



# OPERATING INSTRUCTIONS

EN

Translation of the Original

## HICUBE PRO

Turbo pumping stations

**PFEIFFER**  **VACUUM**

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## Dear Customer,

Thank you for choosing a Pfeiffer Vacuum product. Your new turbo pumping station 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](mailto: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

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

### 1.1.1 Applicable documents

HiCube Pro	Operating instructions
Declaration of conformity	A component of these instructions
Operating instructions for the individual components	see product description

You can find this document in the [Pfeiffer Vacuum Download Center](#).

### 1.1.2 Variants

These instructions apply to HiCube Eco line turbo pumping stations:

- HiCube 80 Pro
- HiCube 300 Pro
- HiCube 300 H Pro
- HiCube 400 Pro
- HiCube 700 Pro
- HiCube 700 H Pro

## 1.2 Target group

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

- Transportation
- 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 meanings.

	<p><b>Rating plate</b> The rating plate is located on the rear of the electronics housing.</p>
	<p><b>Mandatory: disconnect mains plug</b> The sticker indicates that the mains plug is to be disconnected from the device prior to installation and maintenance work.</p>
	<p><b>Electrical voltage warning</b> The sticker warns of the risk of electric shock when working with the housing open.</p>
	<p><b>Transport lock</b> This sticker indicates that the backing pump transport lock must be released prior to commissioning.</p>
<p><b>Other stickers</b></p>	<p>Remove stickers on the components according to the respective operating instructions.</p>

Tbl. 1: Stickers on the product



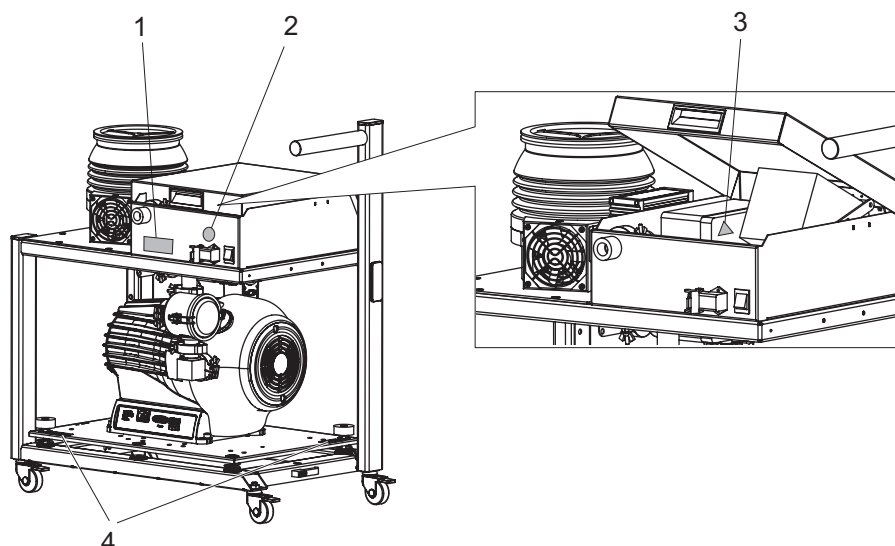


Fig. 1: Position of the stickers on the product

- |  |   |
|--|---|
| 1 Rating plate                         | 3 Electrical voltage (power supply pack) warning sign |
| 2 Mandatory disconnect mains plug sign | 4 Transport lock sticker                              |

### 1.3.4 Abbreviations

Abbreviation	Meaning in this document
CF	Flange: Metal-sealed connector in accordance with ISO 3669
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)
HV	High vacuum flange, high vacuum side
ISO	Flange: Connector in accordance with ISO 1609 and ISO 2861
LC	Display: Liquid crystal display (LCD)
LED	Light emitting diode
MVP	Diaphragm vacuum pump
PE	Protective earth (earthed conductor)
[P:xxx]	Electronic drive unit control parameters. Printed in bold as a three-digit number in square brackets. Frequently displayed in conjunction with a short description. Example: <b>[P:312]</b> software version
T	Temperature (in °C)
TC	Turbopump electronic drive unit (turbo controller)
TPS	Voltage supply (turbo power supply)
X3	15-pole D-Sub connecting socket on the turbopump TC 110 electronic drive unit
remote	26-pole D-Sub connecting socket on the turbopump TC 400 electronic drive unit

Tbl. 2: Abbreviations used in this document

## 2 Safety

### 2.1 General safety information

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

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

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

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

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

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

All safety instructions in this document are based on the results of the risk assessment carried out in accordance with 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

<b>⚠ WARNING</b>
<p><b>Danger of serious injury due to falling objects</b></p> <p>Due to falling objects there is a risk of injuries to limbs through to broken bones.</p> <ul style="list-style-type: none"> <li>▶ Take particular care and pay special attention when transporting products manually.</li> <li>▶ Do not stack the products.</li> <li>▶ Wear protective equipment, e.g. safety shoes.</li> </ul>

<b>⚠ CAUTION</b>
<p><b>Danger of injury due to the pumping station tipping or rolling away</b></p> <p>Superstructural parts change the center of gravity. There is a danger of crushing due to rolling away or tipping.</p> <ul style="list-style-type: none"> <li>▶ Place the pumping station on a flat installation surface.</li> <li>▶ Anchor the pumping station at the installation location.</li> <li>▶ Wear personal protective equipment.</li> </ul>

## Risks during installation

**⚠ 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****Risk of fatal injury due to electric shock on account of incorrect installation**

The device's power supply uses life-threatening voltages. Unsafe or improper installation can lead to life-threatening situations from electric shocks obtained from working with or on the unit.

- ▶ Ensure safe integration into an emergency off safety circuit.
- ▶ Do not carry out your own conversions or modifications on the unit.

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

With the high vacuum flange open, access to sharp-edged parts is possible. A manual rotation of the rotor increases the danger situation. There is the risk of cuts, up to the separation of body parts (e.g. fingertips). There is a risk of hair and loose clothing being drawn in. Objects falling in destroy the turbopump during subsequent operation.

- ▶ Only remove the original protective covers immediately prior to connecting the high vacuum flange.
- ▶ Do not reach into the high vacuum connection.
- ▶ Wear protective gloves during installation.
- ▶ Do not start the turbopump with open vacuum connections.
- ▶ Always carry out the mechanical installation before electrical connection.
- ▶ Prevent access to the high vacuum connection of the turbopump from the operator side (e.g. open vacuum chamber).

**⚠ 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 of death from poisoning due to toxic gases being expelled without an exhaust line**

Exhaust gases and vapors are released from the turbo pumping station unhindered during normal use. In the case of processes with toxic media, there is a risk of injury and danger of death due to poisoning.

- ▶ Note the corresponding regulations for handling toxic substances.
- ▶ Toxic process gases should be safely conveyed away via an exhaust line.

**⚠ CAUTION**

**Danger of injury due to the pumping station tipping or rolling away**

Superstructural parts change the center of gravity. There is a danger of crushing due to rolling away or tipping.

- ▶ Place the pumping station on a flat installation surface.
- ▶ Anchor the pumping station at the installation location.
- ▶ Wear personal protective equipment.

**⚠ CAUTION**

**Danger of injury from bursting as a result of high pressure in the exhaust line**

Faulty or inadequate exhaust pipes lead to dangerous situations, e.g. increased exhaust pressure. There is a danger of bursting. Injuries caused by flying fragments, the escaping of high pressure, and damage to the unit cannot be excluded.

- ▶ Route the exhaust line without shut-off units.
- ▶ Observe the permissible pressures and pressure differentials for the product.
- ▶ Check the function of the exhaust line on a regular basis.

**Risks during operation**

**⚠ WARNING**

**Danger of death from poisoning due to toxic gases being expelled without an exhaust line**

Exhaust gases and vapors are released from the turbo pumping station unhindered during normal usage. In the case of processes with toxic media, there is a risk of injury and danger of death due to poisoning.

- ▶ Note the corresponding regulations for handling toxic substances.
- ▶ Toxic process gases should be safely conveyed away via an exhaust line.

**⚠ WARNING**

**Risk of poisoning from incorrect use of the gas ballast system**

The gas ballast system of the scroll pump is vacuum sealed only when used in valid, snapped positions "0", "1" and "2". When operating the valves in intermediate stages, there is a risk that process media can escape to the environment uncontrolled. When using toxic process media, there is a risk of poisoning.

- ▶ Change the positions of the valve only for setting the gas ballast stages.
- ▶ Operate the gas ballast valve only in the snap positions.

**⚠ CAUTION**

**Danger of injury from bursting as a result of high pressure in the exhaust line**

Faulty or inadequate exhaust pipes lead to dangerous situations, e.g. increased exhaust pressure. There is a danger of bursting. Injuries caused by flying fragments, the escaping of high pressure, and damage to the unit cannot be excluded.

- ▶ Route the exhaust line without shut-off units.
- ▶ Observe the permissible pressures and pressure differentials for the product.
- ▶ Check the function of the exhaust line on a regular basis.

**⚠ 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, decommissioning and disposal

### **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.

### **WARNING**

#### **Health hazard and risk of environmental damage from toxic contaminated operating fluid**

Toxic process media can cause operating fluid contamination. When changing the operating fluid, there is a health hazard due to contact with poisonous substances. Illegal disposal of toxic substances causes environmental damage.

- ▶ Wear suitable personal protective equipment when handling these media.
- ▶ Dispose of the operating fluid according to locally applicable regulations.

### **WARNING**

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

With the high vacuum flange open, access to sharp-edged parts is possible. A manual rotation of the rotor increases the danger situation. There is the risk of cuts, up to the separation of body parts (e.g. fingertips). There is a risk of hair and loose clothing being drawn in. Objects falling in destroy the turbopump during subsequent operation.

- ▶ Only remove the original protective covers immediately prior to connecting the high vacuum flange.
- ▶ Do not reach into the high vacuum connection.
- ▶ Wear protective gloves during installation.
- ▶ Do not start the turbopump with open vacuum connections.
- ▶ Always carry out the mechanical installation before electrical connection.
- ▶ Prevent access to the high vacuum connection of the turbopump from the operator side (e.g. open vacuum chamber).

### **CAUTION**

#### **Scalding from hot operating fluid**

Danger of burns when draining operating fluid if it comes into contact with the skin.

- ▶ Wear protective equipment.
- ▶ Use a suitable collection receptacle.

**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 jamming of the rotor generates high destructive torques in accordance with ISO 27892. If the turbopump is **not** properly secured, it can shear off. 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.

- ▶ 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.

**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 conformity due to modifications to the product**

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

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

**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°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



### 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.
- If the maximum permissible operating temperature of the turbopump is exceeded, the electronic drive unit first reduces the drive output and then switches it off where necessary.

Parameter	Limit value	
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 °C up to max. 50% at T < 40 °C	
Installation surface flatness	≤ 5 degrees	
Protection class	I	
Overvoltage category	II	
Permissible protection degree	IP20	
Degree of pollution	2	
Ambient temperature	5°C to 35°C with air cooling 5°C to 40°C with water cooling	
Max. permissible ambient magnetic field	<ul style="list-style-type: none"> <li>• HiPace 80</li> <li>• HiPace 300</li> <li>• HiPace 400</li> <li>• HiPace 700</li> </ul>	<ul style="list-style-type: none"> <li>• 3.3 mT</li> <li>• 5.5 mT</li> <li>• 6 mT</li> <li>• 6 mT</li> </ul>
Maximum irradiated thermal input	<ul style="list-style-type: none"> <li>• HiPace 80</li> <li>• HiPace 300</li> <li>• HiPace 400</li> <li>• HiPace 700</li> </ul>	<ul style="list-style-type: none"> <li>• 3 W</li> <li>• 8 W</li> <li>• 14 W</li> <li>• 14 W</li> </ul>
Maximum permissible rotor temperature of the turbopump	90 °C	

Tbl. 3: Limits of use for turbopump stations

## 2.5 Proper use

- The turbo pumping station is designed exclusively for generating a vacuum.
- The turbo pumping station is designed only for evacuating dry and inert gases.
- The turbo pumping station is designed only for use in closed interiors.

## 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, in particular:

- Establishing the voltage supply without correct installation
- Installation with non-specified fastening material
- Pumping explosive media
- Pumping of corrosive media

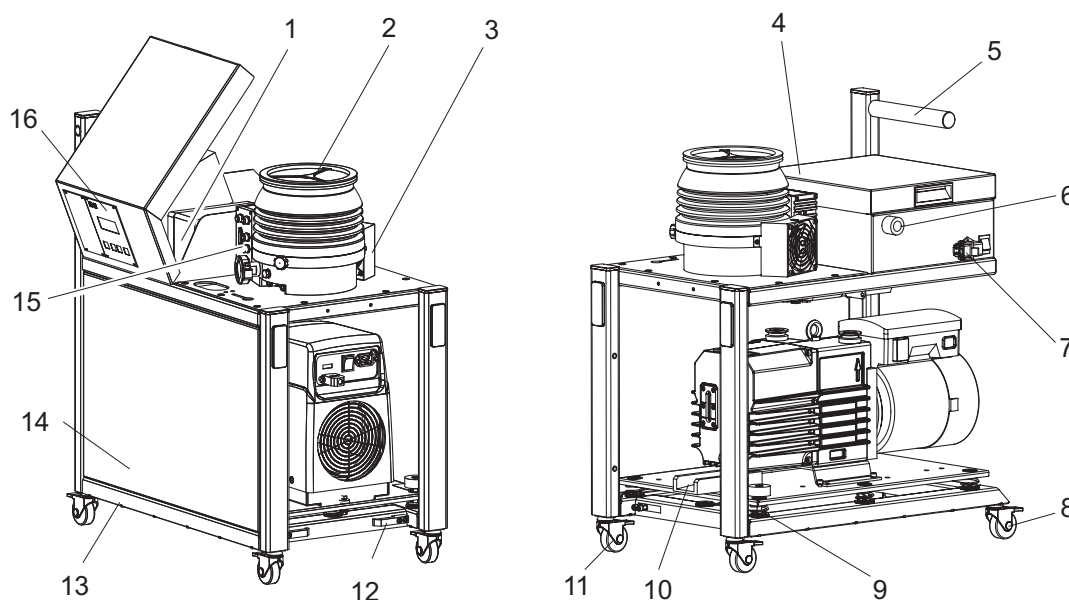
- Pumping of condensing vapors
- Pumping of fluids
- Pumping of dust
- Operation with impermissible high gas throughput
- Operation with impermissible high fore-vacuum pressure
- Operation with excessively high irradiated heat output
- Operation in impermissible high magnetic fields
- Operation in an 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 Function

Turbopump stations are fully automatic pump units ready for connection. A turbo pumping station consists of a portable or mobile vacuum pump unit, with a turbopump and a specially matched backing pump.

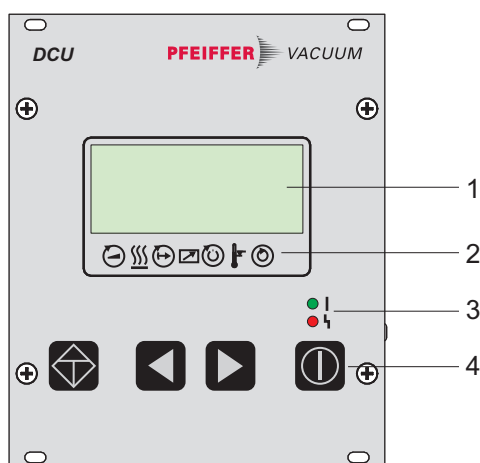


**Fig. 2: Product overview with combination examples**

- |                       |                                      |
|-----------------------|--------------------------------------|
| 1 Relay box           | 9 Transport lock                     |
| 2 Turbopump           | 10 Drain channel for operating fluid |
| 3 Air cooling         | 11 Swivel Castor with wheel brake    |
| 4 Electronics housing | 12 Fastening hook or security hook   |
| 5 Transport handle    | 13 Frame                             |
| 6 Exhaust connection  | 14 Cladding, casing, sheathing       |
| 7 Mains connection    | 15 Electronic drive unit TC          |
| 8 Swivel Castor       | 16 Display and control unit          |

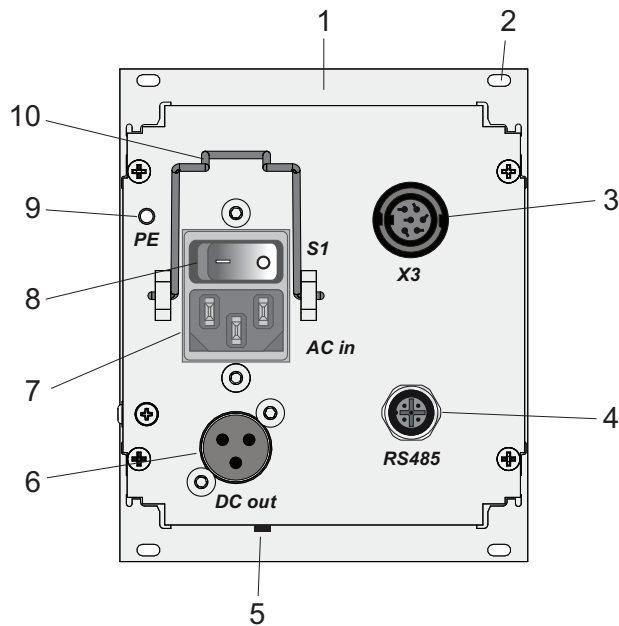
#### 3.1.1 Operating interface

The integrated display and control unit (DCU) is used to control and monitor the entire turbo pumping station. The DCU is optionally used as a remote control if removed from the housing and used with an extension cable.



**Fig. 3: DCU control panel**

- |                           |                              |
|---------------------------|------------------------------|
| 1 LC display, illuminated | 3 LED operating mode display |
| 2 Status symbols          | 4 Controls                   |



**Fig. 4: DCU with integrated power supply pack, rear view**

- |                            |  |
|----------------------------|--|
| 1 Front plate, rear side   | 6 Connecting socket DC out               |
| 2 Mounting hole            | 7 Connecting plug ACin, mains input      |
| 3 Connecting socket X3     | 8 Mains switch S1                        |
| 4 Connecting socket RS-485 | 9 Earthed conductor, M4                  |
| 5 Contrast setting         | 10 Mounting bracket for mains connection |

### 3.1.2 Drive

- Electronic drive unit of the turbopump
- Electronic drive unit of the backing pump

### 3.1.3 Cooling

- Air cooling
- Water cooling (optional)

At excessively high temperatures, the electronic drive unit automatically reduces the drive power.

## 3.2 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.certipedia.com](http://www.certipedia.com) with company ID no. 000021320.

### 3.3 Product features

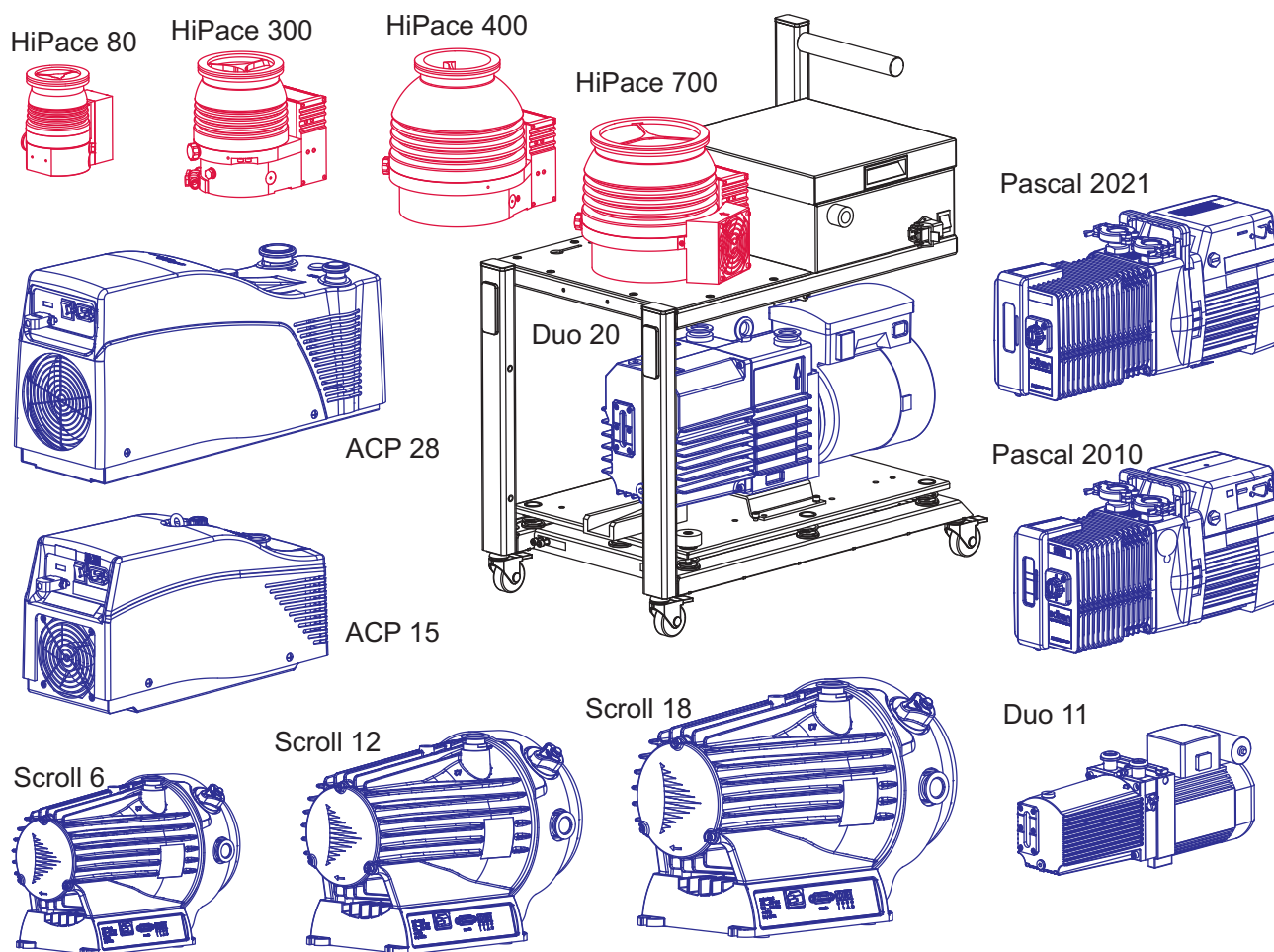


Fig. 5: Overview: Turbo and backing pump combinations

Feature	HiCube Pro				Operating instructions
	DN 40 DN 63	DN 100	DN 100	DN 160	
Turbopump	HiPace 80	HiPace 300	HiPace 300 H	HiPace 400	PT 0208 BN PT 0200 BN PT 0509 BN PT 0210 BN PT 0209 BN PT 0621 BN
Electronic drive unit	TC 110	TC 400 TC 110	TC 400	TC 400	PT 0203 BN PT 0204 BN
Air cooling	yes	yes	yes	yes	PT 0500 BN
Backing Pump: Multi-stage roots pump	ACP 15 ACP 18	ACP 15 ACP 18	ACP 15 ACP 18	ACP 15 ACP 18	123884 O 112369 O
Backing Pump: Rotary vane pump	Duo 11 M Duo 20 M	Duo 11 M Duo 20 M	Duo 11 M Duo 20 M	Duo 11 M Duo 20 M	PD 0070 BN PK 0203 BN 103275 O 103275 O
Backing Pump: Scroll Pumps	HiScroll 6	HiScroll 6	HiScroll 6	HiScroll 6	PU 0080 BN PU 0081 BN

Feature	HiCube Pro				Operating instructions
	DCU 110	DCU 310	DCU 400	DCU 400	
Current supply with display and control unit	DCU 110	DCU 310	DCU 400	DCU 400	PT 0250 BN
<b>Accessories</b>					
Venting valve	optional	optional	optional	optional	PT 0228 BN
Housing heater (water cooling required)	optional (only for CF-F)	optional (only for CF-F)	optional (only for CF-F)	optional (only for CF-F)	PT 0233 BN
Control adapter for accessories	yes	yes	yes	yes	PT 0521 BN

**Tbl. 4: Pumping station component combination options**

### 3.4 Scope of delivery

- HiCube Pro turbo pumping station
- Protective cover for the high vacuum flange
- Power supply cable, country-specific
- Grounding cable, 3 m (incl. fastening material)
- Operating fluid and filling hose (only with rotary vane pump as backing pump)
- Operating instructions for the turbo pumping station and individual components

## 4 Transportation and Storage

### 4.1 Transporting the pumping station

#### **⚠ WARNING**

##### **Danger of serious injury due to falling objects**

Due to falling objects there is a risk of injuries to limbs through to broken bones.

- ▶ Take particular care and pay special attention when transporting products manually.
- ▶ Do not stack the products.
- ▶ Wear protective equipment, e.g. safety shoes.

#### **⚠ CAUTION**

##### **Danger of injury due to the pumping station tipping or rolling away**

Superstructural parts change the center of gravity. There is a danger of crushing due to rolling away or tipping.

- ▶ Place the pumping station on a flat installation surface.
- ▶ Anchor the pumping station at the installation location.
- ▶ Wear personal protective equipment.



#### **Packing**

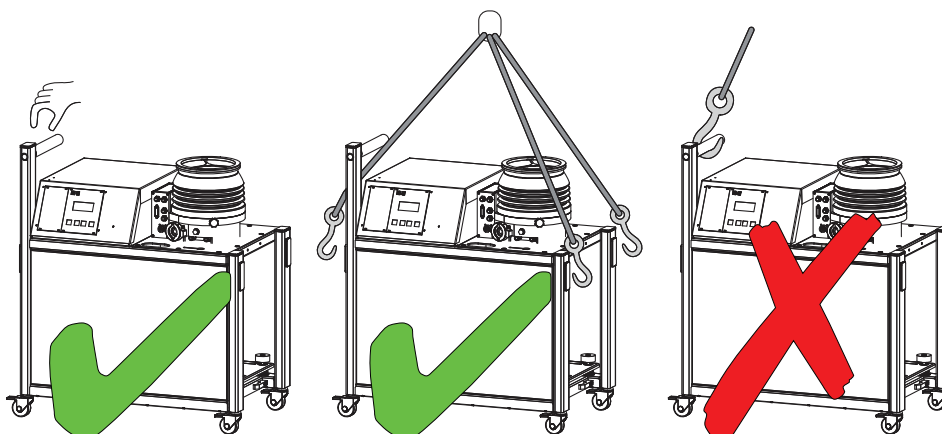
We recommend keeping the transport packaging and original protective cover.

#### **General information regarding safe transport**

1. Observe the weight specified on the packaging.
2. Where possible, always transport or ship the pumping station in the original packaging.
3. Always move the product upright, and over the flattest possible surface.
4. Remove the protective cover only immediately prior to installation.

#### **Information regarding transport of the vacuum pump in its packaging**

1. Use a pallet truck to transport the vacuum pump in its packaging.
2. Note the center of gravity of the load.
3. Observe safe handling of manually operated transport devices.
4. Ensure harmonious movements and moderate speeds.
5. Ensure a flat substrate.
6. Wear protective equipment, e.g. safety shoes.



**Fig. 6: Transport turbo pumping station**

1 Protective cap

2 Attachment points

#### Information for transport of the vacuum pump without packaging

For transport without packaging, HiCube Pro turbopump stations are equipped with recesses on the side of the housing frame.

1. Remove the protective caps from the recesses.
2. Attach suitable lifting devices to at least 3 attachment points.
3. Pay attention to the correct use and fastening of the lifting equipment.
4. Lift the pumping station vertically (e.g. out of packaging).
5. Place the turbo pumping station securely on an adequately sized, level surface.
6. Insert protective caps into the recesses of the attachment points.
7. Release the transportation lock prior to commissioning at the installation location.

## 4.2 Transport lock

Backing pumps in HiCube line turbopump stations are secured against damage during transport.

#### Handling the transport lock

1. Release the backing pump transport lock, only directly prior to commissioning at the installation location.
2. Observe the installation instructions .

## 4.3 Store pumping station



#### Packing

We recommend storing the product in its original packaging.

1. Seal the flange opening with the original protective cover.
2. Close all other connections (e.g. exhaust) with the corresponding protective covers.
3. Store the vacuum pump only in dry, dust-free rooms, within the specified ambient conditions.
4. In rooms with humid or aggressive atmospheres: Hermetically seal the turbo pumping station, 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 Preparing for set-up

#### **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.

##### **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 limits of use.
- ▶ Provide the highest possible level of cleanliness during assembly.
- ▶ Ensure that flange components during installation are grease-free, dust-free and dry.

### 5.2 Setting up the pumping station

#### **WARNING**

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

With the high vacuum flange open, access to sharp-edged parts is possible. A manual rotation of the rotor increases the danger situation. There is the risk of cuts, up to the separation of body parts (e.g. fingertips). There is a risk of hair and loose clothing being drawn in. Objects falling in destroy the turbopump during subsequent operation.

- ▶ Only remove the original protective covers immediately prior to connecting the high vacuum flange.
- ▶ Do not reach into the high vacuum connection.
- ▶ Wear protective gloves during installation.
- ▶ Do not start the turbopump with open vacuum connections.
- ▶ Always carry out the mechanical installation before electrical connection.
- ▶ Prevent access to the high vacuum connection of the turbopump from the operator side (e.g. open vacuum chamber).

##### **Procedure**

1. Maintain a minimum distance of 50 cm to lateral boundaries or adjacent devices.
2. Make sure that there are sufficient cooling options for the pumping station.
3. Install suitable shielding if the surrounding magnetic fields exceed the permissible levels.
4. If you use housing heating and water cooling, make sure that the temperature at the vacuum chamber connection flange does not exceed 120 °C.
5. Install suitable shielding so that the irradiated thermal output does not exceed the permissible values when high temperatures occur due to the process.

## 5.3 Anchor pumping station

### **⚠ CAUTION**

#### **Danger of injury due to the pumping station tipping or rolling away**

Superstructural parts change the center of gravity. There is a danger of crushing due to rolling away or tipping.

- ▶ Place the pumping station on a flat installation surface.
- ▶ Anchor the pumping station at the installation location.
- ▶ Wear personal protective equipment.



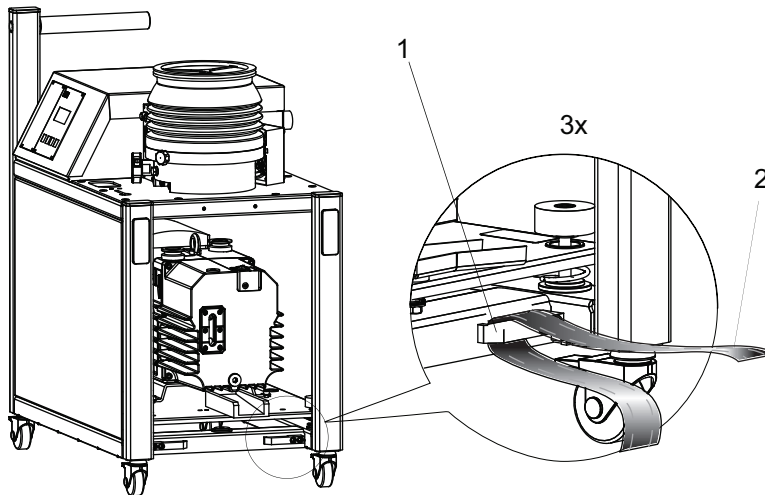
#### **Anchor pumping station**

The operator is responsible for anchoring.

- Make sure that the operator-installed pumping station housing fixation absorbs the torque that occurs in case the turbopump rotor blocks suddenly.

#### **Required aids**

- 3x lashing straps of adequate length and loading capacity; width approximately 3 cm
- On-site attachment points to retain the lashing straps



**Fig. 7: Fix pumping station with lashing straps**

- 1 Mounting hooks (3x)                      2 Lashing strap

#### **Secure pumping station against twisting**

1. Always fix the pumping station with lashing straps on all three mounting hooks.
  - Observe max. load of 2000 N per mounting point.
2. Affix the lashing straps perpendicularly to the mounting hooks opening, i.e., against the turbo-pump rotation direction.
3. Make sure that the belts are fitted and tensioned correctly. Make sure that the belt loop is in the hollow of the mounting hook.



## 5.4 Connecting the high vacuum side

### 5.4.1 Designing the 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.



##### Superstructural parts and fittings on the high vacuum connection

Installing superstructural parts and fittings to 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 axial values specified.
- Make sure that all the torques generated if the rotor blocks suddenly, are absorbed by the system on the operator side and the high vacuum connection.
- Only use the approved mounting kits of Pfeiffer Vacuum for the high vacuum connection of the turbopump.

Parameter	HiCube 80 Pro	HiCube 300 Pro	HiCube 400 Pro	HiCube 700 Pro
Maximum torque occurring in the event of a burst <sup>1)</sup>	620 Nm	2000 Nm	4200 Nm	4200 Nm
Maximum permissible axial load on the high vacuum flange <sup>2)</sup>	1000 N (equivalent to 100 kg)	1000 N (equivalent to 100 kg)	1000 N (equivalent to 100 kg)	1000 N (equivalent to 100 kg)
Flatness	± 0.05 mm	± 0.05 mm	± 0.05 mm	± 0.05 mm
Minimum tensile strength of the flange material in all operating states in relation to the engagement depth of the fixing screws	170 N/mm <sup>2</sup> at 2.5 x d 270 N/mm <sup>2</sup> at 1.5 x d	170 N/mm <sup>2</sup> at 2.5 x d 270 N/mm <sup>2</sup> at 1.5 x d	170 N/mm <sup>2</sup> at 2.5 x d 270 N/mm <sup>2</sup> at 1.5 x d	170 N/mm <sup>2</sup> at 2.5 x d 270 N/mm <sup>2</sup> at 1.5 x d
Maximum permissible surrounding magnetic field	3.3 mT	5.5 mT	6.0 mT	6.0 mT
Maximum permissible irradiated thermal output	3.0 W	8.0 W	14.0 W	14.0 W
Maximum permissible rotor temperature	90 °C	90 °C	90 °C	90 °C

Tbl. 5: Requirements for the dimensioning of high vacuum connection supplied by the customer

### 5.4.2 Use 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 turbopump reduces according to the passage guide values and the size of the high vacuum flange.

Flange size	Reduced pumping speed in % for the gas type			
	H <sub>2</sub>	He	N <sub>2</sub>	Ar
Splinter shield DN 40	6	9	17	18

- 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.

Flange size	Reduced pumping speed in % for the gas type			
	3	6	15	16
Splinter shield DN 63	3	6	15	16
Protective screen DN 63	1	1	4	4
Splinter shield DN 100	5	7	24	24
Protective screen DN 100	2	2	10	8
Splinter shield DN 160	6	9	20	23
Protective screen DN 160	1	2	6	7

**Tbl. 6: Reduction of the pumping speed when using a splinter shield or protective screen**

**Procedure**

- ▶ With ISO flanges, use centering rings with protective screen or splinter shield.
- ▶ For CF flanges, always insert protective screen or splinter shield with the clamping lugs pointing towards the rotor in the high vacuum flange.

### 5.4.3 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.

### 5.4.4 Connecting the turbopump externally

Depending on the configuration, the turbopump can be operated independently from the pumping station.

**i** **Dismantling the turbopump**

Please see the descriptions for removing a turbopump from the pumping station ([see chapter "Removing components for maintenance", page 44](#)).

**Procedure**

1. Follow the installation instructions for the turbopump in the associated operating instructions for the individual components.
2. Use the appropriate cable set from the scope of delivery.
  - Other lengths available on request.
3. Extend the fore-vacuum line or utilize a line of the required length.

### 5.4.5 Installation of ISO-KF flange



#### 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

- Allen key
- Calibrated torque wrench (Tightening factor  $\leq 1.6$ )

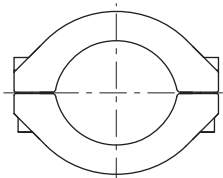


Fig. 8: Flange connection ISO-KF to ISO-KF

#### Using of clamping ring

1. Only use the approved mounting kits from Pfeiffer Vacuum for the connection.
2. Fasten the high vacuum connection on the turbopump and the clamping ring to the counter flange.
3. Utilize all prescribed components for the turbopump.
4. Tighten the clamping ring screws evenly.
  - Tightening torque: **3,7 Nm**.

### 5.4.6 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  $\leq 1.6$ )

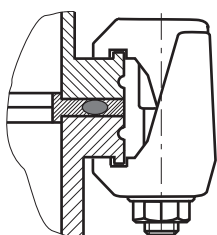


Fig. 9: Flange connection ISO-K to ISO-F, bracket screws

#### 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 for all prescribed components for the turbopump.
4. Tighten the bracket screws cross-wise in 3 steps.
  - Tightening torque: **5, 15, 25  $\pm$  2 Nm**

### 5.4.7 Installation of ISO-K flange onto ISO-F

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

- "Claw and tapped hole"
- "Hexagon head set screw and tapped hole"

- "Stud screw and tapped hole"
- "Stud screw and through-bore"

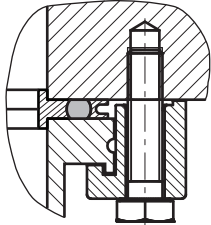


**ISO flange connections**

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.

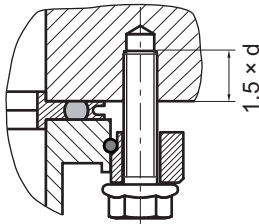
- Leak-tightness of the flange connection, however, is not jeopardized in this regard.

**Connection of claw and tapped hole**



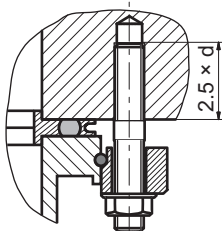
1. Only use the approved mounting kits from Pfeiffer Vacuum for the connection.
2. Connect the flange according to the diagram using the components in the mounting kit.
3. Utilize all prescribed components for the turbopump.
4. Tighten the claws in 3 stages in opposite pairs.
  - Tightening torque: **5, 10, 16 ± 1 Nm**

**Connection of hexagon head set screw and tapped hole**



1. Only use the approved mounting kits from Pfeiffer Vacuum for the connection.
2. Place the collar flange over the high vacuum flange on the turbopump.
3. Insert the snap ring into the side groove on the high vacuum flange of the turbopump.
4. Fasten the turbopump onto the counter flange in accordance with the diagram using the collar flange, snap ring and centering ring.
5. Utilize all prescribed components for the turbopump.
6. Screw the hexagon head set screws into the tapped holes.
  - Observe the minimum tensile strength of the flange material and the screw-in depth.
7. Tighten the hexagon head set screws in 3 stages in opposite pairs.
  - Tightening torque: **5, 10, 16 ± 1 Nm**

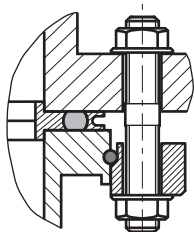
**Connection of stud screw and tapped hole**



1. Only use the approved mounting kits from Pfeiffer Vacuum for the connection.
2. Screw the required number of stud screws with the shorter screw-in end into the holes in the counter flange.
  - Observe the minimum tensile strength of the flange material and the screw-in depth.
3. Place the collar flange over the high vacuum flange on the turbopump.
4. Insert the snap ring into the side groove on the high vacuum flange of the turbopump.
5. Fasten the turbopump onto the counter flange in accordance with the diagram using the collar flange, snap ring and centering ring.

6. Utilize all prescribed components for the turbopump.
7. Tighten the nuts in 3 stages in opposite pairs.
  - Tightening torque: **5, 10, 16 ± 1 Nm**

#### Connection of stud screw and through-bore



1. Only use the approved mounting kits from Pfeiffer Vacuum for the connection.
2. Place the collar flange over the high vacuum flange on the turbopump.
3. Insert the snap ring into the side groove on the high vacuum flange of the turbopump.
4. Fasten the turbopump onto the counter flange in accordance with the diagram using the collar flange, snap ring and centering ring.
5. Utilize all prescribed components for the turbopump.
6. Tighten the nuts in 3 stages in opposite pairs.
7. Tightening torque: **5, 10, 16 ± 1 Nm**

### 5.4.8 Attaching 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

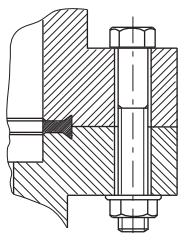
##### Leaks may occur due to the incorrect installation of CF flanges

Inadequate cleanliness when handling CF flanges and copper gaskets results in leaks and may cause process damage.

- ▶ 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)

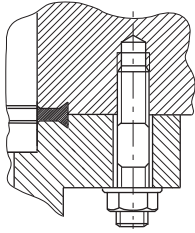


**Fig. 10:** Flange connection CF-F, hexagon head screw and through hole

#### 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.

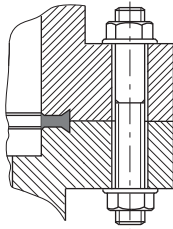
5. Tighten the screw couplings all the way around.
  - Tightening torque: **22 ± 2 Nm**
6. Then check the torque, since flowing of the sealing material may make it necessary to re-tighten the screws.



**Fig. 11: 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 turbo-pump 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. 12: 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 turbo-pump 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.

## 5.5 Connect the exhaust side

**⚠ WARNING**

**Danger of death from poisoning due to toxic gases being expelled without an exhaust line**

Exhaust gases and vapors are released from the turbo pumping station unhindered during normal usage. In the case of processes with toxic media, there is a risk of injury and danger of death due to poisoning.

- ▶ Note the corresponding regulations for handling toxic substances.
- ▶ Toxic process gases should be safely conveyed away via an exhaust line.

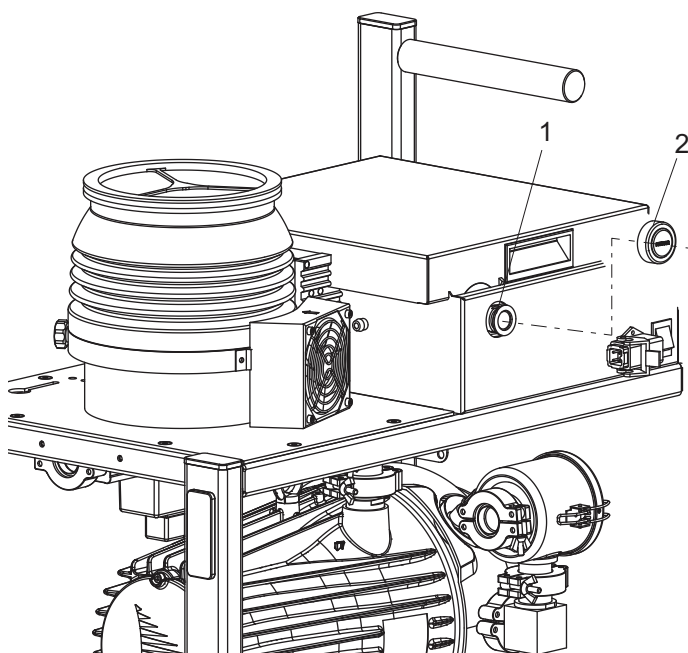
**⚠ CAUTION****Danger of injury from bursting as a result of high pressure in the exhaust line**

Faulty or inadequate exhaust pipes lead to dangerous situations, e.g. increased exhaust pressure. There is a danger of bursting. Injuries caused by flying fragments, the escaping of high pressure, and damage to the unit cannot be excluded.

- ▶ Route the exhaust line without shut-off units.
- ▶ Observe the permissible pressures and pressure differentials for the product.
- ▶ Check the function of the exhaust line on a regular basis.

**Condensate separator**

Pfeiffer Vacuum recommends installing a condensate separator, with condensate drain at the lowest point of the exhaust line.



**Fig. 13: Example backing pump exhaust connection**

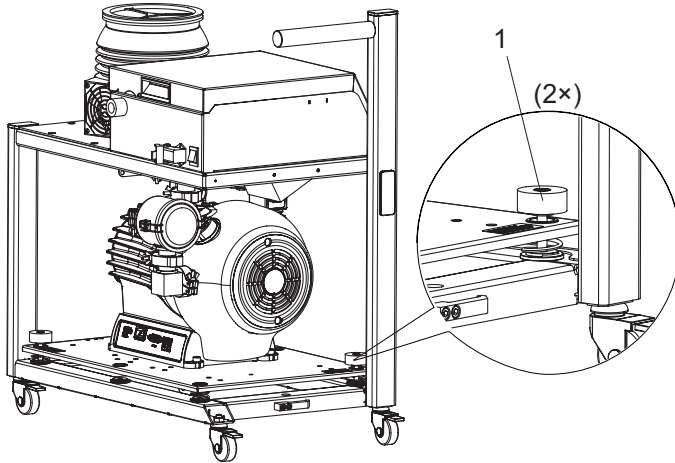
- 1 Exhaust connection, 1/2" internal thread      2 Protective cover

**Procedure**

1. Remove the protective cover from the exhaust connection.
2. Choose a minimum exhaust line cross section equal to the nominal size of the connection.
3. Install a vacuum connection with small flange components, e.g. screw-in flange DN 16 ISO-KF from the [Pfeiffer Vacuum Components Shop](#).
4. Route the piping downwards from the vacuum pump, to prevent condensate return.
5. Support or suspend the piping to the vacuum pump so that no piping system forces act on the vacuum pump.

## 5.6 Remove transportation lock

The transportation lock fixes the spring-mounted floor panel diagonally with 2 knurled screws.



**Fig. 14: Backing pump transportation lock**

- 1 Knurled screw on transportation lock

**Procedure**

1. Turn the knurled screw on the transportation lock upwards to the stop.
2. Release the transportation lock on the opposite side.

## 5.7 Fill operating fluid

**NOTICE**

**Risk of damage due to the use of non-approved operating fluid**

Product-specific performance data are not achieved. All liability and warranty claims against Pfeiffer Vacuum are also excluded.

- ▶ Only use approved operating fluids.
- ▶ Only use other application-specific operating fluids after consultation with Pfeiffer Vacuum.



**Use of operating fluids**

Only applies to HiCube Pro with rotary vane pump as backing pump.

- The operating fluid for rotary vane pumps is included in the scope of delivery.
- The operating fluid reservoir on the turbopump is already filled and installed.
- The dry-sealing ACP backing pump is filled with lubricant ex factory.
- The dry-sealing scroll pump does not need lubricant.

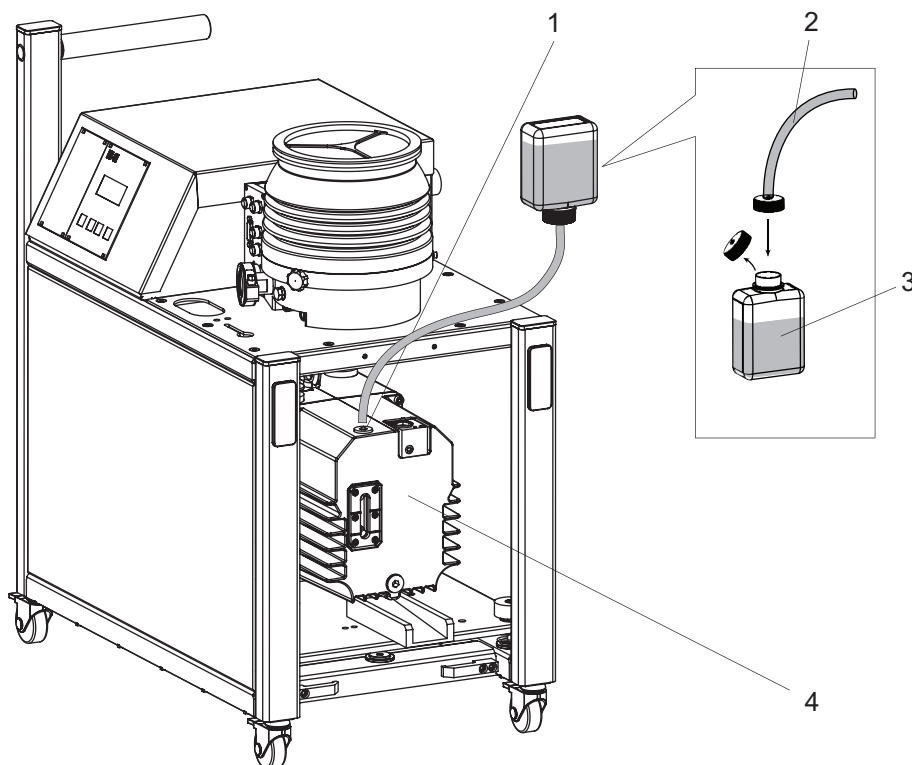
**Permissible operating fluid**

- P3 (standard operating fluid)

**Read the operating fluid type on the rating plate**

- ▶ Refer to the rating plate of the vacuum pump for type and quantity of intended operating fluid.





**Fig. 15: Fill operating fluid**

- |                |                                  |
|----------------|----------------------------------|
| 1 Filler screw | 3 Operating Fluid Bottle         |
| 2 Filler Tube  | 4 Backing Pump: Rotary vane pump |

#### Required consumables

- Operating fluid of the vacuum pump
- Filler Tube

#### Required tools

- Allen key, **WAF 5**
- Calibrated torque wrench (tightening factor  $\leq 2.5$ )

#### Procedure

1. Unscrew and remove the locking screw on the operating fluid bottle.
2. Screw the filling hose onto the operating fluid bottle.
3. Unscrew and remove the filler screw from the rotary vane pump.
4. Fill operating fluid according to the rotary vane pump operating instructions.
5. Screw in the filler screw again.
  - Be careful with the O-ring.

## 5.8 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 for hybrid bearing turbo-pumps](#) can be found online.

**Electronic drive unit TC 400 accessory connection**



**Auxiliary connection to electronic drive unit TC 400 and TM 700**

The electronic drive unit of the turbopump offers space for the connection of maximum 4 accessory devices. M12 connector 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.
- For detailed information see the "Electronic drive unit TC 400" or "Electronic drive unit TC 700" operating instructions.

	Electronic drive unit connection	Accessory connection	Y-connector	Pre-set configuration
	Acc. A	A1	Y-1	Fan (temperature controlled)
		A2	Y-2	Backing pump
	Acc. B	B1	Y-1	Venting valve
		B2	Y-2	Heating

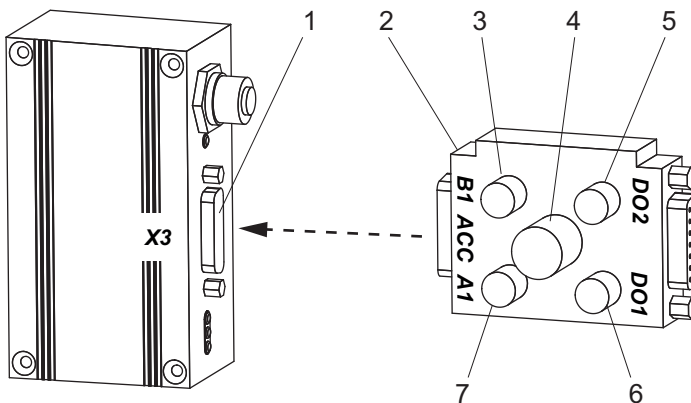
**Tbl. 7: Pre-set accessory connections to electronic drive unit TC 400**

**Electronic drive unit TC 110 accessory connection**



**Connect accessory devices to the TC 110**

- The use of Pfeiffer Vacuum accessories via the TC 110 electronic drive unit is only possible using the corresponding connection cable and/or adapter on the X3 multifunctional connection.
- Configure the required accessory output via RS-485 using Pfeiffer Vacuum display and control units or PC.



**Fig. 16: Example of accessory connection via adapter TCS 12**

- |                               |                           |
|-------------------------------|---------------------------|
| 1 Multifunction connection X3 | 5 Digital output DO2      |
| 2 Adapter TCS                 | 6 Digital output DO1      |
| 3 Accessory connection B1     | 7 Accessory connection A1 |
| 4 Connection RS-485           |                           |

**Connecting pre-configured accessories**

- ▶ Observe the installation instructions in the operating instructions for the relevant accessory.
- ▶ Note the existing configuration of existing connections and control lines.

- ▶ Connect only matching accessory devices to the electronic drive unit.
- ▶ Use the Y-connector from the accessories range if you want to connect 3 or 4 devices to the TC 400.

## 5.9 Connecting measuring tubes

The connecting socket with designation "X3" is used to connect a Pfeiffer Vacuum transmitter.

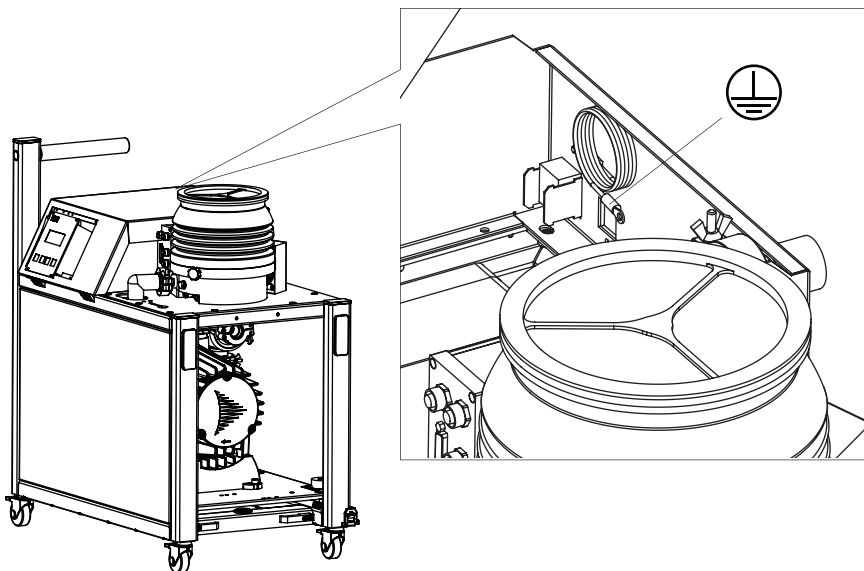
Measuring tubes	Display on the DCU [P:738]
APR 250/260	CMRx61
CMR 261/361	CMRx61, following manual selection
CMR 262/362	CMRx62, following manual selection
CMR 263/363	CMRx63, following manual selection
CMR 264/364	CMRx64, following manual selection
CMR 365	CMRx65, following manual selection
MPT 200 AR	PKR2xx
PCR 280	TP/PCR
PKR 251/261/360/361	PKR2xx
PPT 200 AR	TP/PCR
RPT 200 AR	TP/PCR
TPR 270/280/281	TP/PCR

**Tbl. 8:** Available Pfeiffer Vacuum transmitters for connection to a DCU

### Procedure

1. Connect a pressure measuring tube to connection "X3" of the DCU as required.
2. The corresponding connection cable is available as a Pfeiffer Vacuum accessory.
3. Change the name of the transmitter as required by setting the parameter [P:738].

## 5.10 Ground pumping station



**Fig. 17:** Grounding cable

### Required aids

- Screw M4 × 8
- Shake proof washer M4, if required

**Procedure**

1. Utilize the grounding cable on the inside of the electronics housing to discharge applicative interferences.
2. Connect the eye for M4 grounding cable to a suitable connector.
3. Route the connection in accordance with locally applicable provisions.

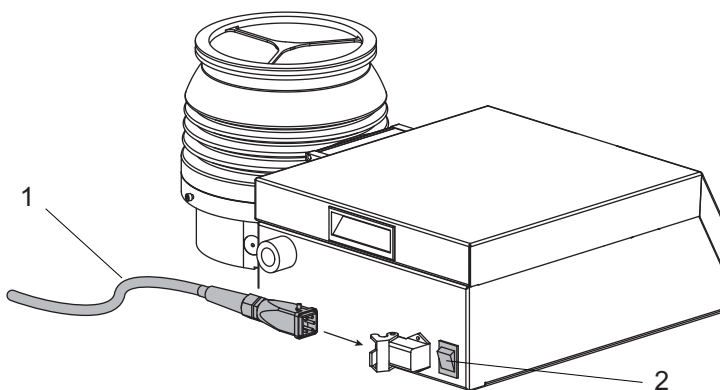
## 5.11 Connect to the mains power supply

**⚠ WARNING**

**Risk of fatal injury due to electric shock on account of incorrect installation**

The device's power supply uses life-threatening voltages. Unsafe or improper installation can lead to life-threatening situations from electric shocks obtained from working with or on the unit.

- ▶ Ensure safe integration into an emergency off safety circuit.
- ▶ Do not carry out your own conversions or modifications on the unit.



**Fig. 18: Power supply connector and main switch on HiCube Pro**

- 1 Power supply cable                      2 Main switch

**Establish mains power supply for HiCube Pro**

1. Make sure that the master switch is off before connecting.
2. Always ensure a secure connection to the earthed conductor (PE).
3. Plug the power supply cable supplied in the scope of delivery into the power supply plug on the side of the pumping station housing.
4. Secure the mains cable using a mounting bracket.
5. Connect the power supply cable to the on-site mains power supply.

## 6 Operation

### 6.1 Commissioning

Important settings and function-related variables are factory-programmed into the vacuum pumps electronic drive units as parameters. Each parameter has a three-digit number and a description. Parameters can be used via Pfeiffer Vacuum DCU display and control units or externally via RS-485, using the Pfeiffer Vacuum protocol.

Parameter	Name	Designation	Option	HiCube 80 Pro	HiCube 300 Pro	HiCube 400 Pro HiCube 700 Pro
[P:001]	Heating	Heating	no heating	0	0	0
			with heating	1	1	1
[P:012]	Enable-Vent	Enable vents		1	1	1
[P:019]	Cfg DO2	Output DO2 configuration		13 (= backing pump)	–	–
[P:023]	Motor-Pump	Motor pump		–	1	1
[P:024]	Cfg DO1	Output DO1 configuration		–	21 = Vacuum valve, delayed	21 = Vacuum valve, delayed
[P:025]	OpMode	Backing pump operating mode	Duo/Pascal	0 = continuous operation	0 = continuous operation	0 = continuous operation
			ACP	1 = intermittent operation	1 = intermittent operation	1 = intermittent operation
			Scroll	1 = intermittent operation	1 = intermittent operation	1 = intermittent operation
[P:035]	Cfg Acc A1	Configuration accessory connection A1	Air cooling	4	4	4
			Water cooling	2	2	2
[P:036]	Cfg Acc B1	Configuration accessory connection B1		1 = Venting valve, closed without current	1 = Venting valve, closed without current	1 = Venting valve, closed without current
[P:046]		Configuration relay 2		–	15 = Pumping station	15 = Pumping station
[P:047]		Configuration relay 3		–	13 = backing pump	13 = backing pump
[P:055]		Output DO1 configuration		8 = Fore-vacuum control	–	13 = backing pump
[P:710]	Swoff BKP	Backing pump switch-off threshold for interval operation	Duo/Pascal	0 W	0 W	0 W
			ACP 15/28	10 W	50 W	65 W
			Scroll	10 W	50 W	65 W
[P:711]	SwOn BKP	Backing pump switch-on threshold for interval operation	Duo/Pascal	0 W	0 W	0 W
			ACP 15/28	10 W	50 W	65 W
			Scroll	20 W	70 W	110 W
[P:794]	Param set	Parameter set		1 = advanced	1 = advanced	1 = advanced
[P:795]	Servicelin	Service row view		309 = Actual speed	309 = Actual speed	309 = Actual speed

Tbl. 9: Factory setting of key parameters on delivery

**NOTICE**

**Turbopump destruction due to gases with too high molecular masses**

The pumping of gases with impermissible high molecular masses leads to the destruction of the turbopump.

- ▶ Make sure that the gas mode is set correctly by **[P:027]** in the electronic drive unit.
- ▶ Consult Pfeiffer Vacuum before you use gases with higher molecular masses (> 80).



**Observe run-up time**

Condensate or moisture from the fore-vacuum area impairs the throughput of the pumping station and can extend the run-up time.

- After switching on, operate the pumping station for approx. 5 minutes with the gas ballast valve open.

**Commission turbo pumping station**

1. Make sure that the transport lock has been released.
2. Where applicable, ensure cooling water supply and flow rate.
3. Where applicable, ensure sealing gas supply and flow rate.
4. Provide the current supply for the product.

## 6.2 Switch on turbo pumping station

**⚠ WARNING**

**Danger of death from poisoning due to toxic gases being expelled without an exhaust line**

Exhaust gases and vapors are released from the turbo pumping station unhindered during normal usage. In the case of processes with toxic media, there is a risk of injury and danger of death due to poisoning.

- ▶ Note the corresponding regulations for handling toxic substances.
- ▶ Toxic process gases should be safely conveyed away via an exhaust line.

**⚠ CAUTION**

**Danger of injury from bursting as a result of high pressure in the exhaust line**

Faulty or inadequate exhaust pipes lead to dangerous situations, e.g. increased exhaust pressure. There is a danger of bursting. Injuries caused by flying fragments, the escaping of high pressure, and damage to the unit cannot be excluded.


- ▶ Route the exhaust line without shut-off units.
- ▶ Observe the permissible pressures and pressure differentials for the product.
- ▶ Check the function of the exhaust line on a regular basis.

**Switch on power supply**

- ▶ Switch on the main switch.

After establishing the current supply, the DCU carries out a self-test and check of the connected units. The duration of the self-test is approx. 20 seconds and is visualized on the display with a progress bar.







**Commission pumping station**

- ▶  Switch on the turbo pumping station.

## 6.3 Normal operation

**Operating the DCU**

- ▶ When working with the DCU 002 Pfeiffer Vacuum display and control unit, please see the associated operating instructions supplied in the shipment.

Key	Parameter   use	Description
	corresponds to [010] = 0 or 1	<b>Pumping station ON/OFF:</b> All components are put into/out of operation according to their configuration
		<b>Error acknowledgement (Reset):</b> Resets active malfunction messages in case the cause is eliminated.
	[308] --> [309]	Scroll forwards through the parameter set
	[309] --> [308]	Scroll back through the parameter set
	Press simultaneously	<b>Editing mode:</b> Allows the setting of parameter options The arrow - - - > designates the option selection in the display
	Press simultaneously again	<b>Selection mode:</b> Accepts the selection made ("change confirmed" is displayed)

Tbl. 10: Description of the key functions of the DCU

## 6.4 Stand-by operation

Depending on the turbopump's power consumption, the electronic drive unit controls the backing pump operation. When the backing pump is in stand-by operation, the overall power consumption of the pumping station and the backing pump operating temperature are reduced.

- Stand-by operation for ACP backing pumps --> pre-set
- Stand-by operation for HiScroll backing pumps --> pre-set
- Stand-by operation for rotary vane pumps --> configurable

Turbopump	Switch-off threshold [P:710]	Switch-on threshold [P:711]
HiPace 80/TC 110	10 W	20 W
HiPace 300/TC 400	50 W	70 W
HiPace 400/TC 400	65 W	110 W
HiPace 700/TC 400	65 W	110 W

Tbl. 11: Pre-set switching thresholds for stand-by operation with ACP and HiScroll backing pumps

### Alternative: Switch on stand-by operation for rotary vane pumps

Fluctuations in power consumption depend on the power consumption of turbopump during idle mode and on the varying fore-vacuum pressures.

Switching thresholds for stand-by operation of rotary vane pumps as backing pumps are configurable via the DCU.

1. Determine the optimum switching threshold for the respective rotary vane pump for your application.
2. Set parameter [P:794] to "1" (display extended parameter set).
3. Configure the switching thresholds for parameters [P:710] and [P:711] according to the operating instructions for the respective electronic drive unit.

## 6.5 Operation with gas ballast

### WARNING

#### Risk of poisoning from incorrect use of the gas ballast system

The gas ballast system of the scroll pump is vacuum sealed only when used in valid, snapped positions "0", "1" and "2". When operating the valves in intermediate stages, there is a risk that process media can escape to the environment uncontrolled. When using toxic process media, there is a risk of poisoning.

- ▶ Change the positions of the valve only for setting the gas ballast stages.
- ▶ Operate the gas ballast valve only in the snap positions.

**NOTICE**

**Risk of damage from condensation in vacuum pump**

Exceeding the saturation vapor pressure of process media during the compression phase leads to condensation in the suction chamber. This results in an increase of the achievable ultimate pressure and to a general deterioration of the performance data of the vacuum pump as a whole. Corrosion and contamination impair service life.

- ▶ Use the gas ballast.
- ▶ Supply dry room air or inert gas in order to increase the vapor capacity of the process medium.
- ▶ Pump condensable vapors only when the vacuum pump is warm and the gas ballast valve open.
- ▶ Operate the vacuum pump with gas ballast a further approx. 30 minutes after finishing the process in order to dissipate any residual moisture.



**Gas ballast connection for backing pump**

All backing pumps have a gas ballast valve.

- For detailed instructions on operation with a gas ballast, see the operating instructions of the respective backing pump.



**Gas flow**

The flow rate (gas flow) increases according to inlet pressure.

**Prerequisites**

- Vacuum pump is heated to operating temperature.
- If necessary, an external gas supply is closed.

**Procedure**

1. If necessary, connect an existing shut-off unit to the vacuum side.
2. Observe the permissible inlet pressure.
3. Turn the selector switch of the gas ballast valve to the desired position.
  - Allow the selector switch to completely engage in position.
4. In case an external gas supply is used, open the supply.

## 6.6 Eliminate condensate load

If opening the gas ballast valve on the backing pump alone is not sufficient to reduce the condensate load, also use the venting connection on the turbopump.

**Prerequisite**

- Turbopump off

**Required aids**

- Dry inert gas, where possible
- Venting valve with gas supply connected

**Procedure**













1. ① Shut down the turbo pumping station.
2. Set parameter **[P:023]** to "0" (turbopump motor off).
3. Set parameter **[P:025]** to "0" (operating mode: backing pump in continuous operation).
4. Set parameter **[P:036]** to "7" (venting valve in continuous operation).
5. ① Switch on the turbo pumping station.
6. Open the venting screw.
7. Allow venting to occur via the connected venting valve.
8. Operate the backing pump for approx. 5 min. to drive out the condensate.
  - Repeat the operation if needed.
9. ① Shut down the turbo pumping station.
10. Restore the initial configuration ([see chapter "Commissioning", page 37](#)).



## 6.7 Operation monitoring

### 6.7.1 Operating mode display via LED

The LEDs on the front panel of the DCU display basic operating statuses.

LED	Symbol	LED status	Display	Meaning
Green 		Off		without current
		On, flashing		"Pumping station OFF", rotation speed $\leq$ 60 rpm
		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", rotation speed $>$ 60 rpm
Red 		Off		no error, no warning
		On, flashing		Warning
		On, constant		Error

Tbl. 12: LED display and meaning at the DCU

### 6.7.2 Temperature monitoring

If threshold values are exceeded, output signals from temperature sensors allow the vacuum pumps to be brought to a safe condition. Depending on pump type, temperature threshold values for warnings and malfunction messages are saved unchanged in the electronic drive unit. For information purposes, various status queries are prepared in the parameter set.

- The drive power of the turbopump is reduced in case of impermissible motor temperature or non-permissibly high housing temperature. This can cause the motor to fall below the set rotation speed switchpoint and so result in switching off of the turbopump.
- At a non-permissibly high temperature ( $> 75^{\circ}\text{C}$ ) of the backing pump, the motor rotation speed is reduced to nominal rotation speed to prevent overheating. After cooling down ( $< 72^{\circ}\text{C}$ ) the backing pump runs at set rotation speed again.

## 6.8 Operation with fore-vacuum valve

The fore-vacuum safety valve is located in the fore-vacuum line between the turbopump and the backing pump. It protects the process vacuum and the turbopump against inadvertent venting after switching off the backing pump or in case of power failure. The fore-vacuum valve switches to the other pumping station components after a time delay to avoid backflows when switching on. The valve is closed currentless.

- [P:010] pumping station "On" = fore-vacuum safety valve opens after 8 seconds.
- [P:010] pumping station "Off" = fore-vacuum safety valve is closed.

## 6.9 Switching off and venting




### We recommend

Vent the turbopump after shutdown. By doing so, you prevent particles flowing back into the vacuum system from the fore-vacuum area.

### 6.9.1 Shutting down the turbo pumping station

#### Procedure

- ▶  Shut down the turbo pumping station.
  - The components shut down according to their configuration. The pumping station remains ready for operation.
- ▶ Shut off the entire current supply at the master switch.

## 6.9.2 Venting

### **⚠ 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.

### **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 turbo pumping 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. 13: Factory settings for delayed venting in turbopumps**

### **General information for fast venting**

We recommend fast venting of larger volumes in 4 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.

#### **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.
- ▶ Seal open connections immediately following removal, using the original protective cover.

### 7.2 Maintenance intervals and responsibilities

#### **Instructions for carrying out maintenance**

1. Carry out the required maintenance on the pumping station components, in accordance with the instructions in the individual operating instructions.
2. Clean the turbopump station exterior with a lint-free cloth and a little isopropanol.
3. Consult Pfeiffer Vacuum Service about shorter maintenance intervals for extreme loads or impure processes.
4. For all other cleaning, maintenance or repair work, contact the appropriate Pfeiffer Vacuum Service location.

## 7.3 Removing components for maintenance

### NOTICE

**Malfunction due to changing the connection configuration**

The pumping station connections are pre-configured at the factory. If the control lines on the connector are mixed up, this causes the pumping station to malfunction or fail.

- ▶ When removing components, note their original layout for subsequent re-assembly.
- ▶ Make a note of the accessories configuration and important setting values from the DCU before disassembly of the pumping station or components.

Customer maintenance on pumping station components may require removal from the pumping station frame.

Connectors on the TC	Preset accessory
Acc. A1	Air cooling
Acc. B1	Venting valve
DO2	Backing pump (HiCube 80 Pro only)

Tbl. 14: Preset accessory connections

### 7.3.1 Carry out preparatory work

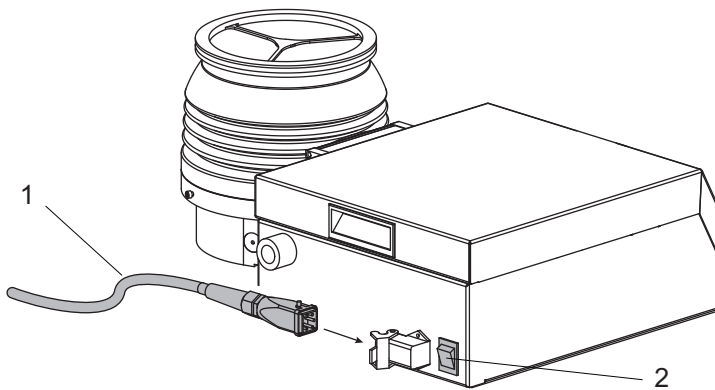


Fig. 19: Electrical connections

- 1 Mains cable                      2 Main switch

**Procedure**

1. Switch off the pumping station at the main switch.
2. Wait until all components are at a complete standstill.
3. Disconnect the mains plug.
4. For water cooling: Shut off the cooling water feed.

### 7.3.2 Remove turbo pump



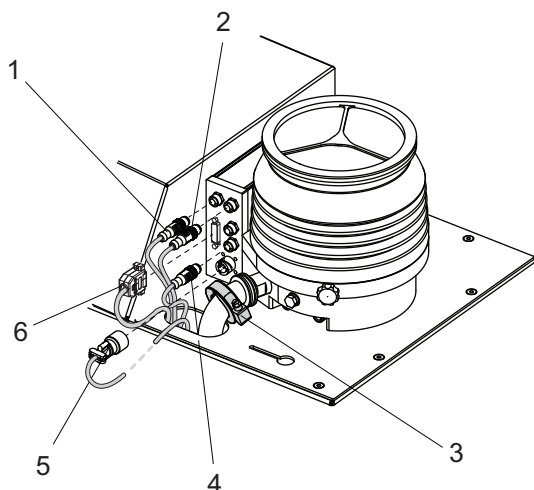
**Factory settings**

All turbopump accessory connections are preconfigured at the factory. Any confusion will cause malfunctions or operational failure.

1. Please note the initial product configuration.
2. Note the cable connections and parameter settings, before making changes.

**Required tools**

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

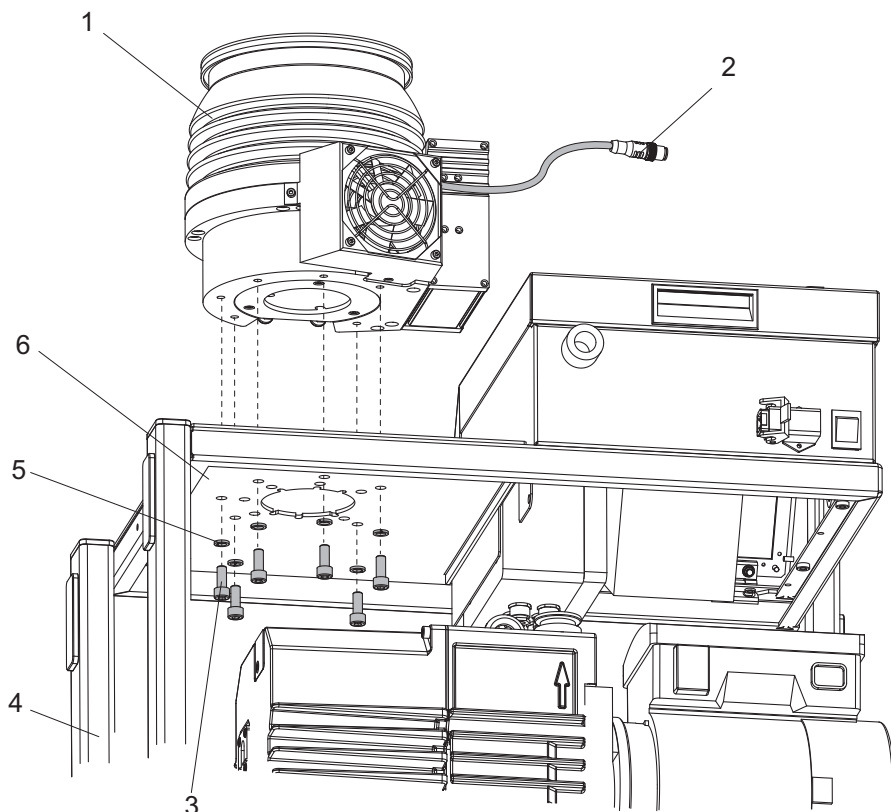


**Fig. 20: Connections to the turbo pump**

- |   |   |
|---|---|
| 1 Air cooling control cable ("accessory")   | 4 RS-485 interface cable                                |
| 2 Venting valve control cable ("accessory") | 5 Connection "DC in"                                    |
| 3 Fore-vacuum connection, clamping ring     | 6 ACP or HiScroll backing pump control cable ("remote") |

**Procedure**

1. Remove all power supply plugs from the electronic drive unit.
2. Remove the fore-vacuum connection from the turbopump.
3. Avoid damage to the fore-vacuum hose.



**Fig. 21: Dismantling the turbopump**

- |                             |                  |
|-----------------------------|------------------|
| 1 Turbopump, complete       | 4 Frame, rack    |
| 2 Air cooling control cable | 5 Washer         |
| 3 Fixing screw with washer  | 6 Mounting plate |

**Required tools**

- Allen key

**Procedure**

1. Unscrew all fixing screws and washers from the mounting plate.
2. Lift the turbopump off the mounting plate.
3. Pay attention to the control cable.
4. Perform maintenance as specified in the operating instructions.



**Service turbopump**

The opening in the mounting plate makes it easy to perform maintenance work on the turbopump (e.g. change the operating fluid reservoir).

### 7.3.3 Install turbopump

**Required tools**

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

**Procedure**

1. Place the turbopump on the mounting plate.
2. Screw the cylinder screws with washers into the pump bottom part.
3. Observe the stated torques.

Turbopump	Fixing screw	Quantity, number	Tightening torque
HiPace 80	Hexagon socket M5 × 12	6 pieces	10 Nm
HiPace 300	Hexagon socket M8 × 20	5 pieces	30 Nm
HiPace 400	Hexagon socket M8 × 20	6 pieces	30 Nm
HiPace 700	Hexagon socket M8 × 20	6 pieces	30 Nm

**Tbl. 15: Tightening torque for fixation of turbopumps**

## 7.4 Change the operating fluid

**⚠ WARNING**

**Health hazard and risk of environmental damage from toxic contaminated operating fluid**

Toxic process media can cause operating fluid contamination. When changing the operating fluid, there is a health hazard due to contact with poisonous substances. Illegal disposal of toxic substances causes environmental damage.

- ▶ Wear suitable personal protective equipment when handling these media.
- ▶ Dispose of the operating fluid according to locally applicable regulations.

**⚠ CAUTION**

**Scalding from hot operating fluid**

Danger of burns when draining operating fluid if it comes into contact with the skin.

- ▶ Wear protective equipment.
- ▶ Use a suitable collection receptacle.



**Use of operating fluids**

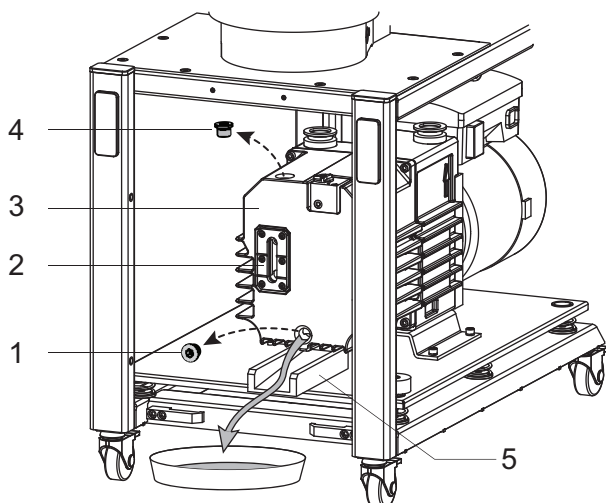
Only applies to HiCube Pro with rotary vane pump as backing pump.

**Prerequisites**

- Vacuum pump switched off
- Vacuum pump vented to atmospheric pressure
- Vacuum pump has cooled so that it can be touched
- Operating fluid still warm

**Required tools**

- Allen key
- Calibrated torque wrench (tightening factor  $\leq 1.6$ )



**Fig. 22: Operating fluid change with rotary vane pump as backing pump**

- |                |                 |
|----------------|-----------------|
| 1 Drain screw  | 4 Filler screw  |
| 2 Sight glass  | 5 Drain channel |
| 3 Backing pump |                 |

**Draining the operating fluid**

1. Unscrew the filler screw.
  - Be careful with the O-ring.
2. Place a collection receptacle below the drain hole.
3. Unscrew the drain screw.
  - Be careful with the O-ring.
4. Allow operating fluid to drain into collection receptacle.

**Agitate remaining operating fluid**

1. Screw in the filler screw.
  - Be careful with the O-ring.
2. Screw in the drain screw.
  - Be careful with the O-ring.
3. Switch on the vacuum pump with the vacuum flange open for a maximum of 5 seconds.

**Drain remaining operating fluid**

1. Unscrew the drain screw.
  - Be careful with the O-ring.
2. Gently tilt the vacuum pump.
3. Drain remaining operating fluid.
4. Screw in the drain screw.
  - Replace the O-ring.
  - Tightening torque: **6 Nm**
5. Dispose of old operating fluid according to applicable regulations.

**Fill fresh operating fluid**

1. Screw the drain screw in finally.
  - Be careful with the O-ring.
2. Observe the permissible tightening torque according to the operating instructions of the individual components.
3. Fill new operating fluid.
4. Check level.
5. Screw the drain screw in completely.
  - Be careful with the O-ring.
6. Observe the permissible tightening torque according to the operating instructions of the individual components.

## 8 Decommissioning

### 8.1 Shut down for longer periods

#### Procedure

1. Remove the pumping station from the vacuum system if necessary.
2. Change the operating fluid reservoir of the turbopump if necessary.
3. Seal all flange openings with the original protective caps.
4. Store the pumping station indoors only, at temperatures between -10 °C and +40 °C.
5. In rooms with humid or aggressive atmospheres: Hermetically seal the pumping station 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.

#### NOTICE

##### **Risk of damage to vacuum pump as a result of operating fluid aging**

The operating fluid usability is limited (max. 2 years). Prior to recommissioning, following a shutdown of **2 years or more**, carry out the following work.

- ▶ Change the operating fluid.
- ▶ Change the radial shaft seal rings and other elastomer parts if required.
- ▶ Observe the maintenance instructions – consult Pfeiffer Vacuum if necessary.

#### Procedure for recommissioning the pumping station

1. Check the pumping station for impurities and moisture.
2. Clean the turbopump station exterior with a lint-free cloth and a little isopropanol.
3. If necessary, arrange for Pfeiffer Vacuum Service to fully clean the pumping station.
4. If necessary, arrange for Pfeiffer Vacuum Service to fully clean the pumping station components.
5. Install the pumping station according to these instructions ([see chapter "Installation", page 23](#)).
6. Recommission the pumping station according to these instructions .



## 9 Recycling and disposal

### 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.



#### Environmental protection

You **must** dispose of the product and its components in accordance with all applicable regulations for protecting people, the environment and nature.

- Help to reduce the wastage of natural resources.
- Prevent contamination.



#### Environmental protection

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

### 9.1 General disposal information

Pfeiffer Vacuum products contain materials that you must recycle.

- ▶ Dispose of our products according to the following:
  - Iron
  - Aluminium
  - Copper
  - Synthetic
  - Electronic components
  - Oil and fat, solvent-free
- ▶ Observe the special precautionary measures when disposing of:
  - Fluoroelastomers (FKM)
  - Potentially contaminated components that come into contact with media

### 9.2 Dispose of turbopumps

Pfeiffer Vacuum turbopumps contain materials that you must recycle.

1. Remove the complete operating fluid reservoir.
2. Remove the electronic drive unit.
3. Decontaminate components that come into contact with process gases.
4. Separate the components into recyclable materials.
5. Recycle the non-contaminated components.
6. Dispose of the product or components in a safe manner according to locally applicable regulations.

### 9.3 Dispose of rotary vane pump

Pfeiffer Vacuum rotary vane pumps contain materials that you must recycle.

1. Fully drain the lubricant.
2. Dismantle the motor.
3. Decontaminate the components that come into contact with process gases.
4. Separate the components into recyclable materials.

5. Recycle the non-contaminated components.
6. Dispose of the product or components in a safe manner according to locally applicable regulations.

## 9.4 Dispose of multi-stage roots pumps

Pfeiffer Vacuum roots pumps from the ACP series contain materials that you must recycle.

1. Fully drain the lubricant.
2. Decontaminate the components that come into contact with process gases.
3. Separate the components into recyclable materials.
4. Recycle the non-contaminated components.
5. Dispose of the product or components in a safe manner according to locally applicable regulations.

## 9.5 Disposing of the scroll pump

Pfeiffer Vacuum scroll pumps contain materials which must be recycled.

1. Disconnect the electronic drive unit.
2. Dismantle the motor.
3. Decontaminate the components that come into contact with process gases.
4. Separate the components into recyclable materials.
5. Recycle the non-contaminated components.
6. Dispose of the product or components in a safe manner according to locally applicable regulations.

# 10 Malfunctions

## 10.1 General

### **WARNING**

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

Sudden jamming of the rotor generates high destructive torques in accordance with ISO 27892. If the turbopump is **not** properly secured, it can shear off. 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.

- ▶ 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.

Malfunctions on the pumping station are usually caused by faults on individual components. LEDs on the turbopump and backing pump indicate the operation statuses for the respective device.

- The DCU display and control unit indicates basic pumping station operating statuses ([see chapter "Operating mode display via LED", page 41](#)).
- The DCU indicates system malfunctions by outputting an error code to the display.

## 10.2 Troubleshooting

Problem	Possible causes	Remedy
Pumping station will not start up. None of the LEDs on the DCU illuminate.	<ul style="list-style-type: none"> <li>• Current supply interrupted</li> </ul>	<ul style="list-style-type: none"> <li>• Check supply lines to pumping station.</li> <li>• Check the 24 V DC output voltage at the "DC out" connection of the built-in power supply pack.</li> <li>• Check the plug contacts on the power supply pack.</li> <li>• Check connection cable between power supply pack, backing pump, and turbopump.</li> </ul>
	<ul style="list-style-type: none"> <li>• Incorrect operating voltage</li> </ul>	<ul style="list-style-type: none"> <li>• Note rating plate specifications.</li> <li>• Supply the correct operating voltage.</li> </ul>
	<ul style="list-style-type: none"> <li>• No operating voltage present</li> </ul>	<ul style="list-style-type: none"> <li>• Connect operating voltage.</li> </ul>
	<ul style="list-style-type: none"> <li>• Electronic drive unit defective</li> </ul>	<ul style="list-style-type: none"> <li>• Replace electronic drive unit according to turbopump operating instructions.</li> <li>• Contact Pfeiffer Vacuum Service.</li> </ul>
Pumping station not reaching final pressure.	<ul style="list-style-type: none"> <li>• Condensate in the backing pump</li> </ul>	<ul style="list-style-type: none"> <li>• Open the backing pump gas ballast valve.</li> </ul>
	<ul style="list-style-type: none"> <li>• Gas ballast valve open</li> </ul>	<ul style="list-style-type: none"> <li>• Close the backing pump gas ballast valve.</li> </ul>


Tbl. 16: Troubleshooting

## 10.3 Error codes

Errors (\*\* Error E—— \*\*) always cause the connected peripheral devices to be switched off.

Warnings (\* Warning F —— \*) are only displayed and do not cause components to be switched off.

### Handle error messages on the HiCube Eco

1. First eliminate the cause of the fault.
2. Reset the error message by pushing back the  button.

Display in DCU	Problem	Possible causes	Remedy
* Warning F110 *	Pressure gauge	<ul style="list-style-type: none"> <li>• Pressure gauge faulty</li> <li>• Connection to the pressure gauge disconnected during operation</li> </ul>	<ul style="list-style-type: none"> <li>• Check the cable connection</li> <li>• Carry out a restart with pressure gauge connected</li> <li>• Replace the pressure gauge completely</li> </ul>
** Error E040 **	Hardware error	<ul style="list-style-type: none"> <li>• external RAM faulty</li> </ul>	<ul style="list-style-type: none"> <li>• Contact Pfeiffer Vacuum Service.</li> </ul>
** Error E042 **	Hardware error	<ul style="list-style-type: none"> <li>• EPROM checksum incorrect</li> </ul>	<ul style="list-style-type: none"> <li>• Contact Pfeiffer Vacuum Service.</li> </ul>
** Error E043 **	Hardware error	<ul style="list-style-type: none"> <li>• <sup>2</sup>EPROM write error</li> </ul>	<ul style="list-style-type: none"> <li>• Contact Pfeiffer Vacuum Service.</li> </ul>
** Error E090 **	Internal device error	<ul style="list-style-type: none"> <li>• RAM not large enough</li> <li>• DCU is connected to incorrect electronic drive unit</li> </ul>	<ul style="list-style-type: none"> <li>• Contact Pfeiffer Vacuum Service.</li> <li>• Connect the DCU to the correct electronic drive unit</li> </ul>
** Error E698 **	Communication error	<ul style="list-style-type: none"> <li>• Electronic drive unit is not responding</li> </ul>	<ul style="list-style-type: none"> <li>• Contact Pfeiffer Vacuum Service.</li> </ul>

**Tbl. 17: Warning and error messages when using the DCU**

Display	Problem	Possible causes	Remedy
E001	Excessive speed		<ul style="list-style-type: none"> <li>• Contact Pfeiffer Vacuum Service.</li> <li>• Acknowledge only at rotation speed <math>f = 0</math></li> </ul>
E002	Overvoltage	<ul style="list-style-type: none"> <li>• Incorrect power supply pack used</li> </ul>	<ul style="list-style-type: none"> <li>• Check the power supply pack type</li> <li>• Check the mains voltage</li> </ul>
E006	Run-up fault	<ul style="list-style-type: none"> <li>• Run-up time threshold set too low</li> <li>• Gas flow in recipient through leaks or open valves</li> <li>• Still below speed-control switch point run-up time expires</li> </ul>	<ul style="list-style-type: none"> <li>• Adjust the run-up time to the process conditions</li> <li>• Check vacuum chamber for leakage and closed valves</li> <li>• Adjust the rotation speed switch point</li> </ul>
E007	Operating fluid low	<ul style="list-style-type: none"> <li>• Operating fluid low</li> </ul>	<ul style="list-style-type: none"> <li>• Check the operating fluid</li> <li>• Acknowledge only at rotation speed <math>f = 0</math></li> </ul>
E008	Connection, electronic drive unit - pump faulty	<ul style="list-style-type: none"> <li>• Connection to the pump faulty</li> </ul>	<ul style="list-style-type: none"> <li>• Check connections</li> <li>• Acknowledge only at rotation speed <math>f = 0</math></li> </ul>
E010	Internal device error		<ul style="list-style-type: none"> <li>• Contact Pfeiffer Vacuum Service.</li> <li>• Acknowledge only at rotation speed <math>f = 0</math></li> </ul>
E021	Electronic drive unit does not detect the pump		<ul style="list-style-type: none"> <li>• Contact Pfeiffer Vacuum Service.</li> <li>• Acknowledge only at rotation speed <math>f = 0</math></li> </ul>
E043	Internal configuration error		<ul style="list-style-type: none"> <li>• Contact Pfeiffer Vacuum Service.</li> </ul>
E044	Excess temperature, electronics	<ul style="list-style-type: none"> <li>• Faulty cooling</li> </ul>	<ul style="list-style-type: none"> <li>• Improve the cooling</li> <li>• Check the operating conditions</li> </ul>
E045	Excess temperature, motor	<ul style="list-style-type: none"> <li>• Faulty cooling</li> </ul>	<ul style="list-style-type: none"> <li>• Improve the cooling</li> <li>• Check the operating conditions</li> </ul>
E046	Internal initialization error		<ul style="list-style-type: none"> <li>• Contact Pfeiffer Vacuum Service.</li> </ul>
E091	Internal device error		<ul style="list-style-type: none"> <li>• Contact Pfeiffer Vacuum Service.</li> </ul>
E092	Unknown connection panel		<ul style="list-style-type: none"> <li>• Contact Pfeiffer Vacuum Service.</li> </ul>
E093	Motor temperature evaluation faulty		<ul style="list-style-type: none"> <li>• Contact Pfeiffer Vacuum Service.</li> </ul>
E094	Electronics temperature evaluation faulty		<ul style="list-style-type: none"> <li>• Contact Pfeiffer Vacuum Service.</li> </ul>

Display	Problem	Possible causes	Remedy
E098	Internal communication error		<ul style="list-style-type: none"> <li>Contact Pfeiffer Vacuum Service.</li> </ul>
E107	Final stage group error		<ul style="list-style-type: none"> <li>Contact Pfeiffer Vacuum Service.</li> <li>Acknowledge only at rotation speed <math>f = 0</math></li> </ul>
E108	Rotation speed measurement faulty		<ul style="list-style-type: none"> <li>Contact Pfeiffer Vacuum Service.</li> <li>Acknowledge only at rotation speed <math>f = 0</math></li> </ul>
E109	Software not released		<ul style="list-style-type: none"> <li>Contact Pfeiffer Vacuum Service.</li> </ul>
E110	Operating fluid evaluation faulty		<ul style="list-style-type: none"> <li>Contact Pfeiffer Vacuum Service.</li> <li>Acknowledge only at rotation speed <math>f = 0</math></li> </ul>
E111	Operating fluid pump communication error		<ul style="list-style-type: none"> <li>Contact Pfeiffer Vacuum Service.</li> <li>Acknowledge only at rotation speed <math>f = 0</math></li> </ul>
E112	Operating fluid pump group error		<ul style="list-style-type: none"> <li>Contact Pfeiffer Vacuum Service.</li> <li>Acknowledge only at rotation speed <math>f = 0</math></li> </ul>
E114	Final stage temperature evaluation faulty		<ul style="list-style-type: none"> <li>Contact Pfeiffer Vacuum Service.</li> </ul>
E117	Excess temperature, pump lower part	<ul style="list-style-type: none"> <li>Faulty cooling</li> </ul>	<ul style="list-style-type: none"> <li>Improve the cooling</li> <li>Check the operating conditions</li> </ul>
E118	Excess temperature, final stage	<ul style="list-style-type: none"> <li>Faulty cooling</li> </ul>	<ul style="list-style-type: none"> <li>Improve the cooling</li> <li>Check the operating conditions</li> </ul>
E119	Excess temperature, bearing	<ul style="list-style-type: none"> <li>Faulty cooling</li> </ul>	<ul style="list-style-type: none"> <li>Improve the cooling</li> <li>Check the operating conditions</li> </ul>
E143	Operating fluid pump excess temperature	<ul style="list-style-type: none"> <li>Faulty cooling</li> </ul>	<ul style="list-style-type: none"> <li>Improve the cooling</li> <li>Check the operating conditions</li> <li>Acknowledge only at rotation speed <math>f = 0</math></li> </ul>
E777	Nominal rotation speed not confirmed	<ul style="list-style-type: none"> <li>Nominal rotation speed not confirmed after replacing the electronic drive unit</li> </ul>	<ul style="list-style-type: none"> <li>Confirm the nominal rotation speed with <b>[P:777]</b></li> <li>Acknowledge only at rotation speed <math>f = 0</math></li> </ul>
F001	TMS heat-up time expired	<ul style="list-style-type: none"> <li>Internal timer for heat-up monitoring exceeded</li> </ul>	<ul style="list-style-type: none"> <li>Check the operating conditions</li> </ul>
F003	TMS heating circuit temperature sensor	<ul style="list-style-type: none"> <li>TMS temperature not in the permissible range between +5 °C and 85 °C</li> </ul>	<ul style="list-style-type: none"> <li>Check the operating conditions</li> <li>Contact Pfeiffer Vacuum Service.</li> </ul>
F007	Undervoltage/power failure	<ul style="list-style-type: none"> <li>Mains failure</li> </ul>	<ul style="list-style-type: none"> <li>Check the mains supply</li> </ul>
F018	Operating supremacy conflict	<ul style="list-style-type: none"> <li>Pumping station switched on with <b>[P:010]</b> while E74 input "start/stop" is off (opened)</li> </ul>	<ul style="list-style-type: none"> <li>Switch on the pumping station via E74</li> <li>Switch the pumping station off via <b>[P:010]</b>.</li> </ul>
F021	Blocking signal invalid	<ul style="list-style-type: none"> <li>Signal of the blocking signal monitoring outside the valid range</li> </ul>	<ul style="list-style-type: none"> <li>Check the connections of the sealing gas monitoring</li> <li>Check the parameter options of the accessory outputs</li> </ul>
F034	Sealing gas flow low	<ul style="list-style-type: none"> <li>Signal of the sealing gas monitoring valid but below the set threshold <b>[P:791]</b></li> </ul>	<ul style="list-style-type: none"> <li>Check and improve the sealing gas supply</li> <li>Check the operating conditions</li> </ul>
F045	Motor high temperature	<ul style="list-style-type: none"> <li>Faulty cooling</li> </ul>	<ul style="list-style-type: none"> <li>Improve the cooling</li> <li>Check the operating conditions</li> </ul>
F076	Electronics high temperature	<ul style="list-style-type: none"> <li>Faulty cooling</li> </ul>	<ul style="list-style-type: none"> <li>Improve the cooling</li> <li>Check the operating conditions</li> </ul>
F097	Invalid pump information	<ul style="list-style-type: none"> <li>Data of the pump faulty</li> </ul>	<ul style="list-style-type: none"> <li>Acknowledging restores factory setting</li> </ul>
F098	Incomplete pump information	<ul style="list-style-type: none"> <li>Connection to the pump faulty</li> </ul>	<ul style="list-style-type: none"> <li>Contact Pfeiffer Vacuum Service.</li> </ul>
F100	Rotation speed raised to minimum value	<ul style="list-style-type: none"> <li>Permissible specifications for rotation speed operation or stand-by incorrect</li> </ul>	<ul style="list-style-type: none"> <li>Check <b>[P:707]</b> or <b>[P:717]</b></li> <li>Obtain the valid rotation speed range from the technical data of the Turbopump</li> </ul>
F115	Pump lower part temperature evaluation faulty		<ul style="list-style-type: none"> <li>Contact Pfeiffer Vacuum Service.</li> </ul>

## Malfunctions

Display	Problem	Possible causes	Remedy
F116	Bearing temperature evaluation faulty		<ul style="list-style-type: none"> <li>• Contact Pfeiffer Vacuum Service.</li> </ul>
F117	Pump lower part high temperature	<ul style="list-style-type: none"> <li>• Faulty cooling</li> </ul>	<ul style="list-style-type: none"> <li>• Improve the cooling</li> <li>• Check the operating conditions</li> </ul>
F118	Final stage high temperature	<ul style="list-style-type: none"> <li>• Faulty cooling</li> </ul>	<ul style="list-style-type: none"> <li>• Contact Pfeiffer Vacuum Service.</li> <li>• Check the operating conditions</li> </ul>
F119	Bearing high temperature	<ul style="list-style-type: none"> <li>• Faulty cooling</li> </ul>	<ul style="list-style-type: none"> <li>• Improve the cooling</li> <li>• Check the operating conditions</li> </ul>
F143	High operating fluid pump temperature	<ul style="list-style-type: none"> <li>• Faulty cooling</li> </ul>	<ul style="list-style-type: none"> <li>• Improve the cooling</li> <li>• Check the operating conditions</li> </ul>
F168	High delay	<ul style="list-style-type: none"> <li>• Rate of pressure rise too high, venting rate too high</li> </ul>	<ul style="list-style-type: none"> <li>• Check and adapt pump-specific venting rate</li> </ul>

**Tbl. 18: Error and warning messages for turbopump electronic drive unit**

# 11 Service solutions by Pfeiffer Vacuum

### We offer first-class service

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

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

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

### Make use of Pfeiffer Vacuum service

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

**You can obtain advice on the optimal solution for you, from your Pfeiffer Vacuum representative.**

**For fast and smooth service process handling, we recommend the following:**



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

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



2. Complete the service request and contamination declaration.



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

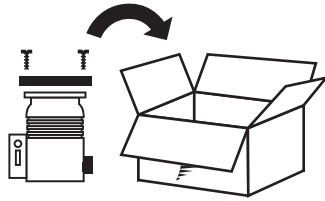


4. You will receive an acknowledgment from Pfeiffer Vacuum.

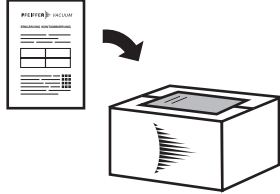
PFEIFFER VACUUM

### Submission of contaminated products

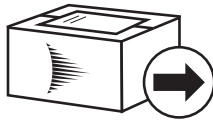
No microbiological, explosive, or radiologically contaminated products will be accepted. Where products are contaminated, or the contamination declaration is missing, Pfeiffer Vacuum will contact you before starting service work. Depending on the product and degree of pollution, **additional decontamination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



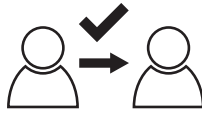
5. Prepare the product for transport in accordance with the provisions in the contamination declaration.
  - a) Neutralize the product with nitrogen or dry air.
  - b) Seal all openings with blind flanges, so that they are airtight.
  - c) Shrink-wrap the product in suitable protective foil.
  - d) Package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



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



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



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

PFEIFFER VACUUM

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



## 12 Accessories

**We recommend**

Please refer to the accessories list for the individual components in their respective operating instructions or online at [Accessories portfolio for hybrid bearing turbopumps](#).

# 13 Technical data and dimensions

## 13.1 General

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

<b>i</b>	<b>Technical data</b> Maximum values refer exclusively to the input as a single load.
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- Specifications according to PNEUROP committee PN5
- ISO 27892 2010: "Vacuum technology - Turbomolecular pumps - Measurement of rapid shutdown torque"
- ISO 21360 2012: "Vacuum technology - Standard methods for measuring vacuum-pump performance - Part 1: General description"
- ISO 21360 2018: "Vacuum technology - Standard methods for measuring vacuum-pump performance - Part 4: Turbomolecular vacuum pumps"
- Ultimate pressure with test dome after 48 h bake out duration
- Gas throughput with water cooling; backing pump = rotary vane pump (10 m<sup>3</sup>/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 · 10 <sup>-3</sup>	100	1	0.1	0.75
bar	1000	1	1 · 10 <sup>5</sup>	1000	100	750
Pa	0.01	1 · 10 <sup>-5</sup>	1	0.01	1 · 10 <sup>-3</sup>	7.5 · 10 <sup>-3</sup>
hPa	1	1 · 10 <sup>-3</sup>	100	1	0.1	0.75
kPa	10	0.01	1000	10	1	7.5
Torr   mm Hg	1.33	1.33 · 10 <sup>-3</sup>	133.32	1.33	0.133	1

1 Pa = 1 N/m<sup>2</sup>

Tbl. 19: Conversion table: Pressure units

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

Tbl. 20: Conversion table: Units for gas throughput

## 13.2 Technical data

### 13.2.1 Technical data for HiCube 80 Pro

Type designation	HiCube 80 Pro	HiCube 80 Pro	HiCube 80 Pro	HiCube 80 Pro	HiCube 80 Pro
Connection flange (in)	DN 40 ISO-KF	DN 40 ISO-KF	DN 40 ISO-KF	DN 40 ISO-KF	DN 40 ISO-KF
Connection flange (out)	G 1/2	G 1/2	G 1/2	G 1/2	G 1/2
Turbopump	HiPace 80	HiPace 80	HiPace 80	HiPace 80	HiPace 80

Type designation	HiCube 80 Pro	HiCube 80 Pro	HiCube 80 Pro	HiCube 80 Pro	HiCube 80 Pro
Backing pump	ACP 15	ACP 28	HiScroll 6	HiScroll 12	HiScroll 18
Final pressure without gas ballast	$< 1 \cdot 10^{-7}$ hPa	$< 1 \cdot 10^{-7}$ hPa	$1 \cdot 10^{-7}$ hPa	$1 \cdot 10^{-7}$ hPa	$1 \cdot 10^{-7}$ hPa
Pumping speed for N <sub>2</sub>	35 l/s	35 l/s	35 l/s	35 l/s	35 l/s
Pumping speed backing pump at 50 Hz	14 m <sup>3</sup> /h	27 m <sup>3</sup> /h	6.1 m <sup>3</sup> /h	12.1 m <sup>3</sup> /h	18.1 m <sup>3</sup> /h
Input voltage(s)	200 – 230 V AC, 50/60 Hz	200 – 230 V AC, 50/60 Hz	200 – 230 V AC, 50/60 Hz	200 – 230 V AC, 50/60 Hz	200 – 230 V AC, 50/60 Hz
Input voltage: tolerance	±10 %	±10 %	±10 %	±10 %	±10 %
Motor for region	Asia, Europe	Asia, Europe	Asia, Europe	Asia, Europe	Asia, Europe
Power consumption max.	590 W	840 W	620 W	1100 W	1580 W
Sound pressure level	≤50 dB(A)	≤50 dB(A)	≤50 dB(A)	≤50 dB(A)	≤50 dB(A)
Cooling method, standard	Air	Air	Air	Air	Air
Relative humidity of air	5 – 85 %, non-condensing	5 – 85 %, non-condensing	5 – 85 %, non-condensing	5 – 85 %, non-condensing	5 – 85 %, non-condensing
Shipping and storage temperature	-10 – 55 °C	-10 – 55 °C	-10 – 50 °C	-10 – 50 °C	-10 – 50 °C
Weight	64 kg	87 kg	67.7 kg	72.7 kg	71.7 kg

**Tbl. 21: Technical data HiCube 80 Pro, DN 40 ISO-KF**

Type designation	HiCube 80 Pro	HiCube 80 Pro	HiCube 80 Pro	HiCube 80 Pro
Connection flange (in)	DN 40 ISO-KF	DN 40 ISO-KF	DN 40 ISO-KF	DN 40 ISO-KF
Connection flange (out)	G 1/2	G 1/2	G 1/2	G 1/2
Turbopump	HiPace 80	HiPace 80	HiPace 80	HiPace 80
Backing pump	Duo 11 M	Duo 20 M	Pascal 2010	Pascal 2021
Final pressure without gas ballast	$< 1 \cdot 10^{-7}$ hPa	$< 1 \cdot 10^{-7}$ hPa	$< 1 \cdot 10^{-7}$ hPa	$< 1 \cdot 10^{-7}$ hPa
Pumping speed for N <sub>2</sub>	35 l/s	35 l/s	35 l/s	35 l/s
Pumping speed backing pump at 50 Hz	9 m <sup>3</sup> /h	20 m <sup>3</sup> /h	9 m <sup>3</sup> /h	18 m <sup>3</sup> /h
Input voltage(s)	200 – 240 V AC, 50/60 Hz	200 – 230 V AC, 50/60 Hz	200 – 230 V AC, 50/60 Hz	200 – 230 V AC, 50/60 Hz
Input voltage: tolerance	±10 %	±10 %	±10 %	±10 %
Motor for region	Asia, Europe	Asia, Europe	Asia, Europe	Asia, Europe
Power consumption max.	430 W	1030 W	680 W	680 W
Sound pressure level	≤50 dB(A)	≤50 dB(A)	≤50 dB(A)	≤50 dB(A)

Type designation	HiCube 80 Pro	HiCube 80 Pro	HiCube 80 Pro	HiCube 80 Pro
Cooling method, standard	Air	Air	Air	Air
Relative humidity of air	5 – 85 %, non-condensing	5 – 85 %, non-condensing	5 – 85 %, non-condensing	5 – 85 %, non-condensing
Shipping and storage temperature	-20 – 55 °C	-20 – 55 °C	-20 – 55 °C	-20 – 55 °C
Weight	62 kg	87 kg	69 kg	71 kg

**Tbl. 22: Technical data HiCube 80 Pro, DN 40 ISO-KF**

Type designation	HiCube 80 Pro	HiCube 80 Pro	HiCube 80 Pro	HiCube 80 Pro	HiCube 80 Pro
Connection flange (in)	DN 63 ISO-K	DN 63 ISO-K	DN 63 ISO-K	DN 63 ISO-K	DN 63 ISO-K
Connection flange (out)	G 1/2	G 1/2	G 1/2	G 1/2	G 1/2
Turbopump	HiPace 80	HiPace 80	HiPace 80	HiPace 80	HiPace 80
Backing pump	ACP 15	ACP 28	HiScroll 6	HiScroll 12	HiScroll 18
Final pressure without gas ballast	$< 1 \cdot 10^{-7}$ hPa	$< 1 \cdot 10^{-7}$ hPa	$1 \cdot 10^{-7}$ hPa	$1 \cdot 10^{-7}$ hPa	$1 \cdot 10^{-7}$ hPa
Pumping speed for N <sub>2</sub>	67 l/s	67 l/s	67 l/s	67 l/s	67 l/s
Pumping speed backing pump at 50 Hz	14 m <sup>3</sup> /h	27 m <sup>3</sup> /h	6.1 m <sup>3</sup> /h	12.1 m <sup>3</sup> /h	18.1 m <sup>3</sup> /h
Input voltage(s)	200 – 230 V AC, 50/60 Hz	200 – 230 V AC, 50/60 Hz	200 – 230 V AC, 50/60 Hz	200 – 230 V AC, 50/60 Hz	200 – 230 V AC, 50/60 Hz
Input voltage: tolerance	±10 %	±10 %	±10 %	±10 %	±10 %
Motor for region	Asia, Europe	Asia, Europe	Asia, Europe	Asia, Europe	Asia, Europe
Power consumption max.	590 W	840 W	620 W	1100 W	1580 W
Sound pressure level	≤50 dB(A)	≤50 dB(A)	≤50 dB(A)	≤50 dB(A)	≤50 dB(A)
Cooling method, standard	Air	Air	Air	Air	Air
Relative humidity of air	5 – 85 %, non-condensing	5 – 85 %, non-condensing	5 – 85 %, non-condensing	5 – 85 %, non-condensing	5 – 85 %, non-condensing
Shipping and storage temperature	-10 – 55 °C	-10 – 55 °C	-10 – 50 °C	-10 – 50 °C	-10 – 50 °C
Weight	64 kg	87 kg	67.7 kg	72.7 kg	71.7 kg

**Tbl. 23: Technical data HiCube 80 Pro, DN 63 ISO-K**

Type designation	HiCube 80 Pro	HiCube 80 Pro	HiCube 80 Pro	HiCube 80 Pro
Connection flange (in)	DN 63 ISO-K	DN 63 ISO-K	DN 63 ISO-K	DN 63 ISO-K
Connection flange (out)	G 1/2	G 1/2	G 1/2	G 1/2
Turbopump	HiPace 80	HiPace 80	HiPace 80	HiPace 80
Backing pump	Duo 11 M	Duo 20 M	Pascal 2021	Pascal 2010

Type designation	HiCube 80 Pro	HiCube 80 Pro	HiCube 80 Pro	HiCube 80 Pro
Final pressure without gas ballast	$< 1 \cdot 10^{-7}$ hPa	$< 1 \cdot 10^{-7}$ hPa	$< 1 \cdot 10^{-7}$ hPa	$< 1 \cdot 10^{-7}$ hPa
Pumping speed for N <sub>2</sub>	67 l/s	67 l/s	67 l/s	67 l/s
Pumping speed backing pump at 50 Hz	9 m <sup>3</sup> /h	20 m <sup>3</sup> /h	18 m <sup>3</sup> /h	9 m <sup>3</sup> /h
Input voltage(s)	200 – 240 V AC, 50/60 Hz	200 – 230 V AC, 50/60 Hz	200 – 230 V AC, 50/60 Hz	200 – 230 V AC, 50/60 Hz
Input voltage: tolerance	±10 %	±10 %	±10 %	±10 %
Motor for region	Asia, Europe	Asia, Europe	Asia, Europe	Asia, Europe
Power consumption max.	430 W	1030 W	680 W	680 W
Sound pressure level	≤50 dB(A)	≤50 dB(A)	≤50 dB(A)	≤50 dB(A)
Cooling method, standard	Air	Air	Air	Air
Relative humidity of air	5 – 85 %, non-condensing	5 – 85 %, non-condensing	5 – 85 %, non-condensing	5 – 85 %, non-condensing
Shipping and storage temperature	-20 – 55 °C	-20 – 55 °C	-20 – 55 °C	-20 – 55 °C
Weight	62 kg	87 kg	71 kg	69 kg

**Tbl. 24: Technical data HiCube 80 Pro, DN 63 ISO-K**

Type designation	HiCube 80 Pro	HiCube 80 Pro	HiCube 80 Pro	HiCube 80 Pro	HiCube 80 Pro
Connection flange (in)	DN 63 CF-F	DN 63 CF-F	DN 63 CF-F	DN 63 CF-F	DN 63 CF-F
Connection flange (out)	G 1/2	G 1/2	G 1/2	G 1/2	G 1/2
Turbopump	HiPace 80	HiPace 80	HiPace 80	HiPace 80	HiPace 80
Backing pump	ACP 15	ACP 28	HiScroll 6	HiScroll 12	HiScroll 18
Final pressure without gas ballast	$< 5 \cdot 10^{-10}$ hPa	$< 5 \cdot 10^{-10}$ hPa	$5 \cdot 10^{-10}$ hPa	$5 \cdot 10^{-10}$ hPa	$5 \cdot 10^{-10}$ hPa
Pumping speed for N <sub>2</sub>	67 l/s	67 l/s	67 l/s	67 l/s	67 l/s
Pumping speed backing pump at 50 Hz	14 m <sup>3</sup> /h	27 m <sup>3</sup> /h	6.1 m <sup>3</sup> /h	12.1 m <sup>3</sup> /h	18.1 m <sup>3</sup> /h
Input voltage(s)	200 – 230 V AC, 50/60 Hz	200 – 230 V AC, 50/60 Hz	200 – 230 V AC, 50/60 Hz	200 – 230 V AC, 50/60 Hz	200 – 230 V AC, 50/60 Hz
Input voltage: tolerance	±10 %	±10 %	±10 %	±10 %	±10 %
Motor for region	Asia, Europe	Asia, Europe	Asia, Europe	Asia, Europe	Asia, Europe
Power consumption max.	590 W	840 W	620 W	1100 W	1580 W
Sound pressure level	≤50 dB(A)	≤50 dB(A)	≤50 dB(A)	≤50 dB(A)	≤50 dB(A)
Cooling method, standard	Air	Air	Air	Air	Air
Relative humidity of air	5 – 85 %, non-condensing	5 – 85 %, non-condensing	5 – 85 %, non-condensing	5 – 85 %, non-condensing	5 – 85 %, non-condensing

Type designation	HiCube 80 Pro	HiCube 80 Pro	HiCube 80 Pro	HiCube 80 Pro	HiCube 80 Pro
Shipping and storage temperature	-10 – 55 °C	-10 – 55 °C	-10 – 50 °C	-10 – 50 °C	-10 – 50 °C
Weight	66 kg	89 kg	69.1 kg	74.1 kg	73.1 kg

**Tbl. 25: Technical data HiCube 80 Pro, DN 63 CF-F**

Type designation	HiCube 80 Pro	HiCube 80 Pro	HiCube 80 Pro	HiCube 80 Pro
Connection flange (in)	DN 63 CF-F	DN 63 CF-F	DN 63 CF-F	DN 63 CF-F
Connection flange (out)	G 1/2	G 1/2	G 1/2	G 1/2
Turbopump	HiPace 80	HiPace 80	HiPace 80	HiPace 80
Backing pump	Duo 11 M	Duo 20 M	Pascal 2010	Pascal 2021
Final pressure without gas ballast	$< 5 \cdot 10^{-10}$ hPa	$< 5 \cdot 10^{-10}$ hPa	$< 5 \cdot 10^{-10}$ hPa	$< 5 \cdot 10^{-10}$ hPa
Pumping speed for N <sub>2</sub>	67 l/s	67 l/s	67 l/s	67 l/s
Pumping speed backing pump at 50 Hz	9 m <sup>3</sup> /h	20 m <sup>3</sup> /h	9 m <sup>3</sup> /h	18 m <sup>3</sup> /h
Input voltage(s)	200 – 240 V AC, 50/60 Hz	200 – 230 V AC, 50/60 Hz	200 – 230 V AC, 50/60 Hz	200 – 230 V AC, 50/60 Hz
Input voltage: tolerance	±10 %	±10 %	±10 %	±10 %
Motor for region	Asia, Europe	Asia, Europe	Asia, Europe	Asia, Europe
Power consumption max.	430 W	1030 W	680 W	680 W
Sound pressure level	≤50 dB(A)	≤50 dB(A)	≤50 dB(A)	≤50 dB(A)
Cooling method, standard	Air	Air	Air	Air
Relative humidity of air	5 – 85 %, non-condensing	5 – 85 %, non-condensing	5 – 85 %, non-condensing	5 – 85 %, non-condensing
Shipping and storage temperature	-20 – 55 °C	-20 – 55 °C	-20 – 55 °C	-20 – 55 °C
Weight	64 kg	89 kg	71 kg	73 kg

**Tbl. 26: Technical data HiCube 80 Pro, DN 63 CF-F**

### 13.2.2 Technical data HiCube 300 Pro

Type designation	HiCube 300 Pro	HiCube 300 Pro	HiCube 300 Pro	HiCube 300 Pro	HiCube 300 Pro
Connection flange (in)	DN 100 ISO-K	DN 100 ISO-K	DN 100 ISO-K	DN 100 ISO-K	DN 100 ISO-K
Connection flange (out)	G 1/2	G 1/2	G 1/2	G 1/2	G 1/2
Turbopump	HiPace 300	HiPace 300	HiPace 300	HiPace 300	HiPace 300
Backing pump	ACP 15	ACP 28	HiScroll 6	HiScroll 12	HiScroll 18
Final pressure without gas ballast	$< 1 \cdot 10^{-7}$ hPa	$< 1 \cdot 10^{-7}$ hPa	$1 \cdot 10^{-7}$ hPa	$1 \cdot 10^{-7}$ hPa	$1 \cdot 10^{-7}$ hPa

Type designation	HiCube 300 Pro	HiCube 300 Pro	HiCube 300 Pro	HiCube 300 Pro	HiCube 300 Pro
Pumping speed for N <sub>2</sub>	260 l/s	260 l/s	260 l/s	260 l/s	260 l/s
Pumping speed backing pump at 50 Hz	14 m <sup>3</sup> /h	27 m <sup>3</sup> /h	6.1 m <sup>3</sup> /h	12.1 m <sup>3</sup> /h	18.1 m <sup>3</sup> /h
Input voltage(s)	200 – 230 V AC, 50/60 Hz	200 – 230 V AC, 50/60 Hz	200 – 230 V AC, 50/60 Hz	200 – 230 V AC, 50/60 Hz	200 – 230 V AC, 50/60 Hz
Input voltage: tolerance	±10 %	±10 %	±10 %	±10 %	±10 %
Motor for region	Asia, Europe	Asia, Europe	Asia, Europe	Asia, Europe	Asia, Europe
Power consumption max.	800 W	1050 W	830 W	1310 W	1790 W
Sound pressure level	≤50 dB(A)	≤50 dB(A)	≤50 dB(A)	≤50 dB(A)	≤50 dB(A)
Cooling method, standard	Air	Air	Air	Air	Air
Relative humidity of air	5 – 85 %, non-condensing	5 – 85 %, non-condensing	5 – 85 %, non-condensing	5 – 85 %, non-condensing	5 – 85 %, non-condensing
Shipping and storage temperature	-10 – 55 °C	-10 – 55 °C	-10 – 50 °C	-10 – 50 °C	-10 – 50 °C
Weight	67 kg	90 kg	72 kg	77 kg	76 kg

**Tbl. 27: Technical data HiCube 300 Pro, DN 100 ISO-K**

Type designation	HiCube 300 Pro	HiCube 300 Pro	HiCube 300 Pro	HiCube 300 Pro
Connection flange (in)	DN 100 ISO-K	DN 100 ISO-K	DN 100 ISO-K	DN 100 ISO-K
Connection flange (out)	G 1/2	G 1/2	G 1/2	G 1/2
Turbopump	HiPace 300	HiPace 300	HiPace 300	HiPace 300
Backing pump	Duo 11 M	Duo 20 M	Pascal 2010	Pascal 2021
Final pressure without gas ballast	< 1 · 10 <sup>-7</sup> hPa	< 1 · 10 <sup>-7</sup> hPa	< 1 · 10 <sup>-7</sup> hPa	< 1 · 10 <sup>-7</sup> hPa
Pumping speed for N <sub>2</sub>	260 l/s	260 l/s	260 l/s	260 l/s
Pumping speed backing pump at 50 Hz	9 m <sup>3</sup> /h	20 m <sup>3</sup> /h	9 m <sup>3</sup> /h	18 m <sup>3</sup> /h
Input voltage(s)	200 – 240 V AC, 50/60 Hz	200 – 230 V AC, 50/60 Hz	200 – 230 V AC, 50/60 Hz	200 – 230 V AC, 50/60 Hz
Input voltage: tolerance	±10 %	±10 %	±10 %	±10 %
Motor for region	Asia, Europe	Asia, Europe	Asia, Europe	Asia, Europe
Power consumption max.	640 W	1240 W	890 W	890 W

Type designation	HiCube 300 Pro	HiCube 300 Pro	HiCube 300 Pro	HiCube 300 Pro
Sound pressure level	≤50 dB(A)	≤50 dB(A)	≤50 dB(A)	≤50 dB(A)
Cooling method, standard	Air	Air	Air	Air
Relative humidity of air	5 – 85 %, non-condensing	5 – 85 %, non-condensing	5 – 85 %, non-condensing	5 – 85 %, non-condensing
Shipping and storage temperature	-20 – 55 °C	-20 – 55 °C	-20 – 55 °C	-20 – 55 °C
Weight	65 kg	90 kg	72 kg	74 kg

**Tbl. 28: Technical data HiCube 300 Pro, DN 100 ISO-K**

Type designation	HiCube 300 Pro	HiCube 300 Pro	HiCube 300 Pro	HiCube 300 Pro	HiCube 300 Pro
Connection flange (in)	DN 100 CF-F	DN 100 CF-F	DN 100 CF-F	DN 100 CF-F	DN 100 CF-F
Connection flange (out)	G 1/2	G 1/2	G 1/2	G 1/2	G 1/2
Turbopump	HiPace 300	HiPace 300	HiPace 300	HiPace 300	HiPace 300
Backing pump	ACP 15	ACP 28	HiScroll 6	HiScroll 12	HiScroll 18
Final pressure without gas ballast	< 5 · 10 <sup>-10</sup> hPa	< 5 · 10 <sup>-10</sup> hPa	5 · 10 <sup>-10</sup> hPa	5 · 10 <sup>-10</sup> hPa	5 · 10 <sup>-10</sup> hPa
Pumping speed for N <sub>2</sub>	260 l/s	260 l/s	260 l/s	260 l/s	260 l/s
Pumping speed backing pump at 50 Hz	14 m <sup>3</sup> /h	27 m <sup>3</sup> /h	6.1 m <sup>3</sup> /h	12.1 m <sup>3</sup> /h	18.1 m <sup>3</sup> /h
Input voltage(s)	200 – 230 V AC, 50/60 Hz	200 – 230 V AC, 50/60 Hz	200 – 230 V AC, 50/60 Hz	200 – 230 V AC, 50/60 Hz	200 – 230 V AC, 50/60 Hz
Input voltage: tolerance	±10 %	±10 %	±10 %	±10 %	±10 %
Motor for region	Asia, Europe	Asia, Europe	Asia, Europe	Asia, Europe	Asia, Europe
Power consumption max.	800 W	1050 W	830 W	1310 W	1790 W
Sound pressure level	≤50 dB(A)	≤50 dB(A)	≤50 dB(A)	≤50 dB(A)	≤50 dB(A)
Cooling method, standard	Air	Air	Air	Air	Air
Relative humidity of air	5 – 85 %, non-condensing	5 – 85 %, non-condensing	5 – 85 %, non-condensing	5 – 85 %, non-condensing	5 – 85 %, non-condensing
Shipping and storage temperature	-10 – 55 °C	-10 – 55 °C	-10 – 50 °C	-10 – 50 °C	-10 – 50 °C
Weight	69 kg	92 kg	74 kg	79 kg	78 kg

**Tbl. 29: Technical data HiCube 300 Pro, DN 100 CF-F**



Type designation	HiCube 300 Pro	HiCube 300 Pro	HiCube 300 Pro	HiCube 300 Pro
Connection flange (in)	DN 100 CF-F	DN 100 CF-F	DN 100 CF-F	DN 100 CF-F
Connection flange (out)	G 1/2	G 1/2	G 1/2	G 1/2
Turbopump	HiPace 300	HiPace 300	HiPace 300	HiPace 300
Backing pump	Duo 11 M	Duo 20 M	Pascal 2010	Pascal 2021
Final pressure without gas ballast	$< 5 \cdot 10^{-10}$ hPa	$< 5 \cdot 10^{-10}$ hPa	$< 5 \cdot 10^{-10}$ hPa	$< 5 \cdot 10^{-10}$ hPa
Pumping speed for N <sub>2</sub>	260 l/s	260 l/s	260 l/s	260 l/s
Pumping speed backing pump at 50 Hz	9 m <sup>3</sup> /h	20 m <sup>3</sup> /h	9 m <sup>3</sup> /h	18 m <sup>3</sup> /h
Input voltage(s)	200 – 240 V AC, 50/60 Hz	200 – 230 V AC, 50/60 Hz	200 – 230 V AC, 50/60 Hz	200 – 230 V AC, 50/60 Hz
Input voltage: tolerance	±10 %	±10 %	±10 %	±10 %
Motor for region	Asia, Europe	Asia, Europe	Asia, Europe	Asia, Europe
Power consumption max.	640 W	1240 W	890 W	890 W
Sound pressure level	≤50 dB(A)	≤50 dB(A)	≤50 dB(A)	≤50 dB(A)
Cooling method, standard	Air	Air	Air	Air
Relative humidity of air	5 – 85 %, non-condensing	5 – 85 %, non-condensing	5 – 85 %, non-condensing	5 – 85 %, non-condensing
Shipping and storage temperature	-20 – 55 °C	-20 – 55 °C	-20 – 55 °C	-20 – 55 °C
Weight	67 kg	92 kg	74 kg	76 kg

Tbl. 30: Technical data HiCube 300 Pro, DN 100 CF-F

### 13.2.3 Technical data HiCube 300 H Pro

Type designation	HiCube 300 H Pro	HiCube 300 H Pro	HiCube 300 H Pro	HiCube 300 H Pro	HiCube 300 H Pro
Connection flange (in)	DN 100 ISO-K	DN 100 ISO-K	DN 100 ISO-K	DN 100 ISO-K	DN 100 ISO-K
Connection flange (out)	G 1/2	G 1/2	G 1/2	G 1/2	G 1/2
Turbopump	HiPace 300 H	HiPace 300 H	HiPace 300 H	HiPace 300 H	HiPace 300 H
Backing pump	ACP 15	ACP 28	HiScroll 6	HiScroll 12	HiScroll 18
Final pressure without gas ballast	$< 1 \cdot 10^{-7}$ hPa	$< 1 \cdot 10^{-7}$ hPa	$1 \cdot 10^{-7}$ hPa	$1 \cdot 10^{-7}$ hPa	$1 \cdot 10^{-7}$ hPa
Pumping speed for N <sub>2</sub>	260 l/s	260 l/s	260 l/s	260 l/s	260 l/s
Pumping speed backing pump at 50 Hz	14 m <sup>3</sup> /h	27 m <sup>3</sup> /h	6.1 m <sup>3</sup> /h	12.1 m <sup>3</sup> /h	18.1 m <sup>3</sup> /h
Input voltage(s)	200 – 230 V AC, 50/60 Hz	200 – 230 V AC, 50/60 Hz	200 – 230 V AC, 50/60 Hz	200 – 230 V AC, 50/60 Hz	200 – 230 V AC, 50/60 Hz

Type designation	HiCube 300 H Pro	HiCube 300 H Pro	HiCube 300 H Pro	HiCube 300 H Pro	HiCube 300 H Pro
Input voltage: tolerance	±10 %	±10 %	±10 %	±10 %	±10 %
Motor for region	Asia, Europe	Asia, Europe	Asia, Europe	Asia, Europe	Asia, Europe
Power consumption max.	800 W	1050 W	830 W	1310 W	1790 W
Sound pressure level	≤50 dB(A)	≤50 dB(A)	≤50 dB(A)	≤50 dB(A)	≤50 dB(A)
Cooling method, standard	Air	Air	Air	Air	Air
Relative humidity of air	5 – 85 %, non-condensing	5 – 85 %, non-condensing	5 – 85 %, non-condensing	5 – 85 %, non-condensing	5 – 85 %, non-condensing
Shipping and storage temperature	-10 – 55 °C	-10 – 55 °C	-10 – 50 °C	-10 – 50 °C	-10 – 50 °C
Weight	77.4 kg	84.4 kg	71.5 kg	76.5 kg	75.5 kg

**Tbl. 31: Technical data HiCube 300 H Pro, DN 100 ISO-K**

Type designation	HiCube 300 H Pro	HiCube 300 H Pro	HiCube 300 H Pro	HiCube 300 H Pro
Connection flange (in)	DN 100 ISO-K	DN 100 ISO-K	DN 100 ISO-K	DN 100 ISO-K
Connection flange (out)	G 1/2	G 1/2	G 1/2	G 1/2
Turbopump	HiPace 300 H	HiPace 300 H	HiPace 300 H	HiPace 300 H
Backing pump	Duo 11 M	Duo 20 M	Pascal 2010	Pascal 2021
Final pressure without gas ballast	< 1 · 10 <sup>-7</sup> hPa	< 1 · 10 <sup>-7</sup> hPa	< 1 · 10 <sup>-7</sup> hPa	< 1 · 10 <sup>-7</sup> hPa
Pumping speed for N <sub>2</sub>	260 l/s	260 l/s	260 l/s	260 l/s
Pumping speed backing pump at 50 Hz	9 m <sup>3</sup> /h	20 m <sup>3</sup> /h	9 m <sup>3</sup> /h	18 m <sup>3</sup> /h
Input voltage(s)	200 – 240 V AC, 50/60 Hz	200 – 230 V AC, 50/60 Hz	200 – 230 V AC, 50/60 Hz	200 – 230 V AC, 50/60 Hz
Input voltage: tolerance	±10 %	±10 %	±10 %	±10 %
Motor for region	Asia, Europe	Asia, Europe	Asia, Europe	Asia, Europe
Power consumption max.	640 W	1240 W	890 W	890 W
Sound pressure level	≤50 dB(A)	≤50 dB(A)	≤50 dB(A)	≤50 dB(A)
Cooling method, standard	Air	Air	Air	Air
Relative humidity of air	5 – 85 %, non-condensing	5 – 85 %, non-condensing	5 – 85 %, non-condensing	5 – 85 %, non-condensing

Type designation	HiCube 300 H Pro	HiCube 300 H Pro	HiCube 300 H Pro	HiCube 300 H Pro
Shipping and storage temperature	-20 – 55 °C	-20 – 55 °C	-20 – 55 °C	-20 – 55 °C
Weight	71.5 kg	96.5 kg	78.5 kg	80.5 kg

**Tbl. 32: Technical data HiCube 300 H Pro, DN 100 ISO-K**

Type designation	HiCube 300 H Pro	HiCube 300 H Pro	HiCube 300 H Pro	HiCube 300 H Pro	HiCube 300 H Pro
Connection flange (in)	DN 100 CF-F	DN 100 CF-F	DN 100 CF-F	DN 100 CF-F	DN 100 CF-F
Connection flange (out)	G 1/2	G 1/2	G 1/2	G 1/2	G 1/2
Turbopump	HiPace 300 H	HiPace 300 H	HiPace 300 H	HiPace 300 H	HiPace 300 H
Backing pump	ACP 15	ACP 28	HiScroll 6	HiScroll 12	HiScroll 18
Final pressure without gas ballast	$< 5 \cdot 10^{-10}$ hPa	$< 5 \cdot 10^{-10}$ hPa	$5 \cdot 10^{-10}$ hPa	$5 \cdot 10^{-10}$ hPa	$5 \cdot 10^{-10}$ hPa
Pumping speed for N <sub>2</sub>	260 l/s	260 l/s	260 l/s	260 l/s	260 l/s
Pumping speed backing pump at 50 Hz	14 m <sup>3</sup> /h	27 m <sup>3</sup> /h	6.1 m <sup>3</sup> /h	12.1 m <sup>3</sup> /h	18.1 m <sup>3</sup> /h
Input voltage(s)	200 – 230 V AC, 50/60 Hz	200 – 230 V AC, 50/60 Hz	200 – 230 V AC, 50/60 Hz	200 – 230 V AC, 50/60 Hz	200 – 230 V AC, 50/60 Hz
Input voltage: tolerance	±10 %	±10 %	±10 %	±10 %	±10 %
Motor for region	Asia, Europe	Asia, Europe	Asia, Europe	Asia, Europe	Asia, Europe
Power consumption max.	800 W	1050 W	830 W	1310 W	1790 W
Sound pressure level	≤50 dB(A)	≤50 dB(A)	≤50 dB(A)	≤50 dB(A)	≤50 dB(A)
Cooling method, standard	Air	Air	Air	Air	Air
Relative humidity of air	5 – 85 %, non-condensing	5 – 85 %, non-condensing	5 – 85 %, non-condensing	5 – 85 %, non-condensing	5 – 85 %, non-condensing
Shipping and storage temperature	-10 – 55 °C	-10 – 55 °C	-10 – 50 °C	-10 – 50 °C	-10 – 50 °C
Weight	79.4 kg	86.4 kg	73.5 kg	78.5 kg	77.5 kg

**Tbl. 33: Technical data HiCube 300 H Pro, DN 100 CF-F**

Type designation	HiCube 300 H Pro	HiCube 300 H Pro	HiCube 300 H Pro	HiCube 300 H Pro
Connection flange (in)	DN 100 CF-F	DN 100 CF-F	DN 100 CF-F	DN 100 CF-F
Connection flange (out)	G 1/2	G 1/2	G 1/2	G 1/2
Turbopump	HiPace 300 H	HiPace 300 H	HiPace 300 H	HiPace 300 H
Backing pump	Duo 11 M	Duo 20 M	Pascal 2010	Pascal 2021

Type designation	HiCube 300 H Pro	HiCube 300 H Pro	HiCube 300 H Pro	HiCube 300 H Pro
Final pressure without gas ballast	$< 5 \cdot 10^{-10}$ hPa	$< 5 \cdot 10^{-10}$ hPa	$< 5 \cdot 10^{-10}$ hPa	$< 5 \cdot 10^{-10}$ hPa
Pumping speed for N <sub>2</sub>	260 l/s	260 l/s	260 l/s	260 l/s
Pumping speed backing pump at 50 Hz	9 m <sup>3</sup> /h	20 m <sup>3</sup> /h	9 m <sup>3</sup> /h	18 m <sup>3</sup> /h
Input voltage(s)	200 – 240 V AC, 50/60 Hz	200 – 230 V AC, 50/60 Hz	200 – 230 V AC, 50/60 Hz	200 – 230 V AC, 50/60 Hz
Input voltage: tolerance	±10 %	±10 %	±10 %	±10 %
Motor for region	Asia, Europe	Asia, Europe	Asia, Europe	Asia, Europe
Power consumption max.	640 W	1240 W	890 W	890 W
Sound pressure level	≤50 dB(A)	≤50 dB(A)	≤50 dB(A)	≤50 dB(A)
Cooling method, standard	Air	Air	Air	Air
Relative humidity of air	5 – 85 %, non-condensing	5 – 85 %, non-condensing	5 – 85 %, non-condensing	5 – 85 %, non-condensing
Shipping and storage temperature	-20 – 55 °C	-20 – 55 °C	-20 – 55 °C	-20 – 55 °C
Weight	73.5 kg	98.5 kg	80.5 kg	82.5 kg

Tbl. 34: Technical data HiCube 300 H Pro, DN 100 CF-F

### 13.2.4 Technical data HiCube 400 Pro

Type designation	HiCube 400 Pro	HiCube 400 Pro	HiCube 400 Pro	HiCube 400 Pro	HiCube 400 Pro
Connection flange (in)	DN 100 ISO-K	DN 100 ISO-K	DN 100 ISO-K	DN 100 ISO-K	DN 100 ISO-K
Connection flange (out)	G 1/2	G 1/2	G 1/2	G 1/2	G 1/2
Turbopump	HiPace 400	HiPace 400	HiPace 400	HiPace 400	HiPace 400
Backing pump	ACP 15	ACP 28	HiScroll 6	HiScroll 12	HiScroll 18
Final pressure without gas ballast	$< 1 \cdot 10^{-7}$ hPa	$< 1 \cdot 10^{-7}$ hPa	$1 \cdot 10^{-7}$ hPa	$1 \cdot 10^{-7}$ hPa	$1 \cdot 10^{-7}$ hPa
Pumping speed for N <sub>2</sub>	355 l/s	355 l/s	355 l/s	355 l/s	355 l/s
Pumping speed backing pump at 50 Hz	14 m <sup>3</sup> /h	27 m <sup>3</sup> /h	6.1 m <sup>3</sup> /h	12.1 m <sup>3</sup> /h	18.1 m <sup>3</sup> /h
Input voltage(s)	200 – 230 V AC, 50/60 Hz	200 – 230 V AC, 50/60 Hz	200 – 230 V AC, 50/60 Hz	200 – 230 V AC, 50/60 Hz	200 – 230 V AC, 50/60 Hz
Input voltage: tolerance	±10 %	±10 %	±10 %	±10 %	±10 %
Motor for region	Asia, Europe	Asia, Europe	Asia, Europe	Asia, Europe	Asia, Europe

Type designation	HiCube 400 Pro	HiCube 400 Pro	HiCube 400 Pro	HiCube 400 Pro	HiCube 400 Pro
Power consumption max.	910 W	1160 W	940 W	1420 W	1900 W
Sound pressure level	≤50 dB(A)	≤50 dB(A)	≤50 dB(A)	≤50 dB(A)	≤50 dB(A)
Cooling method, standard	Air	Air	Air	Air	Air
Relative humidity of air	5 – 85 %, non-condensing	5 – 85 %, non-condensing	5 – 85 %, non-condensing	5 – 85 %, non-condensing	5 – 85 %, non-condensing
Shipping and storage temperature	-10 – 55 °C	-10 – 55 °C	-10 – 50 °C	-10 – 50 °C	-10 – 50 °C
Weight	73 kg	96 kg	76.9 kg	81.9 kg	80.9 kg

**Tbl. 35: Technical data HiCube 400 Pro, DN 100 ISO-K**

Type designation	HiCube 400 Pro	HiCube 400 Pro	HiCube 400 Pro	HiCube 400 Pro
Connection flange (in)	DN 100 ISO-K	DN 100 ISO-K	DN 100 ISO-K	DN 100 ISO-K
Connection flange (out)	G 1/2	G 1/2	G 1/2	G 1/2
Turbopump	HiPace 400	HiPace 400	HiPace 400	HiPace 400
Backing pump	Duo 11 M	Duo 20 M	Pascal 2010	Pascal 2021
Final pressure without gas ballast	$< 1 \cdot 10^{-7}$ hPa	$< 1 \cdot 10^{-7}$ hPa	$< 1 \cdot 10^{-7}$ hPa	$< 1 \cdot 10^{-7}$ hPa
Pumping speed for N <sub>2</sub>	355 l/s	355 l/s	355 l/s	355 l/s
Pumping speed backing pump at 50 Hz	9 m <sup>3</sup> /h	20 m <sup>3</sup> /h	9 m <sup>3</sup> /h	18 m <sup>3</sup> /h
Input voltage(s)	200 – 240 V AC, 50/60 Hz	200 – 230 V AC, 50/60 Hz	200 – 230 V AC, 50/60 Hz	200 – 230 V AC, 50/60 Hz
Input voltage: tolerance	±10 %	±10 %	±10 %	±10 %
Motor for region	Asia, Europe	Asia, Europe	Asia, Europe	Asia, Europe
Power consumption max.	750 W	1350 W	1000 W	1000 W
Sound pressure level	≤50 dB(A)	≤50 dB(A)	≤50 dB(A)	≤50 dB(A)
Cooling method, standard	Air	Air	Air	Air
Relative humidity of air	5 – 85 %, non-condensing	5 – 85 %, non-condensing	5 – 85 %, non-condensing	5 – 85 %, non-condensing
Shipping and storage temperature	-20 – 55 °C	-20 – 55 °C	-20 – 55 °C	-20 – 55 °C
Weight	71 kg	96 kg	78 kg	80 kg

**Tbl. 36: Technical data HiCube 400 Pro, DN 100 ISO-K**

Type designation	HiCube 400 Pro	HiCube 400 Pro	HiCube 400 Pro	HiCube 400 Pro	HiCube 400 Pro
Connection flange (in)	DN 100 CF-F	DN 100 CF-F	DN 100 CF-F	DN 100 CF-F	DN 100 CF-F
Connection flange (out)	G 1/2	G 1/2	G 1/2	G 1/2	G 1/2
Turbopump	HiPace 400	HiPace 400	HiPace 400	HiPace 400	HiPace 400
Backing pump	ACP 15	ACP 28	HiScroll 6	HiScroll 12	HiScroll 18
Final pressure without gas ballast	$< 5 \cdot 10^{-10}$ hPa	$< 5 \cdot 10^{-10}$ hPa	$5 \cdot 10^{-10}$ hPa	$5 \cdot 10^{-10}$ hPa	$5 \cdot 10^{-10}$ hPa
Pumping speed for N <sub>2</sub>	355 l/s	355 l/s	355 l/s	355 l/s	355 l/s
Pumping speed backing pump at 50 Hz	14 m <sup>3</sup> /h	27 m <sup>3</sup> /h	6.1 m <sup>3</sup> /h	12.1 m <sup>3</sup> /h	18.1 m <sup>3</sup> /h
Input voltage(s)	200 – 230 V AC, 50/60 Hz	200 – 230 V AC, 50/60 Hz	200 – 230 V AC, 50/60 Hz	200 – 230 V AC, 50/60 Hz	200 – 230 V AC, 50/60 Hz
Input voltage: tolerance	±10 %	±10 %	±10 %	±10 %	±10 %
Motor for region	Asia, Europe	Asia, Europe	Asia, Europe	Asia, Europe	Asia, Europe
Power consumption max.	910 W	1160 W	940 W	1420 W	1900 W
Sound pressure level	≤50 dB(A)	≤50 dB(A)	≤50 dB(A)	≤50 dB(A)	≤50 dB(A)
Cooling method, standard	Air	Air	Air	Air	Air
Relative humidity of air	5 – 85 %, non-condensing	5 – 85 %, non-condensing	5 – 85 %, non-condensing	5 – 85 %, non-condensing	5 – 85 %, non-condensing
Shipping and storage temperature	-10 – 55 °C	-10 – 55 °C	-10 – 50 °C	-10 – 50 °C	-10 – 50 °C
Weight	79 kg	102 kg	82.8 kg	87.8 kg	86.8 kg

**Tbl. 37: Technical data HiCube 400 Pro, DN 100 CF-F**

Type designation	HiCube 400 Pro	HiCube 400 Pro	HiCube 400 Pro	HiCube 400 Pro
Connection flange (in)	DN 100 CF-F	DN 100 CF-F	DN 100 CF-F	DN 100 CF-F
Connection flange (out)	G 1/2	G 1/2	G 1/2	G 1/2
Turbopump	HiPace 400	HiPace 400	HiPace 400	HiPace 400
Backing pump	Duo 11 M	Duo 20 M	Pascal 2010	Pascal 2021
Final pressure without gas ballast	$< 5 \cdot 10^{-10}$ hPa	$< 5 \cdot 10^{-10}$ hPa	$< 5 \cdot 10^{-10}$ hPa	$< 5 \cdot 10^{-10}$ hPa
Pumping speed for N <sub>2</sub>	355 l/s	355 l/s	355 l/s	355 l/s
Pumping speed backing pump at 50 Hz	9 m <sup>3</sup> /h	20 m <sup>3</sup> /h	9 m <sup>3</sup> /h	18 m <sup>3</sup> /h
Input voltage(s)	200 – 240 V AC, 50/60 Hz	200 – 230 V AC, 50/60 Hz	200 – 230 V AC, 50/60 Hz	200 – 230 V AC, 50/60 Hz
Input voltage: tolerance	±10 %	±10 %	±10 %	±10 %

Type designation	HiCube 400 Pro	HiCube 400 Pro	HiCube 400 Pro	HiCube 400 Pro
Motor for region	Asia, Europe	Asia, Europe	Asia, Europe	Asia, Europe
Power consumption max.	750 W	1350 W	1000 W	1000 W
Sound pressure level	≤50 dB(A)	≤50 dB(A)	≤50 dB(A)	≤50 dB(A)
Cooling method, standard	Air	Air	Air	Air
Relative humidity of air	5 – 85 %, non-condensing	5 – 85 %, non-condensing	5 – 85 %, non-condensing	5 – 85 %, non-condensing
Shipping and storage temperature	-20 – 55 °C	-20 – 55 °C	-20 – 55 °C	-20 – 55 °C
Weight	77 kg	102 kg	84 kg	86 kg

Tbl. 38: Technical data HiCube 400 Pro, DN 100 CF-F

### 13.2.5 Technical data HiCube 700 Pro

Type designation	HiCube 700 Pro	HiCube 700 Pro	HiCube 700 Pro	HiCube 700 Pro	HiCube 700 Pro
Connection flange (in)	DN 160 ISO-K	DN 160 ISO-K	DN 160 ISO-K	DN 160 ISO-K	DN 160 ISO-K
Connection flange (out)	G 1/2	G 1/2	G 1/2	G 1/2	G 1/2
Turbopump	HiPace 700	HiPace 700	HiPace 700	HiPace 700	HiPace 700
Backing pump	ACP 15	ACP 28	HiScroll 6	HiScroll 12	HiScroll 18
Final pressure without gas ballast	$< 1 \cdot 10^{-7}$ hPa	$< 1 \cdot 10^{-7}$ hPa	$1 \cdot 10^{-7}$ hPa	$1 \cdot 10^{-7}$ hPa	$1 \cdot 10^{-7}$ hPa
Pumping speed for N <sub>2</sub>	685 l/s	685 l/s	685 l/s	685 l/s	685 l/s
Pumping speed backing pump at 50 Hz	14 m <sup>3</sup> /h	27 m <sup>3</sup> /h	6.1 m <sup>3</sup> /h	12.1 m <sup>3</sup> /h	18.1 m <sup>3</sup> /h
Input voltage(s)	200 – 230 V AC, 50/60 Hz	200 – 230 V AC, 50/60 Hz	200 – 230 V AC, 50/60 Hz	200 – 230 V AC, 50/60 Hz	200 – 230 V AC, 50/60 Hz
Input voltage: tolerance	±10 %	±10 %	±10 %	±10 %	±10 %
Motor for region	Asia, Europe	Asia, Europe	Asia, Europe	Asia, Europe	Asia, Europe
Power consumption max.	910 W	1160 W	940 W	1420 W	1900 W
Sound pressure level	≤50 dB(A)	≤50 dB(A)	≤50 dB(A)	≤50 dB(A)	≤50 dB(A)
Cooling method, standard	Air	Air	Air	Air	Air
Relative humidity of air	5 – 85 %, non-condensing	5 – 85 %, non-condensing	5 – 85 %, non-condensing	5 – 85 %, non-condensing	5 – 85 %, non-condensing

Type designation	HiCube 700 Pro	HiCube 700 Pro	HiCube 700 Pro	HiCube 700 Pro	HiCube 700 Pro
Shipping and storage temperature	-10 – 55 °C	-10 – 55 °C	-10 – 50 °C	-10 – 50 °C	-10 – 50 °C
Weight	73 kg	96 kg	76.8 kg	81.8 kg	80.8 kg

**Tbl. 39: Technical data HiCube 700 Pro, DN 160 ISO-K**

Type designation	HiCube 700 Pro	HiCube 700 Pro	HiCube 700 Pro	HiCube 700 Pro
Connection flange (in)	DN 160 ISO-K	DN 160 ISO-K	DN 160 ISO-K	DN 160 ISO-K
Connection flange (out)	G 1/2	G 1/2	G 1/2	G 1/2
Turbopump	HiPace 700	HiPace 700	HiPace 700	HiPace 700
Backing pump	Duo 11 M	Duo 20 M	Pascal 2010	Pascal 2021
Final pressure without gas ballast	$< 1 \cdot 10^{-7}$ hPa	$< 1 \cdot 10^{-7}$ hPa	$< 1 \cdot 10^{-7}$ hPa	$< 1 \cdot 10^{-7}$ hPa
Pumping speed for N <sub>2</sub>	685 l/s	685 l/s	685 l/s	685 l/s
Pumping speed backing pump at 50 Hz	9 m <sup>3</sup> /h	20 m <sup>3</sup> /h	9 m <sup>3</sup> /h	18 m <sup>3</sup> /h
Input voltage(s)	200 – 240 V AC, 50/60 Hz	200 – 230 V AC, 50/60 Hz	200 – 230 V AC, 50/60 Hz	200 – 230 V AC, 50/60 Hz
Input voltage: tolerance	±10 %	±10 %	±10 %	±10 %
Motor for region	Asia, Europe	Asia, Europe	Asia, Europe	Asia, Europe
Power consumption max.	750 W	1350 W	1000 W	1000 W
Sound pressure level	≤50 dB(A)	≤50 dB(A)	≤50 dB(A)	≤50 dB(A)
Cooling method, standard	Air	Air	Air	Air
Relative humidity of air	5 – 85 %, non-condensing	5 – 85 %, non-condensing	5 – 85 %, non-condensing	5 – 85 %, non-condensing
Shipping and storage temperature	-20 – 55 °C	-20 – 55 °C	-20 – 55 °C	-20 – 55 °C
Weight	71 kg	96 kg	78 kg	80 kg

**Tbl. 40: Technical data HiCube 700 Pro, DN 160 ISO-K**

Type designation	HiCube 700 Pro	HiCube 700 Pro	HiCube 700 Pro	HiCube 700 Pro	HiCube 700 Pro
Connection flange (in)	DN 160 CF-F	DN 160 CF-F	DN 160 CF-F	DN 160 CF-F	DN 160 CF-F
Connection flange (out)	G 1/2	G 1/2	G 1/2	G 1/2	G 1/2
Turbopump	HiPace 700	HiPace 700	HiPace 700	HiPace 700	HiPace 700
Backing pump	ACP 15	ACP 28	HiScroll 6	HiScroll 12	HiScroll 18
Final pressure without gas ballast	$< 5 \cdot 10^{-10}$ hPa	$< 5 \cdot 10^{-10}$ hPa	$5 \cdot 10^{-10}$ hPa	$5 \cdot 10^{-10}$ hPa	$5 \cdot 10^{-10}$ hPa
Pumping speed for N <sub>2</sub>	685 l/s	685 l/s	685 l/s	685 l/s	685 l/s



Type designation	HiCube 700 Pro	HiCube 700 Pro	HiCube 700 Pro	HiCube 700 Pro	HiCube 700 Pro
Pumping speed backing pump at 50 Hz	14 m <sup>3</sup> /h	27 m <sup>3</sup> /h	6.1 m <sup>3</sup> /h	12.1 m <sup>3</sup> /h	18.1 m <sup>3</sup> /h
Input voltage(s)	200 – 230 V AC, 50/60 Hz	200 – 230 V AC, 50/60 Hz	200 – 230 V AC, 50/60 Hz	200 – 230 V AC, 50/60 Hz	200 – 230 V AC, 50/60 Hz
Input voltage: tolerance	±10 %	±10 %	±10 %	±10 %	±10 %
Motor for region	Asia, Europe	Asia, Europe	Asia, Europe	Asia, Europe	Asia, Europe
Power consumption max.	910 W	1160 W	940 W	1420 W	1900 W
Sound pressure level	≤50 dB(A)	≤50 dB(A)	≤50 dB(A)	≤50 dB(A)	≤50 dB(A)
Cooling method, standard	Air	Air	Air	Air	Air
Relative humidity of air	5 – 85 %, non-condensing	5 – 85 %, non-condensing	5 – 85 %, non-condensing	5 – 85 %, non-condensing	5 – 85 %, non-condensing
Shipping and storage temperature	-10 – 55 °C	-10 – 55 °C	-10 – 50 °C	-10 – 50 °C	-10 – 50 °C
Weight	79 kg	102 kg	82.7 kg	87.7 kg	86.7 kg

**Tbl. 41: Technical data HiCube 700 Pro, DN 160 CF-F**

Type designation	HiCube 700 Pro	HiCube 700 Pro	HiCube 700 Pro	HiCube 700 Pro
Connection flange (in)	DN 160 CF-F	DN 160 CF-F	DN 160 CF-F	DN 160 CF-F
Connection flange (out)	G 1/2	G 1/2	G 1/2	G 1/2
Turbopump	HiPace 700	HiPace 700	HiPace 700	HiPace 700
Backing pump	Duo 11 M	Duo 20 M	Pascal 2010	Pascal 2021
Final pressure without gas ballast	< 5 · 10 <sup>-10</sup> hPa	< 5 · 10 <sup>-10</sup> hPa	< 5 · 10 <sup>-10</sup> hPa	< 5 · 10 <sup>-10</sup> hPa
Pumping speed for N <sub>2</sub>	685 l/s	685 l/s	685 l/s	685 l/s
Pumping speed backing pump at 50 Hz	9 m <sup>3</sup> /h	20 m <sup>3</sup> /h	9 m <sup>3</sup> /h	18 m <sup>3</sup> /h
Input voltage(s)	200 – 240 V AC, 50/60 Hz	200 – 230 V AC, 50/60 Hz	200 – 230 V AC, 50/60 Hz	200 – 230 V AC, 50/60 Hz
Input voltage: tolerance	±10 %	±10 %	±10 %	±10 %
Motor for region	Asia, Europe	Asia, Europe	Asia, Europe	Asia, Europe
Power consumption max.	750 W	1350 W	1000 W	1000 W
Sound pressure level	≤50 dB(A)	≤50 dB(A)	≤50 dB(A)	≤50 dB(A)
Cooling method, standard	Air	Air	Air	Air
Relative humidity of air	5 – 85 %, non-condensing	5 – 85 %, non-condensing	5 – 85 %, non-condensing	5 – 85 %, non-condensing

Type designation	HiCube 700 Pro	HiCube 700 Pro	HiCube 700 Pro	HiCube 700 Pro
Shipping and storage temperature	-20 – 55 °C	-20 – 55 °C	-20 – 55 °C	-20 – 55 °C
Weight	77 kg	102 kg	84 kg	86 kg

**Tbl. 42: Technical data HiCube 700 Pro, DN 160 CF-F**

### 13.2.6 Technical data HiCube 700 H Pro

Type designation	HiCube 700 H Pro	HiCube 700 H Pro	HiCube 700 H Pro	HiCube 700 H Pro	HiCube 700 H Pro
Connection flange (in)	DN 160 ISO-K	DN 160 ISO-K	DN 160 ISO-K	DN 160 ISO-K	DN 160 ISO-K
Connection flange (out)	G 1/2"	G 1/2"	G 1/2	G 1/2	G 1/2
Turbopump	HiPace 700 H	HiPace 700 H	HiPace 700 H	HiPace 700 H	HiPace 700 H
Backing pump	ACP 15	ACP 28	HiScroll 6	HiScroll 12	HiScroll 18
Final pressure without gas ballast	$< 1 \cdot 10^{-7}$ hPa	$< 1 \cdot 10^{-7}$ hPa	$1 \cdot 10^{-7}$ hPa	$1 \cdot 10^{-7}$ hPa	$1 \cdot 10^{-7}$ hPa
Pumping speed for N <sub>2</sub>	685 l/s	685 l/s	685 l/s	685 l/s	685 l/s
Pumping speed backing pump at 50 Hz	14 m <sup>3</sup> /h	27 m <sup>3</sup> /h	6.1 m <sup>3</sup> /h	12.1 m <sup>3</sup> /h	18.1 m <sup>3</sup> /h
Input voltage(s)	200 – 230 V AC, 50/60 Hz	200 – 230 V AC, 50/60 Hz	200 – 230 V AC, 50/60 Hz	200 – 230 V AC, 50/60 Hz	200 – 230 V AC, 50/60 Hz
Input voltage: tolerance	±10 %	±10 %	±10 %	±10 %	±10 %
Motor for region	Asia, Europe	Asia, Europe	Asia, Europe	Asia, Europe	Asia, Europe
Power consumption max.	910 W	1160 W	940 W	1420 W	1900 W
Sound pressure level	≤50 dB(A)	≤50 dB(A)	≤50 dB(A)	≤50 dB(A)	≤50 dB(A)
Cooling method, standard	Air	Air	Air	Air	Air
Relative humidity of air	5 – 85 %, non-condensing	5 – 85 %, non-condensing	5 – 85 %, non-condensing	5 – 85 %, non-condensing	5 – 85 %, non-condensing
Shipping and storage temperature	-10 – 55 °C	-10 – 55 °C	-10 – 50 °C	-10 – 50 °C	-10 – 50 °C
Weight	83 kg	90 kg	77.1 kg	82.1 kg	81.1 kg

**Tbl. 43: Technical data HiCube 700 H Pro, DN 160 ISO-K**

Type designation	HiCube 700 H Pro	HiCube 700 H Pro	HiCube 700 H Pro	HiCube 700 H Pro
Connection flange (in)	DN 160 ISO-K	DN 160 ISO-K	DN 160 ISO-K	DN 160 ISO-K
Connection flange (out)	G 1/2"	G 1/2"	G 1/2"	G 1/2"
Turbopump	HiPace 700 H	HiPace 700 H	HiPace 700 H	HiPace 700 H
Backing pump	Duo 11 M	Duo 20 M	Pascal 2010	Pascal 2021
Final pressure without gas ballast	$< 1 \cdot 10^{-7}$ hPa	$< 1 \cdot 10^{-7}$ hPa	$< 1 \cdot 10^{-7}$ hPa	$< 1 \cdot 10^{-7}$ hPa
Pumping speed for N <sub>2</sub>	685 l/s	685 l/s	685 l/s	685 l/s
Pumping speed backing pump at 50 Hz	9 m <sup>3</sup> /h	20 m <sup>3</sup> /h	9 m <sup>3</sup> /h	18 m <sup>3</sup> /h
Input voltage(s)	200 – 240 V AC, 50/60 Hz	200 – 230 V AC, 50/60 Hz	200 – 230 V AC, 50/60 Hz	200 – 230 V AC, 50/60 Hz
Input voltage: tolerance	±10 %	±10 %	±10 %	±10 %
Motor for region	Asia, Europe	Asia, Europe	Asia, Europe	Asia, Europe
Power consumption max.	750 W	1350 W	1000 W	1000 W
Sound pressure level	≤50 dB(A)	≤50 dB(A)	≤50 dB(A)	≤50 dB(A)
Cooling method, standard	Air	Air	Air	Air
Relative humidity of air	5 – 85 %, non-condensing	5 – 85 %, non-condensing	5 – 85 %, non-condensing	5 – 85 %, non-condensing
Shipping and storage temperature	-20 – 55 °C	-20 – 55 °C	-20 – 55 °C	-20 – 55 °C
Weight	77.1 kg	102.1 kg	84.1 kg	86.1 kg

**Tbl. 44: Technical data HiCube 700 H Pro, DN 160 ISO-K**

Type designation	HiCube 700 H Pro	HiCube 700 H Pro	HiCube 700 H Pro	HiCube 700 H Pro	HiCube 700 H Pro
Connection flange (in)	DN 160 CF-F	DN 160 CF-F	DN 160 CF-F	DN 160 CF-F	DN 160 CF-F
Connection flange (out)	G 1/2"	G 1/2"	G 1/2"	G 1/2"	G 1/2"
Turbopump	HiPace 700 H	HiPace 700 H	HiPace 700 H	HiPace 700 H	HiPace 700 H
Backing pump	ACP 15	ACP 28	HiScroll 6	HiScroll 12	HiScroll 18
Final pressure without gas ballast	$< 1 \cdot 10^{-10}$ hPa	$< 1 \cdot 10^{-10}$ hPa	$1 \cdot 10^{-10}$ hPa	$1 \cdot 10^{-10}$ hPa	$1 \cdot 10^{-10}$ hPa
Pumping speed for N <sub>2</sub>	685 l/s	685 l/s	685 l/s	685 l/s	685 l/s
Pumping speed backing pump at 50 Hz	14 m <sup>3</sup> /h	27 m <sup>3</sup> /h	6.1 m <sup>3</sup> /h	12.1 m <sup>3</sup> /h	18.1 m <sup>3</sup> /h
Input voltage(s)	200 – 230 V AC, 50/60 Hz	200 – 230 V AC, 50/60 Hz	200 – 230 V AC, 50/60 Hz	200 – 230 V AC, 50/60 Hz	200 – 230 V AC, 50/60 Hz
Input voltage: tolerance	±10 %	±10 %	±10 %	±10 %	±10 %

Type designation	HiCube 700 H Pro	HiCube 700 H Pro	HiCube 700 H Pro	HiCube 700 H Pro	HiCube 700 H Pro
Motor for region	Asia, Europe	Asia, Europe	Asia, Europe	Asia, Europe	Asia, Europe
Power consumption max.	910 W	1160 W	940 W	1420 W	1900 W
Sound pressure level	≤50 dB(A)	≤50 dB(A)	≤50 dB(A)	≤50 dB(A)	≤50 dB(A)
Cooling method, standard	Air	Air	Air	Air	Air
Relative humidity of air	5 – 85 %, non-condensing	5 – 85 %, non-condensing	5 – 85 %, non-condensing	5 – 85 %, non-condensing	5 – 85 %, non-condensing
Shipping and storage temperature	-10 – 55 °C	-10 – 55 °C	-10 – 50 °C	-10 – 50 °C	-10 – 50 °C
Weight	88.9 kg	95.9 kg	83 kg	88 kg	87 kg

**Tbl. 45: Technical data HiCube 700 H Pro, DN 160 CF-F**

Type designation	HiCube 700 H Pro	HiCube 700 H Pro	HiCube 700 H Pro	HiCube 700 H Pro
Connection flange (in)	DN 160 CF-F	DN 160 CF-F	DN 160 CF-F	DN 160 CF-F
Connection flange (out)	G 1/2"	G 1/2"	G 1/2"	G 1/2"
Turbopump	HiPace 700 H	HiPace 700 H	HiPace 700 H	HiPace 700 H
Backing pump	Duo 11 M	Duo 20 M	Pascal 2010	Pascal 2021
Final pressure without gas ballast	< 1 · 10 <sup>-10</sup> hPa	< 1 · 10 <sup>-10</sup> hPa	< 1 · 10 <sup>-10</sup> hPa	< 1 · 10 <sup>-10</sup> hPa
Pumping speed for N <sub>2</sub>	685 l/s	685 l/s	685 l/s	685 l/s
Pumping speed backing pump at 50 Hz	9 m <sup>3</sup> /h	20 m <sup>3</sup> /h	9 m <sup>3</sup> /h	18 m <sup>3</sup> /h
Input voltage(s)	200 – 240 V AC, 50/60 Hz	200 – 230 V AC, 50/60 Hz	200 – 230 V AC, 50/60 Hz	200 – 230 V AC, 50/60 Hz
Input voltage: tolerance	±10 %	±10 %	±10 %	±10 %
Motor for region	Asia, Europe	Asia, Europe	Asia, Europe	Asia, Europe
Power consumption max.	750 W	1350 W	1000 W	1000 W
Sound pressure level	≤50 dB(A)	≤50 dB(A)	≤50 dB(A)	≤50 dB(A)
Cooling method, standard	Air	Air	Air	Air
Relative humidity of air	5 – 85 %, non-condensing	5 – 85 %, non-condensing	5 – 85 %, non-condensing	5 – 85 %, non-condensing
Shipping and storage temperature	-20 – 55 °C	-20 – 55 °C	-20 – 55 °C	-20 – 55 °C
Weight	83 kg	108 kg	90 kg	92 kg

**Tbl. 46: Technical data HiCube 700 H Pro, DN 160 CF-F**

### 13.3 Dimension drawings

All dimensions in mm

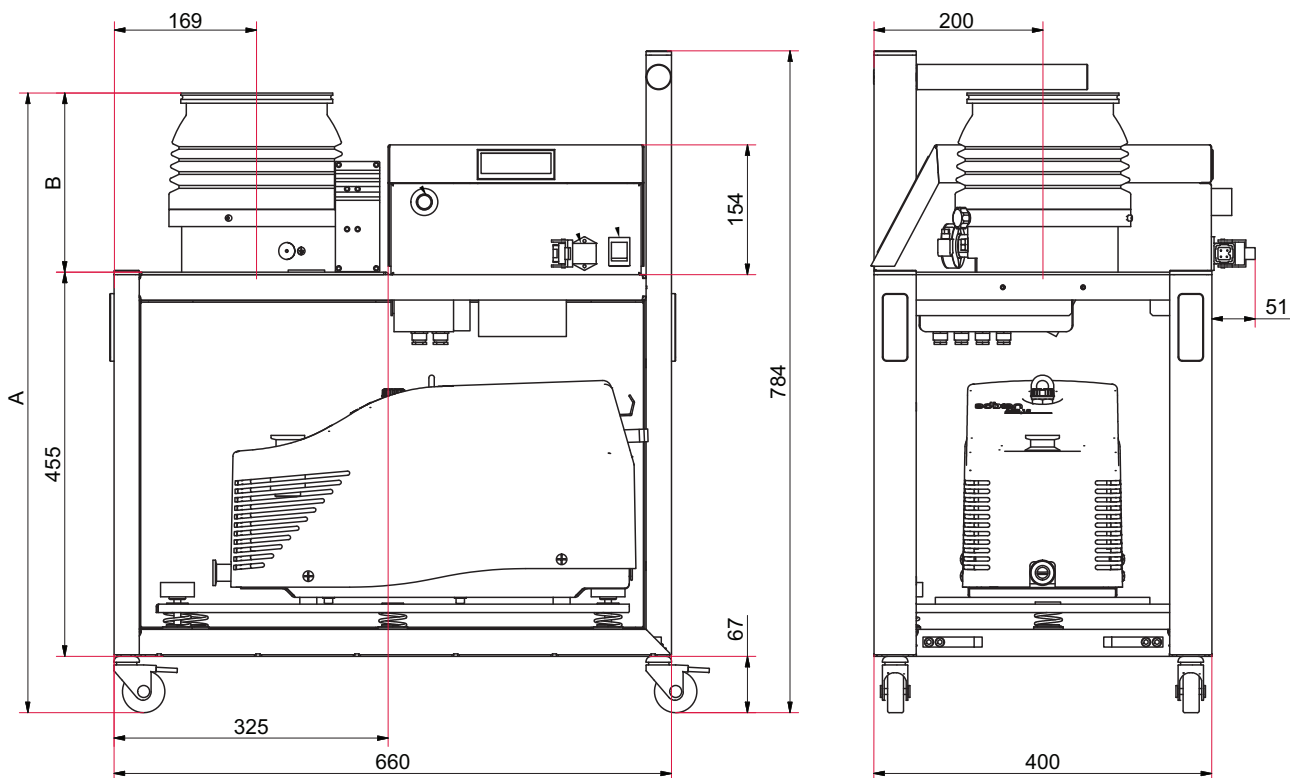


Fig. 23: Dimensions HiCube Pro

Dimensions	HiCube 80 Pro	HiCube 80 Pro	HiCube 80 Pro
Flange	DN 40 ISO-KF	DN 63 ISO-K	DN 63 CF-F
A	680 mm	671 mm	676 mm
B	158 mm	149 mm	155 mm

Tbl. 47: Dimensions HiCube 80 Pro

Dimensions	HiCube 300 Pro	HiCube 300 Pro
Flange	DN 100 ISO-K	DN 100 CF-F
A	716 mm	728 mm
B	195 mm	207 mm

Tbl. 48: Dimensions HiCube 300 Pro

Dimensions	HiCube 400 Pro	HiCube 400 Pro
Flange	DN 100 ISO-K	DN 100 CF-F
A	760 mm	760 mm
B	239 mm	239 mm

Tbl. 49: Dimensions HiCube 400 Pro

Dimensions	HiCube 700 Pro	HiCube 700 Pro
Flange	DN 160 ISO-K	DN 160 CF-F
A	733 mm	745 mm
B	212 mm	224 mm

Tbl. 50: Dimensions HiCube 700 Pro

# Declaration of conformity

Declaration for product(s) of the type:

## **Turbo pumping station**

HiCube Pro

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

**Machinery 2006/42/EC (Annex II, no. 1 A)**

**Electromagnetic compatibility 2014/30/EU**

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

**Restriction of the use of certain hazardous substances, delegated directive 2015/863/EU**

### **Harmonized standards and applied national standards and specifications:**

DIN EN ISO 12100: 2011

DIN EN 62061: 2013

DIN EN 1012-2: 2011

DIN EN 61326-1: 2013

DIN EN ISO 13857: 2008

DIN EN 1127-1: 2019

DIN EN ISO 2151: 2009

DIN EN 50581: 2013

DIN EN 61000-3-2: 2015

ISO 21360-1: 2016

DIN EN 61000-3-3: 2014

ISO 21360-2: 2012

DIN EN 61000-6-2: 2006

ISO 21360-4: 2018

DIN EN 61000-6-4: 2011

DIN EN IEC 63000: 2019

DIN EN 61010-1: 2011

The authorized representative for the compilation of technical documents is Mr. Tobias Stoll, Pfeiffer Vacuum GmbH, Berliner Straße 43, 35614 Asslar, Germany.

Signature:



Pfeiffer Vacuum GmbH  
Berliner Straße 43  
35614 Asslar  
Germany

(Daniel Sälzer)  
Managing Director

Asslar, 2020-16-09





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

[www.pfeiffer-vacuum.com](http://www.pfeiffer-vacuum.com)

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