OPERATING INSTRUCTIONS

EN

Translation of the Original

HICUBE ECO

Turbo pumping stations

PFEIFFER VACUUM

Table of contents

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 a 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 Related documents

HiCube Eco	Operating manual
Declaration of Conformity	A component of this manual
Operating manuals for the individual components	see product description[1)]

1.1.2 Variants

These instructions apply to HiCube Eco with the pumping speed classes:

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

1.2 Target group

These 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 carried out by persons with appropriate technical training (specialist staff) or with corresponding training from Pfeiffer Vacuum.

1.3 Conventions

1.3.1 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 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

1) also available from the Pfeiffer Vacuum Download Center

Abbreviation	Meaning in the document
LC	Display: Liquid crystal (LCD)
LED	Illuminating diode
DVP	Diaphragm vacuum pump
PE	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	Electronic drive unit of the turbopump (turbo controller)
TPS	Power supply (turbo power supply)
X3	15-pole D-Sub connection socket on the electronic drive unit of the turbopump

Tbl. 1: Abbreviations used in the document

1.3.2 Pictographs

Pictographs used in the document indicate useful information.

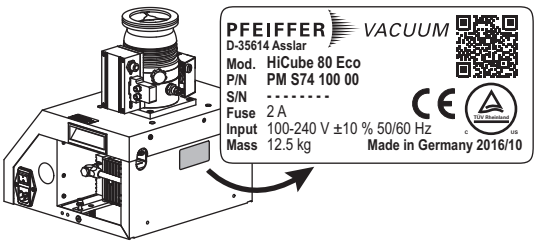
Note

Tip

Example

1.3.3 Stickers on the product

This section describes all existing stickers on the product, and their meanings.



Rating plate

The rating plate is located on the rear of the pumping station housing.

Warranty seal

The product is factory-sealed. Damaging or removing a warranty seal results in the warranty being voided.

Protection class

The sticker describes protection class 1 for the product. The positioning shows the position for the grounding connection.

	**Warning of electrical voltage** The sticker warns of the risk of electric shock when working with the housing open.
	**Imperative: Disconnect the mains plug** The sticker instructs the disconnection of the mains plug from the equipment before installation, servicing and maintenance work.

1.3.4 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 or by multiple action steps.

Individual action step

A horizontal, solid triangle indicates the individual action step of an action.

► This is an individual action step.

Sequence of multiple action steps

The numbering indicates an action with multiple action steps required.

1. Action step 1
2. Action step 2
3. ...

2 Safety

2.1 General safety instructions

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

⚠ DANGER

Imminent danger

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

► Instructions on avoiding the hazardous situation

⚠ WARNING

Possibly imminent danger

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

► Instructions on avoiding the hazardous situation

⚠ CAUTION

Possibly imminent danger

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

► Instructions on avoiding the hazardous situation

NOTICE

Danger of property damage

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

► Instructions on avoiding property damage

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

2.2 Safety instructions

All safety instructions in this document are based on results from the risk assessment in accordance with Machine Directive 2006/42/EC AG Appendix I and EN ISO 12100 chapter 5. Where applicable, all service life phases of the product have been taken into account.

Risks during transport

⚠ 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.

Risks during installation

⚠ WARNING

Danger of death from electric shock due to improper 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 on the device.

⚠ CAUTION

Cutting injuries on sharp and rotating parts with the high vacuum flange open during installation

With the high vacuum flange open, access to sharp-edged parts is possible. There is a risk of cutting injuries. Objects falling inside destroy the pump during subsequent operation.

- ► Only remove the original protective cover immediately before connecting the high vacuum flange.
- ► Do not reach into the high vacuum flange.
- ► Wear protective gloves during the installation process.
- ► Do not put the pump into operation with the vacuum flanges open.
- ► Ensure that the mechanical installation is completed before the electrics are connected.

NOTICE

Danger of property damage due to an incorrect counter flange design

Unevennesses of the customers counter flange result in distortion in the pump housing even when correctly affixed. The result is leaks or negative changes in the running properties.

- ► Observe the shape tolerances for the counter flange.
- ► Observe the maximum deviations in evenness across the entire surface.

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.

NOTICE

Leaks may occur due to the incorrect installation of CF flanges

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

- ► Always wear suitable gloves before touching or fitting any components.
- ► Fit seals only if dry and free of grease.
- ► Note any damaged surfaces and cutting edges.
- ► Replace the damaged components.

NOTICE

Destruction of the pump due to gases with excessively high molecule masses

When conveying gases with non-permissibly high molecule masses, there is a risk of the turbopump being destroyed.

- ► Make sure the gas mode is set correctly **[P:027]** on the electronic drive unit.
- ► Consult Pfeiffer Vacuum before using gases with larger molecule gases (> 80).

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.

Risks during maintenance

⚠ WARNING

Danger of death from electric shock during servicing and maintenance work

The device is only free of voltage with the mains plug disconnected and the turbopump at a standstill.

- ► Switch off the main switch prior to starting any work.
- ► Wait for the turbopump to come to a standstill (speed = 0)
- ► Disconnect the mains plug from the device.
- ► Secure the device against accidental restart.

⚠ WARNING

Health risk and potential environmental damage due to toxic contaminated parts or devices

Toxic process media result in contamination of the devices or parts thereof. During maintenance work there is a health risk due to contact with these poisonous substances. The non-permitted disposal of toxic substances results in environmental damage.

- ► Take appropriate safety precautions and avoid health risks or environmental hazards due to toxic process media.
- ► Decontaminate the affected parts before carrying out maintenance work.
- ► Wear protective equipment.

NOTICE

Malfunction due to changing the connection configuration

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

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

Risks during recommissioning

NOTICE

Damage to the turbopump due to excessive aging of the operating fluid after recommissioning

The storage capacity of the operating fluid in the turbopump is limited. Excessive aging of the operating fluid can result in the ball bearings failing and cause damage to the turbopump.

- ► Observe the usable service life of the operating fluid:
  - Without operation, maximum of 2 years,
  - Following operating and standstill times, 4 years in total.
- ► Observe the maintenance instructions and inform Pfeiffer Vacuum Service.

Risks in the event of faults

⚠ WARNING

Danger of death due to the turbopump tearing off in the event of a fault

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

- ► Follow the installation instructions from the manufacturer.
- ► Observe the requirements for stability and the design of the counter flange.
- ► Only use approved original accessories or mounting elements approved by Pfeiffer Vacuum for the installation process.

⚠ WARNING

Danger of death due to the turbopump with vibration damper is tearing off in the event of a fault

Sudden blocking of the rotor generates high destructive torques in accordance with ISO 27892. These result in the turbopump tearing off when using a vibration damper. The energy released in this way can throw the entire pump or broken pieces from the inside of the pump through the space. Potentially dangerous gases may escape. There is a risk of serious injury, potentially even fatal, and significant property damage.

- ► Provide suitable safety measures on customer's side to compensate the torques arising.
- ► Please contact Pfeiffer Vacuum before installing a vibration damper.

2.3 Safety precautions

Information requirement on possible hazards

The owner or operator of the product is required to make all operating personnel aware of hazards arising from the use of this product.

Every person who is involved in the installation, operation or maintenance of the product must have read and understood the safety-relevant parts of this documentation.

Infringement of EU conformity due to modifications to the product

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

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

General safety measures 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 any body parts to the vacuum.
- ► Always ensure a safe connection to the protective conductor (PE).
- ► Do not unplug any plug connectors during operation.
- ► Observe the specified shutdown procedures.
- ► Wait for the rotor to come to a complete standstill (speed f = 0) before working on the high vacuum connection.
- ► Do not put the device into operation with an open high vacuum flange.
- ► Keep lines and cables away from hot surfaces (> 70 °C).
- ► Never fill or operate the device with cleaning agents or cleaning agent residue.
- ► Do not carry out any unauthorized modifications or changes to the device.
- ► Observe the protection rating of the device being installation or operation in different environments.

2.4 Limits of use of the product

Parameters	Limit values
Installation location	Weather-protected (interior spaces)
Air pressure	750 hPa to 1060 hPa
Installation altitude	max. 2000 m
Relative humidity	max. 80 %, at T < 31 °C max. 50 % at T < 40 °C
Protection class	I
Overvoltage category	II
Protection rating (IP code)	IP20
Contamination level	2
Ambient temperature	5 °C to 35 °C with air cooling 5 °C to 40 °C with water cooling
Permissible surrounding magnetic field	Depends on the turbopump used
Maximum irradiated thermal output	Depends on the turbopump used
Maximum permissible rotor temperature of the turbo pump	90 °C

Tbl. 2: Permissible ambient conditions

Notes on ambient conditions

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

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

2.5 Proper use

- 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 misuse

Misuse of the product automatically 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:

- Pumping corrosive or explosive media
- Pumping condensing vapors
- Pumping liquids
- Pumping dusts
- Operation with non-permissibly high gas throughput
- Operation with non-permissibly high fore-vacuum pressure
- Operation with excessively high radiated heat output
- Operation in non-permissibly high magnetic fields
- Operation in the incorrect gas mode
- Venting with non-permissibly high venting rates
- Use for pressure generation

- Use in areas with ionizing radiation
- Operation in explosion-hazard areas
- Use in systems in which impact loads and vibrations or periodic forces are exerted on the equipment
- Use of accessories or spare parts that are not described in this manual

3 Transportation and Storage

3.1 Transport

⚠ 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.

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

Notes on safe transportation

1. Transport the pumping station in the original packaging.
2. Always transport the pumping station upright and in as level a position as possible.
3. Always position the pumping station securely on a sufficiently large, level surface.

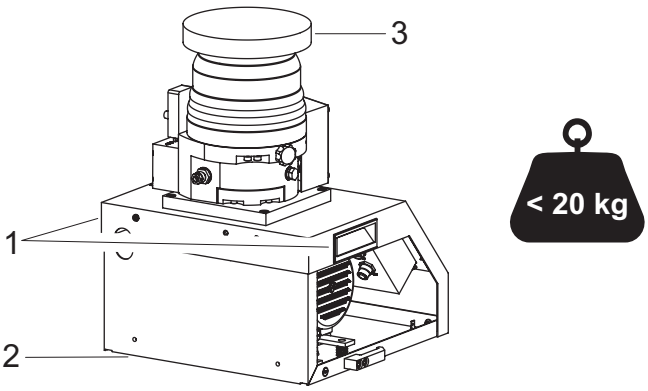


Fig. 1: HiCube Eco transport

1 Recessed handle
2 Installation base
3 Protective cover

Notes on safe transportation without packaging

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

1. Observe the weight specified on the rating plate.
2. Lift the turbo pumping station with both hands at the recessed handles.
3. Always transport the turbo pumping station upright with the base downward.
4. Always position the pumping station securely on a sufficiently large, level surface.

3.2 Transport protection

The fore-vacuum pumps in HiPace turbo pumping stations are secured against damage during transport.

Using the transport retainers

1. Do not unfasten the transport retainer on the backing pump until immediately before commissioning at the installation location.
2. Observe the notes on installation (see chapter “Unfastening the transport retainer”, page 29).

3.3 Storage

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

Storing the pumping station

1. Seal the flange openings using the original protective covers.
2. Seal other connections (e.g. exhaust) with appropriate protective covers.
3. Only store the turbo pumping station in indoor areas at temperatures between -10 °C and +40 °C.
4. In rooms with a humid or caustic atmosphere: Seal the turbo pumping station airtight in a plastic bag together with a drying agent.

4 Product description

4.1 Product identification

To ensure reliable identification of the product, always keep all of the information on the rating plate to hand, and use it when communicating with Pfeiffer .

Information on certifications can be found on the test seal on the product, as applicable, or from:

- www.tuvdotcom.com
- with the company ID no. 000021320

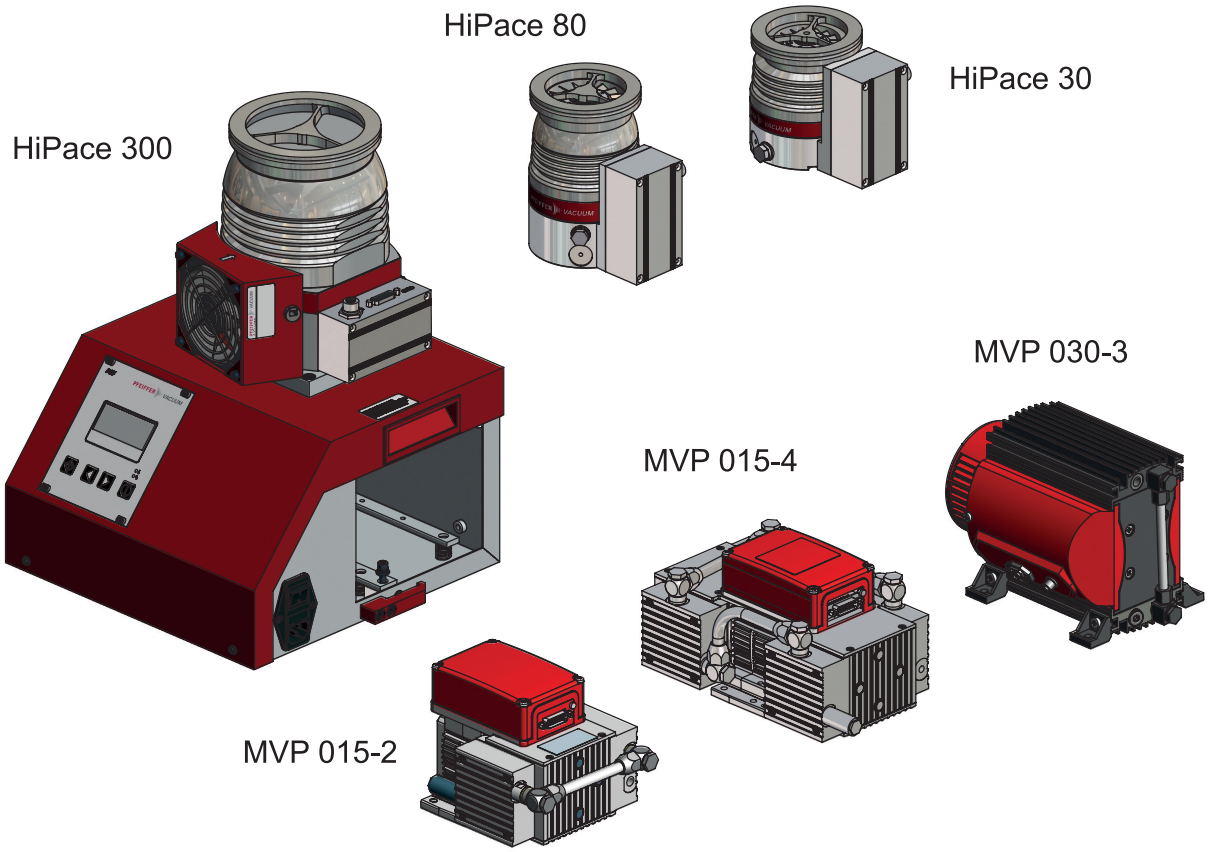


Fig. 2: HiCube Eco pump configuration

Characteristics	HiCube Eco			Operating manual
HV flange	DN 40 / DN 63		DN 100	
Turbopump	HiPace 30	HiPace 80	HiPace 300 HiPace 300 H	PT 0510 BN PT 0208 BN PT 0202 BN PT 0509 BN
Electronic drive unit	TC 110	TC 110	TC 110	PT 0204 BN
Backing pump: Diaphragm pump	MVP 015-2 MVP 015-4 MVP 030-3	MVP 015-2 MVP 015-4 MVP 030-3	(MVP 015-2) MVP 015-4 MVP 030-3	PU 0070 BN PU 0070 BN PU 0065 BN
Power supply	TPS onboard, 24 V DC	TPS onboard, 24 V DC	TPS onboard, 24 V DC	

Characteristics	HiCube Eco			Operating manual
Display and 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 (water cooling required)	Not available	optional, only with CF flange	optional, only with CF flange	PT 0233 BN

Tbl. 3: HiCube Eco configuration of vacuum pumps and accessories

4.2 Function

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

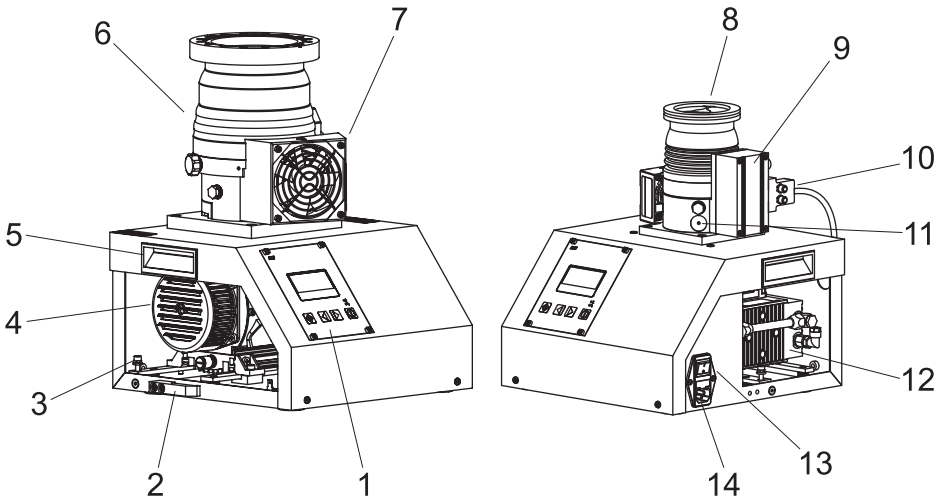


Fig. 3: HiCube Eco construction

1 Display and control unit DCU 002
2 Retaining hook (only with HiCube 300 Eco)
3 Transport protection
4 Backing pump diaphragm pump MVP 030-3
5 Recessed handle
6 Turbopump HiPace 300, DN 100 CF-F
7 Air cooling
8 Turbopump HiPace 80, DN 63 ISO-K
9 Electronic drive unit TC 110
10 Connecting cable
11 Ground terminal
12 Backing pump diaphragm pump MVP 015-2
13 Master switch
14 Mains power supply

4.2.1 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.

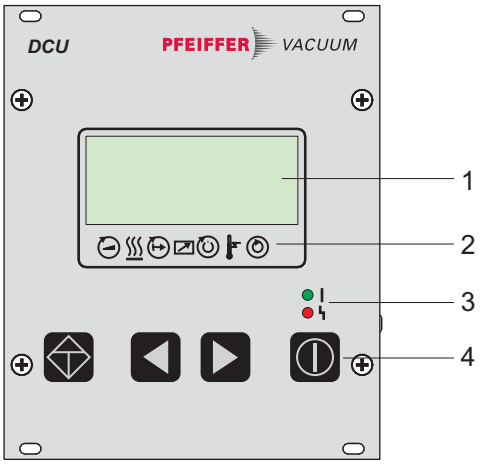


Fig. 4: DCU control panel

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

4.2.2 Drive

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

4.2.3 Cooling

- Air cooling
- Water cooling (optional)

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

4.3 Scope of delivery

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

5 Installation

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. This makes the stability of the turbopump and its fastenings extremely important.

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

5.1 Preparatory work

Preliminary note

► Choose an installation location that permits access to the pumping station and to supply lines at all times.

Prerequisites

- The given ambient conditions
- level, vibration-free surface
- Distance to side walls or adjacent devices: at least 50 cm
- Distance to free table edges min. 10 cm
- when using a housing heater and water cooling, the temperature on the connection flange on the vacuum chamber is not permitted to exceed 120 °C

Choosing the installation location

1. Ensure adequate cooling options for the pumping station.
2. Install suitable protective shielding if ambient magnetic fields occur that are higher than the maximum permitted.
3. Install suitable protective shielding to prevent the radiated heat output exceeding the permissible values when high temperatures arise due to the processes involved.

5.2 Setting up the pumping station

⚠ CAUTION

Cutting injuries on sharp and rotating parts with the high vacuum flange open during installation

With the high vacuum flange open, access to sharp-edged parts is possible. There is a risk of cutting injuries. Objects falling inside destroy the pump during subsequent operation.

► Only remove the original protective cover immediately before connecting the high vacuum flange.
► Do not reach into the high vacuum flange.
► Wear protective gloves during the installation process.
► Do not put the pump into operation with the vacuum flanges open.
► Ensure that the mechanical installation is completed before the electrics are connected.

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 named 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.

5.2.1 Grounding the pumping station

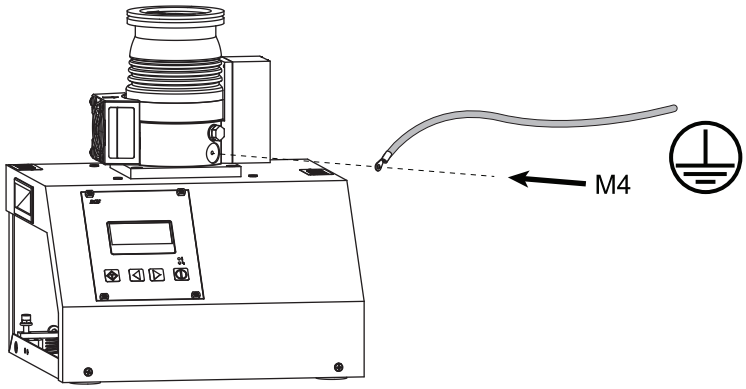


Fig. 5: Example grounding terminal for a HiCube 80 Eco

Connecting the grounding

Pfeiffer Vacuum recommends connecting an appropriate grounding cable to divert applicative interference forces.

1. Use the grounding terminal of the turbopump (M4 internal thread).
2. Perform the connection in accordance with applicable local regulations.

5.2.2 Anchor the pumping station (only applies to HiCube 300 Eco)

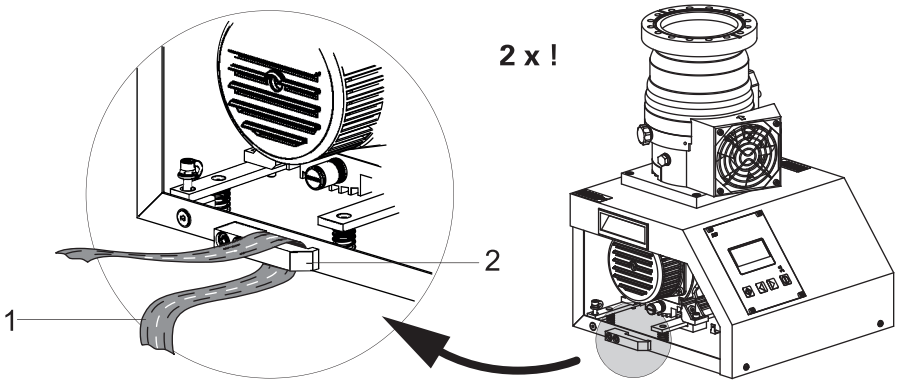


Fig. 6: Fasten the HiCube 300 Eco pumping station using securing straps

1 Securing strap 2 Securing hooks

Secure the HiCube 300 Eco against twisting

In the case of a sudden blocking of the turbopump rotor, the resulting torque must be taken up via the pumping station frame by the fixture provided by customer. Anchoring the pumping station is mandatory in order to secure the pumping station and the vacuum system. For this purpose there are 2 securing hooks at the sides of the pumping station frame.

1. Always fasten the HiCube 300 Eco pumping station using securing straps to both securing hooks.
2. Fix the securing straps against the securing hook openings and thus against the direction of rotation of the turbopump.
3. Fasten the securing straps at the customer's site such that they are able to withstand loads of up to 2000 N per fixing point.
4. Ensure that the straps are correctly positioned and tensioned. The loop of each strap must be in the hollow of the hook.

5.3 Connecting the high vacuum side

5.3.1 Requirements for the design of the counterflange

NOTICE

Danger of property damage due to an incorrect counter flange design

Unevennesses of the customers counter flange result in distortion in the pump housing even when correctly affixed. The result is leaks or negative changes in the running properties.

- ► Observe the shape tolerances for the counter flange.
- ► Observe the maximum deviations in evenness across the entire surface.

The assembly of attachments onto the HiCube Eco turbo pumping station is the responsibility of the operator. The load capacity of the high vacuum flange is specific to the turbopump being used. The total weight of attachments onto the HiCube Eco turbo pumping station is not permitted to exceed the specified maximum values.

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

Turbo pumping station	Maximum torque occurring in the event of a burst[2)]	Permissible total weight of attachments on the pumping station	Form tolerance	Tensile strength of the flange material in all operating conditions	Screw-in depth of the fastening bolts	Maximum permissible surrounding magnetic field	Maximum permissible irradiated thermal output
HiCube	500 Nm	50 kg	± 0.05 mm	170 N/mm²	2.5 x d	3 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/mm²	1.5 x d		

Tbl. 4: Requirements for the design of the high vacuum connection at the customer's site

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

5.3.2 Using accessories for the high vacuum connection

Installation and operation of accessories

Pfeiffer Vacuum offers a range of specially coordinated accessories for its products. The installation, operation and maintenance of connected devices are described in detail in the operating manuals of the individual components.

- Information on approved accessories can be found at pfeiffer-vacuum.com.

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 gas type			
	H_2	He	N_2	Ar
Splinter shield DN 40	6	9	17	18

2) The theoretically calculated torque in the event of a burst (rotor shaft breakage) according to ISO 27892 was not reached in any experimental test.

Flange size	Reduced pumping speed in % for gas type			
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. 5: Reduction of the pumping speed of a turbopump when using a 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.

⚠ WARNING

Danger of death due to the turbopump with vibration damper is tearing off in the event of a fault

Sudden blocking of the rotor generates high destructive torques in accordance with ISO 27892. These result in the turbopump tearing off when using a vibration damper. The energy released in this way can throw the entire pump or broken pieces from the inside of the pump through the space. Potentially dangerous gases may escape. There is a risk of serious injury, potentially even fatal, and significant property damage.

1. Provide suitable safety measures on customer's side to compensate the torques arising.
2. Please contact Pfeiffer Vacuum before installing a vibration damper.

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 “Installation of ISO-K flange onto ISO-K”, page 23) and (see chapter “Installation of ISO-K flange onto ISO-F”, page 23).

5.3.3 Connecting an external turbopump

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

It is possible to operate the turbopump with separate electronic drive unit following consultation with Pfeiffer Vacuum and using the relevant accessories.

Example for dismantling a turbopump from the turbo pumping station (see chapter “Removal of components for their maintenance”, page 36).

Installing an external turbopump

1. Observe the installation notes for the turbopump in the relevant operating instructions for the individual component.
2. Use cable set PM 071 477 -T (3 m) from the Pfeiffer Vacuum accessories range and extend the fore-vacuum line and the control cable.
   – Other lengths on request.

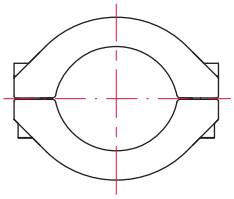
5.3.4 Installation of ISO-KF flange

Mounting of ISO-flanges

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

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

Connection using a clamping ring



1. Only use the approved fastening sets from Pfeiffer Vacuum for the connection.
2. Fasten the high vacuum connection on the turbopump and the clamping ring to the counter flange.
3. Use all prescribed components for the turbopump.
4. Tighten the clamping ring screws evenly.
   – Tightening torque: **3.7 Nm**.

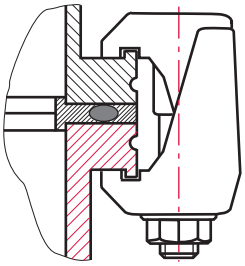
5.3.5 Installation of ISO-K flange onto ISO-K

Mounting of ISO-flanges

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

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

Creating the ISO-K connection using bracket screws



1. Only use the approved fastening sets from Pfeiffer Vacuum for the connection.
2. Connect the flange according to the diagram using the components in the mounting kit.
3. Use all prescribed components for the turbopump.
4. Tighten the bracket screws in 3 stages in opposite pairs.
   – Tightening torque: **5, 15, 25 ± 2 Nm**

5.3.6 Installation of ISO-K flange onto ISO-F

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

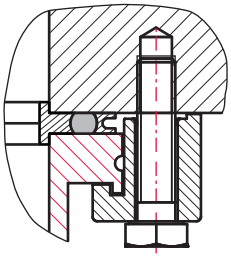
- "Claw and threaded hole"
- "Hexagonal screw and threaded hole"
- "Stud screw and threaded hole"
- "Stud screw and through-bore"

Mounting of ISO-flanges

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

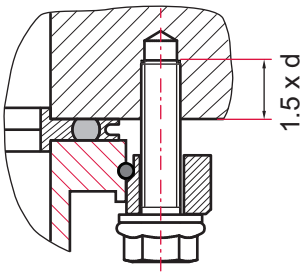
- The tightness of the high vacuum connection is not at risk thereby.

Connection of claw and threaded hole



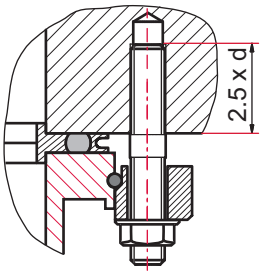
1. Only use the approved fastening sets from Pfeiffer Vacuum for the connection.
2. Connect the flange according to the diagram using the components in the mounting kit.
3. Use all prescribed components for the turbopump.
4. Tighten the claws in 3 stages in opposite pairs.
   – Tightening torque: **5,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

Connection of hexagonal screw and threaded hole



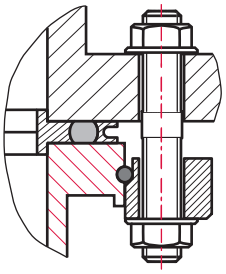
1. Only use the approved fastening sets from Pfeiffer Vacuum for the connection.
2. Place the collar flange over the high vacuum flange on the turbopump.
3. Insert the snap ring into the side groove on the high vacuum flange of the turbopump.
4. Fasten the turbopump onto the counter flange in accordance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

Connection of stud screw and threaded hole



1. Only use the approved fastening sets 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. Use 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 fastening sets 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. Use all prescribed components for the turbopump.
6. Tighten the nuts in 3 stages in opposite pairs.
7. Tightening torque: **5, 10, 16 ± 1 Nm**

5.3.7 Installation of CF flanges

The connection types for the installation of CF with CF flange are:

- "Hexagonal screw and through-bore"
- "Stud screw and threaded hole"
- "Stud screw and through-bore"

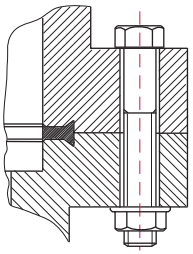
NOTICE

Leaks may occur due to the incorrect installation of CF flanges

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

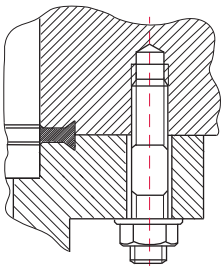
- ► Always wear suitable gloves before touching or fitting any components.
- ► Fit seals only if dry and free of grease.
- ► Note any damaged surfaces and cutting edges.
- ► Replace the damaged components.

Connection of hexagonal screw and through-bore



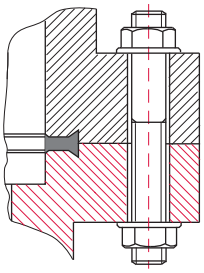
1. Only use the approved mounting kits from Pfeiffer Vacuum for the connection.
2. If used: Insert the protective screen or splinter shield with the clamping lugs pointing downward into the high vacuum flange.
3. Place the seal precisely in the hollow.
4. Connect the flange according to the diagram using the components in the mounting kit.
5. Tighten the screw connections all the way around.
   – Tightening torque: **22 ± 2 Nm**
6. After this, check the torque as flowing of the sealing material may make it necessary to tighten the screws.

Stud screw and threaded 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.
3. If used: Insert the protective screen or splinter shield with the clamping lugs pointing downward into the high vacuum flange.
4. Place the seal precisely in the hollow.
5. Connect the flange according to the diagram using the components in the mounting kit.
6. Tighten the screw connections all the way around.
   – Tightening torque: **22 ± 2 Nm**
7. After this, check the torque as flowing of the sealing material may make it necessary to tighten the screws.

Stud screw and through-bore



1. Only use the approved mounting kits from Pfeiffer Vacuum for the connection.
2. If used: Insert the protective screen or splinter shield with the clamping lugs pointing downward into the high vacuum flange.
3. Place the seal precisely in the hollow.
4. Connect the flange according to the diagram using the components in the mounting kit.
5. Tighten the screw connections all the way around.
   – Tightening torque: **22 ± 2 Nm**
6. After this, check the torque as flowing of the sealing material may make it necessary to tighten the screws.

5.4 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.

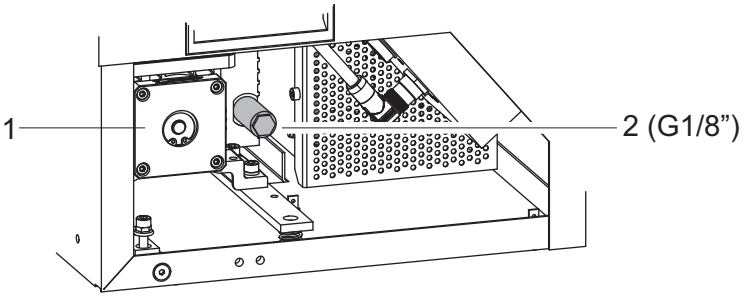


Fig. 7: Example for the exhaust connection on the backing pump

1 Diaphragm pump 2 Exhaust silencer (included as standard)

Notes on installing an exhaust line

1. Choose an exhaust line cross-section of at least the size of the exhaust connection on the backing pump.
2. Unscrew the exhaust silencer from the backing pump.
3. Lay the pipelines so that they fall away from the pump to avoid condensate formation.

1. Where necessary, install a condensate separator in the exhaust line.
2. Install the condensate drain at the lowest point in the exhaust line.

5.5 Use of the DCU as a remote control

The display and control unit can be removed from the pumping station and used as a remote control.

Safely disconnect the device from the mains before performing any work

1. Switch the equipment off.
2. Wait until all components have come to a complete standstill.
3. Switch off the main switch.
4. Disconnect the mains plug from the equipment.

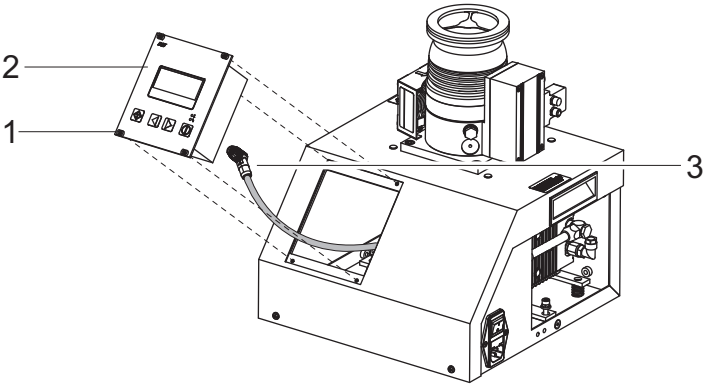


Fig. 8: Removing the DCU from the pumping station

1 Necked screw with retaining nipple
2 Display and control unit DCU 002
3 Control cable with M12 connector

Remove the DCU from the pumping station housing

1. Unfasten the 4 necked screws from the corners of the DCU front panel.
2. Keep the retaining nipple safely.
3. Take the DCU out of the pumping stand housing.
   – Note the length of the control cable.
4. Unscrew the M12 connector on the control cable from the DCU.

Using the supplied cables

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

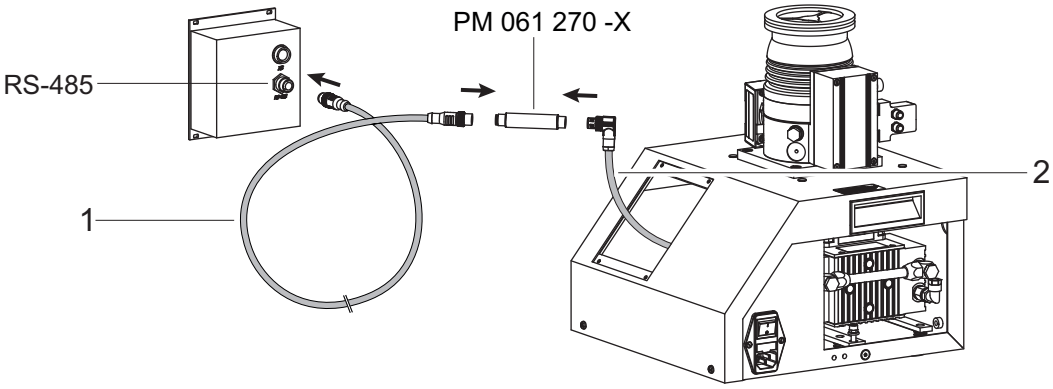


Fig. 9: Connecting the DCU as a remote control

1 Extension cable
2 Control cable with M12 connector

Connect the DCU as a remote control

1. Screw the interface cable supplied into the RS-485 connection on the DCU.
2. Use the PM 061 270 -X coupling and connect the extension cable to the connection cable on the control cable from the pumping station.

5.6 Connecting accessories for the pumping station

Installation and operation of accessories

Pfeiffer Vacuum offers a range of specially coordinated accessories for its products. The installation, operation and maintenance of connected devices are described in detail in the operating manuals of the individual components.

- Information on approved accessories can be found at pfeiffer-vacuum.com.

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 a Pfeiffer Vacuum display and control unit or PC.
- Detailed instructions can also be found in the "TC 110 electronic drive unit" operating instructions.

Note the factory settings.

The accessory connections on the turbopump have been preconfigured at the factory. If the control lines on the connector are mixed up, this can cause the pumping station to malfunction or fail.

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.

5.7 Unfastening the transport retainer

All turbo pumping stations in the HiCube Eco range are equipped with a transport retainer for the backing pumps (see sticker). The backing pump is fixed diagonally to the pumping station baseplate on 2 spring-mounted rails by 2 cheesehead bolts with nuts.

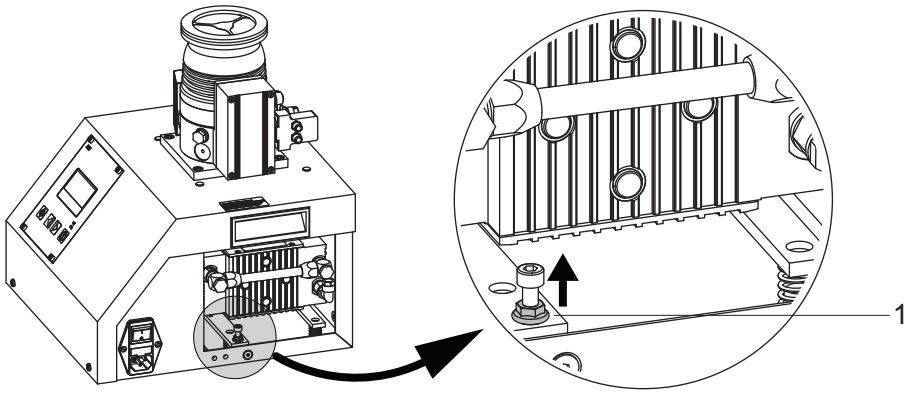


Fig. 10: Position of the transport retainer on the diaphragm pump

1 Hexagon nut on the transport retainer

Unfastening the transport retainer of the backing pump

1. Turn the hexagon nuts on the transport retainer as far as they will go.
2. Also unfasten the transport retainer on the opposite side.

5.8 Connecting to the mains power supply

⚠ WARNING

Danger of death from electric shock due to improper 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 on the device.

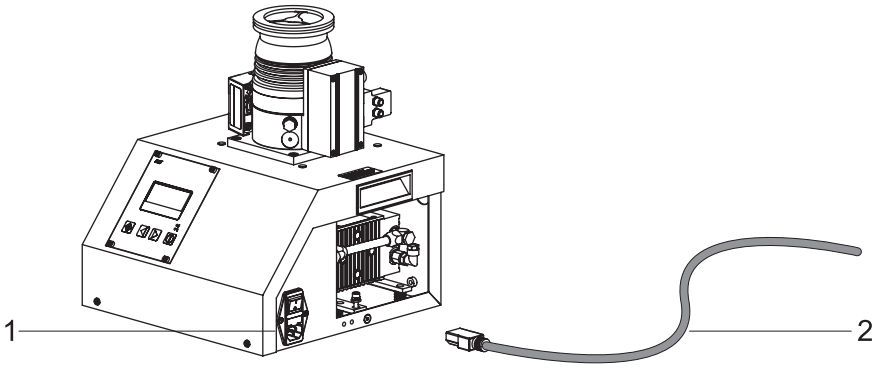


Fig. 11: Mains connection plug and main switch on the HiCube Eco

1 Mains plug 2 Mains connection cable, country-specific (included as standard)

Provide a mains supply to the HiCube Eco

1. Ensure that the main switch is switched off before connection.

2. Always ensure a safe connection to the protective conductor (PE).
3. Plug the mains cable provided into the connecting socket on the side of the pumping station housing.
4. Connect the mains cable to the mains supply at the operator's site.

6 Operation

6.1 Commissioning

Important settings and function-related values are programmed into the electronic drive units of the vacuum pumps as parameters. Each parameter has a three-digit number and a designation. Parameters can be used via Pfeiffer Vacuum display and control units or via RS-485 with the Pfeiffer Vacuum protocol.

The DCU is used for both parameter sets as a user interface. The HiCube Eco controls two independent parameter sets for the turbopump and the backing pump. The parameters of the backing pump are shown in order on the display and are identified with a  symbol.

Parameters	Name	Designation	Configuration	HiCube 30 Eco	HiCube 80 Eco	HiCube 300 Eco
[P:001]	Heating	Heating	Without heating	not available	0	0
			With heating		1	1
[P:012]	EnableVent	Enable venting		1	1	1
[P:019]	Cfg DO2	Configuration of output DO2		22 = Backing pump standby	22 = Backing pump standby	22 = Backing pump standby
[P:023]	MotorPump	Motor pump		1	1	1
[P:024]	Cfg DO1	Configuration of output DO1		15 = Pumping station	15 = Pumping station	15 = Pumping station
[P:025]	Op-Mode BKP	Backing pump mode		1 = Intermittent operation	1 = Intermittent operation	1 = Intermittent operation
[P:035]	Cfg Acc A1	Configuration accessory connection A1	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	Configuration accessory connection B1		1 = Venting valve, normally closed	1 = Venting valve, normally closed	1 = Venting valve, normally closed
[P:708]	PwrSVal	Set value power consumption	with MVP 015-2	90 %	90 %	90 %
			with MVP 015-4	100 %	100 %	100 %
			with MVP 030	100 %	100 %	100 %
[P:710]	Swoff BKP	Switching off threshold backing pump in intermittent mode		25 W	25 W	45 W | MVP 015 52 W | MVP 030
[P:711]	SwOn BKP	Switching on threshold backing pump in intermittent mode		40 W	40 W	55 W | MVP 015 62 W | MVP 030
[P:794]	Param set	Parameter set		1 = extended	1 = extended	1 = extended
[P:795]	Servicelin	Service line		309 = Active rotation speed	309 = Active rotation speed	309 = Active rotation speed
 **[P: 030]**	ValveMode	Configuration gas ballast	with MVP 015	0 = auto	0 = auto	0 = auto
 **[P: 717]**	StdbySVal	Set value rotation speed in standby	with MVP 015	66 %	66 %	66 %

Tbl. 6: Preset setting values for HiCube Eco on delivery

NOTICE

Destruction of the pump due to gases with excessively high molecule masses

When conveying gases with non-permissibly high molecule masses, there is a risk of the turbopump being destroyed.

- ► Make sure the gas mode is set correctly **[P:027]** on the electronic drive unit.
- ► Consult Pfeiffer Vacuum before using gases with larger molecule gases (> 80).

Notes on commissioning the turbo pumping station

1. Release the transport retainer.
2. When using water cooling, note the cooling water feed and flow.
3. When using sealing gas, note the sealing gas feed and flow.

6.2 Switching on the turbo pumping station

Switch on the power supply

- ► Switch on the power supply at the main switch.

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

Put the pumping station into operation

- ►  Switch on the turbo pumping station.

6.3 Operating mode of the turbo pumping station

Using the DCU

1. When using the Pfeiffer Vacuum DCU 002 display and control unit, observe the corresponding operating manual supplied.

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. 7: Description of the key functions of the DCU

6.4 Operation with gas ballast

Steam or moisture from pumped media can condense in the backing pump and hence impair the suction performance. Adding gas ballast can improve the expulsion of condensate. The pumping station reaches the specified final vacuum in a shorter time again.

- The backing pumps MVP 015-4 and MVP 030-3 have an adequately high water vapor tolerance and are not fitted with a gas ballast valve.
- The MVP 015-2 backing pump is equipped with an electronic gas ballast valve.

- The parameters for automatic operation of the gas ballast valve are preset at the factory for normal applications.

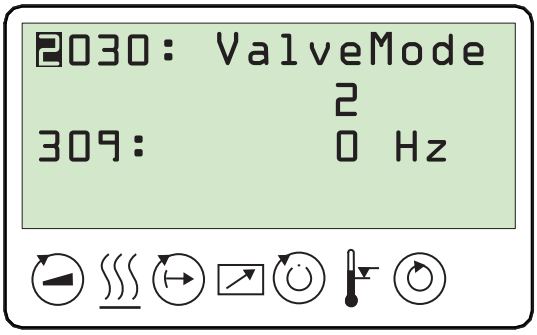


Fig. 12: Display view of second parameter set "ValveMode = open"

Open the gas ballast valve manually with the MVP 015-2

The HiCube Eco turbo pumping station with diaphragm pump MVP 015-2 as the backing pump is equipped with an automatic gas ballast function. If delays in the startup time still occur due to condensate in the fore-vacuum range, Pfeiffer Vacuum recommends opening the gas ballast valve manually.

1. Activate the expanded parameter set (see chapter “Operating mode of the turbo pumping station”, page 32).
2. Switch off the turbo pumping station.
3. Scroll through the entire first parameter set to **[030]: ValveMode**.
4. Press both buttons simultaneously: This will open editing mode.
5. Select the option **"2" = open**.
6. Press both buttons simultaneously: This confirms your selection and exits editing mode.
7. Switch on the turbo pumping station.
8. Operate the turbo pumping station with the gas ballast valve open.
   – Operating duration approx. 15 to 30 minutes.
9. Switch off the turbo pumping station.
10. Select the parameter **[030]: ValveMode**.
11. Press both buttons simultaneously: This will open editing mode.
12. Select the option **"0" = auto**.
13. Press both buttons simultaneously: This confirms your selection and exits editing mode.
14. Switch the turbo pumping station back on.

6.5 Monitoring the operating status

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		currentless
		On, flashing		"Pumping station OFF", speed ≤60 rpm
		On, inverse flashing		"Pumping station ON", nominal speed not reached
		On, constant		"Pumping station ON", nominal speed reached
		On, blinking		"Pumping station OFF", speed >60 rpm
Red		Off		No error, no warning
		On, flashing		Warning
		On, constant		Errors

Tbl. 8: Response and meaning of the LEDs on the DCU

6.5.2 Temperature monitoring

If threshold values are overrun, output signals from temperature sensors allow the pumps to be brought to a safe condition. Depending on pump type, temperature threshold values for warnings and error 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 impermissibly high motor temperature or impermissibly high housing temperature. This can cause the motor to fall below the set rotation speed switchpoint and so result in switching off of the pump.
- In the event of a non-permissibly high temperature (> 75 °C) of the backing pump, the motor speed is reduced to nominal rotation speed to prevent the pump overheating. After cooling down (< 72° C), the pump begins to run again at the set rotation speed.

6.6 Switching off and venting

Recommendation

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

6.6.1 Switching off the turbo pumping station

Take the pumping station out of operation

► Switch off the turbo pumping station.

Switch off the power supply

► Switch off the complete power supply at the main 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 (standard design)

1. Ensure that the vacuum system is switched off.
2. Open the black venting screw on the turbopump by one rotation.
3. Wait for the pressure to equalize to atmospheric pressure in the vacuum system.
4. Close the venting screw again.

Vent with the Pfeiffer Vacuum venting valve (accessories)

The Pfeiffer Vacuum venting valve is closed without current. Control is carried out via the electronic drive unit of the turbopump and the parameter settings of **[P:012]** and **[P:030]**.

In the event of a power failure, the turbopump continues to run on, providing sufficient energy to initiate a correct venting process. When power is restored, the venting process is interrupted.

Venting speed [P:720]	Venting duration [P:721]	Venting duration on power failure
50 % of the nominal rotation speed	3600 s	3600 s

Tbl. 9: Factory settings for delayed venting with turbopumps

► Switch off the turbopump via the control unit or the remote control.
  – The venting process starts automatically.

General notes for rapid venting

Pfeiffer Vacuum recommends performing the rapid venting of larger volumes in 2 stages.

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

7 Maintenance

7.1 General maintenance information

⚠ WARNING

Danger of death from electric shock during servicing and maintenance work

The device is only free of voltage with the mains plug disconnected and the turbopump at a standstill.

- ► Switch off the main switch prior to starting any work.
- ► Wait for the turbopump to come to a standstill (speed = 0)
- ► Disconnect the mains plug from the device.
- ► Secure the device against accidental restart.

⚠ WARNING

Health risk and potential environmental damage due to toxic contaminated parts or devices

Toxic process media result in contamination of the devices or parts thereof. During maintenance work there is a health risk due to contact with these poisonous substances. The non-permitted disposal of toxic substances results in environmental damage.

- ► Take appropriate safety precautions and avoid health risks or environmental hazards due to toxic process media.
- ► Decontaminate the affected parts before carrying out maintenance work.
- ► Wear protective equipment.

7.2 Maintenance intervals and responsibilities

Instructions for performing maintenance activities

1. Perform the required maintenance on the components of the pumping station in accordance with the instructions in the individual operating manuals.
2. Clean the pumping station externally with a lint-free cloth cloth and a little industrial alcohol.
3. Clarify shorter maintenance intervals for extreme loads or contaminated processes with Pfeiffer Vacuum Service.
4. For all other cleaning, maintenance or repair work, please contact your Pfeiffer Vacuum service point.

7.3 Removal of components for their maintenance

Maintenance work performed by the customer on the pumping station's components may require the components to be removed 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.

- ► 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 (only with MVP-30-3)

Tbl. 10: Preset accessory connections on the HiCube Eco

7.3.1 Dismantling connections

Safely disconnect the device from the mains before performing any work

1. Switch the equipment off.
2. Wait until all components have come to a complete standstill.
3. Switch off the main switch.
4. Disconnect the mains plug from the equipment.

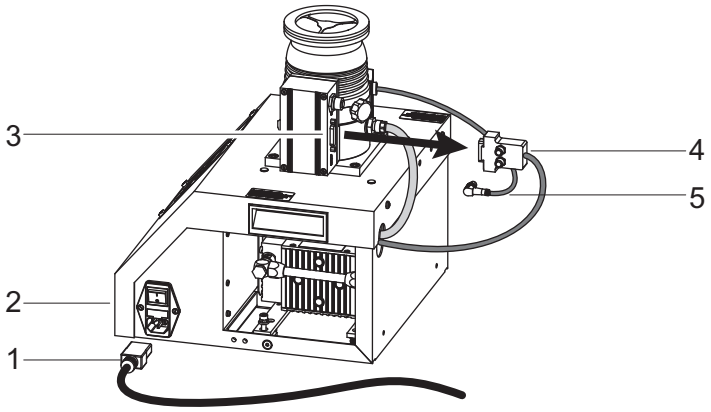


Fig. 13: Removing HiCube Eco connections

1	Mains cable	4	Connecting cable connector
2	Main switch	5	Accessories control cable
3	Multi-functional connection "X3"		

1. Remove the connector from the multi-functional connection on the electronic drive unit of the turbopump.
2. Unfasten and remove the accessories control cables from the connector.

7.3.2 Removing the turbopump

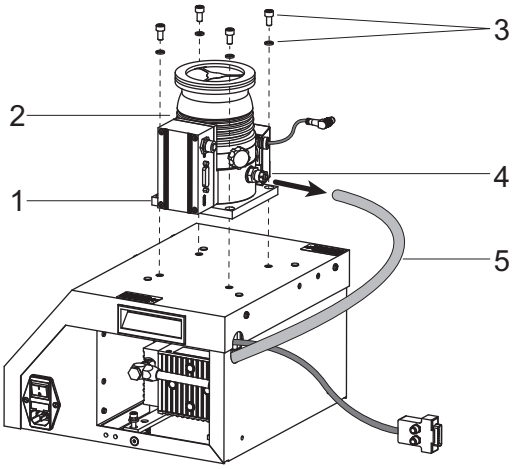


Fig. 14: HiCube Eco | Dismantling the turbopump

1	Mounting plate	4	Fore-vacuum connection
2	Turbopump, complete	5	Fore-vacuum line
3	Retaining bolt with washer		

1. Unfasten and remove the fore-vacuum line from the turbopump.
2. Ensure that the fore-vacuum hose is not bent or damaged.
3. Unscrew all retaining bolts (x4) and washers from the mounting plate.

– Tightening torque of the retaining bolts during subsequent assembly: **10 Nm**.

4. Remove the entire turbopump with mounting plate from the frame.

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

8 Decommissioning

8.1 Shutting down for longer periods

Procedure for an extended standstill of the turbo pumping station

1. Remove the pumping station from the vacuum system where necessary.
2. Replace the operating fluid reservoir of the turbopump where necessary.
3. Seal the flange openings using the original protective covers.
4. Only store the pumping station in indoor areas at temperatures between -10 °C and +40 °C.
5. In rooms with a humid or caustic atmosphere: Seal the pumping station airtight in a plastic bag together with a drying agent.

8.2 Recommissioning

NOTICE

Damage to the turbopump due to excessive aging of the operating fluid after recommissioning

The storage capacity of the operating fluid in the turbopump is limited. Excessive aging of the operating fluid can result in the ball bearings failing and cause damage to the turbopump.

► Observe the usable service life of the operating fluid:
  - Without operation, maximum of 2 years,
  - Following operating and standstill times, 4 years in total.

► Observe the maintenance instructions and inform Pfeiffer Vacuum Service.

Procedure for recommissioning the pumping station

1. Check the pumping station for contamination and humidity.
2. Clean the pumping station externally with a lint-free cloth cloth and a little industrial alcohol.
3. Have the pumping station thoroughly cleaned by Pfeiffer Vacuum Service as necessary.
4. Have the pumping station components serviced by Pfeiffer Vacuum Service as necessary.
5. Install the pumping station in accordance with these instructions (see chapter “Installation”, page 19).
6. Put the pumping station back into operation in accordance with these instructions (see chapter “Commissioning”, page 31).

8.3 Disposal

⚠ WARNING

Health risk and potential environmental damage due to toxic contaminated parts or devices

Toxic process media result in contamination of the devices or parts thereof. During maintenance work there is a health risk due to contact with these poisonous substances. The non-permitted disposal of toxic substances results in environmental damage.

► Take appropriate safety precautions and avoid health risks or environmental hazards due to toxic process media.
► Decontaminate the affected parts before carrying out maintenance work.
► Wear protective equipment.

► Dispose all substances safely and in accordance with the locally applicable regulations.

9 Malfunctions

9.1 General

Malfunctions on the pumping station are usually caused by faults on individual components. LEDs on the turbo pump and backing pump indicate the operating conditions for the corresponding device.

- The DCU display and control unit displays basic operating conditions of the pumping station (see chapter “Operating mode display via LED”, page 33).
- Operational faults are indicated by the DCU with an output of an error code on the display.

9.2 Troubleshooting

Problem	Possible causes	Remedy
Pumping station will not start up. None of the LEDs on the DCU is lit.	• Electrical supply interrupted	1. Check the supply lines to the pumping station. 2. Check the 24 V DC output voltage on the "DC out" connection of the integrated power supply. 3. Check the plug-in contacts on the power supply. 4. Check the connection cable between the power supply, backing pump and turbopump.
	• Incorrect operating voltage	1. Observe the specifications on the rating plate. 2. Apply the correct operating voltage.
	• No operating voltage applied	1. Apply the operating voltage
	• Electronic drive unit defective	1. Replace the electronic drive unit according to the operating instructions for the turbopump. 2. Inform Pfeiffer Vacuum Service.
Pump not achieving the required final pressure.	• Condensate in the backing pump	1. **Only with MVP 015-2:** Open the gas ballast valve on the backing pump (see chapter “Operation with gas ballast”, page 32).
	• Gas ballast valve open	1. **Only with MVP 015-2:** Close the gas ballast valve on the backing pump (see chapter “Operation with gas ballast”, page 32).

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	Problem	Possible causes	Remedy
E040	Hardware fault	• External RAM faulty	• Contact Pfeiffer Vacuum Service.
E042	Hardware fault	• EPROM checksum	• Contact Pfeiffer Vacuum Service.
E043	Hardware fault	• E^2PROM write error	• Contact Pfeiffer Vacuum Service.
E090 **	Internal device error	• RAM insufficient • DCU is connected to the wrong pump electronics	• Contact Pfeiffer Vacuum Service. • Connect the correct pump electronics

Display	Problem	Possible causes	Remedy
E698	Communication error	• Electronic drive unit not responding	• Contact Pfeiffer Vacuum Service.
F110	Pressure gauge	• Transmitter faulty • Connection to the transmitter disconnected during operation	• Restart with connected measuring tube • Replace the pressure measuring tube • Install the pressure measuring tube correctly

Tbl. 11: Error displays and warnings for the DCU display and control unit

Display	Problem	Possible causes	Remedy
E001	Overspeed		• Call Pfeiffer Vacuum Service • Only acknowledge for rotational speed f = 0
E002	Overvoltage	• Incorrect power pack used	• Check power pack type • Check partial mains voltage
E006	Run-up fault	• Run-up time threshold set too low • Gas flow in recipient through leaks or open valves • Speed-control switching point not reached upon expiration of run-up time	• Adjust run-up time to process conditions • Check recipient for leakage and closed valves • Adjust speed-control switching point
E007	Insufficient operating fluid	• Insufficient operating fluid	• Check operating fluid • Only acknowledge for rotational speed f = 0
E008	Connection from electronic drive unit to pump faulty	• Connection to pump faulty	• Check connections • Only acknowledge for rotational speed f = 0
E010	Internal device error		• Call Pfeiffer Vacuum Service • Only acknowledge for rotational speed f = 0
E021	Drive electronics fail to identify pump		• Call Pfeiffer Vacuum Service • Only acknowledge for rotational speed f = 0
E043	Internal configuration error		• Call Pfeiffer Vacuum Service
E044	Excess temperature electronics	• Insufficient cooling	• Improve cooling • Check deployment conditions
E045	Motor overheated	• Insufficient cooling	• Improve cooling • Check deployment conditions
E046	Internal initialization error		• Call Pfeiffer Vacuum Service
E091	Internal device error		• Call Pfeiffer Vacuum Service
E092	Unknown terminal panel		• Call Pfeiffer Vacuum Service
E093	Temperature evaluation on motor is faulty		• Call Pfeiffer Vacuum Service
E094	Temperature evaluation on electronics is faulty		• Call Pfeiffer Vacuum Service
E098	Internal communication error		• Call Pfeiffer Vacuum Service
E107	Combined error for output stage		• Call Pfeiffer Vacuum Service • Only acknowledge for rotational speed f = 0
E108	Speed measurement fault		• Call Pfeiffer Vacuum Service • Only acknowledge for rotational speed f = 0
E109	Software not released		• Call Pfeiffer Vacuum Service
E110	Operating material analysis contains errors		• Call Pfeiffer Vacuum Service • Only acknowledge for rotational speed f = 0

Display	Problem	Possible causes	Remedy
E111	Operating materials pump communication error		• Call Pfeiffer Vacuum Service • Only acknowledge for rotational speed f = 0
E112	Operating materials pump collective fault		• Call Pfeiffer Vacuum Service • Only acknowledge for rotational speed f = 0
E114	Temperature evaluation on output stage is faulty		• Call Pfeiffer Vacuum Service
E117	Excess temperature on pump base	• Insufficient cooling	• Improve cooling • Check deployment conditions
E118	Excess temperature on output stage	• Insufficient cooling	• Improve cooling • Check deployment conditions
E119	Excess temperature on bearings	• Insufficient cooling	• Improve cooling • Check deployment conditions
E143	Operating fluid pump overtemperature	• Insufficient cooling	• Improve cooling • Check deployment conditions • Only acknowledge for rotational speed f = 0
E777	Nominal speed not confirmed	• Nominal speed not confirmed after replacing drive electronics	• Confirm nominal speed with **[P:777]** confirmed • Only acknowledge for rotational speed f = 0
F001	TMS warm-up time elapsed	• Internal timer for warm-up monitoring elapsed	• Check deployment conditions
F003	TMS heating circuit temperature sensor	• TMS temperature not in the permissible range between +5 °C and 85 °C	• Check deployment conditions • Call Pfeiffer Vacuum Service
F007	Undervoltage/mains failure	• Mains failure	• Check power supply
F018	Authorization level conflict	• Pumping station switched on with **[P:010]** while E74 input "start/stop" is off (open)	• Switch on pumping station E74 • **[P:010]** Switch off
F021	Sealing gas signal invalid	• Sealing gas monitoring unit signal outside the valid range	• Check connections for sealing gas monitoring • Check parameter options for accessory outputs
F034	Low sealing gas flow	• Sealing gas monitoring unit signal valid, but below the set threshold **[P:791]**	• Check and improve sealing gas supply • Check deployment conditions
F045	High motor temperature	• Insufficient cooling	• Improve cooling • Check deployment conditions
F076	High electronics temperature	• Insufficient cooling	• Improve cooling • Check deployment conditions
F097	Invalid pump information	• Pump data error	• Factory setting through acknowledgment
F098	Insufficient pump information	• Connection to pump faulty	• Call Pfeiffer Vacuum Service
F100	Speed increased to minimum value	• Permitted specifications for speed setup mode or standby not correct	• **[P:707]** or **[P:717]** • Refer to technical data for the turbopump for valid speed range
F115	Temperature evaluation on pump base is faulty		• Call Pfeiffer Vacuum Service
F116	Temperature evaluation on bearings is faulty		• Call Pfeiffer Vacuum Service

Display	Problem	Possible causes	Remedy
F117	High pump base temperature	• Insufficient cooling	• Improve cooling • Check deployment conditions
F118	High output stage temperature	• Insufficient cooling	• Improve cooling • Check deployment conditions
F119	High bearing temperature	• Insufficient cooling	• Improve cooling • Check deployment conditions
F143	High temperature of operating materials pump	• Insufficient cooling	• Improve cooling • Check deployment conditions
F168	High delay	• Pressure increase speed too high; venting rate too high	• Check and adjust venting rate on pump-specific basis

Tbl. 12: Error and warning messages for the drive electronics of the turbopump

Display	Problem	Possible causes	Remedy
E042	Software inconsistent	Checksum error	• Call Pfeiffer Vacuum Service
E091	Hardware unknown		• Call Pfeiffer Vacuum Service
E098	Internal communication error between the interface board and drive		• Call Pfeiffer Vacuum Service
E117	Excess temperature pump	• Insufficient cooling	• Improve cooling • Check deployment conditions
E173	Overcurrent on pump		
E174	Pump blocked		

Tbl. 13: Error and warning messages for the drive electronics of the diaphragm pump MVP 015

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.

Our intention is always to optimize our core expertise, servicing vacuum components. After the purchase of a product from Pfeiffer Vacuum, our service is still far from over. Often that's precisely where it starts. Naturally with proven Pfeiffer Vacuum quality.

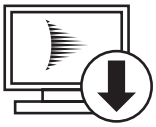
Our professional sales engineers and service technicians stand ready to provide hands-on support to you worldwide. Pfeiffer Vacuum offers a complete portfolio of service offerings, ranging from genuine spare parts right through to service agreements.

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:



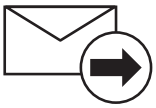
1. Download the current form templates.
   - Declaration of Service Request
   - Service Request
   - Declaration of Contamination

a. Dismantle all accessories (all parts that are not original parts).

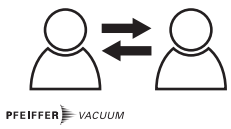
b. Drain the operating fluid/lubricant as necessary.

c. Drain the cooling medium as necessary.

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



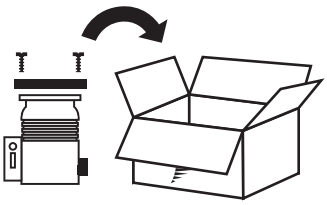
3. Send the forms via email, fax or post to your local Service Center.



4. You will receive a response from Pfeiffer Vacuum.

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 performs decontamination at the **shipper's expense**.



5. Prepare the product for transport in accordance with the details in the declaration of contamination.

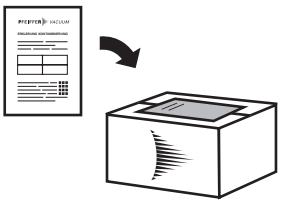
a) Neutralize the pump with nitrogen or dry air.

b) Close all openings airtight.

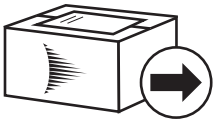
c) Seal the product in appropriate protective film.

d) Only pack the product in suitable, stable transport containers.

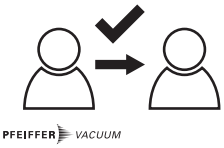
e) Observe the valid transport conditions.



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 from 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

Please note the lists of accessories for the individual components in the corresponding operating manuals or online at pfeiffer-vacuum.com.

12 Technical data and dimensions

12.1 General

This section describes the basic technical specifications on Pfeiffer Vacuum turbopumps.

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

- Specifications according to the PNEUROP Committee PN5
- ISO 27892 2010:"Vacuum technology - Turbomolecular pumps. Measurement of rapid shutdown torque"
- ISO 21360 2007: "Vacuum technology — Standard methods for measuring vacuum-pump performance — General description"
- ISO 5302 2003: "Vacuum technology - Turbomolecular pumps - Measurement of performance characteristics"
- End pressure with test dome after 48 hours of heating
- Gas throughput with water cooling; backing pump = rotary vane pump (10 m^3/h)
- Cooling water consumption at maximum gas throughput, cooling water temperature 25 °C
- Integral leakage rate with helium concentration 100 %, measuring period 10 s
- Sound pressure level at distance from pump = 1 m

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

Tbl. 14: Conversion table: Pressure units

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

Tbl. 15: 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 · 10^{-7} hPa	< 1 · 10^{-7} hPa	< 1 · 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 m³/h	0.75 m³/h	1.8 m³/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 %, non-condensing	5-85 %, non-condensing	5-85 %, non-condensing
Weight	11.7 kg	13.4 kg	13.3 kg

Tbl. 16: Technical data for 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 · 10^{-8} hPa	< 1 · 10^{-8} hPa	< 1 · 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 m³/h	0.75 m³/h	1.8 m³/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 %, non-condensing	5-85 %, non-condensing	5-85 %, non-condensing
Weight	12.9 kg	14.6 kg	14.5 kg

Tbl. 17: Technical data for 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
Ultimate pressure	< 1 · 10^{-7} hPa	< 1 · 10^{-7} hPa	< 1 · 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 m³/h	0.75 m³/h	1.8 m³/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 %, non-condensing	5-85 %, non-condensing	5-85 %, non-condensing
Weight	11.7 kg	13.4 kg	13.3 kg

Tbl. 18: Technical data for 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 m³/h	0.75 m³/h	1.8 m³/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 %, non-condensing	5-85 %, non-condensing	5-85 %, non-condensing
Weight	12.1 kg	13.8 kg	13.7 kg

Tbl. 19: Technical data for 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 m³/h	0.75 m³/h	1.8 m³/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 %, non-condensing	5-85 %, non-condensing	5-85 %, non-condensing
Weight	13.5 kg	15.2 kg	15.1 kg

Tbl. 20: Technical data for 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 m³/h	0.75 m³/h	1.8 m³/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 %, non-condensing	5-85 %, non-condensing	5-85 %, non-condensing
Weight	12.1 kg	13.8 kg	13.7 kg

Tbl. 21: Technical data for 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
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 m³/h	0.75 m³/h	1.8 m³/h	1 m³/h	0.75 m³/h	1.8 m³/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 %, non-condensing	5-85 %, non-condensing	5-85 %, non-condensing	5-85 %, non-condensing	5-85 %, non-condensing	5-85 %, non-condensing
Weight	17.9 kg	19.6 kg	19.5 kg	17.9 kg	19.6 kg	19.5 kg

Tbl. 22: Technical data for 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	< $1 \cdot 10^{-7}$ hPa	< $1 \cdot 10^{-7}$ hPa	< $1 \cdot 10^{-7}$ 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 m³/h	0.75 m³/h	1.8 m³/h	1 m³/h	0.75 m³/h	1.8 m³/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 %, non-condensing	5-85 %, non-condensing	5-85 %, non-condensing	5-85 %, non-condensing	5-85 %, non-condensing	5-85 %, non-condensing
Weight	15.9 kg	17.6 kg	17.5 kg	15.9 kg	17.6 kg	17.5 kg

Tbl. 23: Technical data for HiCube 300 Eco, DN 100 ISO-K

12.3 Dimensioned drawings

All dimensions given in mm

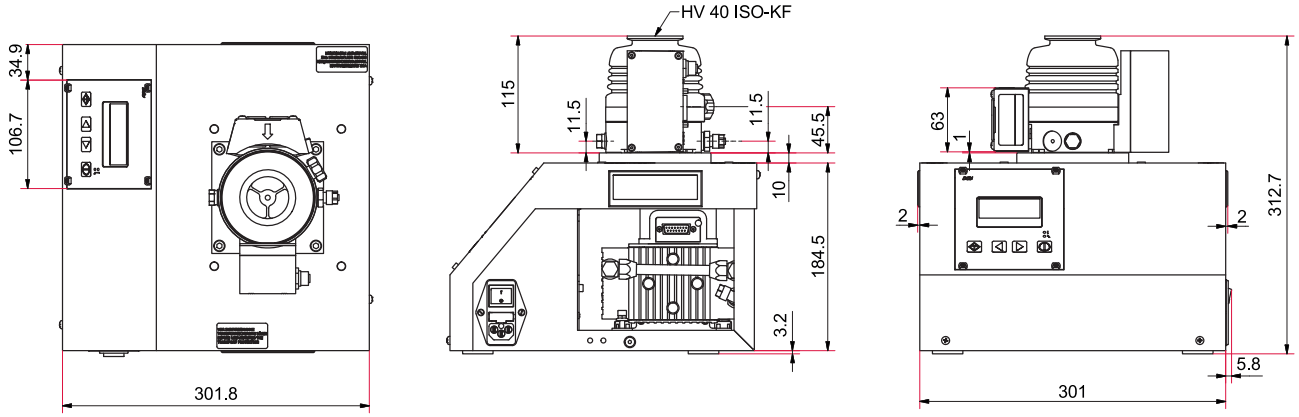


Fig. 15: Dimensions of HiCube 30 Eco, DN 40 ISO-KF

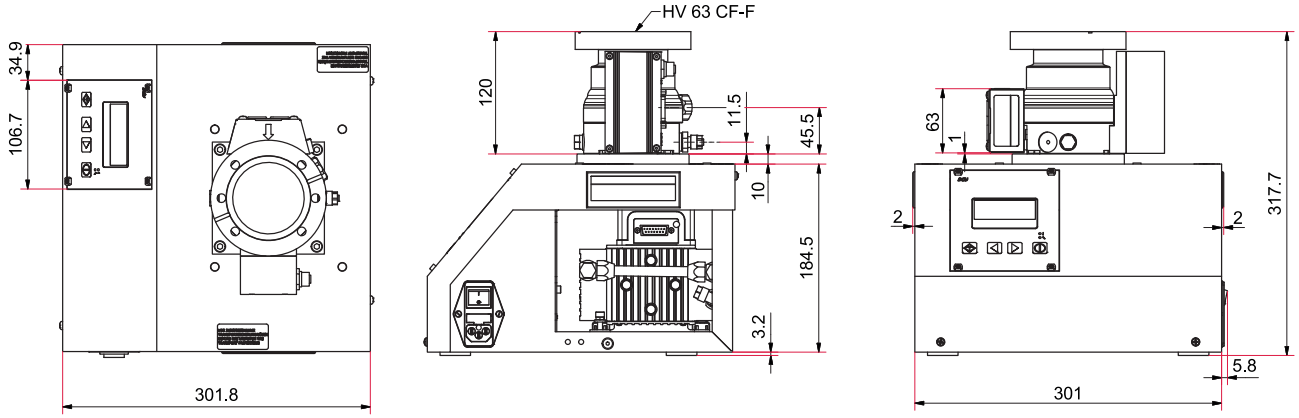


Fig. 16: Dimensions of HiCube 30 Eco, DN 63 CF-F

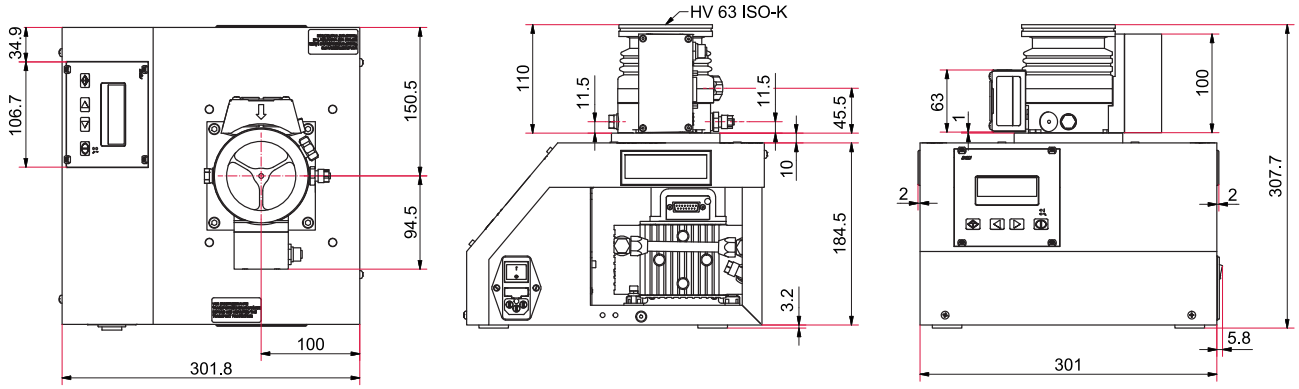


Fig. 17: Dimensions of HiCube 30 Eco, DN 63 ISO-K

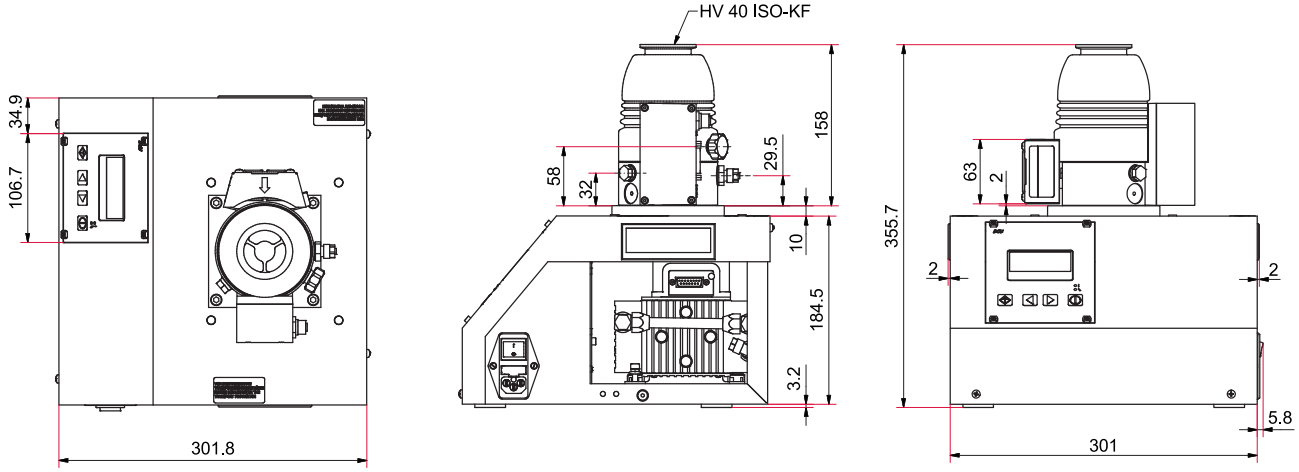


Fig. 18: Dimensions of HiCube 80 Eco, DN 40 ISO-KF

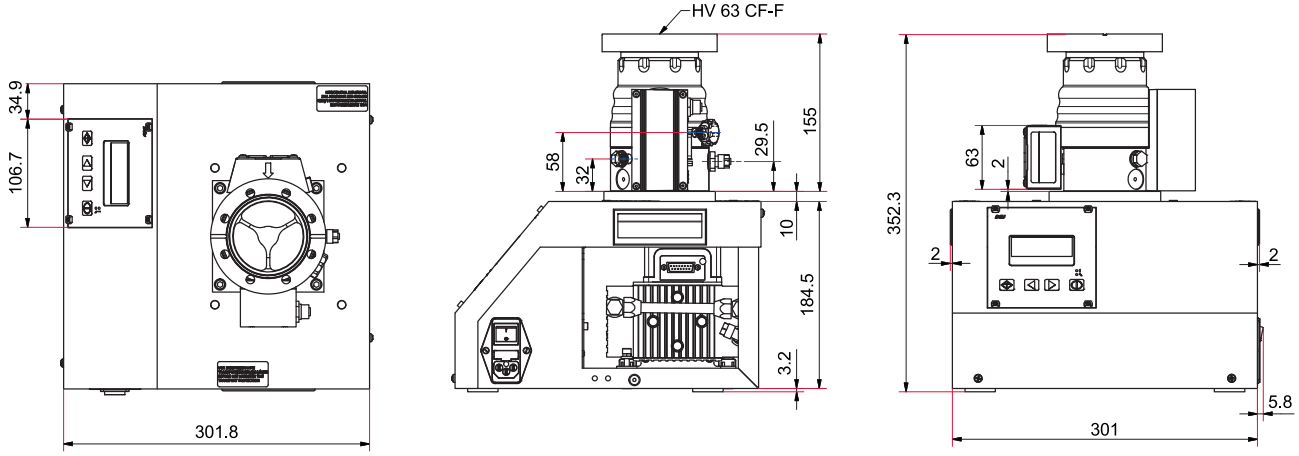


Fig. 19: Dimensions of HiCube 80 Eco, DN 63 CF-F

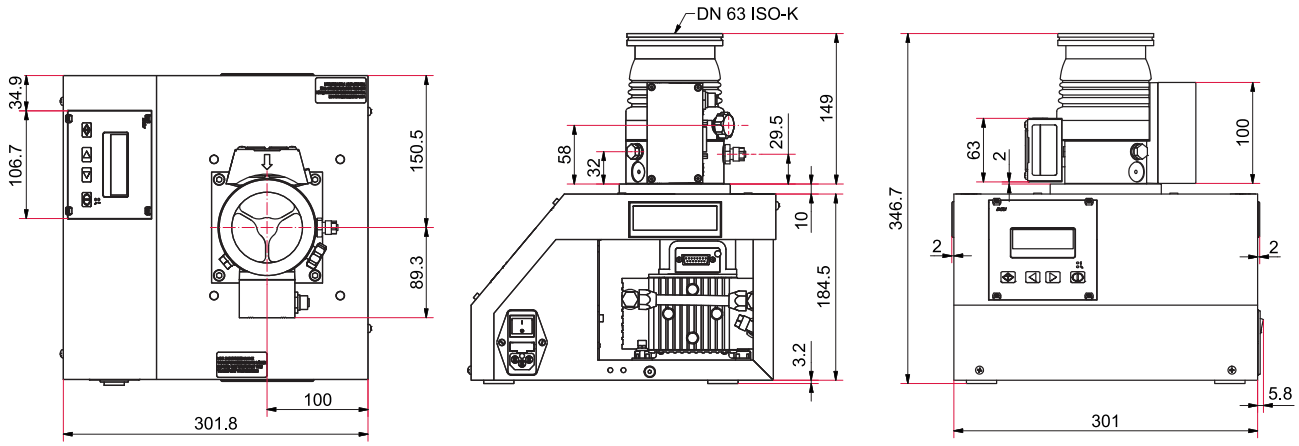


Fig. 20: Dimensions of HiCube 80 Eco, DN 63 ISO-K

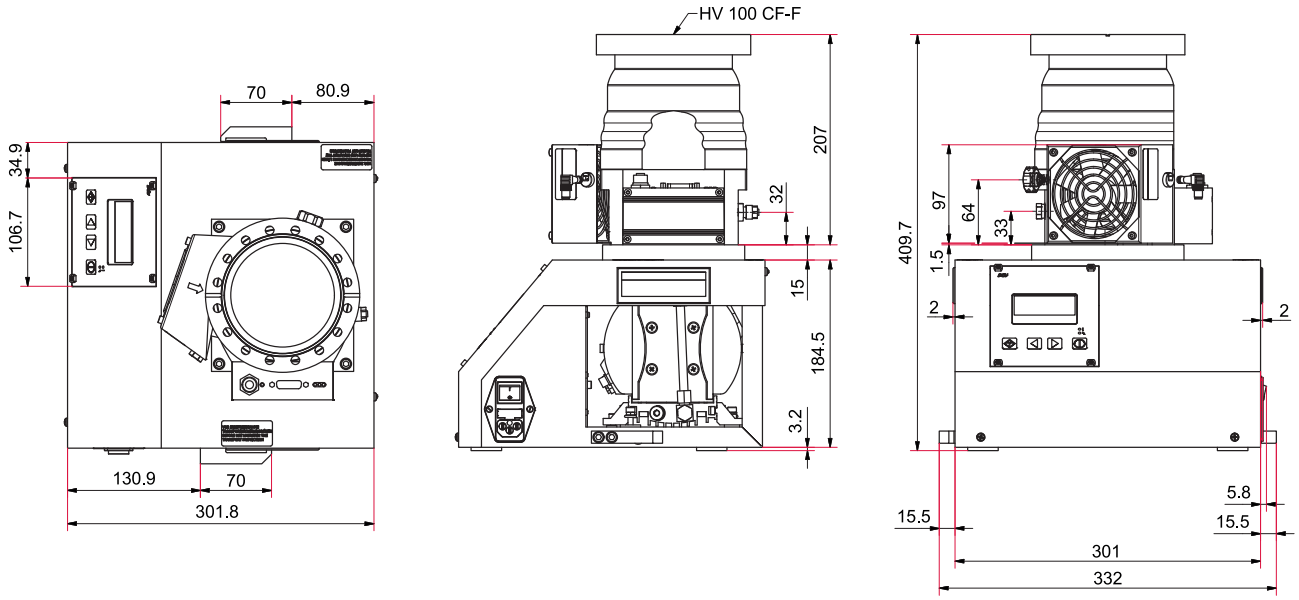


Fig. 21: Dimensions of HiCube 300 Eco, DN 100 CF-F

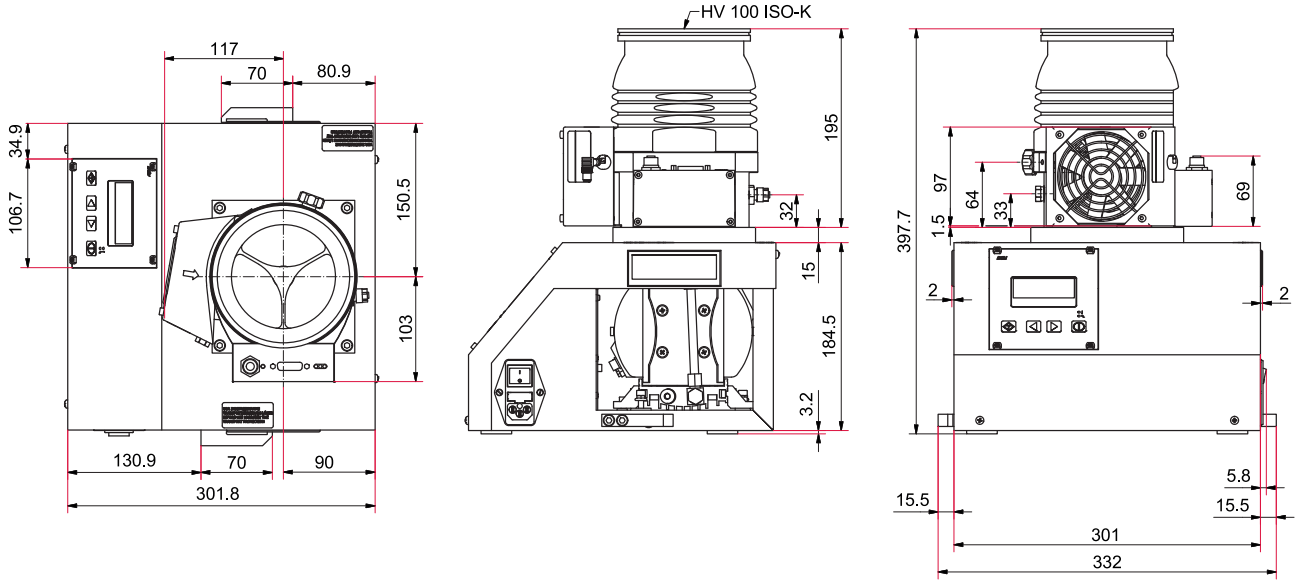


Fig. 22: Dimensions of HiCube 300 Eco, DN 100 ISO-K

Declaration of Conformity

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

- **Machinery 006/42/EC (Appendix II, No. 1 A)**
- **Electro-magnetic Compatibility 2014/30/EU**
- **Restriction in the use of certain hazardous substances 2011/65/EU**

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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

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9/10/2016

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