



OPERATING INSTRUCTIONS

EN

Translation of the Original

HIPACE 1200 Turbopump



Dear Customer,

Thank you for choosing a Pfeiffer Vacuum product. Your new turbopump is designed to support you by its performance, its perfect operation and without interfering your individual application. The name Pfeiffer Vacuum stands for high-quality vacuum technology, a comprehensive and complete range of top-quality products and first-class service. With this expertise, we have acquired a multitude of skills contributing to an efficient and secure implementation of our product.

Knowing that our product must not interfere with your actual work, we are convinced that our product offers you the solution that supports you in the effective and trouble-free execution of your individual application.

Please read these operating instructions before putting your product into operation for the first time. If you have any questions or suggestions, please feel free to contact **info@pfeiffer-vacuum.de**.

Further operating instructions from Pfeiffer Vacuum can be found in the [Download Center](#) on our website.

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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1 About this manual



IMPORTANT

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

1.1 Validity

These operating instructions are for customers of Pfeiffer Vacuum. They describe the function of the designated product and provide the most important information for safe usage of the product. The descriptions comply with applicable directives. All information provided in these operating instructions refer to the current development status of the product. The documentation remains valid as long as the customer does not modify the product in any way.

1.1.1 Applicable documents

Document	Number
Operating instructions, Electronic drive unit TC 1200, standard	PT 0239 BN
Operating instructions, Electronic drive unit TC 1200 PB, Profibus	PT 0269 BN
Operating instructions, Electronic drive unit TC 1200 E74, according to Semi E74	PT 0303 BN
Operating instructions, Electronic drive unit TC 1200 DN, DeviceNet	PT 0353 BN
Operating instructions, Electronic drive unit TC 1200 EC, EtherCat	PT 0455 BN
Declaration of conformity	A component of these instructions

1.1.2 Product variants affected

- HiPace 1200 Standard, DN 200 ISO-K
- HiPace 1200 Standard, DN 200 ISO-F
- HiPace 1200 Standard, DN 200 CF-F
- HiPace 1200 U, DN 200 ISO-K
- HiPace 1200 U, DN 200 ISO-F
- HiPace 1200 U, DN 200 CF-F
- HiPace 1200 C, DN 200 ISO-K
- HiPace 1200 C, DN 200 ISO-F
- HiPace 1200 C, DN 200 CF-F
- HiPace 1200 U C, DN 200 ISO-K
- HiPace 1200 U C, DN 200 ISO-F
- HiPace 1200 U C, DN 200 CF-F

1.2 Target group

This operating instructions are aimed at all persons performing the following activities on the product:

- transport,
- setup (installation),
- usage and operation,
- decommissioning,
- maintenance and cleaning,
- storage or disposal.

The work described in this document is only permitted to be performed by persons with the appropriate technical qualifications (expert personnel) or who have received the relevant training from Pfeiffer Vacuum.

1.3 Conventions

1.3.1 Instructions in the text

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

Individual action step

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

- ▶ This is an individual action step.

Sequence of multi-part action steps

The numerical list indicates an action with multiple necessary steps.

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

1.3.2 Pictographs

Pictographs used in the document indicate useful information.



Note

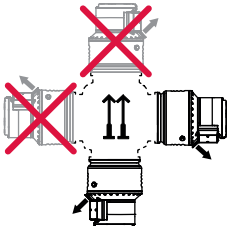
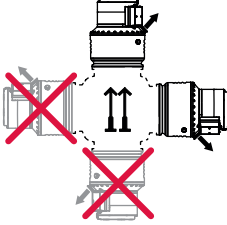




Tip

1.3.3 Stickers on the product

This section describes all the stickers on the product along with their meaning.

	<p>Rating plate (example)</p> <p>Rating plates of individual assemblies are located on the lower part of the turbopump or on the relevant attachments.</p>
	<p>Operating manual note</p> <p>This sticker indicates that this operating manual must be read before performing any tasks.</p>
	<p>Operating fluids note</p> <p>This sticker emphasizes the necessity to fill the turbopump with operating fluid before commissioning.</p>

	<p>Mounting orientation upright note</p> <p>This sticker depends on the variant. The sticker shows the valid spatial positions for the installation and operation of the turbopump.</p>
	<p>Overhead mounting orientation note</p> <p>This sticker depends on the variant. The sticker shows the valid spatial positions for the installation and operation of the turbopump.</p>
<p>ACHTUNG! Wird F3-Öl über 300 °C erwärmt, entstehen giftige Dämpfe, die den Atemwegen schaden! F3-Öl nicht mit Tabakwaren in Berührung bringen! Die üblichen Vorsichtsmaßnahmen im Umgang mit Chemikalien beachten!</p> <p>ATTENTION! If oil F3 will be heated to more than 300 °C poisonous vapours come out which are noxious for the respiratory organs! Do not bring oil F3 in contact with tobacco! Care for the usual precautions for treating chemicals!</p> <p>ATTENTION ! Quand on chauffe l'huile F3 à une température supérieure à 300 °C, il se forment des vapeurs toxiques, nuisibles pour les organes de la respiration! Le contact de l'huile F3 avec des produits en tabac doit être évité! Il faut faire attention aux précautions usuels pour le traitement des substances chimiques!</p>	<p>F3 operating fluid note</p> <p>This sticker provides information on the safe handling of hazardous substances.</p>
<p>Öleinfüll- und Ablassschraube nur dann öffnen wenn Pumpe auf Atmosphärendruck geflutet</p> <p>Do not open oil-filling or oil-drain flange unless interior of the pump is under atmospheric pressure</p> <p>Ne pas ouvrir les brides d'entrée d'huile et de vidange si l'intérieur de la pompe ne se trouve pas sous pression atmosphérique</p>	<p>Operating fluid filler screws note</p> <p>This sticker provides information on the safe handling of the screws on the operating fluid pump.</p>
	<p>Operating fluid filler screw</p> <p>This sticker describes the position of the respective filler screw for operating fluid.</p>
	<p>Protection class</p> <p>This sticker describes protection class 1 for the product. The positioning indicates the position for the ground connection.</p>
<p>COOLING WATER IN max. 6 bar (90 psi)</p>	<p>Cooling water connection</p> <p>This sticker indicates the position and conditions for the cooling water supply of the turbopump.</p>
<p>COOLING WATER OUT</p>	<p>Cooling water connection</p> <p>This sticker indicates the position for the cooling water discharge of the turbopump.</p>
<p>warranty seal PFEIFFER VACUUM</p>	<p>Closure seal</p> <p>The product is sealed ex-factory. Damaging or removing a closure seal results in loss of the warranty.</p>
<p>PURGE</p>	<p>Sealing gas connection note</p> <p>This sticker indicates the position for the exclusive sealing gas connection.</p>

1.3.4 Abbreviations

Abbreviation	Meaning in this document
AC	Alternating current (AC)
d	Diameter value (in mm)
DCU	Display Control Unit (Pfeiffer Vacuum display and control unit).
DN	Nominal diameter as size description
f	Rotation speed value of a vacuum pump (frequency, in rpm or Hz)
HPU	Handheld Programming Unit. Aid for control and monitoring pump parameters
HV	High vacuum flange, high vacuum side
ISO	Flange: Connector in accordance with ISO 1609 and ISO 2861
LED	Illuminating diode
PE	Earthed conductor (protective earth)
[P:xxx]	Electronic drive unit control parameters. Printed in bold as three-digit number in square brackets. Frequently displayed in conjunction with a short description. Example: [P:312] software version
remote	26-pole D-Sub connecting socket on the turbopump electronic drive unit
T	Temperature (in °C), property abbreviation of the turbopump
TC	Turbopump electronic drive unit (turbo controller)
WAF	width across flats
U	Overhead version, property abbreviation of the turbopump
VV	Fore-vacuum flange, fore-vacuum connection

Tbl. 1: Abbreviations used in this document

2 Safety

2.1 General safety instructions

This document includes the following four risk levels and one information level.

DANGER

Imminent danger

Indicates a hazardous situation which, if not avoided, will result in death or serious injury.

- ▶ Instructions on avoiding the hazardous situation

WARNING

Possibly imminent danger

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

- ▶ Instructions on avoiding the hazardous situation

CAUTION

Possibly imminent danger

Indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.

- ▶ Instructions on avoiding the hazardous situation

NOTICE

Danger of property damage

Notice is used to address practices not related to physical injury.

- ▶ Instructions on avoiding property damage



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

2.2 Safety instructions

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

Risks during transport

WARNING

Risk of serious injury from swinging, toppling or falling objects

During transport, there is a risk of crushing and impact on swinging, toppling or falling objects. There is a risk of injuries to limbs, up to and including bone fractures and head injuries.

- ▶ Secure the danger zone if necessary.
- ▶ Pay attention to the center of gravity of the load during transport.
- ▶ Ensure even movements and moderate speeds.
- ▶ Observe safe handling of the transport devices.
- ▶ Avoid sloping attachment aids.
- ▶ Never stack products.
- ▶ Wear protective equipment, e.g. safety shoes.

Risks during installation

⚠ DANGER

Danger to life from electric shock

Contact with exposed and live elements generate an electric shock. Incorrect connection of the mains supply leads to the risk of live housing parts that can be touched. There is a risk to life.

- ▶ Before the installation, check that the connection leads are voltage-free.
- ▶ Make sure that electrical installations are only carried out by qualified electricians.
- ▶ Provide adequate grounding for the device.
- ▶ After connection work, carry out an earthed conductor check.

⚠ WARNING

Danger to life from electric shock due to improperly performed installation

The device uses voltage that is dangerous on contact as the electrical power supply. Potentially fatal situations arise due to unsafe or incorrectly installation when reaching into the device.

- ▶ Ensure that the system is safely integrated into an emergency off safety circuit.
- ▶ Do not carry out any unauthorized modifications or changes to the device.

⚠ WARNING

Risk of danger to life through missing mains disconnection device

The vacuum pump and electronic drive unit are **not** equipped with a mains disconnection device (mains switch).

- ▶ Install a mains disconnection device according to SEMI-S2.
- ▶ Install a circuit breaker with an interruption rating of at least 10,000 A.

⚠ WARNING

Risk of cuts on moving, sharp-edged parts when reaching into the open high vacuum flange

Opening the high vacuum flange enables access to sharp-edged parts. A manual rotation of the rotor increases the danger situation. There is a risk of cut injuries up to a piece of your body being severed of (e.g. finger tips). There is a risk of hair and loose clothing being drawn in. Objects dropping into the turbopump will destroy the pump in subsequent operation.

- ▶ Remove the original protective cover only immediately prior to connecting the high vacuum flange.
- ▶ Never reach into the high vacuum connection.
- ▶ Wear protective gloves during installation.
- ▶ Never start the turbopump operation while the vacuum connections are open.
- ▶ Always carry out the mechanical installation before connecting the electrics.
- ▶ Prevent access to the high vacuum connection of the turbopump from the operator side (e.g. open vacuum chamber).

⚠ WARNING

Danger of cut injuries from unexpected start up.

The use of mating plugs of the electronic drive unit (accessories) enables the automatic run-up of the vacuum pump as soon the power is turned on. Attaching mating plugs before or during the installation leads to the movement of parts hence the risk of cut injuries by sharp-edged in the exposed high vacuum flange.

- ▶ Only connect mating plugs after the mechanical installation.
- ▶ Only switch on the vacuum pump immediately prior to operation.

⚠ WARNING**Risk of serious injury from oscillating, toppling or falling objects**

Incorrect handling during the mechanical installation leads to a risk of oscillating, toppling or falling heavy loads. There is a risk of crushing and impacts (e.g. on colliding flange connections). There is a risk of injuries to limbs, up to and including bone fractures and head injuries.

- ▶ Use the intended eye bolts during the installation.
- ▶ When approaching the vacuum pump, be particularly careful at the counter flange.
- ▶ Note the center of gravity of the load.

⚠ WARNING**Danger of poisoning from toxic vapors**

Igniting and heating synthetic operating fluid generates toxic vapors. Danger of poisoning if inhaled.

- ▶ Observe the application instructions and precautions.
- ▶ Do not allow tobacco products to come into contact with the operating fluid.

⚠ WARNING**Risk of scalding from suddenly escaping hot cooling water**

The turbopump water connections are open to both sides. When connecting the cooling water supply, there is a risk of scalding from suddenly escaping, hot cooling water at over pressure.

- ▶ Prior to installation, ensure that pressure is discharged from the cooling water system, and that it is cooled down.
- ▶ Wear protective equipment, e.g., safety goggles and gloves.

Risks during operation**⚠ WARNING****Risk of burns on hot surfaces when using additional equipment for heating during operation**

The use of additional equipment for heating the vacuum pump or for optimizing the process generates very high temperatures on surfaces that can be touched. There is a risk of burning.

- ▶ If necessary, set up a contact guard.
- ▶ If necessary, apply the warning stickers provided for this at the danger points.
- ▶ Ensure adequate cooling down before working on the vacuum pump or in its vicinity.
- ▶ Wear protective equipment, e.g., gloves.

⚠ WARNING**Risk of serious injury in the event of vacuum pump destruction due to over pressure**

Gas entry with very high over pressure results in destruction of the vacuum pump. There is a risk of serious injury due to ejected objects.

- ▶ Never exceed the permissible 1500 hPa (absolute) inlet pressure on the suction side or the venting and sealing gas connection.
- ▶ Make sure that high, process-related over pressures cannot directly enter the vacuum pump.

⚠ CAUTION**Risk of injuries due to contact with vacuum when venting**

While venting the vacuum pump there is a risk of minor injuries due to the direct contact of body parts with the vacuum, e.g. hematomas.

- ▶ Do not fully unscrew the venting screw out of the housing during venting.
- ▶ Keep a distance from automatic venting device, such as venting valves.

Risks during maintenance

⚠ WARNING

Danger to life from electric shock during maintenance and service work

The device is only completely de-energized when the mains plug has been disconnected and the turbopump is at a standstill. There is a danger to life from electric shock when making contact with live components.

- ▶ Before performing all work, switch off the main switch.
- ▶ Wait until the turbopump comes to a standstill (rotation speed =0).
- ▶ Remove the mains plug from the device.
- ▶ Secure the device against unintentional restarting.

⚠ WARNING

Danger of poisoning from toxic vapors

Igniting and heating synthetic operating fluid generates toxic vapors. Danger of poisoning if inhaled.

- ▶ Observe the application instructions and precautions.
- ▶ Do not allow tobacco products to come into contact with the operating fluid.

⚠ WARNING

Health hazard through poisoning from toxic contaminated components or devices

Toxic process media result in contamination of devices or parts of them. During maintenance work, there is a risk to health from contact with these poisonous substances. Illegal disposal of toxic substances causes environmental damage.

- ▶ Take suitable safety precautions and prevent health hazards or environmental pollution by toxic process media.
- ▶ Decontaminate affected parts before carrying out maintenance work.
- ▶ Wear protective equipment.

⚠ WARNING

Risk of burns on hot surfaces when using additional equipment for heating during operation

The use of additional equipment for heating the vacuum pump or for optimizing the process generates very high temperatures on surfaces that can be touched. There is a risk of burning.

- ▶ If necessary, set up a contact guard.
- ▶ If necessary, apply the warning stickers provided for this at the danger points.
- ▶ Ensure adequate cooling down before working on the vacuum pump or in its vicinity.
- ▶ Wear protective equipment, e.g., gloves.

⚠ WARNING

Risk of cuts on moving, sharp-edged parts when reaching into the open high vacuum connection

Incorrect handling of the turbopump before maintenance work results in hazardous situations with risk of injury. There is a risk of cuts from accessing sharp-edged, rotating parts when removing the turbopump.

- ▶ Wait until the turbopump comes to a standstill (rotation speed f=0).
- ▶ Switch the turbopump off properly.
- ▶ Secure the turbopump against re-start.
- ▶ Close open connections immediately following removal, using the original protective cover.

⚠ CAUTION

Risk of injuries due to contact with vacuum when venting

While venting the vacuum pump there is a risk of minor injuries due to the direct contact of body parts with the vacuum, e.g. hematomas.

- ▶ Do not fully unscrew the venting screw out of the housing during venting.
- ▶ Keep a distance from automatic venting device, such as venting valves.

⚠ CAUTION**Electric shock and damage to the vacuum pump and electronic drive unit due to improper disconnection of components**

Even after the mains power is switched off, the turbopump continues to deliver electrical energy during its run-down period. If the turbopump and electronic drive unit are disconnected prematurely, there is the risk of electric shock from contact with live components. There is a risk of electric body contact and, as a result, the destruction of electronic components.

- ▶ Never disconnect the turbopump and electronic drive unit from each other if power is still connected or if the rotor is running.
- ▶ Monitor the turbopump rotation via the parameters available in the electronic drive unit (e.g., [P: 398]).
- ▶ Wait until the turbopump comes to a standstill (rotation speed $f=0$).

Risks in the event of malfunctions**⚠ 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.

⚠ WARNING**Danger to life from the turbopump breaking away in the event of a fault**

Sudden blocking of the rotor generates high destructive torques in accordance with ISO 27892. If the turbopump is **not** properly secured, it will tear off. The energy released in this way can propel the entire turbopump or shattered pieces from its interior through the surrounding area. Potentially dangerous gases may escape. There is a risk of serious injury, potentially even fatal, and significant equipment damage.

- ▶ Follow the installation instructions for this turbopump.
- ▶ Observe the requirements regarding stability and design of the counter flange.
- ▶ Use only original accessories or fixing material approved by Pfeiffer Vacuum for the installation.

⚠ WARNING**Risk of injury caused by the turbopump breaking away with the vibration compensator in the event of a malfunction**

Sudden jamming of the rotor generates high destructive torques in accordance with ISO 27892. When using a vibration compensator, this will probably lead to the turbopump being sheared off in use. The energy that this would release could throw the entire turbopump or shattered pieces from its interior through the surrounding space. Potentially dangerous gases can escape. There is a risk of very serious injuries, including death, and extensive property damage.

- ▶ Take suitable safety precautions on-site for the compensation of the occurring torques.
- ▶ Before installing a vibration compensator, you must first of all contact Pfeiffer Vacuum.

⚠ WARNING**Danger to life from poisoning where toxic process media leak from damaged connections**

Sudden twisting of the turbopump in the event of a fault causes fittings to accelerate. There is the risk of damaging on-site connections (e.g., fore-vacuum line) and resulting leaks. This results in leakage of process media. In processes involving toxic media, there is a risk of injury and danger to life due to poisoning.

- ▶ Keep masses connected to the turbopump as low as possible.
- ▶ Use flexible lines to connect to the turbopump where necessary.

2.3 Safety 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 EU 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 installation into a system, the operator is required to check and re-evaluate as necessary the conformity of the overall system in the context of the relevant EU Directives before commissioning that system.

General safety precautions when handling the product

- ▶ Observe all applicable safety and accident prevention regulations.
- ▶ Check that all safety measures are observed at regular intervals.
- ▶ Do not expose body parts to the vacuum.
- ▶ Always ensure a secure connection to the earthed conductor (PE).
- ▶ Never disconnect plug connections during operation.
- ▶ Observe the above shutdown procedures.
- ▶ Before working on the high vacuum connection, wait until the rotor has stopped completely (rotation speed $f = 0$).
- ▶ Never put the device into operation with the high vacuum connection open.
- ▶ Keep lines and cables away from hot surfaces ($> 70^{\circ}\text{C}$).
- ▶ Never fill or operate the unit with cleaning agents or cleaning agent residues.
- ▶ Do not carry out your own conversions or modifications on the unit.
- ▶ Observe the unit protection class prior to installation or operation in other environments.

2.4 Limits of use of the product

Installation location	weatherproof (internal space)
Air pressure	750 hPa to 1060 hPa
Installation altitude	max. 2000 m
Rel. air humidity	max. 80%, at $T < 31^{\circ}\text{C}$, up to max. 50% at $T < 40^{\circ}\text{C}$
IP degree of protection (according to IEC 61010)	I
Degree of pollution (according to IEC 61010)	2
Excess voltage category	II
Permissible protection class	IP54
Ambient temperature	5°C to 40°C with water cooling
Permissible surrounding magnetic field	6 mT
Maximum irradiated thermal output	22.5 W
Maximum permissible rotor temperature of the turbopump	120°C
Maximum permissible temperature at HV-flange	120°C

Tbl. 2: Permissible ambient conditions



Notes on ambient conditions

The specified permissible ambient temperatures apply to operation of the turbopump at maximum permissible backing pressure or at maximum gas throughput, depending on the cooling type. The turbopump is intrinsically safe thanks to redundant temperature monitoring.

- The reduction in backing pressure or gas throughput permits operation of the turbopump at higher ambient temperatures as well.
- If the maximum permissible operating temperature of the turbopump is exceeded, the electronic drive unit first reduces the drive output and switches it off where necessary.

2.5 Proper use

- ▶ Use the turbopump only for generating vacuum.
- ▶ Use the turbopump only in combination with a suitable backing pump that can deliver up to the required maximum fore-vacuum pressure.
- ▶ Use the turbopump only in closed indoor areas.
- ▶ Use the turbopump only for the evacuation of dry and inert gases.
- ▶ Exclusively use C-version turbopumps with sealing gas supply for the pumping of corrosive media.

2.6 Foreseeable improper use

Improper use of the product invalidates all warranty and liability claims. Any use that is counter to the purpose of the product, whether intentional or unintentional, is regarded as misuse.

- Transport, installation or operation of the vacuum pump in an impermissible spatial position
- Establishing the voltage supply without correct installation
- Installing the pump with unspecified mounting material
- Pumping explosive media
- Pumps of corrosive media with turbopumps in the standard version
- Pumping of fluids
- Pumping of dust
- Operation with impermissible high gas throughput
- Operation with impermissible high fore-vacuum pressure
- Operation with excessively high irradiated heat output
- Operation in impermissible high magnetic fields
- Operation in an incorrect gas mode
- Venting with impermissible high venting rates
- Use for pressure generation
- Use in areas with ionizing radiation
- Operation in explosion-hazard areas
- Use in systems in which sporadic loads and vibrations or periodic forces act on the device
- The causing of hazardous operating conditions by a presetting on the electronic drive unit that is contrary to the process
- Use of accessories or spare parts that are not listed in these instructions

3 Product description

3.1 Identifying the product

- ▶ To ensure clear identification of the product when communicating with Pfeiffer Vacuum, always keep all of the information on the rating plate to hand.
- ▶ Learn about certifications through test seals on the product or at www.tuvdotcom.com with company ID no. 000021320.

3.1.1 Product types

The product designation of Pfeiffer Vacuum turbopumps from the HiPace series is composed of the family name, the size (which is based on the pumping speed of the vacuum pump) and, if required, an additional feature description.

Family	Size/model	Property, attribute, feature
HiPace	10 to 2800	none = Standard version
		mini = Compact version
		U = Overhead version
		C = Corrosive gas version
		P = Process
		M = Active magnetic bearing
		T = Temperature management
		E = High efficiency
		H = high compression
		I = ion implantation

Tbl. 3: Product designation of Pfeiffer Vacuum HiPace turbopumps

3.1.2 Product features

Feature	Version		
	HV flange	DN 200 ISO-K	DN 200 ISO-F
Flange material	Aluminium	Aluminium	Stainless steel

Tbl. 4: Turbopump features

Mains voltage ± 10%	Output of the electronic drive unit
100 to 120 V AC	700 to 930 W
200 to 240 V AC	1200 W

Tbl. 5: Drive power depending on the supplied mains voltage

3.2 Functional properties

The turbopump forms a compact unit with the electronic drive unit. The integrated power supply pack acts as a voltage supply.

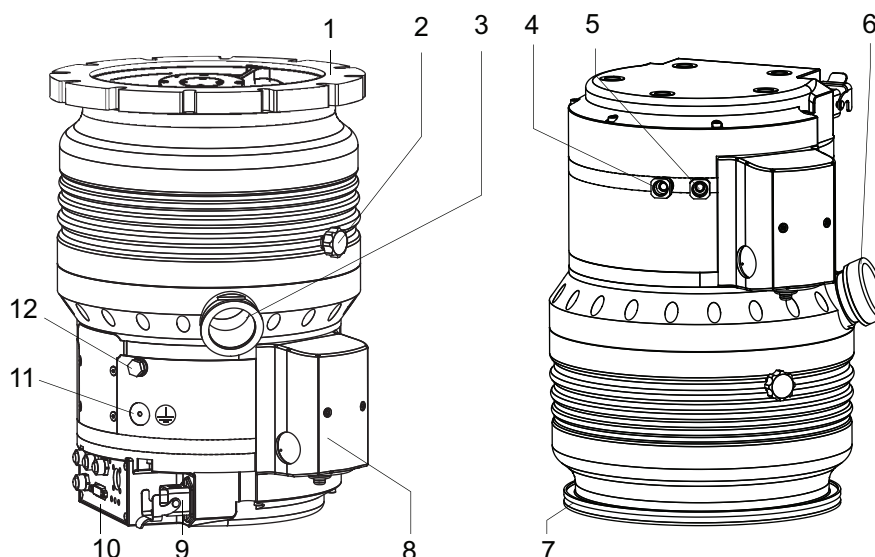


Fig. 1: HiPace 1200 design (example: standard version, DN 200 ISO-F | U-version
DN 200 ISO-K)

- | | |
|---|---|
| 1 High vacuum connection | 7 Protective cover for the high vacuum flange |
| 2 Venting connection, venting screw | 8 Protective cap of operating fluid pump |
| 3 Fore-vacuum connection, DN 40 ISO-KF | 9 Mains connection "AC in" |
| 4 Cooling water connection, outlet | 10 Electronic drive unit TC 1200 |
| 5 Cooling water connection, inlet | 11 Ground terminal |
| 6 Protective cover for the fore-vacuum flange | 12 Sealing gas connection |

3.2.1 Cooling

- Water cooling

The electronic drive unit automatically regulates the drive power down in the event of excessive temperatures.

3.2.2 Rotor bearing

Hybrid-bearing turbopump

- High vacuum side: wear proof permanent magnetic bearing
- Fore-vacuum side: ball bearing with ceramic balls

Turbopumps from the hybrid bearing HiPace series use ceramic ball bearings for the rotor bearing on the fore-vacuum side. The permanent lubrication and the performance of the ball bearings ensures the defined supply from an operating fluid pump.

The design of the operating fluid pump is largely mirror-symmetrical. The screws for filling the operating fluid are each marked by a symbol and are located on the long sides of the operating fluid pump. The drain screws are located at the front of the operating fluid pump.

3.2.3 Drive

- Electronic drive unit TC 1200

3.3 Shipment

- Turbopump with electronic drive unit and integrated power supply pack
- Protective cover for the high vacuum connection
- Protective cover for the fore-vacuum connection
- Mating plug for the "remote" connection on the TC 1200 (type-dependent)
- Mating plug for the "E74" connection on the TC 1200 (type-dependent)
- Mains power socket HAN 3A for mains connection of the turbopump

Product description

- Sealing gas valve (already fitted)
- Operating fluid F3 (50 ml) with syringe
- 2 eye bolts for transport
- 2 threaded hose nozzles with sealing ring for cooling water connection, G 1/4"
- Operating instructions

4 Transportation and Storage

4.1 Transport

WARNING

Risk of serious injury from swinging, toppling or falling objects

During transport, there is a risk of crushing and impact on swinging, toppling or falling objects. There is a risk of injuries to limbs, up to and including bone fractures and head injuries.

- ▶ Secure the danger zone if necessary.
- ▶ Pay attention to the center of gravity of the load during transport.
- ▶ Ensure even movements and moderate speeds.
- ▶ Observe safe handling of the transport devices.
- ▶ Avoid sloping attachment aids.
- ▶ Never stack products.
- ▶ Wear protective equipment, e.g. safety shoes.

NOTICE

Destruction of the vacuum pump due to failure to observe the type-specific spatial position

Impermissible spatial positions lead to pollution of the vacuum pump by operating fluid. There is a risk of pollution of the process vacuum and damage to the vacuum pump up to and including its destruction.

- ▶ Observe the labels relating to the valid spatial position of the vacuum pump.
- ▶ Observe the property labels on the type plate.
- ▶ Drain off the operating fluid before moving or transporting the vacuum pump.
- ▶ Only fill the vacuum pump with operating fluid after mechanical installation.



Pfeiffer Vacuum recommends keeping the transport packaging and original protective cover.

General information regarding safe transport

1. Observe weight specified on the rating plate.
2. Where possible, always transport or ship the turbopump in its original packaging.
3. Remove the protective cover only immediately prior to installation.

Information regarding transport of the turbopump in its packaging

1. Use a pallet truck to transport the turbopump when still in its packaging.
2. Note the center of gravity of the load.
3. Observe safe handling of manually operated transport devices.
4. Only transport the turbopump in its valid spatial position and with the rotor axis vertically aligned.
5. Ensure harmonious movements and moderate speeds.
6. Ensure a flat substrate.
7. Wear protective equipment, e.g. safety shoes.

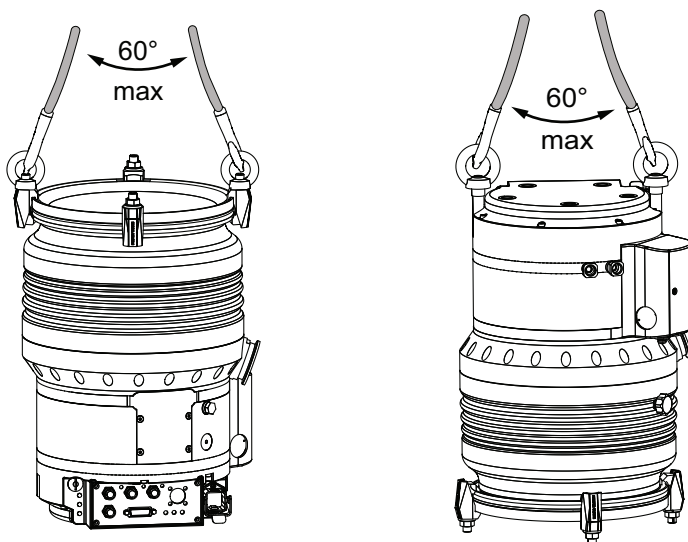


Fig. 2: Slinging points for transport of the turbopump in the standard and U versions

Information regarding transport of the turbopump without packaging

2 eye bolts are included in the shipment and are firmly bolted to the turbopump ex works.

1. Attach suitable lifting tools to both eye bolts.
2. Pay attention to the correct use and fastening of the lifting equipment.
3. Lift the turbopump vertically (e.g. out of the packaging).
4. Only transport the turbopump in its valid spatial position and with the rotor axis vertically aligned.
5. If necessary, remove the eye bolts after transport and installation.
 - Keep the eye bolts for future use.

4.2 Storage



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

Storing the turbopump

1. Close all flange openings with the original protective caps.
2. Close all other connections (e.g. venting connection) with the respective original parts.
3. Store the turbopump only indoors within the permissible temperature limits.
4. In rooms with humid or aggressive atmospheres: Hermetically seal the turbopump together with a drying agent in a plastic bag.

5 Installation

The installation of the turbopump and its fastening is of outstanding importance. The rotor of the turbopump revolves at very high speed. In practice it is not possible to exclude the risk of the rotor touching the stator (e.g. due to the penetration of foreign bodies into the high vacuum connection). The kinetic energy released acts on the housing and on the anchoring of the turbopump within fractions of a second.

Comprehensive tests and calculations conforming to ISO 27892 confirm the safety of the turbopump both against crashes (destruction of the rotor blade) and against bursting (breakage of the rotor shaft). The experimental and theoretical results are expressed in safety measures and recommendations for the correct and safe fastening of the turbopump.

5.1 Preparatory work

⚠ WARNING

Risk of cuts on moving, sharp-edged parts when reaching into the open high vacuum flange

Opening the high vacuum flange enables access to sharp-edged parts. A manual rotation of the rotor increases the danger situation. There is a risk of cut injuries up to a piece of your body being severed of (e.g. finger tips). There is a risk of hair and loose clothing being drawn in. Objects dropping into the turbopump will destroy the pump in subsequent operation.

- ▶ Remove the original protective cover only immediately prior to connecting the high vacuum flange.
- ▶ Never reach into the high vacuum connection.
- ▶ Wear protective gloves during installation.
- ▶ Never start the turbopump operation while the vacuum connections are open.
- ▶ Always carry out the mechanical installation before connecting the electrics.
- ▶ Prevent access to the high vacuum connection of the turbopump from the operator side (e.g. open vacuum chamber).

General notes for the installation of vacuum components

- ▶ Choose an installation location that permits access to the product and to supply lines at all times.
- ▶ Observe the ambient conditions given for the area of use.
- ▶ Provide the highest possible level of cleanliness during assembly.
- ▶ Ensure that flange components during installation are grease-free, dust-free and dry.

Select the installation location

1. Observe the instructions for transport to the installation location.
2. Make sure that there are sufficient cooling options for the turbopump.
3. Install suitable shielding if the surrounding magnetic fields exceed the permissible levels.
4. Install suitable shielding so that the irradiated thermal output does not exceed the permissible values when high temperatures occur due to the process.
5. Observe the permissible temperatures for the vacuum connection.

5.2 Connecting the high vacuum side

5.2.1 Requirements for the dimensioning of a counter flange

NOTICE

Risk of damage due to incorrect counter flange design

Unevenness on the operator-side counter flange results in stresses in the vacuum pump housing, even when properly attached. This can produce leakage or negative changes in running characteristics.

- ▶ Adhere to the shape tolerances for the counter flange.
- ▶ Observe the maximum flatness deviations over the entire surface.



The assembly of vertical superstructural parts on the high vacuum connection is the responsibility of the operating company. The loading capacity of the high vacuum flange is specific for the turbopump used. The total weight of superstructural parts must not exceed the maximum values specified.

If the rotor is suddenly blocked, the torques arising from the system and the high vacuum flange must be absorbed. The installation elements for turbo pumps are special designs by Pfeiffer Vacuum.

Maximum torque occurring in the event of a burst ¹⁾	Maximum permissible axial load on the high vacuum flange ²⁾	Flatness	Minimum tensile strength of the flange material in all operating states	Screw depth of the fastening screws	Maximum permissible surrounding magnetic field	Maximum permissible irradiated thermal output
9800 Nm	2000 N (equivalent to 200 kg)	± 0.05 mm	170 N/mm ²	2.5 x d	6.0 mT	22.5 W
			270 N/mm ²	1.5 x d		

Tbl. 6: Requirements for the dimensioning of customer-specific high vacuum connection

Important information for correct installation

- ▶ Only use the approved mounting kits of Pfeiffer Vacuum for the high vacuum connection of the turbopump.

5.2.2 Considering the earthquake protection

NOTICE

Vacuum pump damage caused by external vibrations

In the event of earthquakes or other external vibrations, there is the risk of the rotor coming into contact with the safety bearings, or the housing wall touching the turbopump. This can produce mechanical loads up to and including destruction of the turbopump.

- ▶ Make sure that all flange and safety connections absorb the resulting forces.
- ▶ Secure the vacuum chamber against displacement or tipping.

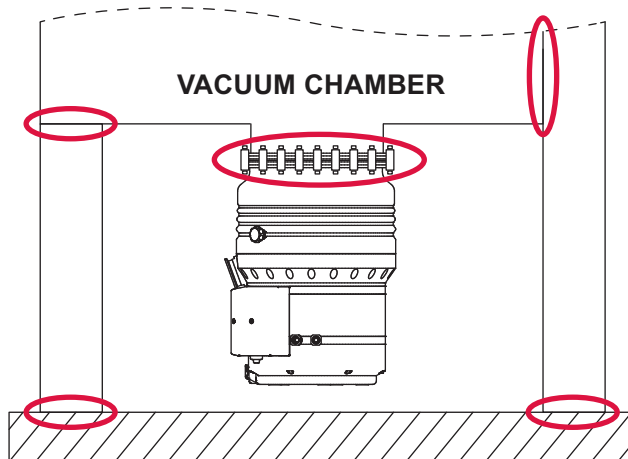


Fig. 3: Example: Secure against displacement and tipping caused by external vibrations

Safety connection, customer-side

- 1) The theoretically calculated torque in the event of a burst (rotor shaft breakage) according to ISO 27892 was not reached in any experimental test.
- 2) A one-sided load is not permitted.

5.2.3 Using a splinter shield or protective screen

Pfeiffer Vacuum centering rings with splinter shield or protective screen in the high vacuum flange protect the Turbopump against foreign matter from the vacuum chamber. The pumping speed of the pump is reduced according to the passage guide values and the size of the high vacuum flange.

Flange size	Reduced pumping speed in % by gas type			
	H ₂	He	N ₂	Ar
Splinter shield DN 200	10	13	26	28
Protective screen DN 200	3	3	8	9

Tbl. 7: Behavior of pumping speed when using a splinter shield or protective screen

- ▶ Use centering rings with protective screen or splinter shield for ISO flanges.
- ▶ Use additional protective screen or splinter shield for CF flanges.

5.2.4 Using the vibration compensator

Pfeiffer Vacuum vibration compensators are suitable for use on vibration-sensitive systems.

⚠ WARNING

Risk of injury caused by the turbopump breaking away with the vibration compensator in the event of a malfunction

Sudden jamming of the rotor generates high destructive torques in accordance with ISO 27892. When using a vibration compensator, this will probably lead to the turbopump being sheared off in use. The energy that this would release could throw the entire turbopump or shattered pieces from its interior through the surrounding space. Potentially dangerous gases can escape. There is a risk of very serious injuries, including death, and extensive property damage.

- ▶ Take suitable safety precautions on-site for the compensation of the occurring torques.
- ▶ Before installing a vibration compensator, you must first of all contact Pfeiffer Vacuum.

Installing the vibration compensator

1. Install the vibration compensator only with vertical passage.
2. Consider the flow resistance.
3. Secure the turbopump additionally to the high vacuum flange.
4. Observe the fastening of the ISO flanges.

5.2.5 Mounting orientations

NOTICE

Destruction of the vacuum pump due to failure to observe the type-specific spatial position

Impermissible spatial positions lead to pollution of the vacuum pump by operating fluid. There is a risk of pollution of the process vacuum and damage to the vacuum pump up to and including its destruction.

- ▶ Observe the labels relating to the valid spatial position of the vacuum pump.
- ▶ Observe the property labels on the type plate.
- ▶ Drain off the operating fluid before moving or transporting the vacuum pump.
- ▶ Only fill the vacuum pump with operating fluid after mechanical installation.

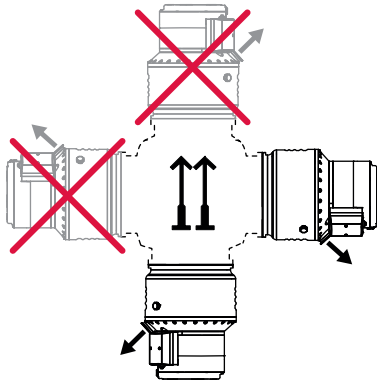


Fig. 4: Mounting orientations of the standard version, upright

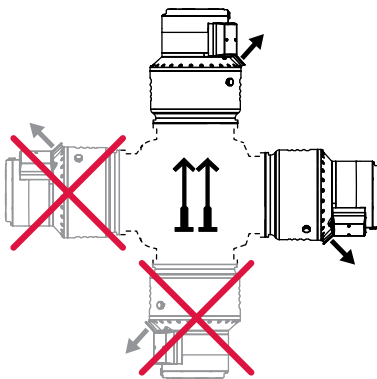


Fig. 5: Mounting orientations of the U version, overhead

► When using oil-sealed backing pumps, avoid backflow from the fore-vacuum range.

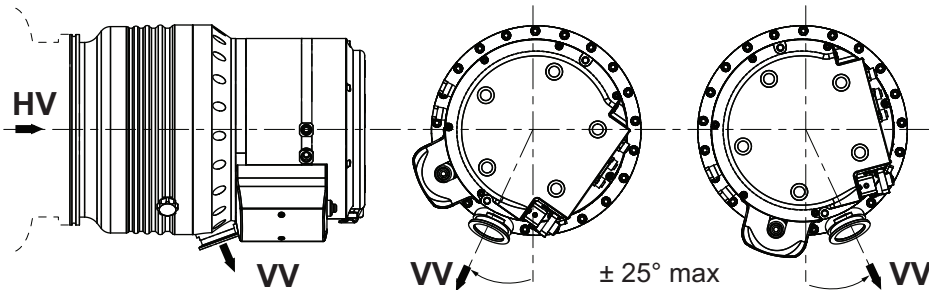


Fig. 6: Alignment of the fore-vacuum connection with horizontal mounting orientation

Determining the horizontal mounting orientation of the turbopump

1. Always align the fore-vacuum connection downwards vertically.
 - Permissible deviation $\pm 25^\circ$
2. Support the tube connections in front of the turbopump.
3. Do not allow any forces from the piping system to act on the turbopump.
4. Do not load the high vacuum flange of the turbopump on one side.

5.2.6 Attaching ISO-K flange onto ISO-K



ISO flange connections

For the connection of flanges in ISO-KF or ISO-K design, twisting may occur in the event of sudden blockage of the rotor, despite correct installation.

- Leak-tightness of the flange connection, however, is not jeopardized in this regard.

Required tools

- Wrench, WAF 15
- Calibrated torque wrench (Tightening factor ≤ 1.6)

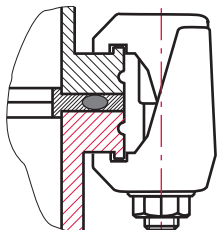


Fig. 7: Flange connection ISO-K to ISO-F, bracket screws

Connection with bracket screw

1. For the connection of the turbopump, use only the approved mounting kits from Pfeiffer Vacuum.
2. Connect the flange with the components of the mounting kit according to the figure.
3. Use all prescribed components for the turbopump.
4. Tighten the bracket screws cross-wise in 3 steps.
 - Tightening torque: **5, 15, 25 \pm 2 Nm**

5.2.7 Attaching ISO-K flange to ISO-F

The connection types for ISO-K flange installation with ISO-F flange are:

- "Hexagon head screw and tapped hole"
- "Stud screw with tapped hole"
- "Stud screw with through hole"

**ISO flange connections**

For the connection of flanges in ISO-KF or ISO-K design, twisting may occur in the event of sudden blockage of the rotor, despite correct installation.

- Leak-tightness of the flange connection, however, is not jeopardized in this regard.

Required tools

- Hexagon wrench (15 WAF)
- Calibrated torque wrench (tightening factor ≤ 1.6)

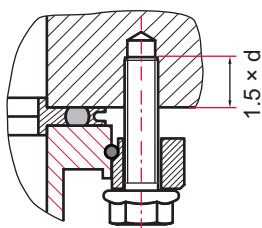


Fig. 8: Flange connection ISO-K to ISO-F, hexagon head screw and tapped hole

Connection of the hexagon head screw and tapped hole

1. For the connection of the turbopump, use only the approved mounting kits from Pfeiffer Vacuum.
2. Place the collar flange over the high vacuum flange of the turbopump.
3. Insert the snap ring in the side groove on the high vacuum flange of the turbopump.
4. Attach the turbopump with collar flange, snap ring and centering ring to the counter flange according to the figure.
5. Use all prescribed components for the turbopump.
6. Screw the hexagon head screws into the tapped holes.
 - Observe the minimum tensile strength of the flange material and the screw depth.
7. Fasten the hexagon head screws cross-wise in 3 steps.
 - Tightening torque: **5, 15, 25 \pm 2 Nm**

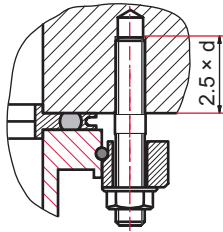


Fig. 9: Flange connection ISO-K to ISO-F, stud screw and tapped hole

Connection of the stud screw and tapped hole

1. For the connection of the turbopump, use only the approved mounting kits from Pfeiffer Vacuum.
2. Screw in the required number of stud screws with the shorter end in the holes on the counter flange.
 - Observe the minimum tensile strength of the flange material and the screw depth.
3. Place the collar flange over the high vacuum flange of the turbopump.
4. Insert the snap ring in the side groove on the high vacuum flange of the turbopump.
5. Attach the turbopump with collar flange, snap ring and centering ring to the counter flange according to the figure.
6. Use all prescribed components for the turbopump.
7. Secure the nuts cross-wise in 3 steps.
 - Tightening torque: **5, 15, 25 ± 2 Nm**

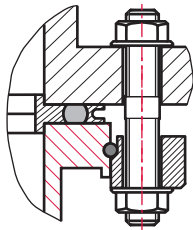


Fig. 10: Flange connection ISO-K to ISO-F, stud screw and through hole

Connection of the stud screw and through hole

1. For the connection of the turbopump, use only the approved mounting kits from Pfeiffer Vacuum.
2. Place the collar flange over the high vacuum flange of the turbopump.
3. Insert the snap ring in the side groove on the high vacuum flange of the turbopump.
4. Attach the turbopump with collar flange, snap ring and centering ring to the counter flange according to the figure.
5. Use all prescribed components for the turbopump.
6. Tighten the nuts cross-wise in 3 steps.
7. Tightening torque: **5, 15, 25 ± 2 Nm**

5.2.8 Attaching ISO-F flange to ISO-F

The connection types for ISO-F flange installation with ISO-F flange are:

- "Hexagon head screw and tapped hole"
- "Hexagon head screw and through hole"
- "Stud screw with tapped hole"
- "Stud screw with through hole"

Required tools

- Hexagon wrench (15 WAF)
- Calibrated torque wrench (tightening factor ≤ 1.6)

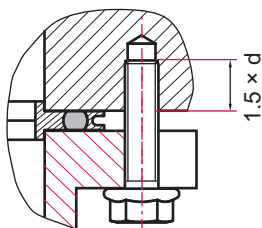
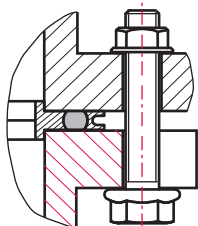
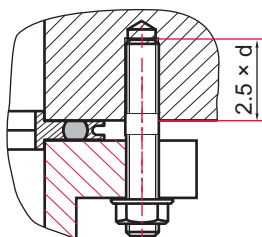


Fig. 11: Flange connection ISO-F, hexagon head screw and tapped hole**Connection of the hexagon head screw and tapped hole**

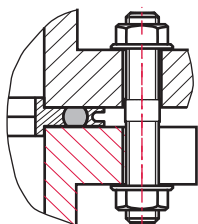
1. For the connection of the turbopump, use only the approved mounting kits from Pfeiffer Vacuum.
2. Attach the turbopump with centering ring to the counter flange according to the figure.
3. Use all prescribed components for the turbopump.
4. Screw the required number of hexagon head screws into the tapped hole.
 - Observe the minimum tensile strength of the flange material and the screw depth.
5. Fasten the hexagon head screws cross-wise in 3 steps.
 - Tightening torque: **10, 20, 38 ± 3 Nm**

**Fig. 12: Flange connection ISO-F, hexagon head screw and through hole****Connection of the hexagon head screw and through hole**

1. For the connection of the turbopump, use only the approved mounting kits from Pfeiffer Vacuum.
2. Attach the turbopump with centering ring to the counter flange according to the figure.
3. Use all prescribed components for the turbopump.
4. Push the hexagon head screws through the holes of the turbopump and counter flange.
5. Secure the hexagon nuts.
6. Fasten the screw connections cross-wise in 3 steps.
 - Tightening torque: **10, 20, 38 ± 3 Nm**

**Fig. 13: Flange connection ISO-F, stud screw and tapped hole****Connection of the stud screw and tapped hole**

1. For the connection of the turbopump, use only the approved mounting kits from Pfeiffer Vacuum.
2. Screw in the stud screws with the shorter end in the tapped holes on the counter flange.
 - Observe the minimum tensile strength of the flange material and the screw depth.
3. Attach the turbopump with centering ring to the counter flange according to the figure.
4. Use all prescribed components for the turbopump.
5. Secure the hexagon nuts.
6. Tighten the nuts cross-wise in 3 steps.
 - Tightening torque: **10, 20, 38 ± 3 Nm**

**Fig. 14: Flange connection ISO-F, stud screw and through hole**

Connection of the stud screw and through hole

1. For the connection of the turbopump, use only the approved mounting kits from Pfeiffer Vacuum.
2. Attach the turbopump with collar flange, snap ring and centering ring to the counter flange according to the figure.
3. Use all prescribed components for the turbopump.
4. Fasten the screw connections cross-wise in 3 steps.
 - Tightening torque: **10, 20, 38 ± 3 Nm**

5.2.9 Fastening CF flange to CF-F

The connection types for CF installation with CF flange are:

- "Hexagon head screw and through hole"
- "Stud screw with tapped hole"
- "Stud screw with through hole"

NOTICE
<p>Leaks may occur due to the incorrect installation of CF flanges</p> <p>Inadequate cleanliness when handling CF flanges and copper gaskets results in leaks and may cause process damage.</p> <ul style="list-style-type: none"> ▶ Always wear suitable gloves before touching or fitting any components. ▶ Fit seals only if dry and free of grease. ▶ Take care of damaged surfaces and cut edges. ▶ Replace the damaged components.

Required tools

- Hexagonal wrench (13 WAF)
- Calibrated torque wrench (tightening factor ≤ 1.6)

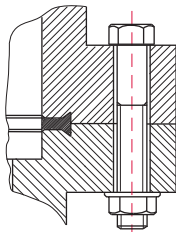


Fig. 15: Flange connection CF-F, hexagon head screw and through hole

Connection of the hexagon head screw and through holes

1. For the connection of the turbopump, use only the approved mounting kits from Pfeiffer Vacuum.
2. If used: Insert the protective screen or splinter shield with clamping lugs downwards in the turbopump high vacuum flange.
3. Place the seal exactly in the hollow.
4. Connect the flange with the components of the mounting kit according to the figure.
5. Tighten the screw couplings all the way around.
 - Tightening torque: **22 ± 2 Nm**
6. Then check the torque, since flowing of the sealing material may make it necessary to re-tighten the screws.

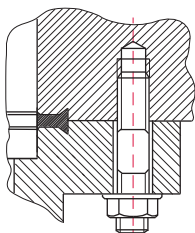


Fig. 16: Flange connection CF-F, stud screw and tapped hole

Connection of the stud screw and tapped hole

1. For the connection of the turbopump, use only the approved mounting kits from Pfeiffer Vacuum.
2. Screw in the required number of stud screws with the shorter end in the holes on the counter flange.
3. If used: Insert the protective screen or splinter shield with clamping lugs downwards in the turbopump high vacuum flange.
4. Place the seal exactly in the hollow.
5. Connect the flange with the components of the mounting kit according to the figure.
6. Tighten the screw couplings all the way around.
 - Tightening torque: **22 ± 2 Nm**
7. Then check the torque, since flowing of the sealing material may make it necessary to re-tighten the screws.

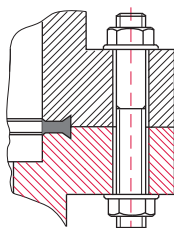


Fig. 17: Flange connection CF-F, stud screw and through hole

Connection of the stud screw and through hole

1. For the connection of the turbopump, use only the approved mounting kits from Pfeiffer Vacuum.
2. If used: Insert the protective screen or splinter shield with clamping lugs downwards in the turbopump high vacuum flange.
3. Place the seal exactly in the hollow.
4. Connect the flange with the components of the mounting kit according to the figure.
5. Tighten the screw couplings all the way around.
 - Tightening torque: **22 ± 2 Nm**
6. Then check the torque, since flowing of the sealing material may make it necessary to re-tighten the screws.

5.3 Filling the operating fluid

⚠ WARNING

Danger of poisoning from toxic vapors

Igniting and heating synthetic operating fluid generates toxic vapors. Danger of poisoning if inhaled.

- ▶ Observe the application instructions and precautions.
- ▶ Do not allow tobacco products to come into contact with the operating fluid.

NOTICE

Destruction of the turbopump due to incorrect operation when filling with operating fluid

The operating fluid filling quantity depends on the selected spatial position of the turbopump. The filler screws are located at clearly marked positions on both sides of the operating fluid pump of the turbopump. Confusion with other screw plugs leads to impurities, damage to the turbopump, up to and including its destruction.

- ▶ Only fill the turbopump with operating fluid after mechanical installation.
- ▶ Fill the turbopump with operating fluid via one of the filler screws marked with an oil can symbol only.
- ▶ If in doubt, contact Pfeiffer Vacuum.

The operating fluid pump of the turbopump is situated beneath a protective cap. The screws for filling the operating fluid are identified with a respective symbol. The drain screws are located at the front of the operating fluid pump.

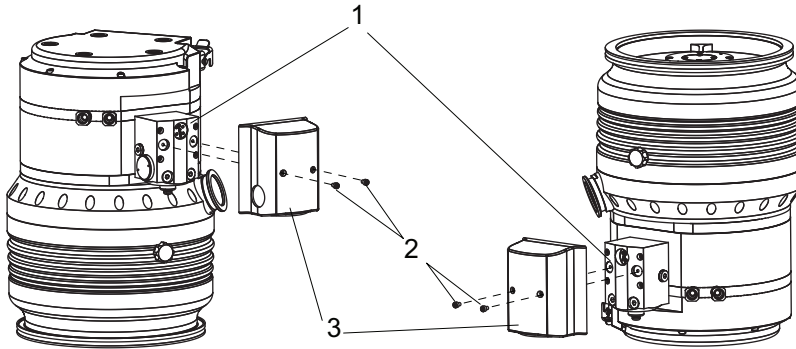


Fig. 18: Removing the protective cap on U- or standard versions

- 1 Operating fluid pump
- 2 Allen head screws
- 3 Protective cap

Required tools

- Allen key, size 3
- Allen key, size 5
- Calibrated torque wrench (tightening factor ≤ 1.6)

Permitted operating fluid

- F3 for vacuum pumps, 50 ml

Remove the protective cap from the operating fluid pump

- ▶ Unscrew the Allen head screws.
- ▶ Remove protective cap.

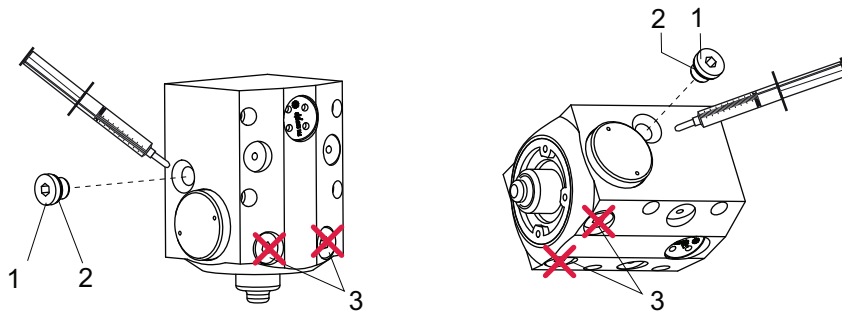


Fig. 19: Position of the operating fluid filler screws depending on orientation of the turbopump

- 1 Filler screw
- 2 O-ring
- 3 Drain screw

Procedure

1. Unscrew and remove the higher filler screw from the operating fluid pump.
2. Use the syringe and the operating fluid from the turbopump shipment.
3. Place a container below the filling port.
4. Continue to fill in operating fluid until it overflows at the filling port
 - Maximum volume **50 ml**.
 - In vertical mounting orientation, the filling volume is a little lower.
5. Seal the filler screw.
 - Tightening torque: **3 Nm**

5.4 Connecting the fore-vacuum side

⚠ WARNING

Danger to life from poisoning where toxic process media leak from damaged connections

Sudden twisting of the turbopump in the event of a fault causes fittings to accelerate. There is the risk of damaging on-site connections (e.g., fore-vacuum line) and resulting leaks. This results in leakage of process media. In processes involving toxic media, there is a risk of injury and danger to life due to poisoning.

- ▶ Keep masses connected to the turbopump as low as possible.
- ▶ Use flexible lines to connect to the turbopump where necessary.



We recommend

Use the turbopump only in combination with a suitable backing pump that can deliver up to the required maximum fore-vacuum pressure. To achieve the fore-vacuum pressure, use a suitable vacuum pump or a pumping station from the Pfeiffer Vacuum range.

In this case, the backing pump is also controlled directly via the turbopump electronic drive unit interfaces (e.g., relay box or connection cable).

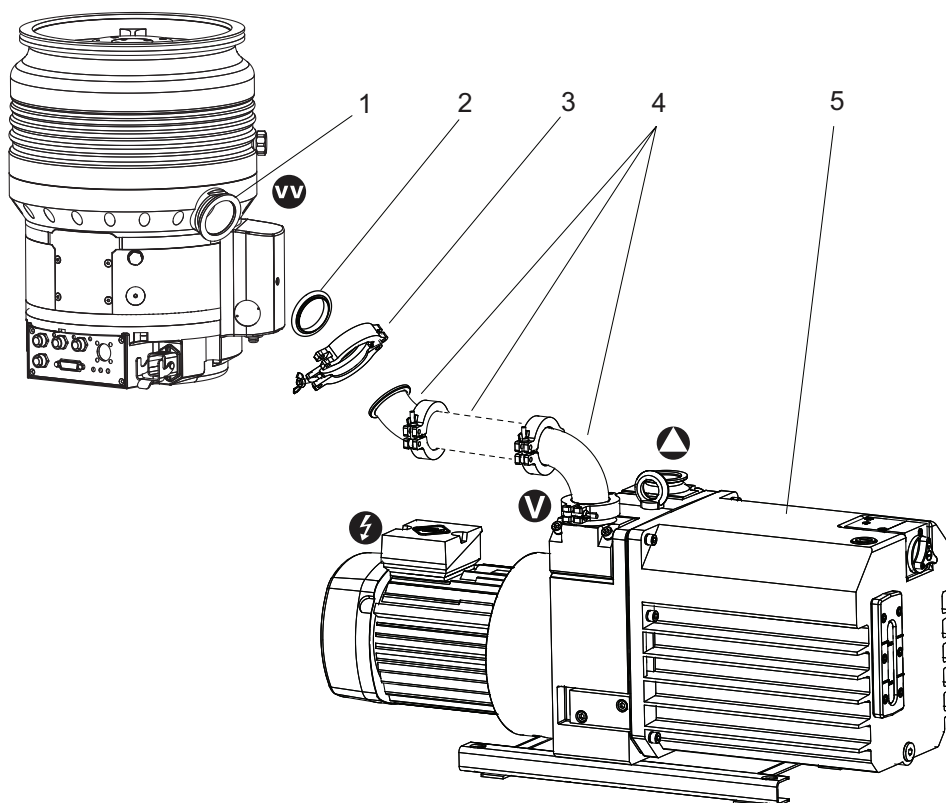


Fig. 20: Example of fore-vacuum connection

- | | |
|------------------------------------|---|
| 1 turbopump fore-vacuum connection | 4 Vacuum components DN 40 ISO-KF |
| 2 Centering ring | 5 Backing pump (e.g. two-stage vane pump) |
| 3 Circlip | |

Procedure

1. With rigid pipe connections, include bellows to attenuate external vibrations.
2. Install a fore-vacuum connection with small flange components, e.g. connection elements and pipe components DN 40 ISO-KF from the [Pfeiffer Vacuum Components Shop](#).
3. Implement measures to counteract the backflow of operating fluids or condensate from the fore-vacuum area.

4. Observe the information in the operating manual of the backup pump or pumping station when connecting and operating it.

5.5 Connecting the cooling water supply

⚠ WARNING

Risk of scalding from suddenly escaping hot cooling water

The turbopump water connections are open to both sides. When connecting the cooling water supply, there is a risk of scalding from suddenly escaping, hot cooling water at over pressure.

- ▶ Prior to installation, ensure that pressure is discharged from the cooling water system, and that it is cooled down.
- ▶ Wear protective equipment, e.g., safety goggles and gloves.

The HiPace 1200 turbopumps use water cooling as standard.

Parameter	Cooling water
Appearance	<ul style="list-style-type: none"> • filtered • mechanically clear • visually clear • no turbidity • no sediment • free from grease and oil
pH value	7 to 9
Carbonate hardness, max.	10 °dH 12.53 °e 17.8 °fH 178 ppm CaCO ₃
Chloride content, max.	100 mg/l
Sulfate content, max.	240 mg/l
Carbonic acid content, max.	not detectable
Ammonia content, max.	not detectable
Electrical conductivity, max.	500 µS/cm
Particle size, max.	150 µm
Cooling water temperature	See "Technical data"
Cooling water consumption	See "Technical data"
Feed line overpressure, max.	6000 hPa

Tbl. 8: Requirements on the cooling water composition

Connection to the turbopump	External cooling water supply
Internal thread, G 1/4"	Hose cable
Hose nozzles (included with shipment)	Inner hose diameter 7 to 8 mm

Tbl. 9: Requirements on the cooling water connection

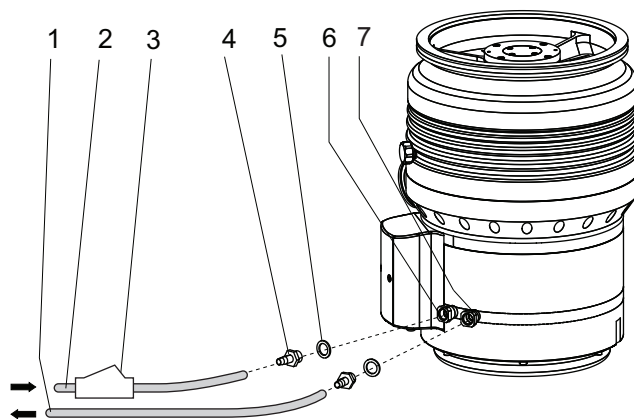


Fig. 21: Cooling water connection

- | | |
|------------------------|-------------------------------------|
| 1 Return line | 5 Sealing ring (2x) |
| 2 Feed line | 6 Cooling water inlet, 1/4" thread |
| 3 Dirt trap | 7 Cooling water outlet, 1/4" thread |
| 4 Threaded nozzle (2x) | |

Procedure

The following instructions describe how to connect the cooling water supply to the turbopump with hose nozzles from the shipment.

Requirements: The customer-side cooling system is closed and depressurized. The provided hose connections correspond to the turbopump connections.

Pfeiffer Vacuum recommends the use of a dirt trap in the supply line.

1. Screw one hose nozzle with sealing ring onto each of the turbopump's cooling water connections.
 - Tightening torque: maximum **15 Nm**
2. Connect the cooling water supply line to the hose nozzle at the designated cooling water inlet of the turbopump.
3. Connect the cooling water return line to the hose nozzle at the designated cooling water outlet of the turbopump.
4. Secure the hose lines on the turbopump with hose clamps.

5.6 Connecting accessories



Installation and operation of accessories

Pfeiffer Vacuum offers a series of special, compatible accessories for its products.

- Information and ordering options for approved [accessories](#) can be found on-line.
- The following accessories are not included in the scope of supply.

5.6.1 Connecting accessories to the turbopumps



Electronic drive unit TC 1200 accessory connection

The electronic drive unit of the turbopump offers space for the connection of maximum 4 accessory devices. M12 sockets with the designation "accessory" are available for this purpose.

- The accessory connections have been preconfigured at the factory.
- After connecting pre-configured accessory devices, these are immediately ready for operation according to the factory settings.
- The use of other accessories for turbopumps is possible and requires settings in the configuration of the electronic drive unit.
- The desired accessory output is configured via RS-485 using Pfeiffer Vacuum display and control units or a PC.
- You can find more detailed information in the "Electronic drive unit TC|1200" operating manual.

	Electronic drive unit connection	Accessory connection	Y-connector	Pre-set configuration
	Acc. A	A1	Y-1	Sealing gas valve
		A2	Y-2	Backing pump
	Acc. B	B1	Y-1	Venting valve
		B2	Y-2	Heating

Tbl. 10: Factory pre-set accessory connections on the electronic drive unit

Connecting accessory devices

1. Observe the installation instructions in the operating instructions for the relevant accessory.
2. Note the existing configuration of existing connections and control lines.
3. Connect only matching accessory devices to the electronic drive unit.
4. Use the Y-distributor from the Pfeiffer Vacuum range of accessories if you want to connect 3 or 4 devices.

Using additional accessories

1. Observe the installation instructions in the operating instructions for the relevant accessory.
2. Note the existing configuration of existing connections.
3. Use the Pfeiffer Vacuum display and control unit DCU 002, or a DCU with integrated power supply pack.

5.6.2 Connecting sealing gas

The use of sealing gas serves to protect the turbopump in dusty processes or with excessive gas throughputs. Sealing gas prevents the ingress of damaging substances into the motor and bearing area. The supply is carried out either via a sealing gas valve or a sealing gas throttle without control.

- Pfeiffer Vacuum recommends the use of sealing gas from 50 % of the maximum gas throughput.
- The permissible inlet pressure for sealing gas is 1,500 hPa absolute.
- The flow rate for sealing gas is at 17.5 to 20 sccm.

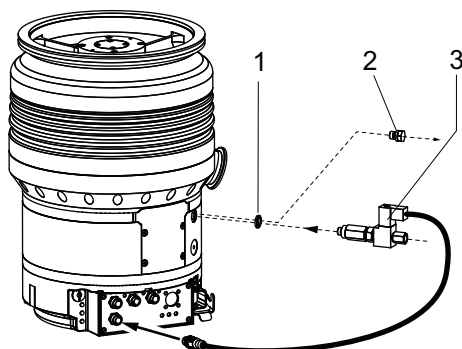


Fig. 22: Connecting the sealing gas valve

Connecting the sealing gas valve

1. Unscrew the screw plug with sealing ring out of the sealing gas connection of the turbopump.
2. Screw the sealing gas valve with the outlet side into the sealing gas connection of the turbopump.
3. Screw the control line of the sealing gas valve into a free accessory connection on the electronic drive unit.
 - The specification in the configuration is "accessory A1".
4. Configure the accessory output for the sealing gas via the interfaces of the electronic drive unit.

Connecting the sealing gas throttle without control valve

1. Unscrew the screw plug with sealing ring out of the sealing gas connection of the turbopump.
2. Screw the sealing gas throttle with the outlet side into the sealing gas connection of the turbopump.

Establishing the sealing gas supply

In case you want to use room air as sealing gas, the sealing gas valve is ready for operation immediately.

In case you want to use another inert gas (e.g. nitrogen N_2) as sealing gas, follow the handling steps.

1. Provide an external sealing gas supply with a maximum inlet pressure of 1,500 hPa absolute.
2. Connect the sealing gas supply to the inlet side (1/8" thread) of the valve.
3. If required, use a connecting adapter from the accessory of the valve (not included in the scope of supply).

5.6.3 Connecting a venting valve

A Pfeiffer Vacuum venting valve serves the automatic venting of a turbopump after switching off or in event of a power failure.

- The permissible inlet pressure for venting gas is 1,500 hPa absolute.

Connecting the venting valve

1. Unscrew the venting screw with sealing ring out of the turbopump by hand.
2. Screw the venting valve with the outlet side into the venting connection of the turbopump.

Connect the venting valve to the accessory connection "accessory B1"

- ▶ Screw the control line of the venting valve into a free accessory connection on the electronic drive unit.
 - The specification in the configuration is "accessory B1".

Establish the venting gas supply

In case you want to use dry room air as venting gas, the venting valve is ready for operation immediately.

In case you want to use another inert gas (e.g. nitrogen N_2) as venting gas, follow the handling steps.

1. Provide an external venting gas supply with a maximum inlet pressure of 1,500 hPa absolute.
2. Connect the venting gas supply to the inlet side (G 1/8") of the valve.
3. If required, use a connecting adapter for the valve inlet side (not included in the shipment).

5.6.4 Installing a heating jacket

⚠ CAUTION

Danger of burns on hot surfaces

When baking out the turbopump or vacuum chamber, there is a risk of burns on contact, even after the housing heater has been switched off.

- ▶ Implement thermal insulation measures on the heating jacket, pump housing, and vacuum chamber.
- ▶ Wear personal protective equipment if necessary.

NOTICE

Vacuum pump destruction due to excessive energy input during operation

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

- ▶ Consult Pfeiffer Vacuum before combining varying loads on the vacuum pump. Lower limit values apply.

The turbopump and vacuum chamber must be baked out to reach the ultimate pressure more quickly. The heating jacket may only be used in turbopumps with high vacuum flange in stainless steel design. The heating duration depends on the degree of contamination in the process, as well as the final pressure to be reached, and should be at least 4 hours.

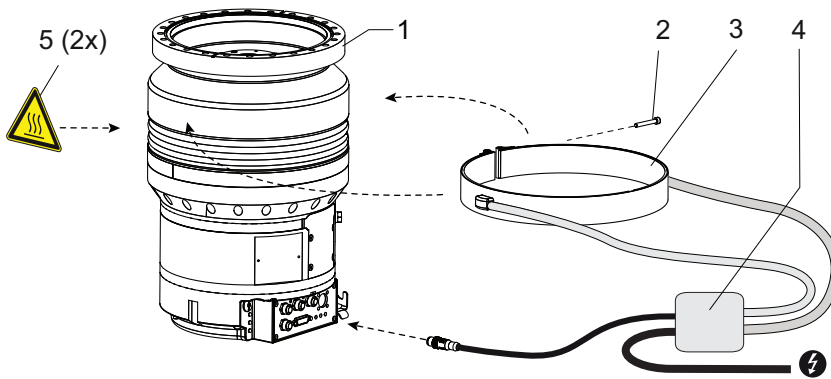


Fig. 23: Connection of the heating jacket

- | | |
|--------------------|---------------------------------|
| 1 Pump housing | 4 Heating relay box |
| 2 Allen head screw | 5 "Hot surface" warning sticker |
| 3 Heating jacket | |

Required tools

- Allen key, size 4 or 5

Installing the heating jacket

1. Carefully bend out the heating jacket at the outer clamping strap.
2. Push the jacket onto the cylindrical section of the pump body from the side.
3. Care should be taken that the heater bands do not become deformed and that the jacket is resting flush against the body.
4. Secure the heating jacket onto the body with the Allen head screw.
5. Observe the max. permissible temperature on the connection flange of the vacuum chamber.
6. Install suitable shielding plates as protection against the radiated heat input exceeding the maximum values.

Fixing screw thread	Tightening torque in cold condition	Tightening torque for bakeout	One-time retightening after cooling
M5	6 Nm	7 Nm	7 Nm
M6	11 Nm	12 Nm	12 Nm

Tbl. 11: Tightening torque for heating jacket fastening screws

Connecting the control line

1. Connect the accessory control line to the electronic drive unit using the corresponding accessory connection, and tighten the plug securely.
2. Check the specification in the configuration "accessory B1".
3. Establish the power supply for the relay box in accordance with the operating instructions for the accessory.

5.7 Connecting the electrical supply

⚠ DANGER

Danger to life from electric shock

Contact with exposed and live elements generate an electric shock. Incorrect connection of the mains supply leads to the risk of live housing parts that can be touched. There is a risk to life.

- ▶ Before the installation, check that the connection leads are voltage-free.
- ▶ Make sure that electrical installations are only carried out by qualified electricians.
- ▶ Provide adequate grounding for the device.
- ▶ After connection work, carry out an earthed conductor check.

5.7.1 Grounding the vacuum pump

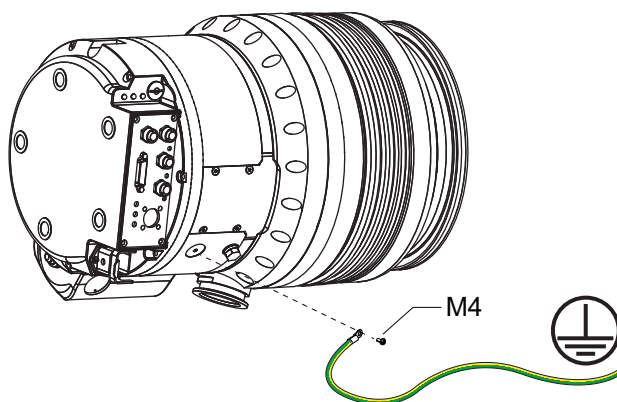


Fig. 24: Example: Connecting the grounding cable

Required aids

- Screw M4 × 8
- Shake proof washer M4, if required
- Suitable grounding cable with cable lug size M4

Procedure

1. Use a suitable grounding cable to divert applicative interferences.
2. Route the connection in accordance with locally applicable provisions.
3. Use the turbopump ground terminal (M4 female thread).



5.7.2 Establishing the electric connection

⚠ WARNING

Danger to life from electric shock due to improperly performed installation

The device uses voltage that is dangerous on contact as the electrical power supply. Potentially fatal situations arise due to unsafe or incorrectly installation when reaching into the device.


- ▶ Ensure that the system is safely integrated into an emergency off safety circuit.
- ▶ Do not carry out any unauthorized modifications or changes to the device.

⚠ WARNING

Danger of cut injuries from unexpected start up.

The use of mating plugs of the electronic drive unit (accessories) enables the automatic run-up of the vacuum pump as soon the power is turned on. Attaching mating plugs before or during the installation leads to the movement of parts hence the risk of cut injuries by sharp-edged in the exposed high vacuum flange.

- ▶ Only connect mating plugs after the mechanical installation.
- ▶ Only switch on the vacuum pump immediately prior to operation.

	Pin	Assignment
	1	Phase L
	2	Neutral conductor
	3	not connected
	PE	Earthed conductor

Tbl. 12: Terminal lay-out of the power supply connector

Preparing a supply cable for the turbopump

There are 2 options for configuring the mains connection for the turbopump.

- ▶ Make sure that you have the correct supply voltage.
- ▶ Order a corresponding mains connection cable from the Pfeiffer Vacuum accessories range.
- ▶ Assemble your own mains connection cable using the HAN 3A connecting socket from the shipment.

6 Operation

6.1 Commissioning

⚠ WARNING

Danger of cut injuries from unexpected start up.

The use of mating plugs of the electronic drive unit (accessories) enables the automatic run-up of the vacuum pump as soon the power is turned on. Attaching mating plugs before or during the installation leads to the movement of parts hence the risk of cut injuries by sharp-edged in the exposed high vacuum flange.

- ▶ Only connect mating plugs after the mechanical installation.
- ▶ Only switch on the vacuum pump immediately prior to operation.

NOTICE

Vacuum pump destruction due to excessive energy input during operation

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

- ▶ Consult Pfeiffer Vacuum before combining varying loads on the vacuum pump. Lower limit values apply.

NOTICE

Damage to the turbopump due to excess temperature

High process temperatures will cause damage to the pump.

- ▶ Always use water cooling when using the vacuum pump with a housing heating or during operation with heated vacuum chambers.
- ▶ Avoid additional energy input in the vacuum pump when using a housing heater.
- ▶ Observe the limit values specified in the ambient conditions.

NOTICE

Turbopump destruction due to gases with too high molecular masses

When pumping gases with impermissibly high molecular masses, there is the risk of destroying the turbopump.

- ▶ Ensure that the correct gas mode **[P:027]** is set in the electronic drive unit.
- ▶ Consult Pfeiffer Vacuum before using gases with larger molecular masses (> 80).

Important settings and function-related variables are factory-programmed into the vacuum pump electronic drive unit as parameters. Each parameter has a three-digit number and a description. Parameter-driven operation and control is supported via Pfeiffer Vacuum displays and control units, or externally via RS-485 using Pfeiffer Vacuum protocol.

Parameter	Name	Designation	Adjustment, setting
[P:027]	GasMode	Gas mode	0 = heavy gases
[P:035]	CfgAccA1	Accessory connection A1	5 = Sealing gas
[P:036]	CfgAccB1	Accessory connection B1	1 = Venting valve
[P:037]	CfgAccA2	Accessory connection A2	3 = backing pump
[P:038]	CfgAccB2	Accessory connection B2	2 = heating
[P:700]	RUTimeSVal	Set value run-up time	8 min
[P:701]	SpdSwPt1	Speed-control switching point	80 %
[P:707]	SpdSVal	Speed-control operation specification	65 %
[P:708]	PwrSVal	Set value power consumption	100 %

Parameter	Name	Designation	Adjustment, setting
[P:720]	VentSpd	Venting at rotation speed, delayed venting	50 %
[P:721]	VentTime	Venting time, delayed venting	3600 s

Tbl. 13: Preconfigured settings for turbopumps when delivered

Putting the turbopump into operation

1. When using water cooling, observe the cooling water flow and throughput.
2. When using sealing gas, observe the sealing gas flow and throughput.
3. Observe the reduction of the drive power depending on the mains connection voltage provided.
4. Provide the current supply for the product.

6.2 Operating modes

The turbopump can be operated in different modes.

- Operation without control unit
- Operation via connection "E74"
- Operation via "remote" connection
- Operation via interface RS-485 and Pfeiffer Vacuum display and control unit or PC
- Operation via field bus

6.2.1 Operation without operating unit



Automatic start

When using the supplied mating plug on the electronic drive unit or bridging contacts according to the terminal lay-out, the turbopump is ready for operation. Once the supply voltage is provided, the turbopump starts up immediately.

Instructions for operation without control panel

1. Use only the approved Pfeiffer Vacuum mating plug with bridges on the connection of the electronic drive unit.
2. Switch on the mains supply of the turbopump only immediately before operation.

After applying the operating voltage, the electronic drive unit carries out a self-test to check the supply voltage. After completing the self-test successfully, the turbopump starts and activates connected additional equipment according to the configuration.

6.2.2 Operation via connection "E74"

Operation is possible via the 15-pole D-sub connection with the "E74" designation on the electronic drive unit. Besides the signals defined in the Directive SEMI E74-0301, the connection is provided with an inverted alarm signal and an analog output.

Instructions for operation with E74

- ▶ See the operating manual of the electronic drive unit with E74 version.

6.2.3 Operation via multi-function connection "remote"

Remote control is available via the 26-pole D-sub connector with the "remote" designation on the electronic drive unit. The accessible individual functions are mapped to "PLC levels".

Instructions for remote control operation

- ▶ See the operating manual of the electronic drive unit for the standard version.

6.2.4 Operation via Pfeiffer Vacuum display and control unit

The connection of a Pfeiffer Vacuum display and control panel permits the controlling of the turbopump via the parameters fixed in the electronic drive unit.

Instructions for operation with display and control unit

1. When handling the Pfeiffer Vacuum display and control unit, observe the associated operating manual:
 - "DCU" operating manual available from the [Pfeiffer Vacuum Download Center](#).
 - "HPU" operating manual available from the [Pfeiffer Vacuum Download Center](#).
2. Observe the electronic drive unit operating manual from the turbopump scope of delivery.
3. Connect the display and control unit to the connection "RS-485" on the electronic drive unit.

6.2.5 Operation via field bus

Integrating and operating Pfeiffer Vacuum turbopumps in the customer's field bus system is possible when using an electronic drive unit with a corresponding connection panel.

The following are available:

- Profibus
- EtherCAT
- DeviceNet

Instructions for field bus operation

- ▶ See the operating manual of the electronic drive unit with corresponding connection panel.

6.3 Switching on the turbopump**⚠ WARNING****Danger of cut injuries from unexpected start up.**

The use of mating plugs of the electronic drive unit (accessories) enables the automatic run-up of the vacuum pump as soon the power is turned on. Attaching mating plugs before or during the installation leads to the movement of parts hence the risk of cut injuries by sharp-edged in the exposed high vacuum flange.

- ▶ Only connect mating plugs after the mechanical installation.
- ▶ Only switch on the vacuum pump immediately prior to operation.

⚠ WARNING**Risk of burns on hot surfaces when using additional equipment for heating during operation**

The use of additional equipment for heating the vacuum pump or for optimizing the process generates very high temperatures on surfaces that can be touched. There is a risk of burning.

- ▶ If necessary, set up a contact guard.
- ▶ If necessary, apply the warning stickers provided for this at the danger points.
- ▶ Ensure adequate cooling down before working on the vacuum pump or in its vicinity.
- ▶ Wear protective equipment, e.g., gloves.

⚠ WARNING**Risk of serious injury in the event of vacuum pump destruction due to over pressure**

Gas entry with very high over pressure results in destruction of the vacuum pump. There is a risk of serious injury due to ejected objects.

- ▶ Never exceed the permissible 1500 hPa (absolute) inlet pressure on the suction side or the venting and sealing gas connection.
- ▶ Make sure that high, process-related over pressures cannot directly enter the vacuum pump.

Establishing mains connection

1. Make sure that the connection to the operator's network is interrupted or switched off.
2. Plug a mains cable into the "AC in" connector on the turbopump's electronic drive unit.
3. Connect the mounting brackets to the connecting plug.













Switching on the turbopump

- ▶ Connect the mains cables to the operator's mains supply or switch it on.

6.4 Operation monitoring

6.4.1 Operating mode display via LED

LEDs on the electronic drive unit indicate basic operating conditions of the turbopump. A differentiated malfunction and warning display is possible only for operation with DCU or HPU.

LED	Symbol	LED status	Display	Meaning
Green 		Off	_____	without current
		On, flashing		"Pumping station OFF", rotation speed $\leq 60 \text{ rpm}^{-1}$
		On, inverse flashing		"Pumping station ON", set rotation speed not reached
		On, constant		"Pumping station ON", set rotation speed reached
		On, flashing		"Pumping station OFF", speed $> 60 \text{ rpm}^{-1}$
Yellow 		Off	_____	no warning
		On, constant		Warning
Red 		Off	_____	no error, no warning
		On, constant		Malfunction, error

Tbl. 14: Behavior and meaning of the LEDS of the electronic drive unit

6.4.2 Temperature monitoring

If threshold values are exceeded, output signals from temperature sensors allow the turbopump to be switched to a safe condition. Depending on the type, temperature thresholds for warning and malfunction messages are stored immutably in the electronic drive unit. For information purposes, various status requests are set up in the parameter set.

- If the excess temperature warning threshold is exceeded, the electronics reduce the turbopump drive power with the aim of avoiding shutdown.
 - Examples are an impermissible motor temperature, or impermissibly high housing temperature.
- Further reduction of drive power and thus decreasing speed can potentially lead to the set rotation speed switchpoint not being met, and thus to the turbopump switching off.
- If the error threshold for excess temperature is exceeded, the turbopump switches off immediately.

6.5 Switching off and venting



Recommendation

After the turbopump is switched off, Pfeiffer Vacuum recommends venting the turbopump to avoid contamination due to particles streaming back from the fore-vacuum area.

6.5.1 Switching off

Notes for switching off the turbopump

1. Shut down the turbopump via the control unit or remote control.
2. Close the fore-vacuum line.
3. Switch off the backing pump, if necessary.
4. Vent the turbopump (options see below).
5. Close the supply lines (e.g. for cooling water or sealing gas).

6.5.2 Venting

NOTICE

Damage to the turbopump due to non-permissibly fast pressure rise during venting

Non-permissibly high pressure rise rates place a significant load on the rotor and the magnetic bearing of the turbopump. During venting very small volumes in the vacuum chamber or the turbopump, there is a risk of uncontrollable pressure rises. This causes mechanical damage to the turbopump, including potential failure.

- ▶ Observe the prescribed maximum pressure rise speed of **15 hPa/s**.
- ▶ Avoid manual and uncontrolled venting of very low volumes.
- ▶ Where necessary, use a venting valve from the Pfeiffer Vacuum range of accessories.

Manual venting

Manual venting describes the standard process for venting the turbopumping station.

1. Ensure that the vacuum system is shut down.
2. Open the black venting screw on the turbopump by one revolution maximum.
3. Wait for pressure equalization to atmospheric pressure in the vacuum system.
4. Close the venting screw again.

Use a Pfeiffer Vacuum venting valve

The Pfeiffer Vacuum venting valve is an optional accessory for installation on the turbopump.

The venting valve is normally closed. Control is via the turbopump electronic drive unit, and configuration of parameters **[P:012]** and **[P:030]**. In the event of a power failure, the turbopump continues to deliver sufficient energy during its run-down period to initiate a proper venting process. When power is restored, the venting process is interrupted.

- ▶ Switch off the turbopump.
 - The venting process starts automatically.

Venting speed [P:720]	Venting duration [P:721]	Venting duration in the event of a power failure
50 % of rated speed	3600 s	3600 s

Tbl. 15: Factory settings for delayed venting in turbopumps

General information for fast venting

Pfeiffer Vacuum recommends fast venting of larger volumes in 2 steps.

1. Use a Pfeiffer Vacuum venting valve for the turbopump, or match the valve cross-section to the size of the recipient and maximum venting rate.
2. Vent the vacuum system with a maximum rate of pressure rise of **15 hPa/s** for a duration of 20 seconds.
3. Then vent the system with a second venting valve of any size, for example directly at the vacuum chamber.
4. Wait for pressure equalization to atmospheric pressure in the vacuum system.

7 Maintenance

7.1 General maintenance information

WARNING

Danger to life from electric shock during maintenance and service work

The device is only completely de-energized when the mains plug has been disconnected and the turbopump is at a standstill. There is a danger to life from electric shock when making contact with live components.

- ▶ Before performing all work, switch off the main switch.
- ▶ Wait until the turbopump comes to a standstill (rotation speed =0).
- ▶ Remove the mains plug from the device.
- ▶ Secure the device against unintentional restarting.

WARNING

Health hazard through poisoning from toxic contaminated components or devices

Toxic process media result in contamination of devices or parts of them. During maintenance work, there is a risk to health from contact with these poisonous substances. Illegal disposal of toxic substances causes environmental damage.

- ▶ Take suitable safety precautions and prevent health hazards or environmental pollution by toxic process media.
- ▶ Decontaminate affected parts before carrying out maintenance work.
- ▶ Wear protective equipment.

7.2 Maintenance intervals and responsibilities

Recommendations for performing maintenance measures

1. Clean the turbopump exterior with a lint-free cloth and a little isopropanol.
2. Replace the electronic drive unit in case of a defect.
3. Replace the operating fluid.
4. Pay attention to when the operating fluid must be changed.
5. Replace the operating fluid at least every 4 years.
6. Have Pfeiffer Vacuum Service replace the rotor bearing of the turbopump at least every 4 years.
7. Consult with Pfeiffer Vacuum Service about shorter maintenance intervals for extreme loads or impure processes.
8. For all other cleaning, maintenance or repair work, contact the responsible Pfeiffer Vacuum Service Center.

7.3 Changing the operating fluid

WARNING

Risk of poisoning from contact with harmful substances

The operating fluid and parts of the turbopump may contain toxic substances from pumped media.

- ▶ Decontaminate affected parts before carrying out maintenance work.
- ▶ Prevent health hazards or environmental impacts with adequate safety precautions.
- ▶ Observe the operating fluid safety data sheet.
- ▶ Dispose of the operating fluid according to locally applicable regulations.

WARNING

Danger of poisoning from toxic vapors

Igniting and heating synthetic operating fluid generates toxic vapors. Danger of poisoning if inhaled.

- ▶ Observe the application instructions and precautions.
- ▶ Do not allow tobacco products to come into contact with the operating fluid.

Preparatory work

1. Switch off the turbopump (see chapter "Switching off", page 44).
2. Vent the vacuum system to atmospheric pressure (see chapter "Venting", page 45).
3. Interrupt the electric supply.
4. Remove all cables from the electronic drive unit.
5. **If dismantling the turbopump from the system:** Close all openings with the original protective covers and screw plugs.

7.3.1 Draining the operating fluid

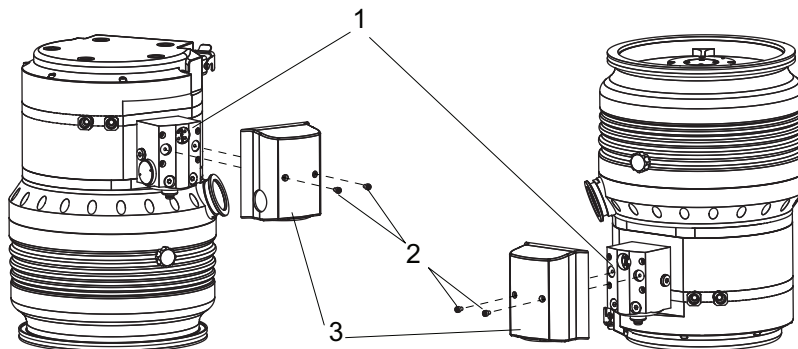


Fig. 25: Removing the protective cap on U- or standard versions

- | | |
|------------------------|------------------|
| 1 Operating fluid pump | 3 Protective cap |
| 2 Allen head screws | |

Required tools

- Allen key, size 3
- Allen key, size 5
- Calibrated torque wrench (tightening factor ≤ 1.6)

Required aids

- Suitable vessel for collecting the operating fluid

Remove the protective cap from the operating fluid pump

1. Unscrew the Allen head screws.
2. Remove protective cap.

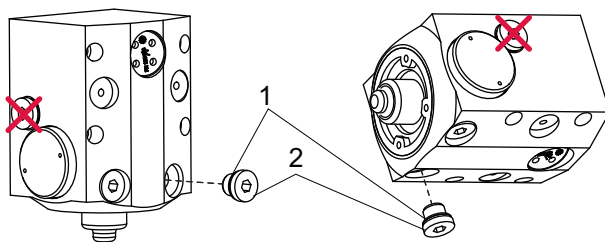


Fig. 26: Position of the operating fluid drain plugs depending on orientation of the turbopump

- | | |
|----------|---------------|
| 1 O-ring | 2 Drain screw |
|----------|---------------|

Draining the operating fluid

1. Place the vessel under the operating fluid pump of the turbopump.
2. Unscrew the lower drain plug from the operating fluid pump.
3. Fully drain the operating fluid.
4. Screw the drain screw back in.
 - Tightening torque: **max. 3 Nm**



7.3.2 Filling the operating fluid

⚠ WARNING

Danger of poisoning from toxic vapors

Igniting and heating synthetic operating fluid generates toxic vapors. Danger of poisoning if inhaled.

- ▶ Observe the application instructions and precautions.
- ▶ Do not allow tobacco products to come into contact with the operating fluid.

NOTICE

Destruction of the turbopump due to incorrect operation when filling with operating fluid

The operating fluid filling quantity depends on the selected spatial position of the turbopump. The filler screws are located at clearly marked positions on both sides of the operating fluid pump of the turbopump. Confusion with other screw plugs leads to impurities, damage to the turbopump, up to and including its destruction.

- ▶ Only fill the turbopump with operating fluid after mechanical installation.
- ▶ Fill the turbopump with operating fluid via one of the filler screws marked with an oil can symbol only.
- ▶ If in doubt, contact Pfeiffer Vacuum.

Required tools

- Allen key, size 5
- Calibrated torque wrench (tightening factor ≤ 1.6)

Permitted operating fluid

- F3 for vacuum pumps, 50 ml

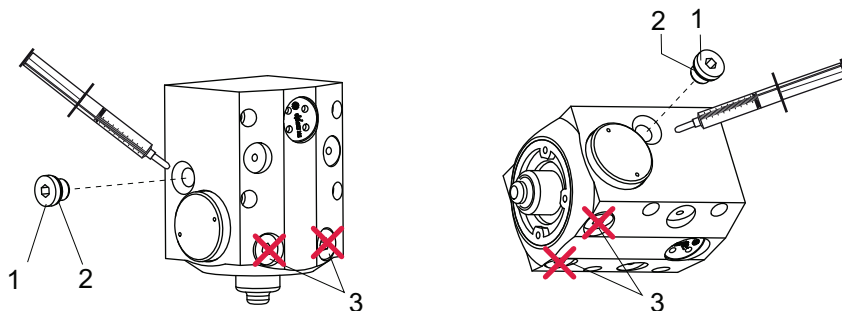


Fig. 27: Position of the operating fluid filler screws depending on orientation of the turbopump

- | | |
|----------------|---------------|
| 1 Filler screw | 3 Drain screw |
| 2 O-ring | |

Procedure

1. Unscrew and remove the higher filler screw from the operating fluid pump.
2. Use the syringe and the operating fluid from the turbopump shipment.
3. Place a container below the filling port.
4. Continue to fill in operating fluid until it overflows at the filling port
 - Maximum volume **50 ml**.
 - In vertical mounting orientation, the filling volume is a little lower.
5. Seal the filler screw.
 - Tightening torque: **3 Nm**

7.4 Replacing the electronic drive unit

NOTICE

Damage to the turbopump and electronic drive unit due to improper disconnection of components

Even after the mains power is switched off, the turbopump continues to deliver electrical energy during its run-down period. If the turbopump and electronic drive unit are disconnected prematurely, there is the risk of body contact and consequently the destruction of electronic components.

- ▶ Never disconnect the turbopump and electronic drive unit from each other if power is still connected or if the rotor is running.
- ▶ Monitor the turbopump rotation speed via the parameters available in the electronic drive unit (e.g., [P:398]).
- ▶ Wait until the turbopump comes to a standstill (rotation speed $f=0$).

NOTICE

Property damage from electrostatic discharge

Neglecting the electrostatic hazard for electronic components results in their damage or destruction

- ▶ Implement ESD safety measures at the workstation.
- ▶ Observe EN 61340 "Protection of electronic devices from electrostatic phenomena".

The electronic drive unit of the turbopump cannot be repaired. In the event of a defect, replace the entire electronic drive unit with a replacement part.



Backing up settings made by the customer

The factory operating parameters are always preset in replacement units. All settings made by the customer to the original electronic drive unit are lost when it is replaced. To preserve your custom settings, you have the following options:

1. Back up all your settings as a parameter set in an HPU.
2. Load a backup parameter set by means of HPU into the new electronic drive unit.
3. Program the individual settings into the new electronic drive unit by hand.
4. Note the operating instructions of the electronic drive unit and the HPU.

Preparatory work

1. Switch off the turbopump (see chapter "Switching off", page 44).
2. Vent the vacuum system to atmospheric pressure (see chapter "Venting", page 45).
3. Interrupt the electric supply.
4. Remove all cables from the electronic drive unit.
5. **If dismantling the turbopump from the system:** Close all openings with the original protective covers and screw plugs.

Required tools

- Allen key, size 3
- Calibrated torque wrench (tightening factor ≤ 1.6)

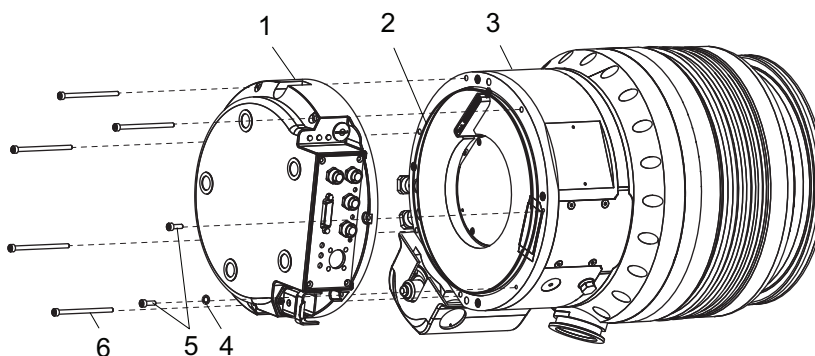


Fig. 28: Replacing the electronic drive unit – Removal

- | | |
|---------------------------------|----------------------------|
| 1 Electronic drive unit TC 1200 | 4 Shake proof washer |
| 2 O-ring | 5 Allen head screw M4 × 12 |
| 3 Pump lower part | 6 Allen head screw M4 × 65 |

Removing the electronic drive unit

1. Observe the valid spatial position after removing the turbopump.
2. Unscrew the M4 × 12 and M4 × 65 Allen head screws that secure the electronic drive unit on the turbopump.
3. Pay attention to the shake proof washer.
4. Store the screws and shake proof washer in a safe place.
5. Carefully remove the old electronic drive unit from the pump, making sure that you keep it straight.

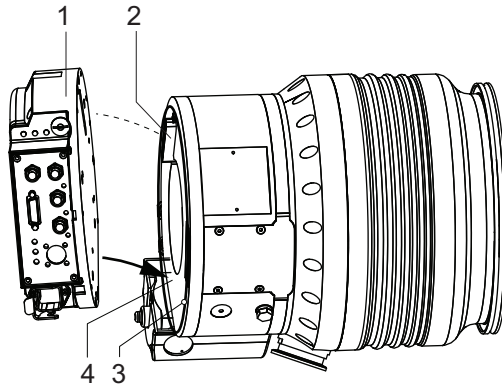


Fig. 29: Replacing the electronic drive unit – Installation

- | | |
|---------------------------------|-----------------|
| 1 Electronic drive unit TC 1200 | 3 O-ring |
| 2 Connecting plug | 4 Cooling plate |

Installing the electronic drive unit

1. If needed, secure the O-ring in the groove in the pump base.
2. Line up the new electronic drive unit with the straight edge on the cooling plate above the operating fluid pump.
3. Carefully place a new electronic drive unit on the connecting plug of the turbopump, making sure that it is straight.
4. Check that the electronic drive unit is correctly seated on the pump base and in relation to the screw connection bores.

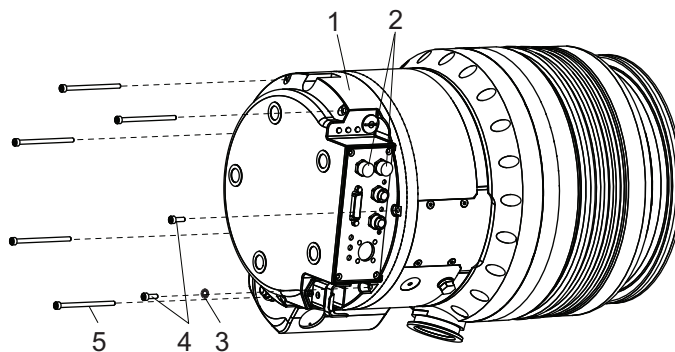


Fig. 30: Replacing the electronic drive unit – Fastening

- | | |
|---------------------------------|----------------------------|
| 1 Electronic drive unit TC 1200 | 4 Allen head screw M4 × 12 |
| 2 Screw plug | 5 Allen head screw M4 × 65 |
| 3 Shake proof washer | |

Fastening the electronic drive unit

1. Screw an M4 × 12 Allen head screw with shake proof washer into the bore in front of the power supply plug of the electronic drive unit.
2. Screw an M4 × 12 Allen head screw into the bore in front of the electronic drive unit connection panel.
3. Use all of the other M4 x 65 Allen head screws to fasten the electronic drive unit to the turbopump.
 - Tightening torque: **2.5 Nm**
4. Remove the screw plugs from the electronic drive unit connections.
5. Keep them in a safe place.

7.5 Confirming the speed specification

The typical nominal rotation speed of a turbopump is preset at the factory in the electronic drive unit. After replacing the electronic drive unit, the set value for the nominal rotation speed is deleted. The manual confirmation of the nominal rotation speed is part of a redundant safety system as a measure for preventing excess rotation speed.

HiPace	Confirmation of nominal rotation speed [P:777]
1200 / 1500	630 Hz
1800 / 2300	525 Hz
2800	455 Hz

Tbl. 16: Characteristic nominal rotation speeds of the turbopumps

Required aids

- A connected Pfeiffer Vacuum display and control unit.
- Knowledge of the configuration and setting of electronic drive unit operating parameters.

Adjusting the nominal rotation speed confirmation

The redundant confirmation of the nominal rotation speed of a turbopump is possible by adjusting the **[P:777] NomSpdConf** parameter in the electronic drive unit.

1. Observe the display and control unit operating instructions.
2. See the electronic drive unit operating instructions.
3. Set the parameter **[P:794]** to "1" and activate the expanded parameter set.
4. Open and edit the parameter **[P:777]**.
5. Set the parameter **[P:777]** to the required value of the nominal rotation speed in Hertz.

Alternative: A Pfeiffer Vacuum SpeedConfigurator for the one-time immediate setting of parameter **[P:777]** is included with the replacement units.

8 Decommissioning

8.1 Shutting down for longer periods

WARNING

Health hazard through poisoning from toxic contaminated components or devices

Toxic process media result in contamination of devices or parts of them. During maintenance work, there is a risk to health from contact with these poisonous substances. Illegal disposal of toxic substances causes environmental damage.

- ▶ Take suitable safety precautions and prevent health hazards or environmental pollution by toxic process media.
- ▶ Decontaminate affected parts before carrying out maintenance work.
- ▶ Wear protective equipment.

Procedure for a longer downtime of the turbopump (> 1 year)

1. Remove the turbopump from the vacuum system if necessary.
2. Drain the operating fluid from the turbopump.
3. Close the high vacuum flange of the turbopump.
4. Evacuate the turbopump via the fore-vacuum connection.
5. Vent the turbopump via the venting connection with dry, oil-free air or inert gas.
6. Close all flange openings with the original protective caps.
7. Store the turbopump with the vertical rotary axis in its permissible spatial position.
8. Store the turbopump indoors only, within the specified temperature range.
9. In rooms with humid or aggressive atmospheres: Hermetically seal the turbopump together with a drying agent in a plastic bag.

8.2 Recommissioning

NOTICE

Risk of damage to the turbopump as a result of operating fluid aging after recommissioning

The shelf life of the operating fluid of the turbopump is limited. Aging of the operating fluid may lead to the failure of the ball bearing and cause damage to the turbopump.

- ▶ Pay attention to when the operating fluid must be changed:
 - after maximum 2 years without operation,
 - after maximum 4 years combined operation and downtimes.
- ▶ Observe the maintenance instructions and inform Pfeiffer Vacuum Service.

Procedures for recommissioning the turbopump

1. Check the turbopump for pollution and moisture.
2. Clean the turbopump exterior with a lint-free cloth and a little isopropanol.
3. If necessary, arrange for Pfeiffer Vacuum Service to completely clean the turbopump.
4. Observe the total running time of the turbopump and if necessary, arrange for Pfeiffer Vacuum Service to replace the bearing.
5. Change the turbopump's operating fluid.
6. Install the turbopump according to these instructions ([see chapter "Installation", page 23](#)).
7. Recommission the turbopump according to these instructions .

8.3 Disposing of the vacuum pump

WARNING

Health hazard through poisoning from toxic contaminated components or devices

Toxic process media result in contamination of devices or parts of them. During maintenance work, there is a risk to health from contact with these poisonous substances. Illegal disposal of toxic substances causes environmental damage.

- ▶ Take suitable safety precautions and prevent health hazards or environmental pollution by toxic process media.
 - ▶ Decontaminate affected parts before carrying out maintenance work.
 - ▶ Wear protective equipment.
-
- ▶ Dispose of all substances in a safe manner according to locally applicable regulations.

9 Malfunctions

⚠ 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.

⚠ WARNING

Danger to life from the turbopump breaking away in the event of a fault

Sudden blocking of the rotor generates high destructive torques in accordance with ISO 27892. If the turbopump is **not** properly secured, it will tear off. The energy released in this way can propel the entire turbopump or shattered pieces from its interior through the surrounding area. Potentially dangerous gases may escape. There is a risk of serious injury, potentially even fatal, and significant equipment damage.

- ▶ Follow the installation instructions for this turbopump.
- ▶ Observe the requirements regarding stability and design of the counter flange.
- ▶ Use only original accessories or fixing material approved by Pfeiffer Vacuum for the installation.

⚠ WARNING

Risk of injury caused by the turbopump breaking away with the vibration compensator in the event of a malfunction

Sudden jamming of the rotor generates high destructive torques in accordance with ISO 27892. When using a vibration compensator, this will probably lead to the turbopump being sheared off in use. The energy that this would release could throw the entire turbopump or shattered pieces from its interior through the surrounding space. Potentially dangerous gases can escape. There is a risk of very serious injuries, including death, and extensive property damage.

- ▶ Take suitable safety precautions on-site for the compensation of the occurring torques.
- ▶ Before installing a vibration compensator, you must first of all contact Pfeiffer Vacuum.

⚠ WARNING

Danger to life from poisoning where toxic process media leak from damaged connections

Sudden twisting of the turbopump in the event of a fault causes fittings to accelerate. There is the risk of damaging on-site connections (e.g., fore-vacuum line) and resulting leaks. This results in leakage of process media. In processes involving toxic media, there is a risk of injury and danger to life due to poisoning.

- ▶ Keep masses connected to the turbopump as low as possible.
- ▶ Use flexible lines to connect to the turbopump where necessary.

Should malfunctions occur, you can find information about potential causes and how to fix them here. The operating manual of the associated electronic drive unit contains more detailed error descriptions.

Problem	Possible causes	Remedy
Turbopump will not start up; none of the built-in LEDs on the electronic drive unit light up	<ul style="list-style-type: none"> • Current supply interrupted 	<ol style="list-style-type: none"> 1. Check the plug contacts on the power supply pack. 2. Check the current supply lines.
	<ul style="list-style-type: none"> • Incorrect operating voltage 	<ol style="list-style-type: none"> 1. Observe the electronic drive unit rating plate. 2. Supply the correct operating voltage.
	<ul style="list-style-type: none"> • No operating voltage present 	<ol style="list-style-type: none"> 1. Supply the correct operating voltage.
	<ul style="list-style-type: none"> • Electronic drive unit defective 	<ol style="list-style-type: none"> 1. Replace the electronic drive unit. 2. Contact Pfeiffer Vacuum Service.

Turbopump will not start up; green LED on the electronic drive unit is flashing	<ul style="list-style-type: none"> • For operation without control unit: Pins 1-3, 1-4 and 1-14 on the "remote" connection are not connected 	<ol style="list-style-type: none"> 1. Connect the connections according to the electronic drive unit connection diagram. 2. Install the mating plug from the shipment.
	<ul style="list-style-type: none"> • For operation via RS-485: The bridge between pins 1 and 14 inhibits control commands 	<ol style="list-style-type: none"> 1. Remove the bridge at the "remote" connection. 2. Remove the mating plug from the electronic drive unit.
	<ul style="list-style-type: none"> • For operation via RS-485: Parameters not set in the electronic drive unit 	<ol style="list-style-type: none"> 1. Set the parameters [P: 010] and [P: 023] via the interface RS-485 to 1 = "ON".
	<ul style="list-style-type: none"> • Voltage drop in the cable is too high 	<ol style="list-style-type: none"> 1. Check the connection cable. 2. Use a suitable connection cable.
Turbopump fails to reach the nominal rotation speed within the set run-up time	<ul style="list-style-type: none"> • fore-vacuum pressure too high 	<ol style="list-style-type: none"> 1. Check backup pump compatibility (see technical data). 2. Check that the backup pump is working.
	<ul style="list-style-type: none"> • Leakage on the turbopump 	<ol style="list-style-type: none"> 1. Carry out leak detection. 2. Check seals and flange connections. 3. Eliminate leaks.
	<ul style="list-style-type: none"> • Gas throughput too high 	<ol style="list-style-type: none"> 1. Reduce the process gas load.
	<ul style="list-style-type: none"> • Rotor not running smoothly, defective bearing 	<ol style="list-style-type: none"> 1. Check the turbopump for noise development 2. Contact Pfeiffer Vacuum Service.
	<ul style="list-style-type: none"> • Run-up time setpoint adjusted too low 	<ol style="list-style-type: none"> 1. Extend the run-up time setpoint [P:700] via a display and control unit.
	<p>Thermal load due to:</p> <ul style="list-style-type: none"> • lack of ventilation • water flow too low • fore-vacuum pressure too high • ambient temperature too high 	<ol style="list-style-type: none"> 1. Reduce the thermal load. <ul style="list-style-type: none"> – Ensure adequate air supply. – Adjust the cooling water flow. – Reduce the fore-vacuum pressure. – Adapt the ambient conditions.
Turbopump not achieving the ultimate pressure	<ul style="list-style-type: none"> • Turbopump is polluted 	<ol style="list-style-type: none"> 1. Heat the turbopump if required. 2. Have it cleaned. 3. Contact Pfeiffer Vacuum Service.
	<ul style="list-style-type: none"> • Vacuum chamber, pipes or turbopump leaking 	<ol style="list-style-type: none"> 1. Carry out leak detection starting from the vacuum chamber. 2. Check seals and flange connections. 3. Eliminate leaks in the vacuum system.

Malfunctions

Unusual noises during operation	<ul style="list-style-type: none"> • Rotor bearing damaged 	<ol style="list-style-type: none"> 1. Contact Pfeiffer Vacuum Service.
	<ul style="list-style-type: none"> • Rotor damaged 	<ol style="list-style-type: none"> 1. Contact Pfeiffer Vacuum Service.
	<ul style="list-style-type: none"> • Splinter shield or protective screen loose 	<ol style="list-style-type: none"> 1. Check and correct the seat of the splinter shield or protective screen in the high vacuum flange. 2. Follow the installation instructions.
Red LED on the electronic drive unit illuminates	<ul style="list-style-type: none"> • Group error 	<ol style="list-style-type: none"> 1. Reset the malfunction by switching the current supply off and on. 2. Reset the malfunction with V+ on pin 13 on the "remote" connection. 3. Set the parameter [P: 009] via the interface RS-485 to 1 = Malfunction acknowledgment. 4. Set the parameter [P: Set parameter [P:010] via the interface RS-485 to 0 = off and then 1 = On and Malfunction acknowledgment. 5. Carry out a differentiated malfunction analysis with a display and control unit. 6. Contact Pfeiffer Vacuum Service.

Tbl. 17: Troubleshooting turbopumps

10 Service solutions from Pfeiffer Vacuum

We offer first class service

Long vacuum component service life, coupled with low downtimes, are clear expectations that you have of us. We satisfy your needs with capable products and outstanding service.

We are consistently striving to perfect our core competence, service for vacuum components. And our service is far from over once you've purchased a product from Pfeiffer Vacuum. It often enough really just begins then. In proven Pfeiffer Vacuum quality, of course.

Our professional sales engineers and service technicians stand ready to provide hands-on support to you worldwide. Pfeiffer Vacuum offers a complete portfolio of service offerings, ranging from genuine spare parts right through to service agreements.

Take advantage of Pfeiffer Vacuum Service

Whether for preventative on-site service from our field service, fast replacement with as-new replacement products or repair in a Service Center close to you; you have various options for upholding your equipment availability. Detailed information and addresses can be found on our website in the Pfeiffer Vacuum Service section.

Advice on the optimum solution is available from your Pfeiffer Vacuum contact partner.

For quick and smooth handling of the service process, we recommend the following steps:



1. Download the current form templates.
 - [Declaration of Service Request](#)
 - [Service Request](#)
 - [Declaration of Contamination](#)

- a. Dismantle all accessories and keep them (all external mounted parts as valve, inlet screen, etc.).
- b. Drain the operating fluid/lubricant as necessary.
- c. Drain the cooling medium as necessary.



2. Fill out the service request and the declaration of contamination.



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

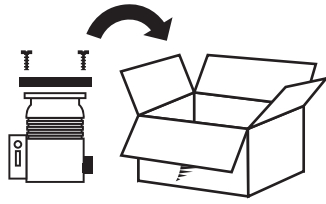


4. You will receive a response from Pfeiffer Vacuum.

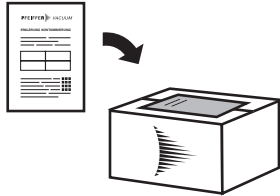
PFEIFFER VACUUM

Sending of contaminated products

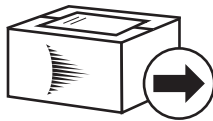
No units will be accepted if they are contaminated with micro-biological, explosive or radioactive substances. If products are contaminated or if the declaration of contamination is missing, Pfeiffer Vacuum will contact the customer before starting maintenance. In addition, depending on the product and the level of contamination **additional decontamination costs** may be required.



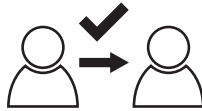
5. Prepare the product for transport in accordance with the details in the declaration of contamination.
 - a) Neutralize the product with nitrogen or dry air.
 - b) Close all openings with airtight blank flanges.
 - c) Seal the product in appropriate protective film.
 - d) Only pack the product in suitable, stable transport containers.
 - e) Observe the applicable transport conditions.



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



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



8. You will receive a confirmation message/a quotation from Pfeiffer Vacuum.

PFEIFFER VACUUM

For all service orders, our General Terms and Conditions of Sales and Supply and General Terms and Conditions of Repair and Maintenance apply to vacuum equipment and components.

11 Spare parts

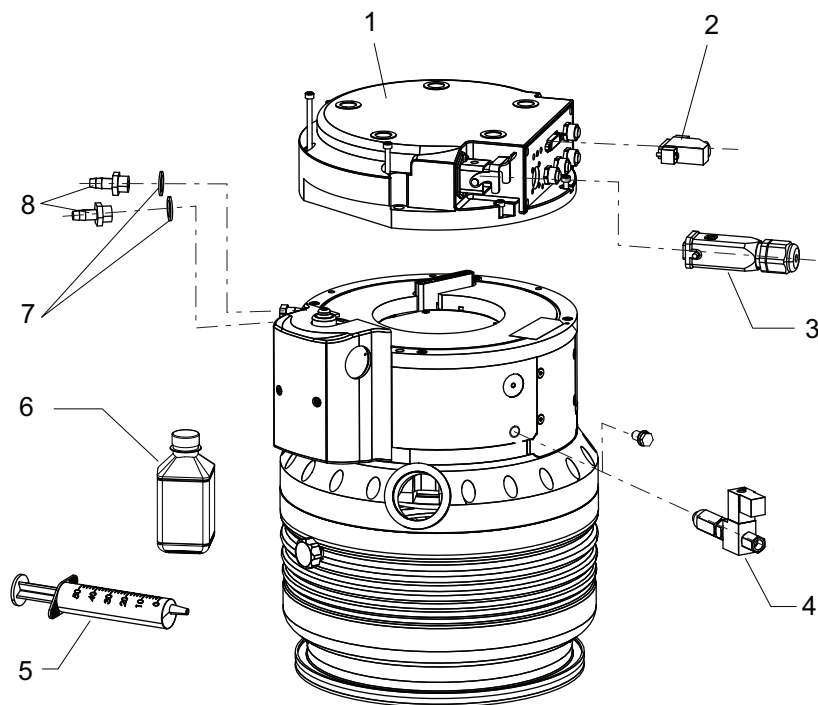


Fig. 31: Spare parts HiPace 1200

Position	Designation	Size	order number	Note	Pieces	Quantity
1	Electronic drive unit TC 1200		refer to the rating plate	depending on the con- nection panel	1	
2	"remote" mating plug		PM 061 378 -X	with solder tags	1	
3	Supply socket	HAN 3	PM 061 200 -T		1	
4	Sealing gas valve	17.5 – 20 sccm	PM Z01 313		1	
5	Syringe	50 ml	PM 006 915 -U		1	
6	Operating fluid F3	50 ml	PM 006 336 -T	Other lengths on re- quest	1	
7	Sealing ring		P 3529 145 -A	for threaded nozzle	2	
8	Threaded nozzle	1/4" thread	P 0998 067	for inner hose diameter 7 to 8 mm	2	

Tbl. 18: Available spare parts

12 Accessories



View the line of accessories for Pfeiffer Vacuum turbopumps online at pfeiffer-vacuum.com.

13 Technical data and dimensions

13.1 General

This section describes the basis for the technical data of Pfeiffer Vacuum turbopumps.



Maximum values refer exclusively to the input as a single load.

- Specifications according to PNEUROP committee PN5
- ISO 27892 2010: "Vacuum technology - Turbomolecular pumps - Measurement of rapid shutdown torque"
- ISO 21360 2007: "Vacuum technology - Standard methods for measuring vacuum-pump performance - General description"
- ISO 5302 2003: "Vacuum technology - Standard methods for measuring vacuum-pump performance"
- Ultimate pressure with test dome after 48 h bake out duration
- Gas throughput with water cooling; backing pump = rotary vane pump (10 m³/h)
- Cooling water consumption at maximum gas throughput, cooling water temperature 25 °C
- Integral leakage rate with 100 % helium concentration, 10 s measurement duration
- Sound pressure level at distance to vacuum pump = 1 m

	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/m²

Tbl. 19: Conversion table: Pressure units

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

Tbl. 20: Conversion table: Units for gas throughput

13.2 Technical data

Selection field	HiPace® 1200 with TC 1200, DN 200 ISO-K	HiPace® 1200 with TC 1200, DN 200 ISO-F	HiPace® 1200, with TC 1200, DN 200 CF-F
Order number	PM P03 910	PM P03 911	PM P03 912
Flange (in)	DN 200 ISO-K	DN 200 ISO-F	DN 200 CF-F
Flange (out)	DN 40 ISO-KF	DN 40 ISO-KF	DN 40 ISO-KF



Technical data and dimensions

Selection field	HiPace® 1200 with TC 1200, DN 200 ISO-K	HiPace® 1200 with TC 1200, DN 200 ISO-F	HiPace® 1200, with TC 1200, DN 200 CF-F
Ultimate pressure according to PNEUROP	$< 1 \cdot 10^{-7}$ hPa	$< 1 \cdot 10^{-7}$ hPa	$< 5 \cdot 10^{-10}$ hPa
Pumping speed for Ar	1200 l/s	1200 l/s	1200 l/s
Pumping speed for H ₂	1100 l/s	1100 l/s	1100 l/s
Pumping speed for He	1300 l/s	1300 l/s	1300 l/s
Pumping speed for N ₂	1250 l/s	1250 l/s	1250 l/s
Gas throughput at full rotational speed for Ar	11 hPa·l/s	11 hPa·l/s	6 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 He	> 30 hPa·l/s	> 30 hPa·l/s	16 hPa·l/s
Gas throughput at full rotational speed for N ₂	20 hPa·l/s	20 hPa·l/s	16 hPa·l/s
Fore-vacuum max. for N ₂	2 hPa	2 hPa	2 hPa
Fore-vacuum max. for Ar	2.5 hPa	2.5 hPa	2.5 hPa
Fore-vacuum max. for H ₂	0.25 hPa	0.25 hPa	0.25 hPa
Fore-vacuum max. for He	0.9 hPa	0.9 hPa	0.9 hPa
Compression ratio for Ar	$> 1 \cdot 10^8$	$> 1 \cdot 10^8$	$> 1 \cdot 10^8$
Compression ratio for H ₂	$6 \cdot 10^3$	$6 \cdot 10^3$	$6 \cdot 10^3$
Compression ratio for He	$2 \cdot 10^5$	$2 \cdot 10^5$	$2 \cdot 10^5$
Compression ratio for N ₂	$> 1 \cdot 10^8$	$> 1 \cdot 10^8$	$> 1 \cdot 10^8$
Power characteristic line in gas mode 0, vertex C	578/37800 W/min ⁻¹	578/37800 W/min ⁻¹	406/37800 W/min ⁻¹
Power characteristic line in gas mode 0, vertex D	717/29400 W/min ⁻¹	717/29400 W/min ⁻¹	616/11280 W/min ⁻¹
Power characteristic line in gas mode 1, vertex A	710/37800 W/min ⁻¹	710/37800 W/min ⁻¹	540/37800 W/min ⁻¹
Power characteristic line in gas mode 1, vertex B	750/35400 W/min ⁻¹	750/35400 W/min ⁻¹	756/14400 W/min ⁻¹
Rotation speed ± 2 %	37800 rpm	37800 rpm	37800 rpm
Rotation speed variable	50 – 100 %	50 – 100 %	50 – 100 %
Run-up time	2.5 min	2.5 min	2.5 min
Sound pressure level	≤ 50 dB(A)	≤ 50 dB(A)	≤ 50 dB(A)
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
Venting connection	G 1/8"	G 1/8"	G 1/8"
Connection pressure max. for venting/sealing gas valve	1500 hPa	1500 hPa	1500 hPa
Electronic drive unit	with TC 1200	with TC 1200	with TC 1200
Mains requirement: voltage (range)	100 – 120/200 – 240 V AC	100 – 120/200 – 240 V AC	100 – 120/200 – 240 V AC
Mains requirement: frequency (range)			
Power consumption max.	1350 VA	1350 VA	1350 VA
Current consumption max.	10 A	10 A	10 A
Cooling method, standard	Water	Water	Water
Cooling water temperature	15 – 35 °C	15 – 35 °C	15 – 35 °C

Selection field	HiPace® 1200 with TC 1200, DN 200 ISO-K	HiPace® 1200 with TC 1200, DN 200 ISO-F	HiPace® 1200, with TC 1200, DN 200 CF-F
Cooling water consumption	–	–	–
Permissible magnetic field max.	6 mT	6 mT	6 mT
Protection category	IP54	IP54	IP54
Relative humidity of air	5 –85, not condens-ing %	5 –85, not condens-ing %	5 –85, not condens-ing %
Mounting orientation	Standard (0° – 90°)	Standard (0° – 90°)	Standard (0° – 90°)
Weight	30 kg	31.9 kg	41 kg

Tbl. 21: Technical data for HiPace 1200 Standard

Selection field	HiPace® 1200 U with TC 1200, DN 200 ISO-K, upside down ver-sion	HiPace® 1200 U with TC 1200, DN 200 ISO-F, upside down ver-sion	HiPace® 1200 U with TC 1200, DN 200 CF-F, upside down version
Order number	PM P03 913	PM P03 914	PM P03 915
Flange (in)	DN 200 ISO-K	DN 200 ISO-F	DN 200 CF-F
Flange (out)	DN 40 ISO-KF	DN 40 ISO-KF	DN 40 ISO-KF
Ultimate pressure according to PNEUR-OP	$< 1 \cdot 10^{-7}$ hPa	$< 1 \cdot 10^{-7}$ hPa	$< 5 \cdot 10^{-10}$ hPa
Pumping speed for Ar	1200 l/s	1200 l/s	1200 l/s
Pumping speed for H ₂	1100 l/s	1100 l/s	1100 l/s
Pumping speed for He	1300 l/s	1300 l/s	1300 l/s
Pumping speed for N ₂	1250 l/s	1250 l/s	1250 l/s
Gas throughput at full rotational speed for Ar	11 hPa·l/s	11 hPa·l/s	6 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 He	> 30 hPa·l/s	> 30 hPa·l/s	16 hPa·l/s
Gas throughput at full rotational speed for N ₂	20 hPa·l/s	20 hPa·l/s	16 hPa·l/s
Fore-vacuum max. for N ₂	2 hPa	2 hPa	2 hPa
Fore-vacuum max. for Ar	2.5 hPa	2.5 hPa	2.5 hPa
Fore-vacuum max. for H ₂	0.25 hPa	0.25 hPa	0.25 hPa
Fore-vacuum max. for He	0.9 hPa	0.9 hPa	0.9 hPa
Compression ratio for Ar	$> 1 \cdot 10^8$	$> 1 \cdot 10^8$	$> 1 \cdot 10^8$
Compression ratio for H ₂	$6 \cdot 10^3$	$6 \cdot 10^3$	$6 \cdot 10^3$
Compression ratio for He	$2 \cdot 10^5$	$2 \cdot 10^5$	$2 \cdot 10^5$
Compression ratio for N ₂	$> 1 \cdot 10^8$	$> 1 \cdot 10^8$	$> 1 \cdot 10^8$
Power characteristic line in gas mode 0, vertex C	578/37800 W/min ⁻¹	578/37800 W/min ⁻¹	406/37800 W/min ⁻¹
Power characteristic line in gas mode 0, vertex D	717/29400 W/min ⁻¹	717/29400 W/min ⁻¹	616/11280 W/min ⁻¹
Power characteristic line in gas mode 1, vertex A	710/37800 W/min ⁻¹	710/37800 W/min ⁻¹	540/37800 W/min ⁻¹

Selection field	HiPace® 1200 U with TC 1200, DN 200 ISO-K, upside down version	HiPace® 1200 U with TC 1200, DN 200 ISO-F, upside down version	HiPace® 1200 U with TC 1200, DN 200 CF-F, upside down version
Power characteristic line in gas mode 1, vertex B	750/35400 W/min ⁻¹	750/35400 W/min ⁻¹	756/14400 W/min ⁻¹
Rotation speed ± 2 %	37800 rpm	37800 rpm	37800 rpm
Rotation speed variable	50 – 100 %	50 – 100 %	50 – 100 %
Run-up time	2.5 min	2.5 min	2.5 min
Sound pressure level	≤ 50 dB(A)	≤ 50 dB(A)	≤ 50 dB(A)
Integral leak rate	< 1 · 10 ⁻⁸ Pa m ³ /s	< 1 · 10 ⁻⁸ Pa m ³ /s	< 1 · 10 ⁻⁸ Pa m ³ /s
Venting connection	G 1/8"	G 1/8"	G 1/8"
Connection pressure max. for venting/sealing gas valve	1500 hPa	1500 hPa	1500 hPa
Electronic drive unit	with TC 1200	with TC 1200	with TC 1200
Mains requirement: voltage (range)	100 – 120/200 – 240 V AC	100 – 120/200 – 240 V AC	100 – 120/200 – 240 V AC
Mains requirement: frequency (range)			
Power consumption max.	1350 VA	1350 VA	1350 VA
Current consumption max.	10 A	10 A	10 A
Cooling method, standard	Water	Water	Water
Cooling water temperature	15 – 35 °C	15 – 35 °C	15 – 35 °C
Cooling water consumption	–	–	–
Permissible magnetic field max.	6 mT	6 mT	6 mT
Protection category	IP54	IP54	IP54
Relative humidity of air	5 – 85, not condensing %	5 – 85, not condensing %	5 – 85, not condensing %
Mounting orientation	Upside down (90° – 180°)	Upside down (90° – 180°)	Upside down (90° – 180°)
Weight	30 kg	31.9 kg	41 kg

Tbl. 22: Technical data for HiPace 1200 U

Selection field	HiPace® 1200 C with TC 1200, DN 200 ISO-K, corrosive	HiPace® 1200 C with TC 1200, DN 200 ISO-F, corrosive	HiPace® 1200 C with TC 1200, DN 200 CF-F, corrosive
Order number	PM P03 916	PM P03 917	PM P04 190
Flange (in)	DN 200 ISO-K	DN 200 ISO-F	DN 200 CF-F
Flange (out)	DN 40 ISO-KF	DN 40 ISO-KF	DN 40 ISO-KF
Ultimate pressure according to PNEUROP	< 1 · 10 ⁻⁷ hPa	< 1 · 10 ⁻⁷ hPa	< 5 · 10 ⁻¹⁰ hPa
Pumping speed for Ar	1200 l/s	1200 l/s	1200 l/s
Pumping speed for H ₂	1100 l/s	1100 l/s	1100 l/s
Pumping speed for He	1300 l/s	1300 l/s	1300 l/s
Pumping speed for N ₂	1250 l/s	1250 l/s	1250 l/s
Gas throughput at full rotational speed for Ar	11 hPa·l/s	11 hPa·l/s	6 hPa·l/s

Selection field	HiPace® 1200 C with TC 1200, DN 200 ISO-K, corrosive	HiPace® 1200 C with TC 1200, DN 200 ISO-F, corrosive	HiPace® 1200 C with TC 1200, DN 200 CF-F, corrosive
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 He	> 30 hPa·l/s	> 30 hPa·l/s	16 hPa·l/s
Gas throughput at full rotational speed for N ₂	20 hPa·l/s	20 hPa·l/s	16 hPa·l/s
Fore-vacuum max. for N ₂	2 hPa	2 hPa	2 hPa
Fore-vacuum max. for Ar	2.5 hPa	2.5 hPa	2.5 hPa
Fore-vacuum max. for H ₂	0.25 hPa	0.25 hPa	0.25 hPa
Fore-vacuum max. for He	0.9 hPa	0.9 hPa	0.9 hPa
Compression ratio for Ar	> 1 · 10 ⁸	> 1 · 10 ⁸	> 1 · 10 ⁸
Compression ratio for H ₂	6 · 10 ³	6 · 10 ³	6 · 10 ³
Compression ratio for He	2 · 10 ⁵	2 · 10 ⁵	2 · 10 ⁵
Compression ratio for N ₂	> 1 · 10 ⁸	> 1 · 10 ⁸	> 1 · 10 ⁸
Power characteristic line in gas mode 0, vertex C	578/37800 W/min ⁻¹	578/37800 W/min ⁻¹	406/37800 W/min ⁻¹
Power characteristic line in gas mode 0, vertex D	717/29400 W/min ⁻¹	717/29400 W/min ⁻¹	616/11280 W/min ⁻¹
Power characteristic line in gas mode 1, vertex A	710/37800 W/min ⁻¹	710/37800 W/min ⁻¹	540/37800 W/min ⁻¹
Power characteristic line in gas mode 1, vertex B	750/35400 W/min ⁻¹	750/35400 W/min ⁻¹	756/14400 W/min ⁻¹
Rotation speed ± 2 %	37800 rpm	37800 rpm	37800 rpm
Rotation speed variable	50 – 100 %	50 – 100 %	50 – 100 %
Run-up time	2.5 min	2.5 min	2.5 min
Sound pressure level	≤ 50 dB(A)	≤ 50 dB(A)	≤ 50 dB(A)
Integral leak rate	< 1 · 10 ⁻⁸ Pa m ³ /s	< 1 · 10 ⁻⁸ Pa m ³ /s	< 1 · 10 ⁻⁸ Pa m ³ /s
Venting connection	G 1/8"	G 1/8"	G 1/8"
Connection pressure max. for venting/sealing gas valve	1500 hPa	1500 hPa	1500 hPa
Electronic drive unit	with TC 1200	with TC 1200	with TC 1200
Mains requirement: voltage (range)	100 – 120/200 – 240 V AC	100 – 120/200 – 240 V AC	100 – 120/200 – 240 V AC
Mains requirement: frequency (range)			
Power consumption max.	1350 VA	1350 VA	1350 VA
Current consumption max.	10 A	10 A	10 A
Cooling method, standard	Water	Water	Water
Cooling water temperature	15 – 35 °C	15 – 35 °C	15 – 35 °C
Cooling water consumption	–	–	–
Permissible magnetic field max.	6 mT	6 mT	6 mT
Protection category	IP54	IP54	IP54
Relative humidity of air	5 –85, not condensing %	5 –85, not condensing %	5 –85, not condensing %

Selection field	HiPace® 1200 C with TC 1200, DN 200 ISO-K, corrosive	HiPace® 1200 C with TC 1200, DN 200 ISO-F, corrosive	HiPace® 1200 C with TC 1200, DN 200 CF-F, corrosive
Mounting orientation	Standard (0° – 90°)	Standard (0° – 90°)	Standard (0° – 90°)
Weight	30 kg	31.9 kg	41 kg

Tbl. 23: Technical data for HiPace 1200 C

Selection field	HiPace® 1200 U C with TC 1200, DN 200 ISO-K, upside down version, corrosive	HiPace® 1200 U C with TC 1200, DN 200 ISO-F, upside down version, corrosive	HiPace® 1200 U C with TC 1200, DN 200 CF-F, upside down version, corrosive
Order number	PM P03 918	PM P03 919	PM P04 191
Flange (in)	DN 200 ISO-K	DN 200 ISO-F	DN 200 CF-F
Flange (out)	DN 40 ISO-KF	DN 40 ISO-KF	DN 40 ISO-KF
Ultimate pressure according to PNEURO-OP	$< 1 \cdot 10^{-7}$ hPa	$< 1 \cdot 10^{-7}$ hPa	$< 5 \cdot 10^{-10}$ hPa
Pumping speed for Ar	1200 l/s	1200 l/s	1200 l/s
Pumping speed for H ₂	1100 l/s	1100 l/s	1100 l/s
Pumping speed for He	1300 l/s	1300 l/s	1300 l/s
Pumping speed for N ₂	1250 l/s	1250 l/s	1250 l/s
Gas throughput at full rotational speed for Ar	11 hPa·l/s	11 hPa·l/s	6 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 He	> 30 hPa·l/s	> 30 hPa·l/s	16 hPa·l/s
Gas throughput at full rotational speed for N ₂	20 hPa·l/s	20 hPa·l/s	16 hPa·l/s
Fore-vacuum max. for N ₂	2 hPa	2 hPa	2 hPa
Fore-vacuum max. for Ar	2.5 hPa	2.5 hPa	2.5 hPa
Fore-vacuum max. for H ₂	0.25 hPa	0.25 hPa	0.25 hPa
Fore-vacuum max. for He	0.9 hPa	0.9 hPa	0.9 hPa
Compression ratio for Ar	$> 1 \cdot 10^8$	$> 1 \cdot 10^8$	$> 1 \cdot 10^8$
Compression ratio for H ₂	$6 \cdot 10^3$	$6 \cdot 10^3$	$6 \cdot 10^3$
Compression ratio for He	$2 \cdot 10^5$	$2 \cdot 10^5$	$2 \cdot 10^5$
Compression ratio for N ₂	$> 1 \cdot 10^8$	$> 1 \cdot 10^8$	$> 1 \cdot 10^8$
Power characteristic line in gas mode 0, vertex C	578/37800 W/min ⁻¹	578/37800 W/min ⁻¹	406/37800 W/min ⁻¹
Power characteristic line in gas mode 0, vertex D	717/29400 W/min ⁻¹	717/29400 W/min ⁻¹	616/11280 W/min ⁻¹
Power characteristic line in gas mode 1, vertex A	710/37800 W/min ⁻¹	710/37800 W/min ⁻¹	540/37800 W/min ⁻¹
Power characteristic line in gas mode 1, vertex B	750/35400 W/min ⁻¹	750/35400 W/min ⁻¹	756/14400 W/min ⁻¹
Rotation speed ± 2 %	37800 rpm	37800 rpm	37800 rpm
Rotation speed variable	50 – 100 %	50 – 100 %	50 – 100 %
Run-up time	2.5 min	2.5 min	2.5 min

Selection field	HiPace® 1200 U C with TC 1200, DN 200 ISO-K, upside down version, corrosive	HiPace® 1200 U C with TC 1200, DN 200 ISO-F, upside down version, corrosive	HiPace® 1200 U C with TC 1200, DN 200 CF-F, upside down version, corrosive
Sound pressure level	≤ 50 dB(A)	≤ 50 dB(A)	≤ 50 dB(A)
Integral leak rate	< 1 · 10 ⁻⁸ Pa m ³ /s	< 1 · 10 ⁻⁸ Pa m ³ /s	< 1 · 10 ⁻⁸ Pa m ³ /s
Venting connection	G 1/8"	G 1/8"	G 1/8"
Connection pressure max. for venting/sealing gas valve	1500 hPa	1500 hPa	1500 hPa
Electronic drive unit	with TC 1200	with TC 1200	with TC 1200
Mains requirement: voltage (range)	100 – 120/200 – 240 V AC	100 – 120/200 – 240 V AC	100 – 120/200 – 240 V AC
Mains requirement: frequency (range)			
Power consumption max.	1350 VA	1350 VA	1350 VA
Current consumption max.	10 A	10 A	10 A
Cooling method, standard	Water	Water	Water
Cooling water temperature	15 – 35 °C	15 – 35 °C	15 – 35 °C
Cooling water consumption	–	–	–
Permissible magnetic field max.	6 mT	6 mT	6 mT
Protection category	IP54	IP54	IP54
Relative humidity of air	5 –85, not condensing %	5 –85, not condensing %	5 –85, not condensing %
Mounting orientation	Upside down (90° – 180°)	Upside down (90° – 180°)	Upside down (90° – 180°)
Weight	30 kg	31.9 kg	41 kg

Tbl. 24: Technical data for HiPace 1200 UC

13.3 Dimensions

Dimensions in mm

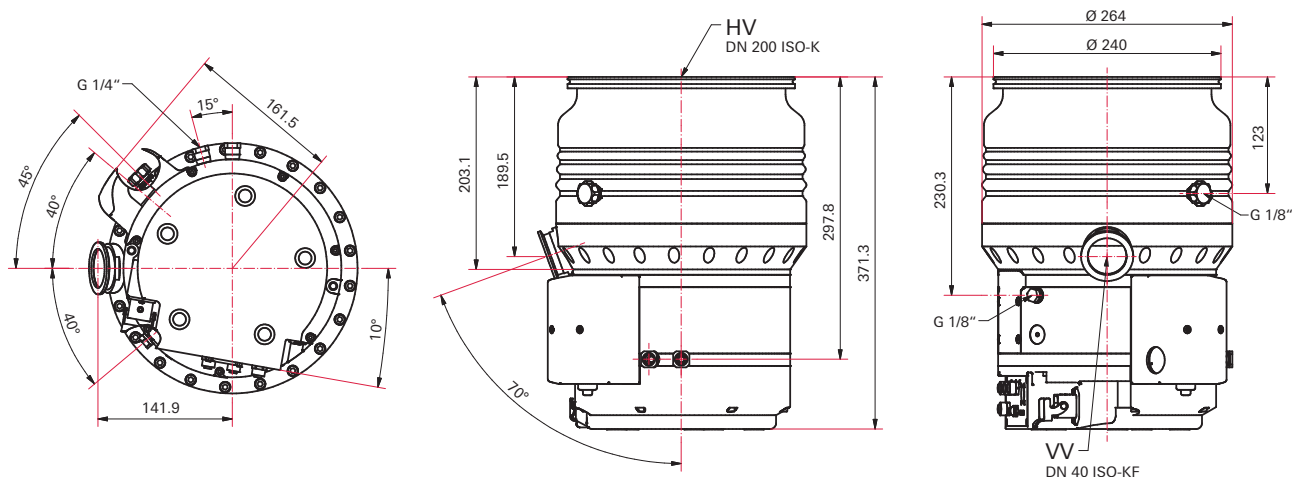


Fig. 32: HiPace 1200 | DN 200 ISO-K

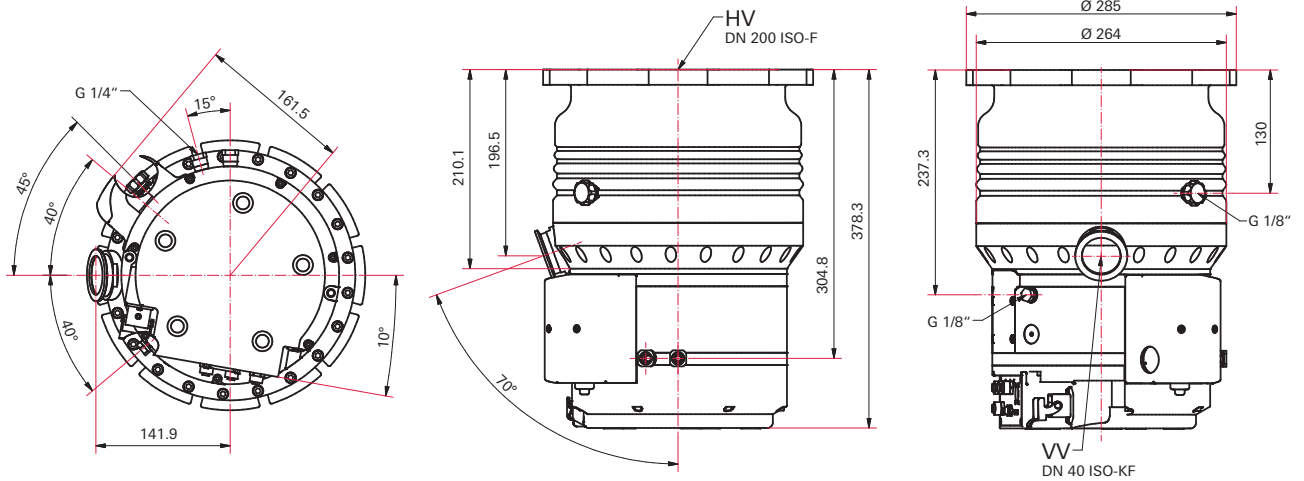


Fig. 33: HiPace 1200 | DN 200 ISO-F

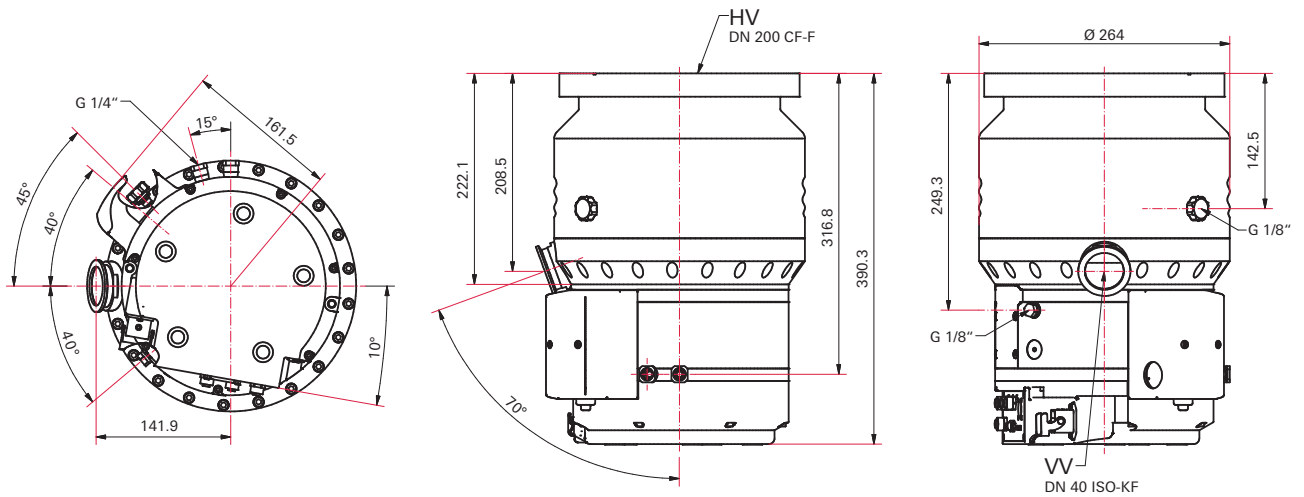


Fig. 34: HiPace 1200 | DN 200 CF-F

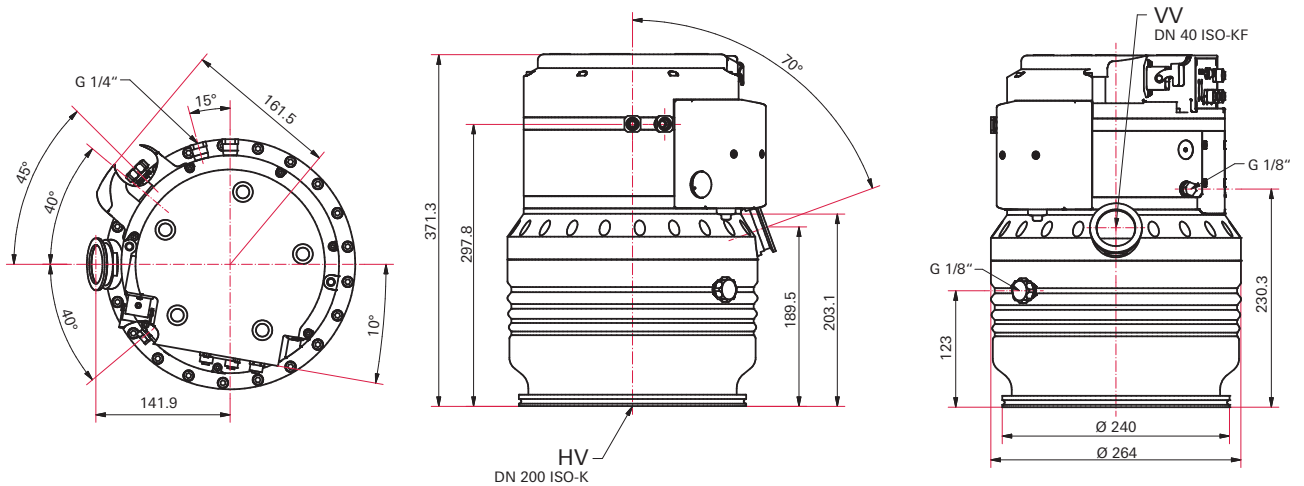


Fig. 35: HiPace 1200 U | DN 200 ISO-K



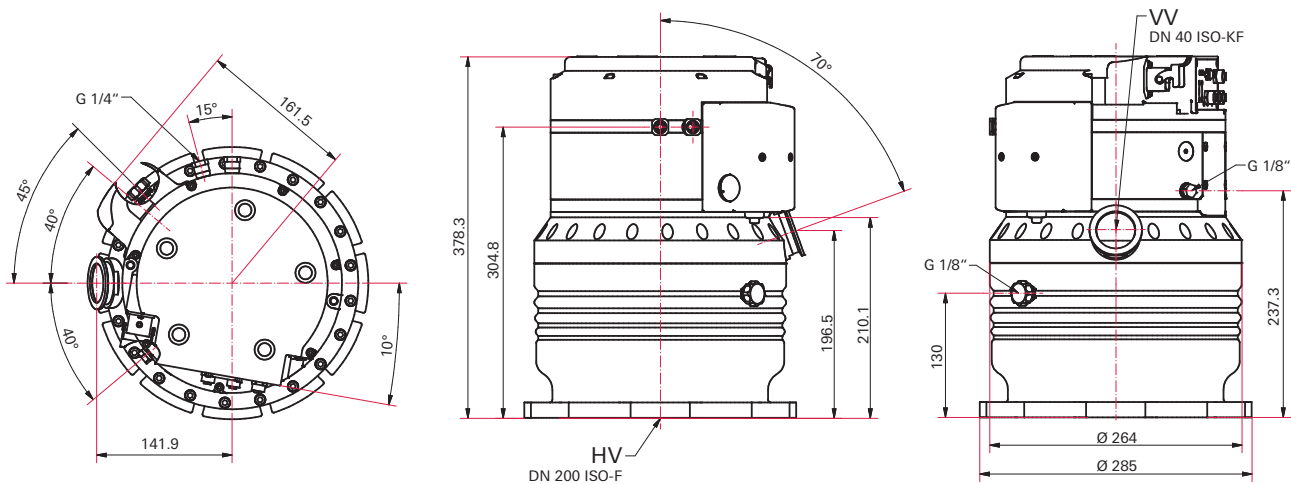


Fig. 36: HiPace 1200 U | DN 200 ISO-F

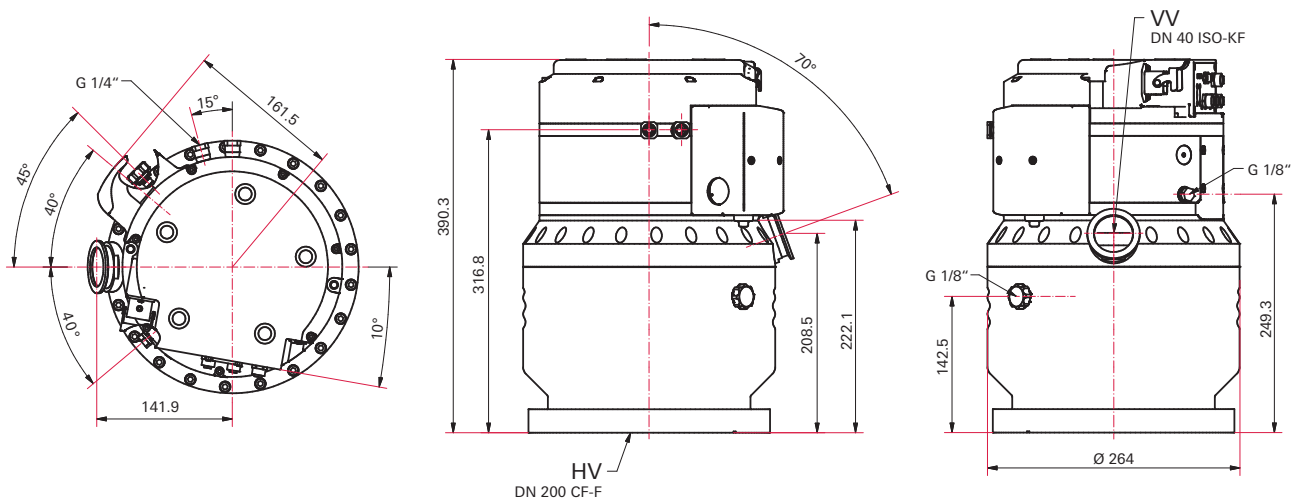


Fig. 37: HiPace 1200 U | DN 200 CF-F



Declaration of conformity

We hereby declare that the product cited below satisfies all relevant provisions of the following **EU Directives**:

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

The authorized representative for the compilation of technical documents is Mr. Helmut Bernhardt, Pfeiffer Vacuum GmbH, Berliner Straße 43, 35614 Aßlar, Germany.

Turbopump

HiPace 1200 | U C

HiPace 1200 U | U C

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

DIN EN ISO 12100:2011

DIN EN 1012-2:2011

DIN EN 61000-3-2:2014

DIN EN 61000-3-3:2014

DIN EN 61010-1:2010

DIN EN 61326-1:2013

DIN EN 62061:2013

Signature:

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(Dr. Ulrich von Hülsen)
Managing Director

Aßlar, 2018-07-11



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