decreases the oil flowrate at the intake of the oil pump (2) and increases the amount of gas mixture in the oil. The sound level decreases but the ultimate pressure increases.
- Unscrewing tube (5) increases the oil flowrate at the intake of the oil pump (2) and decreases the amount of air mixture with the oil. The sound level increases but the ultimate pressure decreases.

This adjustment can be performed via the oil fill port while the pump is in operation at ultimate pressure.

Anti-suckback and tightness at stopping

When the pump is stopped or the power is turned off, the anti-suckback device (6), (7) and (8) isolates the functional block of the pump against air or oil returning to the chamber being evacuated.

When the pump stops, the discharge pressure of the oil pump (2) drops rapidly through the jet (9). Diaphragm (7) under pressure from spring and the difference of pressure is forced against its seat (8) thus closing off the injection line through the seat (8).

The seal is also ensured by flush-mounted o-rings between the faces of the functional parts (stators, flanges, housing...) and by spring loaded check valves in the discharge ports.

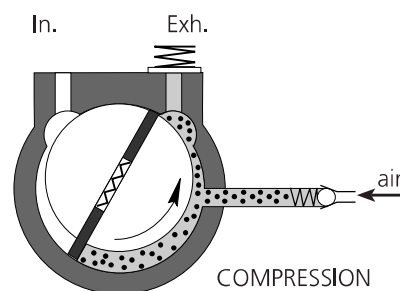
Gas ballast

When condensable vapors are being pumped, gas is compressed beyond its saturated vapor pressure in the «compression» phase and can condense, impairing pump performance and life.

The gas ballast can be used to inject a certain quantity of air (inert or dry gas) into the last stage of the pump during the «compression» phase so that the partial pressure of the pumped gas is less than its saturated vapor pressure at the temperature of the pump. Condensation is therefore impossible if this limit is not reached. The maximum admissible vapor pressure is obtained at pump inlet for this value.

At the end of «compression», the pressure in the exhaust chamber is greater than atmospheric pressure. An anti-suckback device (valve + spring) prevents the gases and oil from being drawn back into the inlet.

The saturated vapor pressure of a body is higher when the system is hot than when it is cold; therefore, the pump must reach operating temperature before pumping condensable vapors.



Gas ballast (cont'd)

CAUTION

- Using the gas ballast increases the ultimate pressure of the pump as well as the temperature.
- The gas ballast control, located on the frame cannot be used to set the gas injection flow rate.
- When the gas ballast control is open, the pump is not tight when stopped. To guarantee this tightness, install an automatic gas ballast.
- The functioning in permanent regime with opened gas ballast draws away important oil losses (mist) by exhaust: use an accessory OME 40 HP + ODK (see *page 14*) or control the oil level very often.
- C1 and C2 pump series:
Because of the danger present if the gas ballast (C1 series) or purge gas ballast (C2 series) was to be opened to atmosphere, remove the plug and connect the port to a neutral gas supply line (see *page 35*).

Technical characteristics

For industry: SD Series

Characteristics	Unit	2033 SD		2063 SD	
Frequency	HZ	50	60	50	60
Number of stages		2		2	
Nominal rotation speed	rpm	1500	1800	1500	1800
Nominal flow rate	m³/h	30		60	
	cfm		23.3		42.4
Flow rate Pneurop method	m³/h	27		55	
	cfm		18.8		38
Partial ultimate pressure ⁽¹⁾ with A120 oil	hPa	< 5 · 10 ⁻⁴			
Ultimate pressure with gas ballast closed ⁽²⁾	hPa	< 1 · 10 ⁻³			
Ultimate pressure with gas ballast open ⁽²⁾	hPa	< 2 · 10 ⁻²			
Maximum pressure in continuous operation					
• without oil recovery	hPa	< 10			
• with oil recovery		< 100			
Maximum exhaust relative overpressure	hPa	500			
Oil capacity (case)	l	3.6		7	
Maximum water vapor pumping capacity ⁽³⁾	hPa	30		25	
Water vapor pumping capacity	g/h	700		1200	
Emission sound pressure level without Gas Ballast ⁽⁴⁾	db (A)	< 62	< 64	< 67	< 70
Weight (pump + motor) ⁽⁵⁾	kg (lb)	65.5 (144.4)		102 (224.9)	
Inlet and exhaust end fittings		DN 40 ISO-KF			

Corrosive applications: C1 Series

Characteristics	Unit	2033 C1		2063 C1	
Frequency	HZ	50	60	50	60
Number of stages		2		2	
Nominal rotation speed	rpm	1500	1800	1500	1800
Nominal flow rate	m³/h	30		60	
	cfm		23,3		42,4
Flow rate Pneurop method	m³/h	27		55	
	cfm		18,8		38
Partial ultimate pressure ⁽¹⁾ with A120 oil	hPa	< 7 · 10 ⁻⁴			
Ultimate pressure with gas ballast closed ⁽²⁾	hPa	< 2 · 10 ⁻³			
Ultimate pressure with gas ballast open ⁽²⁾	hPa	< 2 · 10 ⁻²			
Maximum pressure in continuous operation					
• without oil recovery	hPa	< 10			
• with oil recovery		< 100			
Maximum exhaust relative overpressure	hPa	500			
Oil capacity	l	3,6		7	
Maximum water vapor pumping capacity ⁽³⁾	hPa	30		30	
Water vapor pumping capacity	g/h	700		1200	
Emission sound pressure level without Gas Ballast ⁽⁴⁾	db (A)	< 62	< 64	< 67	< 70
Weight (pump + motor) ⁽⁵⁾	kg (lb)	68,5 (150)		105,5 (232,6)	
Inlet and exhaust end fittings		DN 40 ISO-KF			

⁽¹⁾ Partial pressure measured according to Pneurop 6602 specifications, with a capacitive diaphragm pressure gauge and a liquid nitrogen trap.

⁽²⁾ ... Ultimate pressure and vapour pressure measured according to Pneurop 6602 specifications, with a capacitive diaphragm pressure gauge.

Note: The measurements are made when the pump is filled with A120 oil for SD, C1 models. Pressure may vary if other oils are used (**see page 19**). Pressure measurements made with a gauge other than a capacitive gauge will give varying pressure results (partial pressure, ultimate pressure or vapour pressure).

⁽³⁾ ... Vapor pressure measured with an automatic gas ballast.

⁽⁴⁾ ... The sound level of SD, C1 models is under this maximum value.

⁽⁵⁾ ... These values are for pumps equipped with IE2 European three-phase motors.

Technical characteristics (cont'd)

Corrosive applications: C2 Series

Characteristics	Unit	2033 C2		2063 C2	
Frequency	HZ	50	60	50	60
Number of stages		2		2	
Nominal rotation speed	rpm	1500	1800	1500	1800
Nominal flow rate	m³/h	30		60	
	cfm		23.3		42.4
Flow rate Pneurop method	m³/h	27		55	
	cfm		18.8		38
Partial ultimate pressure ⁽¹⁾ with A120 oil	hPa	< 7 · 10 ⁻⁴			
Ultimate pressure with gas ballast closed ⁽²⁾	hPa	< 3 · 10 ⁻³			
Maximum pressure in continuous operation					
• without oil recovery	hPa	< 10			
• with oil recovery		< 100			
Maximum exhaust relative overpressure	hPa	500			
Oil capacity (case)	l	3.6		7	
Emission sound pressure level without Gas Ballast ⁽⁴⁾	db (A)	< 62	< 64	< 67	< 70
Weight (pump + motor) ⁽⁵⁾	kg (lb)	66.5 (145.5)		102.5 (226)	
Inlet and exhaust end fittings		DN 40 ISO-KF			

⁽¹⁾ Partial pressure measured according to Pneurop 6602 specifications, with a capacitive diaphragm pressure gauge and a liquid nitrogen trap.

⁽²⁾ ... Ultimate pressure and vapour pressure measured according to Pneurop 6602 specifications, with a capacitive diaphragm pressure gauge.

Note: The measurements are made when the pump is filled with A113 oil for C2 models. Pressure may vary if other oils are used (**see page 19**). Pressure measurements made with a gauge other than a capacitive gauge will give varying pressure results (partial pressure, ultimate pressure or vapour pressure)..

⁽⁴⁾ ... The sound level of C2 models is under this maximum value.

⁽⁵⁾ ... These values are for pumps equipped with IE2 European three-phase motors.

Materials

The pumps are made in different materials to address the requirements of all major vacuum applications.

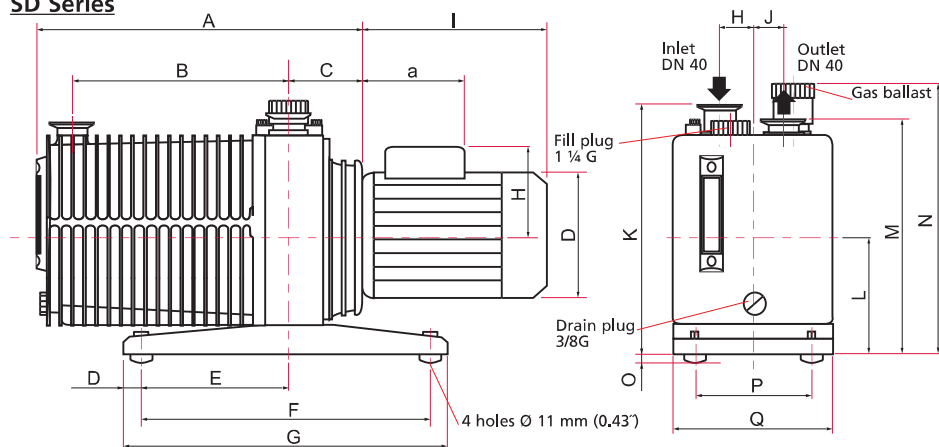
Materials	SD Series	C1 Series	C2 Series
Valves	FPM		
Optional valves	PAI		
Oil sight glass	PA	Glass	PA
O-rings, lip seals	FPM		
Rotors	Carbon steel		
HP, LP valves	Abestos free plastic		
Stators, central housing, plates	Cast iron (without Cu, Zn, Cad)		
Oil casing	Aluminium		
Friction rings	Alloy of zinc	Graphite	

Environmental conditions

Use of the product	Indoor use
Operating altitude	< 2000 m
Motor (TEFC type) ingress protection	IP 54
Ambient operating temperature	
Model SD, C1	Mini 12 °C (53 °F) / Maxi 45 °C (113 °F)
Model C2	Mini 15 °C (59 °F) / Maxi 45 °C (113 °F)
Storage temperature	Mini 5 °C (41 °F) / Maxi 65 °C (149 °F)
Maximum relative humidity	80 % for temperature up to 31 °C (87 °F) decreasing linearly to 50% at 40 °C (104 °F)
Transient overvoltage	Category II
Pollution degree	2
Withstand a supply voltage variation	+/- 10 %

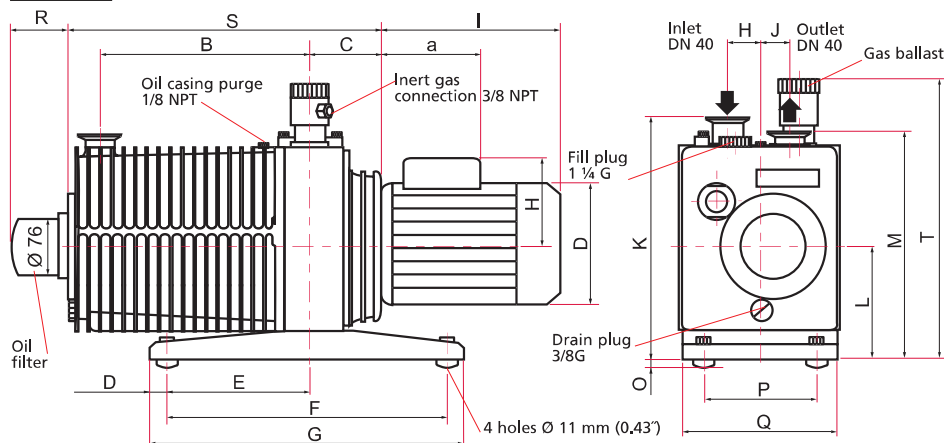
Pump dimensions

SD Series

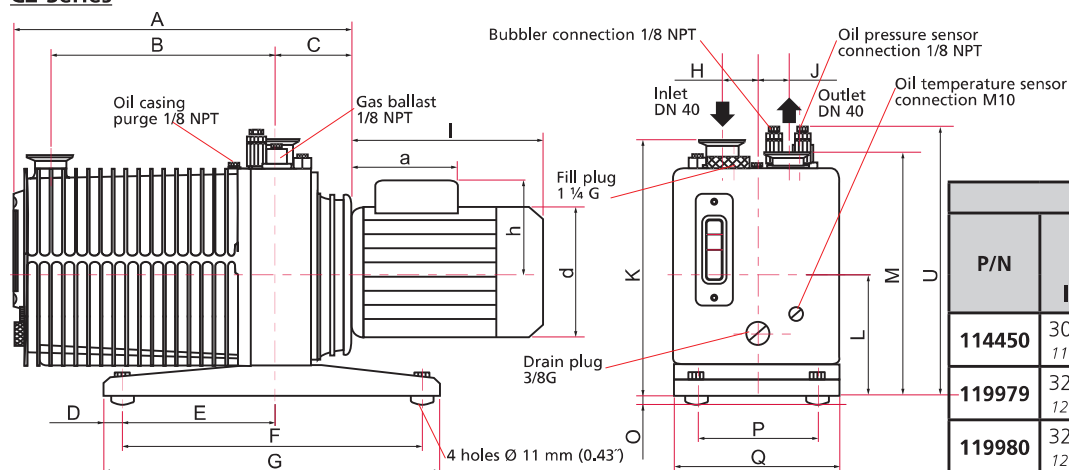


2033 motors					
P/N	Dimensions (mm/inch)				Weight (kg/lb)
	l	d	h	a	
114449	270 10.6	170 6.7	140 5.5	200 7.9	21.7 47.8
119997	267 10.5	177 7	137 5.4	143 5.6	18.2 40.1
119998	267 10.5	177 7	137 5.4	143 5.6	16.4 36.2

C1 Series



C2 Series



2063 motors					
P/N	Dimensions (mm/inch)				Weight (kg/lb)
	l	d	h	a	
114450	300 11.8	190 7.5	150 5.9	230 9.1	29.8 65.7
119979	321 12.6	196 7.7	144 5.7	149 5.9	26 57.3
119980	321 12.6	196 7.7	144 5.7	149 5.9	26 57.3

Dimensions en mm (inch)

	A	B	C	D	E	F	G	H	J	K	L	M	N	O	P	Q	R	S	T	U
2033	455 17.7	288 11.2	103 4	31 1.2	206 8	375 14.6	437 17	53 2	42 1.6	336 13.1	164 6.3	323 12.5	362 to 385 14.1 to 15	12 0.46	140 5.4	213 8.3	91 3.5	452 17.6	389 to 398 15 to 5.5	353 13.7
2063	529 20.6	342 13.3	118 4.6	29 1.13	229 8.9	459 17.9	521 20.3	56 2.1	45 1.7	385 15	186 7.2	371 14.4	410 to 422 16 to 6.4	12 0.46	190 7.4	264 10.2	91 3.5	526 20.5	438 to 447 17 to 17.4	402 15.6

Accessories

Name	SD	C1	C2	Part number	Location	Fonctions
Oil mist eliminator	OME 40 S	●		104887	Exhaust	• Separates oil droplets and particles contained in exhaust gases emitted by the pump.
	OME 40 C1	○	●	068785		
	OME 40 C2	○	○	068492		
High pressure oil mist eliminator OME 40 HP+	●			200024	Exhaust	• Separates oil droplets and particles contained in exhaust gases emitted by the pump when pump operate in high pressure and/or in frequent cycles. Can be fitted to ODK 136 and ODK 236 .
Oil level switch OLS 36	●			104377	On oil casing	Provide information about oil level inside oil casing of RVP, whenever the pump is located in an unaccessible area.
Oil draining kit ODK 136	●			118773	Gas ballast	• Connect to the OME 40 HP+, it is used to recover oil via the gas ballast. Note : the pump is not sealed when switched off.
Oil draining kit ODK 236	●			118776: 220/240V 50/60 Hz 118777: 115V 60 HZ	Inlet	Connect to the OME 40 HP+, it is used to recover oil. Equipped with an electrovalve which seals the pump when switched off.
Sorption trap ST 40	●			104731 -115V 053380 220 V	Inlet	• Prevents oil backstreaming when pumping in a “clean” vacuum.
Automatic gas ballast AGB 36*	●	○	○	068391: 220/240V 50/60Hz 104367 115V 60Hz	Gas ballast	• Remote control for gas ballast. • Allows the gas ballast to be closed when the pump is off, ensuring that the pump is tight.
Oil filter DE1	●	●	●	068990 220V 50/60Hz 068991 115V 50/60Hz	External device	• Filters and/or neutralizes oil when pumping gases which are corrosive and could rapidly degrade oil quality.
Oil filter DE2	●	●	●	104374 220V 50/60Hz 104375 115V 50/60Hz		
Shock mount	●	●	●	082691 LAX 100 model D	Between base and machine frame	• Allows pump to be mounted on a frame.
Oil short-circuit adaptor		●		054273	On the wessel pipe fitting	• On C1 model, allows to remove the oil filter cartridge and replace it by an oil filtration system type DE1 or DE2.

*Other voltages and frequencies available in the Pfeiffer Vacuum catalog.

☒ Possible without restrictions

☐ Possible with restrictions

☐ Out of question

WARNING

- When pumping on corrosive, aggressives or flammable gases, the gas can cause injury or death. In these cases,
 - connect the exhaust of the pump to an exhaust stack or an evacuation duct.
 - connect a relief valve or rupture disc directly on the pump. Contact your closest service center (see addresses on our website).
 When the exhaust is connected to an extraction duct or an oil mist eliminator, you must remove the exhaust safety valve mounted in the pump's exhaust orifice.
- At the pump exhaust, the discharge circuit must be such that the resulting excess pressure in the oil case is as low as possible. The maximum excess pressure recommended for correct pump operation is 500 hPa (6 PSI). A slight negative pressure in the oil case (100 to 200 hPa / 1.5 PSI), at the exhaust, will prevent gases from accumulating and reduce pump corrosion and pollution.
- For safety reasons, use accessories on the inlet and exhaust lines whose materials and sealing properties are compatible with the gases being used.

Safety instructions concerning the installation and operation

CAUTION

Before switching on the equipment, the user must read all of the start-up and operation sections of this operating manual and observe the safety instructions listed in this operating manual.

Unpacking

- We took care to provide you with a clean product. To keep it in this condition, unpack it only in its final place of use.
- Make sure the equipment shows no sign of transport damage. If it has been damaged, take the necessary steps to record this with the carrier and inform the manufacturer. In all cases, we recommend keeping the packaging (reusable materials) for further transport of the equipment or for prolonged storage.

⚠ WARNING



Handling

- Vane roughing pumps use lubricants, it is recommended to request information from the manufacturer on the safety data sheets concerning the lubricant (MSDS available on our website).
- The pumps are delivered without an oil charge: the oil is delivered in separate containers.
In the same way, it is recommended to drain the pump before returning the equipment.
Wear appropriated safety equipment to fill in or drain the oil in the pumps.
- For all handling of the equipment, it is highly recommended to only use the devices provided for this purpose (handle, hoisting rings, spring hook..).
The spring hook and square support must not be used to tip up the pump from horizontal to vertical position and vice versa.
The maker can not be held liable for the consequences of using other handling devices.

CAUTION

- The product is supplied with the inlet and exhaust sealed. These are to prevent foreign bodies entering the pump during transport and storage.
- C2 Series: In order to prevent moisture from entering the pump before installation, it has been pressurized before hand with nitrogen and sealed with blanking plates.
- Do not remove these blanking plates until you are ready to install the product on the vacuum line.

Safety instructions concerning the installation and operation of pumping systems (cont'd)

Storage **New pump:**

C2 series If the pump is new and has not been unpacked, store it as received since it has been pressurized with neutral gas at factory.

All series • If the pump is to be stored, we guarantee the reliability of our equipment without particular storage precautions for up to 3 months (ambient temperature between 41 °F and 149 °F (5 °C and 65 °C).

• For storage periods of over 3 months, we recommend to fill the pump with oil during storage. For this, fill the pump and run it at ultimate vacuum (inlet orifice blocked) for approximately 1 hour in order to lubricate all the parts of the functional block (*see page 29*).

Then, stop the pump and store it with the inlet and exhaust orifices sealed: clamping ring, centring ring, plug, etc.

The shaft must be rotated by hand (be means of the fan) or by starting the pump every six months following this storage procedure.

• After 3 months storage without oil, factors such as temperature, degree of humidity, salt air, etc. may cause the deterioration of the pump components, particularly the hardening of O-rings and the "sticking" of lip seals on shafts and the gumming of oil. In this state, a pump may have operational problems, particularly oil leaks. Before any start-up (new pump as well as used), the pump must be disassembled, and all the seals changed. See the **Maintenance instructions** available on the website.

All series **Pump which have been used:**

If the pump is not new, drain and rinse it (*see page 44*). Fill it with new oil, then pump a dry inert gas through it to remove all traces of dampness in the pumping system and oil casing. Pump in dry inert gas as follows:

- 10 minutes at above 30 hPa.
- 10 minutes at ultimate pressure with gas ballast open.
- 10 minutes at ultimate pressure.

Stop the pump and seal the inlet and exhaust orifices tightly with quick connect clamps, centering rings, blank-off flanges...

Note:

The seal kits must be stored with caution. Keep them away from heat and light (sunlight and ultraviolet light) in order to prevent the elastomers from hardening (AFNOR standard FD T 46.022).

Installation and start-up

CAUTION

- The pump must be operated in the horizontal position in support on its base.
- Ensure that the product is connected to an electrical installation:
 - in compliance with the local and national safety requirements,
 - equipped with electrical protection (fuses, circuit breaker, ...) which has a suitable earth (ground) point, properly connected.

WARNING

- Do not expose any part of the human body to vacuum.
The product is supplied with the inlet and exhaust sealed. Remove these blanking plates when you are ready to connect the product on your vacuum system.
As well as, don't operate the product unless the inlet and exhaust are connected to a vacuum and exhaust pumping line.
- The products are designed to avoid subjecting users to heat hazards. Specific operating conditions can nevertheless exist that require extra caution from users due to the high temperatures generated (outer surfaces > 70 °C):
Wear protective gloves to work on the product, especially during maintenance.

Our pumps are tested in the factory with A120 oil or A119 for the USA (A113 oil for the C2 series).

It is recommended to use the same oil during operation, because the oils are not mixable (refer to table page 18 and replacement fluids page 19).

- If changing the type of oil, refer to the chapter concerned for the procedure and the type of lubricant required (**see page 45**).

Table of recommended oils

Recommended oils

In the vane pumps, we recommend to use only the Pfeiffer Vacuum oils in the table below:

Oils	Characteristics and applications	SD	C1	C2	Density	Viscosity mm ² /s (cst)	Vapor pressure at 25 °C (hPa)	Total ultimate pressure* (hPa)	Flash point/ self ignition temperature (°C)
A102	Additivated hydro-carbon anti-emulsion mineral oil - oil and water separation (anti-emulsion) - drying and water vapor pumping - freeze-drying	●	○		0.88	98 to 40 °C 11.1 to 100 °C	< 1·10 ⁻³	< 3·10 ⁻²	230 °C 260 °C
A111	Hydro-carbon based synthetic oil - stable pumping at high temperature - gas circulation in recycling - oxidation sensitive (frequent atmospheric cycle prohibited)	●			0.87	100 to 40 °C 7.8 to 100 °C	< 1·10 ⁻³	< 1·10 ⁻²	212 °C 245 °C
A113	Perfluoropolyether (PFPE) synthetic oil - pure Oxygen pumping - highly inert to chemical - highly corrosive gas pumping - plasma etching compatible	○	○	●	1.9	90 to 40 °C 11 to 100 °C	< 3·10 ⁻⁵	< 5·10 ⁻³	None None
A119	Hydro-carbon mineral oil - general purposes (common use at 60 Hz) - non-corrosive products - low viscosity (low temperature starting)	●	○		0.86	54 to 40 °C 8.1 to 100 °C	< 4·10 ⁻⁵	< 3·10 ⁻³	213 °C 244 °C
A120	Additivated hydro-carbon mineral oil - general purposes (common use at 50 Hz) - non-corrosive products - high viscosity	●	○		0.87	100 to 40 °C 12.5 to 100 °C	< 4·10 ⁻⁵	< 3·10 ⁻³	246 °C 295 °C
A121	Special hydro-carbon double distilled synthetic oil with anti-oxidant additive - atmospheric cycle pumping - high temperature and pressures - acid and organic vapor resistivity - plasma etching prohibited	●	○		0.83	64 to 40 °C 10 to 100 °C	< 1·10 ⁻⁷	< 3·10 ⁻³	268 °C 296 °C
A155	Synthetic oil organic ester type - compatible with hydro-carbon vapors - compatible with NH3, R134a, refrigerating agent fluids - oxidation resistivity - polymerization resistivity (low coating)	●	○	○	0.957	94 to 40 °C 9.1 to 100 °C	< 1·10 ⁻⁵	< 3·10 ⁻³	240 °C 350 °C
A200	Double distilled mineral oil non additivated - pumping of corrosive products - ionizer plasma resistivity - low backstreaming	○	●	○	0.86	58 to 40 °C 8.5 to 100 °C	< 1·10 ⁻⁵	< 2·10 ⁻³	223 °C 259 °C
A300	Hydro-carbon based mineral oil, double distilled, non additivated. - highly resistant to chemical attacks - highly ionizer plasma resistivity - pumping of Lewis acids, halogens - low backstreaming Possible without restrictions	○	●	○	0.86	56 to 40 °C 8.9 to 100 °C	< 1·10 ⁻⁵	< 5·10 ⁻³	243 °C 270 °C



Possible with restrictions



Not recommended



Requires special preparation of pump (**see page 45**).

* Ultimate pressure measured according to Pneurop 6602 specifications on 2033 pump.

These values are given as a rough guide only. They may vary according to the type of pump and the pumping conditions.

Recommended oils (cont'd)

- The oil has many important functions in the pump (see page 8) and is important for the functioning of the rotary vane pumps. Pfeiffer Vacuum SAS ensures the continuity of the oils in its catalogue and recommends primarily using oils from the Pfeiffer Vacuum catalogue.

Replacement fluids

Other replacement fluids might be used:

Mineral oils:

INLAND 19 (INLAND registered trademark)

Mineral-based synthetic oils:

INVOIL 20 (INLAND registered trademark)

INLAND TW (INLAND registered trademark)

ELITE Z (CAMBRIDGE MILL PRODUCTS, INC. reg. trademark)

Ester type synthetic oils:

ANDEROL 555 (ANDEROL-BV registered trademark)

Fluorocarbon synthetic oils:

FOMBLIN YL VAC 25-6 (MONTEDISON registered trademark)

KRYTOX 15-25 (DU PONT DE NEMOURS registered trademark)

Note: In this case, pump performances may be slightly different from those given on **pages 11 and 12**. The use of fluids which do not appear on this list is forbidden and Pfeiffer Vacuum SAS accepts no responsibility for the use of fluids others than those on the following list.

Filling with oil

2033 and 2063 m³/h SD, C1 series pumps are tested in the factory with **A120** oil (**A119** for the US).

2033 and 2063 m³/h C2 series pumps are tested in the factory with **A113** oil.

At delivery, there is some oil remaining in the functional block.

WARNING



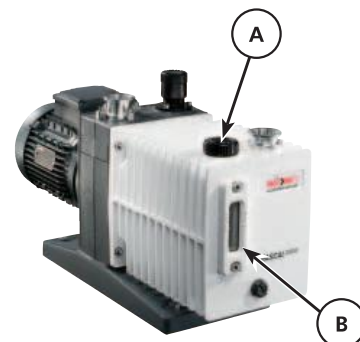
- Our pumps are tested in the factory with Pfeiffer Vacuum oil: it is recommended to use the same oil during operation. To change the type of oil, refer to the Maintenance Chapter, "replacement of oil type" section page 45.
In all cases, follow the recommendations of the pump specifier for the choice of the required oil.
- The pumps are delivered without an oil charge: the oil is delivered in separate containers. It is recommended to drain the pump before returning the equipment.
Wear appropriated safety equipment to fill in or drain the oil in the pumps.

Filling with oil (cont'd)

If necessary, carry out the special preparation procedure for the pump (**see page 45**), then:

- remove the filling cap (**A**).
- fill with oil until:
 - the oil is between the maximum and minimum levels (**SD, C2 Series**),
 - the oil reaches the middle of the sight glass (**C1 Series**).

This operation must be performed with the pump switched off and in the horizontal position.

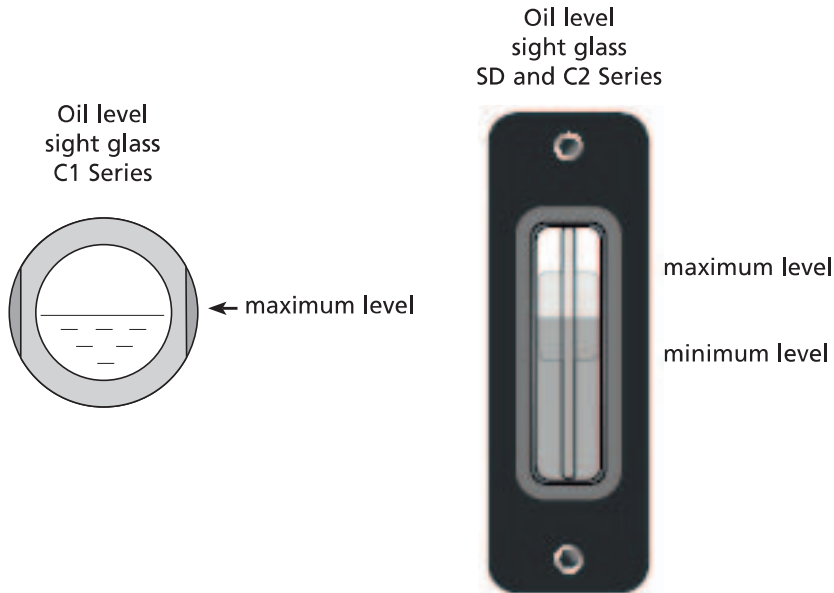


At the first start-up, to facilitate lubrication of the pump, pour a few drops of oil (1 to 2 cm³) through the inlet orifice.

C2 series: if the pump is equipped with an oil temperature sensor, the installation must be made with the pump drained of oil.

Checking the oil level

To use the pump in optimum conditions, the oil level must be observed and checked regularly. This level is checked with the pump switched off, **hot and on a horizontal plane**.



Note: Optimum pump performance and service life are obtained when the oil level is between the maximum level and the minimum level.

Mechanical connections

⚠ CAUTION

For a given application, pump performance, vacuum characteristics, temperature and reliability depend on the following:

- assembly conditions (accessory, filter...) and mechanical connections,
- used oil,
- maintenance frequency and quality.

For the assembly of the vacuum circuit, provide the accessories required for maintenance: isolation valves, purges, etc.

For safety reasons, use accessories on the inlet and exhaust lines whose materials and sealing properties are compatible with the gases being used. Several fitting accessories are available in the Pfeiffer Vacuum catalog.

Mounting on a frame

The pump can be mounted on a frame using the 4 attachment holes on the base and the special shock mounts (*refer to accessories page 14*).

Note: Special shock mounts, effective against the pump's own vibrations, can also be used but they do not ensure correct attachment during the transfer of equipment. In this case, the pump should be clamped onto its support (*see page 14*).

Ventilation

The pump and the motor are each equipped with a ventilation system. During pump installation, the pump should be placed in ventilated place. Provide a minimum gap of 25 mm around the pump.

The vents on the pump and the motor should be checked regularly to ensure that they are not blocked.

Pascal Series pumps are designed for operation at an ambient temperature between 53 °F and 113 °F (12 and 45 °C) (with A120 oil).

Inlet and exhaust fitting

⚠ WARNING

- Do not expose any part of the human body to vacuum.

The product is supplied with the inlet and exhaust sealed. Remove these blanking plates when you are ready to connect the product on your vacuum system.

As well as, don't operate the product unless the inlet and exhaust are connected to a vacuum and exhaust pumping line.

At inlet:

- Make sure that the parts or chambers connected to the inlet of our pumps products withstand a negative pressure of $1 \cdot 10^3$ hPa in relation to the atmospheric pressure.
- The inlet pressure must be no higher than atmospheric pressure. Too high pressure can damage the product.

Mechanical connections (cont'd)

Inlet and exhaust fitting (cont'd)

WARNING

At exhaust:

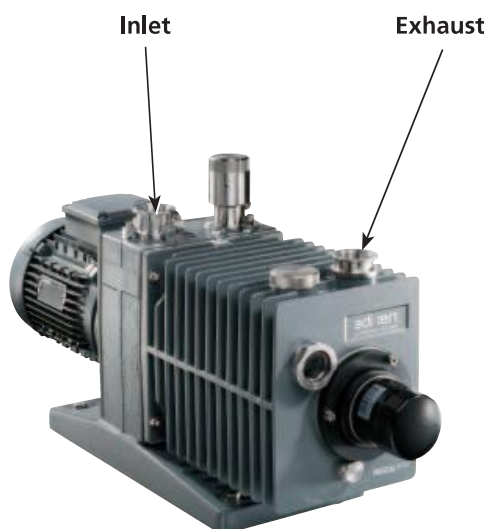
- When pumping on corrosive, aggressives or flammable gases, the gas can cause injury or death. In these cases,
 - connect the exhaust of the pump to an exhaust stack or an evacuation duct.
 - connect a relief valve or rupture disc directly on the pump. Contact your closest service center (see addresses on our website).

When the exhaust is connected to an extraction duct or an oil mist eliminator, you must remove the exhaust safety valve mounted in the pump's exhaust orifice.

- Make sure the excess exhaust pressure does not exceed 500 hPa (relative). Too high a pressure can damage the product. Check periodically that the pipes and accessories connected at exhaust are not clogged and that the purge is running (Series C1, C2).

After connecting the product to the pumping line, check for leaks along the whole of the line to ensure proper connections have been made (pump, pipes, valves, etc.).

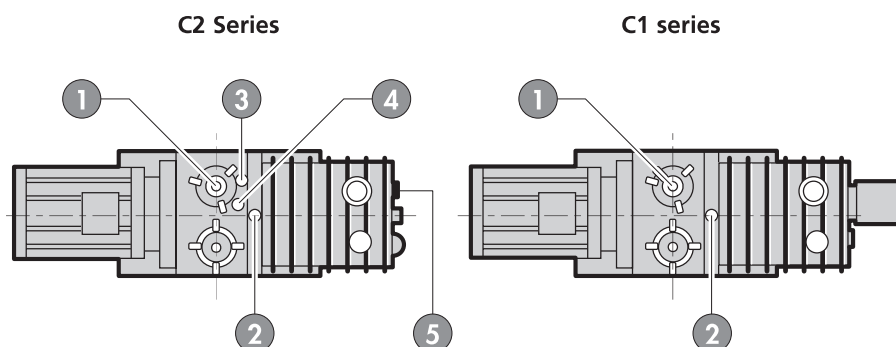
The pump inlet and exhaust orifices are equipped with **DN 40 ISO-KF end fittings** which can be used to fit various line components made of stainless steel, plastic, etc. (*see the product catalog*).



Purge and indicator connections

Serie	Item	Description	Connection
C2	C1	1 Gas ballast purge	1/8" NPT
		2 Oil casing purge	1/8" NPT
		3 Oil pressure sensor connection *	M 10 X 1
		4 Purge - Bubbler	1/8" NPT
		5 Oil casing temperature sensor connection *	M 12 X 1

* Sensors are customer supplied.



Specific equipment: HP valve (C2 Series)

The C2 pumps are equipped with HP and LP elastomer valves (FPM™ according to standard NPT 40-002). In certain applications with fluorinated gases, HP valve may harden and become brittle and compromise pump performances. Alternatively, the pump may be equipped with a plastic, corrosion-resistant HP valve on request. On request we can supply these specific components depending on your needs.

Equipment	HP Valve material	Tightness	Part Number
Standard	Elastomer	Installation tight	053443
On request	Plastic *	Installation not tight	065057

WARNING

* If a plastic valve is used, the pump's anti-suckback operation cannot be guaranteed and an anti-suckback device must be installed in the pumping line to ensure tightness when the pump is not operating.

Electrical connections

WARNING

- Ensure that the product is connected to an electrical installation:
 - in compliance with the local and national safety requirements,
 - equipped with electrical protection (fuses, circuit breaker, ...) which has a suitable earth (ground) point, properly connected.
- Our products are designed to comply with current EEC regulations. Users making their own modifications to the product are liable to break its compliance with these regulations, degrade its EMC (electromagnetic compatibility) rating, and make it unsafe to use. The manufacturer declines all liability for the consequences of such operations.
- Electric shock hazard.
The voltages and currents in use can induce electric shock.
Isolate and lock out power line to the appliance before maintaining it /or removing the cover.
Only skilled, authorized people may carry out maintenance work.
If a main isolator is installed by the customer, it must be in compliance with local regulations, with a minimum interrupting short circuit current of 10 kA.
- Check that the electrical wiring of the motor corresponds to the line voltage, before starting up the pump.

Three-phase version

Electrical motor is in accordance with major international standards (UL, CSA, VDE).

All three phase motors (protection level IP 54 - TEFC type) must be protected by a customer supplied starter consisting of a suitably rated contactor and thermal overload (see page 27).

In all the cases, the pumps are delivered with its motor connected to the maximum voltage (see page 26).

Direction of rotation

Wire the motor according to the line voltage. The connections to be made are shown on a diagram inside the terminal box or on its lid (see page 25).

Check the direction of rotation of the motor (direction of arrow located on the motor cover). For this:

- Remove the protective caps on the inlet and exhaust orifices.
- Fit a pressure gauge at the pump inlet
- Switch on the pump for 2 to 3 seconds, then stop the pump
- if the pressure indicated is less than $5 \cdot 10^{-1}$ hPa, the direction of rotation is correct.
- if the pressure increases, invert two phases.

Motor characteristics, connection, protection

The information below is given as a recommendation.

The user must comply with the electrical standards or recommendations (UL, CSA, VDE) applicable in the country in which the pump is used.

The use of electrical protection for the pump motor makes it possible to protect:

- The motor: in the event of excess voltage or rotor blocking, the resulting excess current may destroy the coil and possibly the start-up system (for a single-phase motor).
- The pump: in the event of a lubrication fault (contaminated oil, presence of particles), increased resistance will draw excessive motor current.

Motor Thermal protection

It is necessary to protect the pump against increase of temperature. The motors are equipped with a dry contact which gives motor temperature information.

To manage the motor thermic protection, It is the user's responsibility to wire this dry contact by connecting the 2 wires available in the terminal box (wiring diagram in the terminal box – NC dry contact - 250 V max. - 0.5 A max.).

CAUTION

Differential circuit breaker.

In case of insulation defect, for personnel protection you must install on the main power supply a type B differential circuit breaker GFI (or RCD) of 30 mA minimum.

This equipment protection device is compatible with type T.T electrical network.

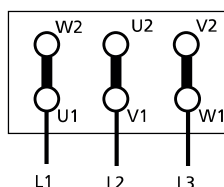
For other network type T.N or I.T, apply the right protection device. Contact adixen product manufacturer for advice.

In all cases, comply with current local regulations.

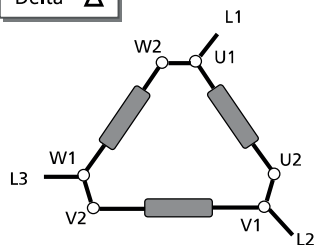
Electrical connections of three-phase motors

Terminal box with 6 wires and 6 terminals

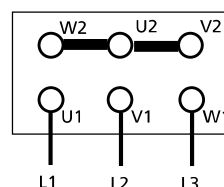
Low voltage



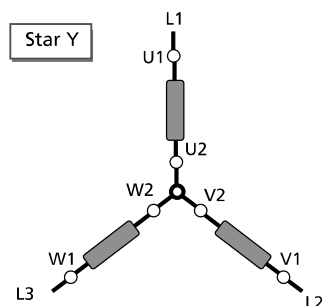
Delta Δ



High voltage

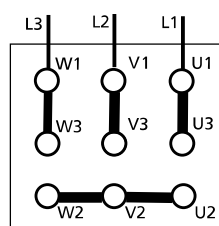


Star Y

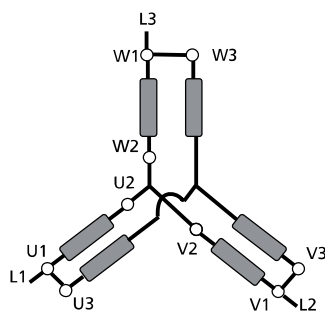


Terminal box with 9 wires and 9 terminals

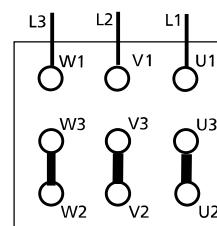
Low voltage



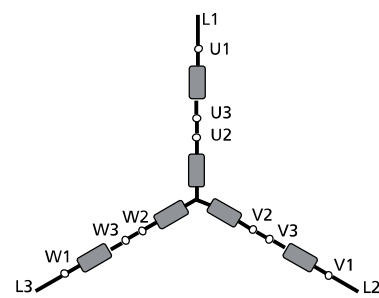
Star parallel YY



High voltage



Star serial Y



Electrical connections (cont'd)

Electrical connections of three-phase motors (cont'd)

Different types of motors are available in accordance to the major international standards UL, CSA, VDE. The three phase motors are compatible with the following voltages:

Motor voltage range - Capacity limits									
	Motor P/N	Country	Fr.	Voltage					
2033	119978*	Europe	50 HZ		220	240		380	415
			60 HZ		220	280		380	480
	114449	Asia & Row	50 HZ	180		240		360	415
			60 HZ	180		240		380	480
	119977*	USA Japan	50 HZ	180	220			380	440
			60 HZ		190	230		380	460
2063	119979*	Europe	50 HZ		220	240		380	415
			60 HZ		220	280		380	480
	114450	Asia & Row	50 HZ	180		240		360	415
			60 HZ	180		240		380	480
	119980*	USA Japan	50 HZ	180	220			380	440
			60 HZ		190	280		380	460

* IE2 high efficiency class according to IEC 60034-30 standard.

External motor protection, electrical protection

⚠ CAUTION

Installation protection with circuit breaker.

The user must supply the pump from facilities equipped with a main circuit breaker, curve D (IEC 60947-2), in accordance with local regulations and with a minimum interrupting short circuit current of 10 kA.

This protection device should be in close proximity to the pump (no further than 7m (25 ft) within line of sight of the pump and visibly marked as a electrical interrupting device of the product.

Electrical protections

The characteristics and ratings of fuses and recommended circuit breaker with standard pump three-phase motors:

Circuit breaker rate for the following motors						
	Motor P/N	Country	Frequency	Motor power	Voltage	Rate
2033	119978	Europe	50 / 60 HZ	1,1 kW	220 V	6 A
					400 V	4 A
			60 HZ	1,3 kW	265 V	6 A
					460 V	4 A
	114449	Asia & Row	50 HZ	1,5 kW	200 V	8 A
					400 V	4 A
			60 HZ	1,8 kW	230 V	8 A
					460 V	4 A
	119977	USA Japon	50 HZ	1,5 kW	200 V	8 A
				400 V	4 A	
		60 HZ	1,8 kW	230 V	8 A	
				460 V	4 A	
2063	119979	Europe	50 HZ	2,2 kW	230 V	10 A
					400 V	6 A
			60 HZ	2,64 kW	265 V	12 A
					460 V	6 A
	114450	Asia & Row	50 HZ	2,2 kW	200 V	8 A
					400 V	4 A
			60 HZ	2 ,2 kW	230 V	8 A
					460 V	4 A
	119980	USA Japon	50 HZ	2,2 kW	200 V	14 A
				400 V	6 A	
		60 HZ	2,64 kW	230 V	12 A	
				460 V	6 A	

Operation

Preliminary precautions

WARNING

- The performance and operational safety of this product are guaranteed provided it is used normally in the operating conditions defined in this manual.
It is the customer's task to:
 - train operators to use the product if they do not speak the language the manual is written in,
 - ensure operators know the safe practices to apply when using the product.
- Fire protection.
The roughing pump is not intended to be installed on process containing flammable materials or in hazardous atmosphere.
- Fire hazard due to the presence of electrical components.
The fire hazard is low due to the use of appropriated components and the containment in the pump cover.
- The vacuum pump is also a compressor: incorrect use may be dangerous.
Study the user's manual before starting up the pump.
- The products are designed to avoid subjecting users to heat hazards. Specific operating conditions can nevertheless exist that require extra caution from users due to the high temperatures generated (outer surfaces > 70 °C):
Wear protective gloves to work on the product, especially during maintenance.
- The products are factory tested to ensure they will not leak in normal operating conditions. It is the user's responsibility to ensure this level of leak tightness is maintained.»
- For emergencies and breakdowns, contact the manager of your local service center (see addresses on our website).

Operating temperature

At start-up, before switching on the motor, check that the oil bath temperature is greater than 53 °F (12 °C).

The ambient operating temperature for the pump must be between 53°F (12 °C) and 113 °F (45 °C).

Under these conditions, **the stabilized pump temperature** (at the front of the oil case) will be between 140 °F and 158 °F (60 and 70 °C) (with A120 oil, depending on operating conditions).

Special case - Synthetic oils

Synthetic oils are much more viscous when cold than mineral oils.

Do not start up the pump at ambient temperatures below 59 °F (15 °C).

The stabilized temperature is higher than with a pump used with mineral oil.

For the same reason and to facilitate lubrication of the pump, pour a few drops of oil (1 to 2 cm³) through the inlet orifice before starting.

Operation (cont'd)

Before starting-up the pump

CAUTION

Before starting up the pump:

- Check that it is properly installed on a clean, flat and stable surface.
- Check that there is no trace of oil on the shock absorber feet.

Check regularly during pump operation:

- That there is no trace of oil around the feet: this could affect the pump stability.
- That the exhaust pipes and the exhaust accessories are not clogged (e.g. oil mist eliminator) and that the purge is running.

In certain cases, when the pump is started up in cold ambient conditions, or with slightly contaminated oil, the current after start-up may remain high until the oil in the pump is heated up. These conditions are sufficient for the internal thermal protection to be activated, making start-up impossible (*see electrical connections page 24*).

Start-up

- When using a three phase motor, **check the direction of rotation of the motor** (*see electrical connections page 24*).
- Check the oil level (*see page 20*).
- Start-up the pump: switch on the customer power device.
- Allow the pump to run for one hour with the inlet blocked at ultimate vacuum:

During this operation, make sure that the oil circuit is operating. Remove one of the oil fill plugs to listen to the pump.

At start-up, the oil enters the lubrication circuit of the vacuum pump. As a result, noises will be heard (*first irregularly, then regularly*) which will reduce as the oil heats up. These noises will no longer be heard when the fill plug has been replaced.

Under normal temperature conditions, the oil circuit should start less than 1 minute after start-up (*this time may vary with the type of oil and its degree of contamination*).

It is normal for the oil level to rise (*as can be seen through the oil sight glass*) when the pump is hot due to expansion of the oil and starting of the oil circuit.

Start-up after pump disassembly or oil change

See specific cases *page 45*.

Cold start-up

When a pump must start cold (ambient temperature about 12 °C) or when it has to start cold after pumping contaminating products or condensables, proceed as follows:

- Unscrew air inlet tube to the maximum extent to help oil circuit to start.
- Readjust antinoise system when the pump is hot.

WARNING

Note : When you have pumped on dangerous products (corrosive, toxic...), you must reheat the pump with an external device to reach the pump starting temperature. Consult us.

Pump stop

Press the circuit breaker of the customer's installation.

Prevent any pumping hazard

Selection of the pump type

Standard and chemical model Pascal Series rotary vane pumps are able to pump several types of gases. They can be adapted to applications by using accessories.

SD models	Pump designed to pump neutral or inert gases (air, nitrogen, etc.). The use of a gas ballast (see page 33) may be required if the pumped gas mixture contains condensable vapors.
C1 model	Pump designed to pump corrosive products and condensable vapors at low pressure.
C2 model	Pump designed for microelectronic activities. Pump is delivered filled with synthetic oil and the gas ballast is sealed to avoid any misuse.

Pumped gas and pump interactions

In some applications, it can be difficult to know which gas is going through the pump:

- the vacuum degassing of the materials of the pump may generate reactive gases (solvent, acid, etc.), which when mixed with pumped gases may alter the gas composition.
- at low pressure, vapors and gases present at low concentration are relatively inactive. When the pressure increases, they can reach their saturation vapor pressure and may become significantly reactive.

WARNING

The user and /or OEM are ultimately responsible for operating the equipment in a safe manner especially with regard to toxicity and explosive hazard prevention.

Operation (cont'd)

Precautions Pump models and accessories selection according to the pumped gases:

Gas/vapor type		Points to be monitored during pumping	Safety measures	Recommended equipment					
				SD	C1	C2	Gas ballast	Evacuation duct	Gas purge
Neutral or inert gas	Air, nitrogen, CO ₂ , noble gases or constant non-reactive gases.	None	None	•					
Gas weakly loaded with condensable vapor	Presence of vapors, gases likely to condense or polymerize	Avoid condensation which reduces the pump performance and reliability.	Avoid overpressure at the exhaust. Allow the pump to run at ultimate pressure for one hour with the inlet blocked.	•	•		•	•	
Polymerizable vapor			Use the gas ballast. Allow the pump to run at ultimate pressure for one hour with the inlet blocked.	•	•		•	•	
Reactive and/or corrosive gas at low concentration	Reactive and/or corrosive with air, dampness or others gases or with some materials, depending on conditions.	Prevent dampness that creates liquid phases and damages the pump's components.	Dilute the gas in order to reduce its concentration and avoid transformation in liquid phase or sublimation. Use the gas ballast. Avoid overpressure at the exhaust. Check that the pump's materials and their sealing properties are compatible with the pumped vapors.		•	•	•	•	•
Reactive and/or corrosive gas at high concentration		Prevent dampness that creates liquid phases and damages the pump's components. Make sure that the gas does not reach its saturation vapor pressure inside the pump.	Dilute the gas in order to reduce its concentration and avoid transformation in liquid phase or sublimation. Use the gas ballast. Avoid overpressure at the exhaust. Check that the pumping line materials and their sealing properties are compatible with the pumped vapors.		•	•	•	•	•
Oxidizing gas	Reactive with compounds containing hydrocarbons such as O ₂ , O ₃ , CO, NO, NO ₂ etc.	Prevent dampness that creates liquid phases that damages the pump's components. Avoid the presence of combustive agents.	It is mandatory to dilute the gas in order to reduce its concentration and to use A113 oil. Avoid overpressure at the exhaust.		•	•		•	•
Flammable or explosive gases		Work outside the flammability condition of the product.	Mixed with a combustive agent containing oxygen like air. Dilute the gas to decrease its concentration. Avoid any gas accumulation in the pumping line. Prohibit any flame or spark close to the pumping line. Monitor the internal temperature of pump.	Not recommended.*					

* Use another type of pump designed to withstand an internal fire or explosion (designed to operate in hazardous environments).
Please consult us. Refer to EC directives: Explosive Atmosphere, ATEX.

Operation of gas ballast

Regeneration of pump oil

In a pump stored with the same oil for a long time, condensed vapors may contaminate the oil bath and affect performance. This is also the case after pumping vapors and when the oil appears cloudy or discolored through the sight glass.

- Run the pump, shutting it off from the system at the inlet by a valve or a plug.
- Open the gas ballast and allow the pump to operate for 1/2 hour to 1 hour, or longer if the oil remains cloudy. This operation accelerates the temperature rise of the pump while eliminating residual vapors present in the oil bath.

Pumping condensable vapors

To pump with condensable products, it is necessary to operate with a hot pump. For this, isolate the pump from the system and allow it to operate for 1/2 hour with the gas ballast open, or 1 hour (if possible) with the gas ballast closed. When the oil bath is hot, the condensation of vapors in the pump is reduced or prevented.

Choice of pump and system

The pump's capacity to eliminate condensable vapors is related to their type, the pump temperature and the quantity of air introduced by the gas ballast.

Care should be taken to limit the inlet pressure of the pump to its maximum admissible water vapor pressure with the pumped product. This is obtained by reading the pump characteristic table for water vapor (*see pages 11 and 12*).

The use of cold traps or condensers are recommended when large quantities of vapors are to be extracted.

Caution : don't forget to regenerate the traps. Excessively intense or prolonged pumping may cause the products condensed in the trap to be evaporated a second time.

Choice of oil

Choose an oil which facilitates the separation of pumped products which may be condensed in the oil bath (anti-emulsion oil for water-based compounds, etc.) (*see page 18*).

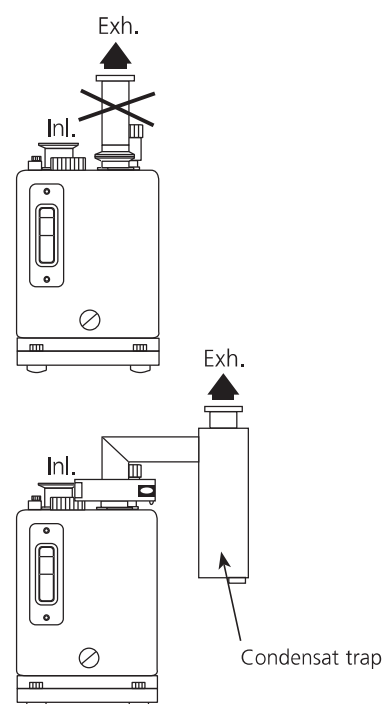
Assembly

The condensation of vapors at the pump exhaust is reduced if:

- The pump and oil temperature are high.
- The pressure at the exhaust is as low as possible (removal of the oil mist eliminator, connection to an evacuation duct...).
- The condensates are collected separately from the oil bath and do not block the exhaust duct.

For this:

- Avoid using any vertical ducting which promotes the condensation of products and the return of these products to the pump.
- Use a condensate collector.
- We do not recommend an oil mist eliminator when pumping condensable vapors: if it is essential, do not connect it directly to the pump exhaust but place it outside the condensation zone.
- Remove the stop valve from the pump exhaust (*SD series*).
- Connect the exhaust to a mechanical device creating a negative pressure from 100 to 200 hPa.



Pumping condensable vapors (cont'd)

Vapor pumping procedure

- Isolate the pump from the system and increase the pump temperature, 30 minutes with gas ballast (**see page 31**).
- Start pumping and check the oil level:
 - The oil level drops, oil is being lost, add oil in the pump.
 - The oil level rises; condensates have been added into the oil.
- After pumping, let the pump running at ultimate pressure and condensates will be separate from the oil.
 - If the oil is cloudy or discoloured, change the oil.
 - If the condensates are heavier than the oil, drain them by the oil drain port.
 - If the condensates are lighter than the oil, drain the pump, flush the pump with clean oil. Let the mixture to clarify, than recover the oil.

Purges for pumping condensable, corrosive, and hazardous gases

Purge description

The use of vane pumps may result in pumping gases or vapors which are flammable or that could contaminate the oil. In this case, these products must be diluted using purges supplied with dry gases, such as nitrogen to avoid undesirable reactions.

These purges can be located at the pump inlet (pumped gas dilution), but also at the gas ballast (condensable product pumping), at the bubbler (oil degasing), or on the oil casing (oil casing and exhaust pipe flushing).

Purge characteristics

For this purpose, a filtered dry nitrogen supply or other inert gases with the same characteristics is required:

- condensation point < 72 °F/ 22 °C,
- dust < 1µm,
- maximum relative pressure 100 kPa,
- H₂O concentration < 10 ppmv,
- O₂ concentration < 5 ppmv.

Oil case purge (all models)

The purge dilutes pumped gases with a inert gas.

It makes it possible to limit corrosion in the oil case, condensation and accumulation of gases in dead spaces of the pump.

Furthermore, the purge allows to flush with gas the pipes and accessories connected at the exhaust of the pump.

Connect the dry nitrogen supply on the specific connector (1/8 NPT).

Set the nitrogen pressure to approximately 10 kPa (relative) (*see table page 36*), and the flowrate so as to satisfy the dilution conditions.

(Caution: do not generate an excess pressure 50 kPa relative).

Purge with gas ballast (models C1, C2)

Because of the danger present if the gas ballast was to be opened to atmosphere (C2 series), the manual gas ballast doesn't operate. Connect the dry nitrogen on the specific connector (1/8 NPT). The nitrogen flowrate should be adjusted according to the values from table *page 36*.

Purge with bubbler (C2 model)

The bubble device is composed of an air tube with several holes, located at the bottom of the oil case, which releases bubbles of inert gas in the oil. In this way, the oil is saturated with neutral gas, which reduces its capacity to dissolve pumped gases. The bubbles of inert gas released make it possible to eliminate the volatile vapours or acids condensed in the oil. The bubbler flow also lowers the pumps temperature which slows corrosion.

Connect the dry nitrogen supply on the specific connector (1/8 NPT).

Setting

The gas flow rate is adapted according to the application and the installation, taking the following criteria into account (flow 60 to 300 l/h) (*see table page 36*):

- When pumping high quantities of gas, a highly corrosive gas or an easily condensable gas, it is recommended to use a high nitrogen flow rate.
Caution ! It is assumed that a sufficient quantity of nitrogen is available.
- The pump exhaust circuit must be such that, for discharged flow rates, pressure drops do not cause an abnormal excess pressure in the oil case.
- The nitrogen flow rate must be such that oil losses have no effect on the operation of the pump throughout the pumping cycle (the oil level must be above the lower limit of the sight glass at the end of pumping).

Run the pump at ultimate vacuum for one hour and set the nitrogen flow rate as follows (at atmospheric pressure and at 60 °F/20 °C).

Purges for pumping condensable, corrosive, and hazardous gases (cont'd)

Purge and sensor setting table

Setting											
Model	Item	Description	Neutral gas flow (l/h)			Pressure (kPa)			T (°C)	Corresponding absolute pressure (kPa) (indicative value)	
			mini	average	maxi	Starting	Operating	Problem			
2033 2063	C1/C2	1	Gas ballast purge **	1200 1500	1500 1700	2000 2500	-			-	10 to 25
2033 2063	C1/C2	2	Oil casing purge	60 70	300 300	700 900	-			-	10 to 25 15 to 25
2033 2063	C2	3	Oil pressure sensor connection *	-			90	120 ± 10	< 80	-	-
2033 2063	C2	4	Purge - Bubbler	60 70	300 300	700 900	-			-	10 to 25 15 to 25
2033 2063	C2	5	Oil temperature sensor connection *	-			-			< 95 °C	-

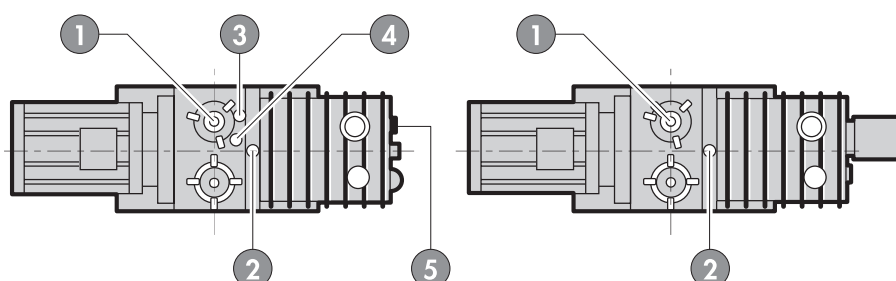
* Sensors are customer supplied.

** with an AGB 36 accessory installed on model SD.

Note: these characteristics apply for pumps operating at a constant inlet pressure (1 to 5 hPa): they are adapted for each case of pumping.

C2 Series

C1 series



Operation principle

Start-up

Isolate the pump from the pumping line (*close the isolation valve at inlet*).
Start up the pump at ultimate vacuum. When it is hot, open the nitrogen purge and adjust the flow.
Wait for the pump stabilization.
Open the inlet valve and pump on corrosive gases: check that the purge is running during all the pumping time.

Stop

Isolate the pump from the pumping line (*close the isolation valve*).
When pumping stops, allow the purge to operate for approximately 1 hour (*depending on the quantity of pumped gas*) at ultimate vacuum, with the purge, in order to degas the oil effectively and clean the pump with nitrogen to eliminate the traces of pumped gases.
Stop the purge but let the pump running to avoid any condensation, or dampness introduction that can react with pumped gases.
If the pump must be stopped, prepare it as described **on page 15** to store a pump which has been used.

Using the two purges simultaneously (C2 series)

When the bubbler and the oil casing purge are used simultaneously, the gas flow rate must be adjusted to suit the application and the installation. **The adjustment data given in the table corresponds to the adding flow adjustment data.**

Oxygen pumping

In certain applications, mixtures containing oxygen at different concentrations, or even pure oxygen, are used.

Oils of mineral origin are combustible. Exposure to pure oxygen at high temperatures may cause them to self-ignite. In addition, they are highly oxidized during pumping and quickly lose their lubricating properties.

Mineral oils must not be used for oxygen levels of over 21 % in pumped gases. In this case, perfluorinated synthetic oils must be used (*see page 18*).

The use of these oils requires a special pump preparation (*see page 45*). The pump must be completely disassembled and all traces mineral oil removed. Flushing the oil case is not adequate.

 **DANGER**

It is strongly recommended not to use fluids such as tri-aryl-phosphate-ester which are known to cause accidents.

Any accumulation of oxygen in the installation should be avoided and the oxygen or combustible mixture should be diluted with a neutral gas at the exhaust: the gas flow rate should be 4 times the oxygen flow rate.

Certain combustible or explosive gases require a higher degree of dilution. Our Support Services and Customer Services can advise you to help solve problems of this kind.

Recovery of oil (high pressure and cycling)

When the pump operates at high pressure, the oil heats up, becomes more fluid and is flushed out of the functional block by the gas stream.

Oil losses at the exhaust are increased.

For intermittent pumping

If the pump only operates for a very short time at high pressure, the lubricating oil is replaced when the pump returns to low pressure. The use of an oil mist eliminator prevents losses due to intermittent high pressure operation.

For cyclical pumping or continuous pumping at high pressure

If the pump operates at high pressure in a cyclical fashion, oil consumption may reach sufficiently high levels (according to the pumped volume and pumping cycle rates) causing the level to drop in the oil case.

There is then a risk of seizure due to a lack of oil. In addition, the high flow of gas passing through the eliminator prevents oil from returning to the oil case.

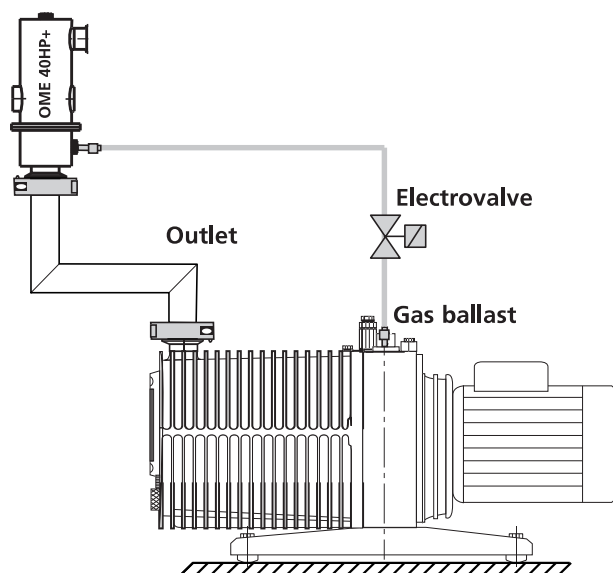
In order to pump in these conditions, the pump must be equipped with an oil mist eliminator and an oil draining kit, which enables oil recovery via the gas ballast (see **accessories page 14**).

In case of oil recovery via the pump inlet port, consult us.

Example:

OME 40HP+ oil mist eliminator with ODK236 oil recovery device.

An electrovalve ensure the tightness when the pump is stopped.



Safety instructions for maintenance

General precautions

For normal operation, the maintenance of 2033-2063 m³/h series pumps only require regular oil changes (*see page 43*).

Tools, consumable products, spare parts and pump overhaul instructions are given in the **Maintenance instructions**, available in our website

WARNING

Maintenance must be performed by a skilled maintenance operator trained in the relevant health and safety aspects (EMC, electrical hazards, chemical pollution, etc.).

Isolate the product from all energy sources (mains electricity, compressed air, etc.) before starting work.

DANGER



■ Certain gases can become corrosive and toxic when trapped in oil. Always wear protective gloves when handling used and dirty pump oil, drain it into a closable container, and do not breathe the oil fumes. Always use fully self-contained breathing apparatus.

■ During pump removal, draining or maintenance operator could be in contact with process residues which could cause severe injury or death. Ask your safety department for instructions according to the local regulations.

We recommend:

- To purge the pumping installation with dry nitrogen.
- To wear gloves, protective glasses, breathing mask or any appropriated safety equipment.
- To ventilate the premises well.
- Do not eliminate maintenance waste via standard disposal channels. Have it destroyed by a qualified company if necessary.
- To install the inlet and exhaust blanking plates, thus accessories are delivered with the pump.

■ Decontamination – product dismantling

According to the regulations 2012/19/EU about Waste of electrical and electronical equipments, and 2011/65/EU about Restriction of Hazardous substances, the manufacturer provides a recycling paid service for the end of-life of waste electrical and electronic equipment.

Any obligation of the manufacturer to take back such equipment shall apply only to complete not amended or modified equipment, using Pfeiffer Vacuum original spare parts, delivered by Pfeiffer Vacuum, containing i.e. all its components and sub-assemblies.

This obligation will not cover the shipping cost to a Pfeiffer Vacuum taking back facility.

■ Whenever you return the product to an repair service center, please make sure you follow the Service procedure and fill in the declaration of contamination found on our website.

WARNING

Insufficient tightness after servicing could result in chemical hazards. Always perform a leak test after maintenance.

Troubleshooting and corrective actions

Incidents	Causes	Corrective actions*
The pump is not running	• Incorrect motor power supply.	Check the power supply.
	• Temperature too low.	Reheat the pump and its oil.
	• Gumming of seals after prolonged storage.	Disassemble the motor and try to turn the fan manually. Disassemble, clean the pump, replace seals, reassemble.
	• Oil contaminated after pumping.	Drain, flush and refill with clean oil.
	• Motor coupling damaged.	Replace by disassembling the motor.
	• Pump seized, due to a stopping after pumping in difficult conditions (no draining or flushing).	Disassemble, clean, hone the scratched metal parts (replace them if necessary) and reassemble.
The pump does not start	• Oil cold.	Warm pump.
	• Insufficient oil in the oil case.	Fill up to the level.
	• Oil contaminated.	Drain, flush and refill with clean oil.
	• Oil pump inlet partially blocked.	Drain, and clean the oil pump inlet duct.
	• Lubrication holes blocked.	Disassemble and clean.
	• Vane of oil pump damaged.	Replace it.
	• Incorrect anti-suckback system assembly.	Repeat the assembly and the setting.
	Oil pressure sensor	
	■ It indicates a too low or too high pressure.	Clear the line or check the manometer/plug tightness.
	■ It continues to indicate a too low or too high pressure.	Disassemble, clean and reassemble using maintenance kit.
The vacuum pump does not produce a vacuum	Ultimate pressure obtained: a few hPa	
	• Direction of motor rotation incorrect.	Rewire.
	• Insufficient motor power.	Check the power supply.
	• Inlet filter blocked.	Clean the inlet filter.
	• Insufficient oil in the oil case.	Add oil.
	• Oil cold, oil pump inlet blocked.	Warm, disassemble, clean.
	• Oil contaminated.	Drain, flush and start again with clean oil.
	• Oil pump inlet partially blocked.	Drain and clean the oil pump inlet duct.
	• One of the LP safety valves is damaged.	Replace the LP safety valve.
	• Part forgotten in reassembly.	Repeat the reassembly.

*The maintenance operations are described in the **Maintenance instructions**, available on the website.

• All series ■ C1 ► C2 ★ C1 and C2

Incidents	Causes	Corrective actions*
The vacuum pump does not produce a vacuum (<i>continued</i>)	Ultimate pressure obtained: a few $1 \cdot 10^{-2}$ hPa)	
	• Gas ballast knob open (or supplied with dry nitrogen C1,C2 Series).	Close the gas ballast or stop the dry air supply.
	• O-ring pinched.	Replace by a new one.
	• One of the seals is damaged.	Replace by new ones.
	• One of the HP safety valves is damaged.	Replace the HP safety valve.
	• Lubrication holes blocked.	Disassemble and clean.
	• Incorrect anti-noise device setting.	Repeat the assembly and setting.
	• Part forgotten in reassembly.	Repeat the reassembly.
	■ Filter cartridge clogged.	Replace by a new cartridge.
	Accessories	
Noisy pump	• At the pump exhaust, the installation produces an exhaust pressure of $1,5 \cdot 10^3$ hPa.	Check the installation.
	• Oil mist eliminator cartridge clogged.	Replace.
	• Oil level too high.	Drain and fill with a new oil.
	• Oil contaminated (presence of particles).	Drain, flush and refill with clean oil.
	• Pump not prepared for the oil used.	Check the pump configuration or the type of oil.
	• Incorrect motor power supply.	Check the power supply.
	• Motor bearings damaged.	Replace the motor after inspection.
	• Motor coupling incorrectly set or damaged.	Check the setting, replace the motor coupling.
	• Incorrect fan assembly.	Check the assembly.
	• Incorrect anti-suckback device assembly.	Repeat the assembly.
Pump too hot	• Vanes damaged or stuck.	Replace the vanes.
	• Ambient temperature too high.	Check that the temperature is between 12 and 45 °C.
	• Pump placed in a poorly ventilated place or vents blocked.	Check the installation.
	• Operation at high pressure $P > 30$ hPa.	Study an outside cooling device.
	• Excess pressure at exhaust.	Check the exhaust line.
	• Motor in over-voltage or motor in short-circuit.	Check the voltage, replace the motor.

*The maintenance operations are described in the **Maintenance instructions**, available on the website.

• All series ■ C1 ► C2 ★ C1 and C2

Troubleshooting and corrective actions (cont'd)

Incidents	Causes	Corrective actions*
Pump too hot (cont'ed)	• Oil contaminated.	Drain, flush and refill with clean oil.
	• Pump not prepared for the oil used or oil unsuitable.	Check pump configuration or type of oil.
Considerable oil losses	• Oil level too high.	Drain and fill with a new oil.
	• Operation at high pressure.	Use an HP type oil mist eliminator with oil recovery.
	• Gas ballast open: 1 - accidentally 2 - pumping of condensable vapors.	1 - Close. 2 - Use a condensate collector.
	• Leak at oil case seal or at front seal.	Check the assembly and replace the seals if necessary.
	★ Purges gas flow too important.	Readjust.
Poor pump tightness when switched off	• Gas ballast open.	Close the gas ballast.
	• Safety valve damaged.	Replace by a new one.
	• Incorrect anti-suckback assembly.	Repeat the assembly.
	• O-ring pinched.	Replace by a new one.
	• Seals damaged.	Replace by a new one.
	• Oil contaminated.	Drain, flush and refill with clean oil.
	► Using a plastic HP valve (not tight)	Check the installation. Contact us.
Oil in plate	• Oil case and frame cleaned poorly during reassembly.	Remove the base and clean.
	• Oil case seal pinched.	Disassemble the oil case, clean the faces and refit a new seal.
	• Front seal damaged or felt saturated.	Replace by new ones.

*The maintenance operations are described in the **Maintenance instructions**, available on the website.

- All series ■ C1 ► C2 ★ C1 and C2

Maintenance

Maintenance frequency

	Frequency	Operating conditions
Oil	6 months	"normal", 24h per day
	1 year	"normal", < 12h per day
Pump	1 year	"normal", 24h per day
	2 years	"normal", < 12h par day

The frequency values are minimum values for «normal» operating conditions: pressure < 1 hPa, clean and non-corrosive gas.

An incorrect ultimate vacuum or a reduction in pumping speed are signs that the oil has deteriorated.

The periodic inspection of the state of the oil is performed by comparison with a sample of new oil in order to check the level of contamination or deterioration of the lubricant.

The frequency at which oil is renewed is adapted to the type of operation:

- If the oil is cloudy, this indicates that condensables have been absorbed during pumping. The oil can be regenerated using the gas ballast (*see page 33*).
- A thickening of the oil, together with a blackish color and a "burnt" smell indicate that the oil has deteriorated. Drain the pump and flush it.

When the lubricating oil is expensive (fluorocarbon synthetic oils), the use of an oil mist eliminator allows oil recovery after deposition.

Roughing

The oil should be changed every 6 months. This value is given as a guide only. It may be extended to 1 year if the ultimate vacuum required is sufficient (for roughing pumps).

Similarly, if the pump is stopped frequently for long periods, the oil should be changed at intervals of 6 months to a maximum of 1 year (oil may become sticky).

Note: Every pumping operation is different. This oil must therefore be changed at intervals adapted to each specific application.

The use of accessories (*see page 14*) can reduce the frequency of these maintenance operations.

Maintenance of the accessories

When a Pfeiffer Vacuum accessory is connected to the pump, periodically it is necessary to make accessory overhaul.

Study the accessory operating instructions and make sure you follow the safety instructions it gives regarding the protection of the personnel.

Ask your safety department for instructions according to the local regulations (*see page 39*). Safety instructions also apply to accessories.

WARNING

When an oil mist eliminator is installed, check periodically at the exhaust orifice that:

- the exhaust valve can move, so the exhaust is not blocked,
- the exhaust valve can move, no overpressure in the oil casing.

Maintenance (cont'd)

Draining

WARNING

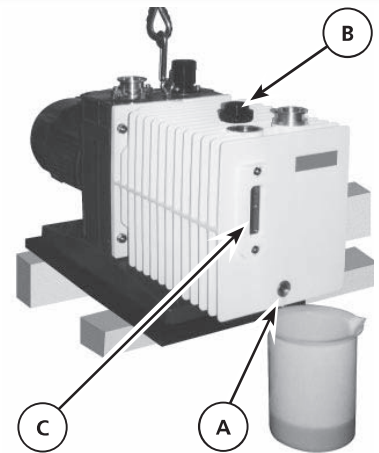
The draining operation places the contaminated pumping circuit in communication with the outside atmosphere. Take all necessary steps to ensure personnel safety: wear gloves, breathing mask and protective glasses.

The pump must be drained when hot and after the oil case has been vented to atmospheric pressure. For this:

- Switch off the pump.
- Isolate the pump or disconnect it from the installation.
- Tilt the pump.
- Unscrew the draining plug (A) on the side of the oil case and the filling plug (B) on the top of the oil case.

When all the oil has drained, replace the two plugs temporarily and run the pump for about 10 seconds leaving the intake open. Take care with the oil mist which may appear at the exhaust. This operation removes the oil from the functional block.

- Drain this oil by removing the draining plug (A).
- Replace the draining plug (A) and fill with fresh oil to the appropriate maximum level of the oil sight glass (C) (see page 19) through the filling orifice (B).



Flushing

The draining operation can be followed by a flushing operation if the oil is particularly dirty. This operation requires a volume of oil equal to the capacity of the pump.

After draining the oil case, replace the draining plug. Remove the intake filter, clean it and replace it. Run the pump at atmospheric pressure, pour the flushing oil very slowly through the inlet orifice. Take care with oil mist which may develop at the exhaust. Stop the pump and drain the flushing oil via the draining plug. Replace the plug and fill with fresh oil (see page 19).

Change of oil type

2033/2063 m³/h SD and C1 pumps are tested in the factory with **A120** oil or **A119** for USA unless specified otherwise in the order.

2033/2063 m³/h C2 pumps are tested in the factory with **A113** oil unless specified otherwise in the order.

When the pump is delivered, a certain quantity of oil remains in the functional block. Thus, if you wish to use another type of oil, proceed as follows:

Compatible oils

Mineral oil can be replaced by another type of mineral oil. Simply flush the pump using the new oil and fill the pump (see page 19).

Mineral oils are also compatible with mineral-based synthetic oils (see page 18).

Change of type of oil (cont'd)

Incompatible oils

This is the case when, for example, a mineral oil is replaced by a synthetic oil (e.g. A120 by A113).

Synthetic oils are considered to be incompatible with each other for practical reasons: they are expensive. A mixture may cause slight cloudiness of the resulting mixture, which could be interpreted mistakenly as a sign of contamination or deterioration. For the same reasons, clear synthetic and mineral oils (A300), which are also expensive, are treated as synthetic oils.

These remarks apply to ester or fluorocarbon type synthetic oils and the oils A111, A113 and A300 (*see page 18*).

Proceed as follows:

- Disassemble the pump completely and clean it (*see Maintenance instructions*).
- Reassemble it.
- Connect an oil mist eliminator to the pump exhaust.
- Fill the pump (oil case and sealed housing) with the new oil (*see page 19*).

NOTE: to replace a synthetic oil by a mineral oil, proceed as for compatible oils.

In all cases, follow the recommendations of the pump integrators for the choice of the oil to be used.

Start-up after pump disassembly or oil change

Using noise limiter

The principle of the noise limiter is described page 9. It is adjusted at the factory when the pump is checked and need only to be readjusted after:

- pump disassembly-reassembly operations,
- changing the oil type (not all oils are miscible in the same proportions with pumped gases).

- Set pump to normal operating condition (temperature, ambient sound level, etc.).
- Connect a liquid nitrogen trap and a Penning gauge to pump inlet.
- Check the direction of rotation.
- Remove the filling plug and unscrew gas inlet tube with a screwdriver all the way out.
- Run pump for about one hour at ultimate pressure.
- When the pump is hot, screw in tube, half a turn at a time, monitoring partial pressure and sound level (wait 3 to 4 minutes after each half turn). When the desired noise level is set, replace the filling plug to evaluate the sound level.

Service

Pfeiffer Vacuum offers first-class customer service!

- On-Site maintenance for many products
- Overhaul / repair in the nearby Service Location
- Fast replacement with refurbished exchange products in mint condition
- Advice on the most cost-efficient and quickest solution

Detailed information, addresses and forms at: www.pfeiffer-vacuum.com (Service).

Overhaul and repair in the Pfeiffer Vacuum Service Center

The following general recommendations will ensure a fast, smooth servicing process:

- ➔ Fill out the «Service Request/Product return» form and send it to your local Pfeiffer Vacuum Service contact.

- ➔ Include the confirmation on the service request from Pfeiffer Vacuum with your shipment.

- ➔ Fill out the declaration of contamination and include it in the shipment (mandatory!). The Declaration of contamination is valid for any product/device including a part exposed to vacuum.

- ➔ Dismantle all accessories and keep them.

- ➔ Close all the ports flange openings by using the original protective covers or metallic airtight blank flanges for contaminated devices.

If possible, send pump or unit in its original packaging.

Sending of contaminated pumps or devices

No devices will be accepted if they are contaminated with micro-biological, explosive or radioactive substances. "Hazardous substances" are substances and compounds in accordance with the hazardous goods regulations (current version).

- ➔ Neutralize the pump by flushing it with nitrogen or dry air.

- ➔ Close all openings airtight.

- ➔ Seal the pump or device in suitable protective film.

- ➔ Return the pump/device only in a suitable and sturdy transport container and send it in while following applicable transport conditions.

Pump or device returned without declaration of contamination form fully completed and/or non-secured in a suitable packaging, will be decontaminated and/or returned at the shipper's expense.

Exchange or repaired devices

The factory operating parameters are always preset with exchange or repaired devices. If you use specific parameters for your application, you have to set these again.

Service orders

All service orders are carried out exclusively according to our general terms and conditions for the repair and maintenance, available in our website.



Declaration of conformity

We hereby declare that the product cited below satisfies all relevant provisions according to the following EC directives :

- Low-voltage 2014/35/EU
- Machinery 2006/42/EC (Annex II, No. 1 A)
- Electromagnetic Compatibility 2014/30/EU
- Restriction of Hazardous Substances 2011/65/EU

The technical file is drawn up by Mr Gilles Baret, Pfeiffer Vacuum, Société par Actions Simplifiées [simplified joint stock company], 98, avenue de Brogny B.P. 2069, 74009 Annecy cedex, France.

2033SD - 2033C1 - 2033C2
2063SD - 2063C1 - 2063C2

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Date 17/11/2015

VACUUM SOLUTIONS FROM A SINGLE SOURCE

Pfeiffer Vacuum stands for innovative and custom vacuum solutions worldwide, technological perfection, competent advice and reliable service.

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From a single component to complex systems:

We are the only supplier of vacuum technology that provides a complete product portfolio.

COMPETENCE IN THEORY AND PRACTICE

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We support you with your plant layout and provide first-class on-site service worldwide.

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www.pfeiffer-vacuum.com

