OPERATING INSTRUCTIONS

EN

Translation of the original instructions

HIPACE 2300

Turbopump

PFEIFFER VACUUM

PT 0468 BEN/B (1607)

Table of contents

1 About this manual

1.1 Validity

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

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

1.1.1 Applicable documents

HiPace 2300, depending on the model	Operating instructions
Operating instructions "Electronic drive unit TCP 1200", standard	PT 0454 BN*
Operating instructions "Electronic drive unit TCP 1200 PB", Profibus	PT 0542 BN*
Operating instructions "Electronic drive unit TCP 1200 E74", acc. Semi E74	PT 0543 BN*
Operating instructions "Electronic drive unit TCP 1200 DN", DeviceNet	PT 0544 BN*
Operating instructions "Electronic drive unit TCP 1200 EC", EtherCAT	PT 0545 BN*
Declaration of conformity	Part of this document

*also available via www.pfeiffer-vacuum.com

1.2 Conventions

1.2.1 Safety instructions

The safety instructions in Pfeiffer Vacuum operating instructions are the result of risk evaluations and hazard analyses and are oriented on international certification standards as specified by UL, CSA, ANSI Z-535, SEMI S1, ISO 3864 and DIN 4844. In this document, the following hazard levels and information are considered:

DANGER

Imminent danger

Indicates an imminent hazardous situation that will result in death or serious injury.

WARNING

Possibly imminent danger

Indicates an imminent hazardous situation that can result in death or serious injury.

CAUTION

Possibly imminent danger

Indicates an imminent hazardous situation that can result in minor or moderate injury.

NOTICE

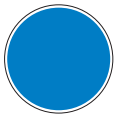
Command or note

Command to perform an action or information about properties, the disregarding of which may result in damage to the product.

1.2.2 Pictographs

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

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



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

Important information about the product or this document

1.2.3 Instructions in the text

➔ Work instruction: here you have to do something.

1.2.4 Abbreviations

DCU:	Display Control Unit
HPU:	Handheld Programming Unit
TCP:	Electronic drive unit for turbopump, external with power supply
PB:	Profibus version
DN:	DeviceNet version

1.2.5 Symbols used

The following symbols are used consistently throughout the diagrams:

- Ⓗ High vacuum flange
- ⓥⓥ Fore-vacuum flange
- Ⓥ Vacuum flange of the backing pump
- Exhaust flange of the backing pump
- Electrical connection
- ⓈⒼ Sealing gas connection
- Ⓕ Venting connection
- Cooling water connection

2 Safety

2.1 Safety precautions

Duty to inform

Each person involved in the installation, operation or maintenance of the vacuum pump must read and observe the safety-related parts of these operating instructions.

➔ The operator is obligated to make operating personnel aware of dangers originating from the vacuum pump, the pumped medium and the entire system.

Installation and operation of accessories

Pfeiffer Vacuum pumps can be equipped with a series of adapted accessories. The installation, operation and maintenance of connected devices are described in detail in the operating instructions of the individual components.

➔ For information on order numbers of components, see "Accessories".

➔ Use original accessory parts only.

NOTICE

Checking the safety system against excess rotation speed

To provide the functioning of the integrated safety system for avoiding excess rotation speed, the pump must run-up from the standstill at least once a year.

➔ Switch off the pump and await the complete standstill (rotation speed = 0 Hz).

➔ Run-up the pump according to this operating instructions.

WARNING

Danger of unsafe electrical installation

Safe operation after installation is the responsibility of the operator.

➔ Do not independently modify or change the pump and electrical equipment.

➔ Make sure that the system is integrated in an emergency off safety circuit.

➔ Consult Pfeiffer Vacuum for special requirements.

WARNING

Danger due to lack of power disconnection device

Pump and electronic drive unit are not equipped with a power disconnection device. Installation of a user-supplied power disconnection device in accordance with SEMI-S2.

➔ Fit a circuit breaker with an interruption rating of min. 10,000 A.

WARNING

Danger of electric shock

In case of defect, the parts connected to the mains supply are under voltage.

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

- Do not expose any body parts to the vacuum.
- Observe all safety and accident prevention regulations.
- Regularly check the proper observance of all safety measures.
- Always ensure a safe connection to the protective earthing conductor (PE, protection class I).
- Do not loosen any plug connection during operations.
- Wait for the rotor to reach standstill before peforming work on the high vacuum flange.
- Keep leads and cables well away from hot surfaces (> 70 °C).
- Never fill or operate turbopump with cleaning agent.
- Do not operate the turbopump with open high vacuum flange.

- Do not carry out any unauthorized modifications or conversions to the pump.
- When returning the turbopump observe the shipping instructions.

2.2 Protective equipment

Determined situations concerning the handling of vacuum pumps require wearing of personal protective equipment. The owner, respectively the employer are obligated to provide an adequate equipment to any operating persons.

DANGER

Danger to health by hazardous substances during maintenance or installation

Depending on the process vacuum pumps, components or operating fluids can be contaminated by toxic, reactive or radioactive substances.

➔ Wear adequate protective equipment during maintenance and repairs or in case of reinstallation.

WARNING

Risk of injury through falling objects

When transporting vacuum pumps by hand, there is a danger through loads slipping and falling down.

➔ Carry small and mid-size vacuum pumps two-handed.

➔ Carry vacuum pumps > 20 kg by a suitable lifting device.

➔ Wear safety shoes with steel toe cap according to directive EN 347.

CAUTION

Risk of injury through hot surfaces

Vacuum pumps can become hot during operation.

➔ Allow the pump to cool before maintenance and repairs.

➔ If necessary wear protective gloves according to EN 420.

CAUTION

Risk of injury through sharp edges

Rotor and stator disks of turbopumps have very sharp edges.

➔ Before any working wait for the complete standstill of the pump.

➔ Do not reach in the high vacuum flange.

➔ If necessary wear protective gloves according to EN 420.

2.3 Proper use

NOTICE

EC conformity

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

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

- The vacuum pump may only be used to generate a vacuum.
- Only operate the turbopump with the suitable external Pfeiffer Vacuum electronic drive unit and the belonging connection cable.
- Only operate the turbopump with an approved backing pump.

2.4 Improper use

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

- transport, installation or operation of the pump in invalid orientation
- installation of the pump with unspecified mounting material
- pumping of corrosive gases (exception: pumps in C version)
- pumping of corrosive gases without sealing gas (only pumps in C version)
- pumping of explosive media
- pumping of condensing vapors
- operation with improper high gas throughput
- operation with improper high fore-vacuum pressures
- operation with improper gas mode
- operation with improper high levels of insulated heat input
- venting with improper high venting rates
- operation of the devices in areas with ionizing radiation
- operation in potentially explosive areas
- use of the devices in systems in which impact-like stress and vibrations or periodic forces affect the devices
- use of accessories or spare parts, which are not named in this manual
- fixing the pump at its bottom part

Closure seal

The product is sealed at the factory. Damaging or removal of a closure seal leads to the loss of liability and warranty entitlements.

➔ Do not open the product within its warranty period!

➔ For process-related shorter maintenance intervals please contact the Pfeiffer Vacuum Service.

3 Transport and storage

3.1 Transport

Two pieces of eye bolts are srewed with the pump on delivery.

NOTICE

Observe type-specific mounting orientations!

Incorrect mounting orientations result in contamination of the process vacuum or damage to the pump.

➔ Pay attention to the properties after the model designation on the name plate!
➔ Observe the pictographs on the pump housing!
➔ Do not transport or tilt the pump filled with operating fluid!

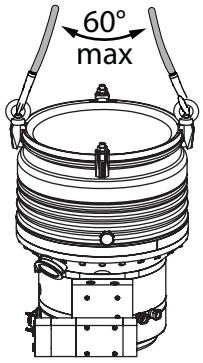


Fig. 1: Transport in valid orientation

WARNING

Danger from falling and swinging loads!

When lifting the pump there is a danger of falling parts.

➔ Make sure that there are no persons under the suspended load.
➔ Close off and supervise the area under the pump.

➔ Only transport the turbopump in the valid orientation and with vertical rotor axis.
➔ Fix a suitable lifting device on **both** eye bolts.
  – Observe the approved fixing (e.g. maximum opening angle towards the longitudinal axis of the pump).
  – Do not lift any additional weights (e.g. vacuum chamber).
➔ Lift the pump perpendicularly out of the packing.
➔ Reuse the transport container of the vacuum pump.
  – Transport or ship vacuum pumps in the original packing preferably.
➔ Only remove the protective covers from the high vacuum and the fore-vacuum side immediately before connection.
➔ Keep the original protective covers.
➔ After the transport the eye bolts can be removed.

3.2 Storage

➔ Close the flange openings by using the original protective covers.
➔ Close further connection ports by using the corresponding protective covers.
➔ Store the pump only indoors at temperatures between -25 °C and +55 °C.
➔ In rooms with moist or aggressive atmospheres, the pump must be airproof shrink-wrapped in a plastic bag together with a bag of desiccant.

4 Product description

4.1 Product identification

4.1.1 Variants

The product designation consists of a family designation (1), the size (2), which is oriented on the pumping speed, and if applicable the additional properties (3) of the pump.

HiPace(1) **2300**(2) (3)

1. Family designation	2. Model designation	3. Property designation
HiPace	**2300** = Model designation of the pump related to its pumping speed class	**none** = Standard version **U** = Upside-down installation orientation **C** = Corrosive gas version **P** = Process **M** = Active magnetic bearing **T** = Temperature management system **E** = High Efficiency **H** = High Compression **I** = Ion implantation

4.1.2 Pump features

This product has been tested to the requirements of CAN/CSA-C22.2 No. 61010-1, second edition, including Amendment 1, or a later version of the same standard incorporating the same level of testing requirements.

For information about other certifications, if applicable, please see the signet on the product or:

- www.tuvdotcom.com
- TUVdotCOM-ID 0000021320

Characteristics	HiPace 2300		
HV flange	DN 250 ISO-K	DN 250 ISO-F	DN 250 CF-F
Flange material	Aluminium	Aluminium	Stainless steel

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

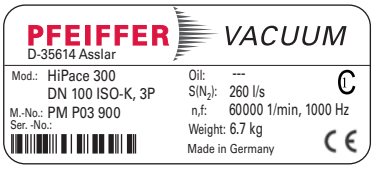


Fig. 2: Example for a rating plate

4.1.3 Scope of delivery

- Turbopump for external electronic drive unit
- Protective cover for the high vacuum flange and the fore-vacuum flange
- Sealing gas valve
- Operating fluid (50 ml) with filling syringe
- Screw-in nozzle (2x) with seal ring for cooling water connection
- Eye bolts
- Operating instructions

4.2 Function

The pumps HiPace 2300 form a functional unit with the external electronic drive unit TCP 1200. Shielded connecting cables of different lengths are available for the external connection to the adapter of the turbopump.

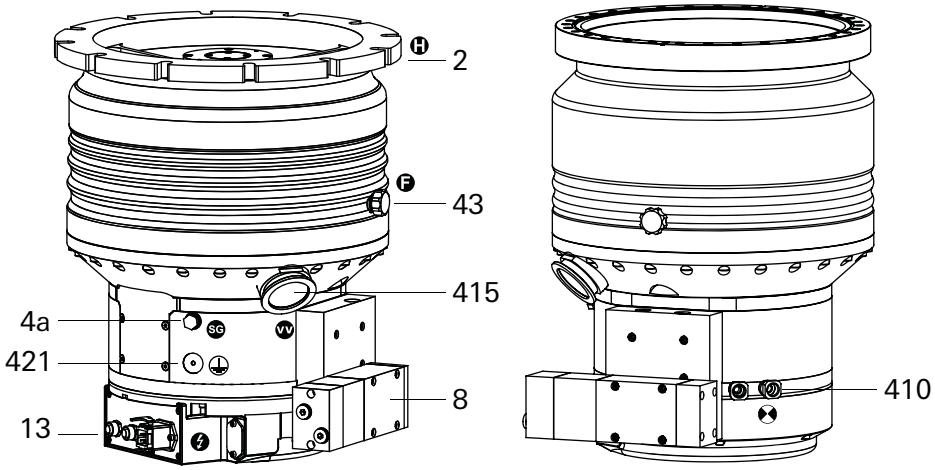


Fig. 3: HiPace 2300 for TCP 1200

2	High vacuum flange	13	Adapter for TCP 1200	410	Cooling water connection
4a	Sealing gas connection	43	Venting screw	415	Fore-vacuum flange
8	Operating fluid pump			421	Earthing connection

4.2.1 Cooling

- Water cooling

In the case of excess temperature the electronic drive unit reduces the drive power automatically.

4.2.2 Rotor bearing

Hybrid bearing turbopump

- High vacuum side: maintenance-free permanent magnetic bearing
- Fore-vacuum side: ceramic ball bearing

4.2.3 Drive

Electronic drive unit TCP 1200

4.3 Range of application

The pump HiPace 2300 must be installed and operated under the following ambient conditions:

Installation location	weather protected (indoors)
Protection class	IP 54
Temperature	+5 °C to +40 °C
Relative humidity	max. 80 %, at T ≤ 31 °C, to max. 50 % at T ≤ 40 °C
Atmospheric pressure	750 hPa - 1060 hPa
Installation altitude	2000 m max.
Degree of pollution	2
Permissible surrounding magnetic field	≤ 7 mT
Overvoltage category	II
Connection voltage	400 (± 10 %) V AC

Remarks to ambient conditions

The specified permissible ambient temperatures apply to operation of the turbopump at maximum permissible fore-vacuum pressure or at maximum gas throughput depending on the cooling method. The turbopump is intrinsically safe by a redundant temperature monitoring.

- By reducing the fore-vacuum pressure or gas throughput, the turbopump can be operated at higher ambient temperatures.
- If the maximum permissible operating temperature of the turbopump is exceeded, the electronic drive unit reduces drive power first and switches off then, if necessary.

5 Installation

WARNING

Danger from the turbopump being ripped off

If the rotor is suddenly blocked, torques of up to 16000 Nm could occur, which could cause the turbopump to be ripped off if it is not properly affixed. The energy that this would release could throw the entire pump or pieces from its interior through the room. That would cause severe, possibly fatal, injuries as well as serious property damage.

➔ Carefully follow the installation instructions in this handbook.

➔ Only use approved original parts from Pfeiffer Vacuum (Accessories) for the installation.

NOTICE

Danger of destroying the pump through impermissible gas loads

An inadmissibly high pressure increase in the pump during operation can result in the destruction of the rotor and the entire pump.

➔ Protect the high-vacuum side and fore-vacuum side against impermissible gas seepage.

➔ Protect the fore-vacuum lines against external mechanical influences.

➔ Protect the isolation devices on the high-vacuum side against accidental opening.

➔ Observe the permitted venting rates (max. 15 hPa/s).

Installation and operation of accessories

Pfeiffer Vacuum pumps can be equipped with a series of adapted accessories. The installation, operation and maintenance of connected devices are described in detail in the operating instructions of the individual components.

➔ For information on order numbers of components, see "Accessories".

➔ Use original accessory parts only.

Operating fluid filling

The pump is delivered without operating fluid filling. The operating fluid is part of the delivery consignment.

➔ Do not fill the pump with operating fluid until the installation is done on site!

5.1 Preparatory work

When installing the pump, observe the following conditions:

- the ambient conditions specified for the range of application
- The attachment of the pump at its bottom part is not permitted.
- It is not allowed to operate the device in systems where impact-like stresses and vibrations or periodically forces occur.

➔ Ensure sufficient cooling for the turbopump.

➔ Where magnetic fields > 7 mT are involved, a suitable shielding must be used. Check installation location and consult Pfeiffer Vacuum if needed!

➔ The maximum permissible rotor temperature for the turbopump is 120 °C. If high temperatures arise for process reasons, the radiated heat input must not exceed 24 W. Install suitable screening sheets, if necessary (design information on request).

5.2 Set-up

- Ensure the greatest possible cleanliness when installing any high vacuum parts. Unclean components prolong the pump-down time.
- All flange components must be grease-free, dust-free and dry at installation.

5.2.1 Earthquake safety

An earthquake can result in contact with the safety bearings. All forces occuring hereby are safely absorbed by the properly installed flange connections.

➔ Secure the vacuum chamber against shifting and tipping on customers side.

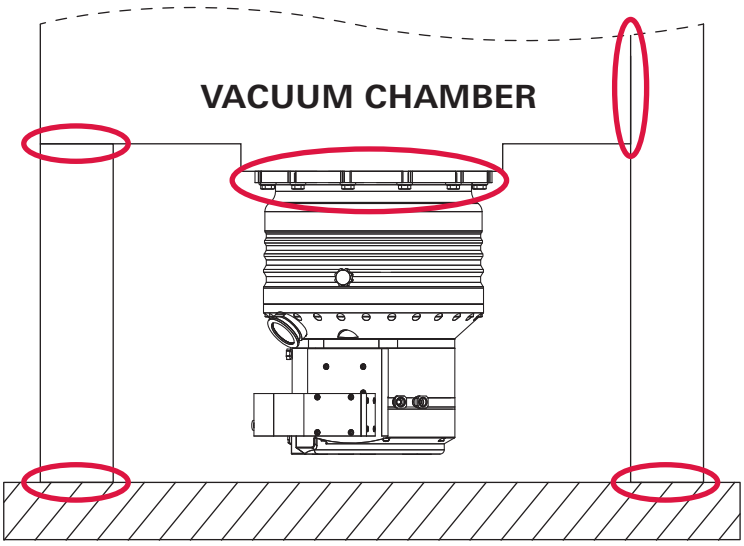


Fig. 4:	Example: How to secure against shifting and tipping by external tremors
⬭	= Safety connection, implementation each by the customer

5.2.2 Use of a splinter shield or protection screen

Pfeiffer Vacuum centering rings with splinter shield or protection screen in the high vacuum flange protect the turbopump against foreign bodies coming from the chamber. Thus, the pumping speed of the pump is reduced.

	Volume flow rate reduction in %			
	H_2	He	N_2	Ar
Splinter shield DN 250	7	11	23	25
Protection screen DN 250	2	3	6	7

5.2.3 Vibration damper

WARNING

Danger from the turbopump and vibration damper being torn-off

In case of sudden blocking of the rotor, an applied vibration damper cannot compensate any of the occurring forces. There is a danger of the turbopump being torn-off and thereby resulting severest injuries and property damages. Applicable safeguards must be taken to compensate possible occurring torques.

➔ Definitely consult with Pfeiffer Vacuum.

➔ Do not exceed the max. permissible temperature at the vibration damper (100 °C).

5.3 Mounting orientation

NOTICE

Observe type-specific mounting orientations!

Incorrect mounting orientations result in contamination of the process vacuum or damage to the pump.

➔ Pay attention to the properties after the model designation on the name plate!
➔ Observe the pictographs on the pump housing!
➔ Do not transport or tilt the pump filled with operating fluid!

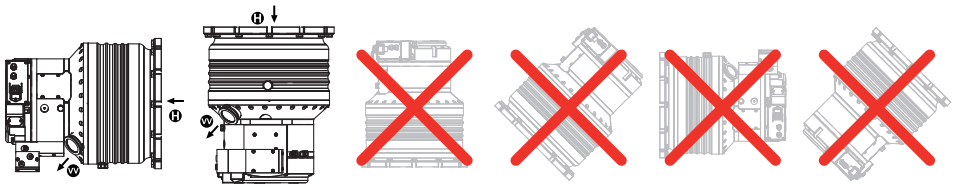


Fig. 5: Valid installation orientations of the turbopump. Other positions are inadmissible.

5.3.1 Horizontal mounting orientation

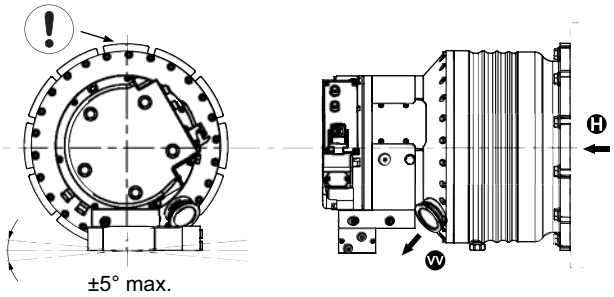


Fig. 6: Admissible fixing and the position of the operating fluid pump for horizontal installation of the turbopump horizontal

➔ For horizontal installation, the longitudinal axis of the operating fluid pump may only deviate from the horizontal line by 5° max, since otherwise the turbopump can be contaminated.

➔ Support pipes in front of the vacuum pump or remove them. No force from the pipe system may be exerted on the fixed pump.

The maximum axial loading capacity of the high vacuum flange is 2000 N (equals 200 kg). A one-sided load on the high vacuum flange is not permitted.

5.4 Connecting the high vacuum side

If the rotor is suddenly blocked, the torques arising from the system and the high vacuum flange must be absorbed. Only the components listed in the following can be used to fasten the turbopumps to the high vacuum flange. The installation elements for turbopumps are special designs by Pfeiffer Vacuum. In all operating conditions, the tensile strength of the flange material must be at least 170 N/mm^2.

➔ Secure the vacuum chamber against shifting and tipping on customers side.

DANGER

Danger to life - impermissible fastening

Twisting or tearing-off is possible in case the rotor is suddenly blocked due to the fastening of pumps on a vacuum chamber with different flange variants.

➔ Use only the correct mounting kit from Pfeiffer Vacuum.

➔ Pfeiffer Vacuum will not accept any liability for all damages resulting from impermissible fastening.

DANGER

Life-threatening hazard - incorrect mounting

The use of clamps to mount pumps can result in life-threatening situations if the rotor suddenly blocks.

➔ Never use claws to mount the pumps!

➔ Use only the correct mounting kit from Pfeiffer Vacuum.

NOTICE

Observe shape tolerances for the counter flange

Unevennesses of the customer supplied counter flange can lead to warping of the pump casing despite proper fastening. Leakiness and negative running characteristics can be the result.

➔ Do not exceed an evenness of max. 0.05 mm for the whole surface.

Mounting of ISO flanges

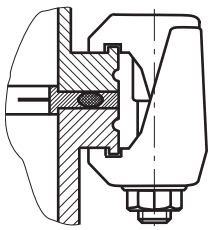
If the rotor suddenly blocks the connection of high vacuum flanges of types ISO-KF or ISO-K can lead to twisting despite proper installation.

- The tightness of the high vacuum flange is not at risk thereby.

5.4.1 Installation of ISO-K flange with ISO-K flange

For the installation the following components are exclusively authorized:

- the valid mounting kit of the Pfeiffer Vacuum accessories programme
- mounting materials including protection screen or splinter shield are optionally available



➔ Mind that the sealing surfaces are not damaged.

1) Connect the flanges according to the drawing and with the component parts of the mounting kit.
2) Use the required number of **22** claw clamps.
3) Tighten the claw clamps crosswise in three steps.
4) Tightening torque: 5, 15, 25 ±2 Nm

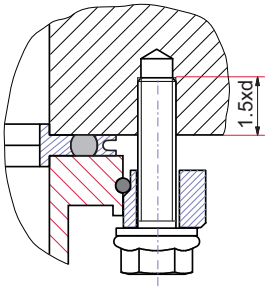
5.4.2 Installation of ISO-K flange with ISO-F flange

The connection types for installation of ISO-K to ISO-F flange are "hex screw and threaded hole," "stud screw and threaded hole," and "stud screw and through hole".

For the installation the following components are exclusively authorized:

- the valid mounting kit of the Pfeiffer Vacuum accessories programme
- mounting materials including protection screen or splinter shield are optionally available

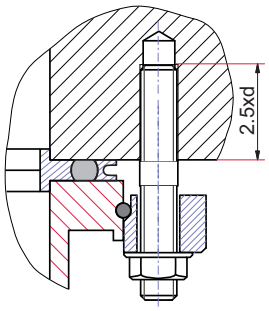
Hexagon screw and threaded hole



➔ Mind that the sealing surfaces are not damaged.

1) Put the collar flange over the high vacuum flange of the turbopump.
2) Insert the retaining ring into the groove of the high vacuum flange.
3) Fasten the turbo pump with collar flange and centering ring to the counter flange as shown in the graphic.
4) Use the required number of **12** hex screws with washer.
5) Screw hex screws 1.5 x d into the threaded holes.
   – The tensile strength of the flange material must be at least 270 N/mm^2 in all operating conditions.
6) Tighten the hex screws crosswise in three steps.
7) Tightening torque DN 250: 5, 15, 25 ± 2 Nm

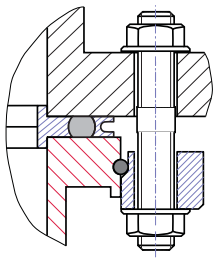
Stud screw and threaded hole



➔ Mind that the sealing surfaces are not damaged.

1) Use the required number of **12** stud screws and nuts.
2) Screw in the stud screws with the shorter threaded end 2.5 x d in the bore holes on the counter flange.
3) Put the collar flange over the high vacuum flange of the turbopump.
4) Insert the retaining ring into the groove of the high vacuum flange.
5) Fasten the turbo pump with collar flange and centering ring to the counter flange as shown in the graphic.
6) Tighten the nuts crosswise in three steps.
7) Tightening torque DN 250: 5, 15, 25 ± 2 Nm

Stud screw and through hole



➔ Mind that the sealing surfaces are not damaged.

1) Put the collar flange over the high vacuum flange of the turbopump.
2) Insert the retaining ring into the groove of the high vacuum flange.
3) Fasten the turbo pump with collar flange and centering ring to the counter flange as shown in the graphic.
4) Use the required number of **12** stud screws and nuts.
5) Tighten the nuts crosswise in three steps.
6) Tightening torque DN 250: 5, 15, 25 ± 2 Nm

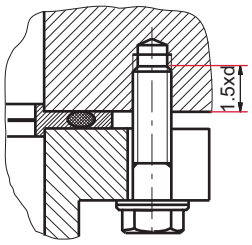
5.4.3 Installation of ISO-F with ISO-F flange

The connection types for installation of ISO-F to ISO-F flange are "hex screw and threaded hole," "stud screw and threaded hole," and "stud screw and through hole".

For the installation the following components are exclusively authorized:

- the valid mounting kit of the Pfeiffer Vacuum accessories programme
- mounting materials including protection screen or splinter shield are optionally available

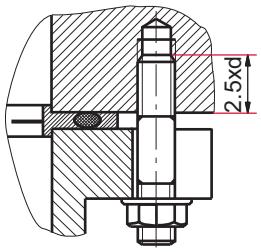
Hexagon screw and threaded hole



➔ Mind that the sealing surfaces are not damaged.

1) Connect the flanges according to the drawing and with the component parts of the mounting kit.
2) Use the required number of **12** hex screws with washer.
3) Screw hex screws 1.5 x d into the threaded holes.
   – The tensile strength of the flange material must be at least 270 N/mm^2 in all operating conditions.
4) Tighten the hex screws crosswise in three steps.
5) Tightening torque DN 250: 10, 20, 38 ± 3 Nm

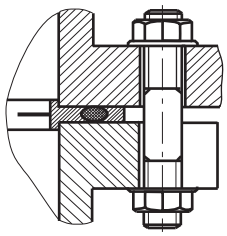
Stud screw and threaded hole



➔ Mind that the sealing surfaces are not damaged.

1) Use the required number of **12** stud screws and nuts.
2) Screw in the stud screws with the shorter threaded end 2.5 x d in the bore holes on the counter flange.
3) Connect the flanges according to the drawing and with the component parts of the mounting kit.
4) Tighten the nuts crosswise in three steps.
5) Tightening torque DN 250: 10, 20, 38 ± 3 Nm

Stud screw and through hole



➔ Mind that the sealing surfaces are not damaged.

1) Connect the flanges according to the drawing and with the component parts of the mounting kit.
2) Use the required number of **12** stud screws and nuts.
3) Tighten the nuts crosswise in three steps.
4) Tightening torque DN 250: 10, 20, 38 ± 3 Nm

5.4.4 Installation of CF- flanges

NOTICE

Assembly of CF flanges!

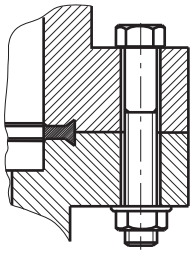
Loss of sealing capability due to a lack of cleanliness when handling the sealing and CF flange.

➔ Assemble the sealing dry and oil-free.
➔ Always wear gloves when handling the components.
➔ Do not damage the surfaces and cutting edges.

The connection types for installation of CF to CF flange are "hexagon screw and through hole", "stud screw and threaded hole" as well as "stud screw and through hole".

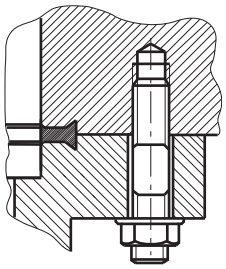
- the valid mounting kit of the Pfeiffer Vacuum accessories programme
- A copper seal
- protection screen or splinter shield are optionally

Hexagon screw and through hole



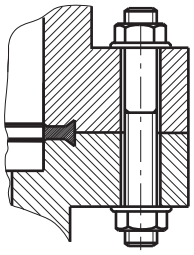
1) If used: Insert protective screen or splinter shield with the clamping lugs downward into the high vacuum flange of the turbopump.
2) Place the seal exactly in the hollow.
3) Connect the flanges using **32** hexagon-head screws (M8) with washers and bolts.
4) Tighten the screw connections circularly.
5) Tightening torque: 22 ± 2 Nm
6) After this, check the torque, since flowing of the sealing material may make it necessary to tighten the screws again.

Stud screw and threaded hole



1) Screw in the stud screws (**32** pieces, M8) with the shorter threaded end into the threaded holes of the counter flange.
2) If used: Insert protective screen or splinter shield with the clamping lugs downward into the high vacuum flange of the turbopump.
3) Place the seal exactly in the hollow.
4) Connect the flanges using washers and nuts.
5) Tighten the screw connections circularly.
6) Tightening torque: 22 ± 2 Nm
7) After this, check the torque, since flowing of the sealing material may make it necessary to tighten the screws again.

Stud screw and through hole



1) If used: Insert protective screen or splinter shield with the clamping lugs downward into the high vacuum flange of the turbopump.
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3) Connect the flanges using **32** hexagon-head screws (M8) with washers and bolts.
4) Tighten the screw connections circularly.
5) Tightening torque: 22 ± 2 Nm
6) After this, check the torque, since flowing of the sealing material may make it necessary to tighten the screws again.

5.5 Filling up the operating fluid

WARNING

Toxic vapours!

Danger of poisoning when igniting and heating synthetic operating fluids (e.g. F3) above 300 °C.

➔ Observe the application instructions.

➔ Do not allow operating fluid to make contact with tobacco products; observe safety precautions when handling chemicals.

NOTICE

Danger of the pump being destroyed

The pump can be destroyed by missing or deficient operating fluid supply.

➔ Before starting up for the first time, fill the pump with the adequate amount of operating fluid.

➔ Only fill in the operating fluid, when the vacuum pump is mounted.

➔ For type of the operating fluid please refer to the rating plate.

➔ The operating fluid capacity must be 50 ml !

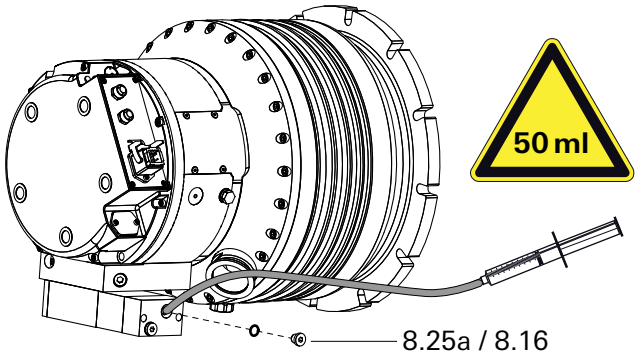


Fig. 7: Filling up the operating fluid

➔ Turn off the vacuum pump, vent to atmospheric pressure and allow to cool.

➔ Unsrew the higher positioned filler screw 8.25a of the operating fluid pump.
  – Observe the O-ring 8.16 !

➔ Fill in the operating fluid (max. 50 ml) into the operating fluid pump by using the filling syringe.

➔ Lock the filler screw 8.25a again.
  – Observe the O-ring 8.16 !

5.6 Connecting the fore-vacuum side

Recommendation: As backing pump, use a suitable vacuum pump from the Pfeiffer Vacuum programme.

WARNING

Damage to health due to poisonous gases

Process gases can damage health and contaminate the environment.

➔ Safely lead away the gas emission from the backing pump!

➔ Observe all safety recommendations of the gas producer.

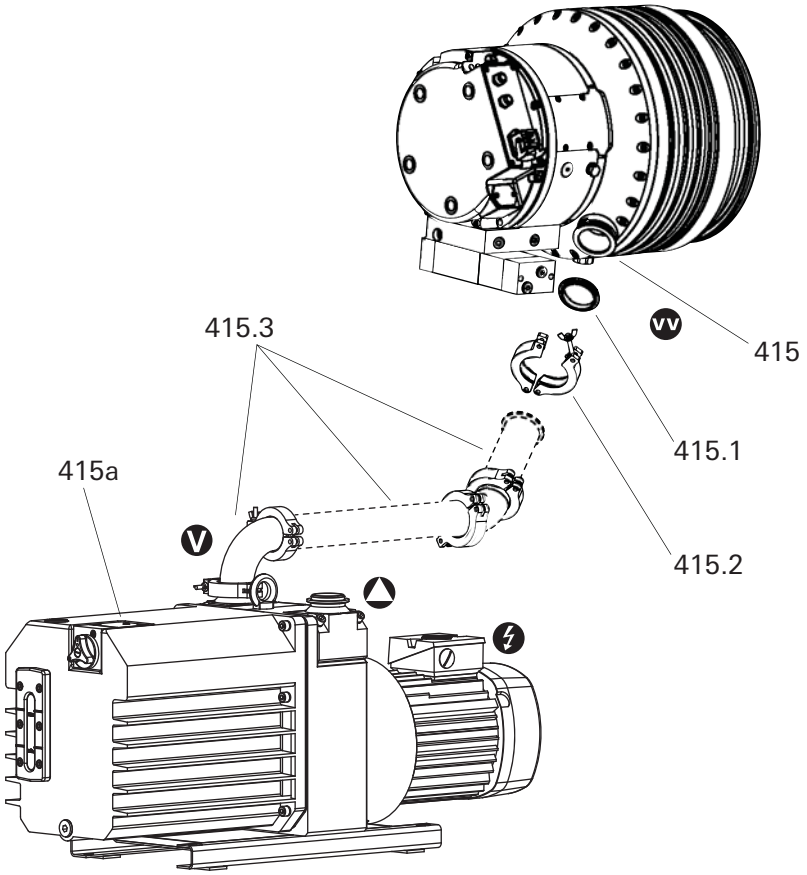


Fig. 8: Connecting the backing pump

415	Fore-vacuum connection	415.1	Centering ring	415.3	Vacuum components
415a	Backing pump	415.2	Clamping ring		

NOTICE

Design of the fore-vacuum connection regarding sudden twisting of the pump

If the rotor suddenly blocks the connection of high vacuum flanges of types ISO-KF or ISO-K can lead to twisting despite proper installation.

➔ Keep masses small, which can be installed directly to the pump.

➔ Connect flexible line elements directly to the turbopump, if necessary.

➔ With rigid pipe connections: Install bellows for attenuation of vibrations in the connection line.

➔ Connect the fore-vacuum line with small-flange components or threaded hose couplings. Do not narrow the free cross section of the fore-vacuum flange!

➔ For connection and operation of the backing pump see its operating instructions.

5.7 Earthing

WARNING

Danger of electric shock

In case of defect, the parts connected to the mains supply can be energized.

➔ Connect the pump with PE according to local regulations, before mains connection.
➔ Connect appropriate earthing cable on the customer side.
➔ Pay attention to the minimum cross-section of the mains connection.

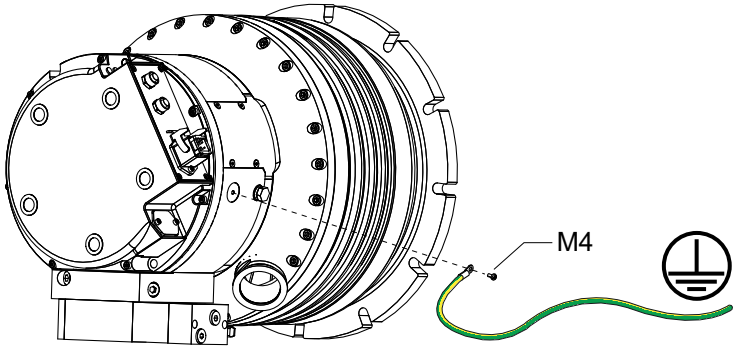


Fig. 9: Installing the earthing connection

5.8 Connection "external pump"

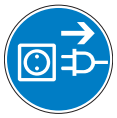
The external connection of a Pfeiffer Vacuum turbopump to the electronic drive unit TCP 1200 is possible, using shielded connection cables of different lengths from the Pfeiffer Vacuum accessories programme.

WARNING

Danger of unsafe electrical installation

Safe operation after installation is the responsibility of the operator.

➔ Do not independently modify or change the pump and electrical equipment.
➔ Make sure that the system is integrated in an emergency off safety circuit.
➔ Consult Pfeiffer Vacuum for special requirements.



WARNING

Danger of electric shock

The system is only free of voltages if the mains plug is disconnected.

➔ Switch off the main switch and disconnect the mains plug before all work.
➔ Secure against unintentional restarting.
➔ Ensure the complete stop of the pump (f < 1).

CAUTION

Risk of tripping!

Risk of tripping when working in the installation area.

➔ Place supply lines in such a way that no tripping hazards occur.

The cable for control and operation of the turbopump is uniquely designated by plugs and sockets.

- HAN-Q5 plug and RJ45 plug for the connection to the TCP 1200
- HAN-Q5 socket and M12 socket for the connection to the turbopump

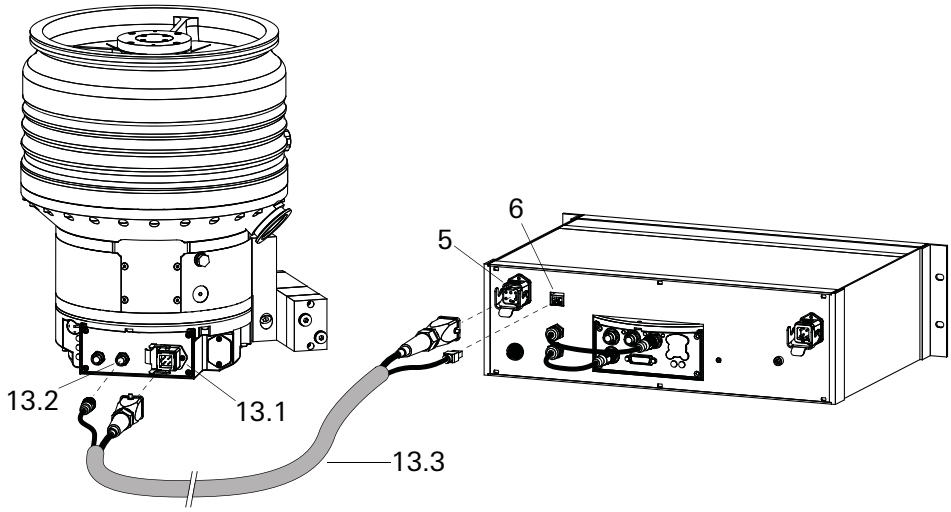


Fig. 10: Connecting the turbopump to the electronic drive unit TCP 1200

5	Connection "pump1. output"	13.1	Connection "pump"
6	Control connection "pump2. output"	13.2	Control connection "pump"
		13.3	Connection cable TCP - turbopump

➔ Install the connection cable between the electronic drive unit and the turbopump.

➔ Secure mounting brackets, snap in plugs and close screw connections.

5.9 Water cooling

The turbopumps HiPace 2300 with TCP 1200 have water cooling as standard equipment.

5.9.1 Cooling water requirements

Cooling water connection	Hose nozzles G 1/4"
Hose lines	Internal diameter 7-8 mm with hose clamp

Cooling water quality	filtrated, mechanically clean, optically clear, no turbidity, no sediments, chemically neutral
Oxygen content max.	4 mg/kg
Chloride content max.	100 mg/kg
Water hardness max.	10 °dH 12.53 °e 17.8 °fH 178 ppm $CaC0_3$
Consumption of potassium permanganate max.	10 mg/kg
Carbon dioxide content max.	undetectable
Ammonia content max.	undetectable
pH-value	7 - 9
Fore-line overpressure max.	6000 hPa
Cooling water temperature	refer to "Technical Data"
Cooling water consumption at max. gas throughput	refer to "Technical Data"

5.9.2 Connecting to a cooling water system

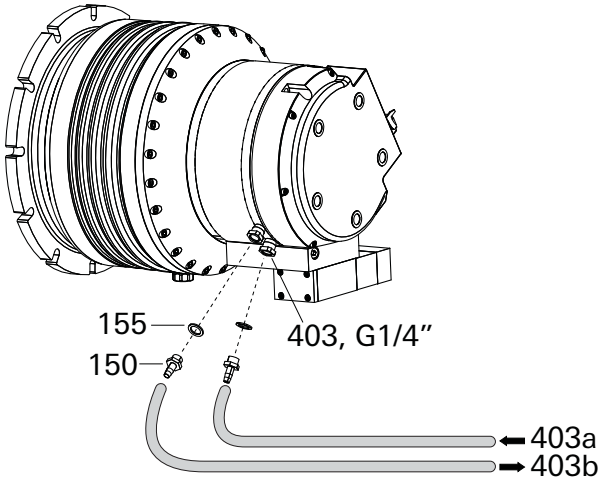


Fig. 11: Connecting the cooling water

150	Screw-in nozzle	403	Cooling water connection	403b	Return-line
155	Seal ring	403a	Fore-line		

➔ Connect the cooling water connection alternatively:
- Direct connection on the pump with G1/4" internal thread.
- Using screw-in nozzles with seal ring (2 pcs. each in the scope of delivery) for hose internal diameters of 7 - 8 mm.
- Tightening torque: max. 15 Nm.

➔ **Recommendation:** install dirt trap in the fore-line.

➔ Connect the cooling water fore-line to the designated connector.

➔ Connect the cooling water return-line to the designated connector.

5.10 Accessory connection

The turbopump HiPace 2300 with TCP is able to control up to 3 connected accessory units. The internal connection (*Acc A1*) of the turbopump is provided for the connection of one accessory unit. A free M12 socket labeled "*Acc B*" on the electronic drive unit is provided for the connecton of two further accessory units.

➔ To connect two devices to the accessory connection "*Acc B*" of the TCP 1200, use the appropriate Y-Connector from the Pfeiffer Vacuum range of accessories.

➔ Settings can be made via the display and control unit of the TCP 1200.

Accessory connection	Connection with the Y-Connector	Preset accessory
accessory A1	not possible	Sealing gas valve
accessory B1	Acc. B to Y-1	Venting valve
accessory B2	Acc. B to Y-2	Heating

Table 1: Overview of factory preset accessory connections on the TCP 1200

5.10.1 Sealing gas connection

The turbopump must be operated with sealing gas to protect it, such as in the case of unclean processes or high gas throughput. The supply is made via a sealing gas valve or alternatively via a sealing gas throttle without control. The activation of the control valve for the sealing gas connection is pre-installed in the electronic drive unit. The sealing gas valve is already part of the delivery consignment.

The permissible connection pressure is max. 1500 hPa absolute.

- When operating the pump with more than 50 % of the maximum gas throughput, sealing gas must be used to ensure rotor cooling.
- The sealing gas flow rate amounts 17.5-20 sccm for the HiPace 2300.

Sealing gas supply with control valve

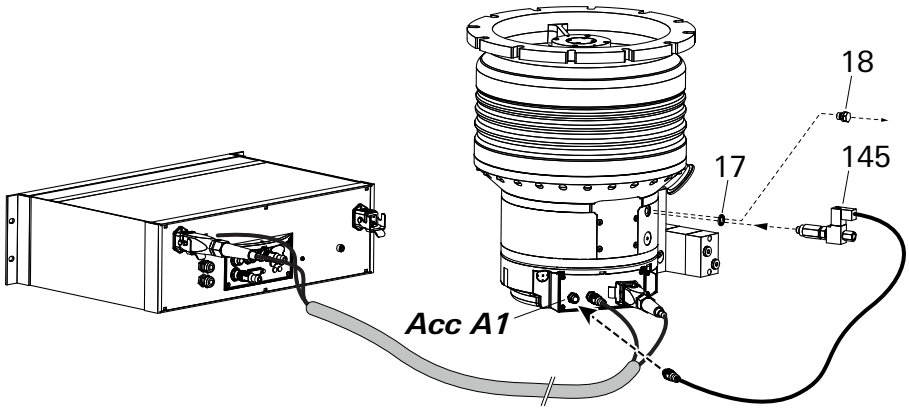


Fig. 12: Connecting the sealing gas valve

17 Seal ring 18 Locking screw 145 Sealing gas valve

➔ Unscrew the locking screw with seal ring out of the sealing gas connection.

➔ Screw the sealing gas valve with seal ring into the sealing gas connection.

➔ Connect the control lead of the sealing gas valve direct to the accessory connection "*Acc A1*" on the adapter of the pump.

➔ Install the sealing gas supply (e.g. inert gas) via a connection adapter or on the inlet side (G 1/8") of the control valve.

Sealing gas supply without control valve

➔ Unscrew the locking screw with seal ring out of the sealing gas connection.

➔ Screw the sealing gas throttle with sealing ring into the sealing gas connection.

5.10.2 Venting valve

The Pfeiffer Vacuum venting valve is used for automatic venting in case of shut-down or power failure.

The permissible connection pressure is max. 1500 hPa absolute.

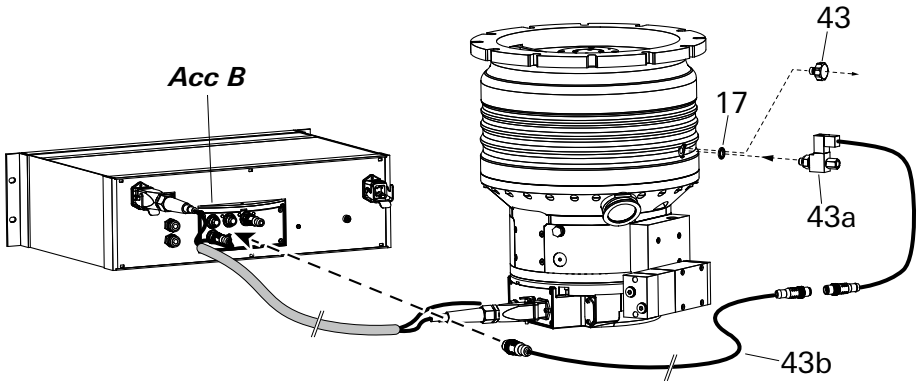


Fig. 13: Connecting the venting valve

17	Seal ring	43a	Venting valve
43	Venting screw	43b	Extension cable M12 on M12

➔ Unscrew the venting screw with seal ring from the venting connection.

➔ Screw in the venting valve with seal ring.

➔ Connect to the electronic drive unit TCP 1200 using an extension cable M12 to M12 in different lengths.

➔ Plug in and fix the control lead in the free accessory connection on the TCP 1200.

➔ Use Y-Connector if applicable.

➔ Default for the venting valve is "*accessory Acc B1*".

➔ If neccessary install a venting gas supply (e.g. inert gas) to the intake (G 1/8") of the solenoid valve.

6 Operation

➔ Consider following manuals for the operation via external electronic drive unit:
- Operating instructions "Electronic drive unit TCP 1200"
- Operating instructions "DCU"

6.1 Commissioning

The following important settings are programmed in the electronic drive unit ex factory.

- Parameter **[P:027]** Gas mode: 0 = heavy gases
- Parameter **[P:700]** Set value max. run-up time monitoring: 8 min
- Parameter **[P:701]** Rotation speed switchpoint: 80% of the nominal roation speed
- Parameter **[P:707]** Set value in rotation speed setting mode: 65 % of the nominal rotation speed
- Parameter **[P:708]** Set value power consumption: 100 %
- Parameter **[P:720]** Venting rotation speed at delayed venting: 50 % of the nominal rotation speed
- Parameter **[P:721]** Venting time: 3600 s

➔ When water cooling is used: Open cooling water supply and check the flow.

➔ When sealing gas is used: Open the sealing gas supply and check the flow.

➔ Switch on the pump by connecting the mains cable with the mains supply.

NOTICE

Risk of destroying the pump by inputting too much energy

Simultaneous loading by means of high drive power (gas flow rate, fore-vacuum pressure), high heat radiation, or strong magnetic fields results in uncontrolled heating of the rotor and may destroy the pump.

➔ Reduced limit values apply when combining these loads.

➔ If necessary consult with Pfeiffer Vacuum.

NOTICE

Danger of the pump being destroyed

Pumping of gases with a higher molecular mass in the wrong gas mode can lead to destruction of the pump.

➔ Ensure the gas mode is correctly set.

➔ Contact Pfeiffer Vacuum before using gases with a greater molecular mass (> 80).

WARNING

Danger due to open high vacuum flange

The rotor of the turbopump turns at high speed. If the high vacuum flange is open, there is a danger of cut injuries and that the pump can be destroyed by objects falling into it.

➔ Never operate the pump with an open high vacuum flange.

6.1.1 Switching on

➔ Connect the mains cable of the electronic drive unit TCP 1200 to the mains.

Start pump by pressing "Pumping station ON/OFF" key

The "Pumping station" key only controls the parameter [P:010]. All components connected via the electronic drive unit will be activated or deactivated according to their configuration.

➔ Ensure that the parameter [P:023] is also switched on for powering-up the turbopump.

Self-test

The DCU carries out a self-test and a check of the connected units after switch-on. The duration of the self-test is approx. 20 s and is visualized in the display with a progress bar.

➔ Reset malfunction messages using key , if necessary.

6.2 Monitoring of the operation conditions

6.2.1 Operation display via LED

The red LED (error status) and green LED (operating status) on the front panel of the DCU show the following states:

LED	Symbol	LED status	Display	Meaning
Green		Off		currentless
		On, flashing		"Pumping Station OFF", rotation speed ≤ 60 min^{-1}
		On, invers flashing		"Pumping Station ON", set rotation speed not attained
		On, constantly		"Pumping Station ON", set rotation speed attained
		On, blinking		"Pumping Station OFF", rotation speed > 60 min^{-1}
Red		Off		no malfunction, no warning
		On, flashing		Warning
		On, constantly		Malfunction

The monochromatic operation display on the front panel of the TCP 1200 shows the operation status of the electronic drive unit.

Display	Activity	Meaning
Off	none	– no adequate power supply
Rapid flashing	10 % active, 1 Hz	– no malfunction – Pumping station "OFF" – Pump stands still
Flashing	50 % active, 1 Hz	– no malfunction – Pumping station "ON" – Pump rotates
Invers rapid flashing	90 % active, 1 Hz	– no malfunction – Pumping station "ON" – Set speed not attained
Permanent on	100 % active	– no malfunction – Pumping station "ON" – Set speed attained
Flickering	50 % active, 10 Hz	– Malfunction

6.2.2 Temperature monitoring

The drive power is reduced in case of impermissible motor temperature or impermissibly high housing temperature. This can cause falling below the rotation speed switchpoint and so result in turning off the turbopump.

6.3 Switching off and venting

6.3.1 Switching off

After the turbopump is switched off, it must be vented to avoid contamination due to particles streaming back from the fore-vacuum area.

➔ Close the fore-vacuum: Switch off the backing pump or close a fore-vacuum valve.
➔ Press key ⏻ on the DCU front panel.
➔ Venting (possibilities see below)
➔ Leave open the cooling water supply until the halt of the rotor (rotation speed < 1 Hz).

6.3.2 Venting

Manually venting

➔ Open the venting screw (included) in the venting connection of the turbopump about one turn.

Venting with Pfeiffer Vacuum Venting Valve

➔ Enable venting via the functions of the electronic drive unit.
➔ Settings are possible via interface RS-485 by using DCU, HPU or PC.

Venting rotation speed	Switch off the pumping station	Mains power failure[1)]
50 % of the nominal rotation speed	Venting valve opens for 3600 s (1 h, works setting)	Venting valve opens for 3600 s (1 h, works setting)

[1)] When mains power is restored the venting procedure is aborted.

Basic information for the rapid venting

Venting of the vacuum chamber in two steps. Ask for details on individual solutions from Pfeiffer Vacuum.

➔ Vent for 20 seconds at a rate of pressure rise of max. 15 hPa/s.
  – The valve cross section for the venting rate of 15 hPa/s must be adapted to the size of the vacuum chamber.
  – For small vacuum chambers, use the Pfeiffer Vacuum venting valve.
➔ Then vent with an additional venting valve of any desired size.

7 Maintenance / replacement

WARNING

Contamination of parts and operating fluid by pumped media is possible.

Poisoning hazard through contact with materials that damage health.

➔ In the case of contamination, carry out appropriate safety precautions in order to prevent danger to health through dangerous substances.

➔ Decontaminate affected parts before carrying out maintenance work.

WARNING

Toxic vapours!

Danger of poisoning when igniting and heating synthetic operating fluids (e.g. F3) above 300 °C.

➔ Observe the application instructions.

➔ Do not allow operating fluid to make contact with tobacco products; observe safety precautions when handling chemicals.

NOTICE

Disclaimer of liability

Pfeiffer Vacuum accepts no liability for personal injury or material damage, losses or operating malfunctions due to improperly performed maintenance. The liability and warranty entitlement expires.

7.1 Maintenance intervals and responsibilities

➔ Clean the turbopump externally with a lint-free cloth and little industrial alcohol.

➔ Change the operating fluid yourself.

➔ Change the operating fluid at least every 4 years.

➔ Change the turbopump bearing at least every 4 years.

– Contact Pfeiffer Vacuum Service.

➔ Clarify shorter maintenance intervals for extreme loads or impure processes with Pfeiffer Vacuum Service.

➔ For all other cleaning, maintenance or repair work, please contact your Pfeiffer Vacuum service location.

7.2 Changing the operating fluid

WARNING

Poisoning hazard through contact with materials that damage health.

Operating fluid and parts of the pump may contain toxic substances from the pumped media.

➔ Dispose of operating fluid in accordance with the applicable regulations. Safety data sheet on request or under www.pfeiffer-vacuum.com

➔ Prevent health hazards or environmental damage due to contamination by means of appropriate safety precautions.

➔ Decontaminate affected parts before carrying out maintenance work.

NOTICE

Danger of the pump being destroyed

The pump can be destroyed by missing or deficient operating fluid supply.

➔ Before starting up for the first time, fill the pump with the adequate amount of operating fluid.

➔ Only fill in the operating fluid, when the vacuum pump is mounted.

➔ For type of the operating fluid please refer to the rating plate.

➔ The operating fluid capacity must be 50 ml !

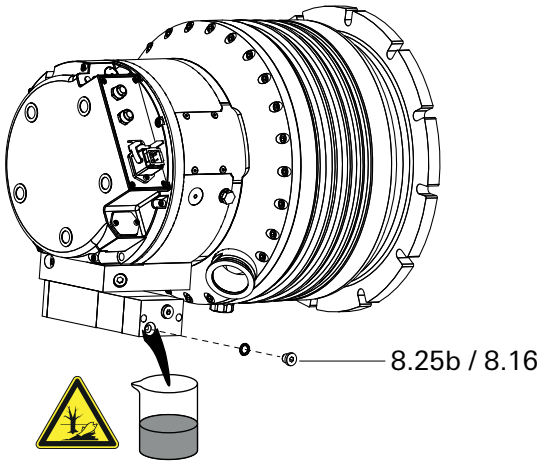


Fig. 14: Draining the operating fluid

➔ Turn off the vacuum pump, vent to atmospheric pressure and allow to cool.

➔ Unsrew the lower positioned drain screw 8.25b of the operating fluid pump.
– Observe the O-ring 8.16 !

➔ Drain the operating fluid in a suitable tank.

➔ Lock the drain screw 8.25b again.
– Observe the O-ring 8.16 !

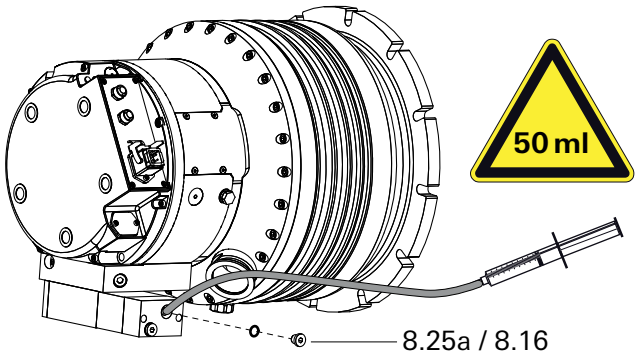


Fig. 15: Filling up the operating fluid

➔ Unsrew the higher positioned filler screw 8.25a of the operating fluid pump.
– Observe the O-ring 8.16 !

➔ Fill in the operating fluid (max. 50 ml) into the operating fluid pump by using the filling syringe.

➔ Lock the filler screw 8.25a again.
– Observe the O-ring 8.16 !

8 Decommissioning

8.1 Shutting down for longer periods

WARNING

Contamination of parts and operating fluid by pumped media is possible.

Poisoning hazard through contact with materials that damage health.

➔ In the case of contamination, carry out appropriate safety precautions in order to prevent danger to health through dangerous substances.

➔ Decontaminate affected parts before carrying out maintenance work.

If the turbopump should be shut down for longer than a year:

➔ Remove the vacuum pump from the system, if necessary.

➔ Drain the operating fluid.

➔ Close the high vacuum flange of the turbopump.

➔ Evacuate turbopump via the fore-vacuum flange.

➔ Vent turbopump via the venting connection with oil-free, dry air or inert gas.

➔ Close the flange openings by using the original protective covers.

➔ Close further connection ports by using the corresponding protective covers.

➔ Store the pump only indoors at temperatures between -25 °C and +55 °C.

➔ In rooms with moist or aggressive atmospheres, the pump must be airproof shrink-wrapped in a plastic bag together with a bag of desiccant.

8.2 Re-starting

NOTICE

Risk of damage to the pump following recommissioning

The operating fluid in the turbo pump has a limited shelf life. The length of its shelf life is as follows:

- max. 2 years without operation or
- a total of max. 4 years following periods of operation and nonoperation.

➔ Follow the maintenance instructions and inform Pfeiffer Vacuum.

➔ Check turbopump for contamination and moisture.

➔ Clean the turbopump externally with a lint-free cloth and little industrial alcohol.

➔ If necessary, have Pfeiffer Vacuum Service clean the turbopump completely.

➔ If necessary, have the bearings replaced. Take into account the total running time.

➔ Installation and commissioning in accordance with the operating instructions.

8.3 Disposal

Products or parts thereof (mechanical and electrical components, operating fluids, etc.) may cause environmental burden.

➔ Safely dispose of the materials according to the locally applicable regulations.

9 Malfunctions

If malfunctions on the pump occur, you will find possible causes and instructions for repair in the following table.

9.1 Rectifying malfunctions

Problem	Possible causes	Remedy
Pump will not start; no LED lights up	• Electrical supply interrupted	⇨ Check plug contacts on the power supply ⇨ Check supply lines on the power supply
	• Operating voltage incorrect	⇨ Apply correct operating voltage ⇨ Observe the rating plate
	• No operating voltage applied	⇨ Apply operating voltage
	• Electronic drive unit defective	⇨ Request an exchange of the electronic drive unit ⇨ Contact the Pfeiffer Vacuum Service
Pump will not start; LED on the TCP 1200 is flashing	• At operation without control panel: Pins 1-3, 1-4 or 1-14 are not connected on the "remote" connection	⇨ Connect the pins 1-3, 1-4 or 1-14 on the "remote" connection ⇨ Install the mating plug (scope of delivery) to the "remote" connection.
	• At operation via RS-485: Bridge at Pin 1-14 prevents control commands	⇨ Remove the bridge at the "remote" connection ⇨ Remove the mating plug from the "remote" connection.
	• At operation via RS-485 (without counter plug): Parameters of the electronic drive unit not set	⇨ Set parameters **[P: 010]** and **[P: 023]** "ON" via interface RS-485. ⇨ Please refer to operating instructions of the electronic drive unit.
Pump does not attain the final rotational speed within the specified run-up time	• Fore-vacuum pressure too high	⇨ Ensure function and suitability of the backing pump
	• Leak	⇨ Perform leak detection ⇨ Check sealings and flange fastenings ⇨ Eliminate leaks
	• Gas load too high	⇨ Reduce process gas supply
	• Rotor runs hard, bearing defective	⇨ Check the bearing for noises ⇨ Contact the Pfeiffer Vacuum Service
	• Setpoint for run-up time to low	⇨ Extend the run-up time via DCU, HPU or PC
	• Thermal overload: – Lack of air ventilation – Water flow too low – Fore-vacuum pressure too high – Ambient temperature too high	⇨ Reduce thermal loads – Ensure adequate cooling – Ensure the cooling water flow – Lower the fore-vacuum pressure – Adjust ambient conditions
Pump does not attain the ultimate pressure	• Pump is dirty	⇨ Bake out the pump ⇨ Cleaning in case of heavy contamination – Contact the Pfeiffer Vacuum Service
	• Vacuum chamber, pipes or pump are leaky	⇨ Leak detection starting from the vacuum chamber ⇨ Eliminate leaks
Unusual noises during operation	• Bearing damage	⇨ Contact the Pfeiffer Vacuum Service
	• Rotor damage	⇨ Contact the Pfeiffer Vacuum Service
	• Splinter shield or protective screen are loose	⇨ Correct the seat of the splinter shield or the protective screen ⇨ Observe the installation notes
LED on the TCP 1200 is on	• Collective fault	⇨ Reset by switching the mains OFF/ON ⇨ Reset via pin 13 on the "REMOTE" connection ⇨ Differentiated malfunction display is possible via "RS 485"[1)] ⇨ Contact the Pfeiffer Vacuum Service

[1)] If no Pfeiffer Vacuum display and control unit is available, please contact the Pfeiffer Vacuum Service.

10 Service

Pfeiffer Vacuum offers first-class service!

- Operating fluid and bearing change on the spot by Pfeiffer Vacuum FieldService
- Maintenance / repair in the nearby ServiceCenter or ServicePoint
- Fast replacement with exchange products in mint condition
- Advice on the most cost-efficient and quickest solution

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

Maintenance and repair in the Pfeiffer Vacuum ServiceCenter

The following steps are necessary to ensure a fast, smooth servicing process:

➔ Download the forms "Service Request" and "Declaration on Contamination".[1)]
➔ Fill out the "Service Request" form and send it by fax or e-mail to your Pfeiffer Vacuum service address.
➔ Include the confirmation on the service request from Pfeiffer Vacuum with your shipment.
➔ Fill out the declaration on contamination and include it in the shipment (required!).
➔ Dismantle all accessories.
➔ Drain the operating fluid (applies for turbopumps with pumping speed > 700 l/s).
➔ Leave electronic drive on the pump.
➔ Close the flange openings by using the original protective covers.
➔ If possible, send pump or unit in the original packaging.

Sending of contaminated pumps or devices

No units will be accepted if they are contaminated with micro-biological, explosive or radioactive substances. “Hazardous substances” are substances and compounds in accordance with the hazardous goods directive (current version). If pumps are contaminated or the declaration on contamination is missing, Pfeiffer Vacuum performs decontamination at the shipper's expense.

➔ Neutralise the pump by flushing it with nitrogen or dry air.
➔ Close all openings airtight.
➔ Seal the pump or unit in suitable protective film.
➔ Return the pump/unit only in a suitable and sturdy transport container and send it in while following applicable transport conditions.

Exchange unit

The factory operating parameters are always preset with exchange units. If you use changed parameters for your application, you have to set these again.

Service orders

All service orders are carried out exclusively according to our repair conditions for vacuum units and components.

1) Forms under www.pfeiffer-vacuum.com

11 Spare parts HiPace 2300

Item	Designation	Size	Order number	Notes	Pieces	Order qty.
13	Electronic drive unit TCP 1200		according to the rating plate	depends on the connection panel	1	
142	Syringe	50 ml	PM 006 915 -U		1	
143	Operating fluid F3	50 ml	PM 006 336 -T	other quantities on request	1	
	Mating plug "remote"		PM 061 378 -X	with bridges	1	
145	Sealing gas valve	17.5 - 20 sccm	PM Z01 313		1	
146	Mains connection socket	HAN 3	PM 061 200 -T		1	
150	Screw-in nozzle	G 1/4"	P 0998 067	for hose internal Ø of 7-8 mm	2	
155	Seal ring		P 3529 145 -A	for screw-in nozzle	2	

Please also specify model number of the the rating plate when ordering accessories or spare parts.

12 Accessories

Designation	HiPace® 2300 for TCP 1200, DN 250 ISO-K	HiPace® 2300 for TCP 1200, DN 250 ISO-F	HiPace® 2300 for TCP 1200, DN 250 CF-F
Mounting kit for DN 250 ISO-K to ISO-F, with collar flange, coated centering ring, hexagon bolts	PM 016 970 -T		
Mounting kit for DN 250 ISO-K to ISO-F, with collar flange, coated centering ring with splinter shield, hexagon bolts	PM 016 971 -T		
Mounting kit for DN 250 ISO-K to ISO-F, with collar flange, coated centering ring with protection screen, hexagon bolts	PM 016 972 -T		
Mounting kit for DN 250 ISO-K to ISO-F, with collar flange, coated centering ring, stud screws	PM 016 975 -T		
Mounting kit for DN 250 ISO-K to ISO-F, with collar flange, coated centering ring with splinter shield, stud screws	PM 016 976 -T		
Mounting kit for DN 250 ISO-K to ISO-F, with collar flange, coated centering ring with protection screen, stud screws	PM 016 977 -T		
Mounting kit for HiPace 1500, DN 250 ISO-K, including coated centering ring, bracket screws	PM 016 395 -T		
Mounting kit for HiPace 1500, DN 250 ISO-K, including coated centering ring, splinter shield, bracket screws	PM 016 396 -T		
Mounting kit for HiPace 1500, DN 250 ISO-K, including coated centering ring, protection screen, bracket screws	PM 016 397 -T		
Mounting kit for DN 250 ISO-F, including coated centering ring, hexagon screws		PM 016 480 -T	
Mounting kit for DN 250 ISO-F, including coated centering ring, splinter shield, hexagon screws		PM 016 481 -T	
Mounting kit for DN 250 ISO-F, including coated centering ring, stud screws		PM 016 485 -T	
Mounting kit for DN 250 ISO-F, including coated centering ring, splinter shield, stud screws		PM 016 486 -T	
Mounting kit for DN 250 ISO-F, including coated centering ring, protective screen, stud screws		PM 016 487 -T	
Centering ring with multifunction coating, DN 250 ISO-K/-F		PM 016 225 -U	
Set of stud screws for threaded hole, DN 250 CF-F			PM 016 695 -T
Set of stud screws for trough hole, DN 250 CF-F			PM 016 737 -T
Set of hexagon screws for trough hole, DN 250 CF-F			PM 016 694 -T
Centering ring with multifunction coating, DN 250 ISO-K/-F	PM 016 225 -U	PM 016 225 -U	
Centering ring with multifunction coating and integrated splinter shield, DN 250 ISO-K/-F	PM 016 226 -U	PM 016 226 -U	
Centering ring with multifunction coating and integrated protection screen, DN 250 ISO-K/-F	PM 016 227 -U	PM 016 227 -U	
Vibration damper for HiPace 1500/2300, DN 250 ISO-K/F	PM 006 670 -X	PM 006 670 -X	
Protection screen for DN 250 CF-F			PM 016 345
Splinter shield for turbopumps, DN 250 CF-F			PM 016 324
Vibration damper for HiPace 1500/2300, DN 250 CF-F			PM 006 671 -X
Mains cable 230 V AC, CEE 7/7 to HAN 3A, 3 m	P 4564 309 HA	P 4564 309 HA	P 4564 309 HA
Mains cable 208 V AC, NEMA 6-15 to HAN 3A, 3 m	P 4564 309 HB	P 4564 309 HB	P 4564 309 HB
DCU 002, Display Control Unit	PM 061 348 -T	PM 061 348 -T	PM 061 348 -T
HPU 001, Handheld Programming Unit	PM 051 510 -T	PM 051 510 -T	PM 051 510 -T
Accessories package for HPU 001/PC	PM 061 005 -T	PM 061 005 -T	PM 061 005 -T
Relay box, shielded, for backing pumps, 1-phase 7 A for TC 400/1200, TM 700 and TCP 350, M12	PM 071 284 -X	PM 071 284 -X	PM 071 284 -X
Relay box, shielded, for backing pumps, 1-phase 20 A for TC 400/1200, TM 700 and TCP 350, M12	PM 071 285 -X	PM 071 285 -X	PM 071 285 -X
TVV 001 fore-vacuum safety valve, 230 V AC	PM Z01 205	PM Z01 205	PM Z01 205
TVV 001 fore-vacuum safety valve, 115 V AC	PM Z01 206	PM Z01 206	PM Z01 206
Venting valve, shielded, 24 V DC, G 1/8", for connection to TC 400/1200 and TM 700	PM Z01 291	PM Z01 291	PM Z01 291

Designation	HiPace® 2300 for TCP 1200, DN 250 ISO-K	HiPace® 2300 for TCP 1200, DN 250 ISO-F	HiPace® 2300 for TCP 1200, DN 250 CF-F
TTV 001, dryer for venting turbopumps	PM Z00 121	PM Z00 121	PM Z00 121
Sealing gas valve, shielded, HiPace 400/700/800 P with TC 400 and HiPace 1200 - 2300 with TC 1200	PM Z01 313	PM Z01 313	PM Z01 313
Sealing gas throttle for HiPace 400/700/800 P version and HiPace 1200 - 2300	PM Z01 318	PM Z01 318	PM Z01 318
Sealing gas throttle for HiPace 1200 - 2300	PM Z01 319	PM Z01 319	PM Z01 319
Sealing gas throttle for 1200 - 2300, 52.5 ± 7.5 sccm	PM Z01 325	PM Z01 325	PM Z01 325
Interface cable, M12 m straight/M12 m straight, 3 m	PM 061 283 -T	PM 061 283 -T	PM 061 283 -T
HiPace - ACP connection cable	PM 071 142 -X	PM 071 142 -X	PM 071 142 -X
Control cable for pumping stations 0.7 m	PM 061 675 AT	PM 061 675 AT	PM 061 675 AT
USB converter to RS-485 interface	PM 061 207 -T	PM 061 207 -T	PM 061 207 -T
Y-Connector M12 to RS-485	P 4723 010	P 4723 010	P 4723 010
Connector M12 to RS-485	PM 061 270 -X	PM 061 270 -X	PM 061 270 -X
Termination resistor for RS-485	PT 348 105 -T	PT 348 105 -T	PT 348 105 -T
Power separator for RS-485	PT 348 132 -T	PT 348 132 -T	PT 348 132 -T
Y-connector, shielded, M12 for accessories	P 4723 013	P 4723 013	P 4723 013

13 Technical data and dimensions

13.1 General

Basic principles for the Technical Data of Pfeiffer Vacuum Turbopumps:

- Recommendations of PNEUROP committee PN5
- ISO 21360; 2007: "Vacuum technology - Standard methods for measuring vacuum-pump performance - General description"
- ISO 5302; 2003: "Vacuum technology - Turbomolecular pumps - Measurement of performance characteristics"
- Ultimate pressure: using a test dome and a 48 hrs. period of baking out
- Gas throughput: water cooling; backing pump = rotary vane pump (120 m^3/h)
- Cooling water consumption: at max. gas throughput, cooling water temp. 25 °C
- Integral leak rate: using a Helium concentration of 100 %, period 10 s
- Sound pressure level: Distance 1 m to the pump

Conversion table: pressure units

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

Conversion table: gas throughput units

	mbar·l/s	**Pa·m^3/s**	**sccm**	**Torr·l/s**	**atm·cm^3/s**
mbar·l/s	1	0.1	59.2	0.75	0.987
Pa·m^3/s	10	1	592	7.5	9.87
sccm	$1.69 \cdot 10^{-2}$	$1.69 \cdot 10^{-3}$	1	$1.27 \cdot 10^{-2}$	$1.67 \cdot 10^{-2}$
Torr·l/s	1.33	0.133	78.9	1	1.32
atm·cm^3/s	1.01	0.101	59.8	0.76	1

13.2 HiPace 2300

Parameter	HiPace® 2300	HiPace® 2300	HiPace® 2300
Flange (in)	DN 250 ISO-K	DN 250 ISO-F	DN 250 CF-F
Flange (out)	DN 40 ISO-KF	DN 40 ISO-KF	DN 40 ISO-KF
Pumping speed for Ar	1800 l/s	1800 l/s	1800 l/s
Pumping speed for H_2	1980 l/s	1980 l/s	1850 l/s
Pumping speed for He	2000 l/s	2000 l/s	2000 l/s
Pumping speed for N_2	1900 l/s	1900 l/s	1900 l/s
Compression ratio for Ar	$> 1 \cdot 10^8$	$> 1 \cdot 10^8$	$<1 \cdot 10^8$
Compression ratio for H_2	$2 \cdot 10^4$	$2 \cdot 10^4$	$2 \cdot 10^4$
Compression ratio for He	$3 \cdot 10^5$	$3 \cdot 10^5$	$3 \cdot 10^5$
Compression ratio for N_2	$> 1 \cdot 10^8$	$> 1 \cdot 10^8$	$<1 \cdot 10^8$
Gas throughput at full rotational speed for Ar	9 hPa l/s	9 hPa l/s	9 hPa l/s
Gas throughput at full rotational speed for He	14 hPa l/s	14 hPa l/s	16 hPa l/s
Gas throughput at full rotational speed for H_2	>30 hPa l/s	>30 hPa l/s	>30 hPa l/s
Gas throughput at full rotational speed for N_2	13 hPa l/s	13 hPa l/s	15 hPa l/s
Fore-vacuum max. for Ar	1.7 hPa	1.7 hPa	2.4 hPa
Fore-vacuum max. for H_2	0.3 hPa	0.3 hPa	0.55 hPa
Fore-vacuum max. for He	0.8 hPa	0.8 hPa	1 hPa
Fore-vacuum max. for N_2	1.6 hPa	1.6 hPa	1.8 hPa
Run-up time	7 min	7 Min.	7 Min.
Ultimate pressure according to PNEUROP	$< 1 \cdot 10^{-7}$ hPa	$< 1 \cdot 10^{-7}$ hPa	$< 5 \cdot 10^{-10}$ hPa
Rotation speed ± 2 %	31500 min^{-1}	31500 min^{-1}	31500 min^{-1}
Rotation speed variable	50-100 %	50-100 %	50-100 %
Power characteristic line in gas mode 1, vertex A	480/31500 W/min^{-1}	480/31500 W/min^{-1}	500/31500 W/min^{-1}
Power characteristic line in gas mode 1, vertex B	560/28320 W/min^{-1}	560/28320 W/min^{-1}	580/25200 W/min^{-1}
Power characteristic line in gas mode 0, vertex C	440/31500 W/min^{-1}	440/31500 W/min^{-1}	440/31500 W/min^{-1}
Power characteristic line in gas mode 0, vertex D	480/28320 W/min^{-1}	480/28320 W/min^{-1}	500/25200 W/min^{-1}
Power characteristic line in gas mode 2, vertex E	480/31500 W/min^{-1}	480/31500 W/min^{-1}	500/31500 W/min^{-1}
Power characteristic line in gas mode 2, vertex F	560/28320 W/min^{-1}	560/28320 W/min^{-1}	580/25200 W/min^{-1}
Sound pressure level	≤ 50 dB (A)	≤ 50 dB (A)	≤50 dB (A)
Relative humidity of air	5-85 %	5-85 %	5-85 %
Protection category	IP54	IP54	IP54
Connection pressure max. for venting/sealing gas valve	1500 hPa	1500 hPa	1500 hPa
Operating voltage power supply	200-240 V AC	200-240 V AC	100-120/200-240 V AC
Integral leak rate	$< 1 \cdot 10^{-8}$ Pa m^3/s	$< 1 \cdot 10^{-8}$ Pa m^3/s	$< 1 \cdot 10^{-8}$ Pa m^3/s
Power consumption max.	900 W	900 W	900 W
Mains requirement: frequency (range)	50/60 Hz	50/60 Hz	50/60 Hz
Mains requirement: voltage (range)	200-240 V AC	200-240 V AC	100-120/200-240 V AC
Current consumption max.	10 A	10 A	10 A
Shipping and storage temperature	-25-+55 °C	-25-+55 °C	-25-+55 °C
Venting connection	G 1/8"	G 1/8"	G 1/8"
Weight	35.5 kg	37 kg	49 kg
Cooling method, standard	Water	Water	Water
Cooling water temperature	15-35 °C	15-35 °C	15-35 °C
Cooling water consumption	100 l/h	100 l/h	100 l/h
Permissible magnetic field max.	7 mT	7 mT	7 mT
Interfaces	TCP 1200	TCP 1200	TCP 1200

13.3 Dimensions

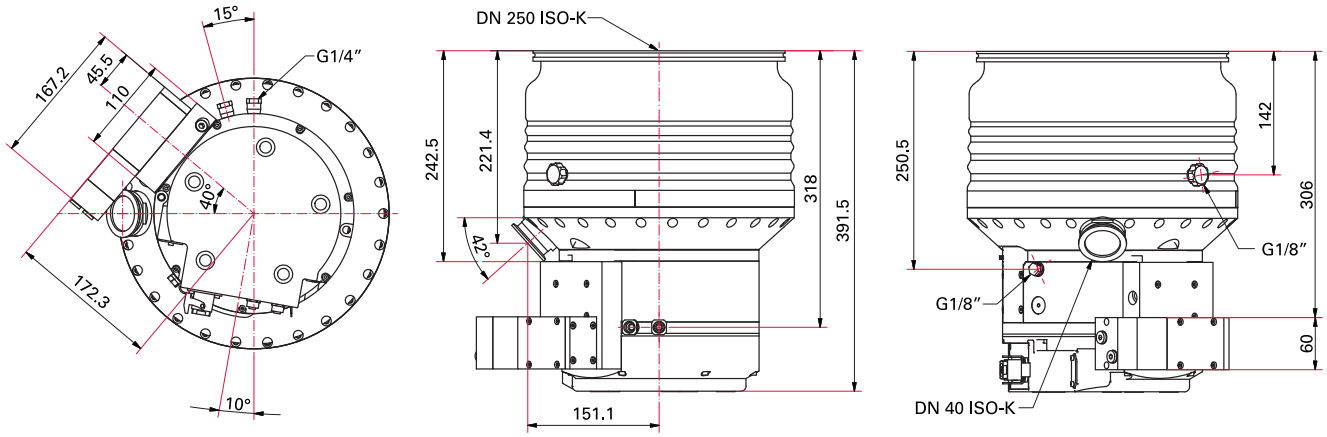


Fig. 16: HiPace 2300, DN 250 ISO-K

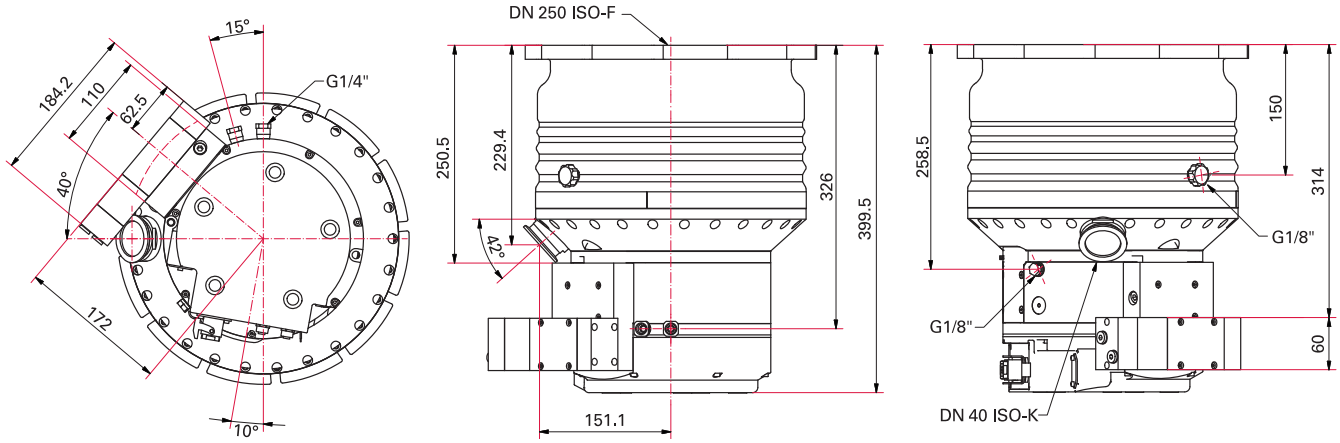


Fig. 17: HiPace 2300, DN 250 ISO-F

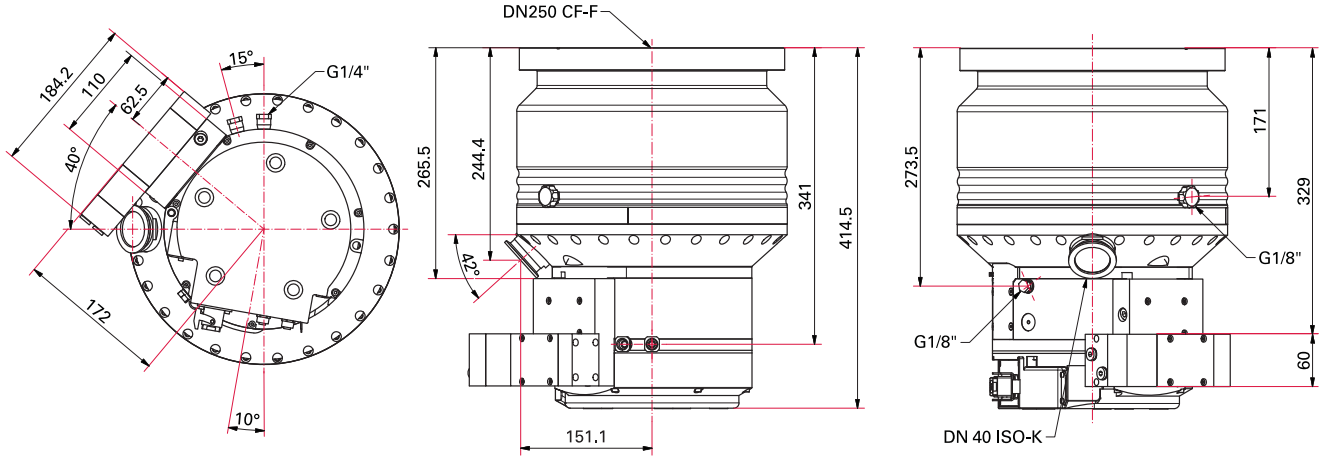


Fig. 18: HiPace 2300, DN 250 CF-F

Declaration of conformity

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

- **Machinery 2006/42/EC (Annex II, no. 1 A)**
- **Electromagnetic Compatibility 2014/30/EU**

The agent responsible for compiling the technical documentation is Mr. Helmut Bernhardt, Pfeiffer Vacuum GmbH, Berliner Straße 43, 35614 Aßlar.

HiPace 2300

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

DIN EN ISO 12100 : 2011-03
DIN EN 1012-2 : 1996
DIN EN 61000-3-2 : 2010
DIN EN 61000-3-3 : 2009
DIN EN 61010-1 : 2010
DIN EN 61326-1 : 2013
DIN EN 62061 : 2013

Signature:

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2016-07-13

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