OPERATING INSTRUCTIONS

EN

Translation of the Original

A 100 L - A 100 L ES

Multi-stage Roots pump, compact, for light duty applications

PFEIFFER VACUUM

Disclaimer of liability

These operating instructions describe all models and variants of your product. Note that your product may not be equipped with all features described in this document. Pfeiffer Vacuum constantly adapts its products to the latest state of the art without prior notice. Please take into account that online operating instructions can deviate from the printed operating instructions supplied with your product.

Furthermore, Pfeiffer Vacuum assumes no responsibility or liability for damage resulting from the use of the product that contradicts its proper use or is explicitly defined as foreseeable misuse.

Copyright

Table of contents

List of tables

List of figures

1 About this manual

IMPORTANT
Read carefully before use.
Keep the manual for future consultation.

1.1 Validity

These operating instructions are a customer document of Pfeiffer Vacuum. The operating instructions describe the functions of the named product and provide the most important information for the safe use of the device. The description is written in accordance with the valid directives. The information in these operating instructions refers to the product's current development status. The document shall remain valid provided that the customer does not make any changes to the product.

1.1.1 Applicable documents

Document	Part number
Serial link operating instructions	included with these operating instructions
UL/CSA compliance (ETL mark)	included with these operating instructions
Certificate of conformity to SEMI	included with these operating instructions
Declaration of incorporation of partly completed machinery	included with these operating instructions
UK Declaration of conformity	included with these operating instructions

1.1.2 Products concerned

This document applies to products with the following part numbers:

Part Number	Description
A100L3XXXX and A100L4XXXX	Model for load-lock or transfer chamber pumping
A100L5XXXX	Model for load-lock or transfer chamber pumping (A 100 L ES model)

1.2 Target group

This user manual is intended for all persons in charge of transport, installation, commissioning/decommissioning, use, maintenance or storage of the product.

The work described in this document must only be carried out by persons with suitable technical training (specialized staff) or persons who have undergone Pfeiffer Vacuum training.

1.3 Conventions

1.3.1 Instructions in the text

Usage instructions in the document follow a general structure that is complete in itself. The required action is indicated by an individual step or multi-part action steps.

Individual action step

A horizontal, solid triangle indicates the only step in an action.

► This is an individual action step.

Sequence of multi-part action steps

The numerical list indicates an action with multiple necessary steps.

1. Step 1
2. Step 2
3. ...

1.3.2 Pictographs

Pictographs used in the document indicate useful information.

Note

Tip

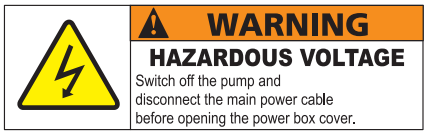
1.3.3 Labels

ON/OFF	Pump Start/Stop
INLET	Pump inlet connection
PUMP EXHAUST	Pump exhaust
MAIN POWER	Mains power supply
SPI	Remote control connection (SPI Smart Pump Interface)
WATER IN	Water circuit connection: inlet
PRESSURE MAX 101 PSI (7 bars)	Maximum water circuit pressure
WATER OUT	Water circuit connection: outlet
Loc/Rem	Control mode switch (local or remote control)
N2 IN	Connecting the nitrogen or compressed dry air circuit (A 100 L ES)
	CPC Earth connection

1

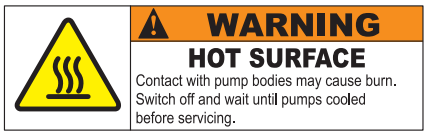
This label warns users about the risk of crushing or cutting due to moving parts: keep a safe distance and/or keep your hands away from the moving parts.

2



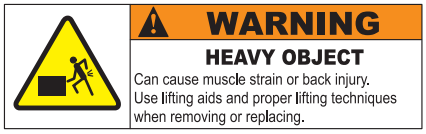
This label indicates that certain internal components carry an electric charge and can cause electric shock if touched: before working on the pump, always either disconnect it, or lock out/tag out the installation breaker in the appropriate manner.

3



This label warns users that they risk being injured if their hands come into contact with a hot surface: wear protective gloves before any intervention.

4

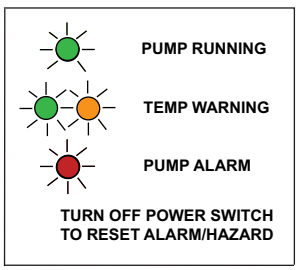


This label indicates that the product should not be handled manually due to its weight and that appropriate handling devices should always be used.

5

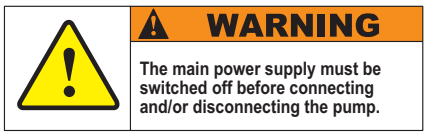
This label indicates the location of the holes for seismic bracket installation.

6



This label indicates the pump's operating status via the indicator lights.

7

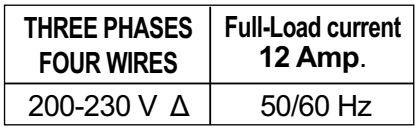


This label indicates that the power supply must be switched off before connecting and/or disconnecting the pump.

8

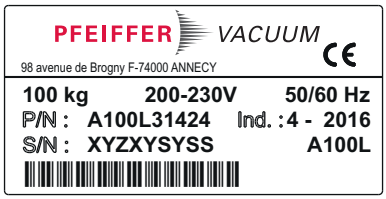
This label indicates that the product has been certified in accordance with quality control when leaving the factory.

9



This label indicates the full load current at the motor output in relation to the mains voltage (illustrative value).

10



Product rating plate (example).

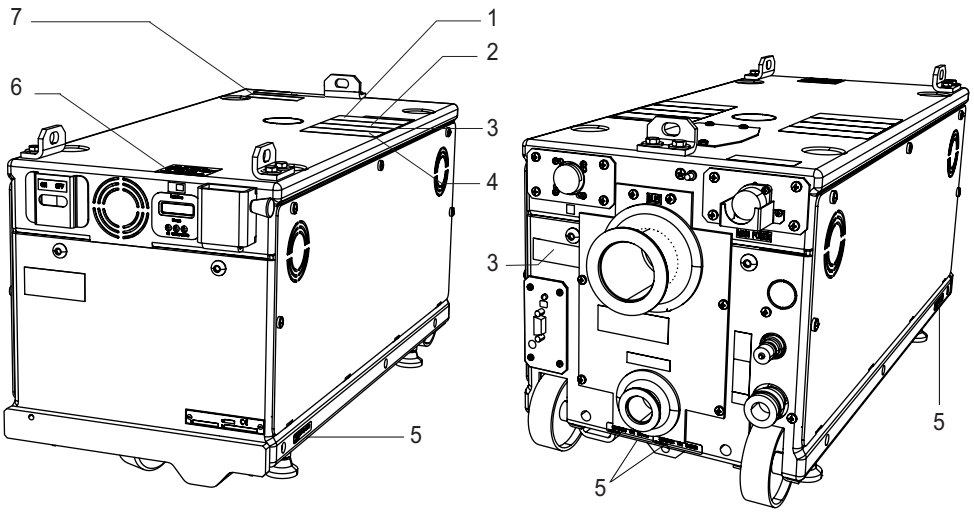


Fig. 1: Safety label locations

1 Moving parts
2 Electric shock hazard
3 Hot surface
4 Heavy object
5 Seismic brackets anchor point
6 Pump operating status
7 Electrical safety

1.3.4 Abbreviations

CDA	Compressed Dry Air
Exh.	Exhaust
EMS	Emergency Stop
IN	Inlet flange

2 Safety

2.1 General safety information

The following 4 risk levels and 1 information level are taken into account in this document.

⚠ DANGER

Immediately pending danger

Indicates an immediately pending danger that will result in death or serious injury if not observed.

► Instructions to avoid the danger situation

⚠ WARNING

Potential pending danger

Indicates a pending danger that could result in death or serious injury if not observed.

► Instructions to avoid the danger situation

⚠ CAUTION

Potential pending danger

Indicates a pending danger that could result in minor injuries if not observed.

► Instructions to avoid the danger situation

NOTICE

Danger of damage to property

Is used to highlight actions that are not associated with personal injury.

► Instructions to avoid damage to property

Notes, tips or examples indicate important information about the product or about this document.

2.1.1 Safety instructions

All safety instructions in this document are based on the results of the risk assessment carried out in accordance with Machinery Directive 2006/42/EC Annex I and EN ISO 12100 Section 5. Where applicable, all life cycle phases of the product were taken into account.

⚠ WARNING

Risk of crushing when the product is slung

Given the heaviness of the product, there is a risk of crushing during handling operations involving lifting devices. Under no circumstances shall the manufacturer be liable if the following instructions are not followed:

► Only qualified staff trained in handling heavy objects are authorized to handle the product.
► The lifting devices provided **must be used** and the procedures set out in this document must be followed.

⚠ DANGER

Risk of crushing due to the rupture of lifting devices

The brackets are not designed to lift two stacked pumps; they may break or be torn loose by the weight of the two pumps.

► Never lift two stacked pumps using the lifting brackets.

⚠ WARNING

Risk of electric shock due to non-compliant electrical installations

This product uses mains voltage for its power supply. Non-compliant electrical installations or installations not done to professional standards may endanger the user's life.

- ► Only qualified technicians trained in the relevant electrical safety and EMC regulations are authorized to work on the electrical installation.
- ► This product must not be modified or converted arbitrarily.
- ► Check that the product is properly connected to the equipment's or pumping installation's emergency stop circuit.

⚠ WARNING

Danger of electrocution by contact during maintenance or overhaul

There is an electric shock hazard in case of contact with a product powered on and not electrically isolated.

- ► Before carrying out any work, set the main switch to **O**.
- ► Disconnect the power cable from the mains.
- ► Secure the installation correctly by tagging and locking (LO/TO) the system to prevent unintentional re-engagement.

⚠ WARNING

Risk of injury in case of contact with pressurized water

The product uses pressurized water as a cooling fluid. Non-compliant installations or installations not done to professional standards may endanger the user's life.

- ► Install a manual valve on the circuit at a distance of 3 m from the product, so that the water supply can be locked out.
- ► Observe the recommended pressure and pressure differences.
- ► Always lock out and disconnect the water circuit before working on the product.
- ► When carrying out maintenance, secure the installation properly by locating and locking out the pressurized water circuit to prevent it from being re-engaged by accident (LO/TO Lock Out/Tag Out procedure).
- ► Regularly check the condition of the pipework and supply circuit connections.

⚠ WARNING

Risk of injury in case of contact with pressurized nitrogen

The product uses pressurized nitrogen as a flushing gas. Non-compliant installations or installations not done to professional standards may endanger the user's life.

- ► Install a manual valve on the circuit at a distance of 3 m from the product, so that the nitrogen supply can be locked out.
- ► Observe the recommended supply pressure.
- ► Always lock out and disconnect the nitrogen circuit before working on the product.
- ► When carrying out maintenance, secure the installation properly by locating and locking out the pressurized nitrogen circuit to prevent it from being re-engaged by accident (LO/TO Lock Out/Tag Out procedure).
- ► Regularly check the condition of the pipework and supply circuit connections.

⚠ WARNING

Risk of poisoning when process gases are present in the atmosphere

The manufacturer has no control over the types of gases used with the pump. Process gases are often toxic, flammable, corrosive, explosive and/or otherwise reactive. There is a risk of serious or fatal injury if these gases are allowed to escape freely into the atmosphere.

- ► Apply the relevant safety instructions in accordance with local regulation. This information is available from the operator's safety department.
- ► **The pump exhaust must be connected** to the installation's dangerous gases extraction system.
- ► Regularly check that there are no leaks where the pump connects to the exhaust pipework.

⚠ WARNING

Risk of burns in case of contact with hot surfaces

Component temperature remains high, even after the pump has stopped. There is a risk of burns through contact with hot surfaces, especially at the pump exhaust.

- ► Wait for the product to fully cool down before working on it.
- ► Protective gloves must be worn in accordance with standard EN ISO 21420.

⚠ WARNING

Risk of crushing and/or cutting in case of contact with moving parts

The pump inlet flange is large enough for body part (finger or hand) to be inserted into it, presenting a risk of crushing due to contact with moving parts. The inlet and exhaust ports should be sealed with blanking plates before connection.

- ► Wait for the pumping line to be connected before removing the blanking plates.
- ► **Wait for the pump to be connected before powering on.**

2.1.2 Precautions

Duty to provide information on potential dangers

The product holder or user is obliged to make all operating personnel aware of dangers posed by this product.

Every person who is involved in the installation, operation or maintenance of the product must read, understand and adhere to the safety-related parts of this document.

Infringement of conformity due to modifications to the product

The Declaration of Conformity from the manufacturer is no longer valid if the operator changes the original product or installs additional equipment.

- Following the installation into a system, the operator is required to check and re-evaluate the conformity of the overall system in the context of the relevant European Directives, before commissioning that system.

Only qualified personnel trained in safety regulations (EMC, electrical safety, chemical pollution) are authorized to carry out the installation and maintenance described in this manual. Our service centers can provide the necessary training.

The potential risks to a dry pumping system intended for load-lock pumping relate to electricity, hot surfaces, pressurized water and nitrogen circuits.

- ► 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 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 turn on the product if the covers are not in place.
- ► Never move the product while in use.

2.2 Intended use

- The vacuum pump should only be used to generate a vacuum while pumping gases.
- The vacuum pump is designed to operate in industrial environments.
- The pump must run on light-duty, non-corrosive applications, essentially for load-lock pumping, or the roughing of turbomolecular pumps.

2.3 Foreseeable misuse

Misuse of the product will render the warranty and any claims void. Any use, whether intended or not, that diverges from the uses already mentioned will be treated as non-compliant; this includes but is not limited to:

- Pumping liquids
- Pumping dust particles
- Pumping of gases other than argon, helium, nitrogen and air
- Pumping of corrosive or explosive media
- Pumping reactive fluids
- Pumping of condensable vapors
- Using the vacuum pump to generate pressure
- Using the pump in potentially explosive areas
- Using accessories or spare parts not mentioned in these operating instructions

The product is not designed to carry people or loads and should not be used as a seat, stepladder or similar.

3 Transportation and Storage

3.1 Receipt of the product

Condition of the 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.

► Keep 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.
► Keep the blanking plates in place on the inlet, exhaust and purge ports while the product is not connected to the pumping line.

Keep the packaging (recyclable materials) in case the product needs to be transported or stored.

3.2 Handling

⚠ WARNING

Risk of crushing when the product is slung

Given the heaviness of the product, there is a risk of crushing during handling operations involving lifting devices. Under no circumstances shall the manufacturer be liable if the following instructions are not followed:

► Only qualified staff trained in handling heavy objects are authorized to handle the product.
► The lifting devices provided **must be used** and the procedures set out in this document must be followed.

⚠ WARNING

Risk of crushing related to product tilting

Although the product fully complies with the EU safety regulations, there is a risk of tilting when it is moved over the floor or is not properly secured.

► Do not place the product on a slope: because of its weight, it will drag the operator with it.
► Only use the casters for moving the equipment over short distances.
► Place it on a flat, hard floor.
► Do not push the product sideways.
► To use the product, place it on its feet so that it no longer rests on its casters.

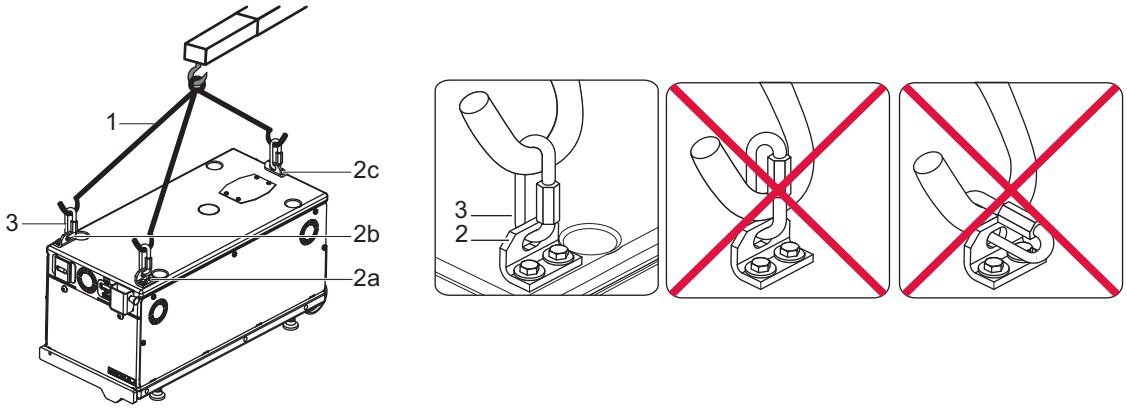


Fig. 2: Fitting the lifting strap

1 Strap
2 Bracket (Qty: 3)
3 Safety hook (Qty: 3)

Handling the pump using a hoist

When handling the pump, **a lifting device appropriate for the weight of the product must be used**. The weight and center of gravity vary according to the model .

1. Remove the pump from its packaging
2. Use a 3-section strap with the following characteristics:
   – length of each section: **1 m**
   – load per section:
      – bracket (2a): **261 N**
      – bracket (2b): **236 N**
      – bracket (2c): **570 N**
3. Use the safety hooks attached to the lifting brackets.
4. Check the position of the safety hooks in the brackets.
5. Hoist the pump using a 3-section strap.
6. Reassemble the leveling pads of the frame and lower the pump on the casters to move it over short distances.

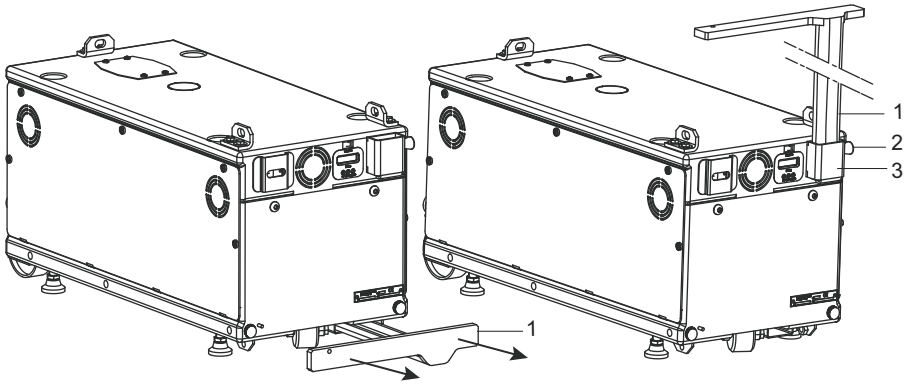


Fig. 3: Installation of the removable handle

1 Handle
2 Lock
3 Handle holder

Moving the pump with the handle

The pump is equipped with a removable handle stored under the product.

1. **Check that the locking screw jacks are not in contact with the ground before moving the pump.**
2. Pull the handle along the rail to remove it.
3. Unlock the lock.
4. Install the handle in its holder.
5. Check that the handle is properly locked before moving the pump.
6. Store the handle underneath the product when the pump is in place.

3.3 Storage

NOTICE

Damage to internal parts in a humid atmosphere

The internal parts may be damaged if moisture is allowed to enter the pump. Pumps are supplied pressurized with nitrogen and sealed with blanking plates.

- ► The pump inlet, exhaust and purge blanking plates must be kept in place until the pump is installed.
- ► Only remove the blanking plates when the pump is connected to the pumping line.

Pfeiffer Vacuum recommends storing the products in their original transport packaging.

Storing a new pump

- ► Keep the pump wrapped in its protective envelope.
- ► The inlet and exhaust blanking plates **must** always be left in place because the pump is pressurized with nitrogen.
- ► Store the pump for up to 1 year, according to the permitted storage temperatures (see chapter “Environmental conditions”).

If the inlet and exhaust blanking plates have been removed, the internal parts may be at risk of corrosion. In such cases:

1. Pressurize the pump with nitrogen in accordance with the following procedure.
2. Store the pump for up to 1 year in a clean and dry area, at ambient temperature (see chapter “Environmental Conditions”).

When a new pump has been stored for more than 1 year, contact our service center before starting the pump.

Pressurizing with nitrogen

To pressurize the pump, you will need a nitrogen supply with the required characteristics (see chapter “Nitrogen characteristics”) and the blanking plates provided with the product or obtainable as accessories.

1. Seal the pump inlet with the airtight accessories.
2. Connect the nitrogen supply to the gas connector located on the inlet blanking plate.
3. Pressurize the pump with nitrogen to a relative pressure of 200 hPa.
4. When nitrogen starts flowing from the exhaust, seal it with the accessories provided.
5. Disconnect the nitrogen supply from the connector.

Never store a pump that has been used! Return it to the service center (see chapter “Service solutions by Pfeiffer Vacuum”, page 38).

4 Product description

4.1 Product identification

To correctly identify the product when communicating with our service center, always have the information from the product rating plate available (see chapter "Labels").

4.1.1 Scope of delivery

- 1 vacuum pump
- 2 water connectors
- 1 power cable equipped with a female electrical connector
- 1 mains socket mounting flange
- 3 CHc M8x16 screws and 3 washers
- 1 lifting hooks safety and usage guide
- 1 set of operating instructions

4.1.2 Function

The manufacturer has developed a pump dedicated to light-duty, non-corrosive applications such as load-lock or transfer chamber pumping for the semiconductor or photovoltaic industry, the roughing of turbomolecular pumps.

The A100 L multi-stage dry pump is a compact model, which is easily integrated into equipment, requires no preventive maintenance and is highly reliable.

The A100 L ES model is equipped with the 'Energy Saving' option which reduces energy consumption by 50%. This 'Energy Saving' option is automatically activated when pumping conditions are required.

4.2 The Human/Machine Interface

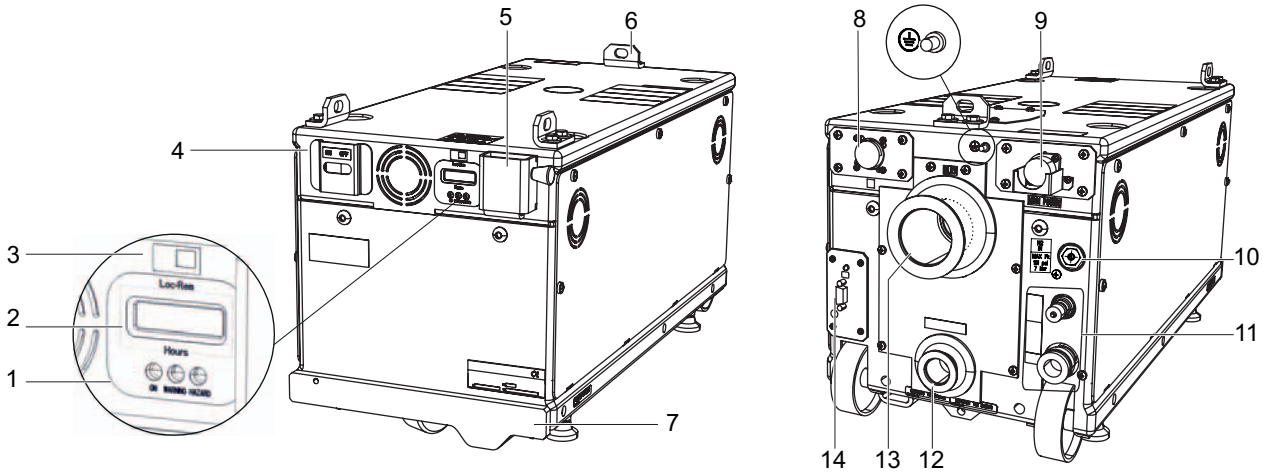


Fig. 4: The Human/Machine Interface

1	Operating indicator lights	8	Remote control connector
2	Time counter	9	Mains power supply
3	Loc-Rem operating mode switch	10	Nitrogen circuit input
4	ON/OFF circuit breaker	11	Water input/output
5	Handle holder	12	Pump inlet
6	Lifting bracket	13	Pump exhaust
7	Removable handle	14	RS-232/RS-485 serial link connector

The pump includes an electronic monitoring system guaranteeing automatic operation and the management of safety features: temperature alarm and warning. It is used to:

- display the pump’s operating status via indicator lights,
- display the pump’s operating time on the time counter,
- interface the pump with the equipment via a remote control connector or RS-232/RS-485 serial link.

5 Installation

5.1 Pump set-up

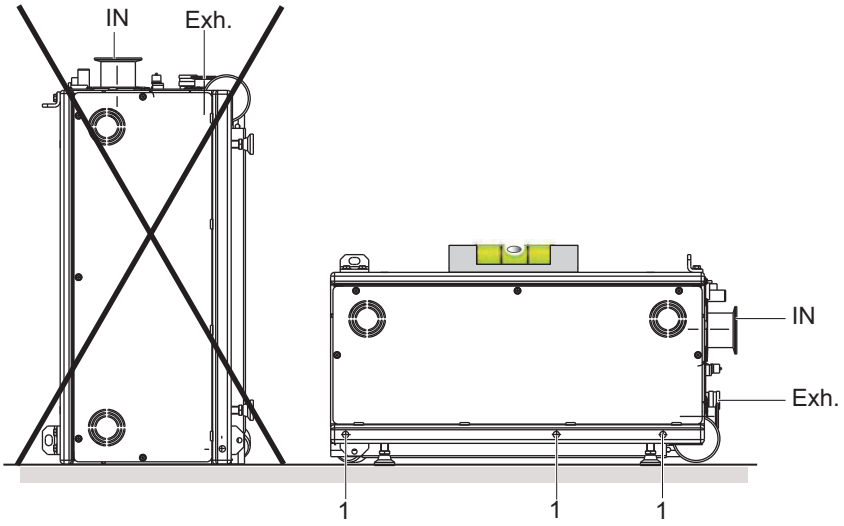


Fig. 5: Operating position

1 Holes for attaching the pump to a frame
IN Inlet
Exh. Pump Exhaust

The product must be used in horizontal position, standing on its feet.

1. Déterminer l'emplacement de la pompe.
2. Use the recommended lifting devices when handling the pump (hoist and safety hooks) (see chapter "Handling").
3. Move the pump into position and adjust the height of the 4 feet.
4. Use a spirit level to check that the pump is perfectly horizontal.

The pump can be secured to the frame of the equipment in which it is installed, using the tapped holes provided for this purpose.

► Tighten at least 4 M 10x25 grade 8-8 screws (supplied by the customer) in the holes of the frame.
  – tightening torque: 40 N·m.

⚠ CAUTION

Risk of falling due to poorly-secured cables or pipework

The space around the pump must be kept clear of obstacles to prevent falls from potentially occurring.

► Route and secure electric cables and pipework in the appropriate pathways.

5.1.1 Stacking of pumps

⚠ DANGER

Risk of crushing due to the rupture of lifting devices

The brackets are not designed to lift two stacked pumps; they may break or be torn loose by the weight of the two pumps.

► Never lift two stacked pumps using the lifting brackets.

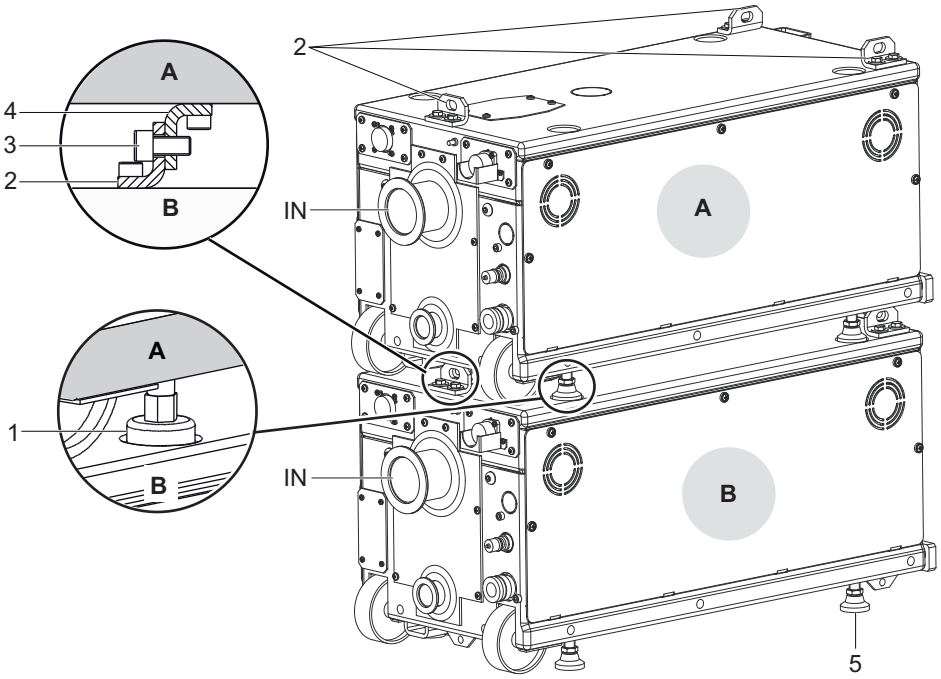


Fig. 6: Stacking of two pumps

1 Locking foot (pump A)
2 Upper bracket (pump B)
3 Screw
4 Lower bracket (pump A)
5 Locking foot (pump B)
A Upper pump
B Lower pump

Procedure for stacking two pumps

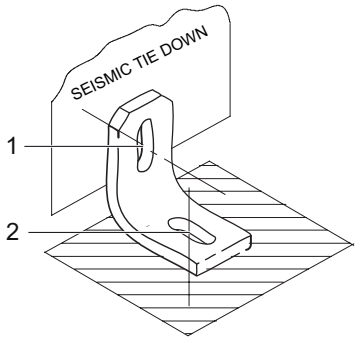
The product is fitted with brackets to facilitate the stacking of two pumps.

1. Check that the brackets are correctly screwed in:
   – 3 lifting brackets on the upper cover of pump **A** and pump **B**
   – 3 brackets under the frame of pump **A**
2. Adjust the locking feet of lower pump **B**:
   – **they must be in contact with the ground**; under no circumstances can the casters be in contact with the ground.
3. Use a spirit level to check that the pump is perfectly horizontal.
4. Adjust the locking feet of upper pump **A**:
   – **the casters must not be in contact with the ground**.
5. Hoist pump **A** using a lifting device (see chapter "Handling").
6. Position pump **A** on the cover of pump **B**:
   – **the locking feet must be positioned in the imprints provided on the cover of pump B**.
7. Lock the locking feet of pump **A**:
   – **they must be locked correctly**.
8. Use a spirit level to check that the pump is perfectly horizontal.
9. Assemble the pumps using the brackets.
10. Tighten the 3 CHc M8x16 screws and the washers to secure stacking.
    – Tightening torque: 22 N·m

5.1.2 Installing the pump in a seismic environment

To install the pump in a seismic environment, it must be anchored to the floor with seismic brackets (see chapter "Accessories"). It is up to the customer to provide the appropriate bolts for fixing the pump to the floor such that the loads are evenly distributed through the feet and the type of floor is properly accommodated .

When two pumps are stacked, only the lower pump is anchored to the floor with seismic brackets.



1 Location of fixing screws (supplied)

2 Location of the fixing accessories (supplied by the customer)

Installing the brackets

Move the pump into its operating position.

1. Install the 4 brackets opposite the holes provided for this purpose, identified by a "Seismic tie down" label.
2. Use a spirit level to check that the pump is perfectly horizontal.
3. Position the brackets and anchor them using the fixing screws supplied:
   – tightening torque 40 N·m.
4. Secure the fixing brackets to the floor.

5.1.3 Connecting the water circuit

⚠ WARNING

Risk of injury in case of contact with pressurized water

The product uses pressurized water as a cooling fluid. Non-compliant installations or installations not done to professional standards may endanger the user's life.

- ► Install a manual valve on the circuit at a distance of 3 m from the product, so that the water supply can be locked out.
- ► Observe the recommended pressure and pressure differences.
- ► Always lock out and disconnect the water circuit before working on the product.
- ► When carrying out maintenance, secure the installation properly by locating and locking out the pressurized water circuit to prevent it from being re-engaged by accident (LO/TO Lock Out/Tag Out procedure).
- ► Regularly check the condition of the pipework and supply circuit connections.

NOTICE

The water cooling circuit may be damaged if an unregulated mains supply is used

Using unregulated mains water can lead to water circuit clogging due to limescale deposition. This may necessitate complete cleaning and overhaul of the water cooling circuit.

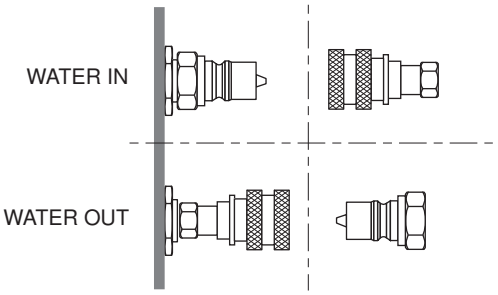
Furthermore, **the presence of micro-organisms such as algae and biological substances such as bacteria** can lead to problems in the cooling circuit.

- ► Connect the water cooling circuit to a regulated water supply.
- ► Take appropriate measures to prevent the growth of such micro-organisms.

The effect of cooling continuity on the process

If an interruption to the water circuit represents a serious risk for the process, it is advisable to control the pump cooling with an external system capable of taking over if the water circuit fails.

To limit corrosion and **clogging of the water circuit**, we recommend using softened or non-aggressive water with the required characteristics. If the solid pollution characteristics cannot be met, install a filter on the water inlet.



Connecting the water circuit

Water connectors specified on the order will be packaged separately.

1. Connect the water pipes to the connectors:
   – Water inlet = female connector
   – Water outlet = male connector
2. Connect the pipework to the pump's **WATER IN** and **WATER OUT** connectors.
3. Check that there are no leaks in the water circuit or the water circuit connections.

5.1.4 Connecting the nitrogen circuit

Replacement of nitrogen with compressed dry air (CDA)

If the pumped gases are inert,the user has the option to replace the nitrogen with compressed dry air.

It is necessary to have a supply of compressed dry and filter air with required characteristics (see chapter 'Compressed dry air characteristics').

⚠ WARNING

Risk of injury in case of contact with pressurized neutral gas

The product uses pressurized neutral gas (nitrogen for example) for 'Energy Saving' option. Non-compliant installations or installations not done to professional standards may endanger the user's life.

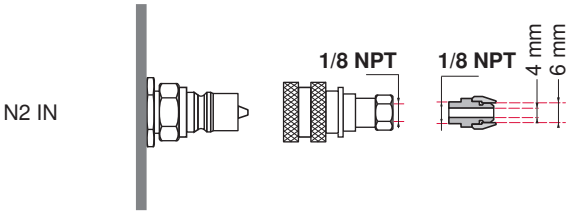
- ► Install a manual valve on the circuit at a distance of 3 m from the product, so that the neutral gas supply can be locked out.
- ► Observe the recommended pressure supply.
- ► Always lock out and disconnect the neutral gas circuit before working on the product.
- ► Regularly check the condition of the pipework and supply circuit connections.

NOTICE

Risk of damage to the pump if purge flow pressure is too high

A sudden influx of nitrogen into the purge flow can damage the internal parts of the pump.

- ► If your installation is equipped with a pressure regulator, it is preferable to use it before putting the circuit under pressure.



Connecting the nitrogen circuit

To guarantee best peformances, It is necessary to dispose of dry and filter nitrogen supply with required characteristics (see chapter 'Nitrogen characteristics').

The nitrogen connector, separetly conditionned, is designed to be connected on 6mm pipe exterior diameter/ 4 mm interior (provided by the customer).

1. Connect the nitrogen pipe to the supplied connector.
2. Then connect to the **N2 IN** of the pump.

5.1.5 Connecting to the pumping line

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

⚠ WARNING

Risk of crushing and/or cutting in case of contact with moving parts

The pump inlet flange is large enough for body part (finger or hand) to be inserted into it, presenting a risk of crushing due to contact with moving parts. The inlet and exhaust ports should be sealed with blanking plates before connection.

- ► Wait for the pumping line to be connected before removing the blanking plates.
- ► **Wait for the pump to be connected before powering on.**

General instructions for installing the pump in the pumping line in accordance with industry best practices

The inlet and exhaust connections must not put undue strain on the pumping line that could cause leakage.

1. Only use accessories on the inlet and exhaust lines with materials and sealing properties that are compatible with the gases being pumped. Refer to the connection accessories catalog available at the Pfeiffer-Vacuum website.
2. When assembling the pumping line, include accessories for isolating the pump from the pumping line and making maintenance easier to carry out (pump inlet and exhaust isolation valves, purge valves, etc.).
3. The O-rings located under the blanking plates are not compatible with all applications. **Product users or integrators are responsible for installing O-rings that are compatible with their applications**.
4. Remove the blanking plates used to seal the inlet and exhaust ports.
5. Keep the blanking plates, screws and washers for reuse when transporting the pump.
6. Ensure that no screws, washers or other objects are dropped into the pump inlet.
7. Fit flexible tubes in the pumping line to reduce the transmission of vibration.
8. Perform a leak test on the entire pumping line after installation.

Pump inlet connection

- ► To achieve optimal pumping speed, make the pumping line **as short and straight as possible and ensure that its inside diameter is not smaller than the pump inlet flange**.

Make sure that the parts or chambers connected to the inlet of our products can withstand a negative pressure of $1 \cdot 10^{-3}$ hPa absolute.

Pump exhaust connection

- ► **Always connect the pump exhaust to a gas extraction and treatment system**.

Ensure that all components in the exhaust line have a maximum pressure rating that exceeds the highest pressure the pump can generate.

5.2 Check that the installation is leak tight

When the product leaves the factory, product leak tightness under normal operating conditions is guaranteed. The operator must maintain this level of leak tightness, especially when pumping dangerous gases. For more information concerning leak tests, please contact our service center.

1. Perform a leak test on the entire pumping line after installation.
2. Carry out regular checks to ensure that there are no traces of the pumped gases in the surrounding environment and that no air is entering the pumping line during operation.

5.3 Remote control via the 16-pin connector

NOTICE

Safety of Extra-Low Voltage circuits

The remote control circuits are equipped with dry contact outputs (50 V - 1 A max). Overvoltages and overcurrents can result in internal electrical damage. Users must observe the following wiring conditions:

- ► Connect these outputs in accordance with the rules and protection of Safety Extra-Low Voltage (SELV) circuits.
- ► The voltage applied to these contacts should be less than 50 V and the current less than 1 A.

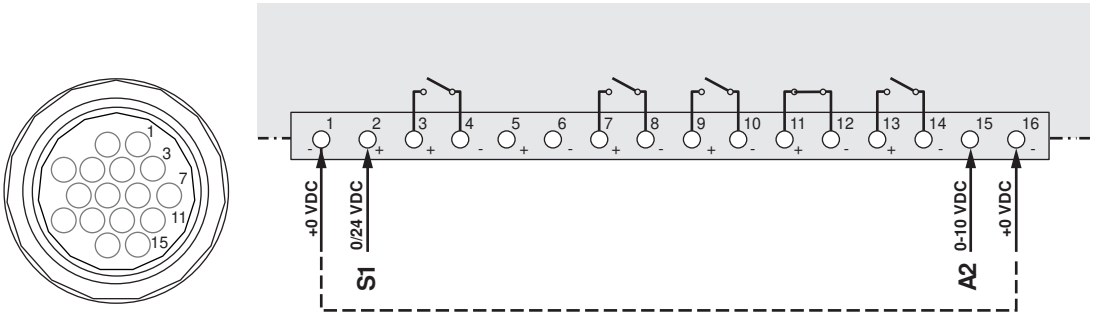


Fig. 7: 16-pin remote control connector wiring

Description

The connection made via the remote control connector provides you with:

- ► remote control of start, stop and rotation speed adjustment functions.
- ► remote pump status through auxiliary dry contacts.

Input wiring

The cabling is the responsibility of the customer.

	Contact	Function	
Logic input	S1 (1-2)	Pump Start/Stop	• to start the pump: 24V DC voltage applied • to stop the pump: 0V DC voltage applied
Analog input	A2 (15-16)	Rotation frequency setpoint This function is possible if the 'Rem' mode is configured (see chapter “Remote mode operation”, page 29) .	Rotation frequency setpoint (0/10V DC input). • for the maximum frequency: 0V DC voltage applied • for the minimum frequency: 10V DC voltage applied

Digital output wiring

These are normally open contacts (NO): these contacts open in the event of a fault.

Contact	Function
3-4	Pump status
7-8	Warning present
9-10	Alarm present
11-12	Reserved
13-14	Authorization to control an isolation valve on the equipment

Pump status	3-4	7-8	9-10	11-12	13-14
Pump in operation	closed	closed	closed	closed	closed
Pump stopped	open	closed	closed	closed	open

Pump status	3-4	7-8	9-10	11-12	13-14
Pump in operation + warning	closed	open	closed	closed	closed
Pump stopped + alarm	open	closed	open	closed	open

5.4 Remote control via the 19-pin connector

NOTICE

Safety of Extra-Low Voltage circuits

The remote control circuits are equipped with dry contact outputs (50 V - 1 A max). Overvoltages and overcurrents can result in internal electrical damage. Users must observe the following wiring conditions:

- ► Connect these outputs in accordance with the rules and protection of Safety Extra-Low Voltage (SELV) circuits.
- ► The voltage applied to these contacts should be less than 50 V and the current less than 1 A.

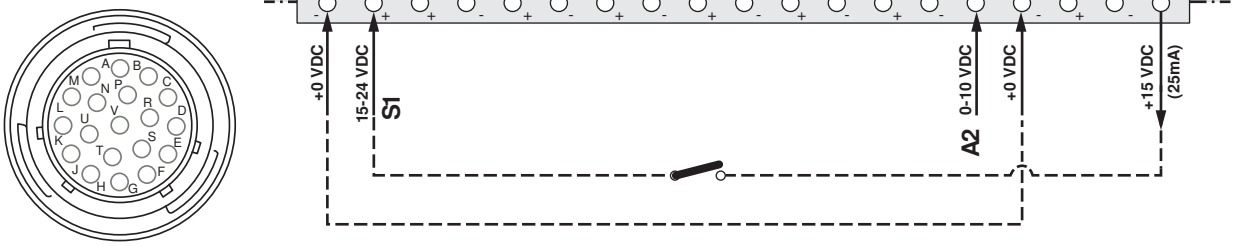


Fig. 8: 19-pin remote control connector wiring

Description

The connection made via the remote control connector provides you with:

- ► remote control of start, stop and rotation speed adjustment functions.
- ► remote pump status through auxiliary dry contacts.

Input wiring

The cabling is the responsibility of the customer.

	Contact	Function	
Logic input	S1 (A-B)	Pump Start/ Stop	When 15 to 24 VDC voltage is applied, the pump is in operation. If no voltage is applied (0 VDC), the pump stops.
Analog input	A2 (R-S)	Rotation frequency setpoint	Rotation frequency setpoint (0/10 VDC input). • for the maximum frequency: 0 VDC voltage applied • for the minimum frequency: 10 VDC voltage applied This function is possible if the 'Rem' mode is configured (see chapter “Remote mode operation”, page 29).

Digital output wiring

These are normally open contacts (NO): these contacts open in the event of a fault.

Contact	Function
C-D	Pump status
E-F	Warning present
G-H	Warning present
J-K	Pump alarm presence
L-M	Reserved

Contact	Function
N-P	Authorization to control an isolation valve on the equipment
T-U	Pump failure

Pump status	C-D	E-F	G-H	J-K	L-M	N-P	T-U
Pump in operation	closed	closed	closed	closed	closed	closed	closed
Pump stopped	open	closed	closed	closed	closed	open	closed
Pump in operation + warning	closed	open	open	closed	closed	closed	closed
Pump stopped + alarm	open	closed	closed	open	closed	open	open

5.5 Electrical connection

⚠ WARNING

Risk of electric shock due to non-compliant electrical installations

This product uses mains voltage for its power supply. Non-compliant electrical installations or installations not done to professional standards may endanger the user's life.

- ► Only qualified technicians trained in the relevant electrical safety and EMC regulations are authorized to work on the electrical installation.
- ► This product must not be modified or converted arbitrarily.
- ► Check that the product is properly connected to the equipment's or pumping installation's emergency stop circuit.

NOTICE

Risk of electromagnetic disturbance

Voltages and currents can induce a multitude of electromagnetic fields and interference signals. Installations that do not comply with the EMC regulations can interfere with other equipment and the environment in general.

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

Electrical safety

The pump is equipped with an **ON/OFF** circuit breaker which isolates the pump from the power line when in **OFF** position.

The pump motor is equipped with thermal protection: when the internal temperature of the motor exceeds the pre-set limit value, the motor stops.

The electronic monitoring power supply is protected by a thermal protection device.

When these safety features are triggered, the power supply is switched off and the pump is in safety position.

Procedure for restarting the pump

1. switch off the main power (circuit breaker in **OFF** position),
2. eliminate the cause of the fault, then
3. wait for about 15 seconds,
4. switch the circuit breaker to **ON** position.

Two 0.1A/250 VAC semi time-lag fuses protect the electronic circuit: the installer must not replace these fuses.

5.5.1 Customer electrical installation protection measures

Circuit breaker protection

The power circuit used to supply the pump must be fitted with a breaker complying with the IEC 60947-2 curve D standard whose short circuit cut-off capacity is at least 10 kA. This protection device should be in close proximity to the pump (no further than 7 m away) and in line of sight of the product.

The customer must provide a correctly-rated main circuit breaker (see chapter "Electrical characteristics").

Differential circuit breaker

To protect individuals against insulation faults, you must install a differential circuit breaker (see chapter "Electrical characteristics"). If necessary, contact our service center. The applicable local regulations must be complied with at all times.

Earthing

Users must provide a second circuit protective conductor (earth) whose cross-section is at least equal to that of the conductors.

The IEC 60417 #5019 ⏚ symbol is marked on the rear panel to indicate where the CPC earth terminal is located.

► Connect the earth stud to a suitable installation earthing point such as the host system frame.

5.5.2 Mains connection

Users need to provide a power cable with the required characteristics (see chapter "Electrical characteristics").

1. Connect to the power supply according to the following diagram.
2. Connect the connector to the plug on the pump frame and lock it.

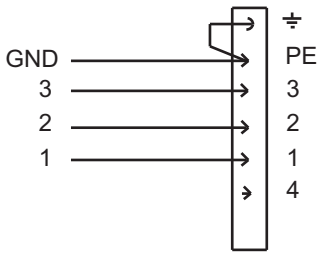
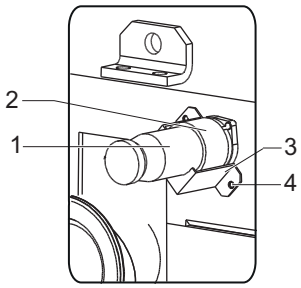


Fig. 9: Electrical connection

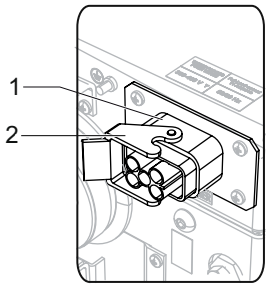
Locking of the low-voltage electrical connector



1 Female connector
2 Clamp ring
3 Mounting flange
4 Screw

1. Remove the mounting flange from the female connector.
2. Tighten the clamp ring of the female connector to the power socket.
3. Install the mounting flange using the 2 fixing screws.

Locking of the high-voltage electrical connector



1 Power socket
2 Lock

1. Lock the female connector to the power socket with the lock.

Absence of emergency stop

The vacuum pump is not equipped with an emergency stop device (EMS) or a lock-out device. The vacuum pump is designed to be integrated into equipment fitted with an emergency stop device.

- When activated, the EMS of the equipment must switch off the vacuum pump.

6 Operation

6.1 Preliminary precautions for use

⚠ WARNING

Risk of poisoning when process gases are present in the atmosphere

The manufacturer has no control over the types of gases used with the pump. Process gases are often toxic, flammable, corrosive, explosive and/or otherwise reactive. There is a risk of serious or fatal injury if these gases are allowed to escape freely into the atmosphere.

- ► Apply the relevant safety instructions in accordance with local regulation. This information is available from the operator's safety department.
- ► **The pump exhaust must be connected** to the installation's dangerous gases extraction system.
- ► Regularly check that there are no leaks where the pump connects to the exhaust pipework.

⚠ WARNING

Risk of electric shock in case of contact with the mains connector at power-off

Certain components use capacitors that are charged up to over 60 VDC and that hold their electrical charge **at power-off**: residual voltages due to filter capacitance can cause electric shock, up to and including mains voltage levels.

- ► Wait 5 minutes after power-off before commencing work on the product.

⚠ WARNING

Danger to life from electric shock in the event of a fault

In the event of a fault, devices connected to the mains may be live. There is a danger to life from electric shock when making contact with live components.

- ► Always keep the mains connection freely accessible so you can disconnect it at any time.

Oil capacity

The pump is delivered with filled oil charge.

- Do not modify the oil level.
- Do not drain the pump: this operation is carried out during pump overhaul by our service centers.

Every time the pump is commissioned:

1. Check that the pump inlet is properly connected to the pumping line.
2. Check that the exhaust lines are not clogged and that all extraction system valves are open.
3. Start up the water circuit and the nitrogen circuit (if present).
4. Switch on the main switch of the customer's electrical installation.

6.2 The control modes

This chapter describes the connections and protocols associated with each control mode. There are 3 control modes:

- **LOCAL**

  The pump is controlled by the circuit breaker **ON/OFF** located on the front. The pump runs independently of the equipment onto which it has been integrated.
- **REMOTE**

  The pump is controlled remotely by the opening or closing of different dry contacts, its rotation speed can be adjusted by applying voltage to the pins of the 16-pins or 19-pins remote control

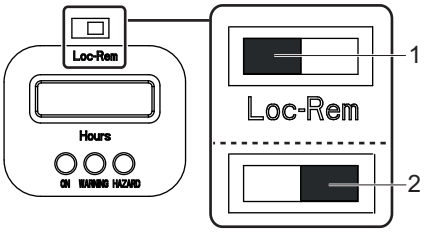
connector (see chapter "Remote control via the connector 16 pins") (see chapter "Remote control via the connector 19 pins").

- **SERIAL LINK**

  The pump is controlled remotely by the opening or closing of different dry **RS-232/RS-485**.

Selecting the control mode

The 'Loc-Rem' switch located on the pump's front panel is used to switch from one control mode to another.



1 Switch on the left: **'Loc'**, operation in local mode

2 Switch on the right: **'Rem'**, operation in remote control mode

6.3 Specific features of the A 100 L ES model's operation

By design, the pump A 100 L ES is characterized by its reduced energy consumption thanks to the ‘Energy Saving‘ option:

The option incorporates a system that reduces the power consumed when operating at ultimate pressure. This system is managed automatically by the monitoring according to the pumping conditions.

6.4 Local mode operation

Pumping start-up

1. Check that the switch is in local mode **'Loc'** on the left.
2. Set the pump’s circuit breaker to **ON**: the pump starts **automatically**.
   - The green LED lights up.
   - The temperature monitoring sensors are activated.

Shutting down the pump

1. Set the circuit breaker to **OFF**: the pump stops **automatically**.
   - The green LED turns off.

⚠ DANGER

Risk of injury associated with the auto-start

In local mode, the pump is configured to start automatically when the circuit breaker is set to **I**.

► Install a safety device in the equipment to warn the operator or prevent the automatic restart.
► You must put the necessary measures in place to make this potentially hazardous mode of operation safe.

Restart after emergency stop (using the equipment)

The emergency stop is managed by the equipment in which the pump is integrated. To restart the pump after an emergency stop, you must:

1. fix the problem,
2. unlock the equipment's emergency stop button.

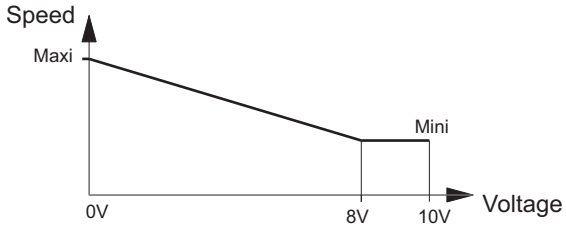
6.5 Remote mode operation

Preliminary configuration

1. Wire and connect the remote connector located at the rear of the pump (see chapter "Remote control via the connector 16 pins") or (see chapter "Remote control via the connector 19 pins").
2. Set the remote control mode switch to **'Rem'** on the right.

Rotational speed setting

1. Apply 0 to 10V direct voltage to analog input A2 of the remote control connector to adjust the rotation speed of the pump:
   - the speed decreases from the maximum value (0 V) to the minimum value (10 V).



Pumping start-up

1. Set the pump's circuit breaker to **ON**:
   – The pump is supplied with power.
   – The time counter lights up.
2. Apply direct voltage to input S1 of remote control connector (see chapter "Remote control via the connector 16 pins") or (see chapter "Remote control via the connector 19 pins")
   - The pump is running according to the set speed.
   - The green LED lights up.

Pumping shutdown

1. Stop applying voltage to input S1 (open the contact):
   - The pump stops automatically.
   - The green LED turns off.

After a power failure, the pumps restarts automatically at the set speed when the power comes back.

Powering off

1. Set the circuit breaker to **OFF**:
   – The pump is no longer supplied with power.
   – The time counter switches off.

Restart after emergency stop (using the equipment)

The emergency stop is managed by the equipment in which the pump is integrated.

1. To restart the pump after an emergency stop:
   – Correct the problem,
   – Unlock the equipment's emergency stop button.
   – Apply voltage to the "On/Off" contact of remote control connector:
      – The pump restarts at the set speed.

6.6 Operation monitoring

The pump is fitted with temperature monitoring sensors which set off:

- a warning when the pump's temperature reaches the pre-set threshold (factory setting can not be changed)
- an alarm when the pump's temperature or motor safety exceeds this threshold. The pump immediately stops when an alarm is detected

When problems occur, user is informed by:

- the relevant indicator light coming on: yellow for warning, red for alarm
- the fault contacts on the remote connector are being activated
- pumping shutdown although the **OFF** command has not been activated,
- a message via the RS-232 or RS-485 link

Message	Indicator light status		Operating status
	○	Indicator lights off	The pump is not running
Pump running	●	Green indicator light on	The pump is running

Message	Indicator light status		Operating status
Warning		Green and yellow indicator lights on	First level temperature warning on the pump: pump continues to run at maximum speed. ● Rectify the problem to eliminate the fault .
Motor temp alarm		Red indicator light on	Motor temperature alarm: the pump is stopped. ● The pump must be replaced .

In the event of a functional anomaly (see chapter “Malfunctions”, page 36)

7 Maintenance

7.1 Maintenance safety instructions

Safety instructions regarding corrosive gases do not apply to pumps intended for load-lock or transfer chamber pumping. In the event of the accidental presence of corrosive gases, users must observe the following precautions when disconnecting the pump from the installation and working on the product.

⚠ DANGER

Risk to health posed by residual traces of process gases inside the pump

Process gases are toxic and hazardous to health. They can cause poisoning and be fatal. Before disconnecting the pump, any remaining traces of process gases must be eliminated.

- ► **The equipment (pumping installation) must be purged with a stream of nitrogen for 30 minutes** at the same pressure and flow as that used for the process itself.

⚠ DANGER

Risk of poisoning in case of contact with toxic substances and by-products generated by the process

The vacuum pump, pumping line components and operating fluids **will potentially be contaminated** with toxic, corrosive, reactive and/or radioactive materials related to the process. Any contact with the contaminated parts or by-products generated by the process may be injurious to health and could cause poisoning.

- ► Appropriate protective equipments must be worn when disconnecting the pump for maintenance, filling it with operating fluid, or draining it.
- ► Ventilate the area thoroughly or carry out the maintenance under an extraction hood.
- ► Do not eliminate the by-products/residue via as common waste; have them destroyed by a qualified company where necessary.
- ► **Close off all the ports with airtight blanking plates** (the product comes with blanking plates that are also available for sale as accessories).

⚠ WARNING

Danger of electrocution by contact during maintenance or overhaul

There is an electric shock hazard in case of contact with a product powered on and not electrically isolated.

- ► Before carrying out any work, set the main switch to **O**.
- ► Disconnect the power cable from the mains.
- ► Secure the installation correctly by tagging and locking (LO/TO) the system to prevent unintentional re-engagement.

⚠ WARNING

Risk of burns in case of contact with hot surfaces

Component temperature remains high, even after the pump has stopped. There is a risk of burns through contact with hot surfaces, especially at the pump exhaust.

- ► Wait for the product to fully cool down before working on it.
- ► Protective gloves must be worn in accordance with standard EN ISO 21420.

⚠ WARNING

Poisoning risk in case of process gas leakage

When connecting/disconnecting components to/from the pumping line (pump, pipework, valves, etc.) for maintenance, the leak tightness of the installation is broken, potentially causing hazardous process gas leakage.

- ► Always protect the inlet and exhaust surfaces during dismantling.
- ► Perform a leak test on the pumping line after reassembly.

General maintenance recommendations

- Ensure that the maintenance technician is trained in the safety regulations that cover the pumped gases.
- Lighting in the maintenance area must be sufficient for working and carrying out maintenance on the pump: brightness of more than 300 lux.
- Disconnect the power cable from all sources of power before working on the product.
- Wait 5 minutes after powering off before working on the electrical components.
- Route and secure cables, hoses and pipework to guard against falls.
- 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 organization to dispose of them.
- Always protect the inlet and exhaust flange surfaces.
- Pressurized circuits - nitrogen and water - pose potential energy risks: always lock out these circuits using the LO/TO (Lock Out/Tag Out) procedure before working on the product.

7.2 Maintenance frequency

No maintenance is generally required before product overhaul in a service center.

Maintenance frequency depends on the process and equipment used. Contact our service center (see chapter “Service solutions by Pfeiffer Vacuum”, page 38).

How to contact us

Product overhauls must be carried out by personnel with manufacturer training. Contact our nearest service center at the following e-mail address: service.fr@pfeiffer-vacuum.com.

7.3 On-site maintenance

The pump does not require any maintenance on the customer’s premises other than the day-to-day servicing described in this manual. Any other maintenance operation must be carried out by our service center (see chapter “Service solutions by Pfeiffer Vacuum”, page 38).

- ► Clean the outer surfaces of the product using a clean, lint-free cloth and a product that will not damage the screen-printed surfaces or adhesive labels.
- ► Check the exhaust line for clogging.
- ► Check the condition of the pipework and connections and repair if you find any corrosion or leaks.
- ► Check the color of the oil against a sample of new oil. This will allow you to check the level of contamination and the extent to which the lubricant has deteriorated. Oil changes are carried out by our service centers.

7.4 Exchange procedure for replacement products

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

1. Disconnecting the pump from the installation.
2. Draining the water circuit.
3. Preparing the pump for shipping.
4. Completing the declaration of contamination (see chapter “Service solutions by Pfeiffer Vacuum”, page 38).
5. Handling the new pump (see chapter "Handling").
6. Installing a new pump (see chapter "Pump set-up").

Familiarize yourself with the service request procedure and fill in the declaration of contamination when returning products to our service centers (see chapter “Service solutions by Pfeiffer Vacuum”, page 38).

7.4.1 Disconnecting the pump from the installation

Reminder of the risks and safety measures

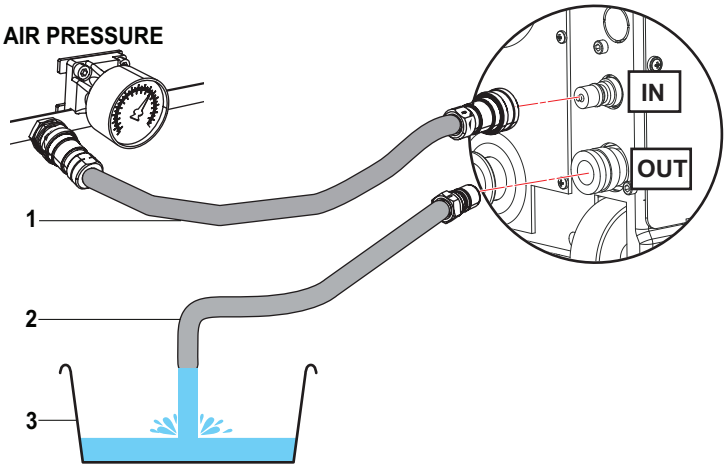
- Follow the maintenance safety instructions.
- Apply the specific safety instructions in accordance with local laws; this information is available from the customer’s health and safety department.

Disconnection procedure

1. Switch off the pump by setting the circuit breaker to **OFF**.
2. Switch off the circuit breaker of the customer installation.
3. Disconnect the power cable at the electrical connector.
4. Disconnect all connectors at the rear of the pump.
5. Disconnect the **WATER IN** connector followed by the **WATER OUT** connector.
6. Disconnect the nitrogen supply (if present).
7. Disconnect the pump from the pumping line and blank off the inlet port with the airtight connection accessories (available as accessories).
8. Disconnect the pump from the exhaust and blank off the exhaust port with the airtight connection accessories (available as accessories).
9. Remove the seismic brackets (accessories).
10. Retract the frame's 4 feet.
    – To leave the pump resting on its casters.
11. Remove the pump from the installation.

7.4.2 Draining the water circuit

Any water that has accumulated must be drained to prevent the pipework from freezing during transport. To do this, users must provide flexible tubes and connectors as well as a compressed air circuit (pressure of 2 to $5 \cdot 10^3$ hPa).



1 Water inlet tube with female connector
2 Purge tube with male connector
3 Container (holding more than 1 liter).

Water circuit drainage procedure

1. Connect the drainage tube to the **WATER OUT** connector and put the other end in the container.
2. Connect the inlet tube to the **WATER IN** connector and connect the other end to the compressed air circuit.
3. Inject compressed air into the pump until the water has been completely evacuated from the circuit.

7.4.3 Preparing the pump for shipping

► Install the airtight connecting accessories included with the pump at first delivery.
► Pressurize the pump with nitrogen in accordance with the following procedure.

Pressurizing with nitrogen

To pressurize the pump, you will need a nitrogen supply with the required characteristics (see chapter "Nitrogen characteristics") and the blanking plates provided with the product or obtainable as accessories.

1. Seal the pump inlet with the airtight accessories.
2. Connect the nitrogen supply to the gas connector located on the inlet blanking plate.
3. Pressurize the pump with nitrogen to a relative pressure of 200 hPa.
4. When nitrogen starts flowing from the exhaust, seal it with the accessories provided.
5. Disconnect the nitrogen supply from the connector.

8 Decommissioning

8.1 Shutting down for longer periods

Pumps intended for load-lock and transfer chamber pumping are designed to run continuously on pumping installations. If the pump is due to be shut down for a prolonged period, observe the following instructions:

1. Disconnect the pump from the installation(see chapter "Disconnecting the pump from the installation").
2. Drain the water circuit (see chapter "Draining of the water circuit").
3. Pressurize and store the pump (see chapter "Conditioning the pump for shipping").

8.2 Recommissioning

To restart the pump after a prolonged shutdown period, refer to the installation instructions (see chapter “Installation ”, page 18)

8.3 Disposal

In accordance with directives on the treatment of waste electrical and electronic equipment (WEEE), and concerning the restriction of hazardous substances (RoHS), end-of-life products can be returned to the manufacturer for decontamination and recycling.

The manufacturer shall only be required to take back equipment that is complete and unmodified, using Pfeiffer Vacuum SAS original spare parts, sold by Pfeiffer Vacuum and including all assemblies and sub-assemblies.

This obligation does not cover the shipping cost to a reclamation facility or services provided, for which the customer will be invoiced.

Familiarize yourself with the service request procedure and fill in the declaration of contamination when returning products to our service centers (see chapter “Service solutions by Pfeiffer Vacuum”, page 38).

Environmental protection

The product and 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 wastage and preventing pollution.

Our products contain various recyclable materials: iron, steel, stainless steel, cast iron, aluminum, copper, fluoroelastomers, PTFE, silicon, operating fluid, electrical and electronic components. Take special precautions for:

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

9 Malfunctions

9.1 Malfunction and fault indication

When problems occur, users are informed by:

- The relevant indicator light coming on: yellow for warnings, red for alarms.
- Fault contacts on the remote connector are being activated.
- Pumping shutdown although the OFF command has not been activated.
- A message via the RS-232 or RS-485 serial link.

9.2 The pump does not start

	Symptom	Cause	Remedy
No indicator light is on	The switch is set to **ON** and the pump is not running.	The circuit breaker is in OFF position	Set the circuit breaker to **ON**.
		The pump supply voltage is not compatible with the equipment's power configuration	Check the power supply.
		The Loc-Rem switch is set to 'Rem'	Check that there is 15 or 24V DC voltage on analog input 1- 2 or A-B of the remote control connector.
			Set the switch to 'Loc'.
		The Loc-Rem switch is set to 'Loc'	*Contact our service center.*
		Other problem	*Contact our service center.*

9.3 The pump is running, an indicator light is on

	Symptom	Cause	Remedy
Green indicator light on	Vacuum poor or non-existent.	The pump is not running at full speed	Check that no voltage is applied to analog input 15-16 (or Q-R) of the remote control connector.
		Leak in the roughing line	Disconnect the roughing line and check the vacuum level.
			Check the connections and conduct a leak test.
		The pump is running at a reduced speed	Check the pumping conditions.
		Other problem	*Contact our service center.*
	The pump is noisy	The pump is not properly secured to the equipment	Check that the pump is properly attached to the equipment.
		The exhaust is not connected	Check the exhaust connection.
		Other problem	*Contact our service center.*

	Symptom	Cause	Remedy
Green and yellow indicator lights on	The temperature of the functional block is too high	Water problem	Check the water circuit supply. Check that the water pipes are not obstructed or check for leaks. Check that the water flow is at least 100 l/h. Check the pumping conditions.
	The pump is not running at maximum speed	Water problem	Check the water circuit supply. Check that the water pipes are not obstructed or check for leaks.
		Other problem	*Contact our service center.*

9.4 The pump stops running

	Symptom	Cause	Remedy
Red indicator light on	The pump stops when no shutdown command has been activated.	The motor's temperature is too high	Disconnect the pump to replace it (see chapter « Maintenance »).
		Other problem	*Contact our service center.*

10 Service solutions by Pfeiffer Vacuum

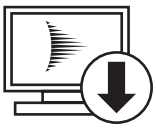
We offer first-class service
High vacuum component service life, in combination with low downtime, are clear expectations that you place on us. We meet your needs with efficient products and outstanding service.

We are always focused on perfecting our core competence – servicing of vacuum components. Once you have purchased a product from Pfeiffer Vacuum, our service is far from over. This is often exactly where service begins. Obviously, in proven Pfeiffer Vacuum quality.

Our professional sales and service employees are available to provide you with reliable assistance, worldwide. Pfeiffer Vacuum offers an entire range of services, from original replacement parts to service contracts.

Make use of Pfeiffer Vacuum service
Whether preventive, on-site service carried out by our field service, fast replacement with mint condition replacement products, or repair carried out in a Service Center near you – you have various options for maintaining your equipment availability. You can find more detailed information and addresses on our homepage, in the Pfeiffer Vacuum Service section.

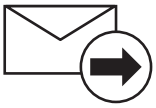
You can obtain advice on the optimal solution for you, from your Pfeiffer Vacuum representative.
For fast and smooth service process handling, we recommend the following:



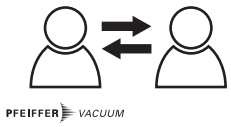
1. Download the up-to-date form templates.
   - Explanations of service requests
   - Service requests
   - Contamination declaration

a) Remove and store all accessories (all external parts, such as valves, protective screens, etc.).
b) If necessary, drain operating fluid/lubricant.
c) If necessary, drain coolant.

2. Complete the service request and contamination declaration.

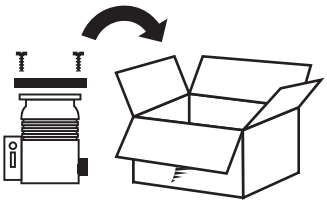


3. Send the forms by email, fax, or post to your local Service Center.

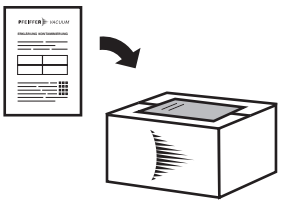


4. You will receive an acknowledgment from Pfeiffer Vacuum.

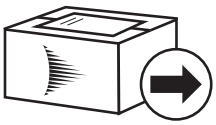
Submission of contaminated products
No microbiological, explosive, or radiologically contaminated products will be accepted. Where products are contaminated, or the contamination declaration is missing, Pfeiffer Vacuum will contact you before starting service work. Depending on the product and degree of pollution, **additional decontamination costs** may be incurred.



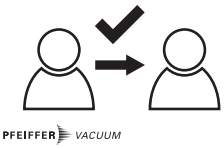
5. Prepare the product for transport in accordance with the provisions in the contamination declaration.
a) Neutralize the product with nitrogen or dry air.
b) Seal all openings with blind flanges, so that they are airtight.
c) Shrink-wrap the product in suitable protective foil.
d) Package the product in suitable, stable transport containers only.
e) Maintain applicable transport conditions.



6. Attach the contamination declaration to the **outside** of the packaging.



7. Now send your product to your local Service Center.



8. You will receive an acknowledgment/quotation, from Pfeiffer Vacuum.

Our sales and delivery conditions and repair and maintenance conditions for vacuum devices and components apply to all service orders.

11 Accessories

Accessory	Description	Dimension	P/N
Seismic brackets	Set of 4 brackets		109790
Female 1/4" NPT connector	Water inlet		076721
1/4" NPT male connector	Water outlet		076720
Nitrogen pressurization kit including			107956S
	Exhaust blank-off flange	DN 25 ISO-KF	
	Quick-connect clamp	DN 25 ISO-KF	
	Centering ring fitted with o-ring	DN 25 ISO-KF	
	Inlet blanking plate + 1/8'' gas connector	DN 25 ISO-KF	
	Centering ring fitted with o-ring	DN 25 ISO-KF	
Anti-noise device		DN 25 ISO-KF	110868
Remote control kit	16-pin connector (AMP182 642-1 + AMP 182 655-1 + AMP 163 088-2)		112460
Remote control kit	19-pin connector (ITT Canon 192926-0530 + 192922-1340 + 192990-0030)		112464
RS-232/RS-485 serial link	Printed circuit board, RS connector + panel		111923
For blanking plates, claw clamps and quick-connect clamps, please refer to the connection accessories catalog at Pfeiffer-Vacuum. Select material properties compatible with the application.			

12 Technical data and dimensions

12.1 General

Basic principles for the Technical Data of Pfeiffer Vacuum compact multi-stage Roots pumps for light-duty applications:

- Recommendations of PNEUROP committee PN5
- ISO 21360; 2007: “Vacuum technology - Standard methods for measuring vacuum-pump performance - General description”
- Sound pressure level: Distance 1 m to the pump

12.2 Technical characteristics

Technical data	Units	A 100 L	A 100 L ES
Maximum rotation speed	min^{-1}	6000	6000
Minimum rotation speed	min^{-1}	3000	3000
Pumping speed	m^3/h	100	100
Ultimate pressure (average value) 1)	hPa	$6.6 \cdot 10^{-3}$	$7 \cdot 10^{-4}$
Ultimate pressure (maximum value) 1)	hPa	$1.2 \cdot 10^{-2}$	$3 \cdot 10^{-3}$
Maximum pumping volume 2)	m^3	1	1
Maximum cycle rate for a 20 L volume	cycle/h	90	90
Maximum cycle rate for a 25 L volume	cycle/h	-	-
Maximum continuous inlet flow	slm	20	20
Nitrogen flow / CDA	slpm	-	30
Supply voltage 3)	V	200-230 V - 3-phase - 50/60 Hz or 380-480 V - 3-phase - 50/60 Hz	200-230 V - 3-phase - 50/60 Hz
Power consumption at ultimate pressure (maximum value)	kW	1.6	< 0.8
Maximum power consumption	kW	3.5	3.5
Full load current (200-230 V)	A	12	15
Full load current (380-480 V)	A	7	-
Maximum exhaust pressure	hPa	1200	1200
Cooling water flow 4)	l/h	100 mini	100 mini
Oil capacity	l	0.09	0.09
Inlet flange		DN 50 ISO-KF	DN 50 ISO-KF
Exhaust flange		DN 25 ISO-KF	DN 25 ISO-KF
Weight	kg	100	100
Vibration level on the inlet flange (10-1000Hz) (maximum value)	g	< 0.1	< 0.1
Sound level 5)(average value)	dB(A)	< 55	< 52
Sound level 5)(maximum value)	dB(A)	< 58	< 55

1) In very low power operation.

2) This pump is certified for pumping a volume of 1 m^3, with 20 mn cycling. For a higher volume or cycling frequency, please contact us.

3) In accordance with EC regulations, the pumps can withstand a voltage variation of ± 10 %.

4) Depending on conditions of use. Contact Pfeiffer Vacuum.

5) Measured at a distance of 1 m and a height of 1.6 m in accordance with standard ISO 9614-2

	mbar	bar	Pa	hPa	kPa	Torr | mm Hg
mbar	1	$1 \cdot 10^{-3}$	100	1	0.1	0.75
bar	1000	1	$1 \cdot 10^{5}$	1000	100	750
Pa	0.01	$1 \cdot 10^{-5}$	1	0.01	$1 \cdot 10^{-3}$	$7.5 \cdot 10^{-3}$
hPa	1	$1 \cdot 10^{-3}$	100	1	0.1	0.75
kPa	10	0.01	1000	10	1	7.5
Torr | mm Hg	1.33	$1.33 \cdot 10^{-3}$	133.32	1.33	0.133	1
1 Pa = 1 N/m^2						

Tbl. 1: Conversion table: Pressure 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	$1.69 \cdot 10^{-2}$	$1.69 \cdot 10^{-3}$	1	$1.27 \cdot 10^{-2}$	$1.67 \cdot 10^{-2}$
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

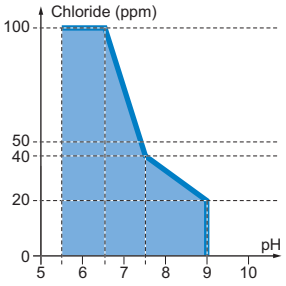
Tbl. 2: Conversion table: Units for gas throughput

12.2.1 Environmental conditions

Use	indoor use
Installation altitude	up to 2000 m
Protection index	IP20 / IP22 [2)]
Ambiant operating temperature	5 - 35 °C
Storage temperature	-25 - +55 °C
Maximum relative humidity	max. 80% with T ≤ 31 °C, up to max. 50% with T ≤ 40 °C
Transient overvoltage protection [1)]	Category II
Pollution degree	2
[1)]Transient overvoltages up to overvoltage category II levels. Temporary overvoltages that affect the mains supply.[2)]With IP22 option	

Tbl. 3: Environmental characteristics

12.2.2 Cooling water characteristics



pH	5.5 to 9
Chlorides [1]	100 to 20 ppm depending on the pH
Hardness	< 10 °fH (French degree) < 2 milliequivalent/L < 100 mg/L of $CaCO_3$ (calcium carbonate)
Total dissolved solids	< 300 mg/L
LSI (Langelier saturation Index) = pH - pHs	- 0.5 < LSI < 0 to 20 °C
Particle size	< 0.2 mm
Resistivity	2,000 Ω·cm < R < 1,000,000 Ω·cm
Inlet temperature [2]	10-35 °C
Relative inlet pressure	$2 \cdot 10^3$ to $6 \cdot 10^3$ hPa
Input/output pressure difference	> $2 \cdot 10^3$ hPa

1) The oxidizing action of the chlorine depends on the pH (aggressiveness of the water). The chloride content must be within the colored area on the graph

2) Depends on pumping conditions. Contact us.

Tbl. 4: Cooling water characteristics

Connector types

Water inlet	1/4'' NPT male connector	Stainless steel
Water outlet	1/4'' NPT female connector	Stainless steel

12.2.3 Nitrogen characteristics

H_2O concentration	< 10 ppm v
O_2 concentration	< 5 ppm v
Dust	< 1 µm
Oil	< 0.1 ppm v
Relative pressure	$2 \cdot 10^3$ to $6 \cdot 10^3$ hPa

Tbl. 5: Nitrogen characteristics

Connector types

Nitrogen inlet	1/8" NPT male connector	Stainless steel
Nitrogen inlet	Male connector for 1/4" tube	Stainless steel

12.2.4 Compressed dry air characteristics (CDA)

Type	Class 4 according to standard ISO 8573-1
Dust	< 15 µm
Oil	< 0.005 ppm v
Relative pressure	$2 \cdot 10^3$ à $6 \cdot 10^3$ hPa

Tbl. 6: Compressed dry air characteristics (CDA)

Connector types

Inlet	1/8" NPT male connector	Stainless steel
Inlet	Male connector for 1/4" tube	Stainless steel

12.2.5 Electrical characteristics

Main switch short circuit cut-off capacity	10 kA
GFI (or RCD) type B, differential circuit breaker compatible with TT electrical networks	300 mA [1)]
[1)] for TN and IT networks, use appropriate protection measures	

Tbl. 7: Electrical network protection

Mains voltage	Rating	Conductor cross-section sizes	
200-230V 50/60 Hz	15 A	2.08 mm²	AWG-14
380-480V 50/60 Hz	15 A	2.08 mm²	AWG-14
If the power supply voltage is changed from the factory configuration, please contact our service center.			

Tbl. 8: Main circuit breaker rating and cable cross-section size

12.3 Dimensions

Dimensions in mm

Center of gravity (mm)

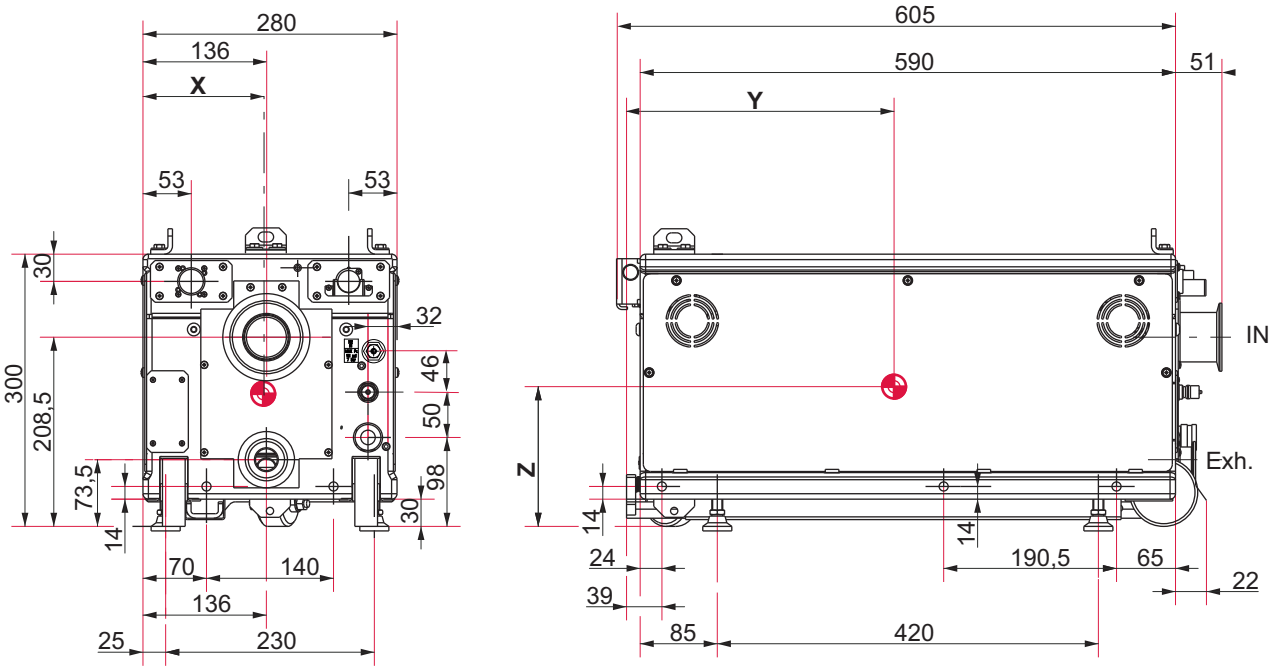
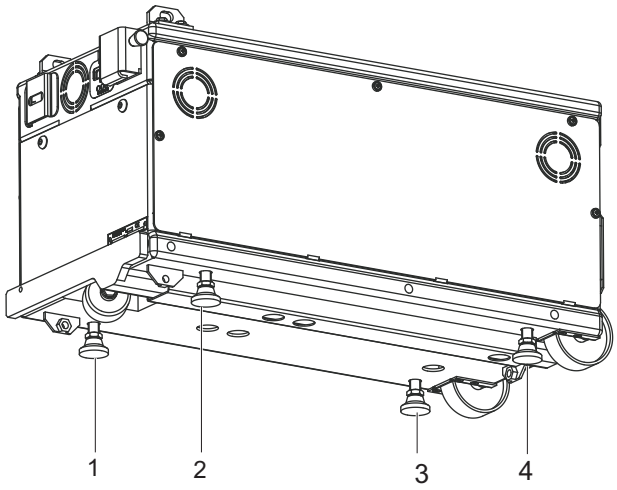


Fig. 10: Dimensions of the pump

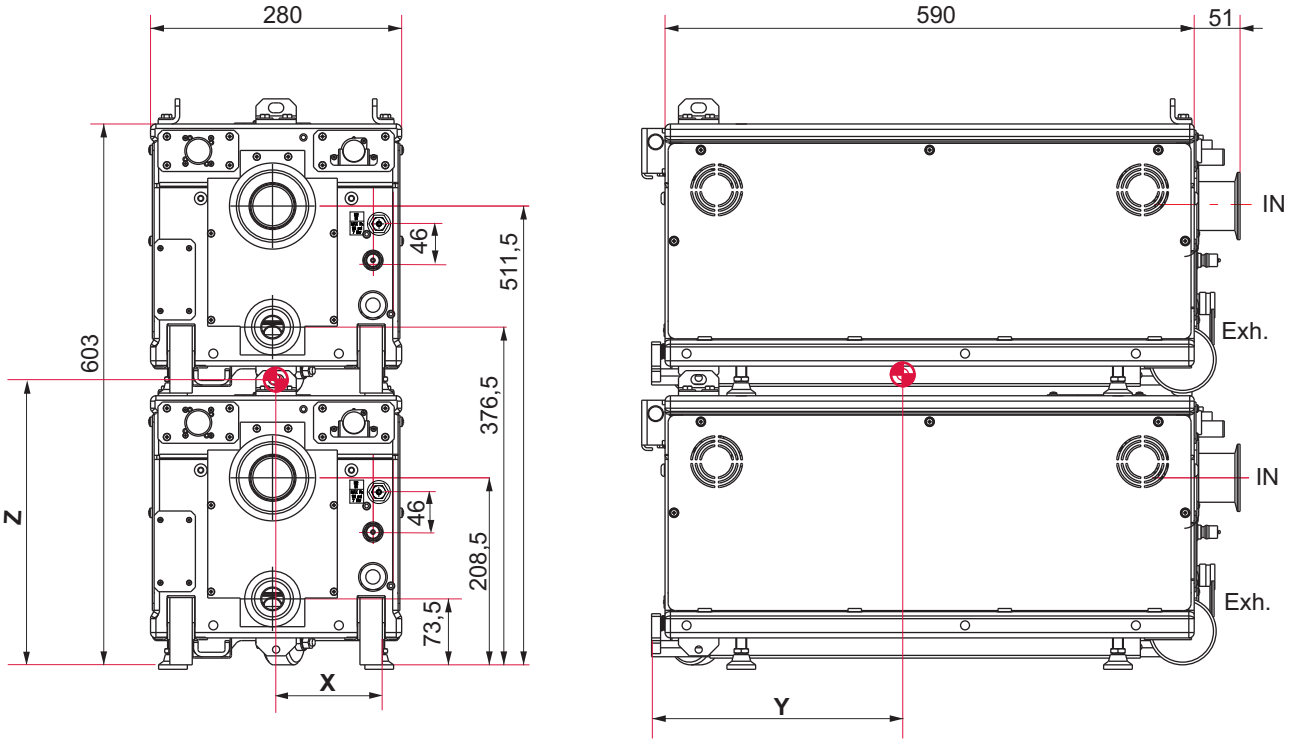


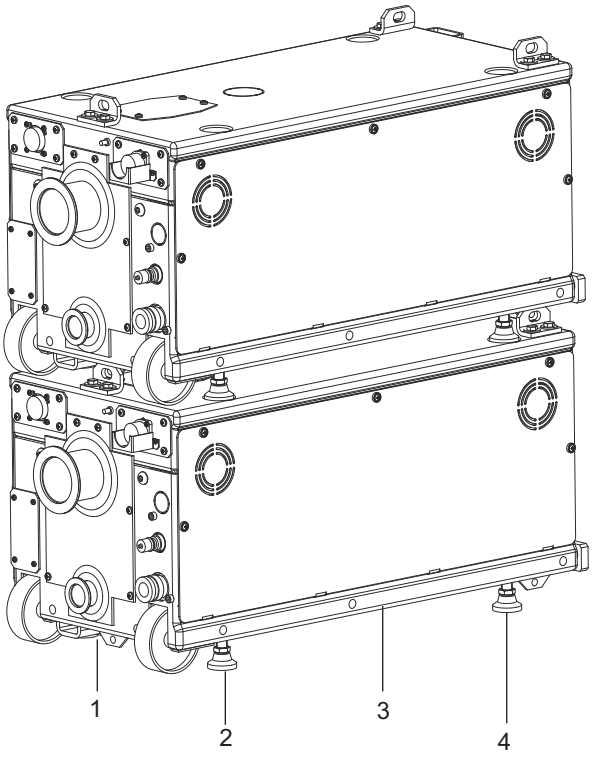
	Center of gravity (mm)			Load by foot[1)]			
	X	Y	Z	1	2	3	4
⊕	135	325	152	22 N	24 N	29 N	28 N

[1)] According to standard Semi S2-200 Section 19

Tbl. 9: Load distribution by foot: case of a single pump

Dimensions of stacked pumps





	Center of gravity (mm)			Load by foot[1)]			
	X	**Y**	**Z**	**1**	**2**	**3**	**4**
	135	325	302	44 N	48 N	58 N	56 N

[1)] According to standard Semi S2-200 Section 19

Tbl. 10: Load distribution by foot: 2 stacked pumps

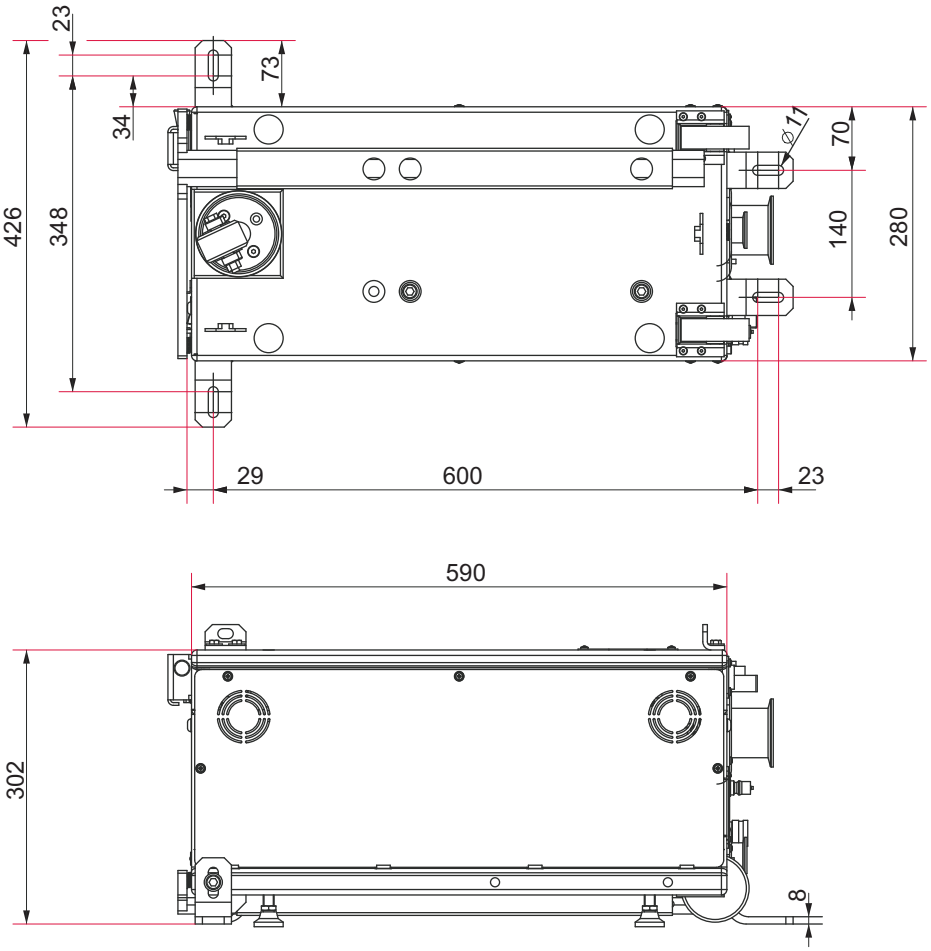
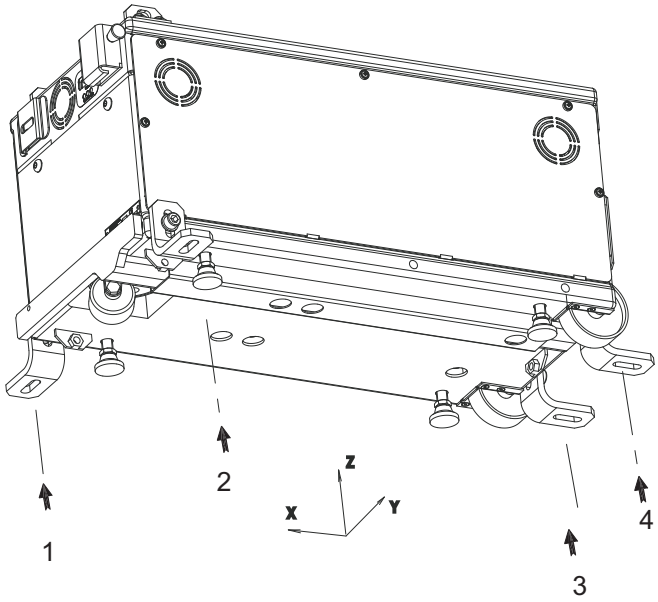


Fig. 11: Dimensions of the pump equipped with seismic brackets



Load distribution on seismic brackets [1]		1	2	3	4
Case of a single pump	X	69 N	33	27	-129
	Y	-272 N	-183	-237	-258
	Z	-580 N	155	19	-454

[1] According to standard Semi S2-200 Section 19

Load distribution on seismic brackets [1]		1	2	3	4
Case of 2 stacked pumps	X	334 N	-300	364	-368
	Y	-356 N	-642	-391	-511
	Z	-1845 N	1008	498	-1381

[1] According to standard Semi S2-200 Section 19

Tbl. 11: Load distribution on seismic brackets

13 Appendix

13.1 Installation of serial link RS-232/RS-485

NOTICE

Risk of electromagnetic disturbance

Voltages and currents can induce a multitude of electromagnetic fields and interference signals. Installations that do not comply with the EMC regulations can interfere with other equipment and the environment in general.

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

⚠ WARNING

Risk of electric shock in case of contact with a non-electrically insulated product

When powering off _mains switch to **O**_, certain components located between the mains connection and the circuit breaker will still contain an electric charge (live). There is a risk of electric shock in case of contact.

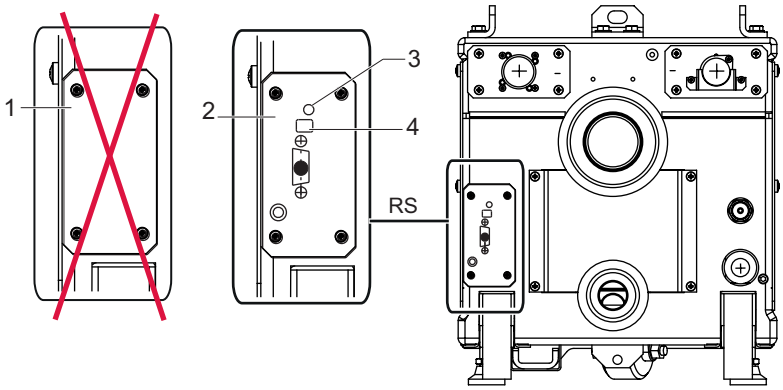
► Make sure that the mains connection is always visible and accessible so that it can be unplugged at any time.

► Disconnect the power cable from the mains supply before working on the product.

Procedure

1. Switch the circuit breaker to **OFF** position to turn the power off.
2. Turn on the customer's installation main switch.
3. Disconnect the power cable at the electrical connector.
4. Remove the plate at the rear of the pump by loosening the 4 screws.
5. Cut the clamp maintaining the cable behind the plate.
6. Connect the RS-232/RS-485 accessory to the cable.
7. Position the RS-232/RS-485 board in the frame and tighten the 4 screws.
8. Connect the pump to the electrical network.
9. Switch the circuit breaker to **ON** position to power on the pump.

When the circuit breaker is in **ON** position, the green LED on the RS-232/RS-485 board is lit.



1 Plate
2 RS-232/RS-485 board
3 LED
4 Red switch (x2)

13.2 Connections

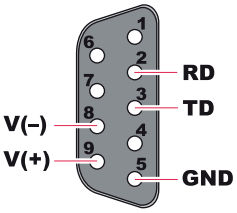
The D-Sub 9-pin connector is used to control and monitor the pump with a computer. The D-Sub 9-pin connector allows also the installation of several pumps in a network.

The connected computer allows the mofication of the default serial link setting (see chapter "Command list of communication protocol RS-485").

Initial setting link configuration

Description	Value
Serial link	RS-232
Transmission speed	9600 bauds
Data word length	8 bits
Parity	none (no parity)
Stop bit	1
Echo	no

RS-232/RS-485 - 9-pin, male connector

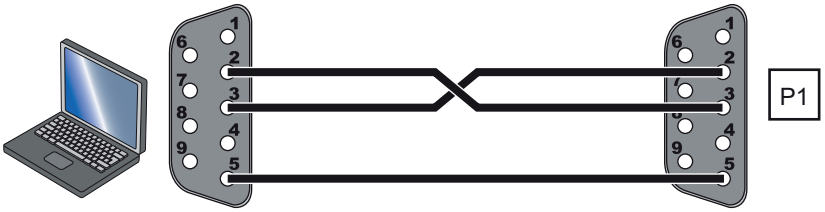


Pin	Assignment
2	Data reception (RS-232)
3	Data transmission (RS-232)
5	GND
8	RS-485: V-
9	RS-485: V+

The user must use shielded links and connections in compliance with EMC and electrical safety standards.

RS-232 connection

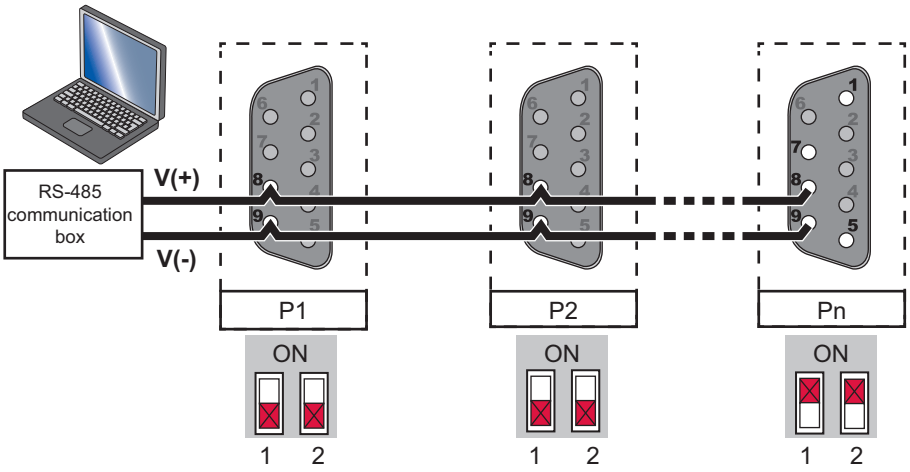
A computer manages a single pump (P1) using a RS-232 serial link via the **RS-232/RS-485** connector.



RS-485 connection

A computer manages several pumps (P1, P2, Pn, etc.) using a RS-485 serial link via the **RS-232/RS-485** connector. This parallel wiring allows communication between the pumps even if a pump is disconnected.

1. Set the red switches of each pump to **1** and **2**.
2. Set the red switches of the end-of-line pump to **ON**.



13.3 Configuration of communication protocol RS-232

When the wiring is carried out, to allow pump control and monitoring:

1. Set the circuit breaker to **ON**: the green LED located on the **RS-232/RS-485** board is lit.
2. Send a command via the serial link: **this command does not have priority over the operation in remote control mode via the SPI connector**.

Commands

Header character	The default setting is the decimal code 035 of the character #
Address	Number given to the pump, 3 characters
Order	Command sent on serial link, 3 characters
Parameter	The number of characters depends on the command
End character	This is the message end character. The setting is ASCII 13 code **<CR>** *The <LF> character is not taken into account.*

Example:

Header character	Pump address Order	Order	Parameter	End character
#	ADR	ODR	XXXX	<CR>

Responses

Header character	Pump address Order	Order	End character
#	ADR	yyyxxxabc	<CR>

OK	If everything is OK, or specific response to the order sent
ERR0	Setting fault
ERR1	Order fault
ERR2	Parameter fault
ERR3	Order fault
ERR4	Checksum fault

Example of dialog

Command	#005ECHON<CR>
Parameter	#005OK<CR>

13.4 Command list of communication protocol RS-232

ADR: Number given to the pump in the serial link

Parameters	Setting limit
Can be used only when the pump is stopped. adr = pump address before change aaa = new address	000-255

ECH: Authorization to return all characters received on the serial link

Description
Activated if ECHON
Deactivated if ECHOFF

HDR: Changes the header character of the command

Parameters	Setting limit
ASCII input value of the character 020: Corresponds with "no header character" 035: Corresponds with # (factory setting)	001-127

IDN: Returns the software version of the product connected to the computer

Parameters
0 = Header character
1-3 = Address
4 = Separator character
5-19 = Type of monitoring
20-24 = X software version, ZZ software vendor
25 = End-of-message character

LEV: Returns the status of the operating parameters defined by SET

Example: #adr,A001,A002,B001,B002,C001,C002,D001,D002,E001,E002,F001,F002,G000, H0000,I0000,J0000,K0000,L0000,M0000,N0000,O001,O002,P001,P002,Q001,Q002<CR>

Parameters
0 = Header character
1-3 = Address
4 = Separator character
5-68 = Reserved
69 = Separator character
70-74 = Revision interval (x 100h)
75 = Separator character
76-140 = Reserved
141 = End-of-message character

SEL: Status of configuration parameters

Example: #adr,A,B,C,D,E,F,G,H,I,J,K,L,M,N,O,P,Q,R,S,T<CR>

Parameters
0 = Header character
1-3 = Address
4 = Separator character
5-11 = Reserved
12 = Separator character
13 = System selected (5 = A 100 L/A 200 L/A 180 L)

Parameters
14 = Separator character
15 = Reserved
16-27 = Reserved
28 = Separator character
29-43 = Reserved
44 = End-of-message character

SET: Setting pump operating parameters

Example: # adrSETXXYZZZZ<CR>

Parameters	Setting limit
XX= 07 Revision interval: A 100 L/A 200 L/A 180 L. 0 = time x100	0010-0420
ZZZZ = value Example: 0010 corresponds with 1000 hours	

SYS: Pump Start/Stop

SYSON: The pump starts
SYSOFF: The pump stops

STA: Pump status

Example: #adr,ABCDEFGHIJK,L123,M123,N12,O12,P12,Q123,R1,abcdefghijllmnopqrstu,S123<CR>

Parameters	
0 = Header character	
1-3 = Address	
4 = Separator character	
5 = Pump status	0 = pump stopped 1= pump in operation
6-14 = Reserved	
15 = Control mode	Bit 2,1,0 = 000 = local Bit 2,1,0, = 001 = remote Bit 4,5,6 = 0 free Bit 7 = always 1
16 = Separator character	
17-20 = Reserved	
21 = Separator character	
22-25 = Reserved	
26 = Separator character	
27-29 = Reserved	
30 = Separator character	
31-33 = Reserved	
34 = Separator character	
35-37 = Reserved	
38 = Separator character	
39-42 = Reserved	
43 = Separator character	
44-45 = Reserved	
46 = Separator character	
47-52 = Reserved	
53 = Frequency converter fault	0 = OK 2 = alarm

Parameters	
54 = Separator character	
55 = Power supply	0 = OK 2 = fault (alarm)
56 = Motor temperature fault	0 = OK 1 = warning 2 = alarm
57-59 = Reserved	
60 = Revision	1 = OK 1 = warning
61-65 = Reserved	
66-67 = Free	
68 = Separator character	
69-72 = Reserved	
73 = End-of-message character	

TPE: Defines maintenance time

Example: # adr,TPEXXYYYY<CR>

Parameters
XX = 00 Operating time
XX = 01 Product revision
XX = 02 Reserved
XX = 03 Reserved
XX = 04 Reserved
XX = 05 Reserved
XX = 06 Reserved
YYYY = Time x 100h

TPS: Displays maintenance time

Example: #adr,A1234,B1234,C1234, D1234,E1234,F1234,G1234<CR>

Parameters
0 = Header character
1-3 = Address
4 = Separator character
5-9 = Operating time
10 = Separator character
11-15 = Maintenance time reached (A 100 L/A 200 L/A 180 L)
16-45 = Separator character
46 = End-of-message character

13.5 Configuration of communication protocol RS-485

The commands are identical to those of the RS-232 serial link: command list (see chapter “Command list of communication protocol RS-232”, page 51)

Commands

Header character	The default setting is the decimal code 035 of the character #
Address	Number given to the pump, 3 characters
Order	Command sent on serial link, 3 characters

Parameter	The number of characters depends on the command
End character	This is the message end character. The setting is ASCII 13 code **<CR>** *The <LF> character is not taken into account.*

Example:

Header character	Pump address Order	Order	Parameter	End character
#	ADR	ODR	XXXX	<CR>

Responses

The responses to SEL and STA commands are in hexadecimal characters.

Header character	Pump address Order	Order	End character
#	ADR	ABCDEF	<CR>

OK	If everything is OK, or specific response to the order sent
ERR0	Setting fault
ERR1	Order fault
ERR2	Parameter fault
ERR3	Context fault
ERR4	Checksum fault

Example of dialog

Command	#005ECHON<CR>
Parameter	#005OK<CR>

13.6 Command list of communication protocol RS-485

Order	Description	Functions								
SEL	Status of configuration parameters	Example: #adr,A,B,C,D,E,F<CR>								
		$A_1A_2A_3A_4A_5A_6A_7A_8$ = status of bit 1* parameters $B_1B_2B_3B_4B_5B_6B_7B_8$ = status of bit 2* parameters $C_1C_2C_3C_4C_5C_6C_7C_8$ = status of bit 3* parameters $D_1D_2D_3D_4D_5D_6D_7D_8$ = status of bit 4* parameters				$E_1E_2E_3E_4E_5E_6E_7E_8$ = status of bit 5* parameters $F_1F_2F_3F_4F_5F_6F_7F_8$ = status of bit 6* parameters * requires conversion from hexadecimal to binary			
SEL	**A: status of bit 1 parameters**	**Bit**	**7**	**6**	**5**	**4**	**3**	**2**	**1**	**0**
				Reserved	Reserved	Reserved	Reserved	Reserved	Reserved	Reserved
		0	-	-	-	-	-	-	-	-
		1	1	-	-	-	-	-	-	-
SEL	**B: status of bit 2 parameters**	**Bit**	**7**	**6**	**5**	**4**	**3**	**2**	**1**	**0**
				Reserved	Reserved	Reserved	Reserved	Reserved	Reserved	Reserved
		0	-	-	-	-	-	-	-	-
		1	1	-	-	-	-	-	-	-
SEL	**C: status of bit 3 parameters**	**Bit**	**7**	**6**	**5**	**4**	**3**	**2**	**1**	**0**
			Reserved	Reserved	Reserved	Reserved	Reserved	Reserved	Reserved	Reserved
		0	-	-	-	-	-	-	-	-
		1	-	-	-	-	-	-	-	-

Order	Description	Functions								
SEL	**D: status of bit 4 parameters**	**Bit**	**7**	**6**	**5**	**4**	**3**	**2**	**1**	**0**
			Reserved	Reserved	Reserved	Reserved	Reserved	Reserved	Reserved	Reserved
		0	-	-	-	-	-	-	-	-
		1	-	-	-	-	-	-	-	-
SEL	**E: status of bit 5 parameters**	**Bit**	**7**	**6**	**5**	**4**	**3**	**2**	**1**	**0**
				Reserved	Reserved	Reserved	Select System	Reserved	Reserved	Reserved
		0	-	-	-	-	-	-	-	-
		1	1	-	-	-	bit 3,2,1,0 = 5 = ADP 100LON			
SEL	**F: status of bit 6 parameters**	**Bit**	**7**	**6**	**5**	**4**	**3**	**2**	**1**	**0**
				Reserved	Reserved	Reserved	Reserved	Reserved	Reserved	Reserved
		0	-	-	-	-	-	-	-	-
		1	1	-	-	-	-	-	-	-

Order	Description	Functions
STA	Pump status	*Example:* *#adr,A,B,000,000,E,0000,0000,000, 0000,00, abcdef <CR>*
		$A_1A_2A_3A_4A_5A_6A_7A_8$ = status bit 1* $B_1B_2B_3B_4B_5B_6B_7B_8$ = status bit 2* $E_1E_2E_3E_4E_5E_6E_7E_8$ = status bit 3* a to f = warning and fault bits* * requires conversion from hexadecimal to binary

STA	**A: status bit 1**	**Bit**	**7**	**6**	**5**	**4**	**3**	**2**	**1**	**0**
				ADP	Reserved	Reserved	Reserved	Reserved	Reserved	Reserved
		0	-	Pump stopped	-	-	-	-	-	-
		1	1	Pump in operation	-	-	-	-	-	-
STA	**B: status bit 2**	**Bit**	**7**	**6**	**5**	**4**	**3**	**2**	**1**	**0**
				Reserved	Reserved	Reserved	(Free)	(Free)	(Free)	(Free)
		0	-	-	-	-	-	-	-	-
		1	1	-	-	-	-	-	-	-
STA	**E: status bit 3**	**Bit**	**7**	**6**	**5**	**4**	**3**	**2**	**1**	**0**
				(Free)	(Free)	(Free)	Reserved			
		0	-	-	-	-	-	-	-	-
		1	1	-	-	-	-	bit 2,1,0 = 000: local mode bit 2,1,0 = 001: remote mode		
STA	**a: warning bit 1**	**Bit**	**7**	**6**	**5**	**4**	**3**	**2**	**1**	**0**
				Reserved	(Free)	Reserved	Reserved	Reserved	(Free)	(Free)
		0	-	-	-	-	-	-	-	-
		1	1	-	-	-	-	-	-	-
STA	**b: alarm bit 1**	**Bit**	**7**	**6**	**5**	**4**	**3**	**2**	**1**	**0**
				Reserved	(Free)	Reserved	Reserved	Reserved	(Free)	(Free)
		0	-	-	-	-	-	-	-	-
		1	1	-	-	-	-	-	-	-

Order	Description	Functions								
STA	**c: warning bit 2**	**Bit**	**7**	**6**	**5**	**4**	**3**	**2**	**1**	**0**
				Reserved	Reserved	Reserved	Reserved	Reserved	Reserved	Reserved
		0	-	-	-	-	-	-	-	-
		1	1	-	-	-	-	-	-	-
STA	**d: alarm bit 2**	**Bit**	**7**	**6**	**5**	**4**	**3**	**2**	**1**	**0**
				Reserved	Reserved	Reserved	Reserved	Reserved	Reserved	Variator
		0	-	-	-	-	-	-	-	OK
		1	1	-	-	-	-	-	-	Alarm
STA	**e: warning bit 3**	**Bit**	**7**	**6**	**5**	**4**	**3**	**2**	**1**	**0**
				Reserved	Reserved	Motor tem-perature	Reserved	Reserved	Reserved	Mainte-nance
		0	-	-	-	OK	-	-	-	0
		1	1	-	-	Warning	-	-	-	Warning
STA	**f: alarm bit 3**	**Bit**	**7**	**6**	**5**	**4**	**3**	**2**	**1**	**0**
				Reserved	Reserved	Motor tem-perature	Reserved	Reserved	Reserved	Reserved
		0	-	-	-	OK	-	-	-	-
		1	1	-	-	Alarm	-	-	-	-

AUTHORIZATION TO MARK

This authorizes the application of the Certification Mark(s) shown below to the models described in the Product(s) Covered section when made in accordance with the conditions set forth in the Certification Agreement and Listing Report. This authorization also applies to multiple listee model(s) identified on the correlation page of the Listing Report.

This document is the property of Intertek Testing Services and is not transferable. The certification mark(s) may be applied only at the location of the Party Authorized To Apply Mark.

Applicant:	adixen Vacuum Products	**Manufacturer:**	adixen Vacuum Products
Address:	98, avenue de Brogny 74009 Annecy	**Address:**	98, avenue de Brogny 74009 Annecy
Country:	France	**Country:**	France
Contact:	Mr. Yannick Grenier	**Contact:**	Mr Frederic Rouveyre Mr. Julien Chevrier
Phone:	0033 (0)450 657 482	**Phone:**	33 4 50 65 77 48 / 33 4 50 65 70 29
FAX:	-	**FAX:**	-
Email:	yannick.grenier@adixen.fr	**Email:**	jullien.chevrier@adixen.fr frederic.rouveyre@adixen.fr

Party Authorized To Apply Mark: Same as Manufacturer
Report Issuing Office: INTERTEK France

Control Number: 3026716 **Authorized by:**

Paul Klemets for
Thomas J. Patterson, Certification Manager

This document supersedes all previous Authorizations to Mark for the noted Report Number.

Intertek Testing Services NA Inc.
545 East Algonquin Road, Arlington Heights, IL 60005
Telephone 800-345-3851 or 847-439-5667 Fax 312-283-1672

Standard(s):	UL 61010-1 Issued: 2012/05/11 Ed: 3 Safety Requirements for Electrical Equipment for Measurement, Control, and Laboratory Use - Part 1: General Requirements CAN/CSA C22.2 No 61010-1 Issued: 2012/05/11 Ed: 3 Safety Requirements for Electrical Equipment for Measurement, Control, and Laboratory Use Part 1: General Requirements
Product:	Vacuum Pumps
Brand Name:	adixen
Models:	A100L EX , A180L, A200L

Global Semiconductor Safety Services

CERTIFICATE OF CONFORMANCE

To SEMI S2-0712 and SEMI S8-0712 Guidelines

November 7, 2014

Company Name & Location:	adixen Vacuum Products 98 avenue de Brogny 74009 Annecy France
Place of Manufacturing:	Annecy France
Document Number:	101772424MPK-003
Model:	Multi-Stage Dry Roots Pumps A200L/A180L/A100L EX
Investigated in accordance with:	SEMI S2-0712 / SEMI S8-0712

Intertek Global Semiconductor Safety Services

PFEIFFER VACUUM

UK Declaration of Conformity

This declaration of conformity has been issued under the sole responsibility of the manufacturer.

Declaration for product(s) of the type:

Multi-stage Roots pumps

A 100 L

A 100 L ES

We hereby declare that the listed product satisfies all relevant provisions of the following **British Directives**.

Supply of Machinery (Safety) Regulations 2008

Electromagnetic Compatibility Regulations 2016

The Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment Regulations 2012

Applied standards and specifications:

EN 1012-2 : 2009

EN 61010-1 : 2011

EN 61000-6-2 : 2005

EN 61000-6-4 : 2007

The manufacturer's authorized representative in the United Kingdom and the authorized agent for compiling the technical documentation is Pfeiffer Vacuum Ltd, 16 Plover Close, Interchange Park, MK169PS Newport Pagnell.

Signature:

Pfeiffer Vacuum SAS
98, avenue de Brogny
74009 Annecy cedex
France
B.P. 2069

(Guillaume Kreziak)
Managing Director

Annecy, 2023/05/31

UK CA

PFEIFFER VACUUM

Declaration of incorporation of partly completed machinery

Declaration for product(s) of the type:

Multi-stage Roots pump, compact
A 100 L
A 100 L ES

We hereby declare that the listed product satisfies all relevant provisions of the following **European 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

Harmonized standards and national standards and specifications applied:

EN 1012-2: 2009
EN 61010-1: 2010
EN 61000-6-2: 2005
EN 61000-6-4: 2007

This product should not be put into service before the machine that they will ultimately be incorporated into has been deemed compliant with Machinery Directive 2006/42/EC.

The undersigned also undertake to pass on pertinent information on the partly completed machinery, in response to any reasoned request properly formulated by a national authority.

The person authorized to compile the technical file is Mr. d'Harboullé Philippe, Pfeiffer Vacuum SAS (Simplified joint stock company), 98, avenue de Brogny B.P. 2069, 74009 Annecy cedex.

Signature:

Pfeiffer Vacuum SAS
98, avenue de Brogny
74009 Annecy cedex
France
B.P. 2069

(Guillaume Kreziak)
Managing Director

Annecy, 2023/08/29

CE

PFEIFFER VACUUM

VACUUM SOLUTIONS FROM A SINGLE SOURCE

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

COMPLETE RANGE OF PRODUCTS

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.

Ed 05 - Date 2023/09 - P/N:119404OEN

Are you looking for a perfect vacuum solution? Please contact us

Pfeiffer Vacuum GmbH
Headquarters • Germany
T +49 6441 802-0
info@pfeiffer-vacuum.de

www.pfeiffer-vacuum.com

PFEIFFER VACUUM