Compact Turbo™
TurboDrag Pump

TMH 261
TMU 261

PFEIFFER *VACUUM*
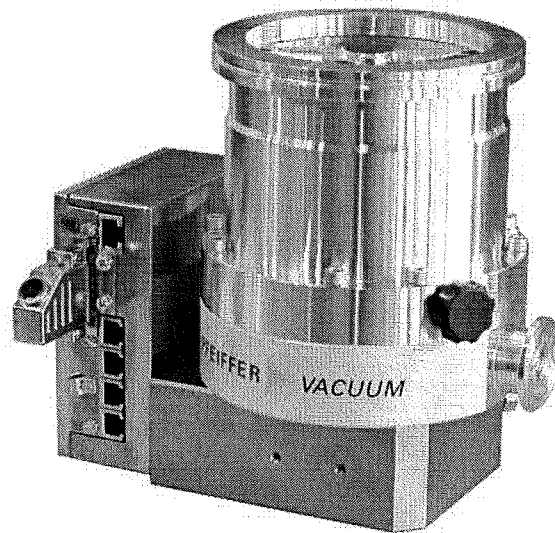
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1 About this manual

1.1 Validity

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

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

Applicable documents

TMH/U 261	Operating instructions
Safety information for vacuum pumps "Safety Guide"	PT 0300 BN*
Operating instructions "Pumping operations with DCU"	PM 0547 BN*
Operating instructions "Pfeiffer Vacuum protocol"	PM 0488 BN*
Manufacturer's declaration	Part of this document
Operating instructions for accessories	see section "accessories"*

*also available via www.pfeiffer-vacuum.net

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

- www.tuvdotcom.com
- TUVdotCOM-ID 0000021320

1.2 Conventions

Safety instructions

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

DANGER
Immediate danger
Death or very severe injuries occur.

WARNING
Possible danger
Death or injuries may occur.

CAUTION
Possible danger
Medium to slight injuries may occur.

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

Piktograph definitions

Prohibition of an action or activity in connection with a source of danger, the disregarding of which may result in serious accidents.

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

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

Instructions in the text

➔ Work instruction: here you have to do something.

Abbreviations used

DCU: Display and operating unit
HPU: Handheld programming unit
TC: Electronic drive unit for turbopump
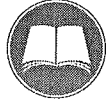**TPS:**Power supply

Symbols used

The following symbols are used consistently throughout the diagrams:

❶ High vacuum flange

Ⓦ Fore-vacuum flange

❶ Venting connection

❸ Cooling water connection

❶ Air cooling

❹ Electric connection

Ⓖ Sealing gas connection

2 Safety

2.1 Safety precautions

NOTE
Duty to inform
Each person involved in the installation, operation or maintenance of the vacuum pump must read and observe the safety-related parts of these operating instructions.
→ Absolute observe the safety information for vacuum pumps (PT 0300 BN) !
→ The operator is obligated to make operating personnel aware of dangers originating from the vacuum pump, the pumped medium and the entire system.
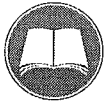
NOTE
Installation and operation of accessories
Pfeiffer Vacuum pumps can be equipped with a series of adapted accessories. The installation, operation and maintenance of connected devices are described in detail in the operating instructions of the individual components.
→ For information on the operating instructions of components, see "Accessories".
→ Use original accessory parts only.

- Do not loosen any plug connection during operations.
- Wait for the rotor to reach standstill before peforming work on the high vacuum flange.
- When using sealing gas, the pressure in the hose connection must be limited to 2 bar via an overpressure valve.
- Keep leads and cables well away from hot surfaces (> 70 °C).
- Always ensure a safe connection to the protective earthing conductor (PE, protection class I).
- Discrete operating of the turbopump and the electronic drive unit is only allowed after authorisation by Pfeiffer Vacuum. In this case the turbopump must be connected to the PE.
- The danger of an electrical shock in the case of ground leakage must be eliminated immediately (red LED flashes).
- Never fill or operate turbopump with cleaning agent.

2.2 Proper use

NOTE
CE conformity
The manufacturer's declaration becomes invalid if the operator modifies the original product or installs additional components!
→ Following installation into a plant and before commissioning, the operator must check the entire system for compliance with the valid EU directives and reassess it accordingly.

- Only operate the turbopump with a prooved backing pump.
- Only operate the turbopump with TC by a specified Pfeiffer Vacuum power supply. The use of other power units than the intended, is only permitted after consultation with Pfeiffer Vacuum.
- Only operate the turbopump with TC 600 in ambient conditions up to protection class IP 30.
- Only operate the turbopump together with a water cooling unit or in ambient conditions up to protection class IP 54 after installing a specified TC cover plate.

2.3 Improper use

Improper use will cause all claims for liability and guarantees to be forfeited. Improper use is deemed to be all use for purposes deviating from those mentioned above, especially:

- Pumping of corrosive or explosive media.
- Pumping of condensing vapors.
- Operation with improper high levels of gas loads.
- Operation with improper high fore-vacuum pressures.
- Operation with improper gas mode.
- Operation with improper high levels of insulated heat input.
- Venting with improper high venting rates.
- Operation of the pump in potentially radioactive areas.
- Installation in systems where the turbopumps are subjected to impact-like stress and vibrations or the effect of periodically occurring forces.
- The connection to a power supply with earthing of a direct voltage pole.
- The use of accessories, which are not named in this manual or not authorised by Pfeiffer Vacuum.

3 Transport and storage

3.1 Transport

→ Reuse the transport container. Vacuum pumps should be transported or shipped in the original packing only.

→ Only remove the protective covers from the high vacuum and the fore-vacuum side immediately before connection.

→ Preserve the original protective covers.

→ Always transport the turbopump uprightly.

3.2 Storage

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

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

→ Storage the pump only indoors with an ambient temperature between -25 °C and +55 °C.

→ In rooms with moist or aggressive atmospheres, the turbopump must be air-sealed in a plastic bag together with a bag of dessicant.

4 Product description

4.1 Product identification

Pump types

The product designations of Pfeiffer vacuum turbomolecular pumps are self-explanatory and permit conclusions about the different versions. The product designation consists of a family designation (1), the size (2), which is oriented on the pumping speed, and the properties (3) of the pump.

TMH[1] **261**[2] **P**[3]

1. Family designation	2. Model designation	3. Properties
T = Turbopump		U = Upside down version
P = Pure turbopump M = Turbo with Holweck stage	261 = Model designation of the pump related to its pumping speed class	P = Purge sealing gas system M = Magnetic bearing
H = ISO-flange variants for high vacuum applications U = CF-flange variants for ultra-high vacuum applications D = "Drag" pump for the medium vacuum range		C = for corrosive gases H = High throughput T = Temerature management Y = Installation in any orientation N = Integrated power supply

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

PFEIFFER VACUUM
D-35614 Asslar

Mod.: TMH 261 P	Oil: PM 063 265 -T
DN 100 ISO-K, 3P	S(N₂): 210 l/s
Mod.-No.: PM P02 821 H	Mass: 6 kg
Ser. No.:	Made in
	Germany 2006/03 CE
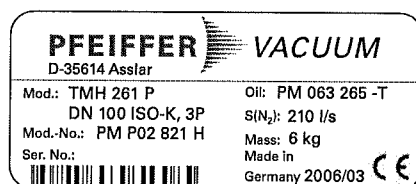
Fig. 1: Example for a rating plate

Standard version

Turbopumps without a property, which concernes to the installation orientation will be characterized as standard version in the following (e.g. TMH 261 P).

Pump features

Characteristics	TMH 261	TMU 261
HV flange	DN 100 ISO-K	DN 100 CF-F

Scope of delivery

- Turbopump
- Protective cover for the high vacuum and the fore-vacuum flange
- Operating instructions

4.2 Function

The turbopumps TMH/U 261 form a complete unit together with the electronic drive unit TC 600. For the voltage supply only Pfeiffer Vacuum power supplies may be used (e.g.TPS oder DCU). The use of other power units than the proper intended is only permitted after consultation with Pfeiffer Vacuum (specification of the power supplies on request).

4 High vacuum flange
8 Electronic drive
unit TC 600
17 Venting screw
20a Fore-vacuum flange
98 Remote plug
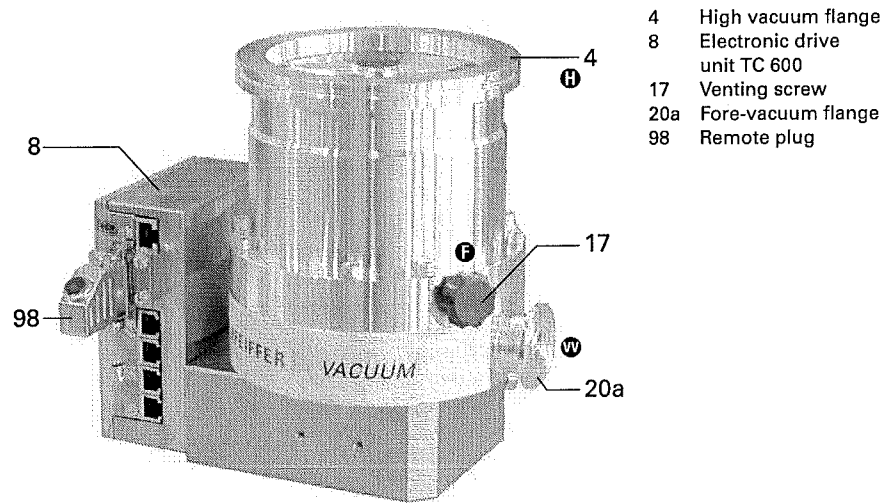
Fig. 2: View of CompactTurbo™ TMH 261

NOTE
Observe the connection instructions!
On delivery turbopumps with TC 600 are set up for operations with "Remote Control".
→ Before operating with DCU, HPU or PC the 15-pole D-Sub connector (remote plug) must be removed from the TC 600.

Cooling

- Air cooling
- Water cooling

In the case of excess temperature the electronic drive unit reduces the rotor rotation speed automatically. Depending on the application and the CompactTurbo™ different cooling variants are selectable.

Rotor bearings

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

4.3 Range of application

The pumps TMH/U 261 must be installed and operated in the following ambient conditions.

Installation location	weather protected (indoors)
Temperature	+5 °C to +40 °C (up to +35 °C with air cooling)
Protection class	IP 30
Relative humidity	max. 80 %, at T ≤ 31 °C, up to max. 50% at T ≤ 40 °C
Atmospheric pressure:	77 kPa - 106 kPa
Installation altitude	2000 m max.
Degree of pollution	2
Permissible surrounding magnetic field	≤ 6 mT
Overvoltage category	II
Connection voltage TC	48 VDC ±5%

5 Installation

⚠️

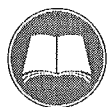| **WARNING** |
|---|
| **Danger from the turbopump being ripped off.**
If the rotor is suddenly blocked, torques of up to 1860 Nm can occur; if the turbopump is not properly fastened, it can be ripped off.
→ Precisely follow installation instructions.
→ Only use original components for the installation. |

NOTE
Installation and operation of accessories Pfeiffer Vacuum pumps can be equipped with a series of adapted accessories. The installation, operation and maintenance of connected devices are described in detail in the operating instructions of the individual components. → For information on the operating instructions of components, see "Accessories". → Use original accessory parts only.

5.1 Set-up

When installing the pump, observe the following conditions:

- The ambient conditions named for the area of use.
- The temperature of the high vacuum flange must not exceed 120 °C.
- The pump may be fastened to the floor only after consultation with Pfeiffer Vacuum.
- The pumps must not be installed in systems in which sporadic loads and vibrations or periodic forces have an effect on the pump.

5.2 Preparatory work

→ Ensure sufficient cooling for the turbopump.

→ Where magnetic fields > 6 mT are involved, a suitable shielding must be used. Check installation location and consult Pfeiffer Vacuum if needed!

→ The maximum permissible rotor temperature for the turbopump is 90 °C. If high temperatures arise for process reasons, the radiated heat input must not exceed 8 W. Install suitable screening sheets, if necessary (design information on request).

5.3 Assembly

- Ensure the greatest possible cleanliness when installing any high vacuum parts. Unclean components prolong the pump-down time.
- All flange components must be grease-free, dust-free and dry at installation.
- The operating fluid reservoir is already installed and filled for the turbopumps TMH/U 261.

Use of a splinter shield or protection screen

The installation of a Pfeiffer Vacuum centering ring with splinter shield or protection screen in the high vacuum flange protects the turbopump against foreign bodies coming from the recipient. The volume flow rate is reduced as followed.

|	Reduced volume flow rate in %		
	H_2	He	N_2
Splinter shield DN 100	5	7	17
Protection screen DN 100	1	2	5

Vibration damper

| CAUTION |
|---|
| **Danger from the pump being ripped off** |
| When a Pfeiffer Vacuum vibration damper is used, suitable safety measures must be taken to compensate for the torques in case of sudden blocking.
→ Definitely consult with Pfeiffer Vacuum.
→ Do not exceed the maximum permitted temperature at the vibration compensator (100°C). |

Mounting orientation

NOTE
Observe type-specific mounting orientations!
Pfeiffer Vacuum CompactTurbo™ pumps may only be installed in specific mounting orientations. Impermissible mounting orientations can result in contamination of the process vacuum or damage to the pump. → Pay attention to the properties code after the model designation on the name plate!
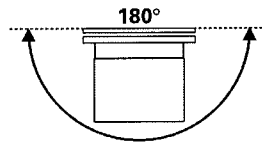
Fig. 3: Permissible installation orientations for standard versions
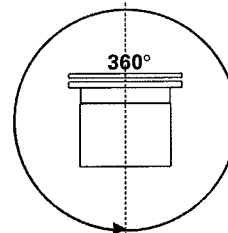
Fig. 4: Installation orientations for turbopumps with "Y" in their properties

Horizontal mounting orientation

20° max
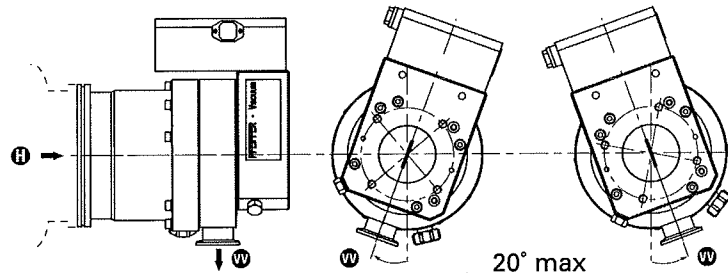
→ For horizontal installation, the fore-vacuum flange must point vertically downward (± 20°), since otherwise the turbopump can be contaminated.

→ Support pipes in front of the pump or remove them. No force from the pipe system may be exerted on the braced turbopump.

The maximum axial loading capacity of the high vacuum flange is 500 N (equals 50 kg). A one-sided load on the high vacuum flange is not permitted.

Installing the high vacuum flange

In the case the rotor is suddenly blocked, the torques arising from the system and the high vacuum flange must be absorbed. Only the components listed in the following can be used to fasten the turbo pumps to the high vacuum flange. The components for installing the turbo pumps are special designs of Pfeiffer Vacuum. Observe the minimum strength of 170 N/mm^2 for the flange material.

NOTE
Possible damage to the pump
If a pump with an ISO-K flange is fastened to a vacuum chamber with an ISO-F flange or if ISO-KF flanges are used, sudden blocking of the rotor can result in twisting despite proper installation.

Installation of ISO-K flange with ISO-K flange

For the installation of the flange connections the following components are available:

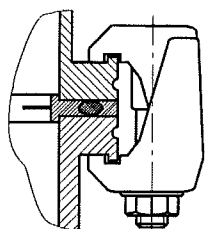| Connection nominal diameter	Designation	Pieces	Ordering No.
DN 100 ISO-K	Centering ring (coated)	1	PM 016 210-U
	Centering ring (coated) with splinter shield	1	PM 016 211-U
	Centering ring (coated) with protective screen	1	PM 016 212-U
	Bracket screw	6	PF 300 110-T

→ Mind that the sealing surfaces are not damaged.
→ Flange the turbopump according to the drawing and together with the component parts in the mounting material kit.
→ Use the required number of bracket screws.
→ Tighten the bracket screws crosswise in three steps.
→ Tightening torque: 5, 15, 25 ±2 Nm

Installation of ISO-K flange with ISO-F flange

For the installation of the flange connections the following components are available:

Connection nominal diameter	Designation	Pieces	Ordering No.
DN 100 ISO-K DN 100 ISO-F	Centering ring (coated)	1	PM 016 210-U
	Centering ring (coated) with splinter shield	1	PM 016 211-U
	Centering ring (coated) with protective screen	1	PM 016 212-U
	Claw grip	8	PF 301 100-T
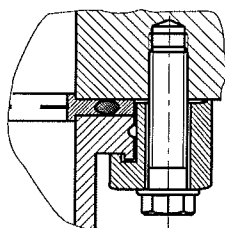
→ Mind that the sealing surfaces are not damaged.
→ Flange the turbopump according to the drawing and together with the component parts in the mounting material kit.
→ Use 8 claw grips.
→ Tighten the claw grips crosswise in three steps.
→ Tightening torque: 3, 10, 16 ±1 Nm.

Installation of CF-flanges

NOTE
Preservation of sealing capacity
Observe the following to preserve sealing capacity:
→ Touch seals only with gloves.
→ Make sure sealing lips are undamaged.

The connection types for installation of CF to CF flange are "stud screw and pocket hole" as well as "hex screw and through hole". The following elements are required:

- A set of mounting material for the respective type of connection
- A copper seal
- A protective screen or splinter shield can optionally be used

Nominal connection diameter	Designation	Ordering no.
DN 100 CF-F	Hexagon bolt M8 with washer and nut (25 pieces)[1]	PF 505 003-T
	Stud screw M8 with washer and nut (25 pieces)[1]	PF 507 003-T
	Copper seal (10 pieces)[1]	PF 501 410-T
	Copper seal, silvered (10 pieces)[1]	PF 501 510-T
	Splinter shield[2]	PM 016 315
	Protective screen[2]	PM 016 336

[1]number of pieces in bracket is the delivery quantity
[2]insert in the high vacuum flange with the clamping lugs towards the pump

Stud screw and pocket hole
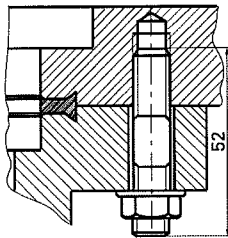
➜ If used: Insert protective screen or splinter shield with the clamping lugs downward into the high vacuum flange.
➜ Place the seal exactly in the hollow.
➜ Connect the flange using **16** stud screws (M8) with washers and nuts and tighten circularly with a torque of 22 ±2 Nm. After this, check the torque, since flowing of the sealing material may make it necessary to tighten the screws.

Hexagon screw and through hole
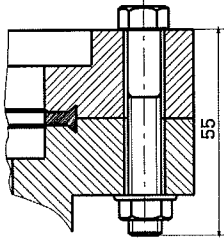
➜ If used: Insert protective screen or splinter shield with the clamping lugs downward into the high vacuum flange.
➜ Place the seal exactly in the hollow.
➜ Connect the flange using **16** hex screws (M8) with washers and nuts and tighten circularly with a torque of 22 ±2 Nm. After this, check the torque, since flowing of the sealing material may make it necessary to tighten the screws.

5.4 Connections to the turbopump
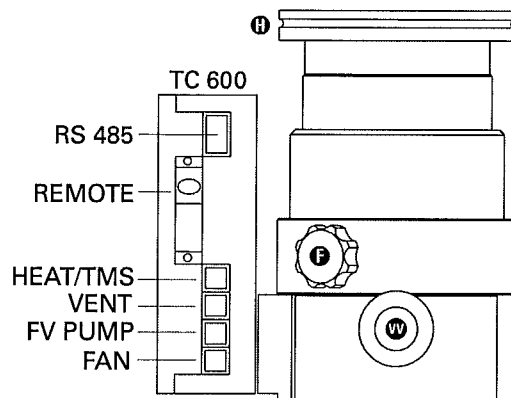
Fig. 5: Connection designations for turbopumps with electronic drive unit TC 600

Connecting the fore-vacuum side

Recommendation: As backing pump, use a dry-compressing diaphragm pump or rotary vane pumps from the Pfeiffer Vacuum programme. The backing pump must generate a vacuum pressure of ≤ 5 mbar.

WARNING
Damage to health due to poisonous gases
Process gases can damage health and contaminate the environment.
→ Safely guide away the gas emission from the backing pump!
→ Observe all safety recommendations of the gas producer.

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

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

→ The backing pump is connected electrically via a relay box. Insert the control line of the relay box into the "FV PUMP" connection of the TC 600 .

Cooling

Pfeiffer Vacuum turbopumps must be cooled by means of air or water cooling.

• When operating the pump with more than 50 % of the maximum gas load, sealing gas must be used to ensure rotor cooling.

• In case of increased backing pressure (> 0.1 mbar) and/or operation with gas loads, either air or water cooling may be used.

• Generally use water cooling if the ambient temperature is > +35 °C.

→ Connect air cooling for the corresponding pump type in accordance with the accessory's operating manual.

→ Connect water cooling for the corresponding pump type in accordance with the accessory's operating manual.

Venting valve

The TVF 005 venting valve is used for automatic flooding in case of shut-down or power failure. The maximum permissible pressure at the venting valve is 1.5 bar absolute.

Installation of the venting valve

→ Unscrew the venting screw from the venting connection of the turbopump.

→ Screw in the venting valve with seal ring.

Electrical connection

→ Plug the control lead of the venting valve in accordance with the accessory's operating instructions.

→ Select the venting mode of the venting valve via the DCU, HPU or serial interface RS485.

Casing heating unit

The turbopump and vacuum chamber can be heated to reach the final pressure more quickly. Use of a casing heating unit makes sense only for pumps with the high vacuum flange in stainless steel design. The heating duration depends on the degree of contamination as well as the final pressure to be reached and should be at least 4 hours.

CAUTION
Dangerous excess temperatures
Process-related high temperatures can result in impermissible excess temperatures and thus damage to the turbopump.
→ Always use water cooling when a casing heating unit is used.

WARNING
Danger of burns
High temperatures arise when the turbopump or vacuum chamber are baked out. As a result, there is a danger of burns from touching hot parts, even after the housing heater is switched off!
→ Thermally insulate heating sleeve, pump housing and vacuum chamber, if possible during installation.
→ Do not touch heating sleeve, pump casing and vacuum chamber during bake out.

→ Connect the casing heating for the corresponding pump type in accordance with the accessory's operating manual.

Sealing gas valve

Only pumps with the pump designation **P** (see rating plate) are equipped for connection of sealing gas. The turbopump must be operated with sealing gas to protect it, such as in the case of corrosive or dusty processes. The connection is made via a sealing gas valve.

3	Pump lower part
3a	Sealing gas connection
3b	Locking screw
3c	O-ring
3d	Sealing gas valve
3e	O-ring
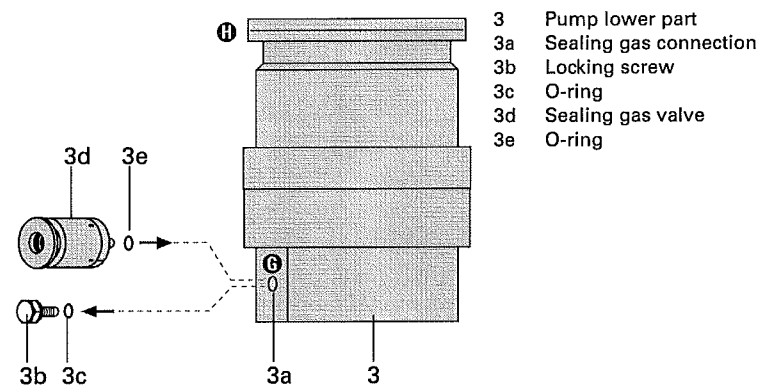
Fig. 6: Connecting the sealing gas valve

→ Unscrew the screw plug with sealing ring out of the sealing gas connection of the turbopump.

→ Screw the sealing gas valve with seal ring into the purge gas connection.

→ Obtain details on adjusting the sealing gas quantity from the corresponding operating manual.

- When operating the pump with more than 50 % of the maximum gas load, sealing gas must be used to ensure rotor cooling.

Connecting the electronic drive unit to the power supply

The turbopumps CompactTurbo™ TMH/U 261 form a single unit with the electronic drive unit. For voltage supply, use only Pfeiffer Vacuum power supplies (e.g. TPS 200 or DCU 200). Use other power supplies only after consultation with Pfeiffer Vacuum and comparison with valid specifications (specifications of the power supplies on request).

WARNING
Danger of electric shock
In case of defect, the parts connected to the power supply are under voltage.
➔ Always keep the mains connection freely accessible so you can disconnect it at any time.
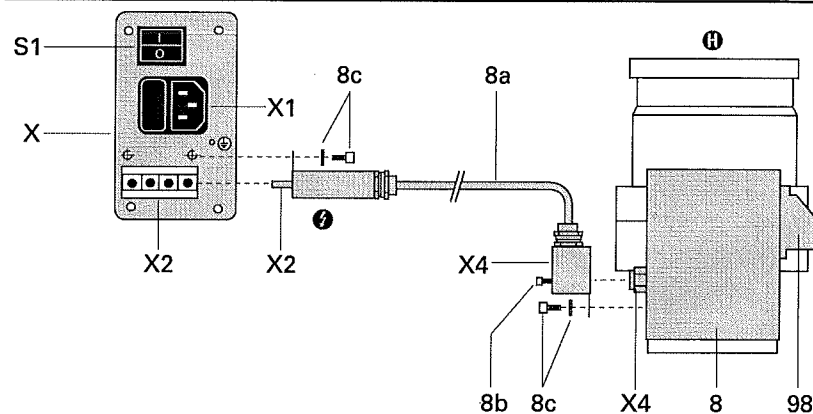
Fig. 7: TC 600 connection to power supply TPS or DCU, installation drawing for shielded cable

8	Electronic drive unit	X	Power supply unit TPS or DCU
8a	Connecting cable TC 600 - TPS/DCU	X1	Mains connection TPS/DCU
8b	Screw	X2	Connection connecting cable - TPS/DCU
8c	Screw with lock washer	X4	Connection connecting cable - TC
98	Remote plug	S1	Switch ON/OFF

➔ Unscrew the screw with lock washer 8c from the TC 600 (below connection X4).[1]

➔ Insert the X4 plug on the 8a connection cable into the X4 connection on the TC 600 and screw in the 8b screw.

➔ Fasten the X4 plug to the TC 600 with a screw and lock washer 8c.[1]

➔ Connect the X2 plug on the 8a connection cable to the TPS 200/DCU 200 power supply pack at the X2 connection.

➔ Fasten the X2 plug to the power supply with a screw and lock washer 8c (included with the cable).[1]

[1] Only for PM 051 843 -T shielded connection cable (see p. 33, chap. 12).

After operating voltage is applied, the TC 600 performs a self-test to check the supply voltage. The supply voltage for the turbopumps TMH/U 261 is 48 VDC ± 5% in accordance with standard EN 60 742.

5.5 Connecting Pfeiffer Vacuum display and control units or PC

NOTE
Observe the connection instructions!
On delivery turbopumps with TC 600 are set up for operations with "Remote Control".
→ Before operating with DCU, HPU or PC the 15-pole D-Sub connector (remote plug) must be removed from the TC 600.
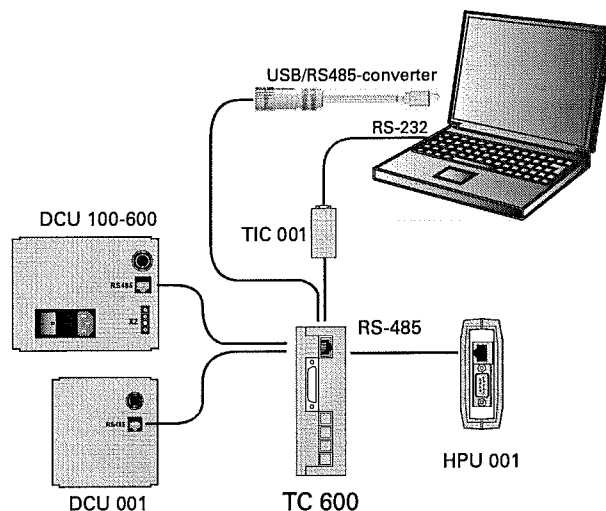
Fig. 8: Connecting the serial interface RS485

An external operating part (DCU **or** HPU 001) **or** an external computer can be connected via the connection with the designation "RS485" on the electronic drive unit. The interface is securely separated galvanically from the maximum occurring supply voltage of the TC 600. The electrical couplings are optically decoupled internally.

Connections

The connection of a RS232- oder USB-interface is possible via a TIC 001 or the USB/RS485-converter.

Designation	Value
Serial interface	RS485
Baud rate	9600 Baud
Data file word length	8 bit
Parity	keine (no parity)
Start bits	1
Stop bits	1..2

Pin	Assignement
1	not connected
2	+24 V output ladable with ≤ 210 mA
3	not connected
4	not connected
5	RS485: D+
6	Gnd
7	RS485: D-
8	not connected

1 8

Cross-linking via the connection RS485
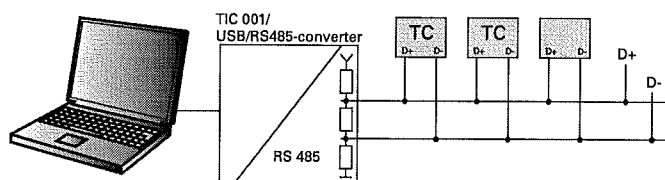
CAUTION
Danger of electric shock
The insulation measures of the bus system are designed only for use with safety extra-low voltage.
→ Connect only suitable devices to the bus system.

→ The connections must be made in accordance with the specification of the interface RS485.

→ Connect all units with D+ (pin 5 / RS485) and D- (pin 7 / RS485) to the bus.

- The group address of the TC 600 is 960.
- All units connected to the bus must have differing serial interface addresses (parameter 797).
- All switched on remote functions have priority over the serial interface functions.
- Refer to the component operating instructions for detailed information concerning operation procedures and electrical data of the interface RS485.

NOTE
Connection to an external bus system
The integration into an external bus system (e.g. Profibus DP, DeviceNet) is possible via connection gateway TIC 250 or TIC 260. Thus a synchronous use of interface RS485 on the TC 600 is not possible.

5.6 Connecting the remote control
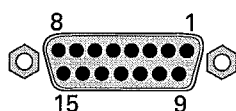
Remote control options are provided via the 15-pole D-Sub connector with the designation "REMOTE" on the TC 600. The inputs 2 - 6 are activated by connecting them with +24 V at Pin 1 (active high) *(see p. 19, chap. 5.7)*. When connecting supply voltage the turbopump is started.

- **On delivery: Pin 1, Pin 2, Pin 3 and Pin 4 are bridged in the remote plug.**

→ Shielded cable must be used.
→ Connect the shielding on the plug side for the TC 600 to the TC housing.

Pin assignment and function of the remote plug

Reference voltage

Pin	Function		
1	+24 V	Reference voltage level for all remote in and outputs	
10	Ground	Ground potential for all remote in- and putputs	

Inputs

Pin	Function	Open (low)	Closed (high)
2	Venting release	Venting blocked	Venting released
3	Motor turbopump	Motor off	Motor on: the turbopump is driven, current flows through the motor coils

Pin	Function	Open (low)	Closed (high)
4	Pumping station	Pumpstand aus	Pumping station on: the turbo-pump is driven, backing pump control via relay box, the air cooling unit runs
5	Heating	Heizung aus	Heating on: the heating is switched on once the rotation switchpoint is attained. The heating is switched off, if the rotation switchpoint is not attained
	Option: Sealing gas connection control[1]	Sealing gas valve closed	Sealing gas valve open
	Reset		Reset: by supplying a pulse (T< 2s) with an amplitude of 24V a malfunction acknowledgement can be processed
6	Standby	Standby off	The turbopump is controlled to 66% of its nominal rotation speed
7	Rotation speed setting mode	Rotation speed setting mode is off	The rotation speed can be modified by feeding a PWM signal to this pin or via RS485[1]

[1] The option must be set via serial interface RS485 (refer to operating instructions PM 0547 BN, Pumping Operation With DCU)

Outputs

Pin	Function	Open (low)	Closed (high)
8	Switching output 1	Rotation speed switchpoint not attained	Rotation speed switchpoint attained; output can be loaded with 24 V/50 mA
9	Switching output 2	Collective malfunction message	failure-free operation; output can be loaded with 24 V/50 mA
11	Contact output 1	Rotation speed switchpoint not attained	contact[2] between Pin 11 and Pin 12 is closed, if the rotation switchpoint is exceeded
12	Contact output 1		
13	Contact output 2	Collective malfunction message	contact[2] between Pin 13 and Pin 14 is closed at failure-free operation
14	Contact output 2		
15	Analog output	Output voltage is proportional to the rotation speed: 0 - 10 VDC = 0 - 100% $*f_{end}$ / load R $\geq$ 10 kΩ (optional current/power)[1]	

[1] The option must be set via serial interface RS485 (refer to operating instructions PM 0547 BN, Pumping Operation With DCU)

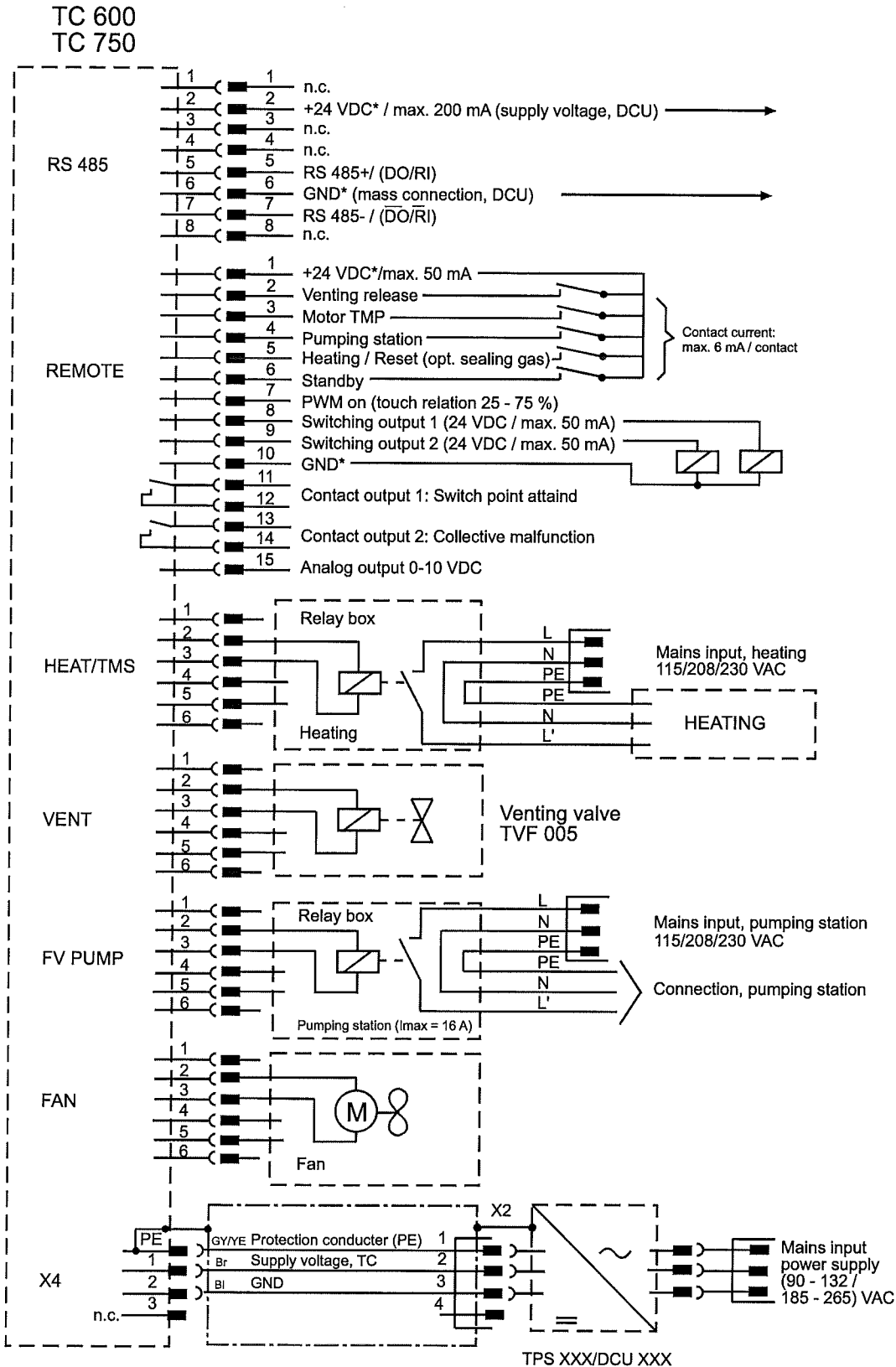[2] The following technical data are applicable for the contacts: U_{max} = 50 VDC, I_{max} = 1 A

5.7 Connections diagram TC

TC 600
TC 750

6 Operation

NOTE
Installation and operation of accessories
Pfeiffer Vacuum pumps can be equipped with a series of adapted accessories. The installation, operation and maintenance of connected devices are described in detail in the operating instructions of the individual components.
→ For information on the operating instructions of components, see "Accessories".
→ Use original accessory parts only.

CAUTION
Re-starting
The serviceability of the operating fluid without operation is a maximum of three years. Before restarting after a shut-down of **3 years or longer**, carry out the following work.
→ Replace the operating fluid reservoir.
→ Replace bearings.
→ Follow the maintenance instructions and inform Pfeiffer Vacuum.

WARNING
Danger due to open high vacuum flange
The rotor of the turbopump turns at high speed. If the high vacuum flange is open, there is a danger of cut injuries and that the pump can be destroyed by objects falling into it.
→ Never operate the pump with an open high vacuum flange.

6.1 Operation modes

The following operation modes are available:

- Operation without operating panel
- Operation via remote control unit
- Operation via RS485 with Pfeiffer Vacuum display and control units or PC

6.2 Commissioning

The following settings are permanently programmed in the TC 600 ex factory.

- Run-up time: 15 min
- Rotation speed switchpoint: 80%
- Automatic venting: 50%

→ Settings are possible via the RS485 on the TC 600 by using DCU, HPU or PC.
→ When water cooling is used: Open cooling water supply and check the flow.
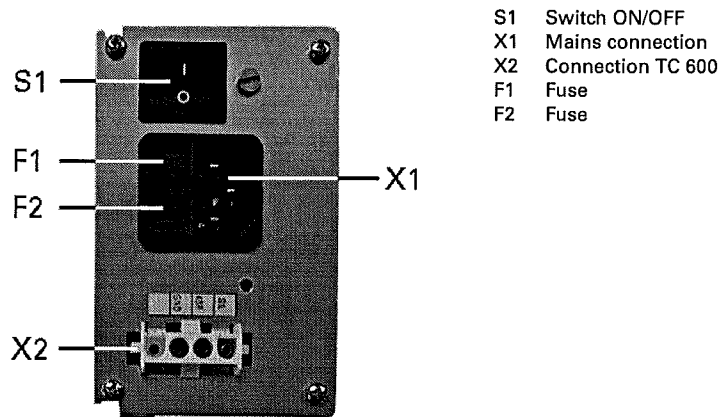→ Plug connecting cable between the TC 600 and the power supply.

S1	Switch ON/OFF
X1	Mains connection
X2	Connection TC 600
F1	Fuse
F2	Fuse

Fig. 9: Rear panel of power supply TPS

6.3 Function description

Operation without operating unit

- **On delivery: Pin 1, Pin 2, Pin 3 and Pin 4 are bridged in the remote plug.**
- For operation without the control unit, the 15-pole D-Sub plug must be in the "*REMOTE*" connection on the TC 600.

→ Switch on the supply voltage with switch S1 on the power supply.

When air cooling is used: the cooling fan is switched on automatically. Once the self test has been successfully completed on the TC 600 (approx. 10 seconds), the turbopump and the backing pump - if connected - begin to operate.

Operation with DCU or HPU

→ Switch on the supply voltage with switch S1 on the power supply or on the DCU 200.
→ Settings are possible via the RS485 on the TC 600 by using DCU, HPU or PC.
→ Observe the following documents for operation with Pfeiffer Vacuum display and control units:
- Operating instructions DCU
- Operating instructions HPU 001
- Pumping operations with DCU

NOTE
Observe the connection instructions!
On delivery turbopumps with TC 600 are set up for operations with "Remote Control".
→ Before operating with DCU, HPU or PC the 15-pole D-Sub connector (remote plug) must be removed from the TC 600.

Operation with remote control

Remote control options are provided via the 15-pole D-Sub connector with the designation "REMOTE" on the TC 600. The inputs 2 - 6 are activated by connecting them with +24 V at Pin 1 (active high) *(see p. 19, chap. 5.7)*. When connecting supply voltage the turbopump is started.

→ Remove the remote plug from the TC 600 and connect a remote control unit. Pin assignment of the connector according to table *(see p. 17, chap. 5.6)*.

Venting release (option)
Venting released (automatic venting)
Venting blocked (no venting)

- Settings are possible via the RS485 on the TC 600 by using DCU, HPU or PC.

Turbopump motor

After the pumping station is switched on and the self-test successfully completed (duration approx. 10 seconds), the turbopump is set into operation. During operation, the turbopump can be switched off and on again, while the pumping station remains switched on. The turbopump is not vented thereby.

Pumping station

Connected pumping station components (e.g. backing pump, venting valve, air cooling) are triggered and, with "turbopump motor" input simultaneously activated, the turbopump is set into operation after a successfully completed self-test (duration approx. 10 seconds).

Heating/Reset

Heating (Option)

After the rotation speed switchpoint is reached, the heating is switched on and switched off again when this point is fallen below. A purge gas valve can optionally be triggered here.

Reset

The heating input is assigned a dual function (*(see p. 17, chap. 5.6)*, Point 5 "Reset").

Standby

With the use of "Standby", the turbopump can be operated either at 66% of the nominal rotation speed (Standby ON) or at the nominal rotation speed (Standby OFF).

Speed actuation mode via PWM input

A pulse-width-modulated (PWM) signal permits setting the speed within the range of 20 - 100% of the nominal rotation speed.

Base frequency 100 Hz ±20%
Amplitude 24 V max.
Key ratio 25 - 75%
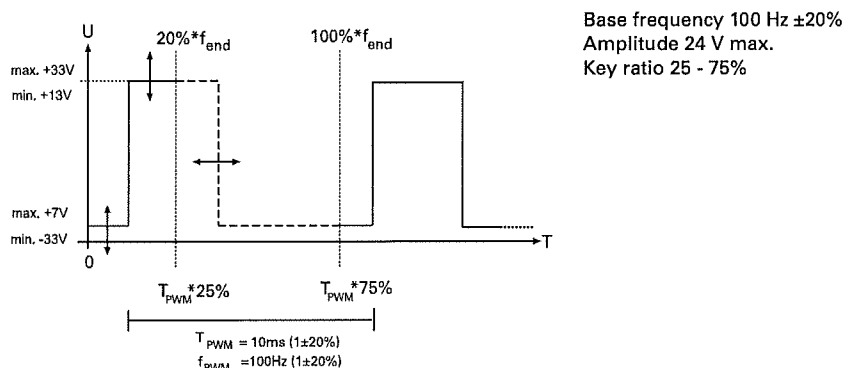
If a signal is present, the pump runs up to the final rotation speed. Optionally, a PWM adapter box for turbopumps can be connected.

Switch outputs

The switch outputs 1 and 2 can be loaded with a maximum 24 V / 50 mA per output. The following functions are assigned to the switching outputs:

- Switching output 1: Active high after the rotation speed switchpoint is reached. The switch-point for the turbopump is set at 80% of the nominal rotation speed. It can, for example, be used for a "pump operational" message.
- Switching output 2: Active low in case of malfunction(common error message).

A relay is connected between Pin 10 (earth) and the respective switching output Pin 8 or Pin 9.

Contact outputs

- Relay contact 1: The contact between Pin 11 and Pin 12 is closed, if the rotation switchpoint is exceeded.
- Relay contact 2: The contact between Pin 13 and Pin 14 is closed at failure-free operation.

Analogue output

Over the analog output, a speed-proportional voltage (0-10 VDC equals 0 - 100 % *f_{end}) can be picked up (load R $\geq$ 10 kΩ). Additional functions (optionally current/power) can be assigned to the analog output via DCU, HPU or PC.

## Gas-type-dependent operation

With gas load and high rotation speed, the rotor heats up strongly. To avoid overheating, the TC 600 has implemented a power-rotation speed-characteristic, whereby the pump can be operated at every rotation speed with the maximum allowable gas load without danger of damage. The maximum power depends on the gas type. Two characteristics are available in order to completely exhaust the pump's capacity for each gas type.

- "Gas mode 0" (factory setting) for gases with the molecular mass $\geq$ 40, e.g. Ar
- "Gas mode 1" for all lighter gases.

CAUTION
Danger of the pump being destroyed
Pumping of gases with the molecular mass $\geq$ 40 in the wrong gas mode can lead to destruction of the pump.
→ Ensure the gas mode is correctly set.
→ Contact Pfeiffer Vacuum before using gases with a greater molecular mass.
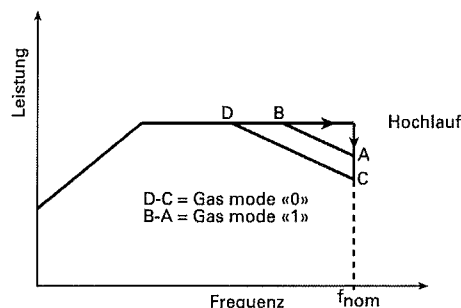
Fig. 10: **Gas mode power characteristic**

- Settings are possible via the RS485 on the TC 600 by using DCU, HPU or PC.
- Vertex of the power characteristic (see p. 34, chap. 13)

The turbopump is always run up under maximum power in order to minimise the run-up time. When the set rotation speed is achieved, the chosen power characteristic is automatically switched over. When the gas-type-dependent maximum power is exceeded, the rotation speed of the turbopump is reduced until an equilibrium between permissible power and gas friction is attained.

→ To avoid rotation-speed fluctuations, Pfeiffer Vacuum recommends setting the equilibrium frequency or a somewhat lower frequency in speed actuation operation.

6.4 Monitoring of the operation conditions

Operating mode display via LED

LEDs in the front panel of the TC 600 show basic operating conditions of the turbopump and TC. A differentiated malfunction and warning display is possible only for operation with DCU or HPU.

LED green	LED red	Cause
glows		power supply is o.k. function "pumping station on" is carried out
flashes short (1/12s active)		power supply is o.k. pumping station is off
blinks (1/2s active)		voltage drop; mains power failure
	glows	Collective malfunction, e.g. – run-up time failure – excess temperature of the pump – switching output 2 active (low)
	blinks (1/2s active)	Warning, e.g. – ground leak of the supply voltage – mains power failure

Temperature monitoring

The motor current is reduced in case of impermissible 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 turbomolecular pump.

6.5 Switching off and venting

Switching off

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

➔ Close the fore-vacuum line. Switch off the backing pump or close a fore-vacuum valve.
➔ Switch off the turbopump on the control unit or via remote control.
➔ Venting (possibilities, see below)
➔ For water cooling: Shut off the water supply.

Venting

Manually Venting

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

Venting with venting valve TVF 005

➔ Enable venting via the functions of the electronic drive unit.
➔ Settings are possible via the RS485 on the TC 600 by using DCU, HPU or PC.

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

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

Basic information for the rapid venting

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

➔ Vent for 20 seconds at a rate of pressure rise of max. 15 mbar/s.
  – The valve cross section for the venting rate of 15 mbar/s must be adapted to the size of the vacuum chamber.

- For small vacuum chambers, use the Pfeiffer Vacuum TVF 005 venting valve.
→ Then vent with an additional venting valve of any desired size.

7 Maintenance / replacement

WARNING
Contamination of parts and operating fluid by pumped media is possible.
Poisoning hazard through contact with materials that damage health.
→ In the case of contamination, carry out appropriate safety precautions in order to prevent danger to health through dangerous substances.
→ Decontaminate affected parts before carrying out maintenance work.

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

7.1 Maintenance intervals and responsibilities

- Clean the turbopump externally with a lint-free cloth and little industrial alcohol.
- You can replace the operating fluid reservoir and electronic drive unit yourself.
- Change the operating fluid reservoir at least every 3 years.
- Change the turbopump bearing at least every 3 years.
  - Contact Pfeiffer Vacuum Service.
- Clarify shorter change intervals for extreme loads or impure processes with Pfeiffer Vacuum Service.
- For all other cleaning, maintenance or repair work, please contact your Pfeiffer Vacuum service location.

7.2 Replacing the operating fluid reservoir

WARNING
Poisoning hazard through contact with materials that damage health.
The operating fluid reservoir and parts of the pump may contain toxic substances from the pumped media.
→ Dispose of operating fluid reservoir in accordance with the applicable regulations. Safety data sheet on request or under www.pfeiffer-vacuum.net
→ Prevent health hazards or environmental damage due to contamination by means of appropriate safety precautions.
→ Decontaminate affected parts before carrying out maintenance work.

| CAUTION |
| --- |
| **Pay attention to pump types** |
| The procedure for changing the lubricant reservoir depends on the pump type. Incorrect execution can result in destruction of the pump. |
| → Pay attention to the properties code after the model designation on the name plate! |

NOTE
Lubricant filling
The lubricant reservoir is sufficiently filled with TL 011 lubricant.
→ Do not add additional lubricant.

Standard version

→ Turn off the vacuum pump, vent to atmospheric pressure and allow to cool, if necessary.

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

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

→ Turn the turbopump over onto the closed high vacuum flange.
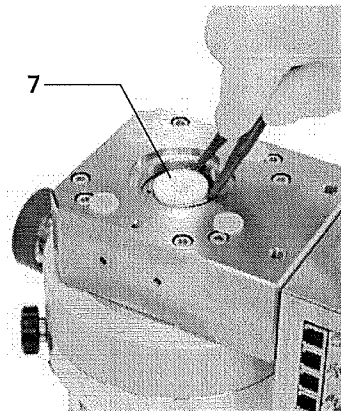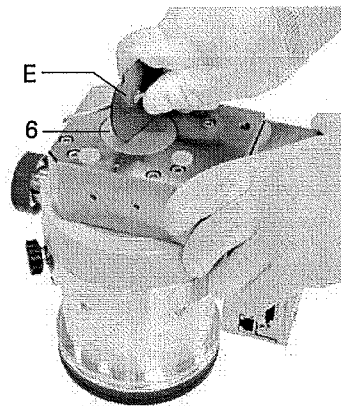
→ Screw out the end cover on the bottom of the turbopump with special tool E. Pay attention to O-ring.

→ Using tweezers, lift out the lubricant reservoir.
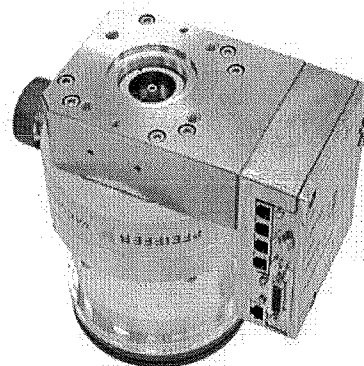
6	End cover
7	Lubricant reservoir
48	O-ring
E	Special tool PV M40 569

→ Remove impurities from the turbopump and the end cover with a clean, lint-free cloth. **Do not use any cleaning fluids!**

→ Push the new operating fluid reservoir into the turbopump up to the O-ring.

→ Screw in the end cover with O-ring. The operating fluid reservoir is brought into the correct axial position with the end cover.

Y Version

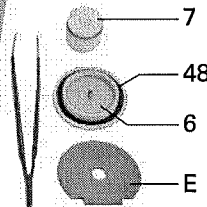➔ Turn off the vacuum pump, vent to atmospheric pressure and allow to cool, if necessary.
➔ Remove the vacuum pump from the system, if necessary.
➔ Close the flange openings by using the original protective covers.
➔ Turn the turbopump over onto the closed high vacuum flange.

➔ Screw out the end cover on the bottom of the turbopump with special tool E. Pay attention to O-ring.
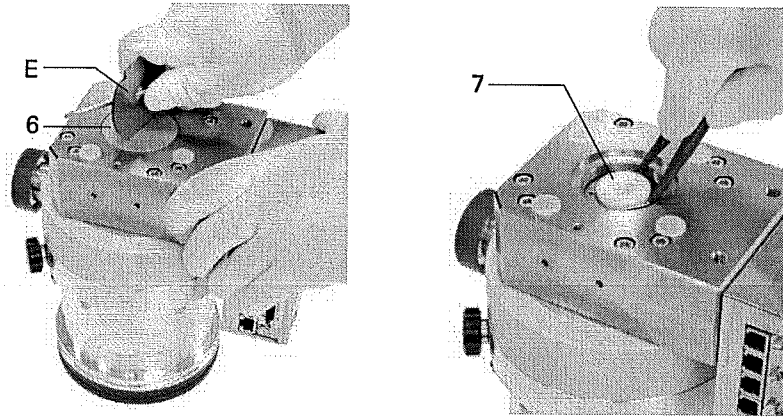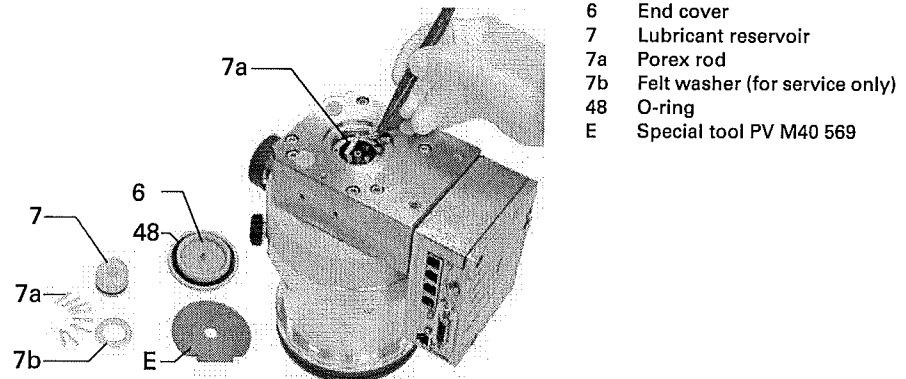➔ Using tweezers, lift out the lubricant reservoir.
➔ Using tweezers, pull out Porex rods (8 pieces).

6	End cover
7	Lubricant reservoir
7a	Porex rod
7b	Felt washer (for service only)
48	O-ring
E	Special tool PV M40 569

NOTE
Felt washer in the lubricant reservoir packet
The felt washer in the operating fluid reservoir is necessary only for special service work and is replaced by Pfeiffer Vacuum Service.

➔ Remove impurities from the turbopump and the end cover with a clean, lint-free cloth. **Do not use any cleaning fluids!**
➔ Using tweezers, insert new Porex rods (8 pieces).
➔ Push the new operating fluid reservoir into the turbopump up to the O-ring.
➔ Screw in the end cover with O-ring. The operating fluid reservoir is brought into the correct axial position with the end cover.

7.3   Replacing the electronic drive unit

WARNING
Danger of electric shock
Even after mains power is switched off, the subsequently running turbopump delivers voltages > 50 V $_{eff}$. There is a danger of electric shock when touching open contacts on conducting parts.
➜ Never separate the electronic drive unit from the pump when the mains power is connected or the rotor is running.
➜ Wait for the turbopump to reach complete standstill.
➜ Disconnect the electronic drive unit from the mains.

NOTE
Operating parameters of the electronic drive unit
The factory operating parameters are always preset with replacement shipments.
➜ The use of a HPU enables the storing and the reuse of an existing parameter record.
➜ Reset any individually changed application parameters.
➜ Refer to the manual "Pumping operations".

8   Electronic drive unit
9   Allen head screw
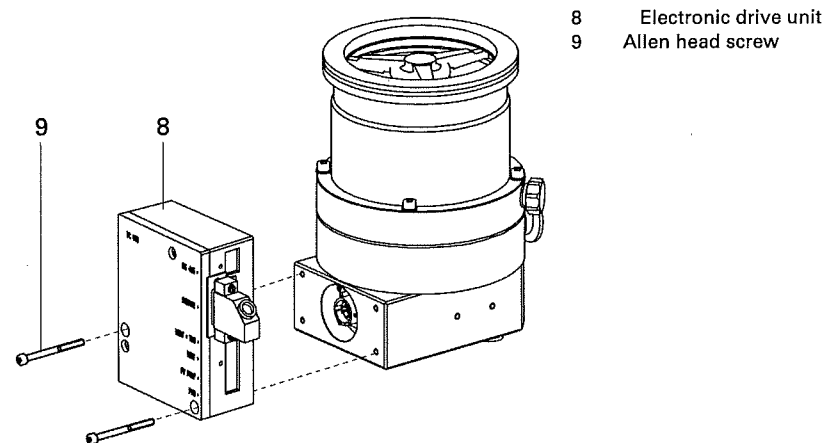
Fig. 11: Assembly / disassembly of the TC 600

➜ Do not exercise any mechanical load on the electronic drive unit.

➜ Turn off the vacuum pump, vent to atmospheric pressure and allow to cool, if necessary.

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

➜ Unscrew Allen head screws (2 x) from the electronic drive unit.

➜ Pull the electronic drive unit off the pump.

➜ Screw on and connect new electronic drive unit to the turbopump.

8 Decommissioning

8.1 Shutting down for longer periods

WARNING
Contamination of parts and operating fluid by pumped media is possible.
Poisoning hazard through contact with materials that damage health.
➔ In the case of contamination, carry out appropriate safety precautions in order to prevent danger to health through dangerous substances.
➔ Decontaminate affected parts before carrying out maintenance work.

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

➔ Remove the vacuum pump from the system, if necessary.
➔ Change the operating fluid reservoir.
➔ Close high vacuum flange of the turbopump.
➔ Evacuate turbopump via the fore-vacuum flange.
➔ Vent turbopump via the venting connection with dry air or inert gas.
➔ Close the flange openings by using the original protective covers.
➔ Close further connection ports by using the corresponding protective covers.
➔ Place pump upright on rubber feet.
➔ Storage the pump only indoors with an ambient temperature between -25 °C and +55 °C.
➔ In rooms with moist or aggressive atmospheres, the turbopump must be air-seeled in a plastic bag together with a bag of dessicant.

8.2 Re-starting

CAUTION
Re-starting
The serviceability of the operating fluid without operation is a maximum of three years. Before restarting after a shut-down of **3 years or longer**, carry out the following work.
➔ Replace the operating fluid reservoir.
➔ Replace bearings.
➔ Follow the maintenance instructions and inform Pfeiffer Vacuum.

➔ Check turbopump for contamination and moisture.
➔ Clean the turbopump externally with a lint-free cloth and little industrial alcohol.
➔ If necessary, have Pfeiffer Vacuum Service clean the turbopump completely.
➔ If necessary, have the bearings replaced. Take into account the total running time.
➔ Change the operating fluid reservoir.
➔ Installation and commissioning in accordance with the operating instructions .

8.3 Disposal

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

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

9 Malfunctions

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

9.1 Rectifying malfunctions

Problem	Possible causes	Remedy
Pump will not start up; none of the built-in LEDs on the TC 600 lights up	• Electrical supply interrupted	⇨ Check fuses in the power supply ⇨ Check plug contacts on the power supply pack ⇨ Check supply lines of the power supply pack ⇨ Check output voltage (48 VDC) on the X2 of the power supply pack ⇨ Check plug contacts on the power supply pack
	• Operating voltage incorrect	⇨ Apply correct operating voltage ⇨ Observe name plate
	• No operating voltage applied	⇨ Supply the operating voltage
	• TC 600 defective	⇨ Exchange TC 600 . ⇨ Contact Pfeiffer Vacuum Service
Pump will not start up; green LED on the TC 600 is flashing	• Pin 1-3 and 1-4 on the remote plug not connected	⇨ Connect Pin 1-3 and 1-4 on the remote plug
	• Voltage drop in the cable	⇨ Use a suitable cable
Pump does not attain the nominal rotation speed within the specified starting time	• Backing pressure too high	⇨ Ensure function and suitability of the backing pump
	• Leak	⇨ Perform leak detection ⇨ Check gaskets and flange fasteners ⇨ Eliminate leaks
	• Gas load too high	⇨ Reduce process gas feed
	• Rotor runs hard, defective bearing	⇨ Check bearing for noise development ⇨ Contact Pfeiffer Vacuum Service
	• Starting time set too low	⇨ Extend starting time via DCU, HPU or PC
	• Thermal overload: – Lack of cooling – Backing pressure too high – Ambient air temperature too high	⇨ Reduce thermal load – Ensure adequate cooling – Lower backing pressure – Adjust ambient conditions
Pump not achieving the end pressure	• Pump is dirty	⇨ Bake out pump ⇨ Cleaning in case of heavy contamination – Contact Pfeiffer Vacuum Service
	• Vacuum chamber, pipes or pump leak	⇨ Leak detection starting from the vacuum chamber ⇨ Eliminate leaks
Unusual noises during operation	• Bearing damage	⇨ Contact Pfeiffer Vacuum Service
	• Rotor damaged	⇨ Contact Pfeiffer Vacuum Service
	• Splinter shield or protective screen loose	⇨ Correct seat of the splinter shield or protective screen ⇨ Observe installation notes
Red LED on the TC 600 lights up	• Common error	⇨ Reset through mains off/on switch ⇨ Reset via Pin 5 on the "REMOTE" connection ⇨ Differentiated malfunction display via DCU or HPU possible[1] ⇨ Contact Pfeiffer Vacuum Service
Red LED on the TC 600 is flashing	• Warning: – Earthing of the supply voltage – Power failure	⇨ Differentiated malfunction display via DCU or HPU possible[1] ⇨ Check partial mains voltage ⇨ Check partial mains voltage for earthing ⇨ Check mains power supply to the power adapter

[1] If no Pfeiffer Vacuum control panel is available, please contact Pfeiffer Vacuum Service

10 Service

Pfeiffer Vacuum offers first-class service!

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

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

Maintenance and repair in the Pfeiffer Vacuum ServiceCenter

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

➔ RMA form and declaration of contamination.[1]
➔ Fill out the RMA form and send it by fax or e-mail to your service address.
➔ Include the RMA confirmation from Pfeiffer Vacuum with your shipment.
➔ Fill out the contamination declaration and include it in the shipment (required!).
➔ Dismantle all accessories.
➔ Drain the operating fluid (applies for turbopumps in corrosive gas version or with suction performance > 550 l/s)
➔ Leave electronic drive on the pump.
➔ Close the flange openings by using the original protective covers.
➔ If possible, send pump in the original packaging.

Contaminated vacuum pumps

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

Sending of contaminated pumps or devices

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

Exchange unit

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

Service orders

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

[1] Return material authorization under www.pfeiffer-vacuum.net

11 Spare parts TMH/U 261

Item	Designation	Size	Order Number	Notes	Pieces	Order Qty
6	End cover	M40 x 1	PM 003 619 A		1	
7	Lubricant reservoir		PM 063 265 -T	incl. O-ring	1	
7	Lubricant reservoir ("Y")		PM 053 266 -T	incl. 8 x Porex rod (7a), O-ring, felt washer	1	
8	Electronic drive unit TC 600		PM C01 720		1	
48	O-ring	38 x 3	P 4070 621 PV		1	
53	Sealing plugs		P 4098 582 FA		4	
98	Remote plug		PM 051 793 -X	Pin 1 to 4 bridged	1	
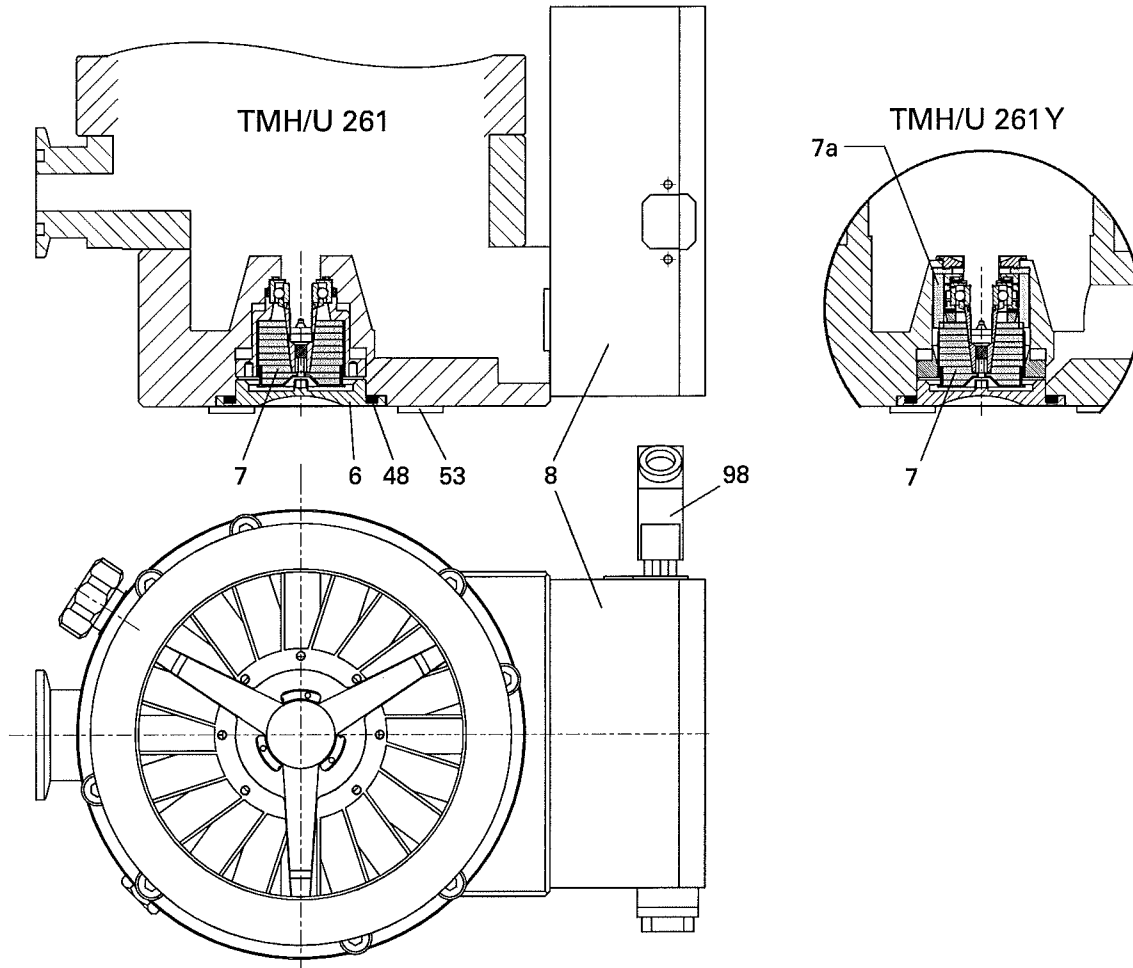
Please also specify model number of the the rating plate when ordering accessories or spare parts.

12 Accessories

Designation	Size	Order Number	Operating instructions	Notes	Order Qty
Power supllies					
DCU 200 power supply with Display Control Unit	200 W	PM C01 695	PM 0477 BN PM 0547 BN		
TPS 200 power supply for wall/ standard rail mounting	200 W	PM 041 813 -T	PM 0521 BN		
TPS 201 power supply 19" rack module 3HU	200 W	PM 041 819 -T	PM 0521 BN		
Mains cable					
Mains cable with safety plug	230 V, 3 m	P 4564 309 ZA		Other lengths on request	
Mains cable with UL plug	115 V, 3 m	P 4564 309 ZE		Other lengths on request	
Mains cable with UL plug	208 V, 3 m	P 4564 309 ZF			
Connecting cable					
TC 600 - TPS / DCU	3 m	PM 051 103 -T		Other lengths on request	
TC 600 - TPS / DCU, shielded	3 m	PM 051 843 -T			
Control panel					
DCU 001 Display Control Unit		PM 041 816 -T	PM 0477 BN PM 0547 BN		
HPU 001 Handheld Programming Unit		PM 051 510 -T	PT 0101 BN		
Accessories package for HPU		PM 061 005 -T			
Components for venting					
TTV 001 Air drier		PM Z01 121	PM 0022 BN	incl. Zeolite filling	
TVF 005 Venting valve	24 V DC, G 1/8"	PM Z01 135	PM 0507 BN	closed without current	
Venting flange	DN 10 ISO-KF	PM 033 737 -T			
Circlip for venting flange	DN 10-15 ISO-KF	PF 102 016 -T			
Components for heating					
Heating jacket, safety plug	230 V,	PM 041 903 -T	PM 0542 BN	Water cooling required	
Heating jacket, UL plug	208 V	PM 041 904 -T			
Heating jacket, UL plug	115 V	PM 041 905 -T			
Components for cooling					
Air cooling	24 V DC	PM Z01 252	PM 0543 BN		
Water cooling		PM 016 040 -T	PM 0546 BN		
TZK 400 Water cooling unit	230 V, 50 Hz	PM Z01 245	PM 0369 BN		
Dirt trap	G 3/8"	P 4161 300 2R			
Fore-vacuum triggering					
Relay box 1-phase	5 A	PM 041 937 -T	PT 0030 BN		
Relay box 1-phase	20 A	PM 041 938 -T			
TVV 001 Fore-vacuum valve	230 V, DN 16 ISO-KF	PM Z01 205	PM 0263 BN		
TVV 001 Fore-vacuum valve	115 V, DN 16 ISO-KF	PM Z01 206			
Accessories, general					
Sealing gas valve	M6 / DN 10 ISO-KF	PM Z01 142	PM 0229 BN		
Hose nipple, sealing gas valve	DN 16 ISO-KF-10	PF 144 020			
Vibration compensator	DN 100 ISO-K	PM 006 459 -X			
Vibration compensator	DN 100 CF-F	PM 006 488 -X			
PWM box rotation speed control	10 - 30 V DC	PM 051 028 -U	PM 0563 BN		
Pfeiffer Vacuum protocol	RS232/RS485		PM 0488 BN	interface protocol	
TIC 001 Interface converter	RS232 in RS485	PM 051 054 -T	PM 0549 BN		
TIC 250 Profibus-DP gateway		PM 051 257 -T	PM 0599 BN		
TIC 260 DeviceNet gateway		PM 061 166 -T	PT 0177 BN		
USB/RS485 converter Connection cable	RS485/M12 in USB 3 m	PM 061 207 -T PM 051 726 -T		incl. CD-ROM	
TC 600 cover for IP 54		PM 051 327 -U	PT 0024 BN		

Installation material, accessories for flange fastening *(see p. 9, chap. 5.3).*

13 Technical data

| Parameter	TMH 261 P TMH 261 YP	TMU 261 P TMU 261 YP
Flange (in)	DN 100 ISO-K	DN 100 CF-F
Flange (out)	DN 25 ISO-KF / G 1/4"	DN 25 ISO-KF / G 1/4"
Venting connection	G 1/8"	G 1/8"
Rotational speed ±2%	60000 rpm	60000 rpm
Run-up time	1.6 min	1.6 min
Ultimate pressure with rotary vane pump	$< 1 \cdot 10^{-7}$ mbar	$< 5 \cdot 10^{-10}$ mbar
Ultimate pressure with diaphragm pump	$< 1 \cdot 10^{-7}$ mbar	$< 1 \cdot 10^{-8}$ mbar
Fore Vacuum max. for N_2	10 mbar	10 mbar
Compression ratio for N_2	$>1 \cdot 10^9$	$>1 \cdot 10^9$
Compression ratio for He	$3 \cdot 10^5$	$3 \cdot 10^5$
Compression ratio for H_2	$1.4 \cdot 10^4$	$1{,}3 \cdot 10^4$
Compression ratio for Ar	$>1 \cdot 10^9$	$>1 \cdot 10^9$
Gas throughput at 0.1 mbar HV for N_2	7 mbar l/s	7 mbar l/s
Gas throughput at 0.1 mbar HV for He	6 mbar l/s	6 mbar l/s
Gas throughput at 0.1 mbar HV for H_2	3.5 mbar l/s	3.5 mbar l/s
Gas throughput at 0.1 mbar HV for Ar	7 mbar l/s	7 mbar l/s
Gas throughput at full rotational speed for N_2	7 mbar l/s	7 mbar l/s
Gas throughput at full rotational speed for He	9 mbar l/s	9 mbar l/s
Gas throughput at full rotational speed for H_2	43 mbar l/s	43 mbar l/s
Gas throughput at full rotational speed for Ar	4 mbar l/s	4 mbar l/s
Pumping speed backing pump for the listed gas throughputs at least	10 m³/h	10 m³/h
Pumping speed for N_2	210 l/s	210 l/s
Pumping speed for He	220 l/s	220 l/s
Pumping speed for H_2	175 l/s	175 l/s
Pumping speed for Ar	200 l/s	200 l/s
Cooling method, standard	Water, air	Water, air
Max. cooling water temperature	25 °C	25 °C
Cooling water consumption	100 l/h	100 l/h
Weight	6.1 kg	8.1 kg
Standby rotational speed	40000 1/min	40000 1/min
Sound pressure level	50 db (A)	50 db (A)
Ultimate pressure of the backing pump	<5 mbar	<5 mbar
Integral leak rate	$<1 \cdot 10^{-7}$ mbar l/s	$<1 \cdot 10^{-7}$ mbar l/s
Max. rotor temperature	90 °C	90 °C
Max. input heat capacity	8 W	8 W
Max. surrounding magnetic field	6 mT	6 mT
Fore vacuum max. for He	8 mbar	8 mbar
Fore vacuum max. for H_2	4 mbar	4 mbar
Fore vacuum max. for Ar	10 mbar	10 mbar
Vertex of the power characteristics line: A B C D	170/1000 W/Hz 170/1000 W/Hz 103/1000 W/Hz 170/760 W/Hz	170/1000 W/Hz 170/1000 W/Hz 103/1000 W/Hz 170/760 W/Hz
Lubricant	TL011	TL011
Max. ambient temperature with air cooling	35 °C	35 °C
Power consumption housing heater		60 W
Operating voltage	48 ± 5% VDC	48 ± 5% VDC
Max. power consumption: pump	200 W	200 W
Power consumption, continous operation	170 W	170 W
Max. current consumption: pump	4.8 A	4.8 A
Current consumption, continous operation	4.1 A	4.1 A
Protection class	IP 30	IP 30
Temperature: Storage	-25 to +55 °C	-25 to +55 °C
Relative humidity (non dewing)	5 to 85 %	5 to 85 %

13.1 Dimension diagrams
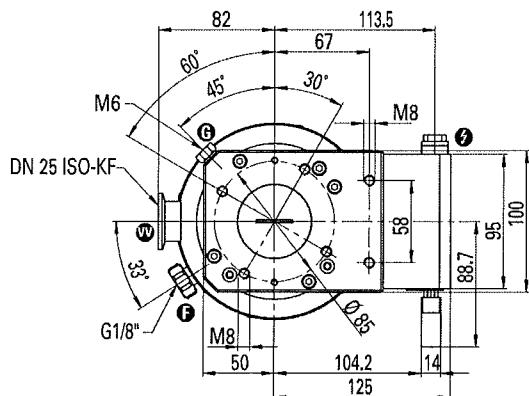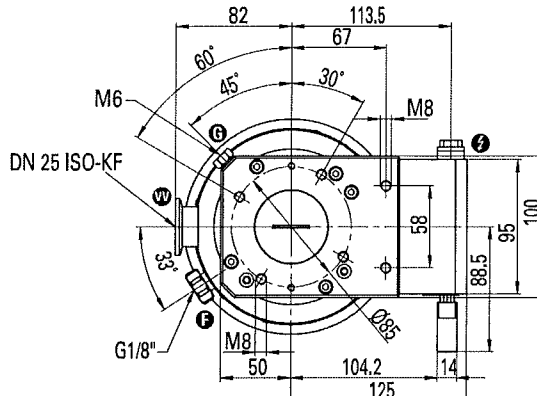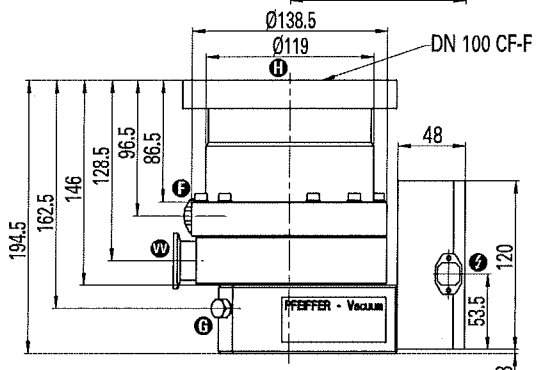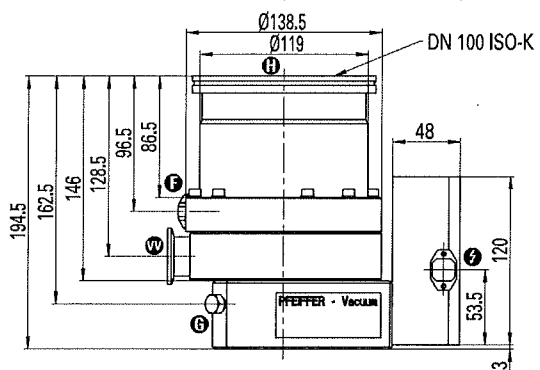

Fig. 12: TMH 261 P / YP, DN 100 ISO-K

Fig. 13: TMU 261 P / YP, DN 100 CF-F

Manufacturer's Declaration

pursuant to the following EU directives:

- **Machinery 98/37/EEC (Annex II B)**
- **Electromagnetic Compatibility 89/336/EEC**
- **Low Voltage 2006/95/EEC**

We hereby certify that the product specified below is intended for installation in a machine which is forbidden to be put into operation until such time as it has been determined that the end product is in accordance with the provision of EU Directive 98/37/EEC.

The product specified below is in correspondence to the EU directives Machinery **98/37/EEC**, Electromagnetic Compatibility **89/336/EEC** and Low Voltage **2006/95/EEC**.

TMH/U 261

Guidelines, harmonised standards, national standards in languages and specifications which have been applied:
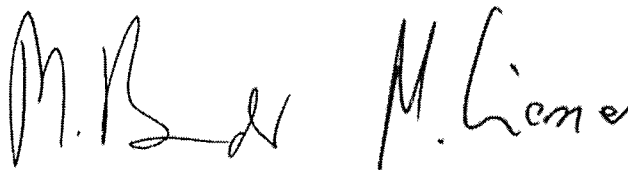
EN 294   EN 1012-2   EN 12100-1   EN 12100-2

EN 61010

Signatures:

Pfeiffer Vacuum GmbH
Berliner Straße 43
35614 Asslar
Germany

(M.Bender)
Managing Director

(Dr. M. Wiemer)
Managing Director

CE/2007

Vacuum is nothing, but everything to us!

- Turbopumps
- Rotary vane pumps
- Roots pumps
- Dry compressing pumps
- Leak detectors
- Valves
- Components and feedthroughs
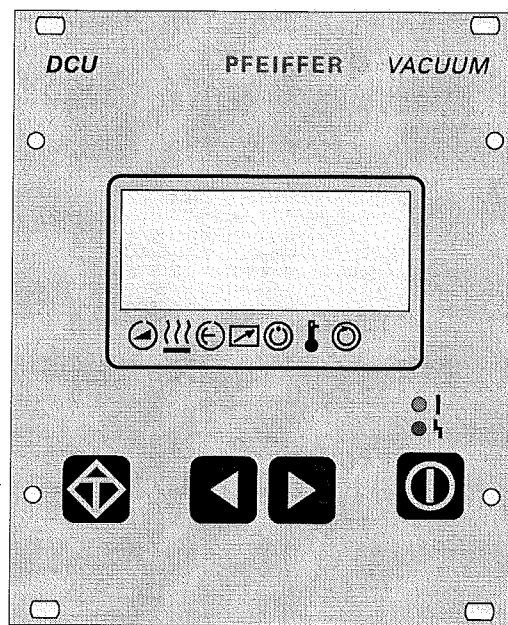- Vacuum measurement
- Gas analysis
- System engineering
- Service

PFEIFFER VACUUM

Pumping Operations With DCU

- Turbomolecular Pumps -

PFEIFFER VACUUM

Index

Pictogram Definitions

WARNING	Warning! Danger of an electric shock.

WARNING	Warning! Danger of personal injury.

CAUTION	Caution! Danger of damage to the unit or system.

PLEASE NOTE	Please Note! Attention to particularly important information on the product, handling the product, or to a particular part of the documentation.

Used Abbreviations
DCU   Operation and Display Unit
TC   Electronic Drive Unit
TCK   Electronic Drive Unit (Print Modul)

Please note
Current operating instructions are also available via
www.pfeiffer-vacuum.net under "infoservice".

1. Introduction To These Instructions

The Display Control Unit DCU is a universal operating unit for the control and monitoring of PFEIFFER vacuum pumps.

These operating instructions describe the operations in respect of PFEIFFER VACUUM turbomolecular pumps. This manual is a component of the complete operating manual for your modular turbopump system. Depending on the configuration of your system, other operating instructions are included in your delivery consignment (please see the table).

We make every effort to ensure that you are in possession of all the necessary product information but should anything be missing please get in touch with your local PFEIFFER VACUUM representatives or telephone the hotline number which you will find on the back cover of these operating instructions.
The respective documents are also available in PDF file format via the homepage www.pfeiffer-vacuum.de.

The following operating instructions are available for the TC pump program:

Product	Definition	Operating Manual Number
Turbomolecular Drag Pump	Definition of the turbopump	dependent on the type of pump*
Pumping operations with the DCU, turbopumps	Operating definitions /parameters	PM 800 547 BE
DCU 001, 100-600	Description of the control unit/installation	PM 800 477 BE
TPS 100, 200, 300, 600	Description of the power pack	PM 800 521 BE
Casing heating, turbopump	Description of the casing heating	PM 800 542 BE
Air cooling, turbopump	Description of the air cooling system	PM 800 543 BE
Water cooling, turbopump	Description of the water cooling system	PM 800 546 BE
Backing Pump relay box	Description of the backing pump control	PT 0030 BE
Temperature Management System TMS	Description of the TMS installation	PT 0099 BE
Pfeiffer protocol RS 232/RS 485	Description of the serial interface protocol	PM 800 488 BE
Level Converter RS 232/RS 485	Description of the pumping control via the RS 232	PM 800 549 BE
TVF 005	Description of the venting valve	PM 800 507 BE
TIC 250	Description of the Profibus	PM 800 599 BE
PWM-Box	Description of the pulse width modulation	PM 800 563 BE
TCS 010	Description of the Pumping Station Control Unit	PT 0045 BE
Cover IP 54 for TC 600	Description of the water protection cover	PT 0024 BE
TBU 600	Description of the brake unit	PT 0018 BE
* The number is available from PFEIFFER VACUUM Service or from the internet address shown in this manual.		

2. Parameter

2.1. General

All function relevant elements of the display control unit or pump are available in the DCU in the form of parameters. Each parameter has a parameter number and a clear text designation, for example [P:026] «OpMode TMP».

The value of the parameter is always readable and in some instances can be altered. In principle there are three different types of parameter:

Parameter Typ	Function
Setting command	Activating/deactivating a parameter
Status request	Parameter status reques (readable only)
Set value standard	Altering a parameter

To adapt these parameters to the individual requirements of the user, the DCU provides two different parameter sets which are distinguished by the number of parameters involved. The respective parameter set is selected via [P:794] «Param. set». The parametering is always active.

Parameter Set	Comment	Setting [P:794] «Param. set»
Basic parameter set	Only parameters sorted according to number and parameter type	0
Extended parameter set	Complete parameter set, sorted according to number and parameter type	1

Parameters which do not appear in the display can nevertheless be operated via the serial interface.

2.2. Parameter Overview, numerical, DCU

Setting Commands (readable and writable)

#	Display		Name, Description	min	max	fact. setting	RS 485[1]	Data type[2]	TC 600/750	TC 100/TCK 100	TC 750-E074
001	Heating	🔒	Pre-selection, heating.ON/OFF	OFF	ON	OFF	R/W	0	•	•	•
002	Standby	🔒	Standby ON/OFF	OFF	ON	OFF	R/W	0	•	•	•
004	RUTime ctr	🔒	Run-up time monitoring, ON/OFF	OFF	ON	ON	R/W	0	•	•	•
009	Error ackn		Error acknowledgement			–	W	0	•	•	•
010	Pump stat	🔒	Pumping station ON/OFF	OFF	ON	ON(*)	R/W	0	•	•	•
012	Vent enab	🔒	Venting enable ON/OFF	OFF	ON	ON(*)	R/W	0	•	•	•
013	Brake enab	🔒	Pre selection brake ON/OFF	OFF	ON	OFF	R/W	0	•	-	•
023	Motor TMP	🔒	Motor Turbopump ON/OFF	OFF	ON	ON(*)	R/W	0	•	•	•
024	Conf. Out1	🔒	Configuration output K1; 0=switchpoint attained; 1= TMS regulator; 2=var. switchp.	0	2	0	R/W	7	•	-	-
025	OpMode BkP	🔒	Operations mode backing pump, 0=non-stop; 1=intermittent; 2=switch on delayed	0	2	0	R/W	7	•	•	•
026	OpMode TMP	🔒	Operations mode TMP 0=final rot. speed op.; 1=rot. speed setting m.	0	1	0 (*)	R/W	7	•	•	•
027	Gas mode	🔒	Gas mode 0=heavy inert gases; 1=other gases	0	1	0	R/W	7	•	•	•
028	Opmode rem	🔒	Remote operations mode 0=standard, 1=Remote priority, 2 Remote error acknowl.	0	2	0	R/W	7	•	•	-
029	OpMode Drv	🔒	Drive unit operations mode OFF=max., ON=reduced power intake	OFF	ON	OFF[6]	R/W	0	•	•	•
030	Vent mode	🔒	Venting mode 0=controlled venting ; 1=no venting; 2=venting "On"	0	2	0	R/W	7	•	•	•
032	Conf Out4	🔒	Configuration heating output; 0=Heat/TMS operations; 1=sealing gas valve control	0	1	0	R/W	7	•	-	•
035	Conf I/O1	🔒	Configuration accessories ON/Output 1 (see chapter 3.21.)	0	3	0	R/W	7	-	•	-
036	Conf I/O2	🔒	Configuration accessories ON/Output 2 (see chapter 3.21.)	0	3	1	R/W	7	-	•	-
055	Conf AO1	🔒	Configuration Analog Output 1 0=Rot Speed; 1=Power; 2=Current	0	2	0	R/W	7	•	•	-

Status request (only readable)

#	Display		Name, Description	min	max	fact. setting	RS 485	Type[2]	TC 600/750	TC 100	TC 750-E074
300	☑		Unit remote controlled, not choosable by ◧ ◨			–	R	0	•	•	•
301	Oil defic		Oil deficiency turbopump	–	–	–	R	0	•	-	•
302	⊙		Rotation switch point attained			–	R	0	•	•	•
303	Error code		Actual error code „no Err", „Errxxx" or „Wrnxxx"			–	R	4	•	•	•
304	↕		Over temperature Electronic drive unit			–	R	0	•	•	•
305	↕		Over temperature turbopump			–	R	0	•	•	•
306	⊙		Set rotation speed attained			–	R	0	•	•	•
307	⊘		Turbopump accelerates			–	R	0	•	•	•
308	Set rotspd		Set rotation speed TMP in Hz	0	2000	–	R	1	•	•	•
309	Act rotspd		Actual rotation speed TMP in Hz	0	2000	–	R	1	•	•	•
310	TMP I-Mot		Motor current TMP in A	0	15.0	–	R	2	•	•	•
311	TMP Op hrs	🔒	Operating hours TMP in h	0	99999	–	R	1	•	•	•
312	Drv Softw		Software version electronic drive unit			–	R	4	•	•	•
313	TMP DClink		Motor voltage TMP in V	0	200.0	–	R	2	•	•	•
314	Drv Op hrs	🔒	Operating hours electronic drive unit	0	99999	–	R	1	•	•	•
315	TMP finspd		Final rotation speed TMP in Hz	0	2000	–	R	1	•	•	•
316	TMP power		Motor power TMP in W	0	1000	–	R	1	•	•	•
319	Cycl count	🔒	Cycle counter	0	99999	–	R	1	•	•	•
331	TMS ActTmp		Heating TMS, actual value in °C	5	200	–	R	1	•	-	•
333	TMS steady		TMS regulator engaged ON/OFF	OFF	ON	–	R	0	•	-	•
334	TMS maxTmp	🔒	Maximum TMS temperature occured in °C	5	200	–	R	1	•	-	•
335	Heat type		Heating type 0=conventional heating, 1=TMS	0	1	–	R	7	•	-	•
340	Pressure		Actual pressure value in mbar [3]	1E-10	1E3	–	R	3	-	-	-
349	Drv Name		Unit type electronic drive unit			–	R	4	•	•	•
350	Ctr Name		Unit type operating and display unit [3]			.	R	4	-	-	-
351	Ctr Softw		Software version Display and Control Unit DCU [3]			–	R	4	-	-	-
360	Past Err1	🔒	Error storage, Position 1 (last error occuring)			–	R	4	•	•	•
361	Past Err2	🔒	Error storage, Position 2			–	R	4	•	•	•
362	Past Err3	🔒	Error storage, Position 3			–	R	4	•	•	•
363	Past Err4	🔒	Error storage, Position 4			–	R	4	•	•	•
364	Past Err5	🔒	Error storage, Position 5			–	R	4	•	•	•
365	Past Err6	🔒	Error storage, Position 6			–	R	4	•	•	•
366	Past Err7	🔒	Error storage, Position 7			–	R	4	•	•	•
367	Past Err8	🔒	Error storage, Position 8			–	R	4	•	•	•
368	Past Err9	🔒	Error storage, Position 9			–	R	4	•	•	•
369	Past Err10	🔒	Error storage, Position 10			–	R	4	•	•	•

Set values (readable and writable)

#	Display		Name, Description	min	max	fact. setting	RS 485	Type[2]	TC 600/750	TC 100	TC 750-E074
700	TMP RUTime	🔒	maximum run-up time in mins	1	120	15[4] / 8[5]	R/W	1	•	•	•
701	Switch pnt	🔒	Rotation speed switchpoint in %	50	97	80	R/W	1	•	•	•
704	TMSheatset	🔒	TMS heating temperature set value in °C	30	90	40	R/W	1	•	-	•
707	TMProt set	🔒	Rotation speed set value in rotation speed setting operations in %	20.0	100.0	50.0(*)	R/W	2	•	•	•
708	DrvPwr set	🔒	Drive power set in %	10	100	80[7]	R/W	7	•	•	•
710	BKP Poff	🔒	Pmin for backing-pump interval operations [W]	0	1000	0	R/W	1	•	•	•
711	BKP Pon	🔒	Pmax for backing-pump interval operations [W]	0	1000	0	R/W	1	•	•	•
717	Stbyrotset	🔒	Rotation speed set value at standby operations (%)	20	100	66	R/W	7	•	•	•
719	Switch pnt2	🔒	Rotation speed switchpoint2 in %	5	97	20	R/W	1	•	•	-
720	Vent frequ	🔒	Venting frequency as a % of the final rotation speed of the TMP	40	98	50	R/W	7	•	•	•
721	Vent time	🔒	Venting time in s	6	3600	3600	R/W	1	•	•	•
738	Gaugetype		Vacuum pressure gauge type [3]			–	R/W	4	-	-	-
777	PumpRotMax		Specific nominal rotation speed [Hz]	0	2000	0	R/W	1	•	•	•
794	Param. set	🔒	Parameter set 0 = basic parameter set; 1 = extended parameter set [3]	0	1	0	R/W	7	-	-	-
795	ServiceIin	🔒	insert service line [3]			795	R/W	7	-	-	-
797	Address	🔒	Unit address	1	255	1	R/W	1	•	•	•

(*) Function can only be affected via remote plug (X16)
A number/parameter in bold type is a basic parameter set.
🔒 = Parameter setting is saved internal and activated after re-switching on.

[1] R = Parameter readable via interface /W = parameter writeable via interface.
[2] See Interface instruction "Pfeiffer Protocol RS 232/485" / PM 800 488 BN
[3] Parameter only for DCU
[4] TC 600/750
[5] TC 100/TCK 100
[6] PN-pumps 071...521 at "ON"
[7] at pumps 262 PN: 75%; at pumps 521 PN: 70%

2.3. Parameter Overview, Operations Oriented, DCU

#	Display	Name, Description	min	max	fact. set	RS 485	Sect.
Run-up time and rotation speed switchpoint							
004	RUTime ctr	Run-up time monitoring, 0=OFF; 1=ON	OFF	ON	ON	•	3.4.
700	TMP RUTime	maximum run-up time in mins	1	120	15 / 8	•	3.4.
701	Switch pnt	Rotation speed switchpoint in %	50	97	80	•	3.4.
719	Switch pnt2	Rotation speed switchpoint 2 in %	5	97	20		3.11.
General operating information							
315	TMP finspd	Final rotation speed TMP in Hz	0	2000	–	•	3.4.
310	TMP I-Mot	Motor current TMP in A	0	15.0	–	•	3.4.
313	TMP DClink	Motor voltage TMP in V	0	200.0	–	•	-
316	TMP power	Motor power TMP in W	0	1000	–	•	-
311	TMP Op hrs	Operating hours TMP in h	0	99999	–	•	3.1.
Operating adjustment turbopump							
002	Standby	Standby ON/OFF	OFF	ON	OFF(*)	•	3.5.
010	Pump stat	Pumping station ON/OFF	OFF	ON	–	•	3.4.
023*	Motor TMP	Motor Turbopump ON/OFF	OFF	ON	–	•	3.10.
026	OpMode TMP	Operations mode TMP 0=final rot. speed oper., 1=rot. speed setting	0	1	0	•	3.11.
027	gas mode	Gas mode 0=heavy inert gases; 1=other gases	0	1	0	•	3.8.
029	OpMode Drv	Operating mode drive unit OFF=max., ON=reduced power consumption	OFF	ON	OFF	•	3.4.
308	Set rotspd	Set rotation speed TMP in Hz	0	2000	–	•	3.4.
309	Act rotspd	Actual rotation speed TMP in Hz	0	2000	–	•	3.1.
717	Stbyrotset	Rotation speed set value at standby operations (%)	20	100	66	•	
707	TMProt set	Rotation speed set value in rotation speed setting operations in (%)	20.0	100.0	50.0(*)	•	3.11.
Heating/cooling turbopump							
001	Heating	Pre-selection, heating. 0=OFF; 1=ON	0	1	0(*)	•	3.6.
032	Conf Out4	Configuration heating output; 0=Heat/TMS operations; 1=sealing gas valve control	0	1	0	•	3.7.
331*	TMS ActTmp	Heating TMS, actual value in °C	5	200	–	•	3.8.
333*	TMS steady	TMS regulator engaged ON/OFF	OFF	ON	–	•	3.8.
334*	TMS maxTmp	Maximum TMS temperature occured in °C	5	200	–	•	-
335*	Heat type	Heating typ 0=conventional heating, 1=TMS, 2=cooling	0	2	–	•	3.6., 3.8.
704*	TMSheatset	TMS heating temperature set value in °C	30	90	40	•	3.8.
Vent valve controlling turbopump							
012	Vent enab	Venting enable ON/OFF	OFF	ON	ON	•	-
030	Vent mode	Venting mode 0=automatic venting ; 1=do not vent; 2=venting "On"	0	2	0(*)	•	3.15.
720	Vent frequ	Venting frequency as a % of the final rotation speed of the TMP	40	98	50	•	3.15.
721	Vent time	Venting time in s	6	3600	3600	•	3.15.
Pumping station controlling							
025	OpMode BkP	Operations mode backing pump, 0=non-stop; 1=intermittent; 2=switch on delayed	0	2	0	•	3.12.
035**	Conf I/O1	Configuration Accessories ON/Output 1	0	3	0	•	3.21.
036**	Conf I/O2	Configuration Accessories ON/Output 2	0	3	1	•	3.21.
340	Pressure	Actual pressure value in mbar	1E-10	1E3	–	•	3.11.
738	Gaugetype	Vacuum pressure gauge type			–	•	3.11.
710	BKP Poff	Pmin for backing-pump interval operations [W]	0	1000	0	•	
711	BKP Pon	Pmax for backing-pump interval operations [W]	0	1000	0	•	
Others							
013*	Brake enab	Preselection Brake ON/OFF	OFF	ON	OFF	•	
024*	Conf. Out1	Configuration output K1 0=switchpoint attained; 1= TMS regulator	0	1	0	•	3.8.
028	OpMode rem	Remote operations mode 0=standard, 1=Remote priority, 2 Remote error acknowl.	0	2	0	•	3.14.
055	Conf AO1	Configuration Analogue Output 1	0	2	0	•	3.19.
303	Error code	Actual error code „no Err", „Errxxx" oder „Wrnxxx"			–	•	–
312	Drv Softw	Software version electronic drive unit			–	•	–
351	Ctr Softw	Software version Display and Control Unit			–	•	–
794	Param. set	Parameter set 0=basic parameter set; 1=extended parameter set	0	1	0	•	3.4.-3.15.
795	Servicelin	insert serviceline			795	•	PM477BD
797	Address	Unit address	1	255	1	•	–
Table of failures							
360	Past Err1	Error storage, Position 1 (last error occuring)			–	•	4.3.
361	Past Err2	Error storage, Position 2			–	•	4.3.
362	Past Err3	Error storage, Position 3			–	•	4.3.
363	Past Err4	Error storage, Position 4			–	•	4.3.
364	Past Err5	Error storage, Position 5			–	•	4.3.
365	Past Err6	Error storage, Position 6			–	•	4.3.
366	Past Err7	Error storage, Position 7			–	•	4.3.
367	Past Err8	Error storage, Position 8			–	•	4.3.
368	Past Err9	Error storage, Position 9			–	•	4.3.
369	Past Err10	Error storage, Position 10			–	•	4.3.

* only for TC 600 / 750
** only for TC 100 / TCK 100
(*) Function can only be affected via remote plug (X16)
• Function can be called by RS 485

3. Pumping Operations

3.1. General

On delivery the pre-set basic parameter sets contain the following parameters:

Setting Command [P:0xx]	Status Request [P:3xx] (readable only)	Set Value Standard [P:7xx]
001: Heating (ON/OFF)	308: Set rotation speed, TMP (in Hz)	700: maximale Anlaufzeit (in min)
002: Stand-by (ON/OFF)	309: Actual rotation speed TMP (in Hz)	701: Schaltpunkt (in %)
	310: TMP Motor current (in A)	794: Parametersatz
	311: operating hours, TMP (in h)	

On delivery, parameter [P:794] «Param. Set» has been preset to the value "0" (basic parameter set). By setting the value to "1" you access the extended parameter set.

3.2. Switching On The DCU

→ Make the connection to the Serial Interface RS 485.

DCU 001:
→ Switch on the external voltage supply to the TOC.

DCU 100/150/200/300/600:
→ Switch on the DCU with switch S1 on the rear panel.

Self Testing

After switching on, the DCU performs a self-test and also a test on the connected turbo electronics. During the test a bar appears in the display in line 4 and this shows the progress of this procedure.

Display test: All signs in the LC display are shown for a short time in black.
LEDs test: During the whole testing procedure the red and the green LEDs illuminate.
DCU self-test: The DCU hardware tests itself.
Testing the connection to the turbo electronics: The correct connection to the turbo electronics and their identity are checked.
Parameter test: Information regarding the parameters is loaded.
Identification of the connected components: The designation of the drive unit is displayed.

Providing there are no errors the DCU is now ready to operate.

3.3. Short Overview Operation
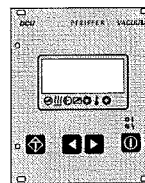
Selecting Parameters

→ Selecting parameters with push-button ◄ (backwards) or ► (forwards). keeping the key depressed enables rapid scrolling.

Setting Parameters

→ Select Parameter.

→ Depress key-button ◄ and ► simultaneously till an arrow (--->) will appear in the second line from the top.
-> Arrow disappears, if there is no setting after 8 sec..

→ With key-button ◄ reduce the value and with key-button ► increase the value.

→ Depress key-button ◄ and ► simultaneously till the arrow (--->) disappears.
-> The Parameter is set.

Error acknowledgement

→ Depress key-button ⊕ for a duration of min. 2 seconds.

For a more comprehensive description please refer to the operating instructions for the DCU / PM 800 477 BN.

3.4. Switching The Pumping Station ON/OFF

Please Note:
Before switching on the pumping station the set value [P:7xx] and setting commands [P:0xx] should be checked for their suitability with regard to the selected pump and pumping process.

➡ Remove the remote plug on the TC (only TC 600).
➡ Switch on switch S1 on the mains power unit.
➡ Select «794 : Param. Set» and set to «1».
➡ Check the relevant set value standards and setting commands (Section 2.2.).
➡ Select «023 : motor TMP» and set to «ON» (only TC 600).
➡ Switch on the pumping station with key ⓪ on the DCU or via the serial interface remote control or Parameter [P:010] «Pump stat» on the DCU.

Start-up of the turbopump
After successful completion of the self test, the turbopump starts up and the backing pump is driven. The rotation speed switchpoint [P:701] must be attained within the pre-set start-up time [P:700]. Both parameters can be matched to the process. If an error code is displayed please refer to the error code table in section 4.

When the error is acknowledged the start-up time is reset.

Operations with mains voltages 90 - 132V

| CAUTION | In case of this rated voltage the output power of the TPS (power supply) or DCU 600 (Control unit with power supply) is reduced. |

Therefore the power input of the pump must be adapted with the DCU and via the parameters [P:029] and [P:708].

➡ Select «794 : Param. Set» and set to «1».
➡ Select «029 : OpMode drv».
➡ Set to «1» = reduced power take-up TC600.
➡ Select «708 : DrvPwr Set» and adjust to the relating pump type (see table below).

Pump type	Adjustment [P:708]
1001/1601/2201	80%
1201/1501/1801/2101/2301	60%

If the TC is not set the error code «E001» or «F007» is displayed.

3.5. Switching Stand-By ON/OFF

➡ Select «002 : Standby».
➡ Select «OFF» oder «ON».

"Stand-by mode" is the operation of the pump at 66% of its final rotation speed (factory setting).This value is changeable.

➡ Select «717 : Stbyrotset».
➡ Adjust Standby rotation speed in the range of 20-100%.

Stand-by is recommended during operating breaks. The function can also be selected via the remote control or the serial interface.

During activ stand-by the rotation speed set point [P:707] refers always to the adjusted stand-by rotation speed [P:717].

Stand-by mode is not possible in rotation speed setting mode (please see section 3.12).

At stand-by mode, pumps with integrated oil pump are first accelerated to 60% of their nominal rotation speed even if the set stand-by rotation speed is <60% x f_{nom}.

During this time the final rotation speed ist shown via [P:308] «set rotation speed». After reaching 60% of speed the adjusted stand-by rotation speed is displayed [P:717].

3.6. Switching The Casing Heating ON/OFF

The TC 600 automatically recognizes a connected casing heating and sets according to the parameters [P:355] «Heat type» to «0». If no heating is connected «1» is displayed.

To control the casing heating on the TC 100/TCK 100 it is necessary to select the respective accessory input and output (see section 3.21.)

➡ Select «794 : Param. Set» and set to «1».
➡ Select «335 : Heat type» and check setting to «0».
➡ Select «001 : Heating».
➡ Select «OFF» or «ON».

The casing heating is switched on and off dependent on the rotation speed switchpoint. Undershooting the rotation speed switchpoint causes the heating to be switched off. The status of the casing heating can be seen on the LC display on the DCU.

The function "casing heating" can be called up either via the serial interface or the remote control.
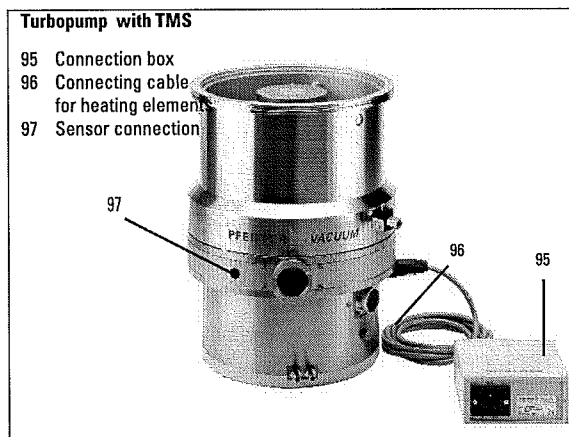
3.7. Sealing Gas Valve Control

Operation of the heating output "Heat/TMS" may be configured through [P:032]. At this output also a sealing gas valve may be driven by a venting valve.

➡ Select «794 : Param. Set» and set to «1».
➡ Select «032 : Conf Out4» and set to «1».

A valve connected to the connection "Heat/TMS" can be switched on at any time independently only through [P:001] or the corresponding control input "Heating ON" at the remote connector.

➡ Select «001 : Heating».
➡ Choose «OFF» or «ON».

3.8. Operations With Temperature Management System (TMS) (only TC 600/750)

Turbopump with TMS

95 Connection box
96 Connecting cable for heating element
97 Sensor connection

The Temperature Management System (TMS) comprises a regulatable heating system which is installed in the fore-vacuum part of the turbomolecular pump. Heating up to a maximum of 90°C prevents the condensation of process gases or by-products in this part of the pump.

As a matter of principle, the TMS heating is only activated on attainment of the rotation speed switchpoint [P:701] The TC 600 automatically recognizes a connected TMS heating unit and sets the parameter [P:335] «Heat type» to «1».

Activating TMS mode
→ Select «794 : Param. Set» and set to «1».
→ Select «335 : Heat type» and check setting.
→ Select «704 : TMSheatset».
→ Enter set temperature value «30°C...90°C».
→ Acknowledge the value.
→ Select «001 : Heating» and set to «1».

With [P:001] «Heating» The TMS heating can be activated and deactivated at any time with «1» or «0» respectively.

In addition to the above parameters (which are used to start the TMS) other parameters are also available to support working with the TMS:

Calling up the TMS temperature
→ Select «331 : TMS ActTmp» and read off the temperature.

TMS set temperature attained?
→ Select «333 : TMS steady» and read off the information.

Function of switch "output 1" (only TC 600)
The switch output 1 is normally set to "high" on the rotation speed switchpoint being exceeded. The function of switch output 1 can be re-programmed so that switch output 1 is "high" only when the TMS set temperature is attained.

→ Select «024 : Conf. Out1» and set to «1».

This information can be used, for example, as an input signal for a higher ordered process control.

3.9. Gas Type Dependent Operations

To protect the rotors against overheating, the maximum power on some turbopumps is limited to the nominal rotation speed. Normally, with a lower, pre-set rotation speed, more power can be provided. This frequency/power curve is dependent on the type of gas.

Selecting the gas type
→ Select «794 : Param. Set» and set tof «1».
→ Select «027 : gas mode».
→ Select «0» for heavy, noble gases and «1» for other gases.

Gas type curve

D-C = Gas mode «0»
B-A = Gas mode «1»
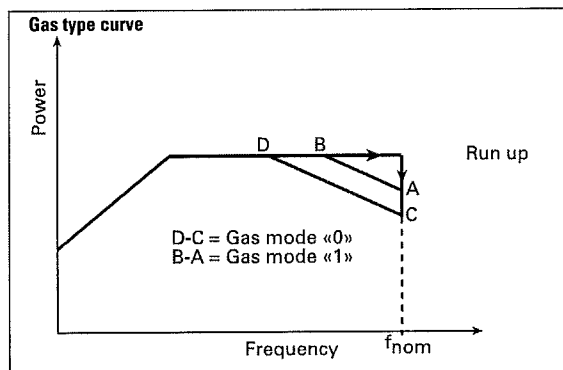
The rotation speed is reduced when the gas dependent maximum power is exceeded until there is equilibrium between the permissible power and the gas friction. To avoid rotation speed fluctuations it is recommended to set (in rotation speed setting mode) the equilibrium frequency or a somewhat lower frequency.

3.10. Switching The Turbopump ON/OFF (only TC 600/750)

During pumping station operations (pumping station "ON") the turbopump can be switched on and off separately:

→ Select «023 : Motor TMP».
→ Select «OFF», or «ON» as required.

3.11. Adjusting Rotation Speed Switchpoint

The speed switch point may be used to generate the message "Pump ready". As soon as the speed exceeds, respectively drops below the speed switch point 1 [P:701] «Switch pnt» the switched output is energized or de-energized. The factory default setting is 80%.

Simple Switch Point Adjustment (upper value only)
→ Select «701 : Switch pnt» .
→ Adjust the switch point in the range between 50-97%.
→ Confirm the adjustment.

Double switch point adjustment (lower and upper value)
Depending on the setting of the parameter [P:024] «Conf Out1» the lower and the upper speed switch point may be influenced simultaneously.

The factory default setting is 20, respectively 80% of the final rotation speed.

→ Select «024 : Conf Out1».
→ Set the parameter to «2».
→ Confirm the adjustment.

The speed switch point can now be varied through two further parameters:

Activated drive
In the case of an activated drive ([P:023] set to "ON") the switch point output is driven independently of the setting for the switch point 1 [P:701]. As soon as the speed exceeds the adjusted switch point, the switch point output is energized. The setting may be selected between 50 and 97% of the final rotation speed.

→ Select «701 : Switch pnt».
→ Adjust the switch point in the range between 50-97%.
→ Confirm the adjustment.

Deactivated drive
In the case of a deactivated drive ([P: 023] set to "OFF") the switch point output is driven independently of the setting for the switch point 2 [P:719]. As soon as the speed drops below the adjusted switch point, the switch output is de-energized. The setting may be selected between 5 and 97% of full speed.

→ Select «719 : Switch pnt2».
→ Adjust the switch point in the range between 5-97%.
→ Confirm the adjustment.

3.12. Rotation Speed Setting Mode

The rotation speed setting mode is selected if the turbopump volume flow rate should be reduced. The pressure ratio of the pump reduces exponentially with the rotation speed.

Rotation speed standard in rotation speed setting mode
→ Select «794 : Param set» and set to «1».
→ Select «707 : TMProt set».
→ Select the rotation speed in the range from 20%.....100%.

Operating mode, turbopump
→ Call up «026 : OpMode TMP».
→ Select "1" for rotation speed setting mode.

PLEASE NOTE

The stand-by mode is ineffective in rotation speed setting mode. The rotation speed switch-point has been fixed at 20%. The rotation speed setting mode can be set via the remote control or the serial interface.

Pumps with integrated oil pumps are first accelerated, in rotation speed setting mode, to 60% of their rated rotation speed, also where the set rotation speed is <60% xf_{nom}.

During this time the final rotation speed ist shown via [P:308] «set rotation speed». After reaching 60% of speed the adjusted stand-by rotation speed is displayed [P:717].

3.13. Pressure Measurement

With the use of a high vacuum pressure gauge the pressure in the vacuum chamber is shown in the DCU display.

PLEASE NOTE

Basically an exactly pressure measurement is not possible by the DCU. This is especially indicated at linear working gauges in the lower pressure range. In case of doubt an intended measuring unit should be used.

The following pressure gauges are automatically recognized by the DCU:

Pressure Gauge	p_{min} [mbar]	p_{max} [mbar]
TPR 2xx	5E-4	1E+3
PKR 2xx	5E-9	1E+3
ACR 261/CMR 261/APR 250/260	1E-1	1E+3
ACR 262/CMR 262	1E-2	1E+2
ACR 263/CMR 263	1E-3	1E+1
CMR 264	1E-4	1E0

Requesting the type of pressure gauge
→ Select «794 : Param set» and set to «1».
→ Select «738 : gauge type».
→ Read off the pressure gauge type.
Some pressure gauges can only be recognized as a group (e.g. ACR 261-ACR 263) and have to be set manually.

Requesting the actual pressure value
→ Select «794 : Param set» and set to «1».
→ Select «340 : Pressure».
→ Read off the pressure value in mbar.

The following can be displayed, depending on the pressure gauge type:

Display (Example)	Appears when
«---- mbar»	no pressure gauge is connected
«<5E-4mbar»	measuring range is non-attained (depending on the pressure gauge in use)
«>1E3mbar»	measuring range is exceeded (depending on the pressure gauge in use)
«6.3E-9mbar»	valid pressure measurement range
«idfam mbar»	pressure gauge type not yet identified
«TPR250»	pressure gauge TPR 250 connected
«ACR..?»	pressure gauge ACR 261, ACR 262 oder ACR 263 connected but not yet selected (in this case the display «id fam» [P:340] is shown)
«Error!»	error in the pressure gauge

3.14. Backing Pump Operations

The operating modes "non-stop operations", "interval operations" or "Switch ON delayed" can be selected depending on the selected backing pump and the vacuum application. Interval operations can be selected, for example, to prolong the working life of the diaphragms in diaphragm vacuum pumps. The backing pump is switched on and off depending on the power take-up of the turbopump.

CAUTION ⚠ Rotary vane pumps must not be used for internal operations.

Non-stop operations backing pump
→ Select «**794 : Param set**» and set to «**1**».
→ Select «**025 : OpMode BkP**» and set to «**0**» for non-stop operations.

Interval operations backing pump
→ Select «**794 : Param set**» and set to «**1**».
→ Select «**025 : OpMode BkP**» and set to «**1**» for interval operations.

For intermittent operations involving the backing pump, either a diaphragm pump with integrated semiconductor relay or a relay box with semiconductor relay should be used. The backing pump is switched on and off in accordance with the power take-up levels of the turbopump.

Differing power take-up levels on an idling turbopump lead to differing pressure switchpoints on various pumps. In addition, on diaphragm pumps there are differing final pressures resulting from the gas ballast equipment. This means that ideal pressure switchpoint setting via the power take-up level is not possible. Nevertheless, the advantage of intermittent operations can still be exploited by setting the pressure switch threshholds individually. In this respect operations between 5 and 10 mbar are recommended.

A vacuum meter, a DCU and a dosing valve are required in order to set the switching threshhold. Instead of the vacuum meter a vacuum gauge can be connected directly to the DCU.

Setting the switching threshholds
→ Select «**340 : Pressure**».
→ Admit air into the fore-vacuum line with the dosing valve while the pumping station is running until the fore-vacuum pressure increases to 10 mbar.
→ Select «**316 : TMP power**».
→ Read off the take-up power at 10 mbar.
→ Select «**711 : BKP Pon**».
→ Save the read-off take-up power as the upper switching threshhold.
→ Proceed analogically with the lower switching threshhold. Take 5 mbar as the pressure value.
→ Select «**710 : BKP Poff**».
→ Save the read-off take-up power as the lower switching threshhold.

Switch On Delayed
→ select «**794 : Param set**» and set to «**1**».
→ select «**025 : OpMode BkP**»; choose «**2**» for delayed switch on.

When simultaneously switching on the turbopump and the backing pump, the gas flow could cause a failure with the error message **E913** during the starting phase. In order to prevent this, it is recommended to first start the turbopump and then the backing pump or open a driven fore-vacuum valve.

In the operating mode "delayed switch on" after activation of the parameter «Pump start» **[P:010]** and «Motor TMP» **[P:023]** the turbopump is started first and as soon as a speed of 6 Hz has been exceeded the backing pump controlled via the TC is then switched on.

Should the backing pump or a fore-vacuum valve be driven by a higher level system controller, it is recommended to proceed in the same way.

3.15. Switching Off The Pumping Station

➡ Depress ⓞ on the front panel. As an alternative, the pumping station can be switched off via the remote control, the serial interface or [P:010].

3.16. Remote Control

The following functions can be activated via the remote control (please also refer to the operating instructions for the respective turbopump):

TC 600:

PIN	Function
2	Venting enable "ON/OFF"
3	Turbopump "ON/OFF" /remote priority "ON/OFF"
4	Pumping Station "ON/OFF"
5	Heating "ON/OFF"/Error acknowledgement
6	Stand-by "ON/OFF"
7	Rotation speed setting mode via pulse width modulation (PWM).

TC 100/TCK 100:

PIN	Function
2/d4	- Remote Priority "ON/OFF"
3/b4	- Accessory 1 "ON/OFF"
4/z4	- Accessory 2 "ON/OFF"
5/d6	- Pumping Station "ON/OFF"
6/b6	- Standby "ON/OFF" / Reset

Operating modes with the remote control

Basically there are three different possibilities with regard to the remote control with differing priorities with respect to the remote control functions:

Standard Remote Control

➡ Select «028 : OpMode rem» and set to «0».

The individual functions which can be operated with the remote control are activated via "SPS High Level". Activated individual functions cannot be operated via the serial interface nor the keyboard. Individual functions deactivated with the remote control can be operated via the serial interface or the keyboard.

Remote Control Priority

Only TC 600:

⚠ **CAUTION** «028 : OpMode rem» may only be altered to «OFF» when the pump is switched off («023 : Motor TMP»).

Priority ON

In certain application cases as, for example, SPS control, the remote control functions can be assigned prioritized switching.

➡ Select «028 : OpMode rem» and set to «1». Bridge pin 1/pin 3 on the connecting plug "remote".
–> All set functions will be switched off excepting "motor, turbopump ON" which remains on "ON".
–> The remote control functions can only be set via the connecting plug "remote". The DCU keyboard/serial interface is inactive.

The functions:
- Heating ON/error acknowledgment
- Stand-by ON
- Pumping station ON
- Enable venting
are activated and deactivated with the signals «1» and «0» respectively. In the rotation speed setting mode the set value standard is processed exclusively via pin 7 on the connecting plug "remote".

If pin 3 on the connection "remote" should be set to "0":
–> Values set via the remote control will be taken over except in rotation speed setting mode. Here, the set value standard is processed via the serial interface or the keyboard.

Priority OFF
➡ Select «028 : OpMode rem» with f=0 Hz and set to «1».
–> All set functions will be switched off excepting "motor, turbopump ON" which remains on "ON".
➡ Set Pin3/"Remote" to «0».
–> Operating is only possible via the DCU keyboard/serial interface (remote control not active).
–> -Set values are not saved.
–> In rotation speed setting mode the rotation speed set via the keyboard or serial interface will be taken over.

If «028 : OpMode rem» should be re-set to «0»:
–> Values set via the keyboard or serial interface will be taken over. Values set with «1» via the remote control will also be taken over.

Only TC 100/TCK 100:

Priority ON
➡ Select «028 : OpMode rem» and set to «1».

TC 100
➡ Bridge pin 2/pin 7 on the connecting plug X3.

TCK 100
➡ Bridge pin d4/pin z28 on the connecting plug X4.

–> All set functions will be switched off.
–> The remote control functions can only be set via the connecting plug X3. The DCU keyboard/serial interface is inactive.

The functions:
- Accessory 1 ON
- Accessory 2 ON
- Pumping station ON
- Standby/Reset ON
are activated and deactivated with the signals «1» and «0» respectively.

Priority OFF
➡ Select «028 : OpMode rem» and set to «1».
➡ Remove bridge pin 2/pin 7 on the connecting plug X3.
–> Values set via the remote control will be taken over.
–> Operating is only possible via the DCU keyboard/serial interface (remote control not active).
–> -Set values are not saved.

If «028 : OpMode rem» should be re-set to «0»:
–> Values set via the keyboard or serial interface will be taken over. Values set with «1» via the remote control will also be taken over.

Remote Control "Malfunction Acknowledgement"

If the reset input on the remote control is not used, it can be utilized as an external malfunction acknowledgement via the remote control; this means that after a switch off and subsequent switch on via the '"Motor TMP" or "Pumping Station" inputs, a malfunction acknowledgement will first be executed.

➡ Set «028 : OpMode rem» to «2».

3.17. Venting The Turbopump

Venting is possible after the pump has been switched off. Basically, a delay time of 6 seconds is observed before each venting procedure to ensure that any possible high vacuum valve is closed. In a currentless state the venting valve is closed. Where a malfunction (error) is involved venting will proceed in accordance with the selected venting mode.

Three types of venting modes can be selected in the extended parameter set:
➡ Select «794 : Param set» and set to «1».
➡ TC 600: Allocate venting release via bridge PIN 1 and PIN 2 on the "remote" plug.
➡ TC 100: Allocate venting release via bridge PIN 1 and PIN 3 respectively PIN 4 (according to the output configuration).
➡ TCK 100: Allocate venting release via bridge z28 and b4 respectively z4 (according to the output configuration).

or
➡ Call up «012 : Vent enab». Select «ON».
➡ Call up «030 : Vent mode». Select «0», «1» oder «2».

Venting mode «0»: automatic venting
Automatic venting means that venting begins at a specific frequency [P:720] after the pumping station has been switched off or a mains power failure and continues for a specific duration [P:721].

In the event of a mains power failure, the set duration value cannot be guaranteed.

➡ Select «720 : Vent frequ».
➡ Set the venting frequency between «40-98%».
➡ Select «721 : Vent time».
➡ Set the venting duration in sec. between «0» and «3600».
–> The venting valve is closed after mains power has been restored.

Venting mode «1»: venting OFF
–> The pump will not be vented.

Venting mode «2»: venting ON
–> When the pumping station is switched off, in cases of malfunction and in the event of a power failure, after a time lag of 6 seconds, venting takes place. If a high vacuum valve is installed, it can be closed in the meantime. Where a mains power failure is involved, venting will only take place as long as the pump is able to supply power to the venting valve. After power has been restored the venting valve stays open. It closes when the pumping station is switched on.

3.18. Operations Via Serial Interface RS 485

The group address of the TC 600 is 960 of the TC 100/TCK 100 is 950. All units connected to the bus must have differing serial interface addresses [P:797]. The connection of an RS 232 (for example, a PC) is possible via Level Converter PM 051 054-X. The description of the data communication (PFEIFFER VACUUM protocol) can be found in Operating Instructions PM 800 488 BN.

3.19. Emergency Power Operations

If during turbopump operations the power fails (warning «F007»), the pump rotor acts as a generator and takes over the supply of power for the electronics. In addition, a power failure is signalled by flashing green and red LEDs on the front panel (50% ON; 50% OFF). At a certain rotation speed (depending on the pump), the pump energy is no longer sufficient and communication between the DCU and the TC is interrupted and error message «E698» appears.

3.20. Brake Mode (only TC 600)

In order to be able to more quickly brake the pump in rotation speed setting mode, some pumps allow the connection of an external braking system (accessory on request).

Activating brake mode
➡ Call up «013 : Brake enab»; select «ON».

De-activating brake mode
➡ Call up «013 : Brake enab»; select «OFF».

| CAUTION | Malfunction «E002» results if the brake mode is activated and there is no connected braking system. |

3.21. Configuration Of The Accessory Input/ Output (only on the TC 100 with TCS 010 or TCK 100)

The following pumping station components can be connected:

- Air cooling, venting valve, heating, backing pump.

In this respect it is necessary to configure the accessory input/output in relation to the function optionally via [P:035] or [P:036].

➡ Select «035 : Conf. I/O1».
➡ Select function as required:
   0 = air cooling (set by factory)
   1 = Venting valve
   2 = Heating
   3 = Backing pump

➡ Select «036 : Conf. I/O2».
➡ Select function as required:
   0 = air cooling
   1 = Venting valve (set by factory)
   2 = Heating
   3 = Backing pump

3.22. Configuration Of The Analog Output

An analog signal (0-10 VDC) with the following information can be taken from the TC or TCK 100:
- Rotation speed of the turbopump
- Power input
- Current input.

In this respect it is necessary to configure the analog input/ output in relation to the function.

➡ Select «055 : Conf. AO1».
➡ Select function 0, 1 oder 2:
   0 = Rotation speed signal, 0-10 VDC = 0-100% x f_{end}
   1 = Power input signal , 0-10 VDC = 0-100% x p_{max}
   2 = Current supply signal, 0-10 VDC = 0-8A

Information about the values f_{end} and p_{max} are readable in the operating instructions of the additional pump.

3.23. Setting The Nominal Rotation Speed of The Pump

| ACHTUNG | After replacing or changing the electronic drive unit TC/TCK to an other pump type the warning «F777» is shown on the display. The warning will be eliminated if [P:777] «PumpRotMax» is set to the nominal rotation speed of the connected pump. |

This setting can be executed via DCU, HPU or RS 485.

The specific nominal rotation speed of the turbo pump must be set as follows:

Pump type	Setting [P777] in [Hz]
011/021/071	1500
261/262	1000
261PC/521	833
521PC	715
1001	660
1201/1501	630
1601/2201	600
1801/2101/2301	525

➡ Select [P:777] «PumpRotMax».
➡ Adjust the specific nominal rotation speed.
➡ Acknowledge the adjustment.

4. Error Codes

4.1. General

| CAUTION |
| ⚠ |

Errors ("Errxxx" or Error "Exxx") always lead to shut-down of the TMP, the fan, the heating and the backing pump.

➡ After the error is eliminated, depress key ⊕.
–> The unit is again ready to operate.

4.2. Errors During Self-Testing

The following errors can occur during self-testing performed when the DCU is switched on:

Display	Error	Possible Action
«Error E040»	Hardware error: external RAM defective	Inform PFEIFFER VACUUM-Service
«Error E042»	Hardware error: EPROM checksum	Inform PFEIFFER VACUUM-Service
«Error E043»	Hardware error: E^{2}PROM erratum	Inform PFEIFFER VACUUM-Service
«Error E090»	Insufficient RAM	Inform PFEIFFER VACUUM-Service
	DCU is connected to the wrong turbo electronics	Connect correct turbo electronics
«Error E698»	The connected drive unit does not respond	Check communication lead between TC and DCU, switch on TC

4.3. Errors During Operations

During operations, errors and warnings which occur are, independent of the function of the service line, always shown in the LC display and can be additionally requested in parameter [P:303] «Error code». In addition, parameters 360 to 369 retain the last ten errors or warnings which occurred.

After an error has occurred all parameters can be viewed but no longer altered. Exception: Error [E698] «TC does not respond». Here, no actualisation of the parameter is possible until the communication has been restored.

Code	Description	Occurs At	Error Elimination Action
E001	TMP excess rotation speed	B -	- Inform PFEIFFER VACUUM Service. - If operations with mains voltage 90 - 132 VAC, check settings [P:029] (see chapter 3.4.)
E002	Power pack unit error	S/B	- Check power pack output voltage. - Check settings [P:013] (see chapter 3.20.) - Inform PFEIFFER VACUUM Service.
E006	Start-up time error When the start-up phase is completed, the rotation speed of the pump drops below the rotation speed switchpoint.	S/B	- Set correct start-up time. - Open vacuum valve. - Reduce fore-vacuum pressure. - Eliminate leak. - Check free running of the turbo pump.
E007[1)3)]	Operating fluid deficiency	S/B	- Check oil level. - Request status of the oil sensor via [P:301]. - Inform PFEIFFER VACUUM Service.
E008	Connection TC and pump	S/B	- Check connection TC and pump.
E014[1)]	The heating type identified in the self test has been changed by pulling the plug or by an error.	B	- Change configuration of heating or cooling unit. - Inform PFEIFFER VACUUM Service.
E015	Error in the TC controller	S/B	- Reset the controller with mains ON/OFF with the pump at standstill (f=0 Hz). - Possibly Inform PFEIFFER VACUUM Service.
E021	Incorrect pump identification resistance	S	- Inform PFEIFFER VACUUM Service.
E025	Error in the temperature monitoring TC	S/B	- Reset the controller with mains ON/OFF with the pump at standstill (f=0 Hz). - Possibly Inform PFEIFFER VACUUM Service.
E026	Error of the temperatur sensor inside the TC	S/B	- Reset the controller with mains ON/OFF with the pump at standstill (f=0 Hz). - Possibly Inform PFEIFFER VACUUM Service.
E037	Error in the motor stages or control	S/B	- Possibly Inform PFEIFFER VACUUM Service.
E698	TC does not respond	S/B	- Check connection DCU - TC. - Change the DCU. - Possibly Inform PFEIFFER VACUUM Service.
E913[2)]	Error in the self test or when the pump starts up	S	- Error resets itself 5 times. Then switching off via «E006» - Possibly set the op. mode backing pump [P:025] up to "2" - Check the free rotation of the pump. - Possibly Inform PFEIFFER VACUUM Service.

[1)] only TC 600/TC750
[2)] This error message is not displayed via switch output 2 (collective error message);

[3)] Error acknowledgement of this failure is only possible for 5 times.
S: self test; B: operations

4.4. Warnings

Warnings ("Wrnxxx" or "Warning Fxxx") are only displayed and (otherwise than is the case with errors) do not cause components to be shut down.

Code	Description	Explanations
F001[1]	TMS heating start-up time elapsed	TMS heating start-up time elapsed.
F002[1]	TMS limit temperature	TMP-temperature > 100°C.
F003[1]	TMS-heating circuit temperature sensor	TMP temperature not within the range 5°C and 120°C.
F007	Mains power failure	Operations voltage has failed.
F039[1]	Protective conductor warning TC	Potential of the supply voltage in contact with the protective conductor PE
F110[2]	Pressure gauge defective	Pressure gauge disconnected during operations

[1] only TC 600/750
[2] Warning only in DCU.

WARNING

Warning «F039» must be eliminated without delay otherwise there is a danger of an electric shock.

5. Supplementary Information

Information with regard to:
- Product
- Proper Use
- Installation
- Operation
- Errors
- Maintenance and Service
- Technical Data

can be found in Operating Instructions PM 800 477 BE for "Display And Operating Unit DCU" which is included in this consignment.

The PFEIFFER VACUUM protocol for Serial Interface RS 485 is described in Operating Instructions PM 800 488 BE which is included in this consignment.

Notizen / Notes:

Vacuum is nothing, but everything to us!

Turbopumps

Rotary vane pumps

Roots pumps

Dry compressing pumps

Leak detectors

Valves

Components and feedthroughs

Vacuum measurement

Gas analysis

System engineering

Service

PFEIFFER VACUUM

Operating Instructions

DCU 001
DCU 100
DCU 150
DCU 200
DCU 300
DCU 600

Display And Operating Unit

Index

1. Safety Instructions

☞ Read and follow all instructions in this manual.
☞ Inform yourself regarding
  − Dangers which can arise from the unit;
  − Dangers which can arise from the system;
☞ Follow the safety and accident prevention instructions.
☞ Check regularly that all safety and protection requirements are being observed.
☞ When installing the DCU, take account of the ambient conditions.
  The protection type is IP 20. The units DCU are protected against the ingress of foreign bodies ≤ ∅ 12 mm. Since water protection is not provided, the unit should be mounted in a suitable housing (see Section 3. "Installation").
☞ Do not carry out any unauthorised modifications or alterations to the DCU.
☞ Do not open the housing cover when the unit is connected to the mains nor during pumping operations.
☞ Take account of the prescribed mains voltage values when connecting units DCU 100 to DCU 600.
☞ When shipping, please note the instructions in Section 7.

Pictogram definitions:

| WARNING | There is danger of an electric shock if the contacts are touched. |

| WARNING | There is danger of personal injury. |

| CAUTION | There is danger of damage to the unit or to the system. |

2. Understanding The Display and Operating Unit DCU

2.1. For Your Orientation

Symbols used

The following symbols will be used in the illustrations throughout the manual:

⚡ Electrical connection

Abbreviations used

TMP = Turbomolecular Pump
DCU = Display and Operating Unit
TC = Electronic Drive Unit
TPS = Mains Power Unit

Position numbers

The same accessory parts have the same position numbers in all illustrations.

Operation instruction in the text

➡ Here you must do something.

2.2. Product Description

The Display Control Unit DCU is an operating unit for PFEIFFER drive units. It enables control over all the main parameters of the unit. Additionally, the connection of a vacuum gauge is possible.

DCU 001 = Basic unit without mains power unit
DCU 100/150/200/300/600 = Unit with mains power unit.

Scope of Delivery

– Display Control Unit DCU
– Connecting cable DCU - TC (3m)
– 4 mounting screws

Mechanical Design

The DCU is fitted in a housing suitable for mounting in a 19"/3HE rack.

Connection Options

The DCU provides the following connection options:
– Electronic drive unit for turbopump (X2)
– Pressure gauge (X3).
– Serial interface RS 485.

The units DCU 001, DCU 100 - DCU 600 have been tested and passed by the authorities in accordance with EN 61010/VDE 0411 "Safety Equipment For Electrical Units".

Proper Use

- The display and operating unit DCU may only be used to control PFEIFFER Electronic Drive Units and their peripheral units.
- Instructions concerning installation, start-up, operating and maintenance must be observed.

Improper Use

Improper is:
- Uses not covered above, especially:
    - Connection to pumps and units which is not permitted in their operating instructions.
    - Connection to units which contain touchable and voltage carrying parts.
    - Applications with this unit in radioactive areas.

Improper use will cause any rights regarding liability and guarantees to be forfeited.

2.3 Front panel
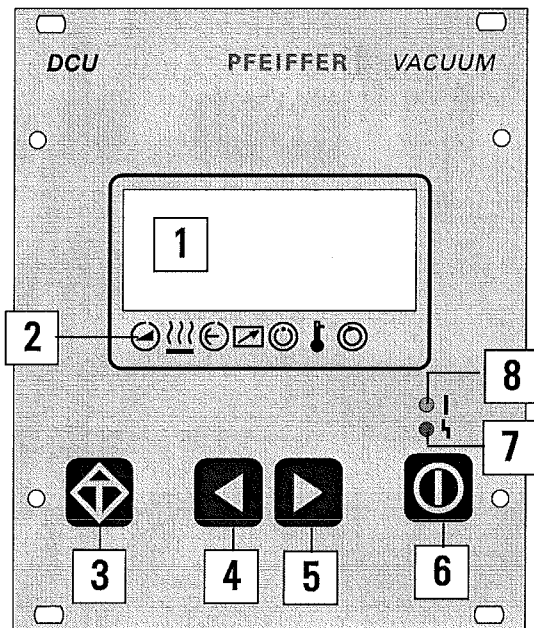
The front panel contains all the operating and display elements.

1   LCD display
2   Status display (symbol defintions see chapter 4.6.)
3   "Error acknowledgement" key
4   Key "Left"
5   Key "Right"
6   "Pumping Station ON/OFF" key
7   Red illuminating diode for error status
8   Green illuminating diode for operating status

2.4 Rear Panel
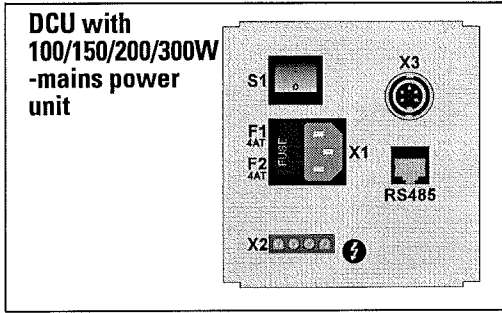
DCU with 100/150/200/300W -mains power unit

S1	Mains switch
F1	Mains fuse
F2	Mains fuse
X1	Mains connection 90-265 V~
X2	Output for voltage supply, electronic drive unit
X3	Pressure gauge connection
RS 485	Communication with electronic drive unit

DCU with 530/812W -mains power unit

S1	Mains switch
F1	Mains fuse
F2	Mains fuse
X1	Mains connection 90-265 V~
X2	Output for voltage supply, electronic drive unit
X3	Pressure gauge connection
RS 485	Communication with electronic drive unit

DCU 001 without mains power unit
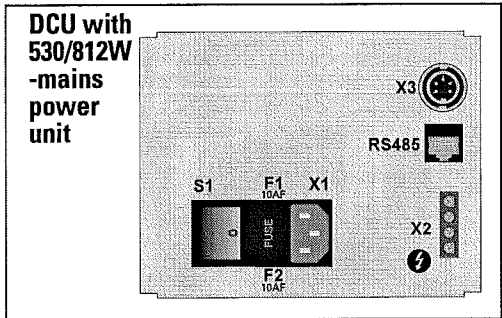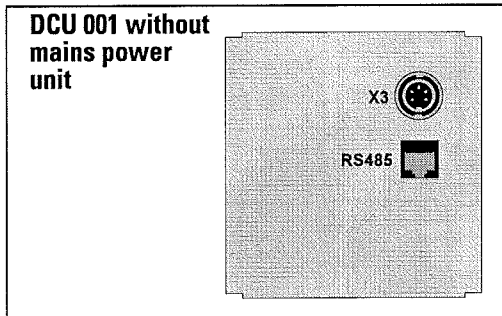
X3	Pressure gauge connection
RS 485	Communication with electronic drive unit

3. Installation

3.1. Preparations For Installation

WARNING ⚠️ Unauthorised modifications or alterations to the Display Control Unit are not allowed.

The unit must be fitted in a housing taking account of the ambient conditions (see section "Technical Data").

➡ Disconnect mains power plug before installation work.

Installation location: Protected against the weather.

The following is applicable for open buildings and operations rooms which are not fully air conditioned:
Temperature: +5°C - +40°C.
Relative humidity: 5 - 85%, non-condensing.
Air pressure: 86 kPa - 106 kPa

3.2. Rack Fitting

The units DCU 001, DCU 100 - DCU 600 are designed to be fitted into a 19"/3HE rack with guide rails.

➡ For installation secure the front panel to the rack using four fixing screws.
➡ Ensure free convection. The minimum distance to the upper and lower ventilation slits must be ≥ 50mm.

The ambient temperature in the rack housing must not exceed 40°C.

Depending on the version, various connections are provided on the DCU.

3.3. Connecting Diagram
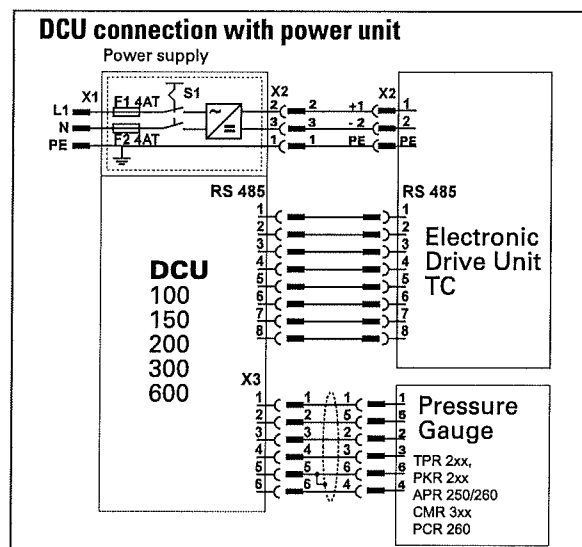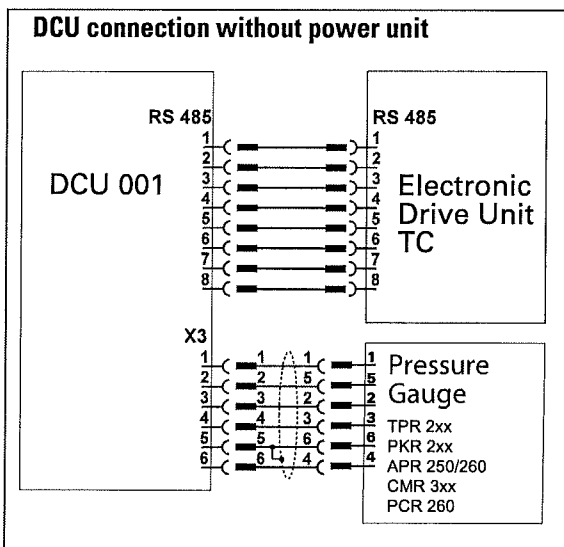
3.4. Making The Connections

- The units DCU 100 - DCU 600 have been designated protection class 1 and must always be connected with the earthed conductor (PE) via the mains cable.

Please note: If using the TC 600 electronic drive unit, please disconnect the remote plug from the RS 485 interface connection.

→ Mains connection must be made in accordance with the local regulations.
→ Make the connection X2 - Electronic Drive Unit in accordance with the connecting diagram, section 3.3.
→ Make the connection pressure gauge to X3 as required.
–> **Please note:** if connecting a pressure gauge PCR 260, "TPR" is shown at the display.
→ Make the connection RS 485/DCU-RS 485/Electronic Drive Unit via the delivered 8 pole cable.

The DCU 001 is re-supplied with its operating voltage via the Serial Interface RS 485 cable from the Electronic Drive Unit. As soon as this unit is switched on, the DCU is supplied with voltage.

Mains voltage
DCU 100: 90 - 265V~, 125VA
DCU 150: 90 - 265V~, 170VA
DCU 200: 90 - 265V~, 230VA
DCU 300: 90 - 265V~, 330VA
DCU 600: 90 - 132/185-265V~, 590/900VA

4. Operations

4.1. Short Overview, Operating
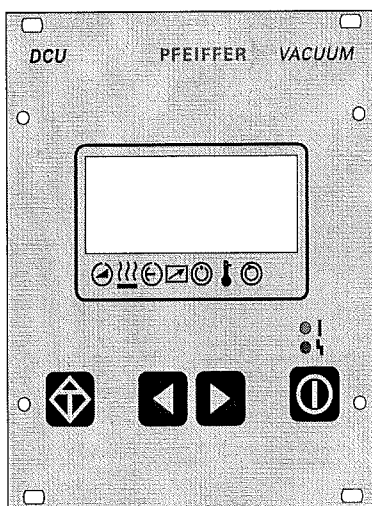
Selecting the parameters
→ Select the parameter numbers with the keys ◄ (back) or ► (forward) (keeping the key depressed enables rapid scrolling).

Setting parameters
→ Select a parameter.

→ Depress keys ◄ and ► simultaneously.
–> The arrow (--->) appears in the second line from the top.

→ Reduce or increase the values with the key ◄ or ► respectively.

→ Depress key ◄ and ► simultaneously.
–> The arrow (--->) disappears.
–> The parameter is set.

4.2. General

All function relevant aspects of the pump electronics are illustrated in the form of parameters. Each parameter has a number and a designation (for example, "720: Vent frequ").

The value of the parameter is always readable, in some cases also modifiable via the keyboard.

4.3. Switching On The Control Unit

➡ Make the connection to the Serial Interface RS 485.

DCU 001:
➡ Switch on the external supply of the Electronic Drive Unit (for example TPS 100-600).

DCU 100/150/200/300/600:
➡ Switch on the DCU by the switch S1 on the rear side.
➡ In the event of an error message: depress: ⬡.

Self-Testing

After switching on, the DCU performs a self-test and also a test on the connected turbo electronics. Run time of the self-test: approx. 20s. During the test a bar appears in the display in line 4 and this shows the progress of this procedure.

- **Display test:** All signs in the LC display are shown for a short time in black.
- **LED test:** During the whole testing process the red and the green LEDs illuminate.
- **DCU test:** The DCU hardware is tested.
- **Connection to the turbo electronics test:** The correct connection to the turbo electronics and their identity are examined.
- **Parameter test:** Information regarding the parameters is loaded.
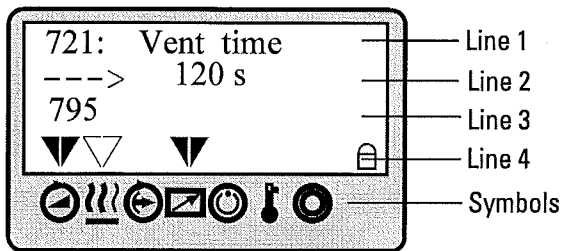- **Identification of the connected components:** The designation of the drive unit is displayed.

Providing there are no errors the DCU is now ready to operate.

4.4. Functions Of The Keys

The four keys on the front panel have the following functions:

Key	Application/Example		Explanation
		⊰⚙⚬	**Reset** (error acknowledgement). Acknowledges errors (red LED illuminates)
		⬑309: Act rotspd ⬑310: TMP I-Mot	**Scroll back parameters** Scrolls back a parameter
	——>	⬎871 Hz ⬎ 872 Hz	**Reduce a value** (with arrow "——>")
		⬐310: TMP I-Mot ⬐311: TMP Op hrs	**Scroll parameters forwards** Scrolls forward a parameter
	——>	871 Hz ⬈ 872 Hz ⬈	**Increases a value** (with arrow "——>")
		001: Heating ☞ off	**Alters a value** (⇨data editing mode) Access to a displayed value, if possible (arrow "——>" appears)
simultan-eously	——>	001: Heating off ✔	**Confirm a value** (⇨param. selection mode) Takes over an altered value (The arrow "——>" disappears)
		010: Pump stat. on ⇔ off	**Pumping Station ON/OFF** Switches the pumping station ON and OFF, equivalent to parameter 010: "Pump stat."

4.5. LC-Display

```
721:    Vent time         ──── Line 1
--->        120 s          ──── Line 2
795                        ──── Line 3
▼▽    ▼              🔒   ──── Line 4
⊝‼⊖✉⊙ ❗ ⊙          ──── Symbols
```

The functions are displayed via a four line LC display. A special function is assigned to each line:

- **Line 1:** Number and name of the selected parameter (for example 721: >>Vent time<<).

- **Line 2:** Relating value. If an arrow (--->) is displayed, the displayed value can be altered.

- **Line 3:** Two functions

    Function 1: Messages relating to operations and operating are displayed. (see table "Operating Messages" in the operating instruction "Pumping Operations with DCU" and "Error Codes", section 5).

    Function 2: An optional second parameter in the form of >>Parameter number<< : >>value<< is displayed. The function of this line enables setting via parameter **[P:795]** >>Servicelin<< at line 1 . With >>Servicelin<< all parameters can be displayed. Error messages are displayed independent of the selected function.

- **Line 4:** Arrows which points to the underlying symbol. This restores the unit status.

Please note:
Prolonged depressing of the key ◄ or ► enables rapid scrolling and/or alterations to the data.

The data mode (arrow "--->" is displayed) is automatically relinquished, without taking over the values to be altered, under the following conditions:

- No settings or key depressing for longer than 10 seconds.
- The occurrence of an error.
- The key ⊙ has been depressed.

4.6. Symbol Definitions

	Symbol	Arrow	Explanation
⟳	Pump	–	No
	accelerates	▼	yes
∫∫∫	Pre-selection	–	No pre-selection
	heating	▽	Pre-selection heating, but switchpoint not attained
		▼	Heating ON, switchpoint attained
⟳→	Stand-by	–	Off
		▼	On
↗	Unit under remote control	–	No
		▼	Yes
◎	Switchpoint	–	No
	attained	▼	Yes
🌡	Excess-	–	No excess temperatures
	temperature	▽	Excess temperature pump
		▽	Excess temperature pump elektronik
		▼	Excess temperature pump and pump elektronik
◎	Final rotation speed attained	–	No
		▼	Yes

4.7. LED Display

The red LED (error status) and green LED (operations status) on the front panel can take on the following conditions:

Red LED
Illuminates: Collective error messages
Flashes: Warning

Green LED
Illuminates: Mains power unit OK, pumping station ON
Flashes: Mains power unit OK, pumping station OFF
Blinks: Mains power failure

4.8. Serial Interface

The serial Interface RS 485 is only used for connecting the pump controller at the vacuum pump. The description of the interface protocol you can find in the operating instruction PM 800 488 BN.

5. Error Codes

5.1. General

Errors ("Errxxx" or "Error Exxx") always causes to shut-down of the TMP, the fan, the heating and the backing pump.
➡ After the error is removed depress key ⊕.
–> The unit is again ready to operate.

Warnings ("Wrnxxx" or "Warning Fxxx") are only displayed and do not cause components to be shut down.

5.2. Errors During Self-Testing

The following errors can occur during self-testing performed when the DCU is switched on:

Display	Error	Possible action
** Error E021 **	• Wrong pump identification resistance	• Mains OFF-ON • Inform PFEIFFER-Service
** Error E040 **	• Hardware error: external RAM defective	• Inform PFEIFFER-Service
** Error E042 **	• Hardware error: EPROM checksum	• Inform PFEIFFER-Service
** Error E090 **	• Insufficient RAM • The DCU is connected to the wrong pump electronic	• Inform PFEIFFER-Service • Connect correct pump electronic
** Error E698 **	• The connected drive unit does not respond	• Check communication lead between electronic drive unit and DCU, switch on electronic drive unit

6. What To Do In Case of Breakdowns ?

Check the fuses

In case of an error:
➡ Loosen F1/F2 with a screwdriver and check fuses. Replace if defective. Only use fuses with high switching capability.

The safety values are stated on the rear panel of the DCU.

CAUTION Caution! Double pole / neutral fusing!

7. Maintenance And Service

The unit requires no maintenance. A damp cloth can be used to wipe away any dirt which has collected on the front panel. Ensure that the unit is first disconnected from the mains power supply.

Do Make Use Of Our Service Facilities
In the event that repairs are necessary a number of options are available to you to ensure any system down time is kept to a minimum:
– Have the unit repaired on the spot by PFEIFFER Service Engineers;
– Return the unit to the manufacturer for repairs;
– Replace with a new value unit.

Local PFEIFFER representatives can provide full details.

WARNING When carrying out their own repairs customers must bear in mind that dangerous voltage levels are present.

Please note:
Units returned to us for repair or maintenance are covered by our general conditions of sale and supply.

Contact addresses and telephone hotline:
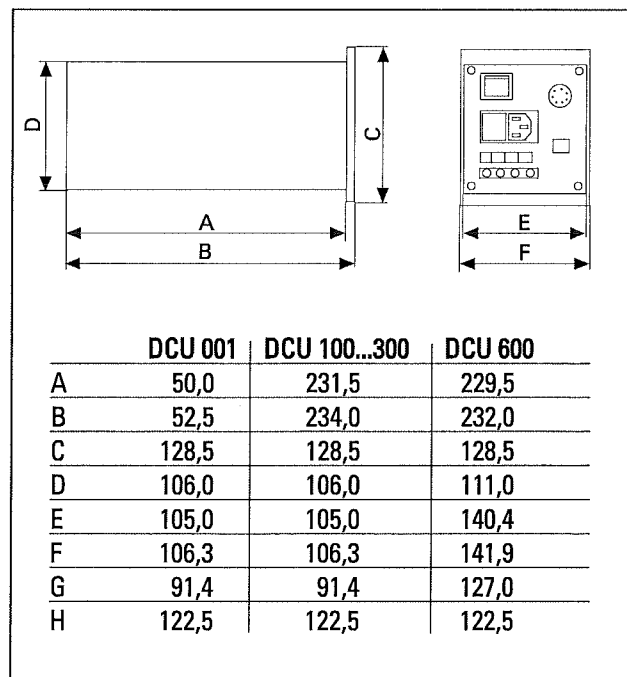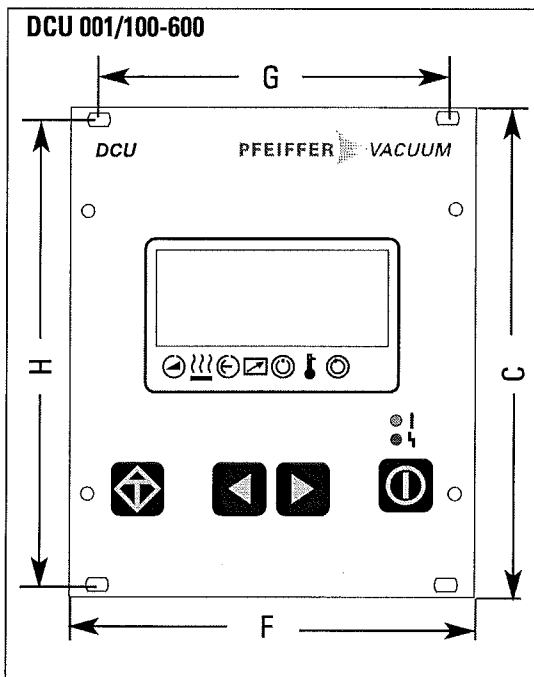Please refer to the back cover of this manual for contact addresses and telephone hotline numbers.

8. Technical Data

8.1. Data List

Definition	Unit	DCU 001	DCU 100	DCU 150	DCU 200	DCU 300	DCU 600
Connection voltage:	V DC	12-30[1]	–	–	–	–	–
	V AC	–	90-132	90-132	90-132	90-132	90-132
	V AC	–	185-265	185-265	185-265	185-265	185-265
Frequency:	Hz	–	50-60	50-60	50-60	50-60	50-60
Max. power consumption.:	VA	≤ 5	≤ 125	≤ 170	≤ 230	≤ 350	590/900[2]
Output voltage X2:	VDC	–	24	24	48	72	140
Max output current X2:	A	–	4,1/4,6 [2]	5/6,2 [2]	4,1/4,6 [2]	3,2/4,2 [2]	3,8/5,8 [2]
Max output power X2.:	W	–	100/110 [2]	120/150 [2]	200/220 [2]	230/300 [2]	530/812 [2]
permiss. amb. temperature.:	°C	5 - 40					
Max. relative humidity.[3]	%	5 - 85					
Air pressure:		86kPa - 106 kPa					
Protection type:		IP 20					
Weight:	kg	0,4	1,6	1,9	1,9	2,2	2,6

1) only supplied by PFEIFFER Electronic Drive Unit
2) at 90-132 V AC / 185-265 V AC
3) non condensing

8.2. Dimesions

DCU 001/100-600

	DCU 001	DCU 100...300	DCU 600
A	50,0	231,5	229,5
B	52,5	234,0	232,0
C	128,5	128,5	128,5
D	106,0	106,0	111,0
E	105,0	105,0	140,4
F	106,3	106,3	141,9
G	91,4	91,4	127,0
H	122,5	122,5	122,5

9. Supplementary Information

The Display And Control Unit DCU is a universal component for the control and monitoring of PFEIFFER vacuum pumps and drive units.

Depending on the configuration of your components further operating instructions are included in the delivery consignment (please see the table). If, despite every effort by us, information on your products is missing please get in touch with your local Pfeiffer representatives or call us on the hotline shown on the back cover page. All operating instructions are also available as PDF files at www.pfeiffer-vacuum.net.

The following operating instructions are available for the range of pumps which come with DCU control units:

Product	Definition	No. Operating Instruction
Vacuum pump	Description of the Pump	dependend to the pump typ[1]
DCU 001, 100-600	Description of the controller	PM 0477 BE
Operating turbo pump with DCU	Operating definition/parameter	PM 0547 BE
TPS 100, 200, 300, 600	Description of the mains power unit	PM 0521 BE
Housing heating turbo pump	Description of the housing heating	PM 0542 BE
Air cooling turbo pump	Description of the air cooling	PM 0543 BE
Water cooling turbopump	Description of the water cooling	PM 0546 BE
Backing pump relay box[2]	Description monitoring of the backing p.	PT 0030 BE
Temperature Management System TMS	Description heating of the pre vacuum section of the turbo pump	PT 0099 BE
RS 232/485	Pfeiffer Vacuum Protocol	PM 0488 BE
RS 232/485	Description of the interface	PM 0214 BE
Level converter RS 232/RS 485	Pump monitoring via RS 232	PM 0549 BE
TVF 005	Description of the vent valve	PM 0507 BE

[1] Numbers can be supplied by PFEIFFER Service.

2) Only for rotary vane vacuum pumps.

Notizen / Notes

PFEIFFER ▛ VACUUM

Konformitätserklärung
Declaration of Conformity

C E   C E

im Sinne folgender EU-Richtlinien:
pursuant to the following EU directives:

- Elektromagnetische Verträglichkeit/*Electromagnetic Compatibility* 89/336/EWG
- Niederspannung/*Low Voltage* 73/23/EWG

Wir bestätigen Konformität mit der **EU-Richtlinie über elektromagnetische Verträg-lichkeit 89/336/EWG** und der **EU-Niederspannungsrichtlinie 73/23/EWG**.

We hereby certify that the product specified below is in accordance with the provision of EU Electromagentic Compatibility Directive 89/336/EEC and EU Low Voltage Directive 73/23/EEC.

Produkt/*Product*:
DCU 001, DCU 100, DCU 200, DCU 300, DCU 600

Angewendete Richtlinien, harmonisierte Normen und angewendete, nationale Normen:
Guidelines, harmonised standards, national standards in which have been applied:

EN 61010, EN 55011, EN 50081-1, EN 50082-2, IEC 801 1-4, VDE 0843-6

Unterschriften/*Signatures*:

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Berliner Strasse 43
35614 Asslar
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Konf.II/2007

Vacuum is nothing, but everything to us!

- Turbo Pumps

- Rotary Vane Vacuum Pumps

- Roots Pumps

- Dry Vacuum Pumps

- Leak Test Units

- Valves

- Flanges, Feedthroughs

- Vacuum Measurement

- Gas Analysis
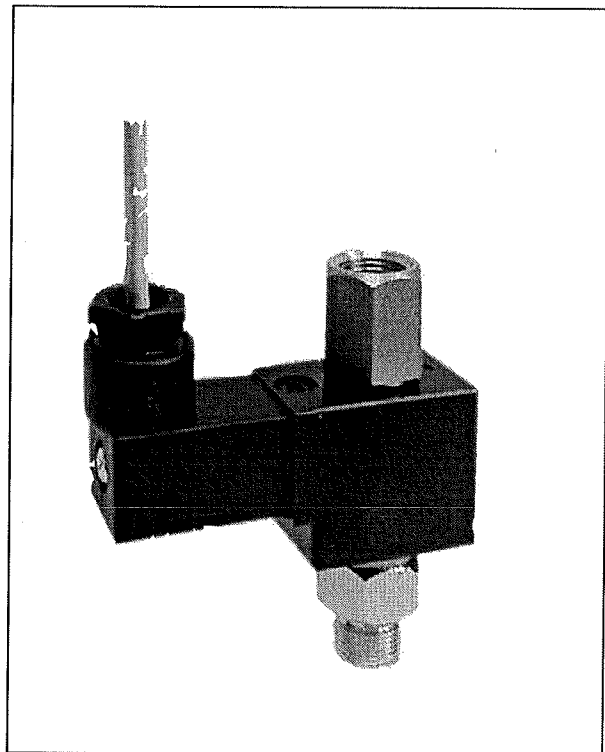
- System Technology

- Service

PFEIFFER VACUUM

PFEIFFER VACUUM

Betriebsanleitung

Operating Instructions

TVF 005

Flutventil

Venting Valve

Main Features And Proper Operating

Venting Valve TVF 005

1   Venting connection
2   Connection adapter
3   Electrical Connection
3a Connection cable
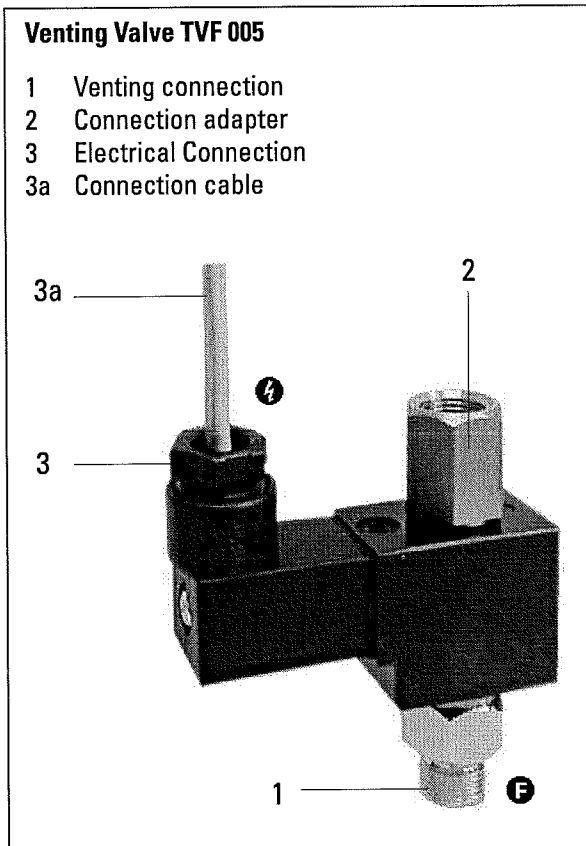
The Venting Valve TVF 005 may only be used to vent PFEIFFER turbomolekular pumps with magnetic bearings or integrated Electronic Drive Units TC.
In a currentless state, the venting valve is closed and it opens (vents) without delay under voltage.
Control is executed via pre-selected setting on the Electronic Drive Unit.
The free flow for the venting medium is Ø 2 mm.

Venting Valve TVF 005 is supplied ready for connection complete with cable and plug.

PLEASE NOTE If a protective cap is installed at the connection adapter 2, the cap must be removed before being operated.

Installing And Operating

The procedure for operating and for connecting Venting Valve TVF 005 to the turbomolecular pump is contained in the operating instructions for the respective turbomolecular pump.

For venting with dry air or other gases, Drying Unit TTV 001 (please see "Accessories") or a gas canister (for example N_2) can be connected to the connecting adapter for the valve.

Technical Data

Feature	Unit	TVF 005
Connection nominal diameter		G 1/8"
Leak rate (Viton sealed)	mbar l/s	$< 1 \cdot 10^{-8}$
Seating diameter	mm	2
Gas flow at atmospheric pressure	mbar l/s	130
Venting gas over-pressure, max.	bar	1.5 (absolute)
Power supply	VDC	24
Weight	g	100

Dimensions Diagram
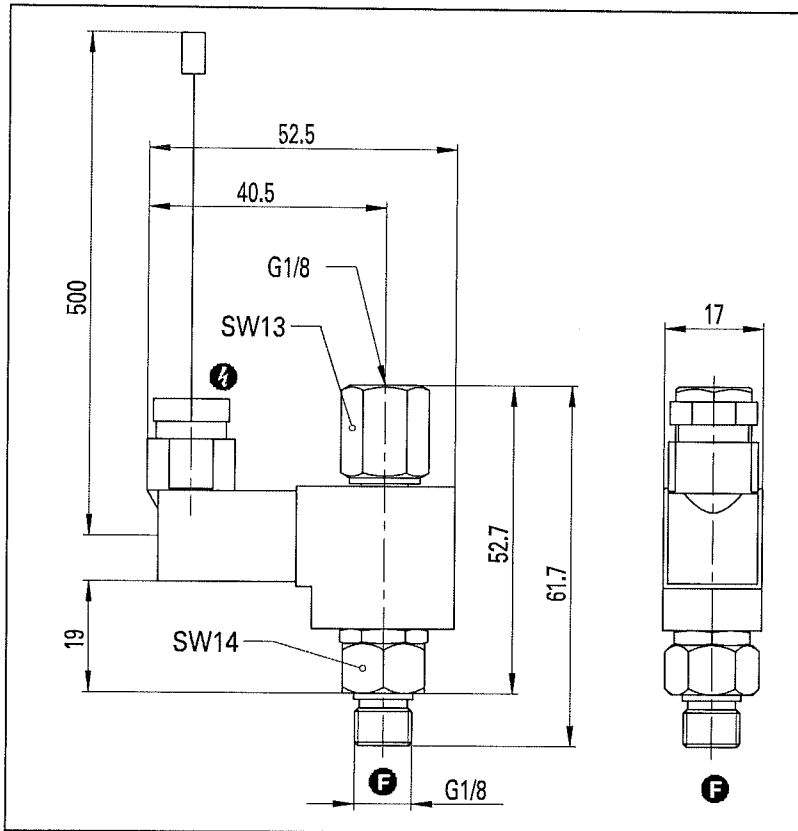
⑤ Venting connection
④ Electrical connection

Maintenance

Under clean operating conditions the venting valve requires no maintenance.

Accessories

Description	Size	Number
Drying Unit TTV 001 (filled with Zeolite)		PM Z00 121
Spare filling for the TTV 001	ca. 260 cm^3	PM 006 786-T

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PFEIFFER VACUUM

Gehäuseheizung

für Turbopumpen mit Antriebselektronik
TC 100 / TC 600 / TC 750 / TCP 350 / TCM 1601
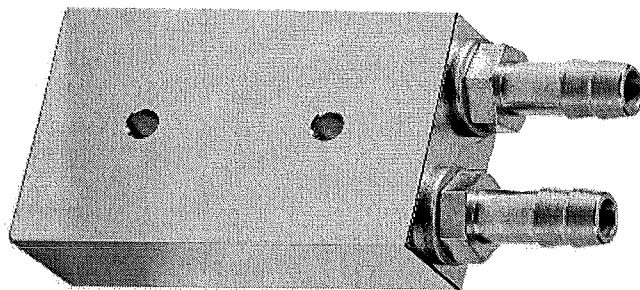
Casing Heating Units

For Turbopumps With Electronic Drive Units
TC 100 / TC 600 / TC 750 / TCP 350 / TCM 1601

PFEIFFER *VACUUM*
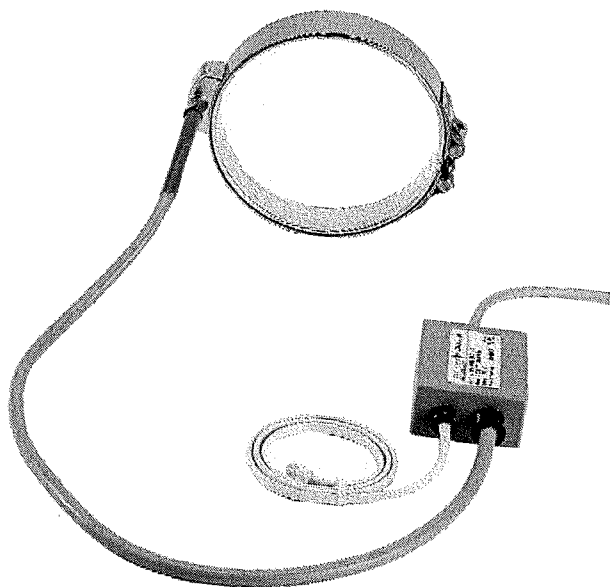
Wasserkühlung
Water Cooling Unit

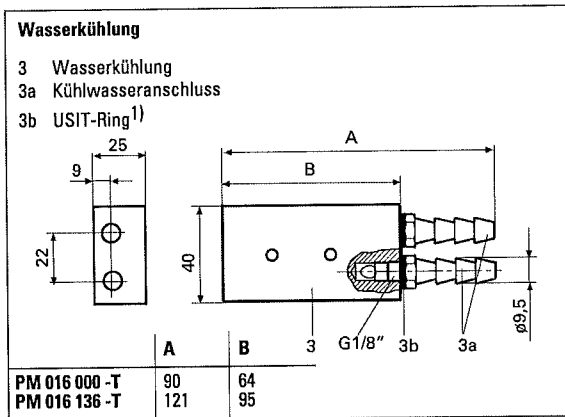## PFEIFFER VACUUM

1. Wichtig für Ihre Sicherheit

WARNUNG

Zum Anschluss des Kühlwassers sind geeignete druckfeste Schläuche und Anschlussteile zu verwenden. Bei nicht sachgemäßem Anschluss besteht Gefahr der Funktionsstörung der TC an der Turbopumpe (Schutzart IP 30; Schutzklasse 1).

Bestimmungsgemäße Verwendung

Die Wasserkühlung ist zum Kühlen der folgenden Pfeiffer Vacuum -Turbomolekularpumpen einzusetzen:

Pumpentyp	Bestell-Nr für Wasserkühlung
TMH/TMU 071	PM 016 000 -T
TMH/TMU 261; TMH/TMU 262	PM 016 136 -T

2. Maßbild

Wasserkühlung

3 Wasserkühlung
3a Kühlwasseranschluss
3b USIT-Ring[1]

|	A	B
PM 016 000 -T	90	64
PM 016 136 -T	121	95

1) Der USIT-Ring ist ein Ersatzteil und kann unter Nummer P 3529 133 -A bei Pfeiffer Vacuum nachbestellt werden.

3. Installation

→ Die Montagefläche an der Wasserkühlung vor der Installation mit Wärmeleitpaste (wenn im Beipack enthalten) bestreichen.
→ Wasserkühlung 3 mit beiliegenden Schrauben und Federringen so an das Pumpenunterteil anschrauben, dass die Wasseranschlüsse 3a in Richtung des Vorvakuumanschlusses 2 zeigen.

Wasserkühlung montieren

2 Vorvakuumanschluss
3 Wasserkühlung
3a Kühlwasseranschluss
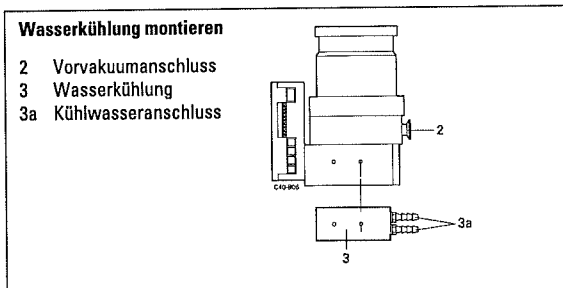
Das Kühlwasser ist entweder aus dem Kühlwassernetz zu entnehmen oder aus einem Wasserrückkühler in geschlossenem Kreislauf.

Kühlung aus Kühlwassernetz

Um Ablagerungen in der Wasserkühlung zu vermeiden, muss das Kühlwasser filtriert sein!
Mindestanforderungen an das Kühlwasser:
Mechanisch rein, optisch klar, ohne Trübung, ohne Bodensatz, chemisch neutral, Temperatur >Taupunkt.

Sauerstoffgehalt:	max.	4 mg/kg
Chloridgehalt:	max.	100 mg/kg
Karbonathärte:	max.	10 °dH
Kaliumpermanganatverbrauch:	max.	10 mg/kg
Kohlensäure:	nicht nachweisbar	
Ammoniak:	nicht nachweisbar	
pH-Wert:	7 – 9	
Vorlauf-Überdruck:	max.	6 bar
Mindest-Durchfluß bei max. Gaslast:	100 l/h bei 15 °C	

Anschluss an das Kühlwassernetz

→ Schmutzfänger 33[2] in die Vorlaufleitung 31 einbauen.
→ Vorlaufleitung mit Schlauchklemme an einen der beiden Kühlwasseranschlüsse 3a anschließen.
→ Rücklaufleitung 32 an den anderen Kühlwasseranschluss 3a der Turbopumpe anschließen.
→ Kühlwasseranschlüsse 3a mit einem Drehmoment von 10 Nm festschrauben.
→ Alle Schlauchklemmen fest anziehen und festen Sitz der Schläuche kontrollieren.

Kühlung aus Kühlwassernetz

2 Vorvakuumanschluss
3a Kühlwasseranschluss
31 Vorlaufleitung
32 Rücklaufleitung
33 Schmutzfänger
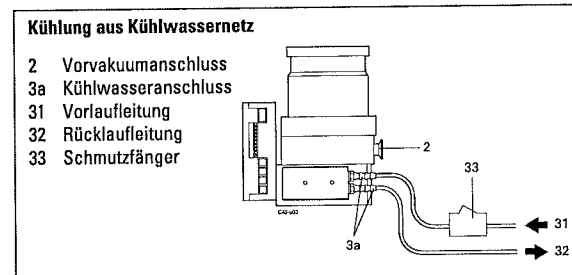
2) Der Schmutzfänger (R3/8") kann mit der Nummer P 4161 300 2R bei Pfeiffer Vacuum bestellt werden.
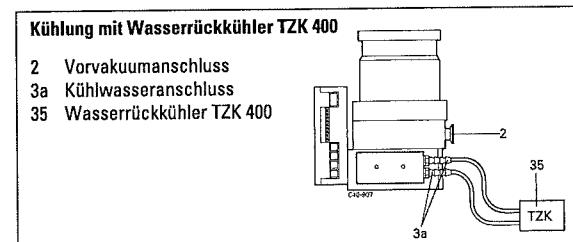
Kühlung mit Wasserrückkühler TZK 400[3]

Einzelheiten zum Wasserrückkühler und dessen Installation sind der Betriebsanleitung des Wasserrückkühlers (PM 0369 BN) zu entnehmen.

Anschluss an den TZK 400

Alle Schritte wie unter "Anschluss an das Kühlwassernetz" ausführen.

HINWEIS

Ein Schmutzfänger in den Leitungen ist nicht zulässig!

Kühlung mit Wasserrückkühler TZK 400

2 Vorvakuumanschluss
3a Kühlwasseranschluss
35 Wasserrückkühler TZK 400

3) Der Wasserrückkühler TZK 400 (230 V; 50 Hz) kann mit der Nummer PM Z01 245 bei Pfeiffer Vacuum bestellt werden.

PFEIFFER VACUUM
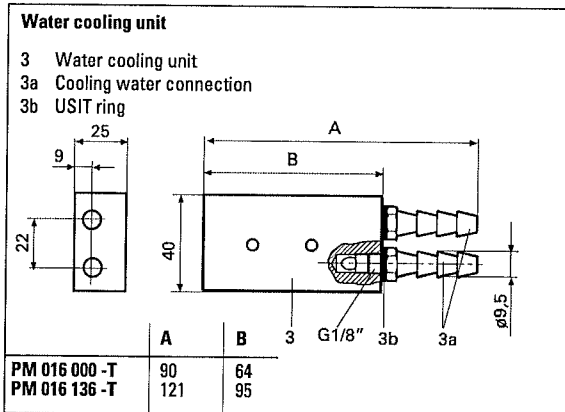
1. Safety Instructions

WARNING For connection purposes only suitable pressure resistant hoses and connecting pieces should be used. With improper connections there is a danger of malfunctions on the TC and on the turbopump (protection type IP 30; protection class 1).

Proper Use

The water cooling unit has been designed for operation with the following Pfeiffer Vacuum turbomolecular pumps:

Pump type	Order Nr. for the water cooling
TMHTMU 071	PM 016 000 -T
TMH/TMU 261; TMH/TMU 262	PM 016 136 -T

2. Dimensions Diagram

Water cooling unit

3   Water cooling unit
3a Cooling water connection
3b USIT ring

|	A	B
PM 016 000 -T	90	64
PM 016 136 -T	121	95

1) The USIT ring is a spare part and can be ordered from Pfeiffer Vacuum under the number P 3529 133-A.

3. Installation

➡ Smear the water cooling unit fitting surface with thermal conduction paste (if included in the delivery) before installing.
➡ Screw water cooling unit 3 to the pump lower part with the screws and spring washers povided in such a way that water connections 3a point towards fore-vacuum connection 2.

Fitting the water cooling unit

2   Fore-vacuum connection
3   Water cooling unit
3a Cooling water connection
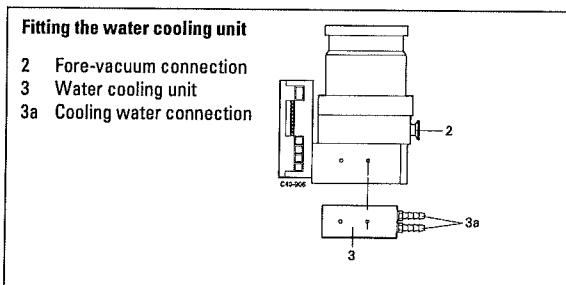
Cooling water should be drawn either from the water mains or from a recycled water cooling unit in closed circuit.

## Cooling from the cooling water mains

To prevent deposits forming in the water cooling unit the cooling water must be filtered.
The minimum requirements for the cooling water where connection to the water mains is involved is that it must be mechanically clean, optically clear, no turbidity, no sediment, chemically neutral and temperature >dew point.

Oxygen content:	max.	4 mg/kg
Chloride content:	max.	100 mg/kg
Carbonate hardness:	max.	10° dH
Consumption of potassium permanganate:	max.	10 mg/kg
Carbon dioxide:	Undetectable	
Ammonia:	Undetectable	
pH-value:		7-9
Max. fore-line over pressure:	max.	6 bar
Minimum flow rate at maximum gas load:	100 l/h at 15 °C	

Connection to the cooling water mains

➡ Fit dirt trap 33[2] in inlet line 31.
➡ Connect the inlet line with a hose clip to one of the two cooling water connections 3a.
➡ Connect outlet line 32 to the other cooling water connection 3a on the turbopump.
➡ Tighten the cooling water connections 3a to a torque of 10 Nm.
➡ Tighten all hose clips and check hoses for firm seating.

Cooling from the cooling water mains

2   Fore-vacuum connection
3a Cooling water connection
31 Inlet line
32 Outlet line
33 Dirt trap
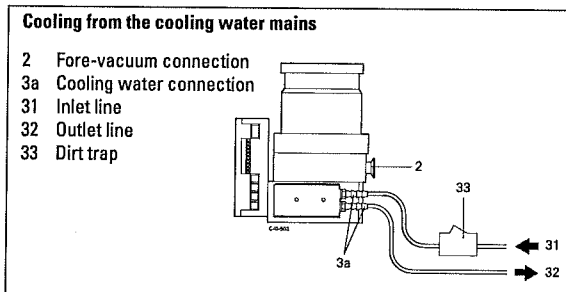
2) The dirt trap (R3/8") can be ordered from PFEIFFER under the number P 4161 300 2R.

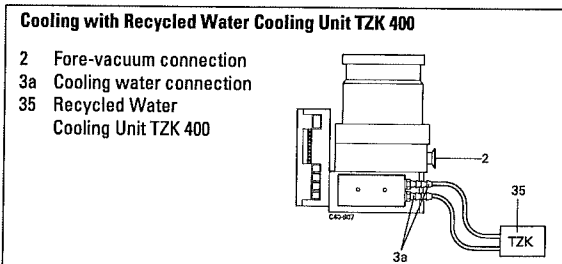## Cooling with the Recycled Water Cooling Unit TZK 400[3]

Please refer to the operating instructions for the recycled cooling water unit (PM 0369 BN) for details on the recycled cooling water unit and its installation.

Connection to the TZK 400

Please proceed as for "Connection to the cooling water mains".

PLEASE NOTE Dirt traps in the lines are not permissible.

Cooling with Recycled Water Cooling Unit TZK 400

2   Fore-vacuum connection
3a Cooling water connection
35 Recycled Water
    Cooling Unit TZK 400

3) Recycled Water Cooling Unit TZK 400 (230 V;50 Hz) can be ordered form PFEIFFER under the number PM Z01 245.

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Dry Vacuum Pumps

Leak Test Units

Valves

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