TurboDrag Pump
with Electronic Drive Unit TC 600

TMH 071
TMU 071
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Please note: Current operating instructions are available via
www.pfeiffer-vacuum.net
1. Safety Instructions

1.1. For Your Orientation

Instruction in the text
➡ Working instruction: here, you have to do something.

Symbols used
The following symbols are used throughout in all illustrations.

- High vacuum flange
- Fore-vacuum flange
- Venting connection
- Cooling water connection
- Air cooling
- Electric connection
- Sealing gas connection

Abbreviations used
DCU = Display and control unit
HPU = Handheld programming unit
TC = Electronic drive unit, turbopump
TPS = Power unit

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

1.2. Pictogram Definitions

Warning, danger of burns from touching hot parts.

Warning, danger of personal injury.

Caution, danger of damage to the pump or to the system.

Warning, danger of injury from rotating parts.

Please note, attention to particularly important information on the product, handling the product or to a particular part of the documentation.

Modifications reserved.
2. Understanding The Pumps TMH 071 / TMU 071

2.1. Main Features
Turbopumps TMH 071 / TMU 071 with the TC 600 form a complete unit. Voltage is supplied by the power unit (see “Accessories”).

On delivery, the pumps have been set up for operations in remote mode. Remote plug 8d should be removed if operations with DCU or HPU are required.

**PLEASE NOTE**

Cooling

- Enhanced convection cooling with cooling unit (accessory),
- air cooling (accessory) or
- water cooling (accessory).

Integrated protective measures against excess temperatures:
The electronic drive unit TC 600 reduces the rotor rotation speed.

Bearings
High vacuum side: Wear free permanent magnetic bearing.

Fore-vacuum side: Oil circulatory lubricated ball bearing with ceramic balls.

Ambient conditions
The turbomolecular pump needs to be installed in compliance with the following ambient conditions:

- **Installation location:** protected against the weather (rooms within buildings)
- **Temperature:**
  - +5 °C to +40 °C
  - max. 80% at T ≤ 31 °C
  - up to max. 50% at T ≤ 40 °C
- **Air pressure:**
  - 77 kPa - 106 kPa
- **Installation altitude:**
  - 2000 m max.
- **Pollution degree:**
  - 2
- **Overvoltage category:**
  - II
- **Connection voltage:**
  - 24 VDC ±5%
Proper Use
- The Turbomolecular Pumps TMH 071 / TMU 071 may only be used for the purpose of generating vacuum.
- The turbopumps may only be used to pump those media against which they are chemically resistant. For other media the operator is required to qualify the pumps for the processes involved.
- If the process produces dust, the maintenance intervals must be specified accordingly and sealing gas must be used.
- The turbopump must be connected to a backing pump in accordance with Section 3.3.
- Only Pfeiffer Vacuum power units may be used to operate the TC 600. The use of other power units requires the prior agreement of the manufacturer and equalization with the valid specification.
- The pumps may only be operated providing the ambient conditions in compliance with Protection Type IP 30 are observed.
- Sealing gas must be used to ensure rotor cooling, when operate the pump with 50% of the maximum gas load.

Improper Use
The following is regarded, inter alia, as improper:
- The pumping of explosive or corrosive gases,
- Operating the pumps in explosive areas,
- The pumping of gases and vapours which attack the materials of the pumps,
- The pumping of radioactive media,
- The pumping of corrosive gases without sealing gas,
- The pumping of condensing vapours,
- Operation involving impermissibly high levels of gas loads.
- Operation with improper gas modes.
- Operation involving too high levels of heat radiation power (see Section “Technical Data”),
- Operation without the use of cooling equipment.
- Operation without cover plate for the TC in environments which require a protection class superior to IP 30.
- Installation in systems where the turbopumps are subjected to impact-like stress and vibrations or the effect of periodically occurring forces.
- The use of other power units or accessories which are not named in this manual or which have not been agreed by the manufacturer.
- The connection to power units with earthing of a direct voltage pole.

Improper use will cause all claims for liability and guarantees to be forfeited.

2.2. Differences Between The Pump Types

<table>
<thead>
<tr>
<th>Feature</th>
<th>TMH 071</th>
<th>TMU 071</th>
</tr>
</thead>
<tbody>
<tr>
<td>High vacuum flange</td>
<td>ISO-KF / ISO-K</td>
<td>CF-F</td>
</tr>
<tr>
<td>High vacuum seal</td>
<td>Elastomer</td>
<td>Metal</td>
</tr>
<tr>
<td>Attainable final pressure</td>
<td>&lt; 1 · 10⁻⁷ mbar (without baking-out)</td>
<td>&lt; 5 · 10⁻¹⁰ mbar (with baking-out)</td>
</tr>
</tbody>
</table>

Abbreviations on the rating plate of the turbopump

Suffix “P”: Purge gas connection for the prevention of the ingress of aggressive gases into the motor and bearing arena (Sealing gas valve see “Accessories”).

Suffix “Y”: Installation orientation in all positions possible.

2.3. Scope Of Delivery

Turbomolecular pump with:
- Electronic drive unit TC 600,
- Protecting cover for high vacuum flange,
- Protecting cover for fore vacuum flange,
- only DN 63 ISO-K: 2 bracket screws.
3. Installation

3.1. Preparations For Installation

Do not carry out any unauthorised conversions or alterations to the turbopump. The operator must ensure that the TC 600 is integrated into an emergency safety circuit. The supply voltage of the TC 600 must be interrupted when releasing the emergency safety condition.

For special requirements please contact Pfeiffer Vacuum.

In case the rotor blocks suddenly, torque levels up to 820 Nm can occur which need to be absorbed by the system and the high vacuum flange.

- The maximum permissible rotor temperature of the pump is 80 °C. If the vacuum chamber or parts in the vacuum chamber are heated must be fitted if necessary, suitable shielding in the vacuum chamber before the turbopump (constructional suggestions available on request).
- The temperature of the high vacuum flange may not exceed 120 °C.
- Only remove the blank flange from the high and fore-vacuum side immediately before connection.
- On Turbopumps TMH 071 / TMU 071 the lubricant reservoir is already fitted and filled.
- Where magnetic fields of > 3 mT are involved suitable shielding must be provided (available on request).
- If the pump is baked out, the heating sleeve and the body of the pump must be insulated to prevent burns from accidental contact.
- Air or water cooling is necessary for operating the pump. Where operations with convection cooling are involved, a cooling unit must be used (please see “Accessories”).
- Floor mounting of the turbomolecular pump is only admissible after consulting the manufacturer.

The person responsible for commissioning must ensure that the installation is carried out in accordance with the legal regulations and the pertinent industrial standards.

Notes to the accessories named below are located in the section 11 “Accessories”. There are also located the information on the appropriate operating instructions.

3.2. Connecting The High Vacuum Side

The utmost cleanliness must be observed when fitting all high vacuum parts. Unclean components prolong the pumping time!

All mounting materials for the flanges must be dry and free of any grease or dust with the installation.

Only those turbopumps with a ‘Y’ behind the type designation (please see rating plate, for example TMH 071 Y P) may be fitted in all positions.

Connecting via a Pfeiffer Vacuum vibration compensator

The high vacuum side can be flanged onto the vacuum chamber either directly or via a Pfeiffer Vacuum vibration compensator (see Section 11. Accessories).

When using a Pfeiffer vacuum vibration compensator, suitable securing needs to be introduced capable of absorbing the energy of the rotor should it suddenly block, since the vibration compensator itself alone cannot absorb the occurring forces. Please consult the manufacturer.

Use a Pfeiffer Vacuum splinter shield or protective screen

The use of a Pfeiffer Vacuum splinter shield or protective screen in the high vacuum flange protects the turbopump against foreign bodies coming from the vacuum chamber but does reduce the volume flow rate as followed:

<table>
<thead>
<tr>
<th>Splinter shield DN 63</th>
<th>Reduced volume flow rate in %</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N₂</td>
<td>H₂</td>
</tr>
<tr>
<td></td>
<td>13</td>
<td>5</td>
</tr>
<tr>
<td>Protective screen DN 63</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>Splinter shield DN 40</td>
<td>26</td>
<td>13</td>
</tr>
</tbody>
</table>
Installing The High Vacuum Flange
– In case the rotor blocks suddenly, torque levels up to **820 Nm** can occur which need to be absorbed by the system and the high vacuum flange.

If the pumps are secured with the attachment of ISO-K flange to ISO-F or with the attachment of ISO-KF flanges it can come to twisting the flange in case the rotor blocks suddenly.

– For installing the turbomolecular pumps to the high vacuum flange, the components listed in the following must be used exclusively. Otherwise the turbomolecular pump may twist or tear off. The clamps, bolts, nuts and centering rings are special designs from Pfeiffer Vacuum
– The minimum strength of 170 N/mm² of the flange material needs to be observed.

Installation is done as follows:

**ISO-K flange with ISO-K flange**
For installing the following components are available:

<table>
<thead>
<tr>
<th>Connection nominal diameter</th>
<th>Designation</th>
<th>Order number</th>
</tr>
</thead>
<tbody>
<tr>
<td>DN 63 ISO-K</td>
<td>Centering ring (coated), incl. 4 bracket screws</td>
<td>PM 016 360 -T</td>
</tr>
<tr>
<td></td>
<td>Centering ring (coated) with splinter shield, incl. 4 bracket screws</td>
<td>PM 016 361 -T</td>
</tr>
<tr>
<td></td>
<td>Centering ring (coated) with protective screen, incl. 4 bracket screws</td>
<td>PM 016 362 -T</td>
</tr>
</tbody>
</table>

**Bracket screw (ISO-K with ISO-K)**

- See that the sealing surface is not damaged.
- Flange the turbopump according to the drawing and the component parts in your set of mounting material.
- Use 4 bracket screws.
- Tighten the bracket screws crosswise in three steps. Tightening torque: 25 ±2 Nm

**ISO-KF flange with ISO-F flange**
For installing the following components are available:

<table>
<thead>
<tr>
<th>Connection nominal diameter</th>
<th>Designation</th>
<th>Order number</th>
</tr>
</thead>
<tbody>
<tr>
<td>DN 63 ISO-K</td>
<td>Centering ring (coated)</td>
<td>PM 016 206 -U</td>
</tr>
<tr>
<td></td>
<td>Centering ring (coated) mit splinter shield</td>
<td>PM 016 207 -U</td>
</tr>
<tr>
<td></td>
<td>Centering ring (coated) mit protective screen</td>
<td>PM 016 208 -U</td>
</tr>
<tr>
<td></td>
<td>Claw grip (use 4 pieces)</td>
<td>PF 301 100 -T</td>
</tr>
</tbody>
</table>

**Claw grip (ISO-K with ISO-F)**

- See that the sealing surface is not damaged.
- Flange the turbopump according to the drawing and the component parts in your set of mounting material.
- Use 4 claw grips.
- Tighten the claw grips crosswise in three steps. Tightening torque: 16 ±1 Nm.

**ISO-KF flange with ISO-KF flange**
For installing the following components are available:

<table>
<thead>
<tr>
<th>Connection nominal diameter</th>
<th>Designation</th>
<th>Order number</th>
</tr>
</thead>
<tbody>
<tr>
<td>DN 40 ISO-KF</td>
<td>Clamping ring for metal seal</td>
<td>PF 105 040 -T</td>
</tr>
<tr>
<td></td>
<td>Centering ring</td>
<td>PF 110 140 -T</td>
</tr>
<tr>
<td></td>
<td>Splitter shield</td>
<td>PM 600 375 -X</td>
</tr>
</tbody>
</table>

**Clamping ring for metal seal**

- The screws on the clamping ring need to be tightened with a tightening torque of 3.7 Nm.
CF-F flange
Applications for installing an CF-F to an CF-F flange are “Stud screw with blind hole” and “Hexagon screw and clearance hole”. The following items are needed: the particular set of mounting material and a copper seal. Using asplinter shield or protective screen is optional.

Don’t touch the copper seal with bare hands, this may affect the sealings efficiency. See that the sealing lip is not damaged.

The components for installing to an CF-F flange are to be ordered under the following numbers:

<table>
<thead>
<tr>
<th>Connection nominal-diameter</th>
<th>Designation</th>
<th>Order-number</th>
</tr>
</thead>
<tbody>
<tr>
<td>DN 63 CF-F</td>
<td>Hexagon screw M8 with washer and nut (25 pieces)</td>
<td>PF 505 002 -T</td>
</tr>
<tr>
<td></td>
<td>Stud screw M8 with washer and nut (18 pieces)</td>
<td>PF 507 002 -T</td>
</tr>
<tr>
<td></td>
<td>Copper seal (10 pieces) or copper seal silvered (10 pieces)</td>
<td>PF 501 406 -T</td>
</tr>
<tr>
<td></td>
<td>Splinter shield</td>
<td>PM 016 312</td>
</tr>
<tr>
<td></td>
<td>Protective screen</td>
<td>PM 016 333</td>
</tr>
</tbody>
</table>

Stud screw with blind hole

If used: Insert the splinter shield and protective screen in the high vacuum flange with the clamping lugs downward (towards the pump).

Bring the seal centric into the correct position.

Connect the flanges via 8 pieces of hexagon screws (M8) with washers and nuts. The hexagon screws need to be tightened revolving with a tightening torque of 22 ±2 Nm. Control the torque afterwards, because of the sealing material’s flowing a retightening of the screws may be required.

Hexagon screw and clearance hole

If used: Insert the splinter shield and protective screen in the high vacuum flange with the clamping lugs downward (towards the pump).

Bring the seal centric into the correct position.

Connect the flanges via 8 pieces of hexagon screws (M8) with washers and nuts. The hexagon screws need to be tightened revolving with a tightening torque of 22 ±2 Nm. Control the torque afterwards, because of the sealing material’s flowing a retightening of the screws may be required.

Directly Flanging The Pump

Only those turbopumps with a “Y” behind the type designation (please see rating plate, e.g. TMH 071 Y P) may be fitted in any positions.

Turbopumps in standard version (without “Y” on the rating plate) can be flanged onto the vacuum chamber vertically (0°) up to an angle of 90° maximum.

The fore-vacuum flange must always point downwards.

PLEASE NOTE
Don’t touch the copper seal with bare hands, this may affect the sealings efficiency. See that the sealing lip is not damaged.
Permissible installation orientation for the turbopump in standard version

11 Vacuum chamber

The maximum loading capacity of the high vacuum flange is 200 N (equivalent to 20 kg). Assymetric loading on the high vacuum flange must be avoided.

Horizontal installation

With horizontal pump installation and oil-sealed backing pumps (e.g. rotary vane pumps) the fore-vacuum flange of the turbopump must be aligned vertically downwards (maximum deviation ±20°), otherwise the turbopump could become dirty.

Connecting the backing pump

All connections of the fore-vacuum line: with the usual small flange components or hose screw connections.

Be sure to conduct away the exhaust gases from the backing pump. Do not reduce the free cross section of the fore-vacuum flange with following components.

Connecting the Cooling Unit

Turbopumps TMH 071 / TMU 071 can optionally be provided with enhanced convection cooling, air cooling or water cooling. The turbopumps must be operated with air or water cooling where the fore-vacuum pressure is increased (> 0.1 mbar) and/or operations with gas loads. For all processes from 50% of the maximum gas load sealing gas must be used to ensure rotor cooling.

Use and installation:

- Heat sink for convection cooling (installation orientations see section "dimensions").
- Water cooling unit
- Air cooling unit (only valid for ambient temperatures from 5° to 40° C).
- Plug control lead into the connection "FAN" of the TC 600 on the turbopump.
3.5. Connecting The Venting Valve
The venting valve TVF 005 (accessory) provides automatic venting in the event of a power failure and switching off.

Fitting the venting valve
- Unscrew the venting screw from the venting connection of the turbopump.
- Screw in the venting valve (42) with seal ring.

Electrical connection
- Plug control lead (42a) into the connection “VENT” of the TC 600 on the turbopump.

The venting mode of the venting valve can be selected via DCU, HPU or PC (via serial interface RS 485).

The maximum pressure at the venting valve is 1.5 bar absolute.

3.6. Connecting The Casing Heating Unit
The attainment of final pressures is accelerated when turbopumps and vacuum chambers are baked out. Baking out is only practical on pumps with stainless steel casings (TMU pumps). On account of their aluminium casings, the temperatures attainable on TMH pumps are not high enough. The heating duration is dependent on the degree of dirt and on the required final pressure level. The heating duration should be at least 4 hours.

Where casing heating is involved the turbopump must be water cooled.

3.7. Connecting The Sealing Gas Valve
To protect the pump, particularly where corrosive or dust producing processes are involved, it is necessary to use sealing gas. For all processes from 50% of the maximum gas load sealing gas must be used to ensure rotor cooling.

- Unscrew the locking screw (9) from the sealing gas connection of the turbopump.
- Screw in the sealing gas valve (66) with seal ring (66a).
- For details on adjusting the sealing gas flow refer to the operating instructions (see “Accessories”).
3.8. Connecting The Electronic Drive Unit TC 600

The turbopump and the electronic drive unit TC 600 are connected and together form a single unit. The connecting cable 8a has to be ordered separately (see "Accessories").

If the turbopump is operated with a display and control unit DCU 001/DCU100 or the HPU 001, the remote plug 8d must be disconnected.

- Unscrew screw with tooth lock 8c from the TC 600 (above the connection X4).
- Plug the plug X4 on connecting cable 8a into the connection X4 on the TC 600 and screw in screw 8b.
- Secure plug X4 on the TC 600 with a screw and tooth lock 8c.
- Connect plug X2 on connecting cable 8a with power supply TPS 200/DCU 200 (Accessories) on connection X2.
- Using screws and toothlock 8c (included with the cable consignment) secure plug X2 to power supply 105.

1) Only with cable PM 051 843 -T (see section "Accessories")

Once operating voltage has been supplied, the TC 600 performs a self test on the supply voltage. The supply voltage for turbopumps TMH 071 / TMU 071 is 24 VDC ±5% in accordance with EN 60 742.

3.9. Installing The Power Supply

Voltage may only be supplied with the Pfeiffer Vacuum power supplies (accessory). The use of other power supplies requires the prior agreement of Pfeiffer Vacuum and equalization with the valid specification (specifications available on request).

The mains connection must be freely accessible at all times.

Connecting the TC 600 with power supply TPS 100 or DCU 100, mounting diagram for shielded connection cable

X1 Mains connection
X2 Connection, power supply
X4 Connection TC 600
S1 ON/OFF switch
8 Electronic Drive Unit TC 600
8a Connecting cable, TC 600 – TPS/DCU
8b Screw
8c Screw with tooth lock (3 pieces)
8d Remote plug
105 power supply
3.10. Installation Of Pfeiffer Vacuum Display And Control Units

An external display and control unit (DCU 001, DCU 100, HPU 001) or an external PC can be connected via the connection “RS 485” on the TC 600 with the use of a shielded 8 pole modular connecting cable (contained with the delivery of the DCU/HPU).

All units connected to the bus must have differing serial interface addresses (parameter 797).

The group address of the TC 600 is 960.

Only SELV may be connected to the serial interface RS 485.

It is possible to connect an RS 232 (e.g. PC) via a level converter (please see “Accessories”).

3.11. Connecting The RS 485

Please refer to the operating instructions PM 0488 BN for detailed operating procedures and electrical data in respect of the serial interface RS 485.

Connection to a fixed bus system

➡ Connect all units with D+ (pin 5 / RS 485) and D- (pin 7 / RS 485) to the bus.
➡ The bus must be closed at both ends.

The connections should be made in accordance with the specification of the Serial Interface RS 485.

The serial interface is galvanically and safely separated from the maximum supply voltage from the TC 600.

**Connection**

<table>
<thead>
<tr>
<th>Designation</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Serial interface type:</td>
<td>RS 485</td>
</tr>
<tr>
<td>Baud rate:</td>
<td>9600 Baud</td>
</tr>
<tr>
<td>Data file word length:</td>
<td>8 bit</td>
</tr>
<tr>
<td>Parity:</td>
<td>no parity</td>
</tr>
<tr>
<td>Start bits:</td>
<td>1</td>
</tr>
<tr>
<td>Stop bits:</td>
<td>1..2</td>
</tr>
</tbody>
</table>

The electrical connections in the TC 600 are optically decoupled.

**Pin Occupancy**

<table>
<thead>
<tr>
<th>Pin</th>
<th>Occupancy</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>not connected</td>
</tr>
<tr>
<td>2</td>
<td>+ 24 V output (loadable with 210 mA)</td>
</tr>
<tr>
<td>3</td>
<td>not connected</td>
</tr>
<tr>
<td>4</td>
<td>not connected</td>
</tr>
<tr>
<td>5</td>
<td>RS 485: D+ (DO / RI)</td>
</tr>
<tr>
<td>6</td>
<td>Gnd</td>
</tr>
<tr>
<td>7</td>
<td>RS 485: D- (DO / RI)</td>
</tr>
<tr>
<td>8</td>
<td>not connected</td>
</tr>
</tbody>
</table>

All units connected to the bus must have differing serial interface addresses (parameter 797).

The group address of the TC 600 is 960.

Only SELV may be connected to the serial interface RS 485.

All switched on remote functions have priority over the serial interface functions.

The Profibus DP Gateway TIC 250 (accessory) is available for connecting an electronic drive unit TC 600 to a Profibus DP.
3.12. Connecting The Remote Control Unit

Remote control options for various functions are provided with the connection "REMOTE" on the TC 600 via the 15-pole D-Sub-Connector. Shielded cable must be used. Shielding is on the plug side of the TC 600 connected to the TC casing.

The inputs 2-6 are activated by connecting them to the + 24 V on pin 1 (active high) (please see 3.12. "Connection Diagram").

**Pin occupancy and remote plug functions**
(please see following table)

**Pin arrangement and function of the remote plug functions**

<table>
<thead>
<tr>
<th>Pin no.</th>
<th>Input open (low)</th>
<th>Input closed (high) on + 24 V (pin 1)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>+24 V</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>venting blocked (see Section 3.5.)</td>
<td>venting released (see Section 3.5.)</td>
</tr>
<tr>
<td>3</td>
<td>motor, turbopump off</td>
<td>motor, turbopump on: the turbopump is driven, current flows through the motor coils</td>
</tr>
<tr>
<td>4</td>
<td>pumping station off</td>
<td>pumping station on: the turbopump is driven, backing pump is started via the relay box</td>
</tr>
<tr>
<td>5</td>
<td>heating off</td>
<td>heating on: the heating is switched on once the rotation speed switchpoint is attained and off when the rotation speed switchpoint is unattained optional: sealing gas valve off(^1)</td>
</tr>
<tr>
<td>5 (\text{reset:})</td>
<td>by supplying a pulse ((T &lt; 2) s) with an amplitude of 24 V a malfunction acknowledgement can be processed</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>standby off</td>
<td>standby on: pump is accelerated to 66% of its nominal rotation speed</td>
</tr>
<tr>
<td>7</td>
<td>rotation speed setting mode off</td>
<td>the rotation speed can be changed by feeding a PWM signal to this pin or via Serial Interface RS 485 (see Section 4.7. &quot;Rotation Speed Setting Mode&quot;)</td>
</tr>
<tr>
<td>8</td>
<td>Output (low)</td>
<td>Output (high) rotation speed switchpoint attained; output can be loaded with 24 V/50 mA</td>
</tr>
<tr>
<td></td>
<td>rotation speed switchpoint not attained</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Output (low) Collective malfunction message</td>
<td>Output (high) malfunction-free operations; output can be loaded with 24 V/50 mA</td>
</tr>
<tr>
<td>10</td>
<td>Mass (ground)</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>Contact Output 1: Switchpoint attained</td>
<td>contact (^1) between pin 11 and pin 12 closed if the turbopump is above the switchpoint</td>
</tr>
<tr>
<td>12</td>
<td>Contact Output 1: Switchpoint attained</td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>Contact Output 2: Collective malfunction message</td>
<td>contact (^1) between pin 13 and pin 14 is closed on failure-free operation</td>
</tr>
<tr>
<td>14</td>
<td>Contact Output 2: Collective malfunction message</td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>Analog output</td>
<td>rotation speed proportional output voltage 0 - 10 VDC = 0 - 100 % * (f_{\text{end}}/\text{load} R \geq 10 \text{k}\Omega) (optional current/power)</td>
</tr>
</tbody>
</table>

---

1) The option must be set via the Serial Interface RS 485 (see Operating Instructions PM 0547 BN, Pumping Operating with DCU)
2) The following technical data is applicable for the contacts:

\[
U_{\text{max}} = 50 \text{ VDC} \\
I_{\text{max}} = 1 \text{ A}
\]
3.13. Connections Diagram

TC 600
TC 750

RS 485
1 n.c.
2 +24 VDC* / max. 200 mA (supply voltage, DCU)
3 n.c.
4 n.c.
5 RS 485+/ (DO/RI)
6 GND* (mass connection, DCU)
7 RS 485-/ (DO/RI)
8 n.c.

REMOTE
1 +24 VDC*/max. 50 mA
2 Venting release
3 Motor TMP
4 Pumping station
5 Heating / Reset (opt. sealing gas)
6 Standby
7 PWM on (touch relation 25 - 75 %)
8 Switching output 1 (24 VDC / max. 50 mA)
9 Switching output 2 (24 VDC / max. 50 mA)
10 GND*
11 Contact output 1: Switch point attained
12 Contact output 2: Collective malfunction
13 Analog output 0-10 VDC

HEAT/TMS
1 Relay box
2 Mains input, heating
3 115/208/230 VAC
4 HEATING
5 N
6 PE
7 PE
8 N
9 L'

VENT
1 Venting valve
2 TVF 005

FV PUMP
1 Relay box
2 Mains input, pumping station
3 115/208/230 VAC
4 Connection, pumping station
5 Pumping station (Imax = 16 A)

FAN
1 Fan

X4
1 Power conductor (PE)
2 Supply voltage, TC
3 GND
4 n.c.

TPS XXX/DCU XXX
1 Mains input power supply (90 - 132 / 185 - 265) VAC

Contact current: max. 6 mA / contact

Contact output 1: Switch point attained
Contact output 2: Collective malfunction
Analog output 0-10 VDC
4. Operations

4.1. Before Switching On
Sections 4.1. to 4.3. refer only to operating the pump in its delivery status, without display and control unit. The bridges “venting release”, “motor, TMP ON” and “pumping station ON” are fitted in the remote control plug.

Turbopump rotors rotate at high speed. When the high vacuum flange is open there is a danger of injury and of damage to the pump caused by objects falling into the pump. Therefore never operate the pump with open high vacuum flange.

- With water cooling: Open cooling water supply and check flow.
- Plug connecting cable (“Accessory”) into the TC 600 and connect with power supply TPS 100 or DCU 100 on X2 (please see section 3.8.).

Please note:
The following pre-settings have been programmed:
- Running up time 15 min
- Rotation speed switchpoint 80%
- Automatic venting 50%

For further works settings please refer to the parameter overview in the operating instructions “Pumping Operations With the DCU”, PM 0547 BN. These settings can only be altered via serial interface RS 485 via DCU / HPU or PC (please refer to the respective operating instructions).

Take care when pumping hazardous gases. Take note of all safety recommendations of the gas manufacturer.

4.2. Switching On
- Switch on the turbopump with switch S1 on the power supply.
- When air cooling is fitted the cooling fan is also switched on via the TC 600.
- Once the self test has been successfully completed on the TC 600 (duration approximately 10 seconds), the turbopump and any possible connected backing pump begin to operate.

4.3. Operations With The Remote Control Unit
Remote control operations can be performed via the 15-pole D-Sub connection with the designation “REMOTE” on the TC 600 (refer to section 3.12. and 3.13.).

Inputs 2 - 6 are activated if they are connected with the 24 V on pin 1 (active high; please see section 3.13. “Connections Diagram”).

Once operating voltage has been supplied and on successful completion of the self-test on the TC 600, the turbopump and any possible connected backing pump begin to operate.

**Venting Release (Optional)**

**Automatic venting:**

<table>
<thead>
<tr>
<th>Venting frequency</th>
<th>Switch off the pumping station</th>
<th>Mains power failure 1)</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; 750 Hz (corresponds to 50% of the final rotation speed)</td>
<td>venting valve opens for 150 ms at 4 s intervals</td>
<td>venting valve opens for 150 ms at 4 s intervals</td>
</tr>
<tr>
<td>&lt; 500 Hz</td>
<td>venting valve opens for 3600 s (works setting)</td>
<td>venting valve opens as long as sufficient energy is generated by the turbopump</td>
</tr>
</tbody>
</table>

1) When mains power is restored the venting procedure is interrupted.

**Venting blocked:**
Venting does not take place.

**Other venting modes:**
Other venting modes can be selected via the serial interface RS 485 with DCU / HPU or PC.

**Motor, Turbopump**

When the pumping station is switched on and once the self test has been successfully completed (duration approx. 10 sec), the turbopump is set in operation. During operations, the turbopump can be switched on and off while the pumping station is switched on. Thereby the turbopump will not be vented.

**Pumping Station**

Any connected pumping station components are started up (e.g. backing pump, venting valve, air cooling) and with simultaneous activation of the input “motor, turbopump” the turbopump is set in operation once the self test has been successfully completed (duration approx. 10 sec).
**Heating/Reset**  
**Heating (optional)**  
Once the rotation speed switchpoint is attained the heating unit is switched on when the rotation speed switchpoint is fallen below the heating unit is switched off.

**Reset**  
The heating input has two functions (please see section 3.12., point 5 "Reset").

**Sealing gas valve (optional)**  
Optionally a valve (e.g. TVF 005, accessory) for sealing gas inlet can be controlled via this input. More information on request.

**Standby**  
The pump can be operated optionally at 66% of its nominal rotation speed (standby ON) or at its nominal rotation speed (standby OFF).

**Rotation Speed Setting Mode Via Input**  
**PWM**  
The supply of pulse width modulated signals (PWM) with a ground frequency of 100 Hz ±20% with an amplitude of maximum 24 V and a key ratio of 25-75% enables the rotation speed to be set in the range 20-100% of the nominal rotation speed.

If no signal is present the pump accelerates up to its final rotation speed. A PVM adapter box for rotation speed setting operations for the turbopump is available as an option (please see "Accessories").

**Analog Output**  
A rotation speed proportional voltage (0 - 10 VDC correspond to 0 - 100%* fend) can be tapped via the analog output (load ≥ 10 kΩ).

Additional functions (power, current) can be assigned to the analog output via a DCU or Serial Interface RS 485.

### 4.4. Gas Type Dependent Operations

Water cooling is required if the pumps are to be operated with gas load.

Where high level gas loads and rotation speeds are involved, the resulting friction subjects the rotor to the effect of great heat. To avoid over-heating, a power rotation speed characteristic line is implemented in the TC 600; this ensures that where maximum gas loads are involved, the pump will operate at any rotation speed without the danger of damage arising. The maximum power is dependent on the type of gas. Two characteristic lines are available for any type of gas in order to fully exploit the power potential of the pump:

- Set the applicable gas mode on the TC 600 via the DCU, HPU or PC.
  - "Gas-Mode 0" for gases with molecular mass ≥ 40 (e.g. Ar);
  - "Gas-Mode 1" for all lighter gases.
  - **Factory setting:** "Gas-Mode 0"

Pumping gases with molecular mass ≥ 40 with the incorrect gas mode can cause damage to the pump. Before pumping such gas types please contact the manufacturer.
4.7. Shutting Down For Longer Periods

If aggressive or hazardous gases are pumped there is a danger of personal injury resulting from coming into contact with process gases. Before removing a turbopump from the system, first:

- Vent the turbopump with a neutral gas or dry air.
- Ensure that there is no residual process gas in the system nor in the feeder lines.

If the turbopump is to be shut down for more than a year:

- Remove turbopump from the system.
- Change the lubricant reservoir (see section 7.2.).
- Lubricant TL 011 should not be used when there have been no operations for 3 years.
- Close the high vacuum flange and evacuate the turbopump via the fore-vacuum flange.
- Vent turbopump via the venting connection with nitrogen or dry air.
- Close the fore-vacuum and venting connections by blank flanging.
- Place the pump vertically on its rubber feet.
- Storage the pump only indoors at a permissible 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.

If the pump has been shut down for 3 years, the bearing must be changed (please contact Pfeiffer Vacuum Service).
5. Monitoring Operations

5.1. Operations Display Via LED

Certain operations modes of the turbopump and the TC 600 can be ascertained via the two integrated LEDs located on the front panel of the TC 600.

The following operations modes are displayed:

<table>
<thead>
<tr>
<th>LED</th>
<th>Cause</th>
</tr>
</thead>
<tbody>
<tr>
<td>green</td>
<td>power supply OK</td>
</tr>
<tr>
<td>red</td>
<td>Function &quot;pumping station ON&quot; carried out</td>
</tr>
<tr>
<td>Flashes short (1/12s active)</td>
<td>power supply OK</td>
</tr>
<tr>
<td>Blinks (1/2s active)</td>
<td>Mains power supply failure</td>
</tr>
<tr>
<td>Grows</td>
<td>Collective malfunction (for example, run-up time error, over-temperature, turbopump or TC 600)</td>
</tr>
<tr>
<td>Blinks (1/2s active)</td>
<td>Warning (e.g. supply voltage short circuit to earth, mains power failure)</td>
</tr>
</tbody>
</table>

Differentiated malfunction and warning signals are only possible with the use of a DCU, HPU or PC.

5.2. Turbopump Temperature Management

Where impermissible motor temperatures are involved or the temperature of the casing is too high, the motor current is reduced. This can lead to dipping below the set rotation speed switch-point and results in the turbomolecular pump being switched off.

LED on the TC 600 glows red: Collective malfunction.
# 6. What To Do In Case Of Breakdowns?

<table>
<thead>
<tr>
<th>Problem</th>
<th>Possible Causes</th>
<th>Remedy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pump doesn’t start; None of the integrated LEDs glow on the TC 600</td>
<td>• Power supply interrupted&lt;br&gt;• Incorrect operations voltage supplied&lt;br&gt;• No supply of operations voltage&lt;br&gt;• Defect TC 600</td>
<td>• Check fuse in the power pack unit&lt;br&gt;• Check plug contacts on the mains power supply&lt;br&gt;• Check power supply feeder line&lt;br&gt;• Check voltage on the power supply (24 V DC) at connection X2&lt;br&gt;• Supply correct operations voltage&lt;br&gt;• Check plug contacts on the power supply&lt;br&gt;• Inform Pfeiffer Vacuum Service of need for repair</td>
</tr>
<tr>
<td>Pump doesn’t start; green LED on the TC 600 is blinking</td>
<td>• Pins 1-3 and 1-4 on the remote plug not connected&lt;br&gt;• Reduction in the voltage in the cable</td>
<td>• Connect pins 1-3 and 1-4 on the remote plug&lt;br&gt;• Use suitable cable</td>
</tr>
<tr>
<td>Pump doesn’t attain nominal rotation speed within the set run-up time</td>
<td>• Fore-vacuum pressure too high&lt;br&gt;• Leak or too much gas&lt;br&gt;• Rotor sluggish caused by defective bearing&lt;br&gt;• TC run-up time too short&lt;br&gt;• Thermal overloading caused by&lt;br&gt; । Water flow insufficient&lt;br&gt; । Insufficient air supply&lt;br&gt; । Fore-vacuum pressure too high&lt;br&gt; । Ambient temperature too high</td>
<td>• Check backing pump function&lt;br&gt;• Check seals&lt;br&gt;• Seek leak and repair&lt;br&gt;• Reduce supply of process gas&lt;br&gt;• Check bearing (noises?): Inform Pfeiffer Vacuum Service&lt;br&gt;• Set longer start-up time with the DCU or PC&lt;br&gt;• Ensure free flow&lt;br&gt;• Ensure adequate air supply&lt;br&gt;• Reduce fore-vacuum pressure&lt;br&gt;• Reduce ambient temperature</td>
</tr>
<tr>
<td>Pump doesn’t attain final pressure</td>
<td>• Pump dirty&lt;br&gt;• Leak in vacuum chamber, lines or pump</td>
<td>• Bake out pump&lt;br&gt;• If seriously contaminated: Request Pfeiffer Vacuum Service to clean&lt;br&gt;• Seek leak starting with vacuum chamber&lt;br&gt;• Repair leak</td>
</tr>
<tr>
<td>Unusual operating noises</td>
<td>• Bearing damaged&lt;br&gt;• Rotor damaged&lt;br&gt;• Splinter shield (if fitted) not seated firmly</td>
<td>• Inform Pfeiffer Vacuum Service of need for repair&lt;br&gt;• Inform Pfeiffer Vacuum Service of need for repair&lt;br&gt;• Check seat of splinter shield (see Section 3.2.)</td>
</tr>
<tr>
<td>Red LED on the TC 600 glows</td>
<td>• Collective malfunction</td>
<td>• Reset via mains OFF/ON or remote pin 5&lt;br&gt;• Different malfunction display with the DCU possible 1)</td>
</tr>
<tr>
<td>Red LED on the TC 600 flashes</td>
<td>• Warning through:&lt;br&gt; । Mains power failure&lt;br&gt; । Supply voltage short circuit to earth&lt;br&gt;• Wrong setting for nominal rotation speed (Parameter 777)</td>
<td>• Different warning message with the DCU possible 1)&lt;br&gt;• Check power supply voltage&lt;br&gt;• Check power supply mains connection&lt;br&gt;• Check power supply voltage for short circuit to earth&lt;br&gt;• Enter 1500 Hz for parameter 777 (see operating instruction PM 0547 BN “Pumping Operations With DCU”). If there is no DCU/HPU available contact Pfeiffer Vacuum Service.</td>
</tr>
</tbody>
</table>

---

1) Without a DCU or HPU inform Pfeiffer Vacuum Service to check the cause of trouble.
7. Maintenance / Exchange

No liability for personal injury nor material damage will be accepted for damages and operational interruptions which have been caused by improper maintenance; in addition, all guarantees become invalid.

The bearing should be changed every three years (request Pfeiffer Vacuum Service to change). Where extreme operating conditions or unclean processes are involved, the replacement interval should be checked with your Pfeiffer Vacuum Service Center.

You can change the electronic drive unit TC 600 and the lubricant reservoir yourself. Please contact your Pfeiffer Vacuum Service for all other maintenance and service work.

Apply no mechanical stress to the electronic drive unit TC 600.

7.1. Replacing The Electronic Drive Unit

The turbopump and the TC 600 must only be disconnected from each other when the turbopump is completely at rest and the TC 600 has been disconnected from the power supply.

Remove the electronic drive unit TC 600 from the turbopump as follows:

- Switch off the turbopump, vent to atmospheric pressure (see section 4.6.) and allow to cool as necessary.
- If necessary, remove the turbopump from the system.
- Unscrew allen head screws 8c (2 pieces) from the electronic drive unit 8

Assembling / disassembling of the TC 600

- The adapter 40 must not be released for the replacement of the TC or following works.
- Assemble the new electronic drive unit TC 600 (order number please see section “Spare Parts”) on the turbopump and connect again.

Please take into account that after replacement the standard operating parameters are always pre-set. If your application requires different parameters, please modify accordingly.
7.2. Replacing The Lubricant Reservoir

The lubricant reservoir should be replaced at least every three years. Where extreme operating conditions or unclean processes are involved, the replacement interval should be checked with Pfeiffer Vacuum Service.

The procedure for the replacement of the lubricant reservoir depends on the turbopump type. Necessarily observe the properties abbreviations on the rating plate.

**Standard Version**

The lubricant reservoir can contain toxic substances from the medium pumped. The lubricant reservoir must be disposed of in accordance with the respective regulations.

Safety instructions data sheet on request or via internet under www.pfeiffer-vacuum.net

➡ Switch off the turbopump, vent to atmospheric pressure (see section 4.6.) and allow to cool as necessary.
➡ If necessary, remove the turbopump from the system.
➡ Unscrew rubber feet 6 from the underside of the pump.
➡ Unscrew locking cover 90 on the underside of the pump with installation tool E (order number N 5709 103).

➡ Lever out the lubricant reservoir 92 with the help of two screwdrivers.

➡ Clean off any dirt on the pump and locking cover with a clean, fluff-free cloth.
➡ Insert new lubricant reservoir 92 up to the O-ring 93 in the pump.

The lubricant reservoir is already filled with Lubricant TL 011; do not add additional lubricant.

➡ Screw in locking cover 90. The lubricant reservoir is brought into the correct axial position with the locking cover.
➡ Screw the rubber feet back in.
“Y”-Version
(Mounting In Any Orientation)

The following instructions are only valid for turbopump types with the properties abbreviation “Y” on the rating plate.

Both the lubricant reservoir 92 and the Porex rods 89 can contain toxic substances from the media being pumped. Lubricant reservoirs and Porex rods must be disposed of in accordance with local regulations. Safety instructions data sheet on request or via internet under www.pfeiffer-vacuum.net

- Switch off the turbopump, vent to atmospheric pressure (see section 4.6.) and allow to cool as necessary.
- If necessary, remove the turbopump from the system.
- Unscrew rubber feet 6 from the underside of the pump.
- Unscrew locking cover 90 on the underside of the pump with installation tool E (order number N 5709 103).

- Lever out the lubricant reservoir 92 with the help of two screwdrivers.
- Remove the Porex rods 89 (eight pieces) with tweezers.

- Clean off any dirt on the pump and locking cover with a clean, fluff-free cloth.
- Insert new Porex rods (eight pieces) with tweezers.
- Insert new lubricant reservoir 92 up to the O-ring 93 in the pump.

The lubricant reservoir is already filled with Lubricant TL 011; do not add additional lubricant.

- Screw in locking cover 90. The lubricant reservoir is brought into the correct axial position with the locking cover.
- Screw the rubber feet back in.
8. Service

Pfeiffer Vacuum offers first-class service!

- Lubricant- and bearing exchange on the spot by Pfeiffer Vacuum field service
- Maintenance/repairs in the nearby service center or service point
- Fast replacement with exchange products in mint condition
- Advice on the most cost-efficient and quickest solution

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

Maintenance and repairs in the Pfeiffer Vacuum Service Center

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

- RMA\(^1\) form and contamination declaration.
- Fill in the RMA form and send it by fax or e-mail to your service address.
- Enclose the RMA confirmation of receipt from Pfeiffer Vacuum in the shipment.
- Fill in the contamination declaration and enclose it in the shipment (required!).
- Dismantle all accessories.
- Drain operating fluid/lubricant.
- Leave the electronic drive unit on the pump.
- Send the pump in its original packaging if at all possible.

Contaminated vacuum pumps

Units which are microbiologically, explosively or radioactively contaminated will not be accepted by Pfeiffer Vacuum as a matter of principle. Hazardous substances are substances and compounds in accordance with the hazardous goods directive (current version). Should pumps be contaminated or the contamination declaration be missing, Pfeiffer Vacuum will decontaminate the pumps at your cost.

Returning contaminated pumps or units

- Neutralise the pump by flushing it with nitrogen or dry air.
- Close off all openings so that they are air-tight.
- Seal the pump or unit in suitable protective film.
- Only return the pump/unit in a suitable and sturdy transport container.

Exchange units

For all exchange units the standard operating parameters are always pre-set. If your application requires different parameters, please modify accordingly.

Service orders

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

\(^1\)Return Material Authorization downloadable at www.pfeiffer-vacuum.net
### 9. Technical Data

<table>
<thead>
<tr>
<th>Feature</th>
<th>Unit</th>
<th>TMH 071 P</th>
<th>TMH 071 Y P</th>
<th>TMU 071 P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Connection nominal diameter</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Inlet</td>
<td></td>
<td>DN 40 ISO-K</td>
<td>DN 16 ISO-K</td>
<td>DN 63 ISO-K</td>
</tr>
<tr>
<td>Outlet</td>
<td></td>
<td>DN 16 ISO-K</td>
<td>DN 16 ISO-K</td>
<td>DN 63 ISO-K</td>
</tr>
<tr>
<td>Venting connection</td>
<td></td>
<td>G 1/8&quot;</td>
<td>G 1/8&quot;</td>
<td>G 1/8&quot;</td>
</tr>
<tr>
<td>Nominal rotation speed</td>
<td>Hz (1/min)</td>
<td>1500 (90 000)</td>
<td>1500 (90 000)</td>
<td>1500 (90 000)</td>
</tr>
<tr>
<td>Standby rotation speed</td>
<td>Hz (1/min)</td>
<td>1000 (60 000)</td>
<td>1000 (60 000)</td>
<td>1000 (60 000)</td>
</tr>
<tr>
<td>Start-up time</td>
<td>min</td>
<td>2.5</td>
<td>2.5</td>
<td>2.5</td>
</tr>
<tr>
<td>Noise level</td>
<td>dB (A)</td>
<td>&lt; 45</td>
<td>&lt; 45</td>
<td>&lt; 45</td>
</tr>
<tr>
<td>Final pressure, backing pump</td>
<td>mbar</td>
<td>&lt; 10</td>
<td>&lt; 10</td>
<td>&lt; 10</td>
</tr>
<tr>
<td>Integral leak rate</td>
<td>mbar l/s</td>
<td>&lt; 2 · 10⁻⁸</td>
<td>&lt; 2 · 10⁻⁸</td>
<td>&lt; 2 · 10⁻⁸</td>
</tr>
<tr>
<td>Maximum permissible</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>rotor temperature</td>
<td>°C</td>
<td>80</td>
<td>80</td>
<td>80</td>
</tr>
<tr>
<td>Permissible heat radiation power</td>
<td>W</td>
<td>4</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>Volume flow rate for</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nitrogen N₂</td>
<td>l/s</td>
<td>33</td>
<td>59</td>
<td>59</td>
</tr>
<tr>
<td>Helium He</td>
<td>l/s</td>
<td>39</td>
<td>50</td>
<td>50</td>
</tr>
<tr>
<td>Hydrogen H₂</td>
<td>l/s</td>
<td>32</td>
<td>42</td>
<td>42</td>
</tr>
<tr>
<td>Compression ratio for</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nitrogen N₂</td>
<td></td>
<td>&gt; 10¹¹</td>
<td>&gt; 10¹¹</td>
<td>&gt; 10¹¹</td>
</tr>
<tr>
<td>Helium He</td>
<td></td>
<td>6 · 10⁻⁶</td>
<td>6 · 10⁻⁶</td>
<td>6 · 10⁻⁶</td>
</tr>
<tr>
<td>Hydrogen H₂</td>
<td></td>
<td>&gt; 10⁻⁵</td>
<td>&gt; 10⁻⁵</td>
<td>&gt; 10⁻⁵</td>
</tr>
<tr>
<td>Maximum gas throughput at nominal rotation speed²)</td>
<td>mbar l/s</td>
<td>1.3</td>
<td>1.3</td>
<td>1.3</td>
</tr>
<tr>
<td>With water cooling</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nitrogen N₂</td>
<td>mbar</td>
<td>18</td>
<td>18</td>
<td>18</td>
</tr>
<tr>
<td>Helium He</td>
<td>mbar</td>
<td>18</td>
<td>18</td>
<td>18</td>
</tr>
<tr>
<td>Hydrogen H₂</td>
<td>mbar</td>
<td>12</td>
<td>12</td>
<td>12</td>
</tr>
<tr>
<td>Maximum gas throughput at intake pressure of 0.1 mbar ³)</td>
<td>mbar l/s</td>
<td>2</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>With water cooling</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nitrogen N₂</td>
<td>mbar</td>
<td>3</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Helium He</td>
<td>mbar</td>
<td>2</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Hydrogen H₂</td>
<td>mbar</td>
<td>2</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Final pressure ⁶)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>With rotary vane pumps</td>
<td>mbar</td>
<td>&lt; 1 · 10⁻⁷</td>
<td>&lt; 1 · 10⁻⁷</td>
<td>&lt; 5 · 10⁻¹⁰</td>
</tr>
<tr>
<td>With diaphragm pumps</td>
<td>mbar</td>
<td>&lt; 1 · 10⁻⁷</td>
<td>&lt; 1 · 10⁻⁷</td>
<td>&lt; 1 · 10⁻⁸</td>
</tr>
<tr>
<td>Lubricant</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Maximum cooling water consumption with water at 15 °C ⁶)</td>
<td>l/h</td>
<td>100</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>Cooling water temperature</td>
<td>°C</td>
<td>5 - 25</td>
<td>5 - 25</td>
<td>5 - 25</td>
</tr>
<tr>
<td>Permissible ambient temperature</td>
<td></td>
<td>0 - 40</td>
<td>0 - 40</td>
<td>0 - 40</td>
</tr>
<tr>
<td>Heating power consumption</td>
<td>W</td>
<td>32</td>
<td>32</td>
<td>32</td>
</tr>
<tr>
<td>Weight</td>
<td>kg</td>
<td>2.8</td>
<td>3.8</td>
<td>3.8</td>
</tr>
<tr>
<td>Permissible magnetic field</td>
<td>mT</td>
<td>3</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Operating voltage</td>
<td>VDC</td>
<td>24 ± 5%</td>
<td>24 ± 5%</td>
<td>24 ± 5%</td>
</tr>
<tr>
<td>Duration ⁷) - / max. current consumption</td>
<td>A</td>
<td>4.1 / 4.6</td>
<td>4.1 / 4.6</td>
<td>4.1 / 4.6</td>
</tr>
<tr>
<td>Duration ⁷) - / max. power</td>
<td>W</td>
<td>100 / 110</td>
<td>100 / 110</td>
<td>100 / 110</td>
</tr>
<tr>
<td>Fuse, internal</td>
<td>V</td>
<td>T8A/250</td>
<td>T8A/250</td>
<td>T8A/250</td>
</tr>
<tr>
<td>Protection class ⁸)</td>
<td></td>
<td>IP 30</td>
<td>IP 30</td>
<td>IP 30</td>
</tr>
<tr>
<td>Relative humidity</td>
<td>%</td>
<td>5-85 non-condensing</td>
<td>5-85 non-condensing</td>
<td>5-85 non-condensing</td>
</tr>
</tbody>
</table>

1) Measured with 20% helium concentration and a measurement period of 10s
2) Until frequency fall-off; higher gas throughputs with reduced rotation speed.
3) Until ambient temperature 40 °C.
4) Rotation speed of pump may drop below the nominal rotation speed.
5) For gas characteristic lines please refer to section 4.4.
6) In accordance with German Industrial Standard DIN 28428
7) At maximum gas throughput.
8) Protection class IP 54 is afforded for the TC 600 by retrofitting a cover plate (Accessory)
9.1. Dimensions Diagram

Cooling unit

Cooling unit rotatable in steps of 90°
10. **Spare Parts**

<table>
<thead>
<tr>
<th>Pos.</th>
<th>Description</th>
<th>Pieces</th>
<th>Size</th>
<th>Number</th>
<th>Comments</th>
<th>Ordering Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td>Rubber foot</td>
<td>4</td>
<td></td>
<td>P 3695 700 ZD</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Electronic drive unit TC 600</td>
<td>1</td>
<td></td>
<td>PM C01 720</td>
<td></td>
<td></td>
</tr>
<tr>
<td>90</td>
<td>Locking cover</td>
<td>1</td>
<td>68 x 3</td>
<td>PM 083 021 -X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>91</td>
<td>O-ring</td>
<td>1</td>
<td></td>
<td>P 4070 972 PV</td>
<td></td>
<td></td>
</tr>
<tr>
<td>92</td>
<td>Lubricant reservoir (standard version)</td>
<td>1</td>
<td></td>
<td>PM 073 073 -T</td>
<td>incl. O-ring (93)</td>
<td></td>
</tr>
<tr>
<td>92</td>
<td>Lubricant reservoir (&quot;Y&quot;-Version)</td>
<td>1</td>
<td></td>
<td>PM 103 794 -T</td>
<td>incl. O-ring (93) and 8 x Porex rods (89)</td>
<td></td>
</tr>
</tbody>
</table>

**Spare parts**

![Diagram of spare parts](C40-930/1)
When ordering accessories and spare parts please be sure to state the full part number. When ordering spare parts please state additionally the unit type and unit number (see rating plate). Please use this list as an order form (by taking a copy).
Declaration of Contamination of Vacuum Equipment and Components

The repair and/or service of vacuum components will only be carried out if a correctly completed declaration has been submitted. Non-completion will result in delay.

This declaration can only be completed and signed by authorised and qualified staff:

1. Description of component:
   - Equipment type/model: _________________________
   - Code No.: __________________________
   - Serial No.: __________________________
   - Invoice No.: __________________________
   - Delivery Date: __________________________

2. Reason for return:

3. Equipment condition
   - Has the equipment been used? yes [ ] no [ ]
   - What type of pump oil was used? __________________________
   - Is the equipment free from potentially harmful substances? yes [ ] no [ ] (go to section 5)

4. Process related contamination of equipment
   - toxic yes [ ] no [ ]
   - corrosive yes [ ] no [ ]
   - microbiological hazard* yes [ ] no [ ]
   - explosive* yes [ ] no [ ]
   - radioactive* yes [ ] no [ ]
   - other harmful substances yes [ ] no [ ]

*) We will not accept delivery of any equipment that has been radioactively or microbiologically contaminated without written evidence of decontamination!

2. Reason for return:

3. Equipment condition
   - Has the equipment been used? yes [ ] no [ ]
   - What type of pump oil was used? __________________________
   - Is the equipment free from potentially harmful substances? yes [ ] no [ ] (go to section 5)

4. Process related contamination of equipment
   - toxic yes [ ] no [ ]
   - corrosive yes [ ] no [ ]
   - microbiological hazard* yes [ ] no [ ]
   - explosive* yes [ ] no [ ]
   - radioactive* yes [ ] no [ ]
   - other harmful substances yes [ ] no [ ]

*) We will not accept delivery of any equipment that has been radioactively or microbiologically contaminated without written evidence of decontamination!

Please list all substances, gases and by-products which may have come into contact with the equipment:

<table>
<thead>
<tr>
<th>Tradename</th>
<th>Chemical name (or Symbol)</th>
<th>Danger class</th>
<th>Precautions associated with substance</th>
<th>Action if spillage or human contact</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

5. **Legally Binding Declaration**

I hereby declare that the information supplied on this form is complete and accurate. The despatch of equipment will be in accordance with the appropriate regulations covering Packaging, Transportation and Labelling of Dangerous Substances.

Name of Organisation: _____________________________________________
Address: ___________________________________________ Post code: __________________________
Tel.: ___________________________________________ Fax: __________________________
Name: ___________________________________________ Telex: __________________________
Job title: ___________________________________________ Date: __________________________
Legally binding signature: ___________________________________________
Herstellererklärung  
Manufacturer’s Declaration

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

- Maschinen/Machinery 98/37/EWG (Anhang/Annex II B)
- Elektromagnetische Verträglichkeit/Electromagnetic Compatibility 89/336/EWG
- Niederspannung/Low Voltage 73/23/EWG

Hiermit erklären wir, daß das unten aufgeführte Produkt zum Einbau in eine Maschine bestimmt ist und dass deren Inbetriebnahme so lange untersagt ist, bis festgestellt wurde, daß das Endprodukt den Bestimmungen der EU-Richtlinie 98/37/EWG entspricht.

Das unten aufgeführte Produkt entspricht den Anforderungen der EU-Richtlinien Maschinen 98/37/EWG, Elektromagnetische Verträglichkeit 89/336/EWG und Niederspannung 73/23/EWG.

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 EU Low Voltage 73/23/EEC.

Produkt/Product:
TMH 071
TMU 071

Angewendete Richtlinien, harmonisierte Normen und angewendete nationale Normen in Sprachen und Spezifikationen:
Guidelines, harmonised standards, national standards in languages and specifications which have been applied:

DIN EN ISO 12100-1 / -2, DIN EN 294, DIN EN 1012-2, DIN EN 61010

Unterschrift/Signature:

W. Dondorf  
Geschäftsführer  
Managing Director

Pfeiffer Vacuum GmbH  
Berliner Straße 43  
35614 Asslar  
Germany

Herst.l/2003
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