



OPERATING INSTRUCTIONS

EN

Translation of the Original

HICUBE ECO

Turbo pumping stations



蒙天真空
M T V A C U U M

PFEIFFER  VACUUM

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**.

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

Disclaimer of liability

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

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

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1 About this manual



IMPORTANT

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

1.1 Validity

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

1.1.1 Applicable documents

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

1.1.2 Variants

This manual applies to HiCube Eco ling turbopump stations:

- HiCube 30 Eco
- HiCube 80 Eco
- HiCube 300 Eco

1.2 Target group

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

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

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

1.3 Conventions

1.3.1 Instructions in the text

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

Individual action step

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

- ▶ This is an individual action step.

Sequence of multi-part action steps

The numerical list indicates an action with multiple necessary steps.

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

1.3.2 Pictographs

Pictographs used in the document indicate useful information.



Note



Tip

1.3.3 Stickers on the product

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

	<p>Rating plate</p> <p>The rating plate is located on the back of the pumping station housing.</p>
	<p>Transport protection</p> <p>This sticker indicates that the backing pump transport lock must be released prior to commissioning.</p>
	<p>Closure seal</p> <p>The product is sealed ex-factory. Damaging or removing a closure seal results in loss of the warranty.</p>
	<p>Protection class</p> <p>The sticker describes protection class 1 for the product. The positioning indicates the position for the ground connection.</p>
	<p>Electrical voltage warning</p> <p>The sticker warns of the risk of electric shock when working with the housing open.</p>
	<p>Mandatory: disconnect mains plug</p> <p>The sticker indicates that the mains plug is to be disconnected from the device prior to installation and maintenance work.</p>

Tbl. 1: Stickers on the product

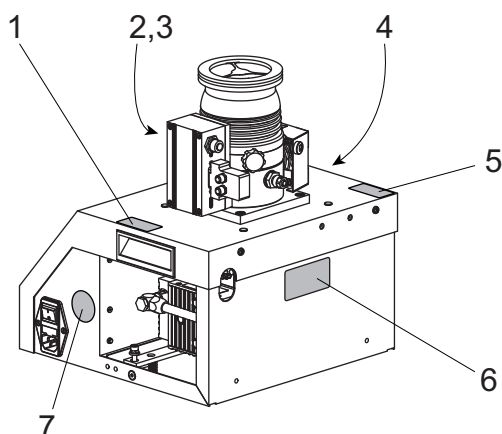


Fig. 1: Position of the labels on the product

- | | | | |
|---|-----------------------------------------------------|---|--------------------------------------|
| 1 | Transport lock sticker | 5 | Transport lock sticker |
| 2 | Closure seal (vacuum pump) | 6 | Rating plate |
| 3 | Ground connection sticker (vacuum pump) | 7 | Mandatory disconnect mains plug sign |
| 4 | Electrical voltage (power supply pack) warning sign | | |

1.3.4 Abbreviations

Abbreviation	Meaning in the document
CF	flange: Metal-sealed connector conforming to ISO 3669
d	Measurement of the diameter (in mm)
DCU	Display Control Unit (display and control unit from Pfeiffer Vacuum).
DN	Nominal diameter as size description
f	Measurement of the rotation speed of a vacuum pump (frequency, in rpm or Hz)
HV	High vacuum flange, high vacuum side
ISO	flange: Connector conforming to ISO 1609 and ISO 2861
LC	Display: Liquid crystal display (LCD)
LED	Light-emitting diode
MVP	Diaphragm vacuum pump
PE	Earthed conductor (protective earth)
[P:xxx]	Control parameters of the electronic drive unit. Printed in bold as a three-digit number in square brackets. Frequently displayed in combination with a short designation. Example: [P:312] Software version
T	Temperature (in °C)
TC	Turbopump electronic drive unit (turbo controller)
TPS	Power supply (turbo power supply)
X3	15-pole D-Sub connecting socket on the electronic drive unit of the turbopump

Tbl. 2: Abbreviations used in the document

2 Safety

2.1 General safety instructions

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

⚠ DANGER
<p>Imminent danger Indicates a hazardous situation which, if not avoided, will result in death or serious injury.</p> <ul style="list-style-type: none"> ▶ Instructions on avoiding the hazardous situation
⚠ WARNING
<p>Possibly imminent danger Indicates a hazardous situation which, if not avoided, could result in death or serious injury.</p> <ul style="list-style-type: none"> ▶ Instructions on avoiding the hazardous situation
⚠ CAUTION
<p>Possibly imminent danger Indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.</p> <ul style="list-style-type: none"> ▶ Instructions on avoiding the hazardous situation
NOTICE
<p>Danger of property damage Notice is used to address practices not related to physical injury.</p> <ul style="list-style-type: none"> ▶ Instructions on avoiding property damage
<div style="display: inline-block; border: 1px solid black; padding: 5px; margin-right: 10px;"> i </div> <div style="border: 1px solid black; padding: 5px;"> Notes, tips or examples indicate important information on the product or on this document. </div>

2.2 Safety instructions

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

Risks during transport

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

Risks during installation

⚠ WARNING
<p>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.</p> <ul style="list-style-type: none"> ▶ Always keep the mains connection freely accessible so you can disconnect it at any time.

⚠ WARNING**Danger to life from electric shock due to improperly performed installation**

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

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

⚠ WARNING**Risk of 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.

⚠ CAUTION**Risk of injury from bursting due to high pressure in the exhaust line**

Faulty or insufficient exhaust lines cause hazardous situations, e.g. increase in exhaust pressure. There is a risk of bursting. It is not possible to rule out the risk of injuries due to broken pieces flying around, high escaping pressure and damage to the equipment.

- ▶ Lay the exhaust line without shut-off units.
- ▶ Observe the permissible pressures and pressure differentials of the product.
- ▶ Check the exhaust line regularly for correct function.

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.

⚠ CAUTION

Risk of injury from bursting due to high pressure in the exhaust line

Faulty or insufficient exhaust lines cause hazardous situations, e.g. increase in exhaust pressure. There is a risk of bursting. It is not possible to rule out the risk of injuries due to broken pieces flying around, high escaping pressure and damage to the equipment.

- ▶ Lay the exhaust line without shut-off units.
- ▶ Observe the permissible pressures and pressure differentials of the product.
- ▶ Check the exhaust line regularly for correct function.

Risks during maintenance

⚠ WARNING

Danger to life from electric shock during maintenance and service work

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

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

⚠ WARNING

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.

Risks during 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.

Risks in the event of malfunctions

⚠ WARNING

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

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

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

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

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

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

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 installation into a system, the operator is required to check and re-evaluate as necessary the conformity of the overall system in the context of the relevant 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 ($> 70^\circ\text{C}$).
- ▶ Never fill or operate the unit with cleaning agents or cleaning agent residues.
- ▶ Do not carry out your own conversions or modifications on the unit.
- ▶ Observe the unit protection class prior to installation or operation in other environments.

2.4 Limits of use of the product

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 $T < 31^\circ\text{C}$ up to max. 50% at $T < 40^\circ\text{C}$
Protection class	I
Excess voltage category	II
Permissible protection class	IP20

Parameter	Limit value
Degree of contamination	2
Ambient temperature	5°C to 35°C with air cooling 5°C to 40°C with water cooling
Permissible surrounding magnetic field	depending on turbopump used
Maximum irradiated thermal output	depending on turbopump used
Maximum permissible rotor temperature of the turbopump	90 °C

Tbl. 3: Limits of use for turbopump stations



Notes on ambient conditions

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

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

2.5 Proper use

- The turbo pumping station is only used to generate the vacuum.
- The turbo pumping station is only used to extract dry and inert gases.
- The turbo pumping station is only intended for use in enclosed interior spaces.
- The turbo pumping station is intended for use as a table-top unit.

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 Identifying the product

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

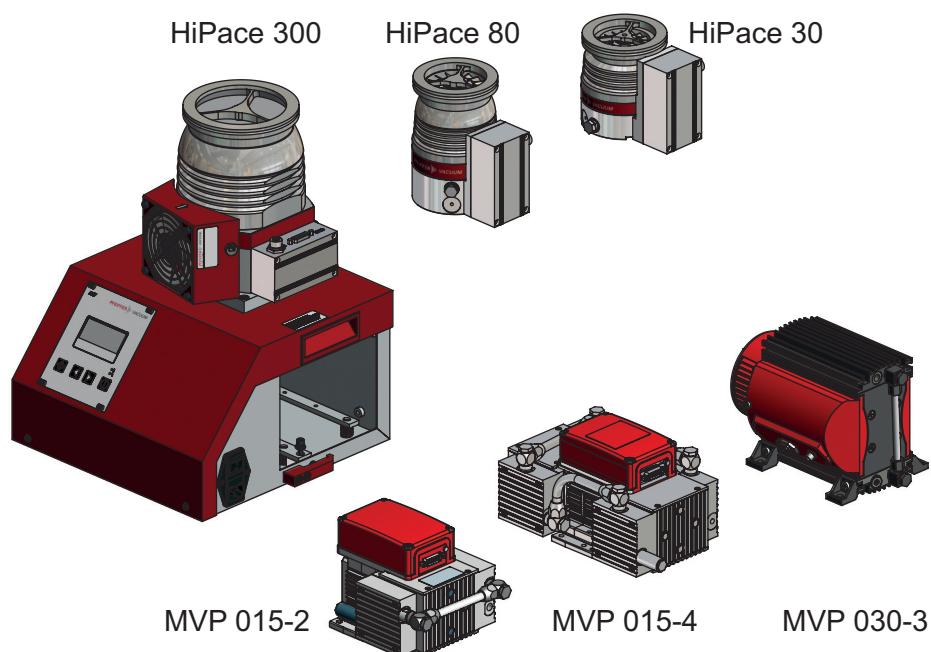


Fig. 2: Overview: Turbo and backing pump combinations

Feature	HiCube Eco			Operating instructions
	DN 40/DN 63		DN 100	
Turbopump	HiPace 30			PT 0510 BN
		HiPace 80		PT 0208 BN
			HiPace 300	PT 0202 BN
			HiPace 300 H	PT 0509 BN
Electronic drive unit	TC 110	TC 110	TC 110	PT 0204 BN
Diaphragm Pump	MVP 015-2	MVP 015-2	(MVP 015-2)	PU 0070 BN
	MVP 015-4	MVP 015-4	MVP 015-4	PU 0070 BN
	MVP 030-3	MVP 030-3	MVP 030-3	PU 0065 BN
Current supply	TPS onboard, 24 V DC	TPS onboard, 24 V DC	TPS onboard, 24 V DC	
Control unit	DCU 002	DCU 002	DCU 002	PT 0250 BN
Air cooling	yes	yes	yes	PT 0500 BN
Venting valve	optional	optional	optional	PT 0228 BN
Housing heater 1)	not available	Optional, with CF flange only	Optional, with CF flange only	PT 0233 BN

1) Water cooling required

Tbl. 4: Pumping station component combination options

3.2 Scope of delivery

- HiCube Eco turbo pumping station
- Protective cover for the high vacuum flange
- Extension cable M12 on M12, 3 m
- Power supply cable, country-specific
- Operating instructions for the turbo pumping station and individual components

3.3 Function

Turbo pumping 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.

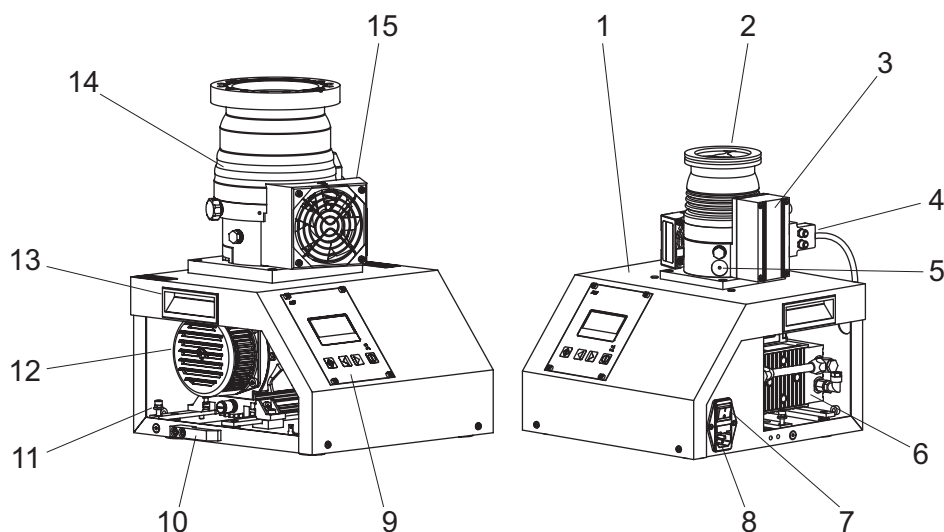


Fig. 3: Example combinations product overview

- | | |
|-----------------------------------------|-------------------------------------------|
| 1 Housing | 9 DCU 002 display and control unit |
| 2 HiPace 80 turbopump, DN 63 ISO-K | 10 Attachment hooks (HiCube 300 Eco only) |
| 3 Electronic drive unit TC 110 | 11 Transport protection |
| 4 Connection cable | 12 MVP 030-3 diaphragm pump backing pump |
| 5 Ground terminal | 13 Recessed handle |
| 6 MVP 015-2 diaphragm pump backing pump | 14 HiPace 300 turbopump, DN 100 CF-F |
| 7 Master switch | 15 Air cooling |
| 8 Mains supply plug | |

3.3.1 Control interface

The integrated DCU 002 display and control unit serves to control and monitor the turbo pumping station. The DCU is optionally used as a remote control when removing the housing and using an extension cable.

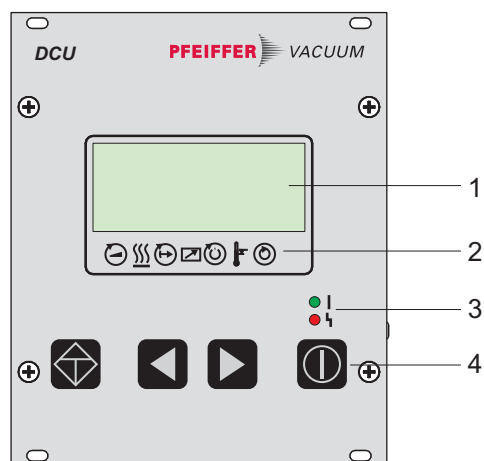


Fig. 4: DCU control panel

- | | |
|---------------------------|-------------------------|
| 1 LC display, illuminated | 3 LED operating display |
| 2 Status icons | 4 Control keys |

3.3.2 Drive

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

3.3.3 Cooling

- Air cooling
- Water cooling (optional)

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

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.



Packing

We recommend keeping the transport packaging and original protective cover.

Instructions for safe transport

- ▶ Observe the weight specified on packaging.
 - Use a transport aid if necessary (trolley, lift truck).
- ▶ Transport the product in its original packaging.
- ▶ Always move the product upright, and over the flattest possible surface.
- ▶ Always place the product on an adequately sized, level surface.

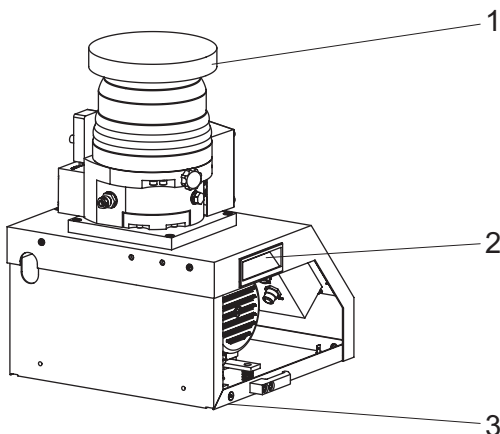


Fig. 5: Transporting the turbo pumping station manually

- | | |
|--------------------|-------------|
| 1 Protective cover | 3 Footprint |
| 2 Recessed handle | |

Instructions for safe transport without packaging

For transport without packaging, HiCube Eco turbo pumping stations are equipped with recessed handles on the side of the housing frame.

1. Observe weight specified on the rating plate.
2. Lift the turbo pumping station with your hands on the two recessed handles.
3. Always transport the turbo pumping station upright, with its standing surface downwards.
4. Always place turbo pumping station securely on an adequately sized, level surface.

4.2 Transport protection

Backing pumps in HiCube line turbo pumping 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 ([see chapter “Removing transport lock”, page 29](#)).

4.3 Storing the pumping station



Packing

We recommend storing the product in its original packaging.

1. Close all flange openings with the original protective caps.
2. Close all other connections (e.g. exhaust) with the corresponding protective caps.
3. Only store the turbo pumping station within the specified limits.
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 area of use.
- ▶ Provide the highest possible level of cleanliness during assembly.
- ▶ Ensure that flange components during installation are grease-free, dust-free and dry.

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. Maintain a minimum distance of 10 cm to exposed table edges.
3. Make sure that there are sufficient cooling options for the pumping station.
4. Install suitable shielding if the surrounding magnetic fields exceed the permissible levels.
5. If you use housing heating and water cooling, make sure that the temperature at the vacuum chamber connection flange does not exceed 120 °C.
6. 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 Anchoring pumping station

(applies to HiCube 300 Eco only)

In the case of a sudden jam of the turbopump rotor, the resulting torque must be taken up via the pumping station frame by the fixture provided by customer. To secure the HiCube 300 Eco pumping station and connected systems, it is essential to anchor the pumping station.

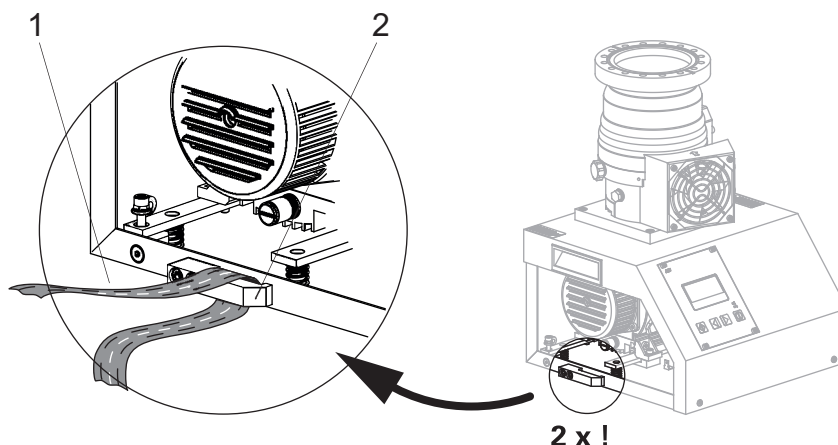


Fig. 6: Secure HiCube 300 Eco with lashing straps

- 1 Lashing strap 2 Mounting hooks

Required aids

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

Secure HiCube 300 Eco against twisting

1. Always attach the HiCube 300 Eco pumping station to the two mounting hooks with lashing straps.
2. Affix the lashing straps perpendicularly to the mounting hooks opening, i.e., against the turbopump 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.
4. Attach the lashing straps at the customer site so that they are able to withstand loads of up to 2000 N per attachment point.

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

Installing vertical superstructural parts 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 values specified.


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

Turbo pumping station	Applied torque ²⁾	Super-structural parts ³⁾	Flatness	Tensile strength ⁴⁾	Screw in depth ⁵⁾	Magnetic field ⁶⁾	Heat input ⁷⁾
HiCube 30 Eco	500 Nm	50 kg	± 0.05 mm	170 N/mm ²	2.5 x d	3.0 mT	1.2 W
HiCube 80 Eco	620 Nm					3.3 mT	0.9 W
HiCube 300 Eco	2000 Nm					5.5 mT	2.4 W
				270 N/mm ²	1.5 x d		

Tbl. 5: Requirements for on-site high vacuum connection

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

5.4.2 Using accessories for the high vacuum connection



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

- Information and ordering options for approved accessories can be found online.
- The following accessories are not included in the scope of supply.

Using a splinter shield or protective screen

Pfeiffer Vacuum centering rings with splinter shield or protective screen in the high vacuum flange protect the turbopump against foreign bodies from the vacuum chamber. The volume flow rate of the pump reduces according to the flow conductance values and the size of the high vacuum flange.

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

Tbl. 6: Changing pumping speed with splinter shield or protective screen

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

Using vibration dampers

Pfeiffer Vacuum vibration dampers are suitable for use on plants sensitive to vibration.

- 2) **Maximum torque applied in the event of a burst: The theoretically calculated torque in the event of a burst (rotor shaft breakage) according to ISO 27892 was not reached in any experimental test.**
- 3) **Permissible total weight of superstructural parts on the pumping station**
- 4) **Tensile strength of counter flange material in all operating conditions, according to screw in depth**
- 5) **Screw in depth of fixing screws in counter flange**
- 6) **Maximum permissible magnetic field surrounding pumping station**
- 7) **Maximum permissible heat absorption in pumping station**

⚠ 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.

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

1. Only install a vibration damper with a vertical passage.
2. Take account of the flow resistance.
3. Secure the turbo pump to the high vacuum flange in addition.
4. Observe the fastening of the ISO-K flanges (see chapter "Attaching ISO-K flange onto ISO-K", page 24) and (see chapter "Installation of ISO-K flange onto ISO-F", page 24).

5.4.3 Connecting the turbopump externally

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

**Dismantling the turbopump**

Please see the descriptions for removing a turbopump from the pumping station (see chapter "Removing components for maintenance", page 38).

Procedure

1. Follow the installation instructions for the turbopump in the associated operating instructions for the individual components.
2. Use cable kit PM 071 477 -T (3 m) from the Pfeiffer Vacuum accessories range.
 - Other lengths available on request.
3. Extend the fore-vacuum line and the control cable.

5.4.4 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 ≤ 1.6)

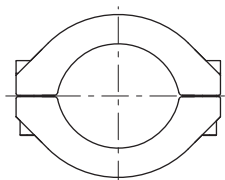


Fig. 7: Flange connection ISO-KF to ISO-KF

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**.

5.4.5 Attaching ISO-K flange onto ISO-K



ISO flange connections

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

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

Required tools

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

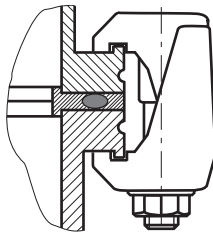


Fig. 8: Flange connection ISO-K to ISO-F, bracket screws

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 ± 2 Nm**

5.4.6 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"

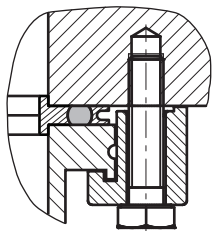


ISO flange connections

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.

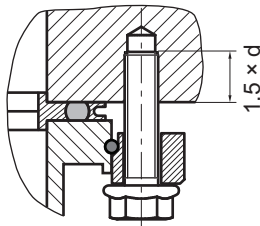
- Leak-tightness of the flange connection, however, is not jeopardized in this regard.

Connection of claw and tapped hole



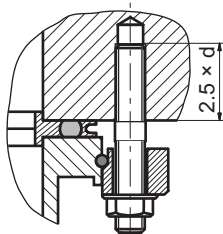
1. Only use the approved mounting kits from Pfeiffer Vacuum for the connection.
2. Connect the flange according to the diagram using the components in the mounting kit.
3. Utilize all prescribed components for the turbopump.
4. Tighten the claws in 3 stages in opposite pairs.
 - Tightening torque: **5,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

Connection of hexagon head set screw and tapped hole



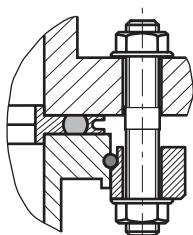
1. Only use the approved mounting kits from Pfeiffer Vacuum for the connection.
2. Place the collar flange over the high vacuum flange on the turbopump.
3. Insert the snap ring into the side groove on the high vacuum flange of the turbopump.
4. Fasten the turbopump onto the counter flange in accordance 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**

5.4.7 Fastening CF flange to CF-F

The connection types for CF installation with CF flange are:

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

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

Required tools

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

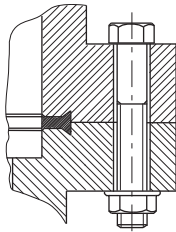


Fig. 9: Flange connection CF-F, hexagon head screw and through hole

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 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.

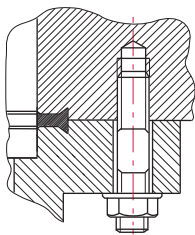


Fig. 10: Flange connection CF-F, stud screw and tapped hole

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.

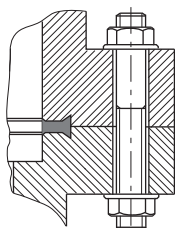


Fig. 11: Flange connection CF-F, stud screw and through hole

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 Connecting 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

Risk of injury from bursting due to high pressure in the exhaust line

Faulty or insufficient exhaust lines cause hazardous situations, e.g. increase in exhaust pressure. There is a risk of bursting. It is not possible to rule out the risk of injuries due to broken pieces flying around, high escaping pressure and damage to the equipment.

- ▶ Lay the exhaust line without shut-off units.
- ▶ Observe the permissible pressures and pressure differentials of the product.
- ▶ Check the exhaust line regularly for correct function.

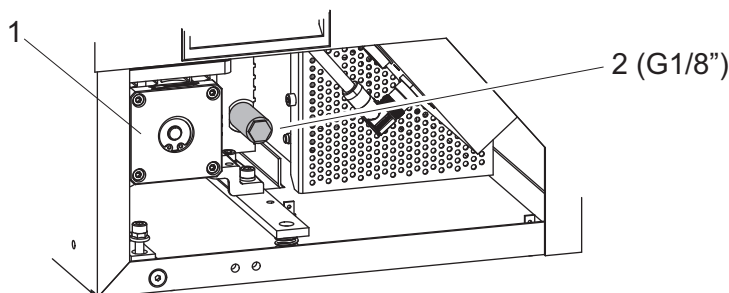


Fig. 12: Example backing pump exhaust connection

- 1 Diaphragm pump
- 2 Exhaust silencer (included in the delivery)

Procedure

1. Choose a minimum exhaust line cross section equal to the size of the exhaust connection.
2. Unscrew the exhaust silencer from the backing pump.
3. Route the piping downwards from the pump, to prevent condensate return.



Condensate separator

We recommend installing a condensate separator, with condensate drain at the lowest point of the exhaust line.

5.6 Modifying the DCU for remote operation

If required, the display and control unit can be used as a remote control, after modification.



Before carrying out any work, safely disconnect device from mains

1. Shut down the device.
2. Wait until all components are at a complete standstill.
3. Switch off the master switch.
4. Disconnect the mains cable from the device.

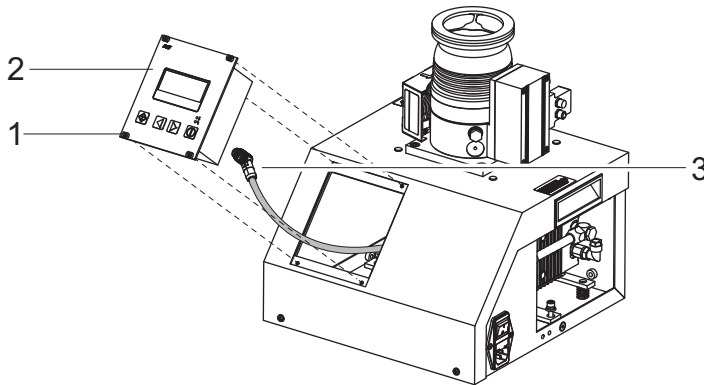


Fig. 13: Remove DCU from pumping station

- | | |
|---------------------------------------|------------------------------------------|
| 1 Collar screw with attachment nipple | 3 Control cable with M12 connecting plug |
| 2 DCU 002 display and control unit | |

Remove DCU

1. Release the 4 collar screws from the corners of the DCU screen.
2. Safely store the attachment nipple.
3. Remove DCU from pumping station housing.
 - Note control cable length.
4. Unscrew M12 control cable connecting plug from DCU.



Cable included in shipment

Other cable lengths are available on request from the Pfeiffer Vacuum accessories.



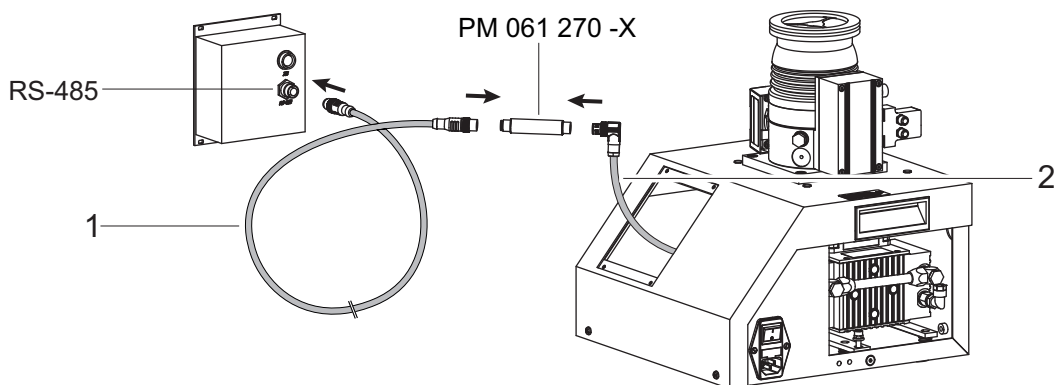


Fig. 14: DCU connection as remote control

- 1 Extension cable 2 Control cable with M12 connecting plug

Connect DCU as remote control

1. Screw interface cable supplied in shipment into DCU RS-485 connection.
2. Use the PM 061 270 -X coupling.
3. Connect the interface cable to the coupling, and to the control cable from the pumping station.

5.7 Connecting accessories for the pumping station



Installation and operation of accessories

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

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



Accessory connection for TC 110 electronic drive unit

- 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 multi-functional connection.
- Configuration of the required accessory output via RS-485 using Pfeiffer Vacuum display and control units or PC.
- Detailed instructions can also be found in the "TC | 110 electronic drive unit" operating instructions.



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.

Use additional accessories

1. Note the present configuration of existing connections and control cables.
2. Use the Pfeiffer Vacuum display and control unit DCU 002.

5.8 Removing transport lock

All HiCube Eco line turbo pumping stations are equipped with a transport lock for the backing pumps. The backing pump is affixed diagonally to the pumping station baseplate, with cheesehead screws and nuts, on 2 spring-loaded rails.

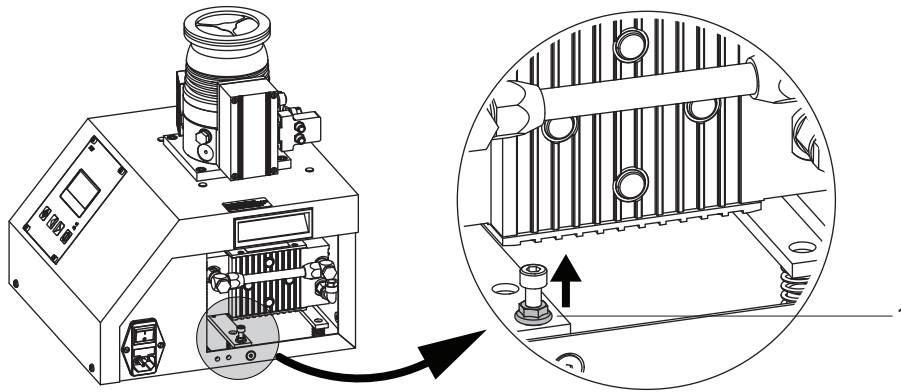


Fig. 15: Backing pump transport lock

- 1 Transport lock hexagon nut

Required tool

- Hexagonal wrench (13 WAF)

Procedure

1. Rotate the transport lock hexagon nut upwards to the stop.
2. Also release the transport lock on the opposite side.

5.9 Grounding the pumping station

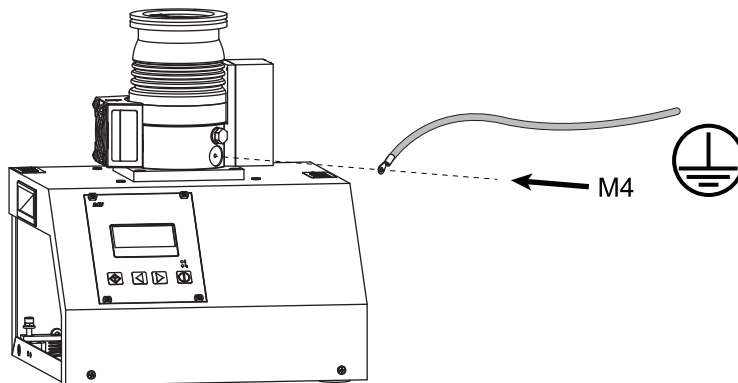


Fig. 16: Example: Connecting the grounding cable

Required aids

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

Procedure

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

5.10 Establishing the mains connection

⚠ WARNING

Danger to life from electric shock due to improperly performed installation

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

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

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

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

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

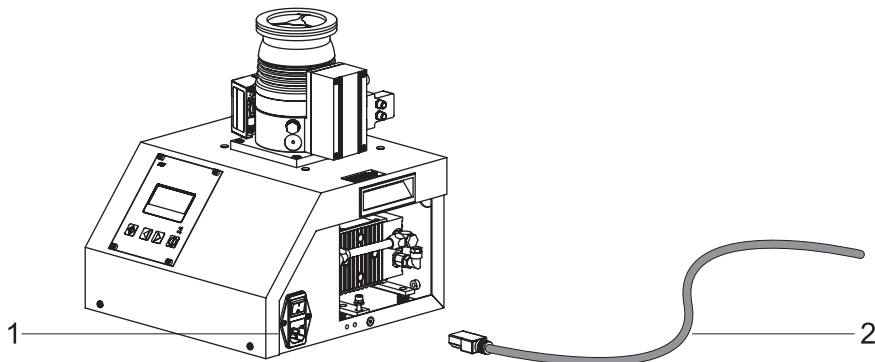


Fig. 17: Power supply connector and master switch on HiCube Eco

- 1 Mains plug 2 Country-specific power supply cable (in shipment)


Establish mains power supply for HiCube Eco



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 mains cable supplied in the shipment into the connecting plug on the side of the pumping station housing.
4. Connect the mains cable to the mains power supply on the customer-side.

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 display and control panels or externally via RS-485, using the Pfeiffer Vacuum protocol.

For both parameter sets, the DCU acts as the user interface. HiCube Eco controls two independent parameter sets, for the turbopump and backing pump. The backing pump parameters are shown hierarchically in the display, and marked with a symbol. 

Parameter	Name	Designation	Option	HiCube pumping station		
				30 Eco	80 Eco	300 Eco
[P:001]	Heating	Heating	no heating	not available	0	0
			with heating		1	1
[P:012]	EnableVent	Enable vents		1	1	1
[P:019]	Cfg DO2	Output DO2 configuration		22 = Backing pump standby	22 = Backing pump standby	22 = Backing pump standby
[P:023]	MotorPump	Motor pump		1	1	1
[P:024]	Cfg DO1	Output DO1 configuration		15 = Pump state	15 = Pump state	15 = Pump state
[P:025]	OpMode	Backing pump operating mode		1 = Interval mode	1 = Interval mode	1 = Interval mode
[P:035]	Cfg Acc A1	Connection A1 accessories configuration	Air cooling	4 = Fan (temperature controlled)	4 = Fan (temperature controlled)	4 = Fan (temperature controlled)
			Water cooling	2 = heating	2 = heating	2 = heating
[P:036]	Cfg Acc B1	Connection B1 accessories configuration		1 = Venting valve, normally closed	1 = Venting valve, normally closed	1 = Venting valve, normally closed
[P:708]	PwrSVal	Default power consumption	for MVP 015-2	90 %	90 %	90 %
			for MVP 015-4	100 %	100 %	100 %
			for MVP 030	100 %	100 %	100 %
[P:710]	Swoff BKP	Backing pump off threshold in interval mode		25 W	25 W	45 W MVP 015 52 W MVP 030
[P:711]	SwOn BKP	Backing pump on threshold in interval mode		40 W	40 W	55 W MVP 015 62 W MVP 030
[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
 [P: 030]	ValveMode	Gas ballast configuration	for MVP 015	0 = auto	0 = auto	0 = auto
 [P: 717]	StdbySVal	Default rotation speed in standby	for MVP 015	66 %	66 %	66 %

Tbl. 7: Factory setting of key parameters on delivery

NOTICE
<p>Turbopump destruction due to gases with too high molecular masses</p> <p>The pumping of gases with impermissible high molecular masses leads to the destruction of the turbopump.</p> <ul style="list-style-type: none"> ▶ 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).

Commissioning the 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 Switching on the turbo pumping station

Switching on the current supply

- ▶ Switch off the power supply at the main switch.

After being switched on, the DCU runs a self-test and a check of the connected instruments. The duration of the self-test is approx. 20 seconds and is visualized on the display with a progress bar.







Putting the pumping station into operation

- ▶  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	Pumping station ON/OFF: All components are put into/out of operation according to their configuration
		Error acknowledgement (Reset): 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	Editing mode: Allows the setting of parameter options The arrow - - - > designates the option selection in the display
	Press simultaneously again	Selection mode: Accepts the selection made ("change confirmed" is displayed)

Tbl. 8: Description of the key functions of the DCU

6.4 Operation with gas ballast (applies to MVP 015-2 only)

Steam or moisture from pumped media condensing in the backing pump will impact throughput. Injecting gas ballast improves (reduces) condensate quantity. The pumping station reaches the specified final vacuum more quickly.

- The MVP 015-4 and MVP 030-3 backing pumps have a sufficiently high water vapor tolerance, and are not equipped with gas ballast valve.
- The MVP 015-2 backing pump is equipped with an electronic gas ballast valve.
- The parameters for automatic gas ballast valve operation of the are factory-set for normal application.



Gas ballast

The HiCube Eco turbo pumping station, with MVP 015-2 diaphragm pump as backing pump, is equipped with an automatic gas ballast function. If however run-up time delays still occur, as a result of condensate in the fore-vacuum area, we recommend opening the gas ballast valve manually.

Manual gas ballast valve operation in this case involves control via the DCU function keys.

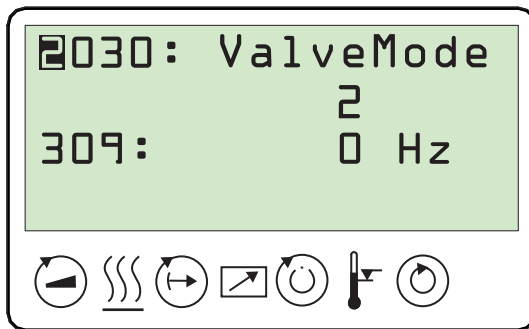


Fig. 18: Example: DCU display for second parameter set

Open gas ballast valve manually


1. Open advanced parameter set, if necessary ([see chapter "Normal operation", page 33](#)).
2. Shut down the turbo pumping station.
3. Scroll through the entire first parameter set, and the second parameter set directly following it, to parameter **[030]: ValveMode**.
4. Press both keys simultaneously: this opens Edit mode.
5. Select option "2" = open.
6. Press both keys simultaneously: this confirms your selection, and exits Edit mode.

Inject gas ballast

1. Switch on the turbo pumping station.
2. Operate the turbo pumping station with gas ballast valve open.
 - Operating time: approximately 15 to 30 minutes.

Set gas ballast function to automatic













1. Shut down the turbo pumping station.
2. Scroll through the entire first parameter set, and the second parameter set directly following it, to parameter **[030]: ValveMode**.
3. Press both keys simultaneously: this opens Edit mode.
4. Select option "0" = auto.
5. Press both keys simultaneously: this confirms your selection, and exits Edit mode.

6.  Switch on the turbo pumping station.

6.5 Operation monitoring

6.5.1 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		Defect

Tbl. 9: LED display and meaning at the DCU

6.5.2 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 ($> 75\text{ }^{\circ}\text{C}$) of the backing pump, the motor rotation speed is reduced to nominal rotation speed to prevent overheating. After cooling down ($< 72\text{ }^{\circ}\text{C}$) the backing pump runs at set rotation speed again.

6.6 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.

6.6.1 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.

6.6.2 Venting

NOTICE

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

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

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

Manual venting

Manual venting describes the standard process for venting the 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. 10: Factory settings for delayed venting of 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.

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 Replacing mains fuses

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.



Device or system problem

Generally, a faulty fuse is an indication of a problem in the device or system. If the new fuse is again faulty after replacement, contact your nearest Pfeiffer Vacuum Service Center.

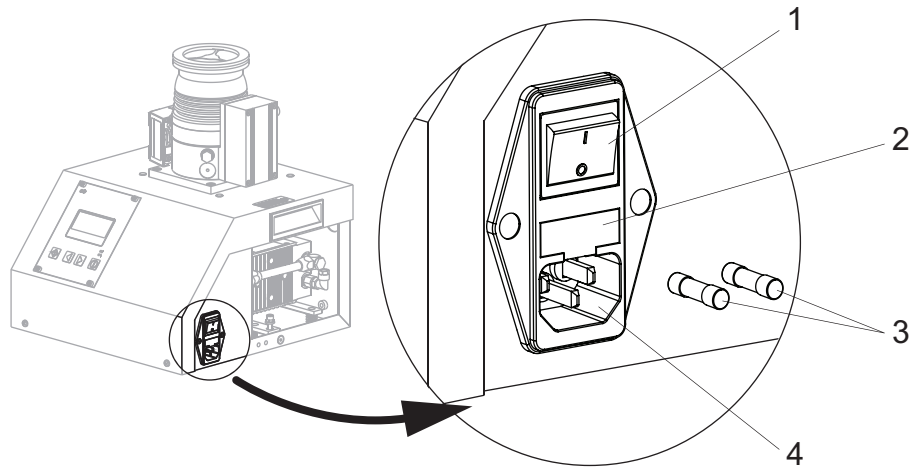


Fig. 19: Replace main fuses

- 1 Master switch
- 2 Fuse holder
- 3 Fuses
- 4 Mains plug

Replacing faulty fuses

Spare parts required

- 2 x fuses, 5 x 20 (T 2 A H 250 V AC)
- 1. Shut down the pumping station.
- 2. Disconnect mains cable from the mains plug.
- 3. Open the fuse holder above the mains plug.
- 4. Replace faulty fuses.
- 5. Close fuse holder.
- 6. Recommission the pumping station.

7.4 Removing components for maintenance

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

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.	
<ul style="list-style-type: none"> ▶ 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. 	

Connection to X3	Preset accessory
Acc. A1	Air cooling
Acc. B1	Venting valve
DO1	Backing pump (MVP 30-3 only)

Tbl. 11: Preset accessory connections

7.4.1 Removing the electrical connections



Before carrying out any work, safely disconnect device from mains

1. Shut down the device.
2. Wait until all components are at a complete standstill.
3. Switch off the master switch.
4. Disconnect the mains cable from the device.

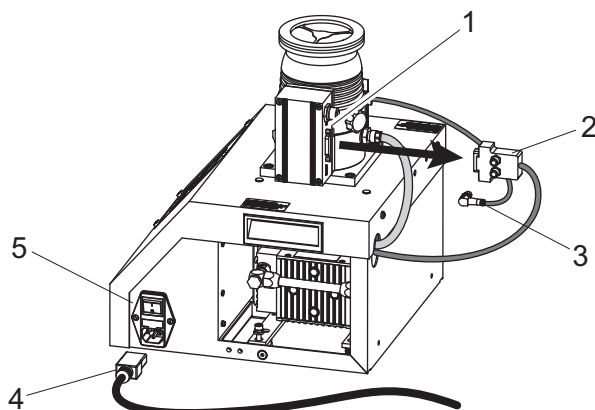


Fig. 20: Electrical connections

- | | |
|------------------------------------|-----------------|
| 1 Multifunction connection "X3" | 4 Mains cable |
| 2 Connection cable connecting plug | 5 Master switch |
| 3 Control cable accessory | |

Procedure

1. Disconnect the connection plug from the multi-function connection on the turbopump electronic drive unit.
2. Disconnect and remove the accessory control lines from the connecting plug.

7.4.2 Dismantling the turbopump from the pumping station

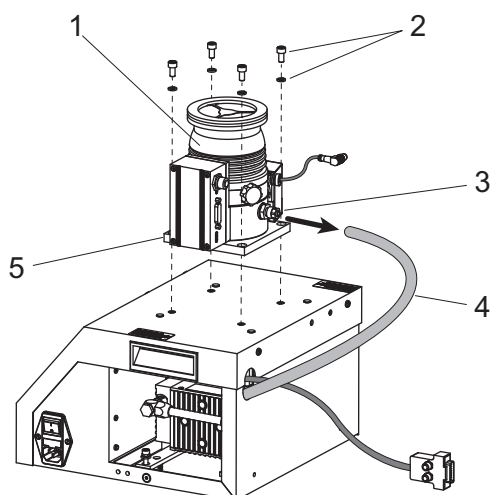


Fig. 21: Dismantling the turbopump

- | | |
|----------------------------|--------------------|
| 1 Turbopump, complete | 4 Fore-vacuum line |
| 2 Fixing screw with washer | 5 Mounting plate |
| 3 Fore-vacuum connection | |



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Required tools

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

Procedure

1. Loosen and remove the fore-vacuum line from the turbopump.
2. Make sure not to kink or damage the fore-vacuum hose.
3. Unscrew all 4 fixing screws and washers from the mounting plate.
 - Fixing screw tightening torque for subsequent reassembly: **10 Nm**.
4. Remove the entire turbopump and mounting plate from frame.



Service turbopump

The opening in the mounting plate makes it easy for customers to perform maintenance work on the turbo pump (e.g. change the lubricant reservoir).

8 Decommissioning

8.1 Shutting 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. Close 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.

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 20](#)).
6. Recommission the pumping station according to these instructions ([see chapter "Commissioning", page 32](#)).

8.3 Disposing of the vacuum pump

⚠ WARNING

Health hazard through poisoning from toxic contaminated components or devices

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

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

Procedure

- ▶ Dispose of all substances safely according to local regulations.

9 Malfunctions

9.1 General

⚠ WARNING

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

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

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

⚠ WARNING

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

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

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

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 35](#)).
- The DCU indicates system malfunctions by outputting an error code to the display.

9.2 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"> • Current supply interrupted 	<ol style="list-style-type: none"> 1. Check supply lines to pumping station. 2. Check the 24 V DC output voltage at the “DC out” connection of the built-in power supply pack. 3. Check the plug contacts on the power supply pack. 4. Check connection cable between power supply pack, backing pump, and turbopump.
	<ul style="list-style-type: none"> • Incorrect operating voltage 	<ol style="list-style-type: none"> 1. Note rating plate specifications. 2. Supply the correct operating voltage.
	<ul style="list-style-type: none"> • No operating voltage present 	<ol style="list-style-type: none"> 1. Connect operating voltage
	<ul style="list-style-type: none"> • Electronic drive unit defective 	<ol style="list-style-type: none"> 1. Replace electronic drive unit according to turbopump operating instructions. 2. Contact Pfeiffer Vacuum Service.

Problem	Possible causes	Remedy
Pumping station not reaching final pressure.	<ul style="list-style-type: none"> Condensate in the backing pump 	1. MVP 015-2 only: open the backing pump gas ballast valve (see chapter “Operation with gas ballast (applies to MVP 015-2 only)”, page 33).
	<ul style="list-style-type: none"> Gas ballast valve open 	1. MVP 015-2 only: close the backing pump gas ballast valve (see chapter “Operation with gas ballast (applies to MVP 015-2 only)”, page 33).

Tbl. 12: Troubleshooting


9.3 Error codes

Error (** Error E— **) always result in the shutdown of the connected peripheral devices.

Warnings (* Warning F— *) are only displayed and do not result in the shutdown of components.

Handling of error messages on the HiCube Eco

1. First eliminate the cause of the error.
- 2.

Reset the error message by pressing the  key.

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

Tbl. 13: Warning and error messages when using the DCU

Display	Problem	Possible causes	Remedy
E001	Excessive speed		<ul style="list-style-type: none"> Contact Pfeiffer Vacuum Service. Acknowledge only at rotation speed $f = 0$
E002	Overvoltage	<ul style="list-style-type: none"> Incorrect power supply pack used 	<ul style="list-style-type: none"> Check the power supply pack type Check the mains voltage
E006	Run-up fault	<ul style="list-style-type: none"> Run-up time threshold set too low Gas flow in recipient through leaks or open valves Still below speed-control switch point run-up time expires 	<ul style="list-style-type: none"> Adjust the run-up time to the process conditions Check vacuum chamber for leakage and closed valves Adjust the rotation speed switch point
E007	Operating fluid low	<ul style="list-style-type: none"> Operating fluid low 	<ul style="list-style-type: none"> Check the operating fluid Acknowledge only at rotation speed $f = 0$

Malfunctions

Display	Problem	Possible causes	Remedy
E008	Connection, electronic drive unit - pump faulty	<ul style="list-style-type: none"> • Connection to the pump faulty 	<ul style="list-style-type: none"> • Check connections • Acknowledge only at rotation speed $f = 0$
E010	Internal device error		<ul style="list-style-type: none"> • Contact Pfeiffer Vacuum Service. • Acknowledge only at rotation speed $f = 0$
E021	Electronic drive unit does not detect the pump		<ul style="list-style-type: none"> • Contact Pfeiffer Vacuum Service. • Acknowledge only at rotation speed $f = 0$
E043	Internal configuration error		<ul style="list-style-type: none"> • Contact Pfeiffer Vacuum Service.
E044	Excess temperature, electronics	<ul style="list-style-type: none"> • Faulty cooling 	<ul style="list-style-type: none"> • Improve the cooling • Check the operating conditions
E045	Excess temperature, motor	<ul style="list-style-type: none"> • Faulty cooling 	<ul style="list-style-type: none"> • Improve the cooling • Check the operating conditions
E046	Internal initialization error		<ul style="list-style-type: none"> • Contact Pfeiffer Vacuum Service.
E091	Internal device error		<ul style="list-style-type: none"> • Contact Pfeiffer Vacuum Service.
E092	Unknown connection panel		<ul style="list-style-type: none"> • Contact Pfeiffer Vacuum Service.
E093	Motor temperature evaluation faulty		<ul style="list-style-type: none"> • Contact Pfeiffer Vacuum Service.
E094	Electronics temperature evaluation faulty		<ul style="list-style-type: none"> • Contact Pfeiffer Vacuum Service.
E098	Internal communication error		<ul style="list-style-type: none"> • Contact Pfeiffer Vacuum Service.
E107	Final stage group error		<ul style="list-style-type: none"> • Contact Pfeiffer Vacuum Service. • Acknowledge only at rotation speed $f = 0$
E108	Rotation speed measurement faulty		<ul style="list-style-type: none"> • Contact Pfeiffer Vacuum Service. • Acknowledge only at rotation speed $f = 0$
E109	Software not released		<ul style="list-style-type: none"> • Contact Pfeiffer Vacuum Service.
E110	Operating fluid evaluation faulty		<ul style="list-style-type: none"> • Contact Pfeiffer Vacuum Service. • Acknowledge only at rotation speed $f = 0$
E111	Operating fluid pump communication error		<ul style="list-style-type: none"> • Contact Pfeiffer Vacuum Service. • Acknowledge only at rotation speed $f = 0$
E112	Operating fluid pump group error		<ul style="list-style-type: none"> • Contact Pfeiffer Vacuum Service. • Acknowledge only at rotation speed $f = 0$
E114	Final stage temperature evaluation faulty		<ul style="list-style-type: none"> • Contact Pfeiffer Vacuum Service.
E117	Excess temperature, pump lower part	<ul style="list-style-type: none"> • Faulty cooling 	<ul style="list-style-type: none"> • Improve the cooling • Check the operating conditions
E118	Excess temperature, final stage	<ul style="list-style-type: none"> • Faulty cooling 	<ul style="list-style-type: none"> • Improve the cooling • Check the operating conditions
E119	Excess temperature, bearing	<ul style="list-style-type: none"> • Faulty cooling 	<ul style="list-style-type: none"> • Improve the cooling • Check the operating conditions
E143	Operating fluid pump excess temperature	<ul style="list-style-type: none"> • Faulty cooling 	<ul style="list-style-type: none"> • Improve the cooling • Check the operating conditions • Acknowledge only at rotation speed $f = 0$
E777	Nominal rotation speed not confirmed	<ul style="list-style-type: none"> • Nominal rotation speed not confirmed after replacing the electronic drive unit 	<ul style="list-style-type: none"> • Confirm the nominal rotation speed with [P: 777] • Acknowledge only at rotation speed $f = 0$
F001	TMS heat-up time expired	<ul style="list-style-type: none"> • Internal timer for heat-up monitoring exceeded 	<ul style="list-style-type: none"> • Check the operating conditions

Display	Problem	Possible causes	Remedy
F003	TMS heating circuit temperature sensor	<ul style="list-style-type: none"> TMS temperature not in the permissible range between +5 °C and 85 °C 	<ul style="list-style-type: none"> Check the operating conditions Contact Pfeiffer Vacuum Service.
F007	Undervoltage/power failure	<ul style="list-style-type: none"> Mains failure 	<ul style="list-style-type: none"> Check the mains supply
F018	Operating supremacy conflict	<ul style="list-style-type: none"> Pumping station switched on with [P:010] while E74 input "start/stop" is off (opened) 	<ul style="list-style-type: none"> Switch on the pumping station via E74 Switch the pumping station off via [P:010].
F021	Blocking signal invalid	<ul style="list-style-type: none"> Signal of the blocking signal monitoring outside the valid range 	<ul style="list-style-type: none"> Check the connections of the sealing gas monitoring Check the parameter options of the accessory outputs
F034	Sealing gas flow low	<ul style="list-style-type: none"> Signal of the sealing gas monitoring valid but below the set threshold [P:791] 	<ul style="list-style-type: none"> Check and improve the sealing gas supply Check the operating conditions
F045	Motor high temperature	<ul style="list-style-type: none"> Faulty cooling 	<ul style="list-style-type: none"> Improve the cooling Check the operating conditions
F076	Electronics high temperature	<ul style="list-style-type: none"> Faulty cooling 	<ul style="list-style-type: none"> Improve the cooling Check the operating conditions
F097	Invalid pump information	<ul style="list-style-type: none"> Data of the pump faulty 	<ul style="list-style-type: none"> Acknowledging restores factory setting
F098	Incomplete pump information	<ul style="list-style-type: none"> Connection to the pump faulty 	<ul style="list-style-type: none"> Contact Pfeiffer Vacuum Service.
F100	Rotation speed raised to minimum value	<ul style="list-style-type: none"> Permissible specifications for rotation speed operation or stand-by incorrect 	<ul style="list-style-type: none"> Check [P:707] or [P:717] Obtain the valid rotation speed range from the technical data of the Turbopump
F115	Pump lower part temperature evaluation faulty		<ul style="list-style-type: none"> Contact Pfeiffer Vacuum Service.
F116	Bearing temperature evaluation faulty		<ul style="list-style-type: none"> Contact Pfeiffer Vacuum Service.
F117	Pump lower part high temperature	<ul style="list-style-type: none"> Faulty cooling 	<ul style="list-style-type: none"> Improve the cooling Check the operating conditions
F118	Final stage high temperature	<ul style="list-style-type: none"> Faulty cooling 	<ul style="list-style-type: none"> Contact Pfeiffer Vacuum Service. Check the operating conditions
F119	Bearing high temperature	<ul style="list-style-type: none"> Faulty cooling 	<ul style="list-style-type: none"> Improve the cooling Check the operating conditions
F143	High operating fluid pump temperature	<ul style="list-style-type: none"> Faulty cooling 	<ul style="list-style-type: none"> Improve the cooling Check the operating conditions
F168	High delay	<ul style="list-style-type: none"> Rate of pressure rise too high, venting rate too high 	<ul style="list-style-type: none"> Check and adapt pump-specific venting rate

Tbl. 14: Error and warning messages for turbopump electronic drive unit

Display	Problem	Possible causes	Remedy
E042	Inconsistent software	Checksum errors	<ul style="list-style-type: none"> Contact Pfeiffer Vacuum Service.
E091	Unknown hardware		<ul style="list-style-type: none"> Contact Pfeiffer Vacuum Service.
E098	Internal communication error between interface board and drive		<ul style="list-style-type: none"> Contact Pfeiffer Vacuum Service.



Malfunctions

Display	Problem	Possible causes	Remedy
E117	Excess temperature pump	<ul style="list-style-type: none">Faulty cooling	<ul style="list-style-type: none">Improve the coolingCheck the operating conditions
E173	Pump overflow		<ul style="list-style-type: none">Contact Pfeiffer Vacuum Service.
E174	Pump blocked		<ul style="list-style-type: none">Contact Pfeiffer Vacuum Service.

Tbl. 15: Error and warning messages for MVP 015 diaphragm pump electronic drive unit

10 Service solutions from Pfeiffer Vacuum

We offer first class service

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

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

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

Take advantage of Pfeiffer Vacuum Service

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

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

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



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

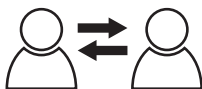
- a. Dismantle all accessories and keep them (all external mounted parts as valve, inlet screen, etc.).
- b. Drain the operating fluid/lubricant as necessary.
- c. Drain the cooling medium as necessary.



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



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

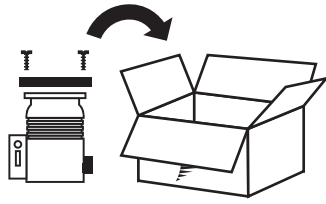


4. You will receive a response from Pfeiffer Vacuum.

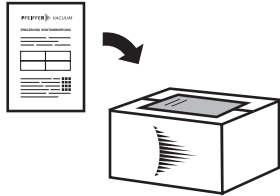
PFEIFFER VACUUM

Sending of contaminated products

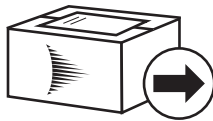
No units will be accepted if they are contaminated with micro-biological, explosive or radioactive substances. If products are contaminated or if the declaration of contamination is missing, Pfeiffer Vacuum will contact the customer before starting maintenance. In addition, depending on the product and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



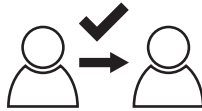
5. Prepare the product for transport in accordance with the details in the declaration of contamination.
 - a) Neutralize the product with nitrogen or dry air.
 - b) Close all openings with airtight blank flanges.
 - c) Seal the product in appropriate protective film.
 - d) Only pack the product in suitable,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



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



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



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

PFEIFFER VACUUM

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

11 Accessories

**We recommend**

Please refer to the accessories list for the individual components in their respective operating instructions or online at pfeiffer-vacuum.de.

12 Technical data and dimensions

12.1 General

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



Technical data

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

- Specifications according to PNEUROP committee PN5
- ISO 27892 2010: "Vacuum technology - Turbomolecular pumps - Measurement of rapid shutdown torque"
- ISO 21360 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 m³/h)
- Cooling water consumption at maximum gas throughput, cooling water temperature 25 °C
- Integral leakage rate with 100 % helium concentration, 10 s measurement duration
- Sound pressure level at distance to vacuum pump = 1 m

	mbar	bar	Pa	hPa	kPa	Torr mm Hg
mbar	1	1 · 10 ⁻³	100	1	0.1	0.75
bar	1000	1	1 · 10 ⁵	1000	100	750
Pa	0.01	1 · 10 ⁻⁵	1	0.01	1 · 10 ⁻³	7.5 · 10 ⁻³
hPa	1	1 · 10 ⁻³	100	1	0.1	0.75
kPa	10	0.01	1000	10	1	7.5
Torr mm Hg	1.33	1.33 · 10 ⁻³	133.32	1.33	0.133	1

1 Pa = 1 N/m²

Tbl. 16: Conversion table: Pressure units

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

Tbl. 17: Conversion table: Units for gas throughput

12.2 Technical data

Classification	HiCube 30 Eco	HiCube 30 Eco	HiCube 30 Eco
Flange (in)	DN 40 ISO-KF	DN 40 ISO-KF	DN 40 ISO-KF
Flange (out)	Silencer, G 1/8"	Silencer, G 1/8"	Silencer, G 1/8"
Turbopump	HiPace 30	HiPace 30	HiPace 30
Backing pump	MVP 015-2	MVP 015-4	MVP 030-3

Ultimate pressure	$< 1 \cdot 10^{-7}$ hPa	$< 1 \cdot 10^{-7}$ hPa	$< 1 \cdot 10^{-7}$ hPa
Pumping speed for N ₂	22 l/s	22 l/s	22 l/s
Pumping speed backing pump at 50 Hz	1 m ³ /h	0.75 m ³ /h	1.8 m ³ /h
Pump-down time for vacuum chamber size 1 l	56 s	84 s	15 s
Pump-down time for vacuum chamber size 10 l	560 s	836 s	145 s
Pump-down time for vacuum chamber size 100 l	5595 s	8358 s	1451 s
Mains requirement: voltage	100 – 240 V	100 – 240 V	100 – 240 V
Mains requirement: frequency (range)	50/60 Hz	50/60 Hz	50/60 Hz
Cooling method, standard	Air	Air	Air
Relative humidity of air	5 – 85 %, not condensing	5 – 85 %, not condensing	5 – 85 %, not condensing
Weight	11.7 kg	13.4 kg	13.3 kg

Tbl. 18: Technical data HiCube 30 Eco, DN 40 ISO-KF

Classification	HiCube 30 Eco	HiCube 30 Eco	HiCube 30 Eco
Flange (in)	DN 63 CF-F	DN 63 CF-F	DN 63 CF-F
Flange (out)	Silencer, G 1/8"	Silencer, G 1/8"	Silencer, G 1/8"
Turbopump	HiPace 30	HiPace 30	HiPace 30
Backing pump	MVP 015-2	MVP 015-4	MVP 030-3
Ultimate pressure	$< 1 \cdot 10^{-8}$ hPa	$< 1 \cdot 10^{-8}$ hPa	$< 1 \cdot 10^{-8}$ hPa
Pumping speed for N ₂	32 l/s	32 l/s	32 l/s
Pumping speed backing pump at 50 Hz	1 m ³ /h	0.75 m ³ /h	1.8 m ³ /h
Pump-down time for vacuum chamber size 1 l	56 s	84 s	15 s
Pump-down time for vacuum chamber size 10 l	560 s	836 s	145 s
Pump-down time for vacuum chamber size 100 l	5595 s	8358 s	1451 s
Mains requirement: voltage	100 – 240 V	100 – 240 V	100 – 240 V
Mains requirement: frequency (range)	50/60 Hz	50/60 Hz	50/60 Hz
Cooling method, standard	Air	Air	Air
Relative humidity of air	5 – 85 %, not condensing	5 – 85 %, not condensing	5 – 85 %, not condensing
Weight	12.9 kg	14.6 kg	14.5 kg

Tbl. 19: Technical data HiCube 30 Eco, DN 63 CF-F

Classification	HiCube 30 Eco	HiCube 30 Eco	HiCube 30 Eco
Flange (in)	DN 63 ISO-K	DN 63 ISO-K	DN 63 ISO-K
Flange (out)	Silencer, G 1/8"	Silencer, G 1/8"	Silencer, G 1/8"
Turbopump	HiPace 30	HiPace 30	HiPace 30
Backing pump	MVP 015-2	MVP 015-4	MVP 030-3

Technical data and dimensions

Ultimate pressure	$< 1 \cdot 10^{-7}$ hPa	$< 1 \cdot 10^{-7}$ hPa	$< 1 \cdot 10^{-7}$ hPa
Pumping speed for N ₂	32 l/s	32 l/s	32 l/s
Pumping speed backing pump at 50 Hz	1 m ³ /h	0.75 m ³ /h	1.8 m ³ /h
Pump-down time for vacuum chamber size 1 l	56 s	84 s	15 s
Pump-down time for vacuum chamber size 10 l	560 s	836 s	145 s
Pump-down time for vacuum chamber size 100 l	5595 s	8358 s	1451 s
Mains requirement: voltage	100 – 240 V	100 – 240 V	100 – 240 V
Mains requirement: frequency (range)	50/60 Hz	50/60 Hz	50/60 Hz
Cooling method, standard	Air	Air	Air
Relative humidity of air	5 – 85 %, not condensing	5 – 85 %, not condensing	5 – 85 %, not condensing
Weight	11.7 kg	13.4 kg	13.3 kg

Tbl. 20: Technical data HiCube 30 Eco, DN 63 ISO-K

Classification	HiCube 80 Eco	HiCube 80 Eco	HiCube 80 Eco
Flange (in)	DN 40 ISO-KF	DN 40 ISO-KF	DN 40 ISO-KF
Flange (out)	Silencer, G 1/8"	Silencer, G 1/8"	Silencer, G 1/8"
Turbopump	HiPace 80	HiPace 80	HiPace 80
Backing pump	MVP 015-2	MVP 015-4	MVP 030-3
Ultimate pressure	$< 1 \cdot 10^{-7}$ hPa	$< 1 \cdot 10^{-7}$ hPa	$< 1 \cdot 10^{-7}$ hPa
Pumping speed for N ₂	35 l/s	35 l/s	35 l/s
Pumping speed backing pump at 50 Hz	1 m ³ /h	0.75 m ³ /h	1.8 m ³ /h
Pump-down time for vacuum chamber size 1 l	56 s	83 s	14 s
Pump-down time for vacuum chamber size 10 l	557 s	834 s	143 s
Pump-down time for vacuum chamber size 100 l	5572 s	8335 s	1428 s
Mains requirement: voltage	100 – 240 V	100 – 240 V	100 – 240 V
Mains requirement: frequency (range)	50/60 Hz	50/60 Hz	50/60 Hz
Cooling method, standard	Air	Air	Air
Relative humidity of air	5 – 85 %, not condensing	5 – 85 %, not condensing	5 – 85 %, not condensing
Weight	12.1 kg	13.8 kg	13.7 kg

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

Classification	HiCube 80 Eco	HiCube 80 Eco	HiCube 80 Eco
Flange (in)	DN 63 CF-F	DN 63 CF-F	DN 63 CF-F
Flange (out)	Silencer, G 1/8"	Silencer, G 1/8"	Silencer, G 1/8"
Turbopump	HiPace 80	HiPace 80	HiPace 80
Backing pump	MVP 015-2	MVP 015-4	MVP 030-3

Ultimate pressure	$< 1 \cdot 10^{-8}$ hPa	$< 1 \cdot 10^{-8}$ hPa	$< 1 \cdot 10^{-8}$ hPa
Pumping speed for N ₂	67 l/s	67 l/s	67 l/s
Pumping speed backing pump at 50 Hz	1 m ³ /h	0.75 m ³ /h	1.8 m ³ /h
Pump-down time for vacuum chamber size 1 l	56 s	83 s	14 s
Pump-down time for vacuum chamber size 10 l	557 s	834 s	143 s
Pump-down time for vacuum chamber size 100 l	5572 s	8335 s	1428 s
Mains requirement: voltage	100 – 240 V	100 – 240 V	100 – 240 V
Mains requirement: frequency (range)	50/60 Hz	50/60 Hz	50/60 Hz
Cooling method, standard	Air	Air	Air
Relative humidity of air	5 – 85 %, not condensing	5 – 85 %, not condensing	5 – 85 %, not condensing
Weight	13.5 kg	15.2 kg	15.1 kg

Tbl. 22: Technical data HiCube 80 Eco, DN 63 CF-F

Classification	HiCube 80 Eco	HiCube 80 Eco	HiCube 80 Eco
Flange (in)	DN 63 ISO-K	DN 63 ISO-K	DN 63 ISO-K
Flange (out)	Silencer, G 1/8"	Silencer, G 1/8"	Silencer, G 1/8"
Turbopump	HiPace 80	HiPace 80	HiPace 80
Backing pump	MVP 015-2	MVP 015-4	MVP 030-3
Ultimate pressure	$< 1 \cdot 10^{-7}$ hPa	$< 1 \cdot 10^{-7}$ hPa	$< 1 \cdot 10^{-7}$ hPa
Pumping speed for N ₂	67 l/s	67 l/s	67 l/s
Pumping speed backing pump at 50 Hz	1 m ³ /h	0.75 m ³ /h	1.8 m ³ /h
Pump-down time for vacuum chamber size 1 l	56 s	83 s	14 s
Pump-down time for vacuum chamber size 10 l	557 s	834 s	143 s
Pump-down time for vacuum chamber size 100 l	5572 s	8335 s	1428 s
Mains requirement: voltage	100 – 240 V	100 – 240 V	100 – 240 V
Mains requirement: frequency (range)	50/60 Hz	50/60 Hz	50/60 Hz
Cooling method, standard	Air	Air	Air
Relative humidity of air	5 – 85 %, not condensing	5 – 85 %, not condensing	5 – 85 %, not condensing
Weight	12.1 kg	13.8 kg	13.7 kg

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

Classification	HiCube 300 Eco	HiCube 300 Eco	HiCube 300 Eco	HiCube 300 Eco	HiCube 300 Eco	HiCube 300 Eco
Flange (in)	DN 100 CF-F	DN 100 CF-F	DN 100 CF-F	DN 100 CF-F	DN 100 CF-F	DN 100 CF-F
Flange (out)	Silencer, G 1/8"	Silencer, G 1/8"	Silencer, G 1/8"	Silencer, G 1/8"	Silencer, G 1/8"	Silencer, G 1/8"
Turbopump	HiPace 300	HiPace 300	HiPace 300	HiPace 300 H	HiPace 300 H	HiPace 300 H

Technical data and dimensions

Backing pump	MVP 015-2	MVP 015-4	MVP 030-3	MVP 015-2	MVP 015-4	MVP 030-3
Ultimate pressure	$< 1 \cdot 10^{-8}$ hPa	$< 1 \cdot 10^{-8}$ hPa	$< 1 \cdot 10^{-8}$ hPa	$< 1 \cdot 10^{-10}$ hPa	$< 1 \cdot 10^{-10}$ hPa	$< 1 \cdot 10^{-10}$ hPa
Pumping speed for N ₂	260 l/s	260 l/s	260 l/s	260 l/s	260 l/s	260 l/s
Pumping speed backing pump at 50 Hz	1 m ³ /h	0.75 m ³ /h	1.8 m ³ /h	1 m ³ /h	0.75 m ³ /h	1.8 m ³ /h
Pump-down time for vacuum chamber size 1 l	55 s	83 s	14 s	55 s	83 s	14 s
Pump-down time for vacuum chamber size 10 l	553 s	830 s	138 s	553 s	830 s	138 s
Pump-down time for vacuum chamber size 100 l	5532 s	8295 s	1382 s	5532 s	8295 s	1382 s
Mains requirement: voltage	100 – 240 V	100 – 240 V	100 – 240 V	100 – 240 V	100 – 240 V	100 – 240 V
Mains requirement: frequency (range)	50/60 Hz	50/60 Hz	50/60 Hz	50/60 Hz	50/60 Hz	50/60 Hz
Cooling method, standard	Air	Air	Air	Air	Air	Air
Relative humidity of air	5 – 85 %, not condensing	5 – 85 %, not condensing	5 – 85 %, not condensing	5 – 85 %, not condensing	5 – 85 %, not condensing	5 – 85 %, not condensing
Weight	17.9 kg	19.6 kg	19.5 kg	17.9 kg	19.6 kg	19.5 kg

Tbl. 24: Technical data HiCube 300 Eco, DN 100 CF-F

Classification	HiCube 300 Eco	HiCube 300 Eco	HiCube 300 Eco	HiCube 300 Eco	HiCube 300 Eco	HiCube 300 Eco
Flange (in)	DN 100 ISO-K	DN 100 ISO-K	DN 100 ISO-K	DN 100 ISO-K	DN 100 ISO-K	DN 100 ISO-K
Flange (out)	Silencer, G 1/8"	Silencer, G 1/8"	Silencer, G 1/8"	Silencer, G 1/8"	Silencer, G 1/8"	Silencer, G 1/8"
Turbopump	HiPace 300	HiPace 300	HiPace 300	HiPace 300 H	HiPace 300 H	HiPace 300 H
Backing pump	MVP 015-2	MVP 015-4	MVP 030-3	MVP 015-2	MVP 015-4	MVP 030-3
Ultimate pressure	$< 1 \cdot 10^{-7}$ hPa	$< 1 \cdot 10^{-7}$ hPa	$< 1 \cdot 10^{-7}$ hPa	$< 1 \cdot 10^{-10}$ hPa	$< 1 \cdot 10^{-10}$ hPa	$< 1 \cdot 10^{-10}$ hPa
Pumping speed for N ₂	260 l/s	260 l/s	260 l/s	260 l/s	260 l/s	260 l/s
Pumping speed backing pump at 50 Hz	1 m ³ /h	0.75 m ³ /h	1.8 m ³ /h	1 m ³ /h	0.75 m ³ /h	1.8 m ³ /h
Pump-down time for vacuum chamber size 1 l	55 s	83 s	14 s	55 s	83 s	14 s

Pump-down time for vacuum chamber size 10 l	553 s	830 s	138 s	553 s	830 s	138 s
Pump-down time for vacuum chamber size 100 l	5532 s	8295 s	1382 s	5532 s	8295 s	1382 s
Mains requirement: voltage	100 – 240 V	100 – 240 V	100 – 240 V	100 – 240 V	100 – 240 V	100 – 240 V
Mains requirement: frequency (range)	50/60 Hz	50/60 Hz	50/60 Hz	50/60 Hz	50/60 Hz	50/60 Hz
Cooling method, standard	Air	Air	Air	Air	Air	Air
Relative humidity of air	5 – 85 %, not condensing	5 – 85 %, not condensing	5 – 85 %, not condensing	5 – 85 %, not condensing	5 – 85 %, not condensing	5 – 85 %, not condensing
Weight	15.9 kg	17.6 kg	17.5 kg	15.9 kg	17.6 kg	17.5 kg

Tbl. 25: Technical data HiCube 300 Eco, DN 100 ISO-K

12.3 Dimensioned drawings

All dimensions given in mm

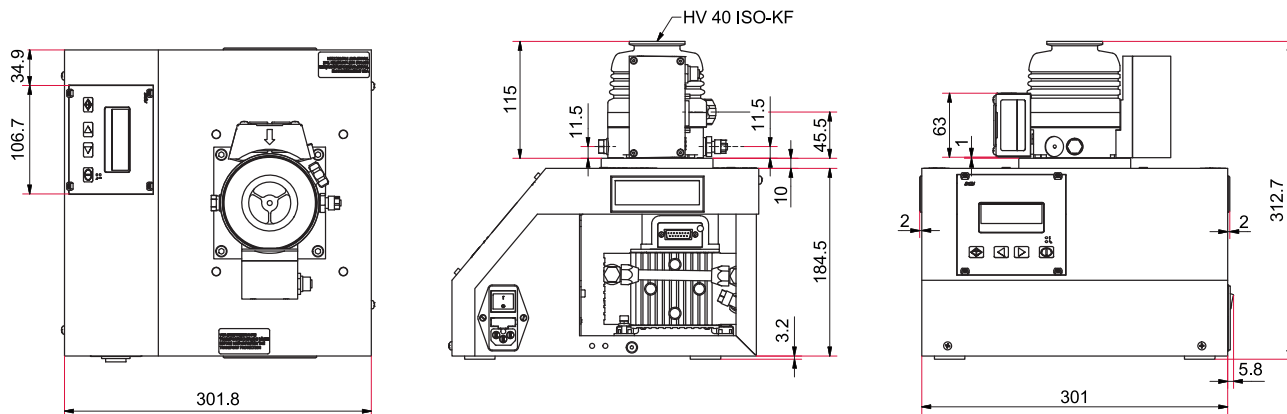


Fig. 22: Dimensions of HiCube 30 Eco, DN 40 ISO-KF

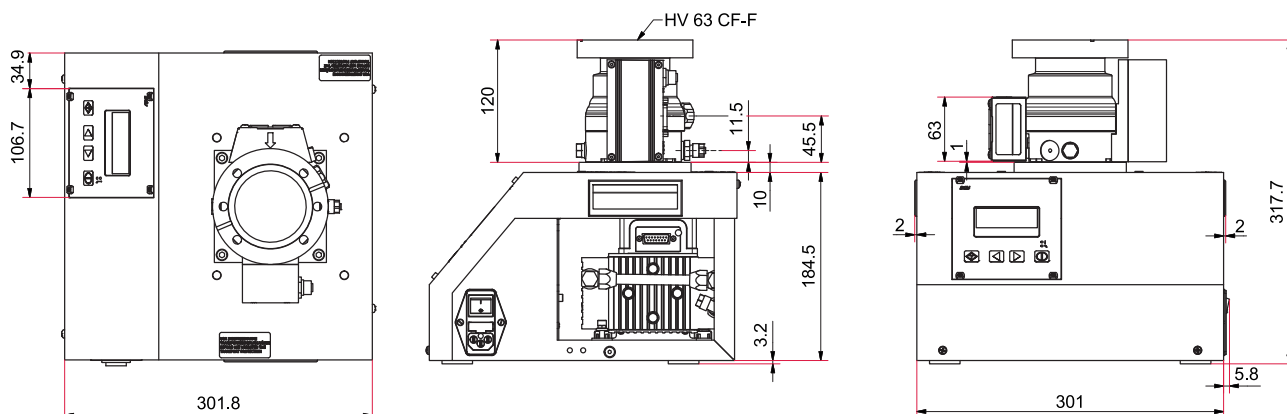


Fig. 23: Dimensions of HiCube 30 Eco, DN 63 CF-F

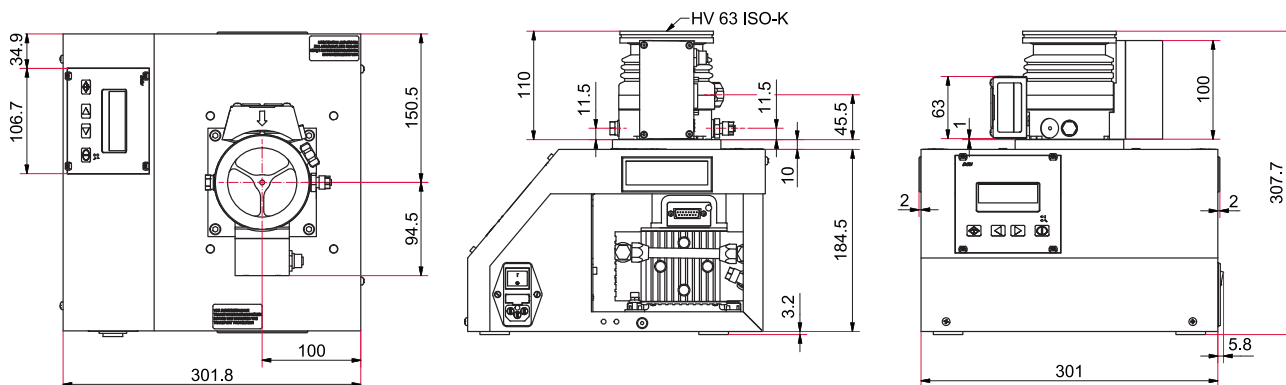


Fig. 24: Dimensions of HiCube 30 Eco, DN 63 ISO-K

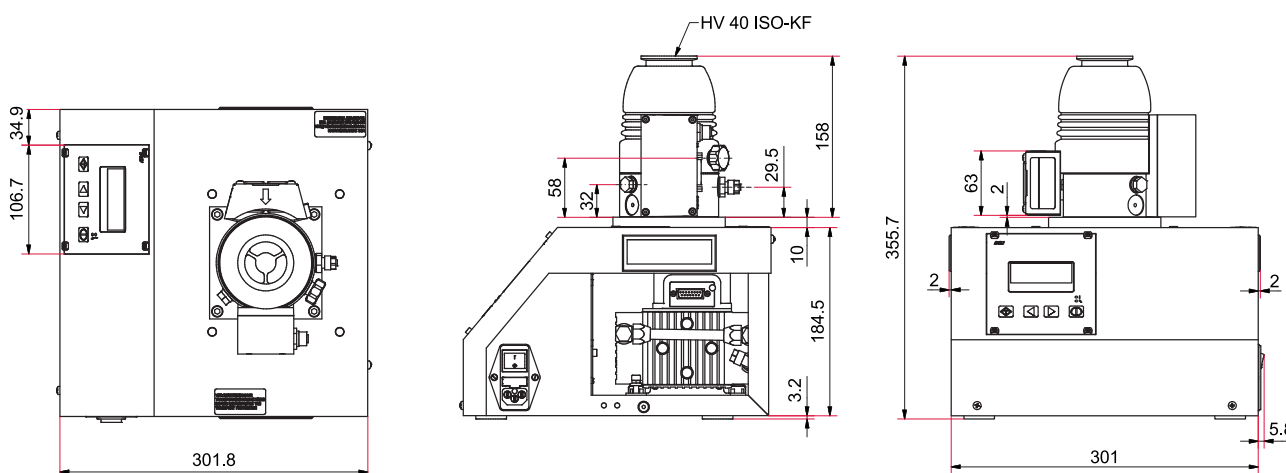


Fig. 25: Dimensions of HiCube 80 Eco, DN 40 ISO-KF

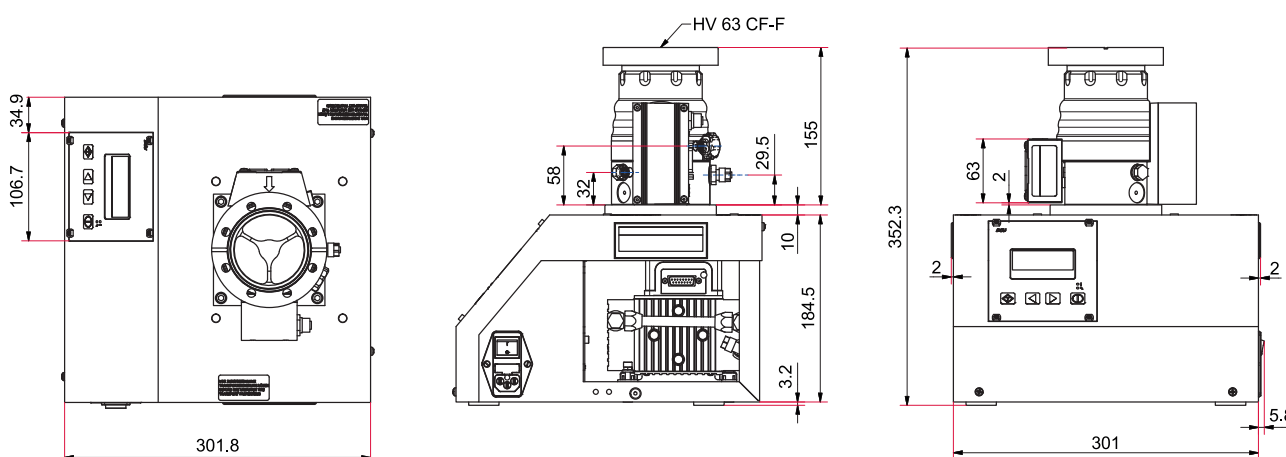


Fig. 26: Dimensions of HiCube 80 Eco, DN 63 CF-F



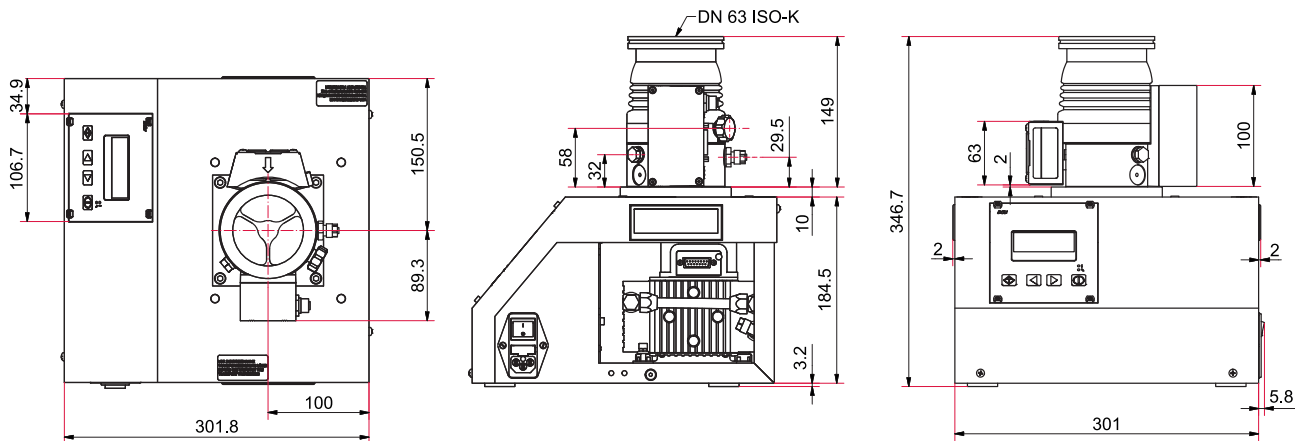


Fig. 27: Dimensions of HiCube 80 Eco, DN 63 ISO-K

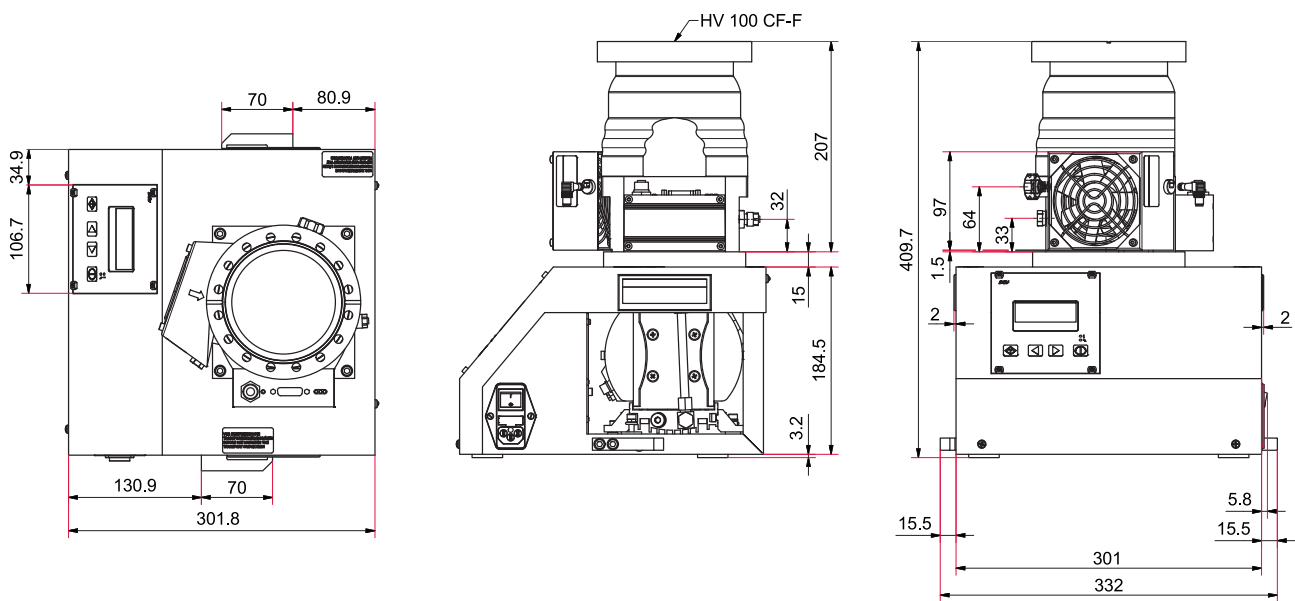


Fig. 28: Dimensions of HiCube 300 Eco, DN 100 CF-F

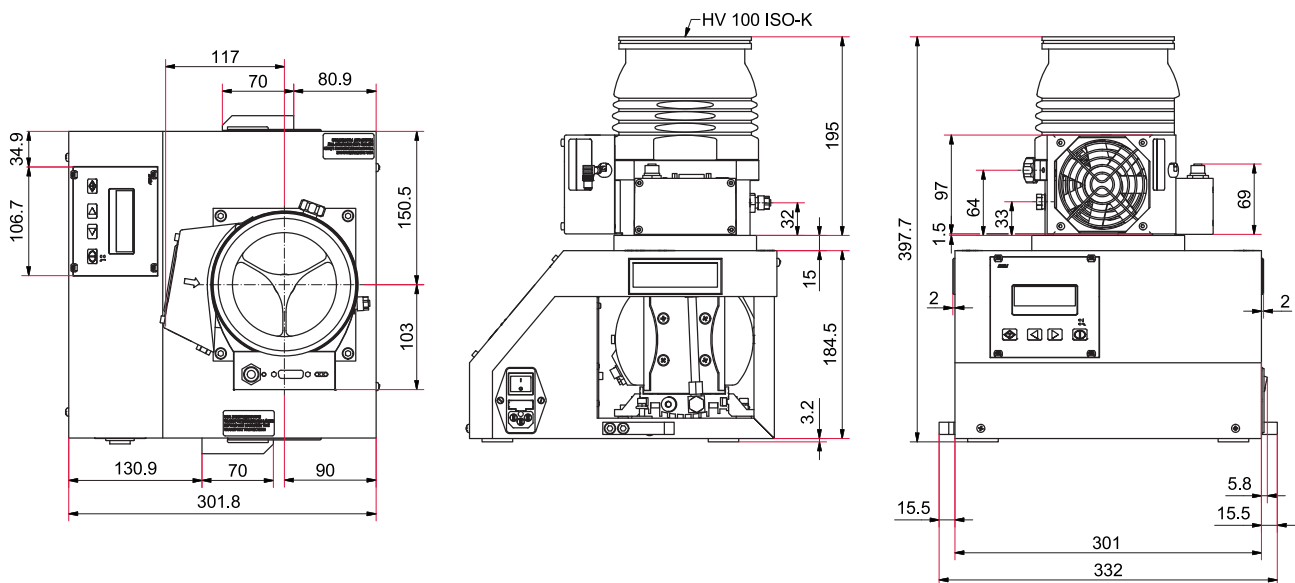


Fig. 29: Dimensions of HiCube 300 Eco, DN 100 ISO-K





Declaration of Conformity

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

- **Machinery 006/42/EC (Appendix II, No. 1 A)**
- **Electro-magnetic Compatibility 2014/30/EU**
- **Restrictions on the Use of Specific Hazardous Substances 2011/65/EU**

Authority for compiling the technical documents rests with Mr. Helmut Bernhardt, Pfeiffer Vacuum GmbH, Berliner Straße 43, 35614 Asslar.

Turbo pumping station

HiCube Eco

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

DIN EN ISO 12100:2011

DIN EN 1012-2:2011

DIN EN 61000-3-2:2014

DIN EN 61000-3-3:2014

DIN EN 61010-1:2010

DIN EN 61326-1:2013

DIN EN 62061:2013

Signature:

Pfeiffer Vacuum GmbH
Berliner Straße 43
35614 Asslar
Germany

(Dr. Ulrich von Hülsen)
Managing director

Asslar, 2016-09-10



VACUUM SOLUTIONS FROM A SINGLE SOURCE

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

COMPLETE RANGE OF PRODUCTS

From a single component to complex systems:

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

COMPETENCE IN THEORY AND PRACTICE

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

We support you with your plant layout and provide first-class on-site service worldwide.

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perfect vacuum solution?
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www.pfeiffer-vacuum.com

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