

OPERATING INSTRUCTIONS

EN

Translation of the Original

OBC V4

Electronic drive unit

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.

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We reserve the right to make changes to the technical data and information in this document.

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1 About this manual



IMPORTANT

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

1.1 Validity

This operating instructions is 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 this 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
Declaration of conformity	included with these operating instructions
Profibus Operating instructions	004432
EtherCAT Operating instructions	123800
Devicenet Operating instructions	123801
ATH 1603 M - ATH 2303 M Operating instructions	115101
ATH 2300 M-MT Operating instructions	108895
ATP 2300 M Operating instructions	112419
ATP 1603 M Operating instructions	127646

1.1.2 Products concerned

This document applies to products with the following part numbers:

Description	Version of pump ¹⁾	Part Number
OBC with Remote control panel	M	123747 - 127802
OBC with Profibus control panel	M	123744 - 127836
OBC with Profibus control	MT	123745
OBC with EtherCAT control panel	M	124400
OBC with EtherCAT control panel	MT	124401
OBC with Devicenet oontrol panel	M	126371 - 128246
OBC with Devicenet oontrol panel	MT	124402 - 126372
OBC with Lonworks control panel	M	128323
OBC with fixed electrical connector and Remote control panel	M/MT	123326

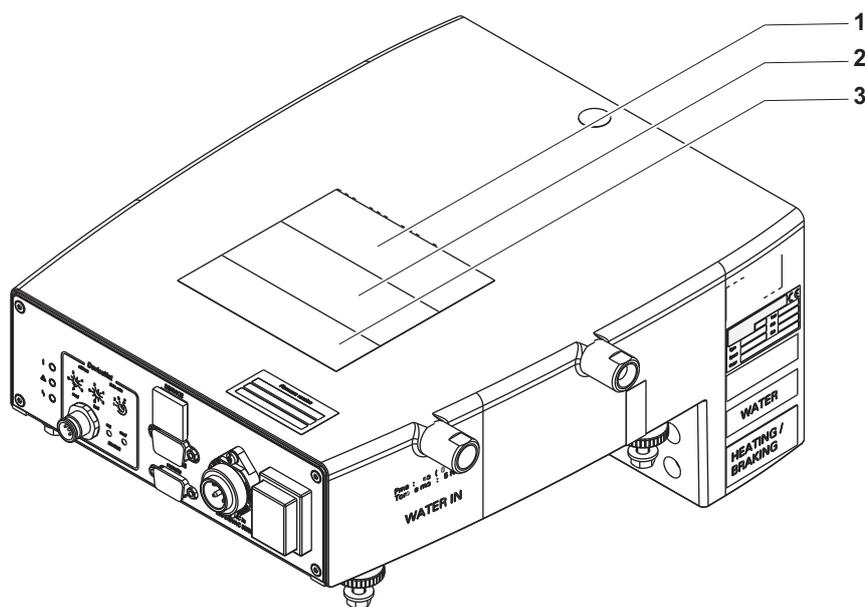
1) OBC is used with ATH 1300, ATH 1600, ATH 1603, ATH 2303, ATP 1300, ATP 1603 magnetically levitated pumps, version M or MT.

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		<p>WARNING HOT SURFACE</p> <p>Contact with pump bodies may cause burn. Switch off and wait until pumps cooled before servicing.</p>	<p>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.</p>
2		<p>WARNING HAZARDOUS VOLTAGE</p> <p>Switch off the pump and disconnect the main power cable before opening the power box cover.</p>	<p>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.</p>
3		<p>WARNING</p> <p>Don't remove the controller when the pump is running</p>	<p>This label indicates that the main power supply must not be disconnected when the electronic drive unit is running.</p>



1.3.4 Abbreviations

IN	Inlet flange
Exh.	Exhaust
HHR	Hand Held Remote
MT	Pump version equipped with a temperature management system (TMS)
M	Pump version without temperature management system (no TMS)
OBC	Electronic drive unit mounted to an active magnetic bearing turbopump
AMB	Active magnetic bearings
[XXXX]	The HHR remote control unit menus and settings are shown in bold between square brackets. For example: [DEFINITION] [LANGUAGE] to select the display language.

1.4 Trademark proof

- DeviceNet® is a trademark of Open DeviceNet Vendor Association Inc.
- Profibus® is a trademark of PI (PROFIBUS & PROFINET International).
- EtherCAT® is trademark and patented technology, licensed by Beckhoff Automation GmbH, Germany.
- LONWORKS® is a trademark of Echelon Corporation.

2 Safety

2.1 General safety information

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

⚠ DANGER
<p>Immediately pending danger</p> <p>Indicates an immediately pending danger that will result in death or serious injury if not observed.</p> <ul style="list-style-type: none"> ▶ Instructions to avoid the danger situation

⚠ WARNING
<p>Potential pending danger</p> <p>Indicates a pending danger that could result in death or serious injury if not observed.</p> <ul style="list-style-type: none"> ▶ Instructions to avoid the danger situation

⚠ CAUTION
<p>Potential pending danger</p> <p>Indicates a pending danger that could result in minor injuries if not observed.</p> <ul style="list-style-type: none"> ▶ Instructions to avoid the danger situation

NOTICE
<p>Danger of damage to property</p> <p>Is used to highlight actions that are not associated with personal injury.</p> <ul style="list-style-type: none"> ▶ Instructions to avoid damage to property

i	<p>Notes, tips or examples indicate important information about the product or about this document.</p>
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2.2 Safety instructions

All safety instructions in this document are based on the results of the risk assessment carried out in accordance with Low-Voltage Directive 2014/35/UE. Where applicable, all life cycle phases of the product were taken into account.

⚠ WARNING
<p>Risk of crushing when the electronic drive unit installed on a magnetically levitated pump is suspended</p> <p>Due to the weight of the magnetically levitated pump and electronic drive unit assembly, there is a risk of crushing during handling. Under no circumstances shall the manufacturer be liable if the following instructions are not followed:</p> <ul style="list-style-type: none"> ▶ Only qualified staff trained in handling heavy objects are authorized to handle the product. <ul style="list-style-type: none"> – Use appropriate lifting rings screwed into holes provided for this purpose (see pump operating instructions). ▶ Wear safety shoes with a steel toe in accordance with directive EN 347.

⚠ 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**Risques de brûlure par contact avec des surfaces chaudes**

Les produits sont conçus de façon à ne procurer aucun risque thermique pour la sécurité de l'opérateur. Selon les applications, les conditions d'utilisations génèrent des températures élevées nécessitant une attention particulière de la part de l'opérateur (surfaces > 65 °C).

- ▶ Respecter le signalement des surfaces chaudes repérées par l'étiquette sécurité.
- ▶ Attendre le complet refroidissement avant d'intervenir sur le produit.
- ▶ Le cas échéant, porter des gants de protection conformément à la norme EN 420.

2.3 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.

- ▶ Observe the instructions for attaching the electronic drive unit to the pump (see chapter "Installation"): in the event of an accident on the pump, the module must remain attached to the pump (see chapter **Installation of the pump operating instructions**).
- ▶ Comply with all safety and risk prevention instructions in accordance with local safety standards.
- ▶ Do not operate the product unless the inlet and exhaust are connected to a vacuum and exhaust pumping line.
- ▶ Do not remove the electronic drive unit from the pump while operating it.
- ▶ Keep leads and cables well away from hot surfaces (> 70 °C).
- ▶ Regularly check compliance with all precautionary measures.

2.4 Intended use

- The OBC electronic drive unit is used to operate Pfeiffer Vacuum magnetically levitated turbomolecular pumps (see chapter "Products Concerned").
- The OBC electronic drive unit installed on the magnetically levitated pump is designed to be integrated into industrial equipment.
- The OBC electronic drive unit must be used with the magnetically levitated pump operating instructions of the manufacturer, Pfeiffer Vacuum (see chapter "Products concerned").

When the pump and electronic drive unit assembly is integrated into industrial equipment, it becomes a component of the equipment: the integrator of this pumping component must take all safety measures with regard to the operator, particularly in relation to hot surface risks.

2.5 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:

- Operation with excessive insulated heat input
- Using accessories or spare parts not mentioned in these operating instructions
- Using the pump in potentially explosive areas
- Operation in areas with ionizing radiation
- Operation in improper high magnetic fields

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.

- ▶ Check the packaging reversal indicator (if present).
- ▶ 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 electronic drive unit installed on a magnetically levitated pump is suspended

Due to the weight of the magnetically levitated pump and electronic drive unit assembly, there is a risk of crushing during handling. 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.
 - Use appropriate lifting rings screwed into holes provided for this purpose (see pump operating instructions).
- ▶ Wear safety shoes with a steel toe in accordance with directive EN 347.

WARNING

Risk of crushing related to product tilting

Although the product meets EEC safety regulations, there is a risk of tilting during product handling, installation and operation.

- ▶ Do not place the product on an inclined plane.
- ▶ Do not push the product sideways.
- ▶ Always secure the pump until it has been integrated into the equipment using the devices supplied.

Handling the OBC installed on a magnetically levitated pump

The OBC electronic drive unit is an integral part of the magnetically levitated pump. It is usually installed on the pump on delivery and the 'pump and electronic drive unit' assembly cannot be handled without it.

When handling the pump and electronic drive unit assembly, **a lifting device that is appropriate for the weight of the product must be used.** The weight and center of gravity vary depending on the pump model.

- ▶ Refer to the magnetically levitated pump operating instructions.

3.3 Stockage

Storing the new electronic drive unit



Pfeiffer Vacuum recommends storing the product in its original packaging to keep it clean.

1. Keep the pump wrapped in its protective envelope.
2. Store the electronic drive unit in line with the permitted storage temperatures (see chapter “Environmental conditions”).
3. Store the electronic drive unit in a clean and dry area, **for a maximum period of 1 year**.

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 electronic drive unit
- 1 mains socket
- 1 operating instructions



The hand-held remote control (HHR) is not included in the order. To order, see chapter "Accessories".

4.1.2 Description

Depending on the ordering guide, the electronic drive unit is equipped with an interface that allows control through **Remote, EtherCAT, Profibus, Devicenet and LonWorks** control networks.

As a standard feature, the electronic drive unit is equipped with an **RS-232/RS-485** serial link interface. It can also be controlled with the hand-held remote (HHR) available as an accessory (see chapter "Accessories").

In this document, only the operations with the **Remote, RS-232/RS-485** and **HHR** interfaces are described.



For the other interfaces, refer to the control interface operating instructions installed on the pump.

Regardless of the product's configuration, the electronic drive unit enables a connection to the command network and display of the pump's operating condition.

The electronic drive unit is in the form of an electronic module and makes it possible:

- to power the turbomolecular pump
- to power and control the water solenoid valve and heating (MT version pump)
- to power the purge solenoid valves (option) and air inlet solenoid valves (option). These are controlled through the electronic control interface if the wiring and configuration is performed.

4.2 Man/machine interface

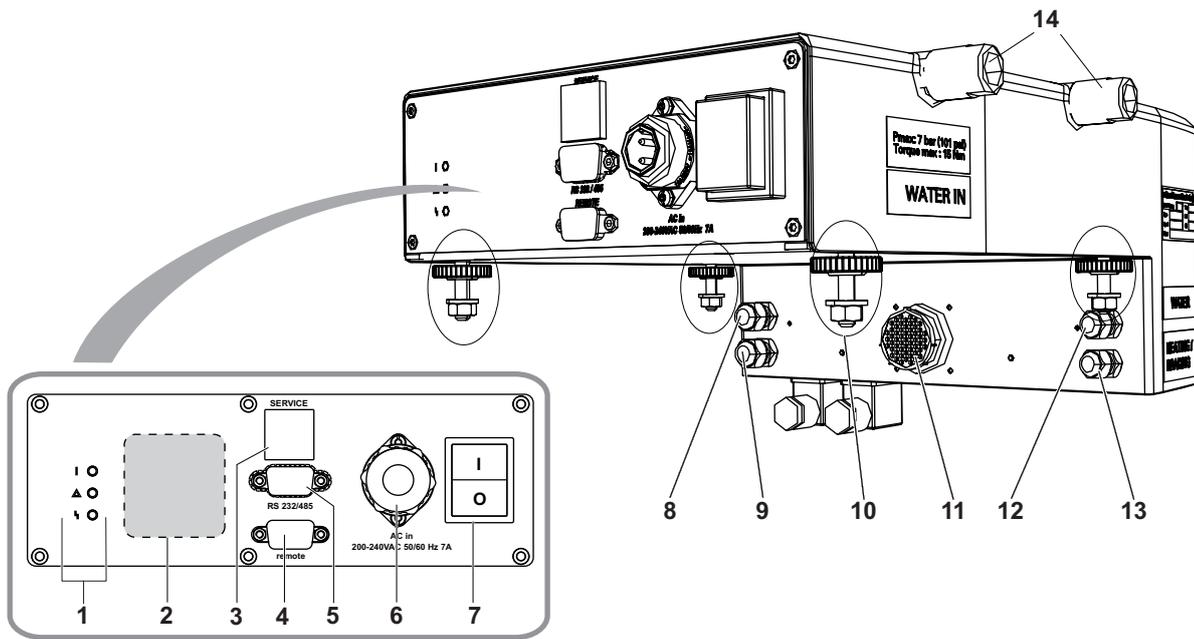


Fig. 1: OBC V4 Description

1. Pump operating status indicator light
2. Fieldbus connection area
3. Hand held remote control connector (Service)
4. Remote control connector (Remote)
5. RS-232/RS-485 serial link connector
6. Mains power supply
7. Mains switch I/O
8. Purge solenoid valve cable
9. Air inlet solenoid valve cable (accessory)
10. Mechanical fastening of the OBC (stud, knurled nut and nut)
11. Female electrical connector for pump
12. Water solenoid cable (MT version pump)
13. Heating cable (M version pump) or braking cable (MT version pump)
14. Water inlet/outlet connections (Water In)

5 Installation

Depending on the ordering guide, on delivery, the electronic drive unit may be:

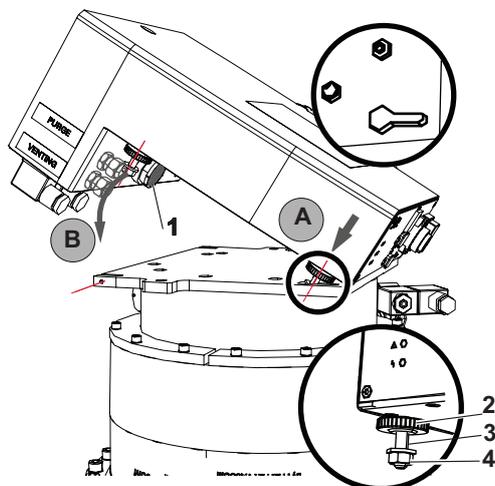
- ▶ installed on the magnetically levitated pump: in this case, install the pump in the equipment (see *chapter Installation of the pump operating instructions*).
- ▶ supplied separately: in this case, connect it to the pump and then install the pump in the equipment (see *chapter Installation of the pump operating instructions*).

5.1 Connecting the electronic drive unit on the pump

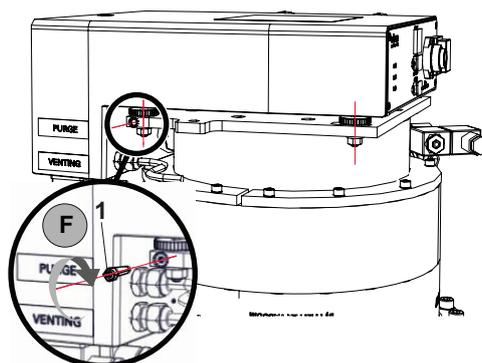
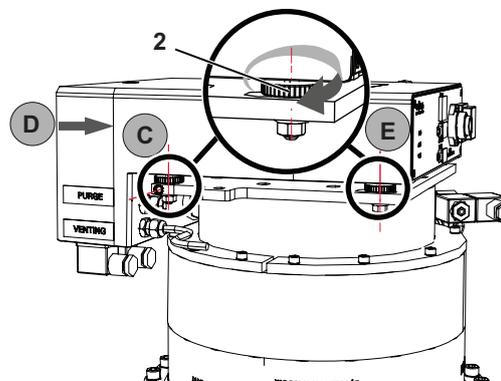


When the electronic drive unit is removed from its original packaging (new or after storage) leave it at room temperature for 24 hours before using it.

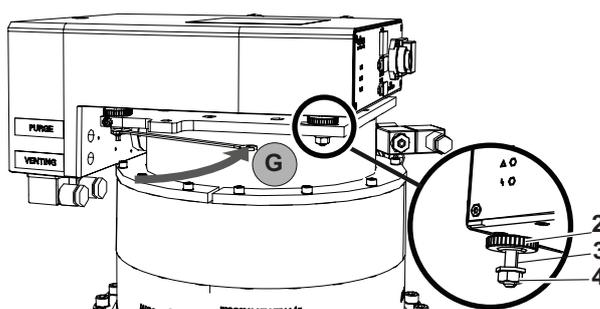
Installation of the electronic drive unit



- | | |
|------------------------|---------|
| 1 Electrical connector | 3 Studs |
| 2 Thumb-wheels | 4 Nut |



- | | |
|----------------|---------|
| 1 Screw | 3 Studs |
| 2 Thumb-wheels | 4 Nut |



1. Mark the 2 oblong holes on the fastening plate and place the box opposite the fastening plate (**step A**).
2. Insert the 2 studs into the oblong holes.
3. Slowly lower the electronic module to insert the other 2 studs (**step B**):
 - **make sure not to damage the connector or the cables of the solenoid valves.**
4. Adjust the module position with the thumb-wheels so that the male and female baseplates of the electrical connector are aligned (**step C**).
5. Slide the module to connect the electrical connector to that of the pump (**step D**).

6. Adjust the module position with the other thumb-wheels so that the module is parallel to the fastening plate (**step E**).
7. Screw the 2 screws to lock the module position on the fastening plate (screws on the fastening plate) (**step F**).
8. Tighten the 4 nuts with a spanner (**step G**).
 - apply a torque of 6 N·m.

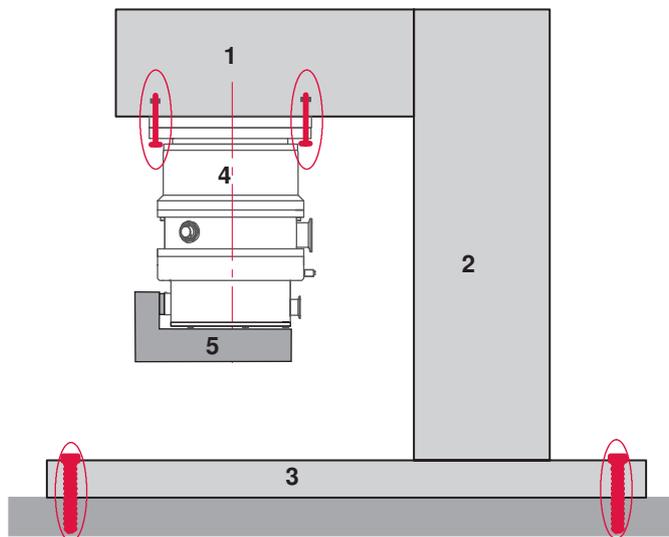
Depending on configuration, the electronic drive unit can be installed laterally to the pump.

5.2 Positioning the equipped pump on the installation



The turbomolecular pump fastening must be connected and secured. To ensure personnel safety and the reliability of operation (see *chapter Installation of the pump operating instructions*).

- ▶ Use the lifting devices to position the pump in the desired location, lift the pump using lifting rings (see chapter “Transport” of the pump operating instructions).



- | | |
|------------------|--------------------------------|
| 1 Vacuum chamber | 4 ATH M/MT turbomolecular pump |
| 2 Equipment | 5 Electronic drive unit (OBC) |
| 3 Frame | |

Installation of the inlet pump in horizontal position

- ▶ To position the pump with a horizontal pumping axis, use a strap.

⚠ 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.

5.3 Connecting the water circuit

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

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 cooling problems in the pump.

- ▶ 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.

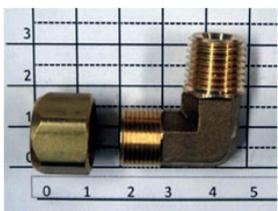
WARNING

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.

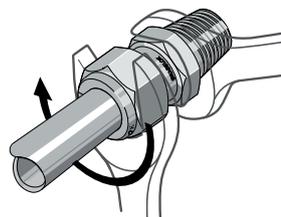
- ▶ Install a manual valve on the circuit at a distance of 3 m from the product, so that the water supply can be locked out.
- ▶ Observe the recommended pressure and pressure differences.
- ▶ Always lock out and disconnect the water circuit before working on the product.
- ▶ When carrying out maintenance, 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.

5.3.1 Procedure for assembly connectors



Threaded connections bonding and tightening procedure

1. Use 1/4 NPT male connectors (to be supplied by the customer).
2. Bond the connections using oleo-waterproof glue or put PTFE sealing tape on the threads.
3. Tighten the connection **while keeping the baseplate on the pump side**.



Procedure for the assembly of twin ferrule connectors

Connectors used to connect rigid pipe (stainless steel, nickel plated copper, etc.).

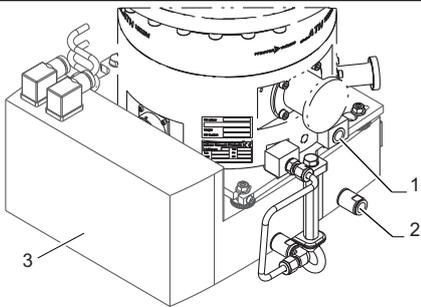
1. Insert the pipe with the ferrules until it is affixed tightly to the connector.
2. Lock the fitting in position

3. Manually place the nut into contact.
4. Tighten the nut 1/2 turn using an open-ended spanner while holding the body of the connector still.

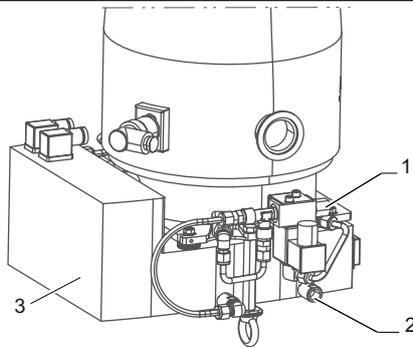
5.3.2 Connecting the pump to the water circuit

Water-cooling circuit connection

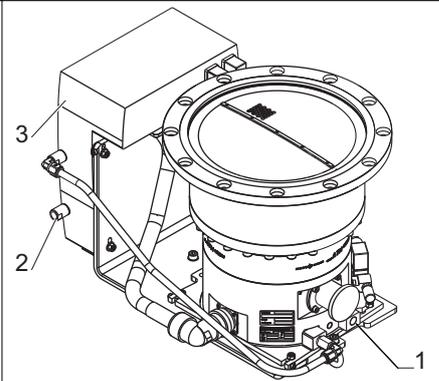
M version of pump with OBC



MT version of pump with OBC



M version of pump with lateral OBC



1. Water outlet connector
2. Water inlet connector (WATER IN)
3. Electronic drive unit (OBC)

For M version pump

1. Provide a water-cooling circuit equipped with a flow meter.
2. Connect the water inlet circuit to **WATER IN**.
3. Connect the other connector to the pump water-cooling circuit with a flexible tube (supplied with the pump).
4. Connect the pump to the drainage circuit with a flexible tube.
5. Check that there are no leaks in the pipes and connections of the water circuit.

For an MT version pump

This pump is equipped with a water solenoid valve supplied and controlled by the electronic drive unit.

1. Provide a water-cooling circuit equipped with a flow meter.
2. Connect the water inlet circuit to **WATER IN**.
3. Connect the other connector to the water solenoid valve and then the solenoid valve to the pump using a rigid pipe (supplied with the pump).
4. Connect the pump to the drainage circuit with a flexible tube.
5. **Note the direction of water flow** so as not to disrupt the operation of the solenoid valve.
6. Check that there are no leaks in the pipes and connections of the water circuit.

5.4 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.

⚠ 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 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.

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.

**Electromagnetic compatibility**

The product complies with industrial environment immunity and emission standards.

This product is designed for professional use with a power greater than 1 kW.

In the case of use in a laboratory environment, contact us.

Electrical safety

The pump motor is protected against overload by the current limitation of the electronic drive unit controller (in case of overload, the speed decreases automatically).

When there is a hazard due to accidental contact with liquids, gases or solids, you must install a hard-wired emergency stop circuit to cut the power supply.

- ▶ **Never override these interlocks during installation, use, or maintenance.**

5.4.1 Customer electrical installation protection**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

In the event of an insulation defect, you must install a differential circuit breaker to protect personnel (see chapter "Electrical characteristics").

The pump is Class 1 equipment and therefore must be grounded. The user must make sure the installation has an earth wire properly connected to the ground.

Grounding

When necessary, the installer must provide dual protection in addition to the existing one. It consists of an uninsulated braid or a separate green/yellow conductor with a minimum section 3 mm² (9AWG). The impedance between the pump body and the ground connection point must be < 0.1 Ohm at 25 A.

- ▶ Use an M4 x 8 screw and a locking washer fitted to the hole from the pump to secure the conductor to the pump \perp and to the installation's ground connection point.



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.



Operation in local mode

There is no device to warn that the pump is operating in local mode.

- Provide a means to warn about local mode operation when the pump is not integrated neither controlled by the equipment.

5.4.2 Mains connection by electrical connector

⚠ 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.

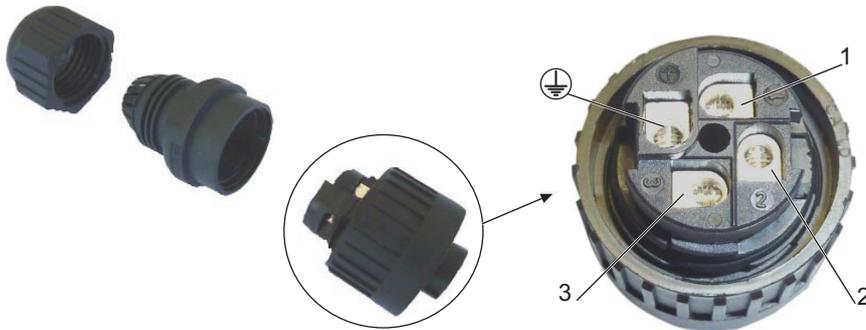


Fig. 2: Electrical connector

- | | |
|-----------|-------------|
| 1 Phase | 3 Not used |
| 2 Neutral | ⊕ CPC Earth |

Procedure for electrical connection to the mains via a connector

The electronic drive unit comes with a mains plug whose wiring is the customer's responsibility.

1. Use an EEC cable in compliance with IEC 60227 and IEC 60245 standards with the following characteristics:
 - cable diameter: 6 to 12 mm
 - heatproof (because it can come into contact with hot surfaces)
 - conducting wire section suitable for cable length (1.5 to 2.5 mm²)
 - current carrying capability: 10 A under 250 V
2. Connect the protective earth (ground) wire to the delivered mains plug.
3. Ensure that the quality of the ground is reliable. If it's not the case:
 - use the dual protection (see chapter "Customer electrical installation protection").
4. Connect the mains plug to the mains socket **AC In**.

The IEC 60417 #5019 symbol ⊕ is located in the electronic module on the CPC earth terminal block.

5.4.3 Mains connection by a stuffing box

⚠ 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.

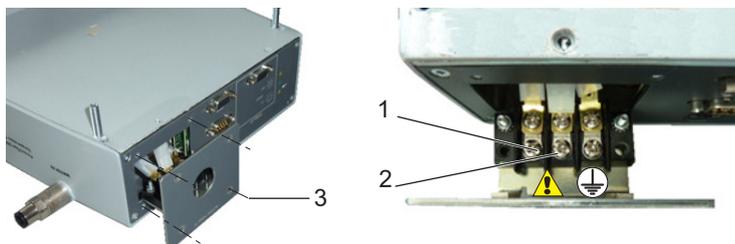


Fig. 3: Electrical connection by a stuffing box

- | | |
|-----------|--------------|
| 1 Phase | ⊕ CPC Earth |
| 2 Neutral | 3 Screw (x4) |

Procedure for electrical connection to the mains via a stuffing box

The electronic drive unit is designed for a fixed electrical connection, which prevents the cable from being pulled out. The installer is responsible for the supply and wiring.

1. Provide an electrical connection in accordance with protection rating IP54. The temperature of the connection can reach 60 °C.
2. Remove the 4 screws and remove the front plate to access the terminal block.
 - Do not pull the plate excessively, otherwise the internal connections will be damaged!
3. Use an EEC cable in compliance with IEC 60227 and IEC 60245 standards with the following characteristics:
 - cable diameter: 6 to 12 mm
 - heatproof (because it can come into contact with hot surfaces)
 - conducting wire section suitable for cable length (1.5 to 2.5 mm²)
 - current carrying capability: 10 A under 250 V
4. Connect the conducting wires to the terminal block.
5. Connect the protective earth (ground) wire to the terminal block.
6. Reattach the plate with the 4 screws to close it.
7. Conduct a test of continuity between the installation, the pump and the electronic drive unit.

The IEC 60417 #5019 symbol ⊕ is located in the electronic module on the CPC earth terminal block.

5.4.4 Connecting the cables

According to the ordering guide, the pump can be equipped with a heater jacket and solenoid valves (water, purge and inlet vent). These components are powered and controlled by the electronic drive unit.

- ▶ Remove the screws fastening the solenoid valves onto the electronic module.
- ▶ Connect the **VENTING** cable to the air valve
- ▶ Connect the **PURGE** cable to the purge valve
- ▶ Connect the **WATER** cable to the water valve for MT version pumps
- ▶ Connect the **HEATING/BRAKING** cable to the heater jacket for MT version pumps.

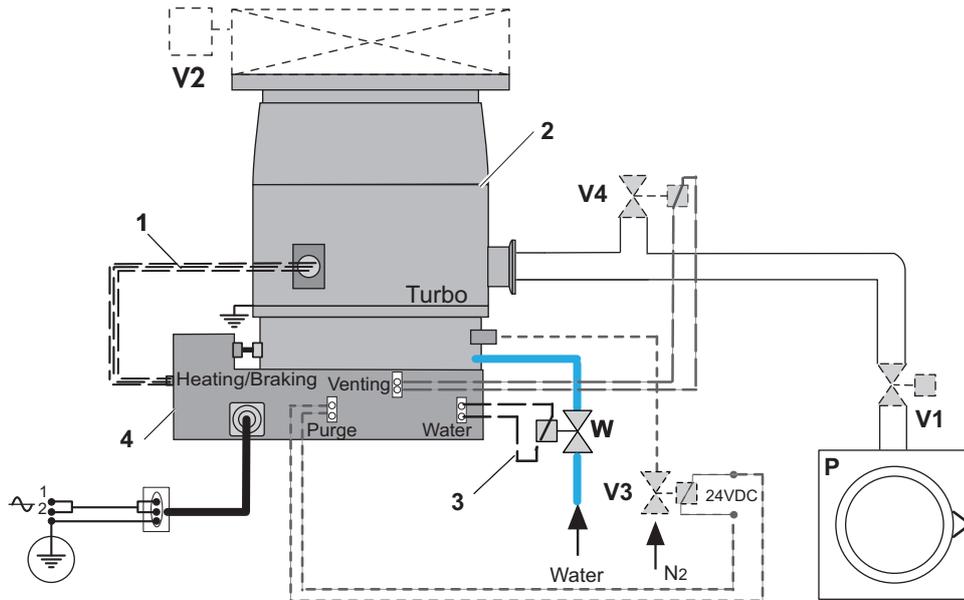


Fig. 4: Typical electrical wiring diagram

1	Heater band power supply (MT version pump)
2	Magnetically levitated turbomolecular pump
3	Water valve power supply (MT version pump)
4	Electronic drive unit
P	Backing pump
N2	Inert gas input
V1	Fore-vacuum isolation valve ²⁾
V2	High vacuum isolation valve ²⁾
V3	Purge solenoid valve (option) ²⁾
V4	Air inlet solenoid valve (accessory) ²⁾
W	Cooling circuit solenoid valve (MT version pump)
⏏	Functional ground connection ¹⁾

1) Recommended for connecting the pump to the ground electrode in an environment affected by electromagnetic waves.

2) These solenoid valves are controlled via the electronic drive.

6 Operation

6.1 Preliminary precautions for use

⚠ WARNING

Risk of electric shock in the event of electrical disconnection while the pump is running

The turbomolecular pump and its electronic drive unit cannot be disconnected from the electrical network before the rotor completely stops rotating: the pump/electronic drive unit must be isolated from the electrical network to prevent electric shock!

1. Stop the pump from rotating by sending an order to **'Stop'** on the control interface.
2. Wait for the rotor to completely stop rotating (several minutes).
3. Switch off customer power supply from the equipment.
4. Unplug the mains cable.

⚠ WARNING

Risk of cutting injuries due to contact with sharp edges via the high vacuum flange

Sharp components can be accessed via the inlet flange. Rotor and stator blades on turbomolecular pumps have very sharp edges.

- ▶ Before starting any work on the product, wait for the pump to come to a complete standstill.
- ▶ Always keep the splinter shield in the inlet housing, as it limits the risk of injury.
- ▶ Always wear protective gloves in accordance with standard EN 420.
- ▶ **Never disconnect the high vacuum flange before the rotor is completely immobilized.**

Every time the pump is commissioned:

1. Check that the pump has been fastened in accordance with the safety instructions (see chapter "Installation") in the magnetically levitated pump instructions.
2. Check that the pump inlet is properly connected to the pumping line.
3. Check that the water, nitrogen and heating circuits are connected and powered according to the installed options.
4. Switch on the main switch of the customer's electrical installation.

6.2 Starting the pump

6.2.1 Powering on

- ▶ Position the main switch to **I**: the electronic drive unit boots up.
 - At the end of initialization, the yellow LED turns off and the green LED flashes at 10%.

6.2.2 Pumping start-up

The following steps describe the use of the pump regardless of the control interface. Refer to chapter "Interfaces for control" for instructions on how to wire and set the parameters of the different interfaces.

- Use via **HHR** (see chapter "Control via the HHR")
- Use via **Remote** control (see chapter "Control via the Remote connector")
- Use via **RS-232/RS-485** serial link (see chapter "Command via the RS-232/RS-485 serial link")
- Use via **Fieldbus** (see chapter "Operation via fieldbus")

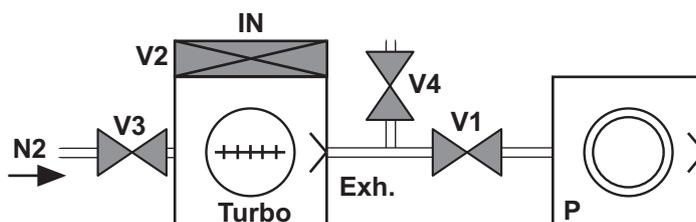


Fig. 5: Pumping installation diagram

Components in the pumping installation			
V1 ¹⁾	Fore vacuum isolation valve	N2	Inert gas purge inlet
V2 ¹⁾	High vacuum isolation valve	Turbo	Magnetically levitated turbomolecular pump
V3 ²⁾	Purge solenoid valve (option)	P ¹⁾	Backing pump
V4 ²⁾	Air inlet solenoid valve (accessory)		

1) The supply, power supply and control of these components are the customer's responsibility.

2) These solenoid valves are controlled via the electronic drive unit.

Pumping start-up procedure

Initial conditions:

Valves V3 and V4 are connected and controlled via the electronic drive unit.

Valves V1 and V2 are connected and controlled by the equipment.

The vacuum chamber and the pumping lines are at atmospheric pressure, the backing pump is stopped and the valves are closed.

1. Start up the water-cooling circuit.
2. Send a pump **'Start'** order via the HHR, Remote, serial link or fieldbus control panel:
 - The backing pump starts up and valves V1 and V2 open.
 - The turbomolecular pump starts to **reach the selected speed**: the green LED flashes at 90 %.
 - When the speed is reached, the LED is lit continuously.
3. Depending on the application, open the V3 purge solenoid valve by sending a **'Purge'** order via the HHR, Remote, serial link or fieldbus control panel.

The pumping operation is performed until the operating pressure for the application is reached.

Stand-by speed

The Stand-by speed is selected when the pump is stopped or rotating.

- ▶ Send a **'Stand-by'** order via Remote, serial link or fieldbus control panel or press the **STD-BY** key of the HHR interface.

Temperature management (MT version pump)

- ▶ Select the temperature setpoint via the HHR, serial link or fieldbus control panel.

For more information about temperature management, see chapter "Pump Temperature management system".

6.2.3 Restarting the pump after an emergency equipment stop

The equipment emergency stop manages the pump stop. To restart the pump after an emergency stop, it is necessary to:

1. Make sure the pump has stopped (all LED are off).
2. Wait for pump rotor has stopped.
3. Correct the problem.
4. Unlock the emergency stop button on the equipment,
5. Start the pump by sending a **'Start'** pump order via the control panel: the pump starts at the selected speed.

6.3 Shutting down the pump

6.3.1 Pumping shutdown

NOTICE

Risk of damaging the pump by generating an electric arc

The pump and its electronic drive unit must not be disconnected from the electrical network before the rotor completely stops rotating and the unit is isolated from the electrical network: an electric arc is created when the circuit is interrupted, which damages internal components.

1. Stop the pump from rotating by sending an order to '**Stop**' on the control interface.
2. Wait for the rotor to completely stop rotating (several minutes).
3. Switch off customer power supply from the equipment.
4. Unplug the mains cable.

Pumping interruption procedure

Initial conditions:

Valves V3 and V4 are connected and controlled via the electronic drive unit.

Valves V1 and V2 are connected and controlled by the equipment.

The vacuum chamber and the pumping lines are under vacuum, the backing pump is on, and the V3 purge valve is open.

1. Close the V2 valve to isolate the pump from the vacuum chamber.
2. Send a pump '**Stop**' order via the HHR, Remote, serial link, or fieldbus control panel:
 - Pump speed slow down: the green LED flashes at 50% as long as the rotation speed is $> 60 \text{ min}^{-1}$, then at 10% when the rotation speed is $< 60 \text{ min}^{-1}$.
3. Activate the V4 air inlet solenoid valve by sending a '**Venting**' order via Remote, serial link or fieldbus control panel.
 - The air inlet solenoid opens when the speed is less than 10000 min^{-1} .
4. Close the V1 valve and the backing pump stops.
5. Stop the water-cooling circuit **when the pump is stopped** (the rotor has stopped rotating).
6. Stop the inert gas purge flow.

NOTICE

Inert gas purge function

When the inert gas purge is stopped, the pumped gases can pass from the fore vacuum side to the high vacuum side and damage the bearing housings.

- ▶ Maintain the inert gas purge flow as long as the rotor is running to prolong the flushing.
- ▶ The purge maximum pressure must not exceed $1 \cdot 10^3$ to $1.5 \cdot 10^3 \text{ hPa}$ (absolute).

NOTICE

Air inlet solenoid valve function

The air inlet solenoid valve reduces the braking time required for the pump to get up to the atmospheric pressure. When isolation valves are installed on the pump inlet and exhaust, the rotor slow-down efficiency is improved.

- ▶ If the pump has been stopped by a sudden air inlet, **limit the number of restarts to 2 per hour**.
- ▶ if the pump has been stopped without air inlet, the number of restarts are not limited.
- ▶ Please contact us for advice on the air inlet solenoid valve.

Pump stop due to power failure



Stopping the pump by disconnecting the mains power supply is not a normal way to stop the pump:

- Always send a '**Stop**' order via the control panel and wait for the pump to stop rotating before starting work on the product.

When a power failure occurs, the rotor remains suspended by the energy emitted by the motor's counter-electromotive force, until the rotor rotation speed is low enough that it can rest on the landing bearings without being damaged.

If the power is restored before the minimum speed is reached, the pump recovers its initial speed without any disturbance. The landing bearing counter does not decrease.

Otherwise, if the minimum speed is reached before the power supply has been restored:

- The pump lands on its landing bearings.
- The electronic drive unit is powered off; no indicator light is on.
- The landing bearings' counter decreases.

Start up the pump according to the standard start-up procedure when the mains supply has been restored.

6.3.2 Powering off

1. Power off the pump by setting the main switch to **O**:
 - the green LED turns off;
 - wait for the rotor to completely stop rotating.
2. Turn on the customer's electrical installation breaker.

6.3.3 Prolonged stoppage

If the pump has to be stopped for a prolonged period, follow the shutting down procedure (see chapter "Decommissioning").

6.4 Operation monitoring

LED	Symbol	LED status	Display	Meaning
		off		Switched off.
		on, flashing 10 %		Power supplied. Pump stopped or rotation speed < 60 min ⁻¹ .
		on, flashing 90 %		The pump has not reached the selected speed.
		on, constant light		The pump has reached the selected speed.
		on, flashing 50 %		The pump speed decreases, speed > 60 min ⁻¹ .
		off		No warning
		on, constant light		Electronic drive unit initialized or warning signaled.
		off		No fault.
		on, constant light		Pump is faulty.

Tbl. 1: Meaning of LED on the control panel

When a problem occurs, the user is warned by:

- Activation of the fault/warning LED
- Audible warning of the HHR (if enabled)
- Activation of the fault contacts on the **Remote** connector
- Pumping interruption when the '**Stop**' order has not been activated
- Fault/warning message displayed on the HHR
- A message via the RS-232 or RS-485 serial link
- A message via the fieldbus

Fault messages are listed in the instructions; see chapter "Malfunctions".

7 Advanced settings



This chapter describes the available functions and how they work. This chapter helps the user and/or the integrator to configure the pump parameters according to the requirements during the process.

7.1 Pump temperature management system

The temperature management system (TMS) fitted on the **MT version** pump consists on a heater band and a water solenoid valve.

The integrated heater band heats the pump to an adjustable temperature (referred to as temperature setpoint) to prevent the effects of condensation. The temperature setpoint depends on the application the pump is to be used for. Contact Pfeiffer Vacuum's applications department for advice in choosing the correct temperature setpoint.

The heater band and the water solenoid valve allow to manage the pump temperature up to the temperature setpoint. The electronic drive unit controls this temperature setpoint. The temperature setpoint is selected via the HHR control panel or via the serial link or fieldbus (see chapter "Control modes").

Depending on the temperature setpoint chosen to heat the pump and the temperature of the cooling water circuit, the pump can take a certain amount of time to reach the specified temperature.

To reduce this time, when the pump is rotating and isolated at the inlet (V2 closed):

- ▶ Inject the purge flow and close the exhaust isolation valve (V1 closed) so as to have a maximum motor current of 5.5 A.

7.2 Pump braking

Braking reduces the time it takes to stop the pump. We distinguish between:

- electric braking,
- braking with the air inlet solenoid valve.

Electric braking

Electric braking makes it possible to slow the pump by sending a pump '**Stop**' order, or in the event of a default stop, after a delay of 15 minutes during which time the pump can be kept under vacuum.

It is possible to perform electric braking by sending a command via the RS-232/RS-485 serial link: this will not result in optimal braking of the pump.

Braking with air inlet solenoid valve

Braking with the air inlet solenoid valve makes it possible to reset the pump to atmospheric pressure on sending a pump '**Stop**' order, or in the event of a default stop. Stopping time until complete shutdown of the rotor can be very long, as it depends on the pump isolation conditions.

It is possible to manage the opening/closing of the valve through the wiring of the '**Venting**' contact on the **Remote** connector or by sending a command via the RS-232/RS-485 serial link or via the fieldbus.

The pump is reset to atmospheric pressure when the pump stops or in the event of a default stop (see chapter "Malfunctions").

The air inlet valve is supplied only if the pump's rotation speed is $< 10000 \text{ min}^{-1}$ and on receipt of a valve opening order via the control interface.



It is a NC (normally closed) valve

- The air inlet valve must be closed to restart the pump.
- The air inlet valve does not close automatically when the pump stops!

8 Interfaces for control

8.1 Control modes

This chapter describes the connections and protocols associated with each control mode. There are 4 control modes:

- **HHR**
The pump is controlled **locally** from a Hand-Held Remote control (HHR), connected on the **SERVICE** connector.
- **REMOTE**
The pump is controlled **remotely** by opening and closing different dry contacts or applying voltage to the **REMOTE** connector.
- **SERIAL LINK**
The pump is controlled remotely by the commands transmitted via serial link **RS-232/RS-485**.
- **FIELDBUS CONNECTION**
The pump is controlled with a remote-control system (automation, control, supervision) that communicates with the pump according to the fieldbus communication protocol.
Different control interfaces for communication with fieldbuses (Profibus, EtherCAT, ...) are available in the ordering guide.

Choice of control mode

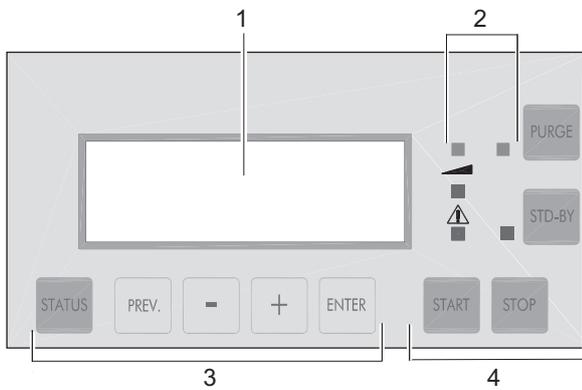
The selected mode controls the pump. The control mode can be selected:

- via the HHR **unit**
- via serial link **RS-232/RS-485**

8.2 Control via the HHR

Description of the HHR

Connected to the electronic drive unit, the HHR allows to display and configure the pump parameters.



- 1 Display
- 2 LED
- 3 Parameter selection and configuration keys
- 4 Manual control keys

Key	Functions	Key	Functions
	<ul style="list-style-type: none"> • To access the parameter display mode. • To exit the menus and return to parameter display. 		<ul style="list-style-type: none"> • To validate the selection of a menu, parameter, or value. • To confirm the answer to a question.
	<ul style="list-style-type: none"> • To access the configuration mode. • To exit the various menus without validating the functions. 		<ul style="list-style-type: none"> • To allow pump operation at reduced speed via HHR when the [SET UP][REMOTE CONTROL] menu is set to [KEYBOARD] (see chapter 'Menu SETUP'). LED is lit when the pump rotates at Stand-by speed.

Key	Functions	Key	Functions
	<ul style="list-style-type: none"> To move to the next or previous menu, next or previous parameter in the displayed menu. 		<ul style="list-style-type: none"> To start the pump in local mode via HHR when the [SET UP][REMOTE CONTROL] menu is [KEYBOARD] (see chapter 'Menu SETUP').
	<ul style="list-style-type: none"> To select or adjust the parameter value. 		
	<ul style="list-style-type: none"> To allow purge operation via HHR when the [SET UP][REMOTE CONTROL] menu is set to [KEYBOARD] (see chapter 'Menu SETUP'). LED is lit when the purge is activated. 		<ul style="list-style-type: none"> To stop the pump in local mode via HHR when the [SET UP][REMOTE CONTROL] menu is [KEYBOARD] (see chapter 'Menu SETUP').

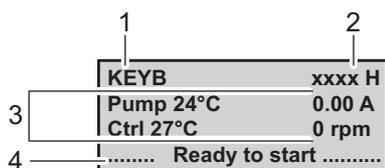
Tbl. 2: Description of the HHR's keys

NOTICE

Risk of damage to the keypad
 The keys are protected by a membrane. Using hard, pointed objects like pens and screwdrivers can damage the keys.
 ► Always use your hands to operate the keypad.

Description of the display

The display shows the status of the pump and the monitored parameters. Use the +/- keys to scroll through the monitored parameters.



- 1 Control mode
- 2 Running time
- 3 Operating parameters/fault messages
- 4 Pump operating status messages

8.2.1 Powering on

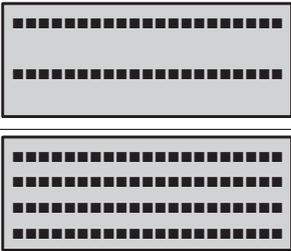
- Check that the electrical connections have been made before using the HHR.
- Connect the hand held remote to the **SERVICE** connector.
- Set the main switch to **I**: the HHR unit boots up.

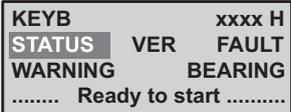
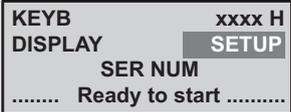
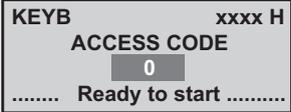
The HHR unit can be connected when the pump is switched on and/or when the rotor is rotating.

i **The factory settings**
 When the pump is run for the first time, it uses the default settings set at the factory to reflect the settings in the ordering guide. The factory settings are protected by an access code (initially 0) that can be changed.

- The user or the integrator is responsible for changing the pump parameters according to the requirements of the application.

HHR mode is active when the 'Keyboard' control mode is configured by the HHR or the RS-232/RS-485 serial link.

Display initialization		
1 .	The electronic drive unit performs a self-test and identifies the connected pump. Boot-up time is approximately 15 seconds.	
2 .	The equipment is identified, the software release is displayed, and communication with the pump is tested.	
3 .	In the meantime, the indicator lights are tested, they light up sequentially.	
4 .	At the end of the test, the type of connected pump and the message 'Ready to start...!' are displayed.	

Access to menus		
1 .	Access to the settings mode by pressing PREV. key. Access to the menu [DISPLAY] by pressing ENTER key.	
2 .	Set the display parameters. Access from one menu to another by pressing +/- keys. Return to the previous menu using PREV. key.	
3 .	Access to the menu [SETUP] using +/- keys. Access the menu using ENTER key.	
3 .	Enter the access code to modify the setting and valid the new code by pressing ENTER . Return to the previous menu using PREV. key.	

8.2.2 DISPLAY menu

Selection	Description
STATUS	Display of the electronic drive unit and pump status: <ul style="list-style-type: none"> • Pump temperature • Pump motor current • Electronic drive unit temperature • Pump rotation speed
VERSION	Display of the electronic drive unit version (depends on the connected pump model): <ul style="list-style-type: none"> • HHR version • HHR front panel version • Frequency converter version • Turbomolecular pump magnetic spindle version
FAULT	Successive display of the last 10 defaults with their titles.
WARNING	Successive display of the last 10 warnings with their titles.
BEARING	Display of the landing bearing lifetime (in %) and the warning setpoint (in %).

8.2.3 SETUP menu

Selection	Choice	Description	Initial setting ¹⁾
ACCESS CODE	0 to 65535		0
REMOTE CONTROL	KEYBOARD REMOTE HARD SERIAL LINK LONWORKS DEVICENET PROFIBUS ETHERCAT	Choose the interface control mode.	According to ordering guide.
STAND-BY SPEED	from 15000 min ⁻¹ to pump nominal speed	Activate pump Stand-by speed (selected speed) between minimum speed and nominal speed (= speed set at factory).	15000
BUZZER	ON OFF	Activate the acoustic signal in case of default. To stop the signal, press OFF .	OFF
THERMOSTAT	ON = 30 to 75 °C OFF	Activate the pump temperature set-point .	OFF (M version) ON = 30 °C (MT version)
RELAY AT SPEED	-3 to 50 % of the nominal speed	Modify the speed contact setpoint.	- 3 %
FIELD BUS PRO-FILE ²⁾	0 1	0 = compatible with OBCV4, OBCV5. 1 = compatible with OBCV3.	0
FIELD BUS ADDRESS ²⁾			
RS-232 SPEED	9K6 19K2 38K4 57K6	Choose the RS-232 serial link transmission speed.	9K6
RS-232 ECHO	ON OFF	Activate all received characters to be echoed over the RS-232 serial link.	OFF
RS SEPARATOR	0 to 255	Enter the separator character in ASCII: e.g. "044" for ";".	44
RS ADDRESS	0 to 255	Number given to the pump in the serial link.	0
BEARING LIVE Warning limit	0 to 99 %	Modify the landing bearing warning threshold.	20
NEW CODING	0 to 65535	Modify the access code.	0

1) For client's specification product, initial settings could be different (see chapter "Product concerned").

2) Refer to the operating manual of the fieldbus interface that controls the pump.

8.2.4 Menu SER NUM

Selection	Display	Initial settings
HHR	Affichage du numéro de série du boîtier de commande déportable. Display the HHR serial number.	XXXXXXXXXX
FRONT PANEL	Part number : display the pump part number Serial number : display the pump serial number (available depending on the type of pump).	YYYYYYYYYY

8.3 Control via the REMOTE connector

NOTICE

Safety of Extra-Low Voltage circuits

Remote control circuits are equipped with dry contact outputs (24 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 24 VDC and the current less than 1 A.

Description

Connection via the **REMOTE** connector (HD, 15-pin D-Sub female) can be used for:

- remote control of following functions: start, stop, purge, and air inlet
- remote pump status through auxiliary dry contacts

The remote control mode is active when the 'Remote hardware' control mode is set on the RS-232/RS-485 serial link or via the HHR unit.

When the 'Remote hardware' control mode is set, the Stand-by speed and temperature setpoint can be set via the RS-232/RS-485 serial link or the HHR unit.

- ▶ Use shielded cable and connect both sides to the ground.

8.3.1 Logic input wiring

Control by direct voltage

The inputs are active when a DC voltage between 10 and 24 VDC is applied between their pins (wiring customer supplied).

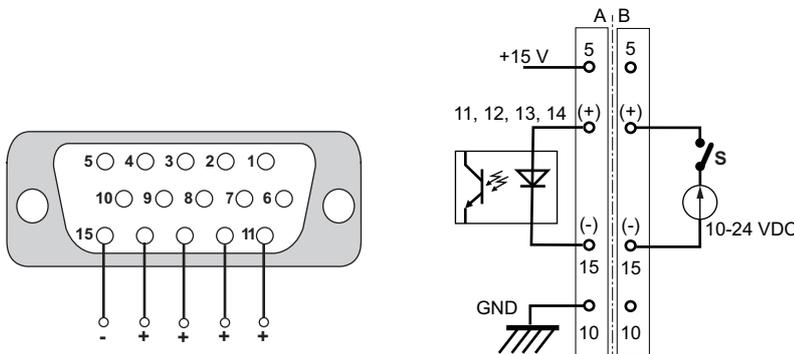


Fig. 6: Remote connector: control by direct voltage

A Internal wiring B Wiring from customer's side

Voltage 10-24 VDC	Function	
S1 (11-15)	Purge ¹⁾	Contact closed: the purge solenoid valve is activated. Contact open: the purge solenoid valve is not activated.
S2 (12-15)	Venting ¹⁾	Contact closed: the air inlet solenoid valve is activated. Contact open: the air inlet solenoid valve is not activated.
S3 (13-15)	Stand-by ¹⁾	Contact closed: Stand-by speed is selected. Contact open: pump rotation speed is the pump nominal speed.
S4 (14-15)	Start/Stop pump ¹⁾	Contact closed: the pump starts. Contact open: the pump stops.

1) This function runs when the control mode is set to 'Remote hard' via the RS-232/RS-485 serial link (see chapter "List of commands") or via HHR (see chapter "SETUP menu").

Control by dry contacts

To control these inputs by external contacts of the host equipment, connect pins 10 with 15 and wire the used contacts (wiring customer supplied). Pins 11, 12, 13, 14 are connected to + 15 V (pin 5) to be active.

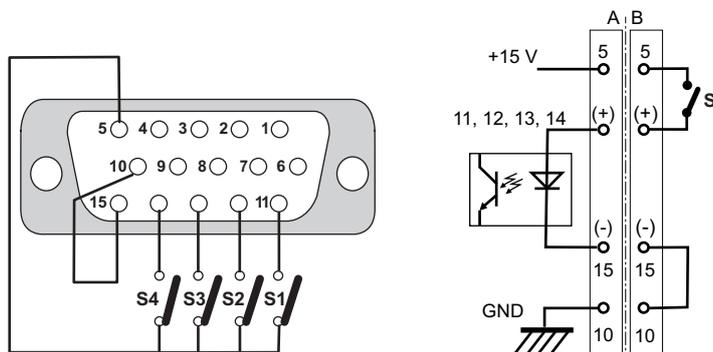


Fig. 7: Remote connector: control by dry contacts

A Internal wiring

B Wiring from customer's side

Contact	Function	
S1 (11-5)	Purge ¹⁾	Contact closed: the purge solenoid valve is activated. Contact open: the purge solenoid valve is not activated.
S2 (12-5)	Venting ¹⁾	Contact closed: the air inlet solenoid valve is activated. Contact open: the air inlet solenoid valve is not activated.
S3 (13-5)	Stand-by ¹⁾	Contact closed: Stand-by speed is selected. Contact open: pump rotation speed is the pump nominal speed.
S4 (14-5)	Start/Stop pump ¹⁾	Contact closed: the pump starts. Contact open: the pump stops.

1) This function runs when the control mode is set to 'Remote hard' via the RS-232/RS-485 serial link (see chapter "List of commands") or via HHR (see chapter "SETUP menu").

8.3.2 Logic output wiring

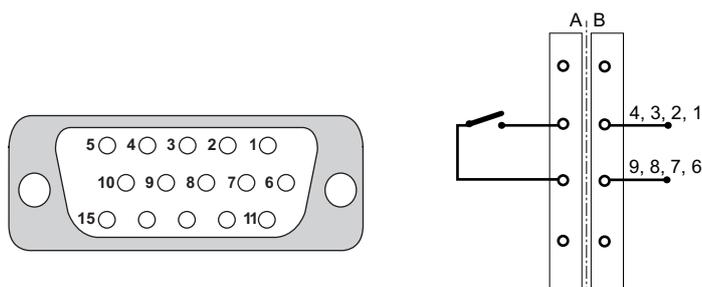


Fig. 8: Remote connector: logic outputs

A Internal wiring

B Wiring from customer's side

Contact	Function	
1-6	OK for process	Contact closed: OK for Process ¹⁾ – M version : speed ≥ nominal speed (set by 'Relay At Speed' parameter), (see chapter "SETUP menu"), (see chapter "List of commands"). – MT version : speed ≥ nominal speed (set by 'Relay At Speed' parameter), (see chapter "SETUP menu"), (see chapter "List of commands"); and if the temperature is ≥ the setpoint temperature - 3 °C. When 'OK for Process' = 'At speed' is set (OPT37), this signal behaves as in the case of an M version.
2-7	Rotation	Contact closed: pump speed > 100 min ⁻¹
3-8	Warning	Contact open: presence of a warning
4-9	Fault	Contact open: presence of a fault

1) If the parameter 'OK for process up to Stand-by speed' is set to 1 (see chapter 'Command list'), the contact opens if the Stand-by speed is selected and while the speed of the pump is greater than the Stand-by speed.

8.4 Command via the RS-232/RS-485 serial link

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.

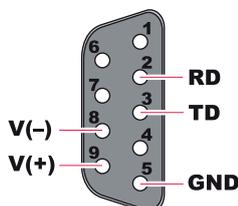
8.4.1 Connections

The 9-pin D-Sub male connector marked **RS-232/RS-485** is used to control and monitor the pump connected to an external computer. It allows also the installation of several pumps in a network. The connected computer allows the modification of the default serial link setting, according to the command list (see chapter "Command list").

Initial serial link configuration

Description	Set Point
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 connector

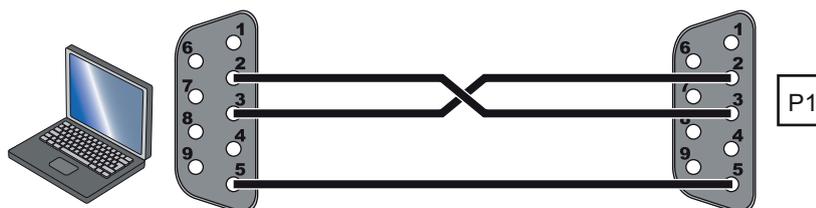


Pin	Assignment
2	Data reception (RS-232)
3	Data transmission (RS-232)
5	GND
8	RS-485: V-
9	RS-485: V+

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

RS-232 connection

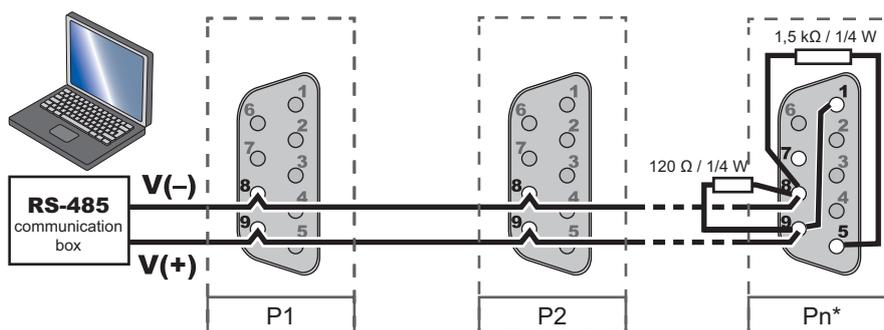
A computer manages a single pump (P1) using the RS-232 link via the **RS-232/RS-485** connector.



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.

The wiring of the product at the end of line Pn* and the wiring of a single product on the network is specific.



Setting

The serial link control mode is active when the wiring is done and when the 'Serial link' control mode is configured by the HHR (see chapter "SETUP" menu) or on the RS-232/RS-485 serial link (see chapter "Command list").

- ▶ Position the mains switch to I.
- ▶ Send an order via the serial link.

8.4.2 Communication protocol

Control commands	
Header character	The default setting is the decimal code 035 of the character #
Address	Number given to the pump, 3 characters
Ordre	Command sent on serial link, 3 characters
Order	The number of characters depends on the command
Parameter	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	Parameter	End character
#	ADR	ODR	XXXX	<CR>

Responses			
Header character	Pump address Order	Respons	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	Context fault		
ERR4	Checksum fault		

Example of dialog	
Order	#005ECHON<CR>
Response	#005OK<CR>

8.4.3 Command list

Order	Pa- ra-me- ter	Descrip- tion	Functions	Min	Max	De- fault set- ting
ADR	xxx	Number given to the pump in the serial link	adr = pump address before change (only for RS-232) aaa = new pump address (only for RS-232)	000	255	0
ACK	none	Default acknowledgment				
DEF	none	Display of warnings/faults	List of the last 40 warnings/faults stamped on the electronic drive unit running time, followed by the name of the fault. The arrow->indicates the ongoing warning/fault. <i>Example:</i> *00000:02:20 / Default list ->00000:01:37 / Default in current Yh ->00000:01:37 / PM Default *00000:02:20 / Warning list ->00000:02:37 / Holweck Temp. sensor 00000:01:30 / Speed controller Hall sensor 00000:00:50 / Holweck Temp. sensor			
DLI	xxx	Data logger read interval	Defines the automatic read interval of pump status (STA) in seconds.	0	255s	1s
DLR	none	Automatic read activated.	Authorizes automatic reading of pump status (STA) according to the DLI interval (RS-232 only).			OFF
ECH	ON or OFF	Return all characters received on the serial link	Activated if ECHON (RS-232 only) Deactivated if ECHOFF (RS-232 only)			OFF

Order	Parameter	Description	Functions	Min	Max	Default setting
EVT	none	Display of last actions	List of the last 40 actions stamped on the electronics drive unit running time, followed by the description of the action (RS-232 only). * 00000:02:28/Actions list 00000:01:37/Serial link:pump stop 00000:01:34/Serial link:pump start * 00000:01:10/Serial link:pump stop 00000:00:59 AM/Serial link:pump start			
FBI	none	Fieldbus information	Return information about used fieldbus (type, address). <i>Example: Devicenet : #adr,n,yy,z</i> n = Device type yy = address z = speed (bauds) <i>Example: Ethercat : #adr,n,yyyy</i> n = Device type yyyy = address z = speed (bauds)			
IDN	none	Identification of the product connected with the computer	Returns the electronic drive type, the software version (x, yy), release (zz), and the type of pump connected to the computer (1234) <i>Example: #adr,OBC V5 Vx.y.zz,ATH1234M<CR></i>			
LEV10	none	Returns the status of the operating parameters defined by SET	<i>Example:</i> <i>#adr,nnnnn,sssss,00000,0,cccc,eeee,00000,0000,0000,jj,kk,ll,mmm<CR></i> nnnnn = nominal speed (min ⁻¹) sssss = stand-by speed (min ⁻¹) 00000 = not used 0 = not used cccc = running time of the pump (hours) eeee = running time of the electronic drive 00000 = not used 0000 = not used jj = 'At speed' relay setpoint (3 to 50%) kk = temperature setpoint (30 to 65°C) ll = landing bearing warning setpoint (0 to 99%) mmm = landing bearing counter (0 to 100%)			
LON	none	Status of LonWorks fieldbus	Returns the status of LonWorks fieldbus <i>Example: LonWorks : #adr,Vx,yy...nn/p</i> Vx,yy : firmware version nn = node p = subnet			
NSP	none	Switches from Stand-by speed to nominal speed	The speed is set to the nominal speed (default setting)			

Order	Parameter	Description	Functions	Min	Max	Default setting
OPT	XX	Setting options/orders	<i>Example: #adrOPTxx,n<CR></i> XX = 14 control mode n = 0 HHR control mode (keyboard) n = 1 Remote control mode (hardware) n = 2 RS-232/RS-485 control mode n = 3 LonWorks fieldbus control mode n = 4 Devicenet fieldbus control mode n = 5 Profibus fieldbus control mode n = 8 EtherCAT fieldbus control mode			
			XX = 20 Air inlet solenoid valve control n = 0 valve not supplied n = 1 valve supplied	0	1	0
			XX = 21 Purge solenoid valve control n = 0 valve not supplied n = 1 valve supplied	0	1	0
			XX = 25 Braking control n = 0 motor braking up to 10000 min ⁻¹ n = 1 no motor braking n = 2 braking up to rotation stop	0	1	0
OPT	XX	Setting options/orders	XX = 26 'OK for Process' up to stand-by speed n = 0 the pump slows down and stays in 'OK for Process' mode n = 1 the pump brakes, the 'OK for Process' status disappears and it switches to 'START' mode. Pump will indicate 'OK for Process' when the speed setpoint is reached.	0	1	0
			XX = 29 TMS ON/OFF (MT pump version) n = 0 temperature management disabled n = 1 temperature management enabled	0	1	1
			XX = 37 'OK for Process' management (MT pump version) n = 0 'OK for Process' when pump speed ≥ nominal speed and temperature ≥ temperature setpoint -3°C. n = 1 'OK for Process' when speed ≥ nominal speed Note: for pumping condensable vapor, selecting n = 0 is recommended for preventing condensation of gases during the process.	0	1	1
RDI	none	Serial number of the electronic drive unit	Serial number, coded with 10 digits and stored in EEPROM, of the pump, pin and electronic drive unit interface serial numbers.			
RPM	none	Stand-by speed setting	<i>Example: #adr,nnnnn<CR></i> nnnnn = Stand-by speed * Pump nominal rotation speed set at factory.	15000	*	15000
SBY	none	Switches from the selected rotation speed to the Stand-by speed	The pump runs at the last Stand-by speed stored value. This can be modified with the RPM order.			

Order	Parameter	Description	Functions	Min	Max	Default setting
SEL10	none	Status of the options/orders set with OPT order	<i>Example: #adr,0,0,1,0,r<CR></i>			
			0 = not used 1 = not used r = returns the control choice r = 0 Hand Held Remote (key-board) r = 1 Remote control r = 2 Serial link r = 3 LonWorks r = 4 Devicenet r = 5 Profibus r = 8 EtherCAT			
SEL20	none	Status of the parameters set with OPTXX	Returns the status of parameters set with OPTXX: S ₂₀ , S ₂₁ , S _{xx} <i>Example : #000,S₂₀, S₂₁, S₂₂, S_{xx}<CR></i>			
SEP	none	Separator character	Valid for parameters returned on DLR, STA and LEV. ASCII input value of the character code 044 corresponds with comma “,”	000	255	044
SET	XX	Setting pump operating parameters	<i>Example: # adrSETXX,cccc<CR></i>			
			XX = 11 electronic drive unit running time (in hours)			
			XX = 30 'at speed' relay setpoint (%)	- 3	- 50	- 3
			XX = 31 temperature setpoint (°C) (MT pump version)	30	75	30
			XX = 32 landing bearing warning setpoint (%)	0	99	20
cccc = value						
TMP	ON or OFF	Start/Stop the pump	The pump rotation starts with TMPON The pump stops with TMPOFF			
TIM	none	Display of the running time	<i>Example:</i> <i>#adr,rrrrrrrrr,ttttttt,eeeeeeeeee,hhhhh,mmm,ss<CR></i> rrrrrrrrr = pump running time (in seconds) ttttttt = pump maintenance time (in seconds) eeeeeeeeee = electronic drive unit running time (in seconds) hhhhh = pump running time (in hours) mmm = pump running time (in minutes) ss = pump running time (in seconds)			
VER	none	Display of software versions	<i>Example: #adr,INTERFACE Vx.yy.zz,CARTRIDGE Vx.yy,TYPE zzzz,FIRMWARE Vx.yy.zz<CR></i> INTERFACE vx.yy.zz = control panel software version CARTRIDGE vx.y = speed controller software version TYPE zzzz = type of connected pump FIRMWARE Vx.yy.zz = software version 1234 = checksum variator software			

Order	Parameter	Description	Functions								
STA	none	Pump status	<i>Example: #adr,s₁s₂s₃, rrrrr,vvv, www, xxx, yyy, zzz, aa, bbbbb, ccc, ddd, gggggggggggggggggggggggg<CR></i>								
			rrrrr = pump rotation speed (min ⁻¹) aa = motor current voltage (V) bbbbb = motor current (mA) ccc = pump temperature (°C) ddd = electronic drive unit temperature (°C) s ₁ s ₂ s ₃ = requires conversion of ASCII to binary	vvv = Radial Xh www = Radial Yh xxx = Radial Xb yyy = Radial Yb zzz = Axial Z g ₀ to g ₂₄ = warning and default bytes							
STA		s ₁ : order status	Bit	7	6	5	4	3	2	1	0
					INH	Local	Fault	Serial Fieldbus	REM	STBY	START
			0	-	0	OFF	OK	OFF	OFF	OFF	OFF
1	1	-	ON if HHR has control	Fault if Fault status activated	ON if field-bus mode is activated	ON if hard Remote is activated	ON if Stand-by mode is activated	ON when starting, at speed, or over-speed			
STA	none	s ₂ : pump status	Bit	7	6	5	4	3	2	1	0
					Fault	Warning Temp.	Braking	Nominal speed & temp	Accelerating	Rotating	Power (init).
			0	-	OFF	OFF	OFF	OFF	OFF	OFF	-
1	1	-	ON if Fault status activated	ON if pump temp. is too high	ON	ON OK for process	ON if starting mode is activated	ON rotor rotating > 100 min ⁻¹	ON		
STA	none	s ₃ : solenoid valve status	Bit	7	6	5	4	3	2	1	0
					Speed	(Free)	Purge	Water valve	TMS	Air inlet valve	Isolat. valve
			0	-	OFF	-	OFF	OFF	OFF	OFF	0
1	1	ON if At speed activated	-	ON if purge valve is powered	ON if water valve is powered (MT)	ON if TMS activated (MT)	ON if air inlet valve is open	-			

Order	Parameter	Description	Functions			
			g	0 = ok	1 = warning	2 = fault
STA	none	g₀ to g₂₄ : warning and default bytes	0		Power overheat	Seized pump, not accelerating
			1			
			2			
			3			
			4		Hall sensor	
			5			
			6			
			7			Mag. suspens.
			8		Power fail	
			9			
			10			Upper radial bearing Yh
			11			Upper radial bearing Xh
			12			Lower radial bearing Yb
			13			Lower radial bearing Xb
			14			Axial bearing Z
			15		Maintenance	
			16		Electronic temperature	Electronic temperature
			17		Pump temperature	Pump temperature
			18			
			19			
			20			
			21			
			22			
			23		Fieldbus communication	Pump not connected
			24		Internal communication	Mag. comm. fail. parameters init.

8.5 Operation via fieldbus

Connecting and using Pfeiffer Vacuum turbomolecular pumps with a fieldbus system is possible when the corresponding control interface is installed on the pump (depends on the ordering guide).

- ▶ Refer to the operating instructions of the corresponding control interface (see chapter “Applicable documents”).

9 Maintenance

9.1 Maintenance safety instructions

The electronic drive unit installed on the magnetically levitated pump is used in the presence of pumped gases. As a result, the security measures against risks related to this type of application must be observed. **Refer to the magnetically levitated pump operating instructions.**

WARNING

Risk of cutting injuries due to contact with sharp edges via the high vacuum flange

Sharp components can be accessed via the inlet flange. Rotor and stator blades on turbomolecular pumps have very sharp edges.

- ▶ Before starting any work on the product, wait for the pump to come to a complete standstill.
- ▶ Always keep the splinter shield in the inlet housing, as it limits the risk of injury.
- ▶ Always wear protective gloves in accordance with standard EN 420.
- ▶ **Never disconnect the high vacuum flange before the rotor is completely immobilized.**

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 EN420.

NOTICE

Risk of damaging the pump by generating an electric arc

The pump and its electronic drive unit must not be disconnected from the electrical network before the rotor completely stops rotating and the unit is isolated from the electrical network: an electric arc is created when the circuit is interrupted, which damages internal components.

1. Stop the pump from rotating by sending an order to **'Stop'** on the control interface.
2. Wait for the rotor to completely stop rotating (several minutes).
3. Switch off customer power supply from the equipment.
4. Unplug the mains cable.

General maintenance recommendations

- Ensure that the maintenance technician is trained in the safety regulations that cover the pumped gases.
- 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.
- Wait for the product to cool down completely before working on it.
- 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.
- Route and secure cables, hoses and pipework to guard against falls.

9.2 Standard exchange procedure



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: Pfeiffer Vacuum Service Support.

Depending on the type of malfunction, it may be necessary to return the product to the service center.

Exchange procedure for replacement products

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

1. Draining the water circuit
2. Disassembling the electronic drive unit

Diagnosis of the defective component

- ▶ Replace the electronic drive with one of the same reference.
 - If the problem persists, it means that the pump is causing the problem. In this case, make a standard exchange.
 - If the problem is resolved, it means that the electronic drive is defective. In this case, only the electronic drive unit must be returned to the service center. (see chapter “Disassembling the electronic drive unit”).

Standard exchange

- ▶ To carry out a standard exchange of the electronic drive unit and magnetically levitated pump, the procedure described in the pump operating instructions must be followed.

Read 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 51).

9.2.1 Draining the water circuit

The water must be drained from the water circuit to prevent the pipework from freezing during transport. To do this, users will need to provide flexible tubes and connections as well as a compressed air circuit (pressure of 2 to 5·10³ hPa).

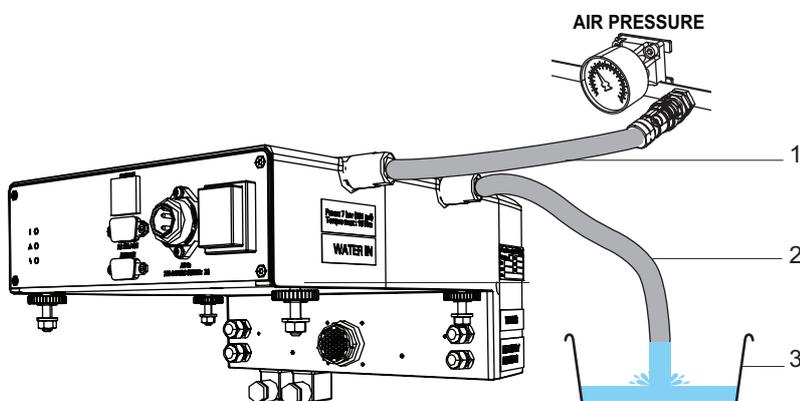


Fig. 9: Draining the water circuit

- | | |
|----------------------------------|----------------------------------|
| 1 Pipe for compressed air supply | 3 Container (capacity > 1 liter) |
| 2 Water drain pipe | |

Water circuit drainage procedure

1. Disconnect the water circuit from the **WATER IN** and **WATER OUT** connections (see chapter “Man/machine interface”).
2. Connect the drain pipe to a pump water connector.
3. Place a container below the connectors (total water volume greater than 1 liter).
4. Connect the other connector to a compressed air circuit.
5. Inject compressed air into the water circuit until the water has been completely evacuated.

9.2.2 Disassembling the electronic drive unit

To disassemble the electronic control unit attached to the pump, key steps must be followed in sequential order:

1. Disconnect the electrical cables.
2. Disconnect the pipes from the cooling circuit.
3. Remove the module.

Electrical cable disconnection

1. Stop the pump by sending a '**STOP**' order (see chapter "Pumping shutdown").
2. Switch off the pump by positioning the mains switch to '**O**': the green LED turns off.
3. Switch off your main circuit breaker.
4. Disconnect the power cable from the electrical connector (see chapter "Connecting the cables").
5. For a fixed electrical connection, disconnect the wires from the terminal block (see chapter "Electrical connection").
6. Disconnect all the connectors on the control interface.
7. Disconnect all cables from the solenoid valves and the heater jacket (if any).

Disconnecting pipes from the cooling system

1. Disconnect and remove all pipes between the pump and the electronic control unit, and the water solenoid valve (if present).
2. Keep these items for the next use:
 - Do not return them to the service center.

Removing the module

1. Unscrew the 4 nuts on the studs as well as the 2 locking screws of the module on the pump.
2. Slide the module to disconnect the electrical connector.
3. Remove the module from the pump.
4. Secure the solenoid valve cables with screws on the module to prevent damage.

10 Decommissioning

10.1 Shutting down for longer periods

To decommission the pump, see the operating instructions of the magnetically levitated pump.

Long-term shutdowns of the electronics module must comply with the storage conditions (see chapter "Storage").

10.2 Recommissioning

When the electronic module is unpacked, **leave it at room temperature for 24 hours before use**.

To restart the pump after prolonged storage, see the operating instructions of the magnetically levitated pump.

10.3 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 51](#)).



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 materials which can be recycled: steel, stainless steel, brass, aluminum, nickel, copper, fluoroelastomers, PTFE, FEP and electronic boards. Take special precautions for:

- fluoroelastomers which may break down if they are exposed to high temperatures,
- components in contact with products resulting from processes which may have been contaminated.

11 Malfunctions

11.1 Malfunction and fault indication

Read the safety instructions for maintenance (see chapter “Maintenance safety instructions”).

When a problem occurs, the user is warned by:

- Activation of the fault/warning LED
- Audible warning of the HHR (if enabled)
- Activation of the fault contacts on the **Remote** connector
- Pumping interruption when the ‘**Stop**’ order has not been activated
- Fault/warning message displayed on the HHR
- A message via the RS-232 or RS-485 serial link
- A message via the fieldbus

Meaning of the LED

- Lit yellow LED = presence of a warning
- Lit red LED = presence of a fault, pump stops

For operation monitoring: (see chapter “Operation monitoring”, page 28).

Recommissioning after a stop due to a fault

During the pump stop following a fault, the speed variator is switched off and the pump is put in a safe condition. To restart the pump, you must:

- ▶ Switch the power off and **wait until the rotor has stopped**.
 - Mains switch on **O**.
- ▶ Wait approximately 15 seconds.
- ▶ Correct the cause of the fault.
- ▶ Restore power supply.
 - Mains switch on **I**.

11.2 Malfunction

The pump does not start: No indicator light is on

Symptom	Cause	Remedy
The mains switch is on I and no LEDs are lit on the electronic control panel.	No power supply	1. Check for the presence of voltage on the power line.
	The pump supply voltage is not compatible with the equipment’s power configuration.	1. Check that the power line voltage corresponds to required power voltage.

Pump starts only in Stand-by mode

Symptom	Cause	Remedy
Green LED is flashing, nominal speed is not reached while Stand-by mode is not activated.	Electronic drive unit problem	1. Stop the pump rotation. 2. Reset mains power: mains switch O/I .

Pump runs but vibrates

Symptom	Cause	Remedy
Pump noisy: vibrations appear over 7000 min ⁻¹	Mechanical attachment problem	1. Check that the pump is correctly fastened to the equipment frame. 2. Check that the vibrations do not come from the equipment. 3. Check that the equipment is correctly fastened to the floor (problem due to an anti-vibration flagstone, for example).

Pump is running and a defect occurs: red LED

Message	Symptom	Cause	Remedy	
Upper radial bearing Lower radial bearing Axial position	Electronic drive unit stops the motor. The air inlet solenoid valve is activated. The pump cannot restart.	Electronic drive unit cannot position the rotor.	<ol style="list-style-type: none"> 1. Check that the pump is correctly fastened to the frame (see chapter "Positioning the pump in the installation"). 2. Turn off the mains power, then turn the pump back on. If the fault occurs again, contact our service center. 	
Upper radial current Lower radial current Axial current				
Pump temperature	Electronic drive unit stops the motor. The air inlet solenoid valve is activated.			<ol style="list-style-type: none"> 1. Check the water-cooling circuit.
Speed controller temperature Electronic housing temperature Power supply temperature	Electronic drive unit stops the motor. The air inlet solenoid valve is activated.			<ol style="list-style-type: none"> 1. Check the water-cooling circuit.
Speed controller Hall sensors	Electronic drive unit stops the motor. The air inlet solenoid valve is activated.			Hall sensors failure
Magnetic bearing	Electronic drive unit stops the motor. The air inlet solenoid valve is activated.	Rotor suspension fault		
Seized pump	Electronic drive unit stops the motor.	Rotor is blocked.	<ol style="list-style-type: none"> 1. Turn off the mains power, then turn the pump back on. If the fault occurs again, contact our service center. 	
Mag. comm. failure	The pump cannot start.	Internal communication fault	<ol style="list-style-type: none"> 1. Turn off the mains power, then turn the pump back on. If the fault occurs again, contact our service center. 	
Not accelerating	Electronic drive unit stops the motor.	The pump cannot accelerate.	<ol style="list-style-type: none"> 1. Check if the backing pump is running (level of fore vacuum). 	
Pump not connected	The pump cannot start.	The electronic drive unit does not receive the pump control signals.	<ol style="list-style-type: none"> 1. Turn off the mains power, then turn the pump back on. If the fault occurs again, contact our service center. 	
No mag. suspension	The pump cannot start.	The electronic drive unit cannot manage the levitation of the rotor.	<ol style="list-style-type: none"> 1. Turn off the mains power, then turn the pump back on. If the fault occurs again, contact our service center. 	

Pump is running and a warning occurs: yellow LED

Message	Symptom	Cause	Remedy
Pump temperature	Electronic drive unit does not stop the pump.	The pump temperature reaches the authorized limits.	<ol style="list-style-type: none"> 1. Check the water-cooling circuit. 2. Check the temperature range.
Speed controller temperature Electronic housing temperature Power supply over-temperature	Electronic drive unit does not stop the pump.	The electronic drive unit temperature reaches the authorized limits.	<ol style="list-style-type: none"> 1. Check the water-cooling circuit. 2. Check the temperature range.

Pump is running and a warning occurs: yellow LED

Message	Symptom	Cause	Remedy
Maintenance	The landing bearings need to be replaced.	Landing bearing counter reaches the warning set-point.	1. Contact our service center.
Internal communication	The pump cannot start.	Internal communication fault	1. Turn off the mains power, then turn the pump back on. If the fault occurs again, contact our service center.

The pump runs but performance is inadequate

Symptom	Cause	Remedy
The pump does not reach the selected speed.	Leaks on the pumping line	1. Close the isolation valve on the vacuum chamber. 2. Restart the pump. If the selected speed is reached, the leak is in the vacuum chamber.
	Isolation valve at pump exhaust remains closed.	This is the case when the V1 isolation valve control is the customer's responsibility = valve is controlled with 'Start' contact. 1. Check that the valve opens by sending a 'Start' order. If the valve does not open, check the valve electrical wiring and the coil status. 2. With an ohmmeter, check that the 'Start' contact on the electronic drive unit closes when the valve is disconnected. Otherwise, contact our service center.
	Defective fore vacuum	1. Connect a gauge at the pump inlet and measure the ultimate pressure: it must be $\leq 1 \cdot 10^{-1}$ hPa.
	Air inlet solenoid valve problem	1. Check the 'Venting' output voltage (0 V) when the electronic drive unit is on and the valve is disconnected. 2. Check the correct operation of the air inlet valve (NC). If the output contact is defective, contact our service center.
	Leaks on the air inlet solenoid valve	1. Replace the solenoid valve with a blanking plate: caution, the pump is no longer secure in this configuration! 2. Start the pump by sending a 'Start' order. If the pump reaches a speed $< 10000 \text{ min}^{-1}$: stop the pump immediately and change the valve otherwise, contact our service center.

12 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.

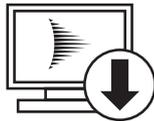
Our professional sales and service employees are available to provide you with reliable assistance, worldwide. Pfeiffer Vacuum offers an entire range of services, from [original replacement parts](#) to [service contracts](#).

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:



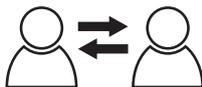
1. Download the up-to-date form templates.
 - [Explanations of service requests](#)
 - [Service requests](#)
 - [Contamination declaration](#)



- 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](#).

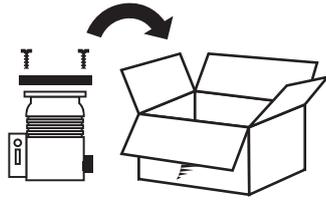


4. You will receive an acknowledgment from Pfeiffer Vacuum.

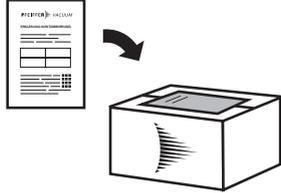
PFEIFFER VACUUM

Submission of contaminated products

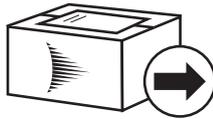
No microbiological, explosive, or radiologically contaminated products will be accepted. Where products are contaminated, or the contamination declaration is missing, Pfeiffer Vacuum will contact you before starting service work. Depending on the product and degree of pollution, **additional decontamination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

PFEIFFER VACUUM

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

13 Accessories

Accessory	Function	Type	Part Number
Hand-held remote control	Allows man/machine interface for controlling the pump in local mode.	Control box with cable	114461

14 Spare parts

Description	Version of pump ¹⁾	Part Number
Female supply connector, IP54	M/MT	119610
OBC ²⁾ with Remote control panel	M	123878
OBC ²⁾ with Remote control panel	MT	123879
OBC ²⁾ with Profibus control panel	M	123880
OBC ²⁾ with Profibus control panel	MT	123881
OBC ²⁾ with EtherCat control panel	M	124400S
OBC ²⁾ with EtherCat control panel	MT	124401S
OBC ²⁾ with Devicenet control panel	M	128382
OBC ²⁾ with LonWorks control panel	M	128323
OBC ²⁾ with fixed electrical connector and Remote control panel	M	123883

1) OBC is used with ATH 1300, ATH 1600, ATH 1603, ATH 2303, ATP 1300, ATP 1603 magnetically levitated pumps, version M or MT.

2) The electronic drive unit is equipped with the purge valve cable.

Tbl. 3: OBC V4 spare parts

15 Technical data and dimensions

15.1 Technical data

Characteristics	OBC
Operating voltage	200 V (-15%) to 240 V (+10%)
Power frequency	50/60 Hz
Maximum current	7 A
Maximum power consumption	1000 W
Rated power	750 W
Degree of protection	IP 54
Type of cooling	water
Cooling water flow rate and temperature	(see chapter "Water characteristics")
Weight	8 kg
Dimensions	(see chapter "Dimensions")

15.2 Environmental conditions

Use	indoor use
Installation altitude	up to 2,000 m
Ambient operating temperature	5 – +45 °C
Storage temperature	-5 – +50 °C
Maximum relative humidity	80 % max. with $T \leq 31$ °C at 50 % max. with $T \leq 40$ °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.

15.3 Electrical characteristics

Main circuit breaker short circuit cut-off capacity	10 kA
Main circuit breaker rating	16 A (for 200-240 V -50/60 Hz voltage)
GFI (or RCD) type B, differential circuit breaker compatible with TT electrical networks	30 mA ¹⁾

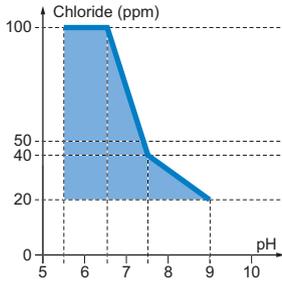
1) for TN and IT networks, use appropriate protection measures

Tbl. 4: Electrical characteristics of the customer's network

15.4 Cooling water characteristics

The characteristics below concern only the magnetically levitated turbomolecular pump. This pump is associated with a backing pump. To ensure the effective operation of the application:

1. Comply with the most restrictive characteristics for the installation.
2. Make sure the water coming from the equipment does not freeze.



pH	5.5 to 9
Chlorides ¹⁾	100 to 20 ppm depending on the pH
Hardness	< 35 °fH (French degree) < 7 milliequivalent/L < 350 mg/L of CaCO ₃ (calcium carbonate)
Total dissolved solids	< 100 mg/L
LSI (Langelier saturation Index) = pH - pHs	< 0 to 20 °C
Particle size	< 0.2 mm
Resistivity	R > 1 500 Ω cm
Inlet temperature ²⁾	15-35 °C (M version) 15-25 °C (MT version)
Relative inlet pressure	< 6 · 10 ³ hPa
Input/output pressure difference	depends on flow
Flow	> 60 l/h

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

2) According to the conditions of use, please contact us.

Tbl. 5: Cooling water characteristics

Connector types

Water inlet	1/4" NPT female connector
Water outlet	1/4" NPT female connector

15.5 Dimensions

Dimensions in mm

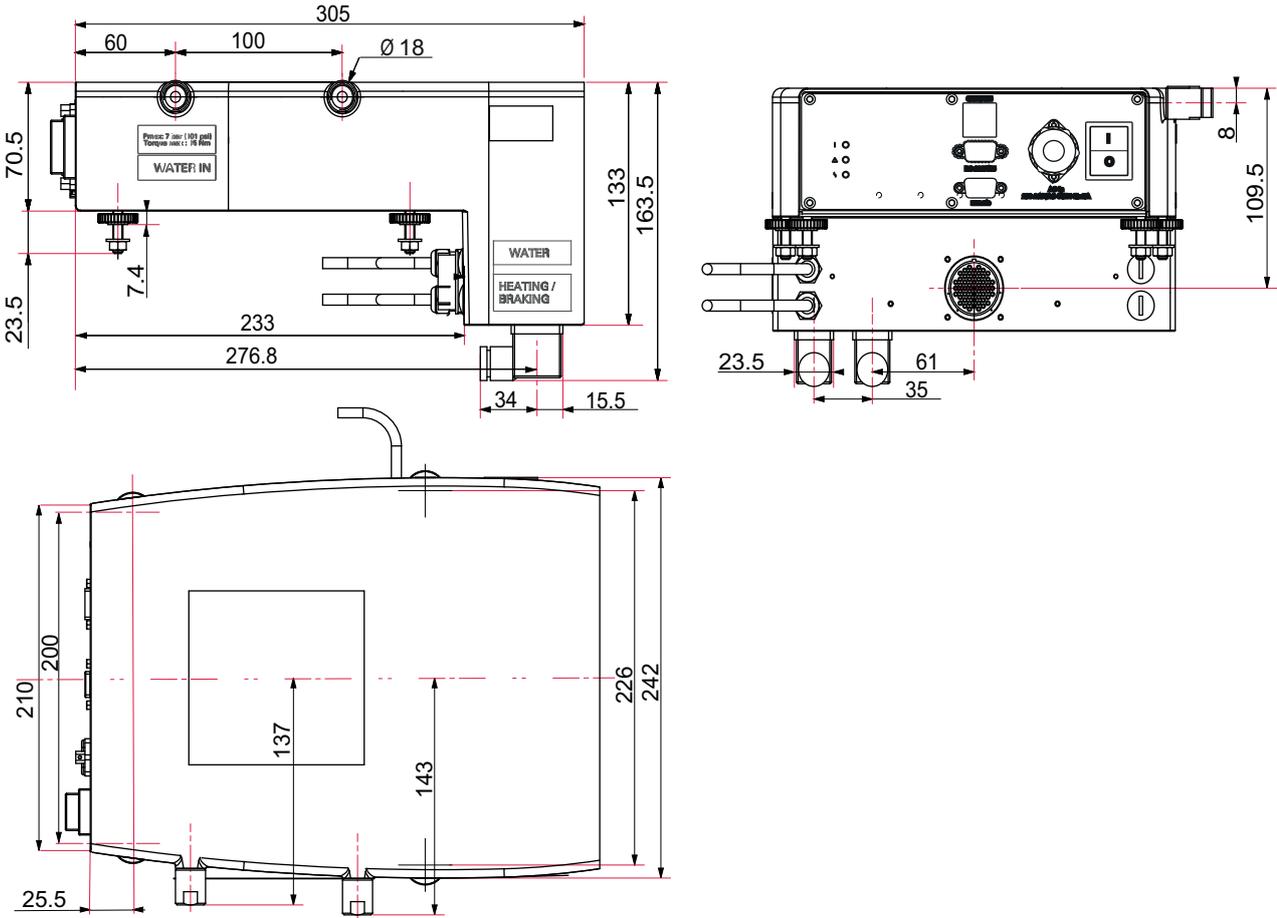


Fig. 10: Dimensions - OBC V4

Declaration of conformity

Declaration for product(s) of the type:

**Electronic drive unit for magnetically levitated turbopump
OBC V4**

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

Low voltage 2014/35/EC

Electromagnetic compatibility 2014/30/EU

Restriction of the use of certain hazardous substances 2011/65/EU

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

NF EN 61010-1+A1: 2019

NF EN 61000-3-2: 2014 -2018

NF EN 61000-3-3+A1: 2014 - 2019

NF EN 61000-6-2: 2019

NF EN 61000-6-4+A1: 2019

The person authorized to compile the technical file is Mr. Billot Ludovic, 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

Bertrand Seigeot
Pump Product Group Director
Pfeiffer Vacuum SAS

Annecy, 2021/02/16





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

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

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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