



OPERATING INSTRUCTIONS

EN

Translation of the original instructions

ACP 120G - ACG 600G

Industrial multistage Roots dry pump

PFEIFFER  **VACUUM**

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1 About this manual

1.1 Validity

This operating manual is for customers of Pfeiffer Vacuum. It describes the functioning of the designated product and provides the most important information for safe use of the unit. The description follows applicable EU guidelines. All information provided in this operating manual refers to the current state of the product's development. The documentation remains valid as long as the customer does not make any changes to the product.

Up-to-date operating instructions can also be downloaded from www.pfeiffer-vacuum.com.

This document is a translation of the original French instructions.

This manual covers products with the following part numbers:

P/N	Description
ACP120Gxxx1xxx1	models for ACP 120G
ACG600Gxxx1xxx1	models for ACG 600G

1.1.1 Applicable documents

ACP 120G/ACG 600G	Operating instructions
Declaration of incorporation	Included with this manual

1.2 Conventions

1.2.1 Safety instructions

The safety instructions in Pfeiffer Vacuum operating instructions are the result of risk evaluations and hazard analyses and are oriented on international certification standards as specified by UL, CSA, ANSI Z-535, SEMI S2, ISO 3864 and DIN 4844. In this document, the following hazard levels and information are considered:

DANGER
Imminent danger Indicates an imminent hazardous situation that will result in death or serious injury.
WARNING
Possibly imminent danger Indicates an imminent hazardous situation that can result in death or serious injury.
CAUTION
Possibly imminent danger Indicates an imminent hazardous situation that can result in minor or moderate injury.
NOTICE
Command or note Command to perform an action or information about properties, the disregarding of which may result in damage to the product.

1.2.2 Pictographs



Prohibition of an action to avoid any risk of accidents, the disregarding of which may result in serious accidents



Warning of a displayed source of danger in connection with operation of the unit or equipment



Command to perform an action or task associated with a source of danger, the disregarding of which may result in serious accidents



Important information about the product or this document

1.2.3 Instructions/Abbreviations used

→ Work instruction: you must perform an operation here.

BF/FB Functional block

HP High pressure

BP/LP Low pressure

(M) Driving shaft

(m) Driven shaft

S1, S2, Sx Specific tools



Inspection instruction: you must check a key point on the illustration.



Instruction: you must discard the part when disassembling. When reassembling, this part will be replaced by a new part.



Apply the stated tightening torque.

FC Variateur / Frequency converter

1.2.4 Labels

WATER IN	Water circuit connection: input										
PRESSURE MAX 101 PSI (7 bars)	Maximum pressure of water circuit										
WATER OUT	Water circuit connection: output										
N2	Nitrogen circuit connection										
EXHAUST	Pump exhaust connection										
	Earth connection										
200-230 V 380-480 V	This label indicates the mains voltage of the installation on which the pump must be connected.										
<table border="1"> <tr> <td rowspan="2">THREE PHASES</td> <td colspan="2">Full-Load current Ampere</td> </tr> <tr> <td>Volt</td> <td>50 Hz - 60 Hz</td> </tr> <tr> <td rowspan="2">FOUR WIRES</td> <td>200-230 Δ</td> <td>xx A</td> </tr> <tr> <td>380-480 Y</td> <td>yy A</td> </tr> </table>	THREE PHASES	Full-Load current Ampere		Volt	50 Hz - 60 Hz	FOUR WIRES	200-230 Δ	xx A	380-480 Y	yy A	This label indicates the full load current value at the exit of the motor depending on the mains voltage (see 12.2.4).
THREE PHASES		Full-Load current Ampere									
	Volt	50 Hz - 60 Hz									
FOUR WIRES	200-230 Δ	xx A									
	380-480 Y	yy A									



It informs the user of the need to fill the pumps with oil (see 5.2).

6



This label warns the user against possible risk of injury due to any hand contact with hot surfaces.

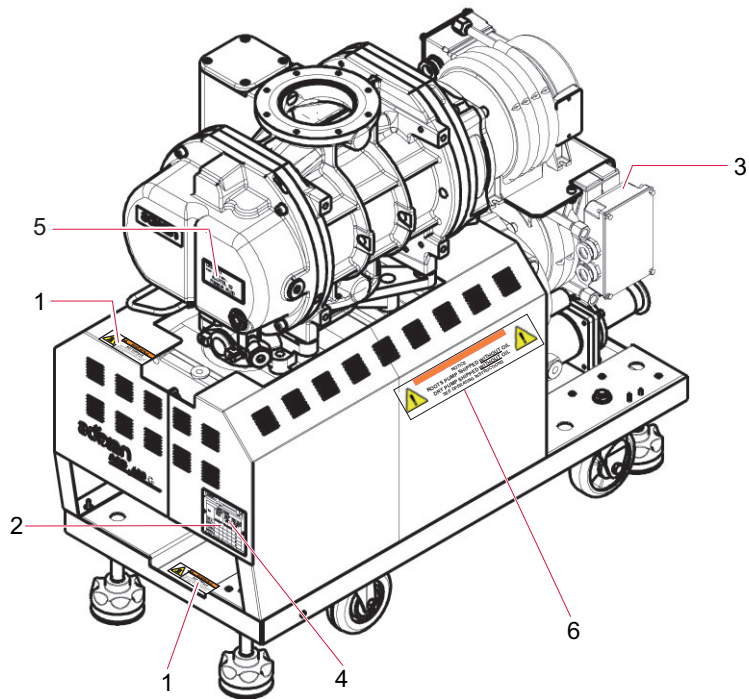
⇒ It states that protective gloves should be used before performing any intervention.

1



This label informs the user of oil to use.

5



- 1 Hot surface label
- 2 Full load current label (see 5.5.4)
- 3 Full load current label
- 4 Manufacturer label (see 4.1)
- 5 Oil label
- 6 Oil filling label

2 Safety

2.1 Safety precautions



Obligation to inform

Any person responsible for installing, using or maintaining the product must first read the security instructions in this operating manual and comply with them.

→ It is the operating customer's responsibility to protect all operators against the dangers associated with the product, with the media pumped and with the entire installation.



Installation and use of the accessories

The products can be fitted with special accessories. The installation, use and refurbishment of the connected accessories are described in detail in the respective manuals.

→ Only use original accessories.

→ Accessory part numbers: see **Accessories**.



WARNING

Hazards associated with non-compliant electrical installation

Safe operation after installation is the operator's responsibility.

→ Connect the product to an installation that is compliant with local safety standards.

→ Do not carry out any alterations or modifications to the product on your own initiative.

→ Check that the pump is correctly connected to the emergency stop system for the equipment (or pumping installation).

→ For specific questions, contact your service centers.



WARNING

Electric shock hazard in case of contact

When the main isolator is set at **O**, or when the emergency stop is activated, some internal components still have an electrical charge

→ Make sure that the mains connection is always visible and accessible so that it can be unplugged at any time.

→ Disconnect the power cable from all power sources before starting any work on the product.



WARNING

Danger due to lack of lock out/tag out (LO/TO) electrical device.

In order to properly secure the pump for installation and/or maintenance, it is required to lock out/tag out the pump properly in accordance with OSHA requirement 29 CFR.1910.147.



WARNING

Other localised hazardous energies

Electrical circuits and other pressurized circuits, such as nitrogen and water are potential hazards.

→ Always lock out these energy sources before working on the product.



WARNING
<p>Thermal safety</p> <p>The motor is equipped with thermal safeties which deliver an information about the motor temperature level.</p> <p>→ It is imperative to cable these thermal safeties to protect the motor.</p> <p>→ Do not neutralize these safeties during the use.</p>



WARNING
<p>Risk associated with process gases</p> <p>The user and/or integrator of the product is/are fully responsible for the operational safety conditions of the equipment. The manufacturer has no control over the types of gases this pump is exposed to. Frequently process gases are toxic, flammable, corrosive, explosive and/or otherwise reactive. It is the user and/or the integrator's responsibility to follow the necessary safety requirements. Toxic gases can cause serious injury or death. Operators and users must:</p> <p>→ Take the appropriate safety recommendations to prevent injury. Consult the responsible department for instructions and safety information.</p> <p>→ Hazardous gases from the pump can cause serious injury or death. Regulations require to connect the pump's exhaust to a facility hazardous gas exhaust system which incorporates appropriate filters, scrubbers, etc. This system must meet all air and water regulations.</p> <p>→ Check that the pump is correctly connected to the equipment (see <i>Installation</i>). Contact the service center for further information.</p>

The potential risks with a dry pumping system involve electricity, the chemical processes, hot surfaces, the pressurized nitrogen and water devices and the lubricant.

- Only qualified personnel trained in safety rules (EMC, electrical safety, chemical pollution) may carry out the installation and maintenance described in this manual. Our service centers can provide the necessary training.
- Do not remove the blanking plates sealing the inlet and exhaust ports if the product is not connected to the pumping line.
- Do not operate the product unless the inlet and exhaust are connected to a vacuum and exhaust pumping line.
- Do not expose any part of the human body to the vacuum.
- Comply with all safety and risk prevention instructions in accordance with local safety standards.
- Regularly check compliance with all precautionary measures.
- Do not turn on the product if the covers are not in place.

2.2 Protective equipment

In some situations, personal protective equipment must be worn when handling the vacuum pump and its components. The owner must provide operators with the necessary equipment. This equipment must be checked regularly and used in accordance with the supplier's recommendations.



DANGER
<p>Health risk due to contact with toxic materials</p> <p>The vacuum pump, pumping line components, and operating media may be contaminated with toxic, corrosive, reactive, or radioactive materials, depending on the process.</p> <p>→ Wear appropriate safety equipment when pump is disconnected for maintenance, while it is being re-installed, and during filling and draining of operating media.</p>

**WARNING****Risk of injury due to hot surfaces**

For the operator's safety, the products are designed to avoid thermal risk. However, specific operating conditions may exist that require extra caution from users due to the high temperatures (external surfaces > 70°C on the exhaust pipe).

- Let the part cool before working on the product.
- If necessary wear protective gloves according to directive EN 420.

**WARNING****Risk of injury due to falling objects**

When transporting parts/components and during maintenance there is a danger of loads slipping and falling down.

- Carry small and medium-size parts/components with both hands.
- Carry parts/components > 20 kg with a suitable lifting device.
- Wear safety shoes with a steel toe in accordance with directive EN 347.

2.3 Proper use

**NOTICE****EC conformity**

The manufacturer's declaration of conformity becomes invalid if the operator modifies the original product or installs additional components.

- Following installation into a plant and before commissioning, the operator must check the entire system for compliance with the valid EU directives and reassess it accordingly.

- The vacuum pump may only be used to generate a vacuum while pumping gases.
- The product may be used in an industrial environment.
- The pumping of condensable vapors.
- The continuously pumping for the inlet pressure > 50 hPa.
- The G version pump is compatible with traces of corrosive gases.

2.4 Improper use

Improper use will cause all claims for liability and warranties to be forfeited. Improper use is defined as usage for purposes deviating from those mentioned above, especially:

- pumping of flammable and explosive mixtures
- pumping of corrosive gases (exception: pumps in G version)
- pumping of explosive media
- pumping of liquids
- pumping of dusts
- use of the vacuum pump to generate pressure
- operation in potentially explosive areas
- use of accessories or spare parts, which are not named in this manual

The product is not designed to carry people or loads and is not for use as a seat, step-ladder or any other similar purpose.

3 Transport and storage

Upon delivery, check that the product has not been damaged during transport. If the product is damaged, take the necessary measures with the carrier and notify the manufacturer. In all situations we recommend:

- Keeping the product in its original packaging so it stays as clean as it was when dispatched by us. Only unpack the product once it has arrived at the location where it will be used.
- Keeping the packaging (recyclable materials) in case the product needs to be transported or stored.
- Keeping the blanking plates in place on the inlet, exhaust and purge ports while the product is not connected to the pumping line.

3.1 Transport

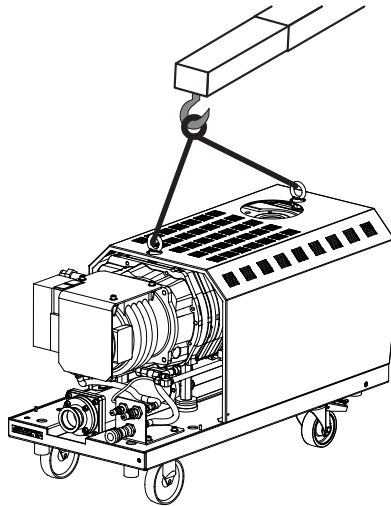


WARNING
<p>Risk of injury associated with heavy loads</p> <p>Given the weight of the product, it should be removed from its packaging only by personnel qualified and trained in handling heavy materials.</p> <ul style="list-style-type: none">→ Use the lifting rings and devices provided with the product.→ The manufacturer cannot be held liable for the consequences of using lifting devices other than those provided.



WARNING
<p>Risk of tilting</p> <p>Even though compliance with EEC safety rules is guaranteed, all necessary precautions should be taken when moving, installing and operating the product.</p> <ul style="list-style-type: none">→ Do not place the product on an inclined plane: its weight could cause the operator to be dragged.→ Only use castors to move it short distances.→ Place it on a flat, hard floor.→ Do not push the product sideways.→ Adjust the levelling feet for operation to make sure that the pump is not supported by the castors. (Refer to Technical data and dimensions in these operating instructions for location of the center of gravity.)

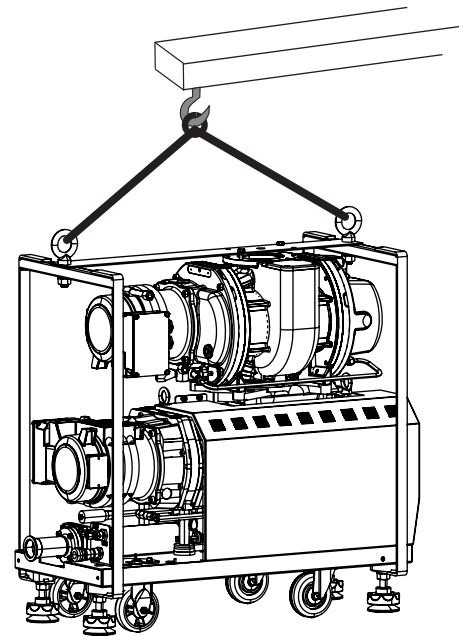
ACP 120G



To lift the product:

- ⇒ Use a lifting device suitable for the product's weight.
- ⇒ Use a lifting sling with 2 arms with the following characteristics:
 - length of each arm > 500 mm
 - load per arm > 350 kg
- ⇒ Screw the hoisting rings (delivered in the crate in separate packaging) in the suitable holes. With a sling, lift the pump using hoisting rings.
- ⇒ Adjust the leveling pads of the frame and lower the pump on the castors to move it over short distances.

ACG 600G



- ⇒ Use the hoisting sling to lift the product with the hoisting rings fixed on the arch.
- ⇒ Adjust the leveling pads of the frame and lower the pump on the castors to move it over short distances.

3.2 Storage



NOTICE

Duty to inform

In order to prevent moisture from entering the pump before installation, it has been pressurized before shipment with nitrogen and sealed with blanking plates.

- Do not remove the blanking plates sealing the inlet and exhaust ports if the product is not connected to the pumping line.
- Do not operate the product unless the inlet and exhaust are connected to a vacuum and exhaust pumping line.

If the new pump is going to be put into storage:

- Keep the pump wrapped in its protective film.
- It is **absolutely necessary** to leave the inlet and exhaust blanking plates in place because the pump has been pressurized with dry nitrogen.
- Store the pump according to storage temperatures (see 12.2.1).

If the inlet and exhaust blanking plates have been removed, there is a risk of internal part corrosion. We advise you to pressurize the pump with nitrogen.

Provide a nitrogen supply with the required characteristics (see 12.2.3).

- Seal the inlet port with inlet blanking plate delivered with the pump.
- Connect the nitrogen to the gas connection located on the inlet blanking flange.
- Pressurize the pump with dry nitrogen to a relative pressure of 200 hPa.

- When the nitrogen flows out of the exhaust, seal it up with the provided accessories.
- Disconnect the nitrogen purge connection.
- Store the pump in a clean and dry area, at ambient temperature (see 12.2.1), for a maximum period of 1 year.

Never store a pump which has been used. Return it to a service center according to the product **Service** procedure (see 10).

4 Product description

4.1 Product identification

To correctly identify the product when communicating with Pfeiffer Vacuum, always have the information from the rating plate available.

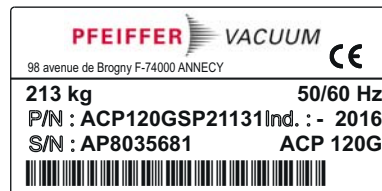


Fig. 1: Rating plate example

4.1.1 Scope of delivery

- 1 vacuum pump
- 2 hoisting rings
- 1 funnel
- 2 water couplings
- 1 nitrogen coupling
- 1 operating instructions
- Oil can(s)
- 2 adaptators M/F NPT

4.1.2 Product presentation

Based on the multi-stages Roots pump technology, the **ACP 120G**, **ACG 600G** provide the benefits of clean and dry vacuum for applications in industrial and research & development.

These pumps are characterised by their robustness, their availability for pumping cycles on high volume and unrivaled long maintenance intervals (up to four years in clean applications).

For each model, a "large volume" option is available. In this configuration, a frequency converter is installed on the FB and on the Roos blower, to allow the pumping of large chamber volumes > 1 m³ (max. Volume 10 m³).

4.2 Man/machine interfaces

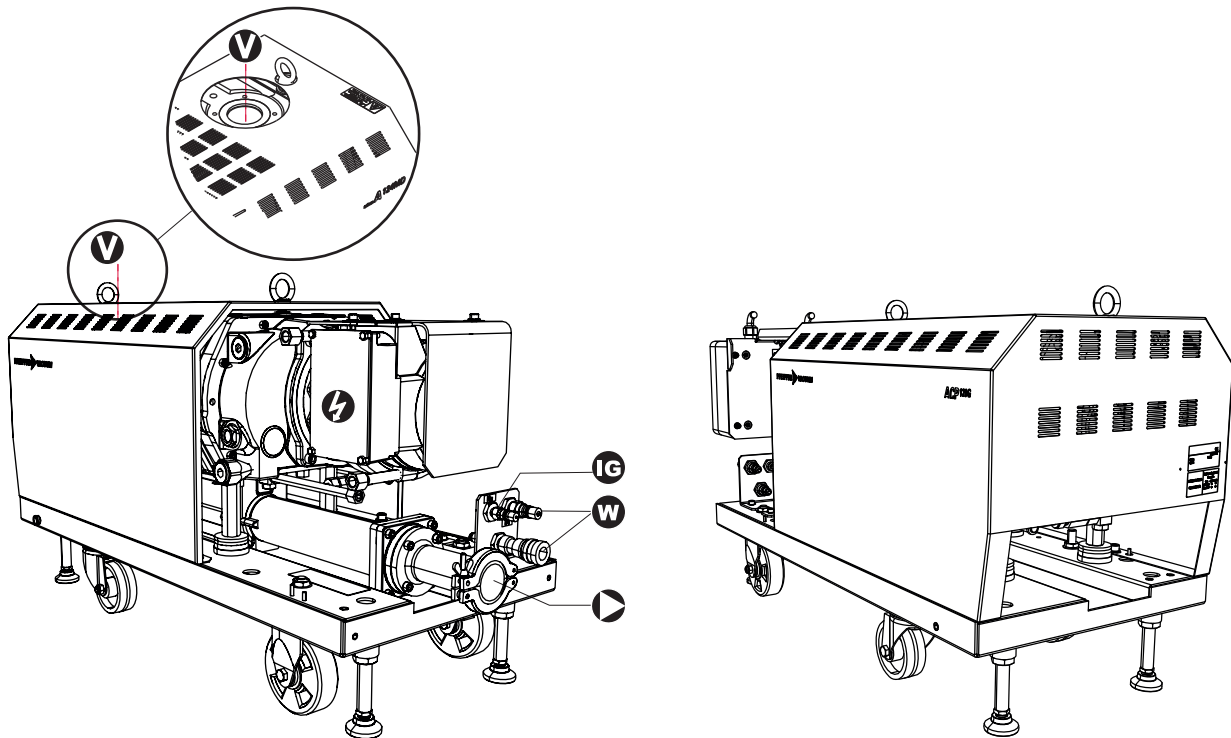







Fig. 2: Man/machine interfaces

	Inlet		Exhaust
	Nitrogen inlet		Power supply
	Water inlet/outlet		

5 Installation

5.1 Set-up

The pump must be operated in the horizontal position in support on its feet, with the pumping axis vertical and the inlet opening upwards.

- Determine where the pump will be placed.
- Use the handling devices to position the pump in the desired location, lift the pump using hoisting rings (see 3.1).
- Lock the pump by adjusting the four leveling feet.
- Use a spirit level to check that the frame is in horizontal position in both axis.
- Unscrew and remove the lifting ring from ACP 120, inlet side.
- Remove the lifting system fixed to frame on the model ACG 600G.



CAUTION

Risk of tear-out or trips

- Route and secure cables, hoses and pipework during installation to avoid any possible risk of tripping.

5.2 Oil filling



DANGER

Health risk in case of oil contact

The pumps are delivered empty of oil: the oil is delivered in separate containers.

- Wear mask, gloves, protective glasses to fill the pumps with oil.

NOTICE

Only use approved operating fluids

The pumps are factory tested using Pfeiffer Vacuum oil.

- The same oil **must be used** during operation. The oil safety data sheet is available on the website.

Model	A113 Oil quantity (liter)			Total
	FB	Roots housing		
		Gear side	Motor side	
ACP 120G	0.35	–	–	0.35
ACG 600G	0.35	0.45	0.18	0.98

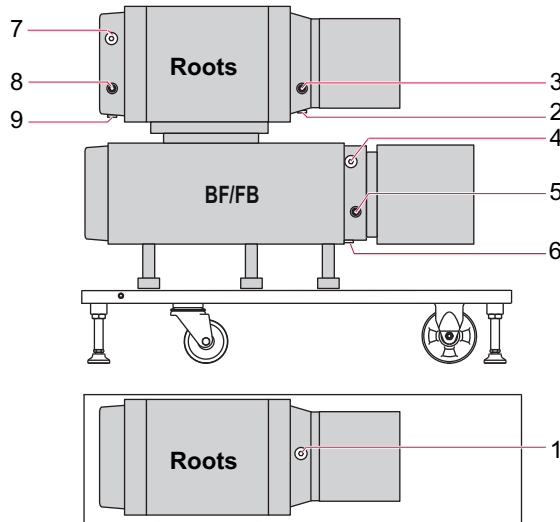


Fig. 3: Oil case filling

1	Roots motor side housing fill plug	6	FB drain plug
2	Roots motor side housing drain plug	7	Roots gear side housing fill plug
3	Roots motor side housing sight glass	8	Roots gear side housing sight glass
4	Functional block fill plug	9	Roots gear side housing drain plug
5	Functional block sight glass	BF	Functional block

5.2.1 Oil filling caution

- Make sure that the mains voltage cable is disconnected by any source of energy.
- Make sure the pump is **positioned horizontally**.
- Use the funnel equipped with a flexible tube (delivered with the pump).

5.2.2 Procedure

Fill the housings:

- Roots motor side, and Roots gear side,
- Functional block (FB).

For each housing, proceed as follows:

- Remove the fill plug.
- Position the funnel in the oil fill neck.
- Fill the pump with oil according to the recommended quantities. **Do not exceed the indicated quantities.** The oil level should be in the middle of the sight glass. For this to be accurate, wait a few minutes for the oil to settle over all internal surfaces.
- Replace the fill plug securely.

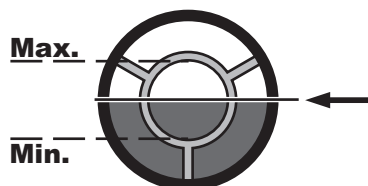


Fig. 4: Oil sight glass

5.3 Connection to the water circuit

In order to **limit corrosion and motor cooling circuit clogging**, it is recommended to use water with the required characteristics (see 12.2.2).

If the "solid particle size" and "solid pollution" water characteristic values cannot be reached, install a filter on the water input.



NOTICE

The use of uncontrolled city water can lead to water circuit clogging due to lime-scale deposition.

This may necessitate, in the worst case scenario, a complete cleaning and overhaul of the cooling circuit.

The presence of micro-organisms like aquatic weeds and micro-biological substances like bacteria can lead to cooling problems in the pump.

→ An appropriate water treatment system must be used to prevent the growth of such microorganisms.

5.3.1 Procedure



NOTICE

Risk of water supply failure

If loss of cooling water creates a significant risk for the process:

→ Control the cooling circuit using an external system able to take over in case of failure.



WARNING

Pressurised circuit

In order to carry out operations on the product safely, the user must:

→ Fit a manual valve on the water circuit 3 m from the product allowing the cooling circuit to be locked.

→ Connect the water pipes to the coupling connections (packaged separately):

Water inlet = female connection,

Water outlet = male connection.

→ Connect the plugs on **WATER IN** and **WATER OUT** (see 4.2).

→ Check that there are no leaks in the pipes and connections of the water circuit.

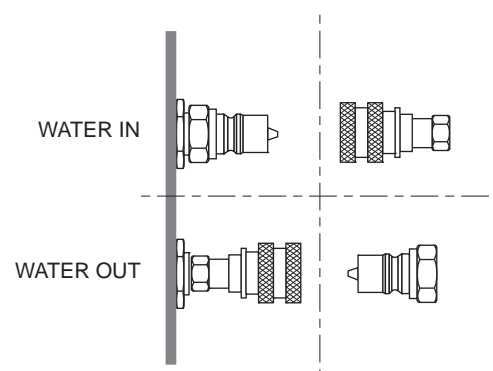
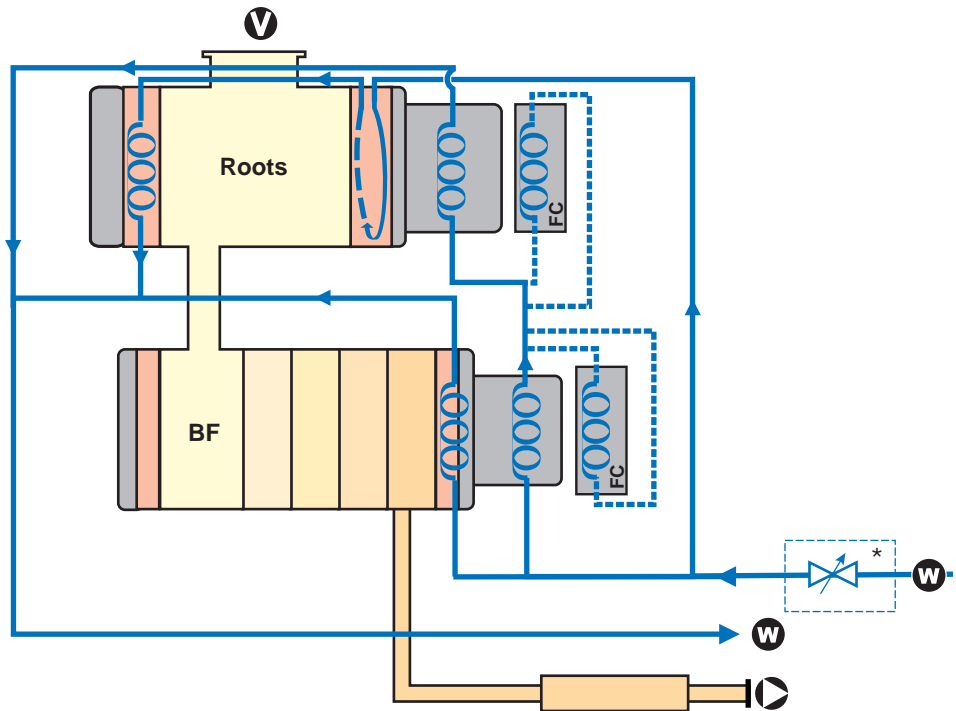


Fig. 5: Water circuit connection

Schematic diagram of the water circuit device



* customer's responsibility

Fig. 6: Water circuit device

W	Water bucket/outlet
BF	Functional block
FC	Frequency converter

Assembly recommendation

It is advised to equip the supply of cooling circuit with a regulator valve (customer's responsibility).

5.4 Connection to the nitrogen circuit



DANGER

Risk of explosion

If pyrophoric materials above the LEL (lower explosive limit) are sent to the pump, the nitrogen supply must make it possible to dilute this concentration.

- Ensure there is a sufficient flow of nitrogen to lower the concentration below the LEL.
- Provide in addition an interlock to ensure that gas flow towards the pump is stopped when nitrogen is lost.

A filtered dry nitrogen supply with the characteristics defined is required for optimum performance (see 12.2.3).

5.4.1 Procedure



NOTICE

Risk of nitrogen supply failure

If loss of purge flow creates a significant risk for the process:

- Control the nitrogen supply using an external system able to take over in case of failure.



WARNING

Pressurised circuit

To work safely on the product, the operator must:

- Install a manual valve on the nitrogen circuit at a distance of 3 m from the product, so that the nitrogen supply can be locked.
- Connect the nitrogen pipe to the coupling connection (packaged separately). Provide a 6.35 OD (1/4 inch) pipe tubing (supplied by the customer).
- Connect the plug on **IG** marked **N2** (see 4.2).

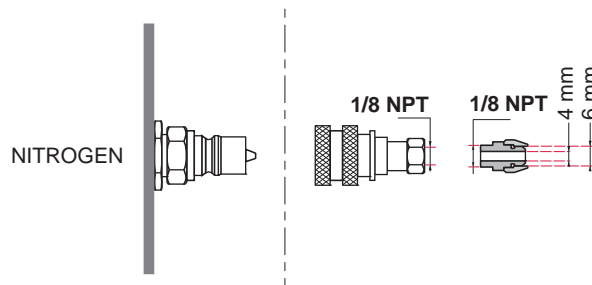


Fig. 7: Nitrogen circuit connection

Schematic diagram of the nitrogen injection device

NOTICE

Damage of internal parts

A sudden inrush of nitrogen into the pressurization circuit may result in damage to internal parts. It is recommended to equip the nitrogen circuit with a nitrogen pressure regulator and a nitrogen manometer (supplied by the customer). Before pressurizing the circuit, check that the pressure regulator is closed.

A gas purge circuit protects the low and high pressure bearings and dilutes trace amounts of corrosive gases.

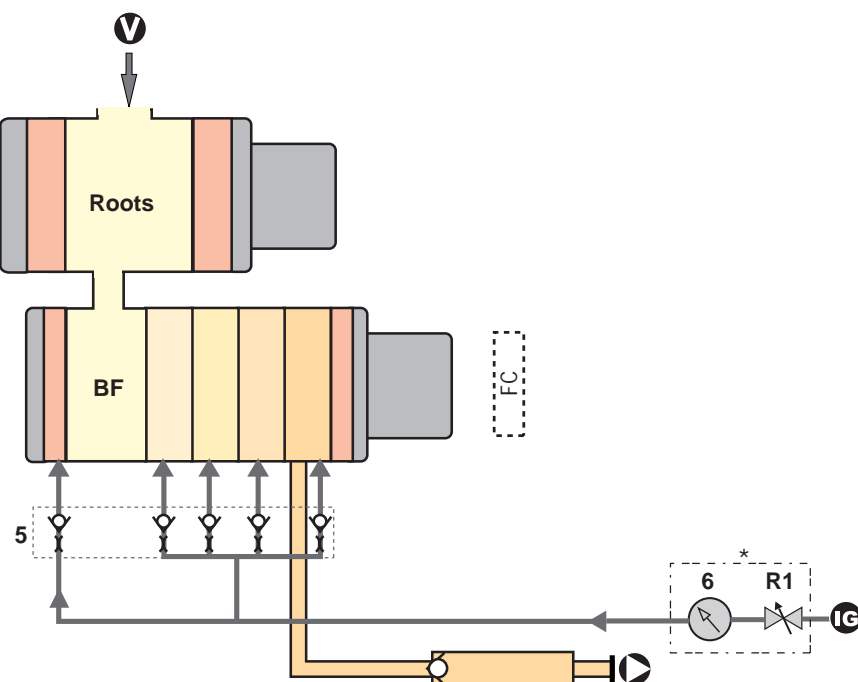


Fig. 8: Nitrogen injection device

R1	Pressure regulator *	<i>Nitrogen flow adjustment</i>
5	Injection manifold fitted with check valves and calibrated injectors	<i>Nitrogen flow distribution in BF</i>
6	Manometer *	<i>Measure the pressure</i>
BF	Functional block	

* customer's responsibility

→ Adjust the nitrogen flow with the pressure regulator in a pressure indicated in the table below according to the process. To define this pressure, contact the Pfeiffer Vacuum customer service.

Pressure (hPa)	Flow (slm)
$0.7 \cdot 10^3$	20
$1.4 \cdot 10^3$	30
$2 \cdot 10^3$	40
$2.6 \cdot 10^3$	50
$3.2 \cdot 10^3$	60

5.5 Electrical connection



WARNING

Electric shock hazard

Voltage and current can cause electric shock. Only skilled, authorized operator trained in the relevant health and safety aspects (EMC, electrical hazards, chemical pollution, etc.) may carry out maintenance work.

→ Disconnect the power line cable from all power sources before doing any work on the product and/or removing the covers.

WARNING

Risk of electromagnetic disturbance

The product's EMC behavior is guaranteed only if the relevant EMC standards are followed during installation.

→ Use shielded cables and connections for the interfaces in interference-prone environments.

WARNING

Hazards associated with non-compliant electrical installation

Safe operation after installation is the operator's responsibility.

- Connect the product to an installation that is compliant with local safety standards.
- Do not carry out any alterations or modifications to the product on your own initiative.
- Check that the pump is correctly connected to the emergency stop system for the equipment (or pumping installation).
- For specific questions, contact your service centers.

The pump has neither command system nor electric protection. The three-phase motor in compliance with the standards UL/CSA/CE is equipped with thermal safeties with dry contacts which it is imperative to connect. The electric installation of the pump is of the owner responsibility who has to:

- Supply the system of command, locking and electric protection (circuit breaker, emergency shutdown) according to the given recommendations (see 5.5.1).
- Connect the pump with its electric installation according to the current safety standards.
- Connect necessarily at least the thermal safety of 150 °C available in the motor terminal box (see 5.5.1).

5.5.1 Customer electrical installation protection

Installation protection with circuit breaker

The user must supply the pump from facilities equipped with main circuit breaker, curve D (IEC 60947-2), in accordance with local regulations and with at least a 10 kA short circuit cut-off capacity. This protection device should be in close proximity to the pump (no further than 7 m) within line of sight of the pump.

This circuit breaker supply and wiring is a customer's responsibility: main circuit breaker rating (see 12.2.4).

Differential circuit breaker

In the event of an insulation defect, you must install a differential circuit breaker on the main power supply to protect personnel (see 12.2.4). Contact your service center for advice. In all cases, comply with current local regulations.



CAUTION

Risk of earth fault

The user must provide a second protective earth (ground) conductor with a cross-sectional area at least equal to the conducting wire size.

- Connect the protective earth stud to the suitable installation earth point such as the host system frame or primary grounding point.
- Ensure that the equipment and the electrical supply cable are suitably protected against earth defects and that the earth wire is longer than the 3 conducting wires.



WARNING

Thermal safety

The motor is equipped with thermal safeties which deliver an information about the motor temperature level.

- It is imperative to cable these thermal safeties to protect the motor.
- Do not neutralize these safeties during the use.

5.5.2 Change of cabling in the motor terminal box

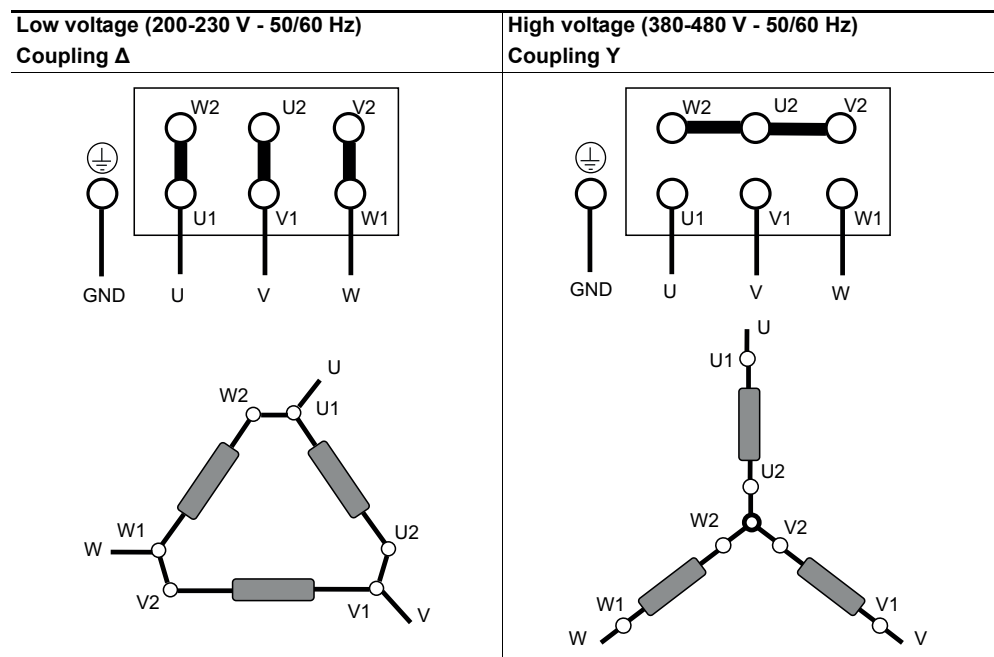
The pump is equipped with a three-phase motor to 6 threads whose cabling is given below. In case of doubt, only the plate appearing in the terminal box holds reference place. In case of **ACG 600G**, there are 2 motors. At factory, the motor(s) is/are coupling in star.

→ Check that the coupling of motor(s) is in conformity with the mains voltage.

Motor characteristics						
Coupling	Mains voltage (V)	Frequency (Hz)	Speed (min-1)	Power supply (kW)	Cos φ	Intensity (A)
Δ	200-230	50	2820 - 2850	1,5	0,84 - 0,76	8
		60	3420 - 3435	1,5	0,90 - 0,85	8
Y	380-480	50	2835 - 2850	1,5	0,84 - 0,76	6
		60	3420 - 3440	1,5	0,88 - 0,77	6

→ Open the terminal box.

→ Do the coupling according to the mains voltage required.



→ Use an EEC cable in compliance with IEC 60227 and IEC 60245 standards with the following characteristics:


- heatproof (because it can come into contact with hot surfaces),
- with conducting wire section suitable at current (see 12.2.4).

→ Connect separately the ground wire (PE) on the ground terminal.

→ Do a test of continuity of mass between the installation and the pump.

→ Identify by a label the mains voltage on the terminal box so that it corresponds to the realized cabling.

→ Proceed at identical for each one of motors.

The symbol IEC 60417#5019  is located near the ground terminal in the terminal box.

5.5.3 Connecting of the thermal safeties

The functional block motor is equipped with 3 thermal safeties (100 °C, 120 °C and 150 °C): NC dry contact - 250 V max. - 0.5 A max.

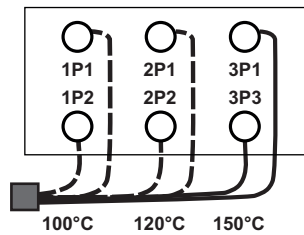


WARNING

Thermal safety
 The motor is equipped with thermal safeties which deliver an information about the motor temperature level.
 → It is imperative to cable these thermal safeties to protect the motor.
 → Do not neutralize these safeties during the use.

Connecting the thermal safety

→ Pass the cable (supplied by the customer) through the feedthrough and connect the safeties according to the drawing below :



In case of an ACG 600G, there are 2 motors. Each motor is equipped with thermal safety which it is necessarily to cable.



NOTICE

It is recommended to cable the sensors of temperature 100 °C and 120 °C so as to activate an alert in case of overheating.
 The implementation of this protection is of the responsibility of the owner.



NOTICE

It is imperative to cable the sensor of temperature 150 °C so as to cut the motor power supply in case of overheating.
 The implementation of this protection is of the responsibility of the owner.

5.5.4 Connecting to the electric cabinet of the customer

→ Check that the mains voltage label stuck on the motor terminal box (see 5.5.2) corresponds to the mains voltage of the installation. If it is not the case, modify the motor cabling (see 5.5.2).

Refer to the full load current label to know the maximal exit current of the motor (see 1.2.4).

THREE PHASES	Full-Load current Ampere		
	Volt	50 Hz	60 Hz
	200-230 Δ	8	8
380-480 Y	5	5	

Fig. 9: Full load current plate

→ Connect the pump to the electrical box of customer according to the characteristics of electrical wires.

5.5.5 Check of the rotation's direction at initial start-up

Before the initial start-up:

- Check that all the electrical connections were well made (see 5.5.2)(see 5.5.4)(see 5.5.3).
- Check that the oil filling was realized (see 5.2).

- Remove the blanking flanges at the inlet and exhaust of the pump: these elements prevent the introduction of foreign body in the pump during the transport and the storage. It is dangerous to leave them on the pump in use.
- Place a pressure gauge at the pump inlet (gauge at the customer expensive).
- **Start the pump hanging a few seconds then stop it.**
 - If the indicated pressure is lower than $5 \cdot 10^{-1}$ hPa, the rotation sens is correct.
 - If the pressure increases, invert 2 phases of the electric plug of arrival of the electric power supply cable on the pump.

ACG 600G pump

- Check the standalone FB direction of rotation according to the procedure described above.
- Start the Roots when the direction of rotation of FB is correct.
- Check the Roots direction of rotation according to the procedure described above.
 - the measured pressure must be lower than the pressure when the FB is stand-alone.

5.6 Connection to the pumping line

The user and/or product OEM is ultimately responsible for the equipment and must apply the specific safety guidelines, in accordance with local legislation.



DANGER	
Risk of ignition	When flammable materials are sent to the pump: <ul style="list-style-type: none"> → Provide a hardware-based LEL detection in the exhaust extraction system (detection capability at 25% of the LEL) that will stop chemical supply to the pump when gas is detected over 25% of the LEL for that flammable material.



DANGER	
Risk of explosion	If any corrosive, reactive, flammable, pyrophoric, oxidizing processes gases can be sent to the pump: <ul style="list-style-type: none"> → Use an exhaust gas monitoring to ensure that gas flow to the pump is stopped when exhaust gas device is lost.



WARNING	
Risk of crushing or cutting related to the rotating parts	Do not expose any part of the human body to the vacuum. The product is supplied with the inlet and exhaust sealed. <ul style="list-style-type: none"> → Remove these blanking plates when you are ready to connect the product to your vacuum system. → Do not operate the product unless the inlet and exhaust are connected to a vacuum and exhaust pumping line.

- Use accessories on the inlet and exhaust lines whose materials and sealing properties are compatible with gases being used.
- Provide in the pumping line, accessories to isolate the pump from the vacuum and exhaust line, to make the maintenance easier (inlet and exhaust isolation valves, purges,...).
- Remove the blanking plates blocking the inlet and exhaust ports.
- Keep the blanking plates, screws and washers for reuse when transporting the pump.
- Ensure that no screws, washers or other objects are dropped into the pump inlet.
- Fit flexible flanged bellows in the pumping line to reduce the transmission of vibrations.

The O-rings located under the blanking plates are compatible with standard applications. Other types of connection accessories are available in the product catalogue. The inlet and exhaust connections must not cause stress that could lead to leaks in the pumping line.

5.6.1 Connection at pump inlet



NOTICE

Limit of operation

→ Make sure that the parts or chambers connected to the inlet of our products withstand a negative pressure of $1 \cdot 10^3$ hPa in relation to atmospheric pressure.

The pump is not sized to support the weight of pumping line. It must be fixed to an other support.

To improve pumping speed, the pumping line must be as short as possible and its internal diameter must not be less than the pump inlet flange.

If need, connect at the inlet an inlet pipe extension (see 11).

5.6.2 Connection at pump exhaust



DANGER

Health risk in case of contact with toxic substances

Exhaust of corrosive, reactive, flammable, pyrophoric or oxidizing process gases may result in severe injury or death.

→ Always connect the pump exhaust to an exhaust extraction system.



NOTICE

Limit of operation

→ Ensure that all components in the exhaust pipeline have maximum pressure rating which is greater than the highest pressure that can be generated in your system.

5.7 Leak test



WARNING

Leak-tightness of the equipment

It is the user's responsibility to ensure this level of leak tightness is maintained, especially when dangerous gases are pumped. The operator must maintain this level of tightness, particularly when pumping dangerous gases. Proceed as follows:

→ Perform a leak test on the entire pumping line after installation.

→ Carry out regular checks to ensure that there are no traces of the gases pumped in the surrounding environment and that no air is entering the pumping line while the pump is running.

For more information concerning leak tests, please contact your service center.

6 Operation

6.1 Prerequisites to use



WARNING

Risk associated with process gases

The user and/or integrator of the product is/are fully responsible for the operational safety conditions of the equipment. The manufacturer has no control over the types of gases this pump is exposed to. Frequently process gases are toxic, flammable, corrosive, explosive and/or otherwise reactive. It is the user and/or the integrator's responsibility to follow the necessary safety requirements. Toxic gases can cause serious injury or death. Operators and users must:

- Take the appropriate safety recommendations to prevent injury. Consult the responsible department for instructions and safety information.
- **Hazardous gases from the pump can cause serious injury or death. Regulations require to connect the pump's exhaust to a facility hazardous gas exhaust system** which incorporates appropriate filters, scrubbers, etc. This system must meet all air and water regulations.
- Check that the pump is correctly connected to the equipment (see *Installation*). Contact the service center for further information.

Before initial start-up:

- Check of the rotation's direction of the pump (see 5.5.5).

Before each pump start-up:

- Check that the pump inlet is connected to the pumping line.
- Check that oil levels of housings are visible in the middle of the sight glasses (see 5.2.2).
- Switch on the supplies of cooling water and nitrogen.
- Switch on the electrical supplies.
- Check that exhaust pipe line is not clogged and that all the valves in the exhaust system are open.

6.2 Pump start-up

6.2.1 Switch on



NOTICE

Roots starting on the model ACG 600G

Differ the Roots starting of approximately 3 seconds after functional block starting.

- Activate the circuit breaker of the electrical cabinet to switch on the pump.
 - the FB and Roots are powered.

6.3 Pump shut-down

6.3.1 Switching off

- Activate the circuit breaker of the electrical cabinet to switch off the pump.
 - the FB and Roots motor power is closed.

6.3.2 Prolonged stop

If the pump has to be stopped for a prolonged period, apply the **Decommissioning** procedure (see 8).

NOTICE

Water solenoid valve

Close imperatively the water solenoid valve on the cooling circuit from stopping of motor power supply motor(s).

7 Maintenance

7.1 Safety and maintenance information



Duty to inform

Every person who is involved in maintenance and servicing work on the pump must read and follow the safety-relevant parts of all associated documents.



NOTICE

Exclusion of liability

Pfeiffer Vacuum accepts no responsibility concerning equipment damage, disrupted service or physical injury resulting from maintenance carried out by technicians who have not been trained in safety rules (EMC, electrical hazards, chemical pollution). Liability and warranty claims shall be inadmissible in this case.



DANGER

Risk due to pumping conditions

Remaining process gases in the pump may cause severe injury or death. Before removing the pump from the installation:

- Continue nitrogen flow from the process tool for 30 min. Nitrogen pressure and flow rate should be identical to the programmed values during process.



DANGER

Risk to the health in the event of contact with toxic substances

The vacuum pump, pumping line components, and operating media may be contaminated with toxic, corrosive, reactive, or radioactive materials, depending on the process.

- Wear appropriate safety equipment when pump is disconnected for maintenance, or reinstalled, and also for oil filling and draining.
- Ventilate the premises well.
- Do not eliminate maintenance waste via standard disposal channels. Have it destroyed by a qualified company if necessary.
- Install the inlet and exhaust blanking plates, accessories delivered with the pump or available as accessories (see chapter **Accessories**).



WARNING

Electric shock hazard in case of contact

Voltage and current can cause electric shock.



- Only skilled, authorized people may carry out maintenance work.
- **Disconnect the mains cable from all power sources.**



WARNING

Tightness after maintenance

Insufficient tightness after servicing could result in chemical hazards.

- Always perform a leak test after maintenance.



WARNING

Risk of injury due to hot surfaces

The exhaust temperature remains high even after the pump has stopped.

- Wait for the product to cool completely before carrying out any operations on it.



WARNING

Other localised hazardous energies

Electrical circuits and other pressurized circuits, such as nitrogen and water are potential hazards.

→ Always lock out these energy sources before working on the product.

- Ensure that the maintenance technician is trained in the safety rules concerning pumped gases.
- Surrounding lighting in maintenance area must be sufficient to work or make maintenance on the pump: higher than 300 lux.
- Allow the product to cool down before removing the covers for maintenance.
- Disconnect the mains cable on the product from all sources of power before carrying out any work on the product.
- Wait 5 minutes after switching off the electricity supply before carrying out any operations on the electrical components.
- Route and secure cables, hoses and pipework to avoid any possible risk of trips.
- Wear suitable protective equipment and dismantle the product in a ventilated area or under a ventilated hood.
- Collect the residues from the processes and call in a competent organisation to destroy them.
- Always protect the inlet and exhaust surfaces.
- Seal the inlet and exhaust orifices and pressurize the pump using nitrogen (see 7.7.4).

7.1.1 How to contact us

Personnel trained by the manufacturer must perform the overhaul. Contact your nearest service center at the following e-mail address: support.service@pfeiffer-vacuum.fr

7.2 Maintenance frequency

Only qualified personnel trained in safety rules (EMC, electrical safety, chemical pollution) may carry out maintenance on its site..In this case, the manufacturer cannot be held liable for this intervention type.

These operations of maintenance can be also realised by the manufacturer in its service center.

The realization of these operations allows to increase the duration of the product life but does not increase the guarantee period defined during the purchase of the product.

Operation	Periodicity
Functional block LP bearings replacement	Consult us
Exhaust pipe	1.5 years or 13 000 h

Operation	Periodicity
Overhaul	3 years or 26 000 h

The overhaul operations must be performed only by our service centers.

7.3 Maintenance on the customer’s site

The pump does not require any maintenance on the customer’s site apart from that described in this manual. All other maintenance must be carried out by your service center (see 10).

- Clean the outer surfaces of the product using a clean, lint-free cloth and a product that will not damage the screen-printed surfaces and adhesive labels.
- Check that exhaust pipe line is not clogged.

- Check the condition of the pipes and their connections and repair them if there is any sign of corrosion or leaks.
- Compare the colour of the oil with a sample of new oil. This will allow you to check the level of pollution or the extent to which the lubricant has deteriorated. The oil is changed during the overhaul by our service center.

7.4 Freeing up the FB

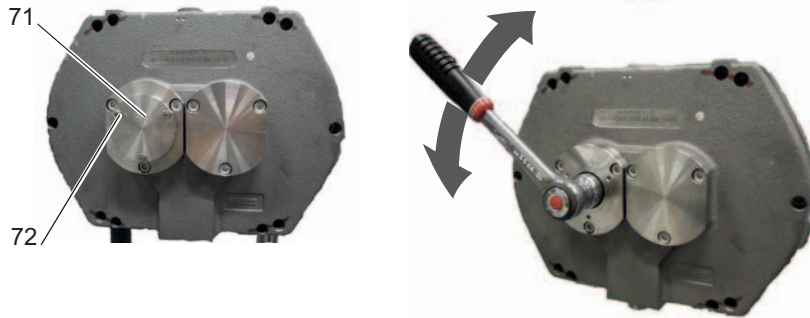


DANGER
<p>Risk to the health in the event of contact with toxic substances</p> <p>During pump disconnection, operator could be in contact with process residues on the exhaust and inlet that could cause severe injury or death.</p> <p>→ Take the appropriate safety measures to prevent injury. Consult the department manager for instructions and safety information.</p>

By-products generated by processes clogg the pump by deposition. When the FB rotation is no more possible, an alarm is displayed and the pump stops. It may be possible to free it up manually.

- Isolate and lock the power supply of the pump at the level of the electrical cabinet.
- Remove the cover.
- Remove the blanking plate (71) by unscrewing 3 screws CHc M4 x 10 (72).
- Remove the O-ring of its groove.
- Using a 21 mm female elbow wrench, move the driving shaft in both directions of rotation until free rotation is obtained.

NOTICE
<p>Risk of damage to the pump</p> <p>Using excessive force to rotate the FB may damage the pump.</p>



There should not be any resistance point.

Otherwise, the pump must have returned to the closest Pfeiffer Vacuum service center.

- Clean the O-ring and grease it lightly with vacuum grease.
- Put the O-ring back in its groove.
- Put the blanking plate (71) back and screw 3 screws CHc M4 x 10 (72): apply a couple of tightening of 2 N·m.
- Put the cover back.
- Realize a tightness test.
- Restart the pump (see 6).

Consumables

Description	P/N
Vacuum grease	064600

7.5 Ball bearing maintenance



DANGER

Risk to the health in the event of contact with toxic substances

During pump disconnection, operator could be in contact with process residues on the exhaust that could cause severe injury or death.

→ Take the appropriate safety measures to prevent injury. Consult the department manager for instructions and safety information.

The pump bearings (low pressure side) are fitted with greased ceramic-ball bearings. The fluorinated grease is resistant to high temperatures and corrosion resulting from vacuum applications. However, the bearings do need to be replaced at maintenance intervals (see 7.2).

Maintenance features

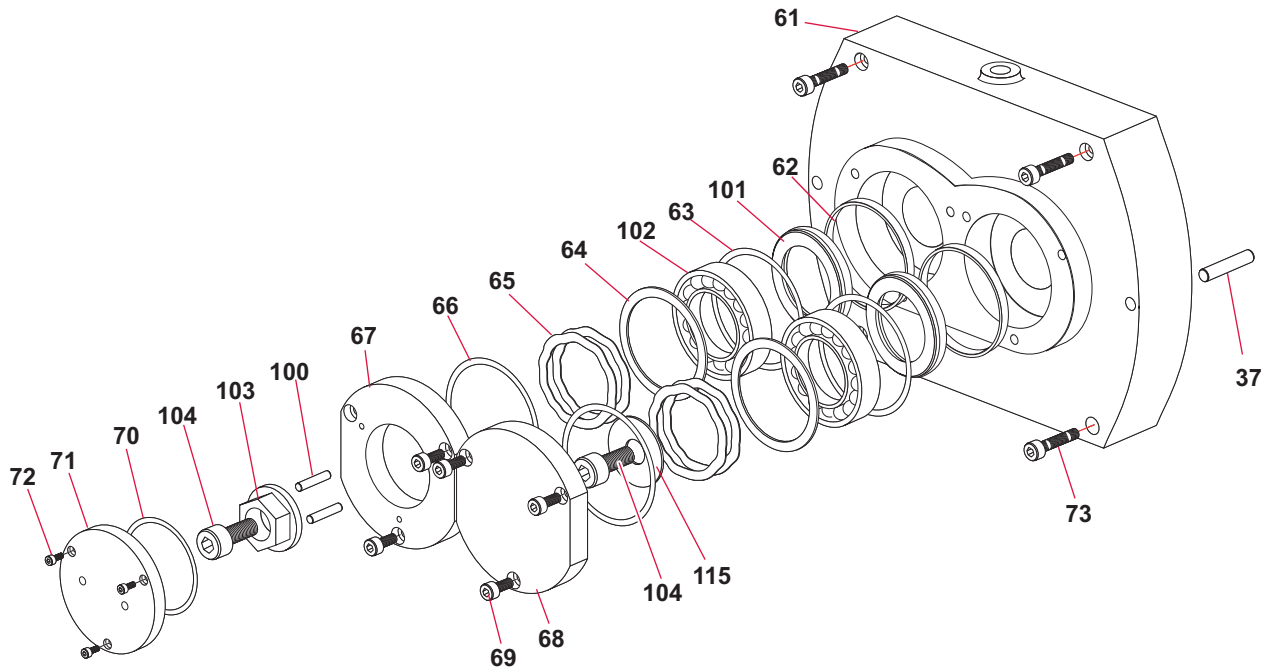
Replace all components (bearings, Borelly washers, washers, O-rings) during this operation.

Description	P/N
Bearing grease LP 10 gr	064627
LP bearings maintenance kit	110909
Description	P/N
Bearing extractor	102084
Seal extractor	063285
CVD lip seal kit	104070
- Positioner for CVD lip seal	
- Push rod for CVD lip seal	
- Pusher for LP bearings	

7.5.1 Cover disassembly

- Unscrew and remove the lifting ring (motor side).
- Unscrew the 4 screws Chc M8 x 20 that secure the cover.
- Remove the 4 washers and remove the cover.

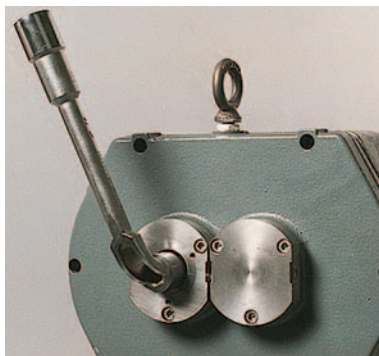
7.5.2 Ball bearing disassembly



Rep	Description	Qty	Rep	Description	Qty
37	Centering pin d8 x 30	2	70	O-ring	1
61	LP support	1	71	End cap	1
62	Friction ring	2	72	CHc M4 x 10 screw	3
63	O-ring	2	73	CHc M6 x 20 (12-9) screw	4
64	Washer ep. 0,2 mm	2	100	Needle d4 x 15	2
65	Wavy washer	4	101	Lip seal	2
66	O-ring	2	102	Ball bearings	2
67	LP bearing cover - Driving shaft (M)	1	103	Driving nut	1
68	LP bearing cover - Driven shaft (m)	1	104	CHc M8 x 17 screw	2
69	CHc M6 x 16 screw	6	115	Washer	1

The parts 62-63-64-65-66-70-102 and 115 are included in the maintenance kit

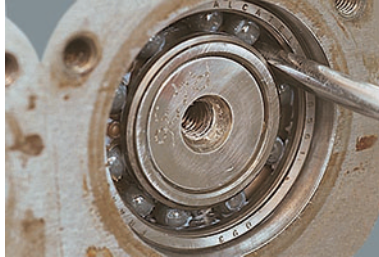
- Remove the end cap (71).
- Extract the O-ring (70).
- Remove the 2 LP bearing covers (67) and (68) from the LP (61).
- Extract the O-rings (66), the Borelly washers (65) and the washers (64).
- Use an open box wrench to block the driving shaft in order to loosen screws (104).



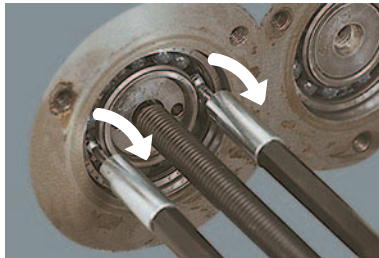
- Recover the driving nut (103), the 2 screws (104), the 2 needles (100) and the washer (115).
- Insert a thin screwdriver in the front shield of the bearings in order to remove them.



- Remove the excess gease on the balls.
- Push in their ball races using a screwdriver.



- Insert the 2 ends of the bearing extractor between the balls.
- Turn its 2 fittings a quarter turn to lock them into the ball bearing.



- Remove the bearings (102) and the 2 O-rings (63).
- Remove the 2 lip seals (101) using the push available in the maintenance kit (see 7.5).

7.5.3 Refitting ball bearings



Recommendations for fitting O-rings

- Only use new O-rings available in the overhaul kit.
- Grease the O-rings using vacuum grease before fitting them.

- Stretch and grease the O-rings (63) with special grease obtained in the maintenance kit (see 7.5) before fitting them the bearing housing of the LP support.
- Lightly grease the bearing housings of the low pressure support and the outer ball race of each bearing.
- Place the O-ring (101) in the positioner.
- Place the positioner against the friction ring (62).



- Slide the push rod and push it to insert the seal into the friction ring. (62).
- Position the 2 bearings (102) in their housings (marked side facing operator) then push them home, taking care not to shear the O-rings.

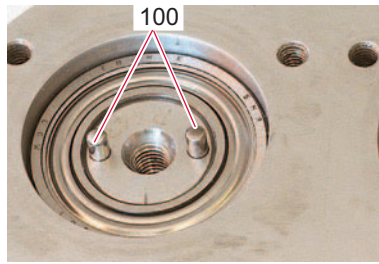


This operation should be done manually and should not require any effort.

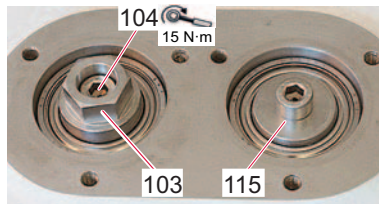
- Temporarily clamp the bearings with the covers (67) and (68) and tighten with the 6 screws (69) to hold them.

Retaining the bearings

- Fit the 2 pins (100) on the Driving shaft.



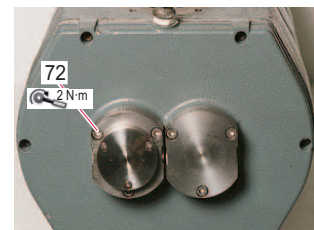
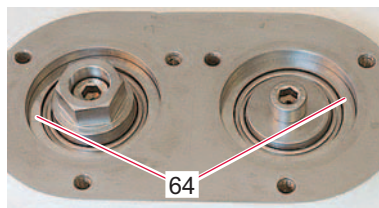
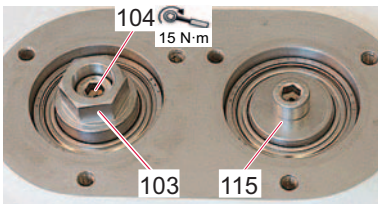
- Position the Driving nut (103). Place a drop of Loctite 222e glue on the drilled screw CHc M8 x 17 (104).



- Use an open socket wrench to hold the Driving shaft (M) in place.
- Tighten the screw (104). Apply a clamping torque of 15 N·m.
- Repeat the same operations for the screw (104) on the driven shaft (m) with the washer (115).
- Remove the covers (67) and (68).

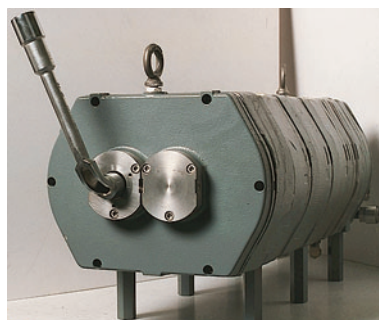
Removing the axial play on the stopped shafts

- Fit the protection washers (64) on the bearings.
- Place the Borelly washers (65) (2 washers per shaft).
- Grease the 2 O-rings (66) and fit them in the grooves on the 2 LP bearing covers (67) and (68).
- Fix the 2 covers (67) and (68) with the 6 screws CHc M6 x 16 (69). Apply a clamping torque of 15 N·m.



Refitting the cover (Driving shaft)

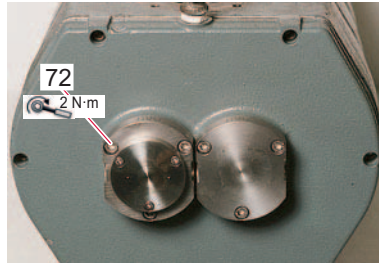
- Check the correct operation by turning the Driving shaft (M) using a wrench.



There should be no tight spots.

- Grease (lightly) the end cap O-ring (70) and place it in its groove.

- Refit the end cap (71) with the 3 screws CHc M4 x 10 (72). Apply a clamping torque of 2 N·m.



Refitting the cover

- Fit the cover.
- Fix the cover with the 4 CHc M8 x 20 screws equipped with their flat washers.
- Screw the lifting ring (motor side).

Helium test

It is recommended to carry out an helium test after intervention on the LP bearings (see 7.6.3)

7.6 Exhaust pipe maintenance



DANGER

Risk to the health in the event of contact with toxic substances
 During pump disconnection, operator could be in contact with process residues on the exhaust that could cause severe injury or death.
 → Take the appropriate safety measures to prevent injury. Consult the department manager for instructions and safety information.

DANGER

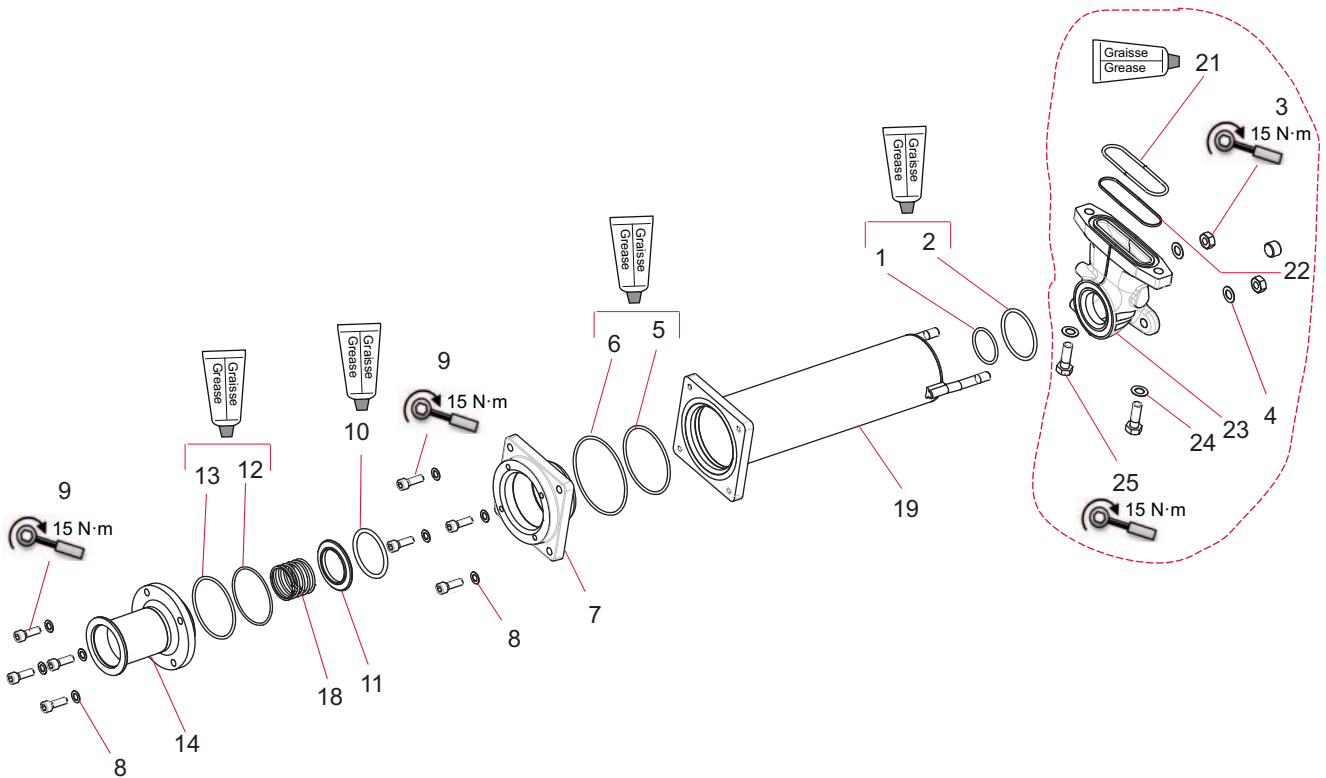
Risk to the health in the event of contact with toxic substances
 The vacuum pump, pumping line components, and operating media may be contaminated with toxic, corrosive, reactive, or radioactive materials, depending on the process.
 → Wear appropriate safety equipment when pump is disconnected for maintenance, or reinstalled, and also for oil filling and draining.
 → Ventilate the premises well.
 → Do not eliminate maintenance waste via standard disposal channels. Have it destroyed by a qualified company if necessary.
 → Install the inlet and exhaust blanking plates, accessories delivered with the pump or available as accessories (see chapter **Accessories**).

Maintenance operation (see 12.2.3).

Description	P/N
Exhaust maintenance kit	108180

7.6.1 Dismantling

- Remove the lifting ring (motor side).
- Remove the 4 screws CHc M8 x 20 of cover.
- Remove the 4 washers and remove the cover.



Rep.	Description	Qty
1	O-ring	1
2	O-ring	2
3	M8 nut	2
4	Washer W8	2
5	O-ring	1
6	O-ring	1
7	Partition silencer *	1
8	Wavy washer SS Diam.6	8
9	CHc 6 x 16 (12-9) screw	8
10	O-ring MSE 20 503302	1
11	Antisuck back valve	1

Rep	Description	Qty
12	O-ring	1
13	O-ring	1
14	Exhaust nozzle	1
18	Spring DN25	
19	Silencer pipe body	1
21	O-ring	1
22	Barrière PTFE Diam.56	1
23	Exhaust collector	1
24	W8 washer	2
25	H M 8 x 25 screw	2

* Partition silencer P/N: A214750S

The parts 1-2-5-6-10-12-13 and 21 are included in the maintenance kit

Exhaust pipe → Unscrew and remove the 2 screws H M8 (25) and washers (24) (if presents) .
 → Remove the silencer sub-assembly.

Silencer → Unscrew and remove the 4 vis CHc M6 (9) and remove the washers (8).
 → Remove the partition silencer (7).
 → Remove and discard the 2 O-rings (5 and 6).
 → Unscrew and remove the 2 nuts H M8 (3) and remove the washers (4).
 → Remove the exhaust collector (23).
 → Remove and discard the 3 O-rings (1-2-21).

Anti suckback valve → Unscrew and remove the 4 screws CHc M6 (9) exhaust pipe (14) fiwing and remove the washers (8).
 → Remove the exhaust nozzle(14), the anti suckbakck valve (11), the spring (18) and the O-rings (10-12 et 13).

7.6.2 Reassembly

Part cleaning → Clean the parts.



Recommendations for fitting O-rings

- Only use new O-rings available in the overhaul kit.
- Grease the O-rings using vacuum grease before fitting them.

Anti-suckback valve

- Refit the new O-rings (10) on the anti-suckback valve (11).
- Place the O-rings (12) and (13) in their housing of exhaust pipe (14).
- Refit the anti-suckback valve (11) on the spring (18), and the spring (18) on the exhaust pipe (14) (spring axe and exhaust pipe axe aligned).
- Refit the exhaust pipe (14) on the partition silencer (7) and secure it with the 4 screws CHc M6 (9) equipped with washers (8).

Silencer

- Place the O-rings (1,2 and 21) in their housing of exhaust collector (23).
- Refit the exhaust collector (23) on the silencer pipe body (19) and secure it with the 2 nuts (3) equipped with washer (4).
- Place the O-rings (5) and (6) in the housing of partition silencer (7).
- Put the partition silencer (7) on the silencer pipe body (19) and fix it using the 4 screws CHc M6 (9) equipped with washer (8).

It is recommended to carry out an helium test after intervention on the silencer.

Exhaust pipe

- Refit the silencer sub-assembly and secure it with the 2 screws H M 8 (25) equipped with washer (24).

Cover

- Place the cover and secure it with the 4 screws CHc M8 x 20 equipped with the washer.
- Fit the lifting rings.

7.6.3 Leak test

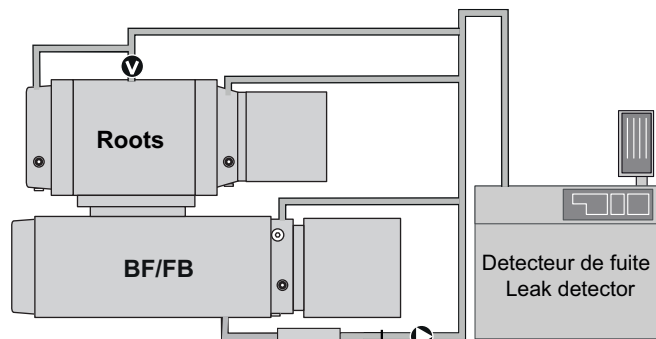
Preliminary operation

- Drain the gear box casing and keep oil apart (see 7.7.3).

Leak tightness

Helium spray measurement condition:

- Connect the pump to the leak detector.
- Pump inside the pump and measure the **residual** helium rate.
 - Result of the measurement: Leak rate $1 \cdot 10^{-7}$ hPa l/s
- Spray the outside of the pump with helium and check the helium rate.
 - Result of the measurement: Leak rate $Q \leq 10^{-6}$ hPa l/s



Filling the machine oil housing

- Fill the oil gear box casing with kept apart oil (see 5.2.2).

7.7 Standard repair exchange

To proceed with a standard exchange, key steps must be followed in sequential order:

- Disconnecting the pump from the installation (see 7.7.1)
- Draining the water circuit (see 7.7.2)
- Conditioning the pump for shipping (see 7.7.4)
- Declaration of contamination (see 10)
- Handling the new pump (see 3)
- Installing the new pump (see 5)

When returning a product to our service center, please consult the **Service** procedure (see 10) and fill in the contamination declaration available on our website.

7.7.1 Disconnecting the pump from the installation



DANGER

Risk to the health in the event of contact with toxic substances

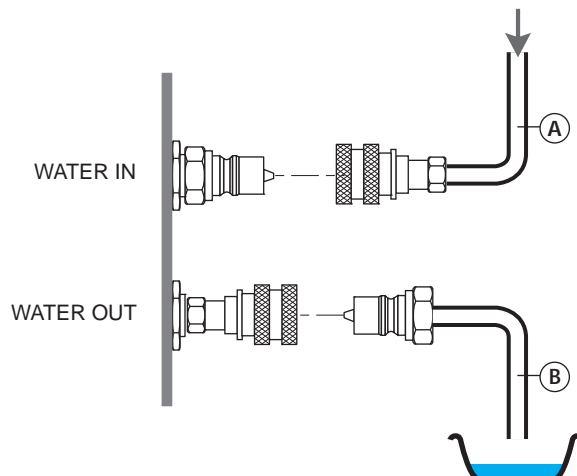
During pump disconnection, operator could be in contact with process residues on the exhaust that could cause severe injury or death.

→ Take the appropriate safety measures to prevent injury. Consult the department manager for instructions and safety information.

- Continue nitrogen flow from the process tool for 30 min. Nitrogen pressure and flow rate should be identical to the programmed values during process.
- Activate the circuit breaker of the electrical cabinet to switch off the pump.
- Disconnect the mains voltage cable by any source of energy.
 - note: l'**AGG 600** is equipped with 2 motors
- Disconnect the nitrogen purge connection.
- Disconnect the **WATER IN** connection then the **WATER OUT** connection **W** (see 4.2).
- Disconnect the pump from the inlet piping and fit a blanking plate on the inlet (see 11).
- Disconnect the pump from the exhaust and fit a blanking plate on the exhaust port (see 11).
- Adjust the levelling feet so that the pump rests on the castors.
- Remove the pump from the installation.

7.7.2 Draining the water circuit

Water must be drained to prevent hoses freezing during shipment.



- Prepare a flexible pipe (A) with a female connection and another flexible pipe (B) with a male connection (supplied by the customer).
- Connect one end of pipe (B) on **WATER OUT** connection and place the other end in a vessel (total water volume will be greater than one liter).
- Connect one end of pipe (A) on **WATER IN** connection and connect the other end to a compressed air circuit (2 to 5 · 10³ hPa).
- Inject compressed air into the pump until the water has been completely evacuated from the circuit.

7.7.3 Draining the pump

Note: in case of a transfer of the pump towards another site for new installation, it is necessary to drain away the housing(s) before transport.



DANGER

Health hazard in case of contact with the operating fluid

Contact with or inhaling products such as oil from the pump can cause irritation.

- Wear appropriate protective equipment when carrying out maintenance or adding/ draining oil.

WARNING

Risk of intoxication in case of contact with substances hazardous to health.

Appropriate precautions should always be taken when handling waste oil:

- Wear appropriate protective equipment when draining and flushing the pump.
- Do not pour waste oil down the drain. Have it destroyed by a qualified company if necessary.
- Take the necessary safety precautions to avoid generating health risks or polluting the environment in case of contamination.
- Decontaminate the parts affected before performing maintenance work.

The draining procedure must be realized for each housing of Roots and FB (see 5.2)

- Unfasten the fill plug in order to eliminate any excess pressure in the housing.
- Place a container under the drain plug to get back the used oil (Mini capacity: 0.5 liter).
- Remove the drain plug and allow the used oil to flow into the container.
- Replace the drain plug with its O-ring.
- Screw the fill plug.
- Repeat the operation for the 2 housings of Roots.

7.7.4 Conditioning the pump for shipping

- Install the connecting accessories provided with the pump when it was first delivered. Contact the service center to order accessories if necessary (see 11).

Provide a nitrogen supply with the required characteristics (see 12.3).

- Seal the inlet port with inlet blanking plate delivered with the pump.
- Connect the nitrogen to the gas connection located on the inlet blanking flange.
- Pressurize the pump with dry nitrogen to a relative pressure of 200 hPa.
- When the nitrogen flows out of the exhaust, seal it up with the provided accessories.
- Disconnect the nitrogen purge connection.
- Drain the pump (see 7.7.3).

8 Decommissioning

8.1 Shutting down for longer periods



NOTICE

Risk of build-up of process residues

All process pumps are designed for continuous operation in pumping process gas and should not be stopped. Pfeiffer Vacuum will be released from any warranty and liability claims if a process pump is stopped for a prolonged time leading to condensation of by-products, powder build-up or corrosion inside the pump. The only guaranteed solution by Pfeiffer Vacuum to restart a process pump after a prolonged stop is to perform a complete overhaul of the pump.

Despite this recommendation, if the pump is shut down for a prolonged time, it is advisable to follow the precautions mentioned below in order to reduce the risks of condensation, powder build-up and corrosion inside the pump.

- From the process chamber, flush the pump using a dry inert gas, such as nitrogen, through the inlet port during 30 minutes.
- Stop inert gas supply and let the pump running at ultimate pressure for 5 minutes.
- Stop the pump and close inlet port with the appropriate blank-off flange.
- Close the pump exhaust with the appropriate blank-off flange.
- Turn off the cooling water supply.
- Isolate and lock the power supply of the pump at the level of the electrical cabinet.

8.2 Re-starting

The only guaranteed solution by Pfeiffer Vacuum to restart a process pump after a prolonged stop is to perform a complete overhaul of the pump. In case of trouble, contact your **service center**.

8.3 Disposal

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

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

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

Before returning the product, please consult the **Service** procedure (see 10). Fill in the declaration of contamination form available on our website. Attach it to the product before shipping to the closest service-repair office.

**WARNING****Environmental protection**

The product or its components must be disposed of in accordance with the applicable regulations relating to environmental protection and human health, with a view to reducing natural resource waste and preventing pollution.

Our products contain various materials which can be recycled: iron, steel, stainless steel, cast iron, brass, aluminum, nickel, copper, fluoroelastomers, PTFE, FEP.

Take particular precautions for:

- fluoroelastomers which may breakdown if they are subjected to high temperatures.
- components in contact with the products resulting from the processes which may have been contaminated.

9 Malfunctions

Study the safety instructions related to maintenance (see 7.1).

9.1 What happens in the event of a defect

The pump is equipped with thermal safeties which protect the pump in case of overheating. The implementation of this protection is of the responsibility of the owner (see 5.5.3).

9.2 Troubleshooting guide

Incident	Cause	Troubleshooting
Bad vacuum or no vacuum	<ul style="list-style-type: none"> • Polluted od clogged pump 	⇒ Pump maintenance. ① Contact your service center
Mechanical noise	<ul style="list-style-type: none"> • Damaged ball bearing • Rotor seizing 	⇒ Pump maintenance. ① Contact your service center.
Pump(s) does not start	<ul style="list-style-type: none"> • Motor(s) does not start 	⇒ Check the wiring(s). ⇒ Check the main power.
Pump(s) is stopped	<ul style="list-style-type: none"> • The customer circuit breaker starts. • The internal temperature of the motor(s) is too high and the thermal safety of 150 °C, cabled by the customer, stopped the pump. • Pump seizing due to the process. 	⇒ Check the customer command system. ⇒ Check the circuit breaker rating. ⇒ Check the water cooling circuits. ⇒ Free up the FB (see 7.4). ① Contact your service center.

10 Service

Pfeiffer Vacuum offers first-class customer service!

- On-Site maintenance for many products
- Overhaul/repair at 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 at 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 flange opening ports by using the original protective covers or metallic airtight blank flanges for contaminated devices.
- If possible, send the pump or unit in its original packaging.

Sending 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 not secured in suitable packaging will be decontaminated and/or returned at the shipper's expense.

Exchange or repair

The factory operating parameters are always pre-set 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 on our website.

11 Accessories

Accessory	Type	Dimension	P/N
Isolation valve at pump inlet	Manual valve (Stainless steel)	DN 50 ISO-KF	30501M
		DN 100 ISO-K	30503M
	Electropneumatic valve 24 VAC (Stainless steel)	DN 50 ISO-KF	30501E
		DN 100 ISO-K	-
1/4" NPT female connector	Water input		101772
1/4" NPT male connector	Water output		101773
1/8" NPT female connector	Nitrogen input		076923+107142
Fitting accessories	Exhaust blanking plate	DN 40 ISO-KF	-
	Quick-connect clamp	DN 40 ISO-KF	-
		DN 50 ISO-KF	-
	Centering ring with FPM72 O-ring + PTFE protection	DN 40 ISO-KF	108785
		DN 50 ISO-KF	123716
	Centering ring with FPM72 O-ring	DN 40 ISO-KF	068230
		DN 50 ISO-KF	087168
	Inlet blank-off flange with 1/8" gas injector	DN 50 ISO-KF	082981+106314
	Inlet blank-off flange for ACG 600 with 1/8" gas injector	DN 100 ISO-K	082981+090467
	Inlet adapter	DN 50 ISO-KF	106308
Anti-noise device	DN 40 ISO-KF	109418	
Others: see manufacturer's catalog			

12 Technical data and dimensions

12.1 Technical data

Characteristics	Unit	ACP 120G / ACP 120G Large Volume	ACG 600G/ ACG 600G Large volume
Peak pumping speed (50/60 Hz)	m ³ /h	95/112	480/560
Maximum ultimate pressure (without N ₂ purge) (50/60 Hz)	hPa	5·10 ⁻² /2·10 ⁻²	2·10 ⁻³ /2·10 ⁻³
Maximum ultimate pressure (with N ₂ purge 50 slm) (50/60 Hz)	hPa	3·10 ⁻¹ /1·10 ⁻¹	1·10 ⁻² /6·10 ⁻³
Maximum pumped volume ⁽²⁾	m ³	1	1 Version "Large volume": 10
Maximum continuous inlet flow ⁽³⁾	slm	80	60
Supply voltage ⁽¹⁾	V	200-230 V / 380-480 V - 3 phases - 50/60 Hz	
Full load current (200-230 V)	A	15	25
Full load current (380-480 V)	A	10	15
Power consumption at ultimate pressure (50/60 Hz)	kW	1.3/1.5	1.8/2.0
Maximum exhaust pressure (absolute)	hPa	1200	1200
Cooling water flow	l/mn	1	1
N ₂ purge flow	slm	10-60	10-60
Oil fluid capacity (A113)	l	0,35	0.98
Inlet flange		DN 50 ISO-K	DN 100 ISO-K
Exhaust flange		DN 40 ISO-KF	DN 40 ISO-KF
Dimensions		(see 12.3)	(see 12.3)
Weight	kg	213	320
Maximum sound level ⁽⁴⁾	dB(a)	< 65	< 68

(1) According to CE regulations. Pumps can withstand a supply voltage variation of ± 10 %.

(2) This pump is certified for pumping a volume of 1 m³, with 20-minute cycling. In case of larger volume or a higher cycling frequency, consult us.

(3) At maximum rotational speed.

(4) Measured at 1 m length. and 1.6 m height. according to ISO 9614-2 standard (pump equipped with a silencer and a check valve).

Conversion table: pressure units

	mbar	bar	Pa	hPa	kPa	Torr mm Hg
mbar	1	1 · 10 ⁻³	100	1	0.1	0.75
bar	1000	1	1 · 10 ⁵	1000	100	750
Pa	0.01	1 · 10 ⁻⁵	1	0.01	1 · 10 ⁻³	7.5 · 10 ⁻³
hPa	1	1 · 10 ⁻³	100	1	0.1	0.75
kPa	10	0.01	1000	10	1	7.5
Torr mm Hg	1.33	1.33 · 10 ⁻³	133.32	1.33	0.133	1

$$1 \text{ Pa} = 1 \text{ N/m}^2$$

Conversion table: gas throughput units

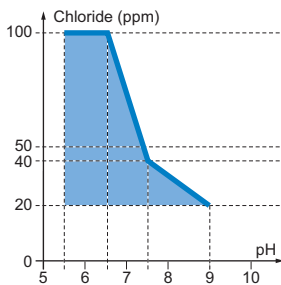
	mbar·l/s	Pa·m ³ /s	sccm	Torr·l/s	atm·cm ³ /s
mbar·l/s	1	0.1	59.2	0.75	0.987
Pa·m ³ /s	10	1	592	7.5	9.87
sccm	1.69 · 10 ⁻²	1.69 · 10 ⁻³	1	1.27 · 10 ⁻²	1.67 · 10 ⁻²
Torr·l/s	1.33	0.133	78.9	1	1.32
atm·cm ³ /s	1.01	0.101	59.8	0.76	1

12.2 Facilities characteristics

12.2.1 Environmental conditions

Use	indoor use
Installation altitude	up to 2000 m
Ingress protection	IP 30
Ambient operating temperature	5-40 °C
Storage temperature	-25-+55 °C
Relative humidity	max. 80% at T ≤ 31°C, up to max. 50% at T ≤ 40°C
Pollution degree	rate 2
Overvoltage protection ¹⁾	category II
1) Transient overvoltage up to the levels of overvoltage category II. Temporary overvoltage occurring on the mains supply.	

12.2.2 Water characteristics



pH	5.5 to 9
Chlorine ⁽³⁾	100 to 20 ppm depending on the pH
Hardness	< 10 °fH (french degree) < 2 milli-equivalent/L < 100 mg/L of CaCO ₃ (Calcium carbonate)
Total dissolved solids	< 300 mg/L
LSI (LANGELIER Saturation Index)	- 0.5 < LSI < 0 to +20°C
Particles size	< 0.2 mm
Resistivity	2000 Ω·cm < R < 1000000 Ω·cm
Input temperature ⁽⁴⁾	10-35 °C
Relative input pressure	2 · 10 ³ to 6 · 10 ³ hPa
Differential pressure (inlet/outlet)	> 2 · 10 ³ hPa

- (3) The oxidising action of the chlorine depends on the pH (aggressiveness of the water). The chlorine content must be within the coloured area on the graph opposite.
- (4) Depend on pumping conditions. Contact Pfeiffer Vacuum.

Connection

Water inlet	1/4" NPT male connection	Stainless steel
Water outlet	1/4" NPT female connection	Stainless steel

12.2.3 Nitrogen characteristics

H ₂ O concentration	< 10 ppm v
O ₂ concentration	< 5 ppm v
Dust	< 1 µm
Oil	< 0.1 ppm v
Relative pressure	2 · 10 ³ to 6 · 10 ³ hPa

Connection

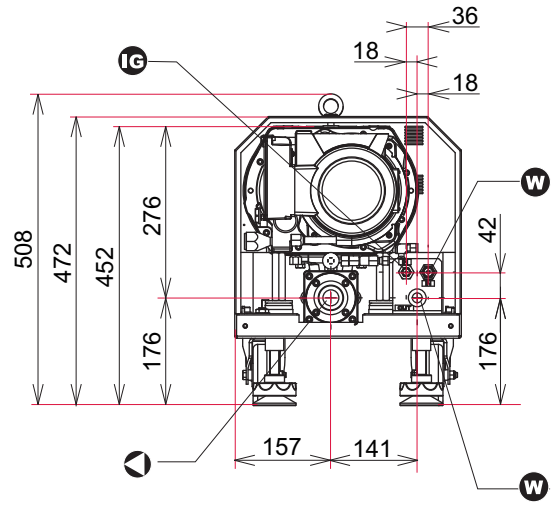
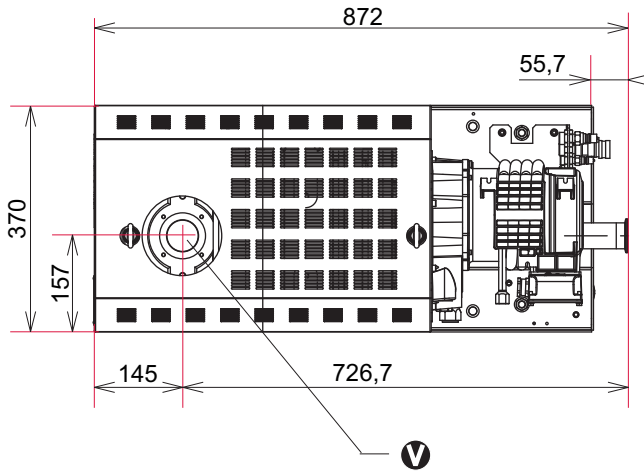
Nitrogen inlet	1/8" NPT male connection	Stainless steel
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12.2.4 Electrical characteristics

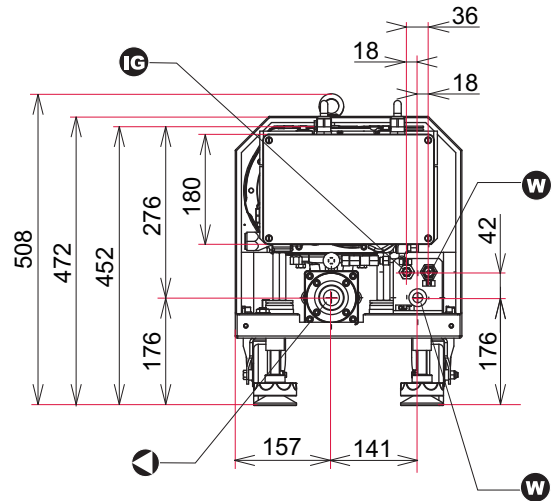
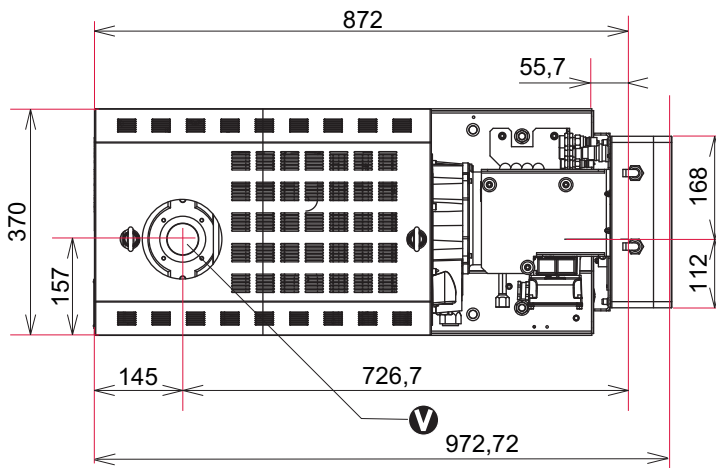
Circuit breaker with a minimum interrupting short circuit current		10 kA	
GFI (or RCD) type B, differential circuit breaker compatible with type T.T electrical network		100 mA ¹⁾	
1) For other networks, types T.N or I.T, use the proper protection device			
Voltage	Main circuit breaker rating (minimum values)	Cable wire specifications	
200-230 V 50/60 Hz	15 A	2,5 mm ²	AWG-14
380-480 V 50/60 Hz	10 A	1,5 mm ²	AWG-14

12.3 Dimensions

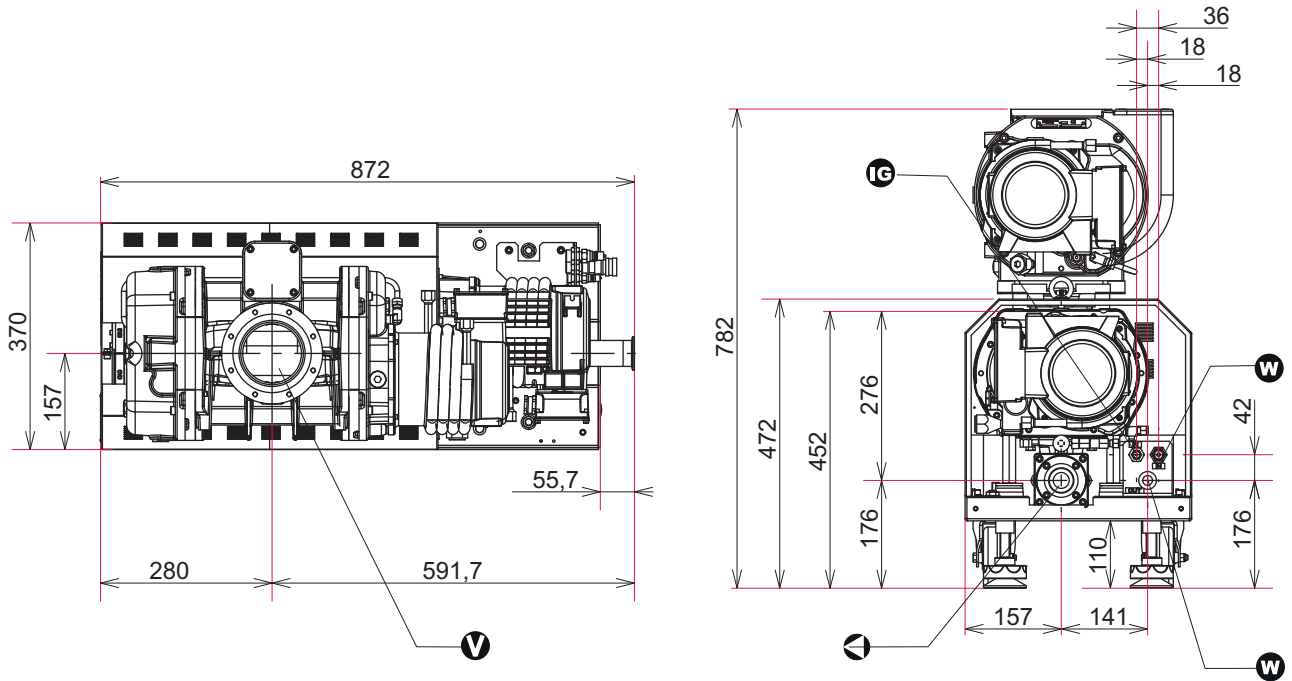
ACP 120G



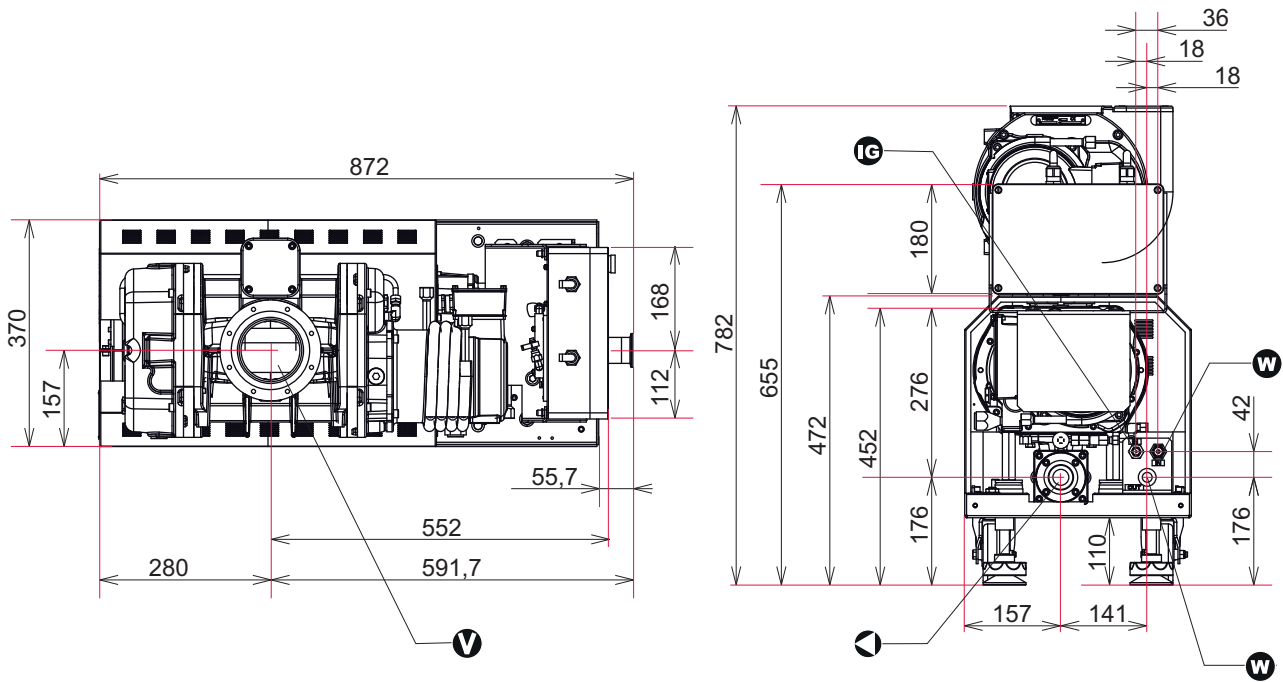
ACP 120G with frequency converter



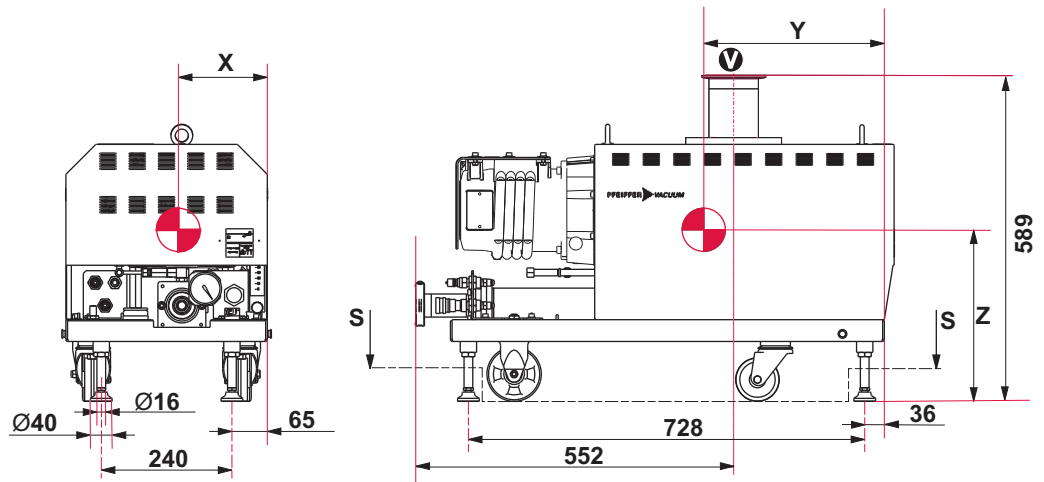
ACG 600G



ACG 600G with frequency converter



12.4 Weight distribution



Section S-S



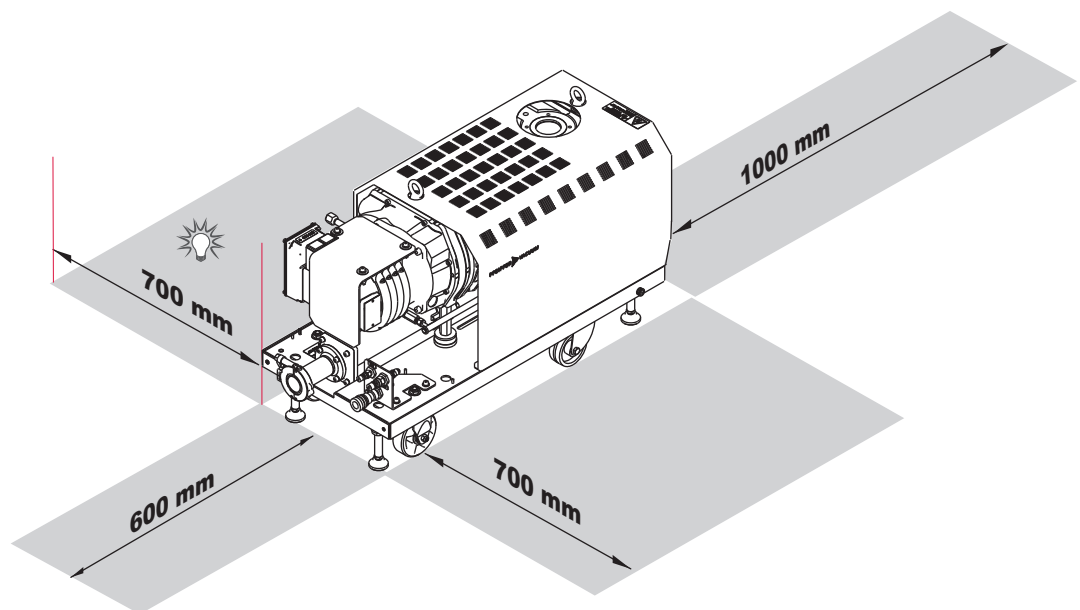
Center of gravity (mm)			
	X	Y	Z
	163.4	331.5	315.1

Weight by foot (DaN)				
	1	2	3	4
	51	74.7	35.4	51.9

12.5 Maintenance area



Luminosity > 300 lux





Declaration of incorporation of partly completed machinery

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

- **Machinery 2006/42/EC (Annex II, no. 1 A)**
- **Electromagnetic Compatibility 2014/30/EU**
- **Restriction of the use of certain Hazardous Substances 2011/65/EU**

This partly completed machinery must not be put into operation until the machinery into which it is to be incorporated has been declared in conformity with the provisions of the **2006/42/EC** Directive.

We, authorized representatives undertake to transmit, in response to a reasoned request by national authorities, relevant information on the partly completed machinery.

The technical file is drawn up by Mr Frédéric Rouveyre, Pfeiffer Vacuum SAS, [simplified joint stock company], 98, avenue de Brogny · B.P. 2069, 74009 Annecy cedex.

ACP 120G, ACG 600G

Harmonised standards and national standards and specifications which have been applied:

Normes NF EN-61000-6-2 : 2005

Normes NF EN-61000-6-3 : 2007

Normes NF EN-61000-6-4 : 2007

Normes NF EN-1012-2 : 2009

Normes NF EN-61010-1 : 2011

Signatures:

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(M. Taberlet)
Président

(M. Rouveyre)
Responsable Recherche & Développement

03/10/16

VACUUM SOLUTIONS FROM A SINGLE SOURCE

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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

Benefit from our know-how and our portfolio of training opportunities!

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

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perfect vacuum solution?
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