SingleGauge™
Single-Channel Measurement and Control Unit for Compact Gauges
TPG 261
Product Identification

In all communications with Pfeiffer Vacuum, please specify the information on the product nameplate. For convenient reference copy that information into the space provided below.

Validity

This document applies to products with part number PTG28030.
The part number (No.) can be taken from the product nameplate.

This manual is based on firmware version 302-510-A.
If your unit does not work as described in this document, please check that it is equipped with the above firmware version (→ 57).

We reserve the right to make technical changes without prior notice.

All dimensions are indicated in mm.
**Intended Use**

The TPG 261 is used together with Pfeiffer Vacuum Compact Gauges (in this document referred to as gauges) for total pressure measurement. All products must be operated in accordance with their respective Operating Instructions.

**Scope of Delivery**

The scope of delivery consists of following parts:

1. TPG 261 Single-Channel Measurement and Control Unit
2. Power cord
3. Connector for control connection
4. Collar screws and plastic sleeves
5. Rubber feet
6. Rubber bar
7. Operating Instructions (this document)
8. Betriebsanleitung

**Trademarks**

SingleGauge™ INFICON AG
FullRange™ INFICON GmbH
For cross-references within this document, the symbol (→  XY) is used, for cross-references to further documents, listed under "Literature", the symbol (→  [Z]).
1 Safety

1.1 Symbols Used

Symbols for residual risks

**DANGER**
Information on preventing any kind of physical injury.

**WARNING**
Information on preventing extensive equipment and environmental damage.

**Caution**
Information on correct handling or use. Disregard can lead to malfunctions or minor equipment damage.

Further symbols

- The lamp/display is lit.
- The lamp/display flashes.
- The lamp/display is dark.
- Press the key (example: PARA key).
- Do not press any key.
1.2 Personnel Qualifications

Skilled personnel

All work described in this document may only be carried out by persons who have suitable technical training and the necessary experience or who have been instructed by the end-user of the product.

1.3 General Safety Instructions

Adhere to the applicable regulations and take the necessary precautions for all work you are going to do and consider the safety instructions in this document.

DANGER

Caution: mains voltage
Contact with live parts is extremely hazardous when any objects are introduced or any liquids penetrate into the unit.
Make sure no objects enter through the louvers and no liquids penetrate into the equipment.

Communicate the safety instructions to all other users.
1.4 Liability and Warranty

Pfeiffer Vacuum assumes no liability and the warranty becomes null and void if the end-user or third parties
- disregard the information in this document
- use the product in a non-conforming manner
- make any kind of interventions (modifications, alterations etc.) on the product
- use the product with accessories not listed in the corresponding product documentation.
## 2 Technical Data

### Mains specifications
- **Voltage**: 90 … 250 VAC
- **Frequency**: 50 … 60 Hz
- **Power consumption**: ≤45 W
- **Overvoltage category**: II
- **Protection class**: 1
- **Connection**: European appliance connector IEC 320 C14 (→ 19)

### Ambiance
- **Temperature**
  - **storage**: –20 … +65 °C
  - **operation**: + 5 … +50 °C
- **Relative humidity**: ≤80% up to +31 °C, decreasing to 50% at +40 °C
- **Use**: indoors only
- **Pollution degree**: II
- **Protection type**: IP30

### Compatible gauges
- **Number**: 1
- **Compatible Compact Gauges**
  - **Pirani**: TPR 261, TPR 265, TPR 280, TPR281
  - **Pirani Capacitance**: PCR 260
  - **Cold Cathode**: IKR 251, IKR 261, IKR 270
  - **FullRange™ CC**: PKR 251, PKR 261
  - **Process Ion**: IMR 265
  - **FullRange™ BA**: PBR 260
  - **Capacitance**: CMR 261 … CMR 275
  - **Piezo**: APR 250 … APR 267

### Gauge connections
- **Number**: 1
- **sensor connector**: Amphenol C91B appliance connector, female, 6-pole (pin assignment → 20)
### Gauge supply

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Voltage</td>
<td>+24 VDC ±5%</td>
</tr>
<tr>
<td>Current</td>
<td>750 mA</td>
</tr>
<tr>
<td>Power</td>
<td>18 W</td>
</tr>
<tr>
<td>Fuse protection</td>
<td>900 mA with PTC element, self-resetting after turning the TPG 261 off or disconnecting the gauge. The supply conforms to the requirements of a grounded protective extra low voltage (SELV-E according to EN 61010).</td>
</tr>
</tbody>
</table>

### Operation

<table>
<thead>
<tr>
<th>Function</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Front panel</td>
<td>via 3 keys</td>
</tr>
<tr>
<td>Remote control</td>
<td>via RS232C interface</td>
</tr>
</tbody>
</table>

### Measurement values

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Measurement range</td>
<td>depending on gauge (&lt;→ [1] … [14])</td>
</tr>
<tr>
<td>Measurement error</td>
<td></td>
</tr>
<tr>
<td>gain error</td>
<td>≤0.01% F.S.</td>
</tr>
<tr>
<td>offset error</td>
<td>≤0.01% F.S.</td>
</tr>
<tr>
<td>Measurement rate</td>
<td>50 / s</td>
</tr>
<tr>
<td>Display rate</td>
<td>10 / s</td>
</tr>
<tr>
<td>Filter time constant</td>
<td></td>
</tr>
<tr>
<td>slow</td>
<td>1.2 s ($f_g = 0.13$ Hz)</td>
</tr>
<tr>
<td>normal (nor)</td>
<td>400 ms ($f_g = 0.4$ Hz)</td>
</tr>
<tr>
<td>fast</td>
<td>20 ms ($f_g = 8$ Hz)</td>
</tr>
<tr>
<td>Measurement units</td>
<td>mbar, Pa, Torr</td>
</tr>
<tr>
<td>Offset correction</td>
<td></td>
</tr>
<tr>
<td>for linear gauges</td>
<td>-5 … 110% F.S.</td>
</tr>
<tr>
<td>Calibration factor</td>
<td></td>
</tr>
<tr>
<td>for logarithmic gauges</td>
<td>0.10 … 9.99</td>
</tr>
<tr>
<td>for linear gauges</td>
<td>0.500 … 2.000</td>
</tr>
<tr>
<td>A/D converter</td>
<td>resolution 0.001% F.S.</td>
</tr>
<tr>
<td>Switching functions</td>
<td>Number</td>
</tr>
<tr>
<td>---------------------</td>
<td>--------</td>
</tr>
<tr>
<td>Reaction delay</td>
<td></td>
</tr>
<tr>
<td>Adjustment range</td>
<td></td>
</tr>
<tr>
<td>Hysteresis</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Switching function relays</th>
<th>Contact type</th>
<th>floating changeover contact</th>
</tr>
</thead>
<tbody>
<tr>
<td>Load max.</td>
<td></td>
<td>30 VAC, 30 W (ohmic)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>60 VDC, 1 A, 30 W (ohmic)</td>
</tr>
<tr>
<td>Service life</td>
<td></td>
<td>5×10⁷ cycles</td>
</tr>
<tr>
<td>mechanic</td>
<td></td>
<td>1×10⁵ cycles (at max. load)</td>
</tr>
<tr>
<td>electric</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Contact positions</td>
<td></td>
<td>→ [22]</td>
</tr>
<tr>
<td>Relay connector</td>
<td>D-Sub appliance connector, female, 15-pole</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(pin assignment → [22])</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Error signal</th>
<th>Number</th>
<th>1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reaction time</td>
<td></td>
<td>≤20 ms</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Error signal relay</th>
<th>Contact type</th>
<th>floating normally open contact</th>
</tr>
</thead>
<tbody>
<tr>
<td>Load max.</td>
<td></td>
<td>30 VAC, 30 W (ohmic)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>60 VDC, 1 A, 30 W (ohmic)</td>
</tr>
<tr>
<td>Service life</td>
<td></td>
<td>5×10⁷ cycles</td>
</tr>
<tr>
<td>mechanic</td>
<td></td>
<td>1×10⁵ cycles (at max. load)</td>
</tr>
<tr>
<td>electric</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Contact positions</td>
<td></td>
<td>→ [21]</td>
</tr>
<tr>
<td>Control connector</td>
<td>Amphenol C91B appliance connector, female, 7-pole</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(pin assignment → [21])</td>
<td></td>
</tr>
<tr>
<td>Gauge control</td>
<td></td>
<td></td>
</tr>
<tr>
<td>---------------</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Manual via keys activation/deactivation (→ 28, 48, 49)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>External via control connector</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ON condition signal ≤ +0.8 VDC</td>
<td></td>
<td></td>
</tr>
<tr>
<td>OFF condition signal +2.0 … 5 VDC or input open</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hotstart when mains power on (→ 48)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Self control deactivation when pressure rises OFF threshold adjustable (→ 50)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Control connector Amphenol C91B appliance connector, female, 7-pole (pin assignment → 21)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Analog output</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number 1</td>
</tr>
<tr>
<td>Voltage range 0 … +10 VDC</td>
</tr>
<tr>
<td>Internal resistance 660 Ω</td>
</tr>
<tr>
<td>Measuring signal vs. pressure depending on gauge (→ [1] … [14])</td>
</tr>
<tr>
<td>Control connector Amphenol C91B appliance connector, female, 7-pole (pin assignment → 21)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Interface</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standard RS232C</td>
</tr>
<tr>
<td>Protocol ACK/NAK, ASCII with 3-character mnemonics, bi-directional data flow, 8 data bits, no parity bit, 1 stop bit</td>
</tr>
<tr>
<td>RS232C only TXD and RXD used</td>
</tr>
<tr>
<td>Transmission rate 9600, 19200, 38400 baud</td>
</tr>
<tr>
<td>RS232 connector D-Sub appliance connector, male, 9-pole (pin assignment → 23)</td>
</tr>
</tbody>
</table>
Dimensions [mm]

Use
For incorporation into a rack or control panel or as desktop unit.

Weight
1.1 kg
3 Installation

3.1 Personnel

The unit may only be installed by persons who have suitable technical training and the necessary experience or who have been instructed by the end-user of the product.

3.2 Installation, Setup

The TPG 261 is suited for incorporation into a 19" rack or a control panel or for use as desk-top unit.

DANGER

Caution: damaged product
Putting a damaged product into operation can be extremely hazardous.
In case of visible damages, make sure the product is not put into operation.

3.2.1 Rack Installation

The TPG 261 is designed for installation into a 19" rack chassis adapter according to DIN 41 494. For this purpose, four collar screws and plastic sleeves are supplied with it.

DANGER

Caution: protection class of the rack
If the product is installed in a rack, it is likely to lower the protection class of the rack (protection against foreign bodies and water) e.g. according to the EN 60204-1 regulations for switching cabinets.
Take appropriate measures for the rack to meet the specifications of the protection class.
Guide rail

In order to reduce the mechanical strain on the front panel of the TPG 261, preferably equip the rack chassis adapter with a guide rail.

Slide rails

For safe and easy installation of heavy rack chassis adapters, preferably equip the rack frame with slide rails.
1. Secure the rack adapter in the rack frame.

⚠️ The admissible maximum ambient temperature (→ 9) must not be exceeded neither the air circulation obstructed.

2. Slide the TPG 261 into the rack chassis adapter …

… and fasten the adapter panel to the rack chassis adapter using the screws supplied with the TPG 261.
3.2.2 Installation in a Control Panel

**DANGER**

Caution: protection class of the control panel

If the product is installed in a control panel, it is likely to lower the protection class of the control panel (protection against foreign bodies and water) e.g. according to the EN 60204-1 regulations for switching cabinets.

Take appropriate measures for the control panel to meet the specifications of the protection class.

For mounting the TPG 261 into a control panel, the following cut-out is required:

The admissible maximum ambient temperature (→ § 9) must not be exceeded neither the air circulation obstructed.

For reducing the mechanical strain on the front panel, preferably support the unit.
3.2.3 Use as Desk-Top Unit

The TPG 261 is also suited for use as desk-top unit. For this purpose, two self-adhesive rubber feet as well as a slip-on rubber bar are supplied with it.

1. Stick the two supplied rubber feet to the rear part of the bottom plate …

… and slip the supplied rubber bar onto the bottom edge of the front panel.
Select a location where the admissible maximum ambient temperature (→ § 9) is not exceeded (e.g. due to sun irradiation).

### 3.3 Mains Power Connector

**DANGER**

Caution: line voltage
Incorrectly grounded products can be extremely hazardous in the event of a fault.
Use only a 3-conductor power cable with protective ground. The power connector may only be plugged into a socket with a protective ground. The protection must not be nullified by an extension cable without protective ground.

The unit is supplied with a power cord. If the mains connector is not compatible with your system, use your own, suitable cable with protective ground (3×1.5 mm²).

The socket must be fuse-protected with 10 A max.

If the unit is installed in a switching cabinet, the mains voltage should be supplied and turned on via a central distributor.
3.4 Gauge Connector sensor

Connect the gauge to the sensor connector via a sensor cable set available from us (→ sales literature) or your own, screened (electromagnetic compatibility) sensor cable. Make sure the gauge you are connecting is compatible (→ 9).

Pin assignment sensor

Pin assignment of the female 6-pole Amphenol C91B appliance connector:

<table>
<thead>
<tr>
<th>Pin</th>
<th>Signal</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Identification</td>
</tr>
<tr>
<td>2</td>
<td>Supply</td>
</tr>
<tr>
<td>3</td>
<td>Supply common</td>
</tr>
<tr>
<td>4</td>
<td>Signal input</td>
</tr>
<tr>
<td>5</td>
<td>Signal common</td>
</tr>
<tr>
<td>6</td>
<td>Screening</td>
</tr>
</tbody>
</table>

+24 VDC          GND          (measuring signal+) (measuring signal–)
3.5 *control* Connector

This connector allows to read the measuring signal, to evaluate the state of the floating contacts of the error relay, and to activate or deactivate the gauge (→ 46).

Connect the peripheral components to the *control* connector on the rear of the unit using your own, screened (electromagnetic compatibility) cable.

Pin assignment of the female 7-pole Amphenol C91B appliance connector:

<table>
<thead>
<tr>
<th>Pin</th>
<th>Signal</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>Analog output gauge 0 … +10 VDC</td>
</tr>
<tr>
<td>5</td>
<td>Screening GND</td>
</tr>
<tr>
<td>4</td>
<td>Gauge on signal +0 VDC</td>
</tr>
<tr>
<td></td>
<td>off signal +2.0 … 5 VDC or input open</td>
</tr>
<tr>
<td>1, 6</td>
<td>Not assigned</td>
</tr>
<tr>
<td>3</td>
<td>No error</td>
</tr>
<tr>
<td>7</td>
<td></td>
</tr>
</tbody>
</table>

A suitable connector is supplied with the TPG 261.
3.6 relay Connector

This connector allows to use the floating switching contacts for an external control system.

Connect the peripheral components to the relay connector on the rear of the unit using your own, screened (electromagnetic compatibility) cable.

Pin assignment of the female 15-pole D-Sub appliance connector:

<table>
<thead>
<tr>
<th>Pin</th>
<th>Signal</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>Switching function 1 (SP1)</td>
</tr>
<tr>
<td>3</td>
<td>Pressure below threshold</td>
</tr>
<tr>
<td>2</td>
<td>Pressure above threshold or power supply turned off</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Pin</th>
<th>Signal</th>
</tr>
</thead>
<tbody>
<tr>
<td>7</td>
<td>Switching function 2 (SP2)</td>
</tr>
<tr>
<td>6</td>
<td>Pressure below threshold</td>
</tr>
<tr>
<td>5</td>
<td>Pressure above threshold or power supply turned off</td>
</tr>
</tbody>
</table>

9 … 14 Not connected

Supply for relays with higher switching power

- Fuse-protected at 300 mA with PTC element, self-resetting after power off or pulling the relay connector.
- Meets the requirements of a grounded protective extra low voltage (SELV-E according to EN 61010).
3.7 Interface Connector RS232

The RS232C interface allows for operating the TPG 261 via a HOST or terminal (→ 64). It can also be used for updating the firmware (→ 95).

Connect the serial interface to the RS232 connector on the rear of the unit using your own, screened (electromagnetic compatibility) cable.

Pin assignment RS232

| Pin | Signal  
|-----|----------
| 2   | RXD      
| 3   | TXD      
| 5   | GND      
| 4   | DTR      
| 7   | RTS      
| 8   | CTS      

Screening

| Pin | Signal        
|-----|--------------
| 1   | not connected
| 6   | not connected
| 9   | not connected

Casing = screening

(Pin assignment of the male 9-pole D-Sub appliance connector:)

<table>
<thead>
<tr>
<th>Chassis</th>
<th>Chassis</th>
</tr>
</thead>
<tbody>
<tr>
<td>RXD</td>
<td>RXD</td>
</tr>
<tr>
<td>TXD</td>
<td>TXD</td>
</tr>
<tr>
<td>GND</td>
<td>GND</td>
</tr>
</tbody>
</table>

(Minimum configuration)
4 Operation

4.1 Front Panel

Measurement value in floating point or exponential format or status messages

Parameter mode activated

Warning/error (flashing)

Measurement unit

Operator keys

Switching function status

Offset value ≠ 0

Correction factor ≠ 1

Degas activated

Gauge activated

No function
4.2 Turning the TPG 261 On and Off

Make sure the TPG 261 is correctly installed and the specifications in the Technical Data are met.

Turning the TPG 261 on

The power switch is on the rear of the unit.

Turn the TPG 261 on with the power switch (or centrally, via a switched power distributor, if the unit is incorporated in a rack).

After power on, the TPG 261 …

• automatically performs a self-test
• identifies the connected gauge
• activates the parameters that were in effect before the last power off
• switches to the Measurement mode
• adapts the parameters if required (if another gauge was previously connected).

Turning the TPG 261 off

Turn the TPG 261 off with the power switch (or centrally, via a switched power distributor, if the unit is incorporated in a rack).

Wait at least 10 s before turning the TPG 261 on again in order for it to correctly initialize itself.
4.3 Operating Modes

The TPG 261 works in the following operating modes:

- **Measurement mode**
  for displaying measurement values or statuses (→ § 27)

- **Parameter mode**
  for displaying or editing parameters (→ § 31)
  - Switching function parameter group [SP-P] for entering or displaying thresholds (→ § 33)
  - Gauge parameter group [GEP-P] for entering or displaying gauge parameters (→ § 37)
  - Gauge control group [CTLP-P] for entering or displaying gauge control parameters (→ § 46)
  - General parameter group [GEP-P] for entering or displaying general parameters (→ § 51)
  - Test program group [TSEP-B] for running internal test programs (→ § 55)

- **Program transfer mode**
  for updating the firmware (→ § 95)
4.4 Measurement Mode

The Measurement mode is the standard operating mode of the TPG 261. Measurement values and statuses as well as the gauge identification are displayed in this mode.
Certain gauges can be turned on and off manually, if the gauge control is set to \textbf{Hand} (→ 49).

Available for:
- Pirani Gauge (TPR)
- Pirani Capacitance Gauge (PCR)
- Cold Cathode Gauge (IKR)
- FullRange™ CC Gauge (PKR)
- Process Ion Gauge (IMR)
- FullRange™ BA Gauge (PBR)
- Capacitance Gauge (CMR)
- Piezo Gauge (APR)

\( \Rightarrow \) Press key >1 s: The gauge is turned off. \textbf{OFF} is displayed instead of the measurement value.

\( \Rightarrow \) Press key >1 s: The gauge is turned on. A status message may be displayed instead of the measurement value.
Pressure measurement range: 0 bar.
Displaying the gauge identification

Press keys >0.5 s:
The type of the connected gauge is automatically identified and displayed for 4 s:

Pirani Gauge
(TPR 261, TPR 265, TPR 280, TPR 281)
Pirani Capacitance Gauge ¹)
(PCR 260)

Cold Cathode Gauge
(IKR251, IKR261)

Cold Cathode Gauge
(IKR270)

FullRange™ CC Gauge
(PKR251, PKR261)

Process Ion Gauge
(IMR265)

FullRange™ BA Gauge
(PBR260)

Capacitance Gauge
(CMR261 ... CMR275)

Piezo Gauge
(APR250 ... APR267)

No gauge connected
(no Sensor)

Connected gauge cannot be identified (no Identifier)

¹) TPR and PCR have identical identifiers. In the TPG 261, there is no distinction made on the display and in data evaluation, since pressure ranges of these gauges are approximately the same.

Getting to the Parameter mode

→ 31
4.5 Parameter Mode

The Parameter mode is used for displaying, editing and entering parameter values as well as for testing the TPG 261. For ease of operation, the parameters are divided into groups.

Measurement mode

Parameter mode

<table>
<thead>
<tr>
<th>Switching function parameters</th>
</tr>
</thead>
<tbody>
<tr>
<td>&gt;10 s</td>
</tr>
</tbody>
</table>

Power on
Selecting a parameter group

⇒ Switching function parameters → 33
Gauge parameters → 37
Gauge control → 46
General parameters → 51
Test parameters → 55

Selecting a parameter in a parameter group

Editing a parameter in a parameters group

Modifications of parameters come into effect immediately and are stored automatically. Exceptions are mentioned under the corresponding parameters.
4.5.1 Switching Function Parameters

The switching function parameter group (setpoint parameters) is used for displaying, entering and editing threshold values of the two switching functions.
The TPG 261 has two switching functions with two adjustable thresholds each. The status of the switching function is displayed on the front panel (→ 24, 21) and can be evaluated via the floating contacts at the relay connector.

Selecting a parameter

The name of the parameter, e.g.: Switching function 1 lower setpoint is displayed as long as the key is pressed or at least for 1.5 s.

Afterwards, the currently valid threshold value is displayed.
Press key <1 s:
The value is increased/
decreased by 1 increment.

Press key >1 s:
The value is increased/
decreased continuously.

The lower switching threshold
(Setpoint low) defines the pres-
sure at which the switching func-
tion is activated when the pres-
sure is dropping.

Gauge dependent (→ table).
If another gauge type is con-
ected, the TPG 261 automati-
cally adjusts the switching
threshold if required.

<table>
<thead>
<tr>
<th>lower threshold limit</th>
<th>upper threshold limit</th>
</tr>
</thead>
<tbody>
<tr>
<td>5×10^{-4}</td>
<td>1500</td>
</tr>
<tr>
<td>1×10^{-6}</td>
<td>1×10^{-2}</td>
</tr>
<tr>
<td>1×10^{-11}</td>
<td>1×10^{-2}</td>
</tr>
<tr>
<td>1×10^{-9}</td>
<td>1000</td>
</tr>
<tr>
<td>1×10^{-6}</td>
<td>1000</td>
</tr>
<tr>
<td>5×10^{-10}</td>
<td>1000</td>
</tr>
<tr>
<td>F.S. / 1000</td>
<td>F.S.</td>
</tr>
</tbody>
</table>

all values in mbar, CAL=1
The minimum hysteresis between the upper and lower switching threshold is at least 10% of the lower threshold or 1% of the set full scale value. If the value of the minimum hysteresis drops below these values, the upper threshold is automatically adjusted to a minimum hysteresis. This prevents unstable states.

### Limits of the upper switching thresholds

<table>
<thead>
<tr>
<th>Value</th>
<th>The upper switching threshold (Setpoint high) defines the pressure at which the switching function is deactivated when the pressure is rising.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>⇨ Gauge dependent (∆ table). If another gauge type is connected, the TPG 261 automatically adjusts the threshold if required.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>lower threshold limit</th>
<th>upper threshold limit</th>
</tr>
</thead>
<tbody>
<tr>
<td>+10% lower threshold</td>
<td>1500</td>
</tr>
<tr>
<td>+10% lower threshold</td>
<td>1×10^-2</td>
</tr>
<tr>
<td>+10% lower threshold</td>
<td>1×10^-2</td>
</tr>
<tr>
<td>+10% lower threshold</td>
<td>1000</td>
</tr>
<tr>
<td>+10% lower threshold</td>
<td>1000</td>
</tr>
<tr>
<td>+10% lower threshold</td>
<td>1000</td>
</tr>
<tr>
<td>+1% measurement range (F.S.)</td>
<td>F.S.</td>
</tr>
</tbody>
</table>

+ all values in mbar, CAL=1

The minimum hysteresis between the upper and lower switching threshold is at least 10% of the lower threshold or 1% of the set full scale value. This prevents unstable states.
The Gauge parameter group (sensor parameters) is used for displaying, entering and editing parameters of the connected gauge.

### Measurement mode
- **Penning Underrange Control**
- **Degas**
- **Offset**
- **Measurement range**
- **Calibration factor**
- **Filter time constant**
- (depending on history)

### Parameter mode
- **Sensor parameter group**
The name of the parameter, e.g.: Filter time constant is displayed as long as the key is pressed or at least for 1.5 s.

Afterwards, the currently valid parameter value is displayed.

Some parameters are not available for all gauges and thus not always displayed.

Available for

Measurement value filter

The measurement value filter permits a better evaluation of unstable or disturbed measuring signals.

The measurement value filter does not affect the analog output (→ 21).
Fast:
The TPG 261 responds quickly to fluctuations of the measurement value. As a result, it will respond faster to interference in measured values.

Normal:
Good relationship between response and sensitivity of the display and the switching functions to changes in the measured values.

Slow:
The TPG 261 does not respond to small changes in measured values. As a result, it will respond more slowly to changes in the measured values.
The calibration factor allows the measured value to be calibrated for other gases than N₂ (→ characteristic curves in [1] ... [12]).

Available for:
- Pirani Gauge (TPR)
- Pirani Capacitance Gauge (PCR)
- Cold Cathode Gauge (IKR)
- FullRange™ CC Gauge (PKR)
- Process Ion Gauge (*) (IMR)
- FullRange™ BA Gauge **) (PBR)
- Capacitance Gauge (CMR)
- Piezo Gauge (APR)

*) only for pressures <1×10⁻² mbar.
**) only for pressures <1×10⁻¹ mbar.

<table>
<thead>
<tr>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>CAL 9.99</td>
</tr>
<tr>
<td>e.g.: 1.000</td>
</tr>
<tr>
<td>e.g.: 1.999</td>
</tr>
</tbody>
</table>

→ No correction

Measurement value corrected by a factor of 0.10 ... 9.99 (logarithmic gauges).
Measurement value corrected by a factor of 0.500 ... 2.000 (linear gauges).
Press key <1 s:
The value is increased/decreased by 1 increment.

Press key >1 s:
The value is increased/decreased continuously.

For linear gauges, the full scale (F.S.) value has to be defined according to the connected gauge type. For logarithmic gauges it is automatically recognized.

Available for:
- Pirani Gauge (TPR)
- Pirani Capacitance Gauge (PCR)
- Cold Cathode Gauge (IKR)
- FullRange™ CC Gauge (PKR)
- Process Ion Gauge (IMR)
- FullRange™ BA Gauge (PBR)
- Capacitance Gauge (CMR)
- Piezo Gauge (APR)

Measurement range (F.S.) of linear gauges

Value

- 0.01 mbar
- 0.1 mbar
- 1 mbar
- 10 mbar
- 100 mbar
- 1000 mbar
- 2 bar
- 5 bar
- 10 bar
- 50 bar

Conversion table
→ Appendix 93

The value is increased/decreased by the defined increments.
Offset correction

The offset value is displayed and readjusted according to the actual measurement value (in the range of -5 ... +110% of the set full scale value).

Available for:
- Pirani Gauge (TPR)
- Pirani Capacitance Gauge (PCR)
- Cold Cathode Gauge (IKR)
- FullRange™ CC Gauge (PKR)
- Process Ion Gauge (IMR)
- FullRange™ BA Gauge (PBR)
- Capacitance Gauge (CMR)
- Piezo Gauge (APR)

The offset correction affects:
- the displayed measurement value
- the displayed threshold value of the switching functions
- the analog output at the control connector (→ 21)

When the offset correction is activated, the saved offset value is subtracted from the actual measurement value. This allows measuring relative to a reference pressure.

When the zero of the gauge is readjusted, the offset correction must be deactivated.
Behavior in the event of an underrange with Cold Cathode Gauges (Penning underrange control).

Available for:
- Pirani Gauge (TPR)
- Pirani Capacitance Gauge (PCR)
- Cold Cathode Gauge (IKR)
- FullRange™ CC Gauge (PKR)
- Process Ion Gauge (IMR)
- FullRange™ BA Gauge (PBR)
- Capacitance Gauge (CMR)
- Piezo Gauge (APR)

There is a number of possible causes of an underrange:
- the pressure in the vacuum system is lower than the measurement range
- the measurement element has not ignited (yet)
- the discharge has failed
- a defect has occurred

Caution: relay is switching

An underrange can lead to unintended reactions of the connected control system. Prevent false control signals and messages by disconnecting the sensor and control cables.
<table>
<thead>
<tr>
<th>Value</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><code>&lt;display&gt;</code></td>
</tr>
<tr>
<td></td>
<td><code>OFF</code></td>
</tr>
</tbody>
</table>

- **Underrange state is interpreted as admissible measurement value.** `<display>` is displayed. The switching function remains **ON**.
- **Underrange state is interpreted as inadmissible measurement value.** `<display>` is displayed. The switching function changes to **OFF**.

- **Activate/deactivate the underrange control.**

If chances are that the pressure in the vacuum system drops below the measurement range of the gauge, it is advisable to select `<display>`. If `<display>` is selected, the evaluation of the switching function is suppressed for approx. 10 seconds when the gauge is turned on and each time after an underrange has occurred. During this time, the switching function remains **OFF**.
Contamination deposits on the electrode system of hot cathode gauges may cause instabilities of the measurement values. The Degas function allows to clean the electrode system.

Available for:
- Pirani Gauge (TPR)
- Pirani Capacitance Gauge (PCR)
- Cold Cathode Gauge (IKR)
- FullRange™ CC Gauge (PKR)
- Process Ion Gauge (IMR)
- FullRange™ BA Gauge (PBR)
- Capacitance Gauge (CMR)
- Piezo Gauge (APR)

<table>
<thead>
<tr>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>DEG</td>
</tr>
<tr>
<td>Ö Normal operation.</td>
</tr>
<tr>
<td>Ö Degas: The electron collection grid is heated to ( \approx 700 ) °C by electron bombardment and the electrode system is thus cleaned.</td>
</tr>
<tr>
<td>Ö Start degas. Duration of the Degas function 3 min. (can be aborted).</td>
</tr>
<tr>
<td>Ö Abort degas.</td>
</tr>
</tbody>
</table>
4.5.3 Gauge Control

The Gauge control group (control parameters) is used for displaying, entering and editing parameters which define the activation/deactivation of the connected gauge.

If the connected gauge cannot be controlled (→ 48), this group is not available.
Selecting a parameter

The name of the parameter, e.g.: Gauge activation is displayed as long as the key is pressed or at least for 1.5 s. Afterwards, the currently valid parameter value is displayed.

Some parameters are not available for all gauges and thus not always displayed.
Gauge activation

Certain gauges can be activated by different means.

The following gauges can be controlled:

- Pirani Gauge (TPR)
- Pirani Capacitance Gauge (PCR)
- Cold Cathode Gauge (IKR)
- FullRange™ CC Gauge (PKR)
- Process Ion Gauge (IMR)
- FullRange™ BA Gauge (PBR)
- Capacitance Gauge (CMR)
- Piezo Gauge (APR)

<table>
<thead>
<tr>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>500.0</td>
</tr>
</tbody>
</table>

- Manual activation:
  The gauge can be activated by pressing the ▲ key.

- External activation:
  The gauge is activated by an input signal fed via the control connector (→ 8 21).

- Hotstart:
  The gauge is automatically activated when the TPG 261 is turned on. Measurement is thus automatically resumed after a power failure. Gauge deactivation → 8 49.

- Increase/decrease the value by the defined increments.
Certain gauges can be deactivated by different means.
The following gauges can be controlled:

- Pirani Gauge (TPR)
- Pirani Capacitance Gauge (PCR)
- Cold Cathode Gauge (IKR)
- FullRange™ CC Gauge (*) (PKRx)
- Process Ion Gauge (*) (IMR)
- FullRange™ BA Gauge (*) (PBR)
- Capacitance Gauge (CMRx)
- Piezo Gauge (APR)

*) except for self control

<table>
<thead>
<tr>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Manual deactivation: The gauge is deactivated by pressing the key.</td>
</tr>
<tr>
<td>External deactivation: The gauge is deactivated by an input signal fed via the control connector (→ 21).</td>
</tr>
<tr>
<td>Self control: The gauge deactivates itself when the pressure rises (→ 50).</td>
</tr>
<tr>
<td>Increase/decrease the value by the defined increments.</td>
</tr>
</tbody>
</table>

Additionally for Cold Cathode Gauge:
OFF threshold

Definition of the OFF threshold for the gauge to be deactivated by itself (self control).

Available for:
- Pirani Gauge (TPR)
- Pirani Capacitance Gauge (PCR)
- Cold Cathode Gauge (IKRx)
- FullRange™ CC Gauge (PKR)
- Process Ion Gauge (IMR)
- FullRange™ BA Gauge (PBR)
- Capacitance Gauge (CMR)
- Piezo Gauge (APR)

Adjustment range

10⁻⁵ … 10⁻² mbar, CAL=1

e.g.:

Press key <1 s:
The value is increased/decreased by 1 increment.

Press key >1 s:
The value is increased/decreased continuously.
The General parameter group (general parameters) is used for displaying, entering and editing generally applicable system parameters.

4.5.4 General Parameters
Selecting a parameter

⇒ The name of the parameter e.g.: Measurement unit is displayed as long as the key is pressed or at least for 1.5 s.
Afterwards, the currently valid parameter value is displayed.

The parameters are available for all gauge types and thus always displayed.

→ 53 53 54 54

Available for

all gauges

Editing a parameter

⇒ Increase/decrease the value by the defined increments.
### Measurement unit

Unit of measured values, thresholds etc. See Appendix (→ § 93) for conversion.

<table>
<thead>
<tr>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>mbar/bar</td>
</tr>
<tr>
<td>Torr (only available if Torr lock is not activated i.e. Torr is not suppressed → § 58)</td>
</tr>
<tr>
<td>Pascal</td>
</tr>
</tbody>
</table>

### Transmission rate

Transmission rate of the RS232C interface.

<table>
<thead>
<tr>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>9600 baud</td>
</tr>
<tr>
<td>19200 baud</td>
</tr>
<tr>
<td>38400 baud</td>
</tr>
</tbody>
</table>
### Display resolution

Display resolution of measured values.

<table>
<thead>
<tr>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image" alt="Display resolution" /></td>
</tr>
<tr>
<td>➔ Display</td>
</tr>
<tr>
<td>• rounded to one decimal digit</td>
</tr>
<tr>
<td>• or two integrals</td>
</tr>
<tr>
<td>➔ Display</td>
</tr>
<tr>
<td>• rounded to two decimal digits</td>
</tr>
<tr>
<td>• or three integrals</td>
</tr>
</tbody>
</table>

### Default settings

All user parameter settings are replaced by the factory settings.

⚠️ Loading of the default parameter settings is irreversible.

<table>
<thead>
<tr>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image" alt="Default settings" /></td>
</tr>
<tr>
<td>➔ The default values are loaded (→ 94).</td>
</tr>
</tbody>
</table>
4.5.5 Test Parameters

The Test parameter group is used for displaying the firmware version, entering and editing special parameter values, and for running test programs.

This group is only available if the key was pressed while the TPG 261 was turned on.
Selecting a parameter

The name of the parameter e.g.: Firmware version is displayed.

The parameters are available for all gauge types and thus always displayed.

Available for all gauges

The name of the parameter is displayed as long as the key is pressed or at least for 1.5 s.

The firmware version is continuously displayed.

Available for all gauges

The name of the test program is displayed until it is started.

Editing a parameter

Increase/decrease the value by the defined increments.
Starting the test program

- Start test program.

Firmware version

- The firmware version (program version) is displayed.

<table>
<thead>
<tr>
<th>Version</th>
</tr>
</thead>
<tbody>
<tr>
<td>PARA:0.0</td>
</tr>
<tr>
<td>BO:9.8</td>
</tr>
<tr>
<td>5.10.8</td>
</tr>
</tbody>
</table>

- The two parts of the firmware number are displayed alternately.

- The last character indicates the modification index (-, A … Z). Please mention this index when contacting Pfeiffer Vacuum in the event of a problem.

Watchdog control

- Behavior of the system control (watchdog) in the event of an error.

<table>
<thead>
<tr>
<th>Setting</th>
</tr>
</thead>
<tbody>
<tr>
<td>AO:8.8</td>
</tr>
<tr>
<td>8:8</td>
</tr>
</tbody>
</table>

- The system automatically acknowledges error messages of the watchdog after 2 s.

- Error messages of the watchdog have to be acknowledged by the operator.
**Torr lock**

The measurement unit **Torr** can be suppressed in the corresponding parameter setting (→ § 53).

<table>
<thead>
<tr>
<th>Setting</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image1.png" alt="Display" /></td>
<td>Measurement unit <strong>Torr</strong> available.</td>
</tr>
<tr>
<td><img src="image2.png" alt="Display" /></td>
<td>Measurement unit <strong>Torr</strong> not available.</td>
</tr>
</tbody>
</table>

**Keylock**

The entry lock function prevents inadvertent entries in the Parameter mode and thus malfunctions.

<table>
<thead>
<tr>
<th>Setting</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image3.png" alt="Display" /></td>
<td>Entry lock function disabled.</td>
</tr>
<tr>
<td><img src="image4.png" alt="Display" /></td>
<td>Entry lock function enabled. <strong>Loc</strong> is displayed when the user attempts to edit a setting in the Parameter mode.</td>
</tr>
</tbody>
</table>
### RAM test

Test of the main memory.

<table>
<thead>
<tr>
<th>Test sequence</th>
</tr>
</thead>
<tbody>
<tr>
<td>The test runs automatically one time:</td>
</tr>
<tr>
<td>⇨ Test in process (very briefly).</td>
</tr>
<tr>
<td>⇨ Test finished, no error found.</td>
</tr>
<tr>
<td>⇨ Test finished, error(s) found. The <strong>Error</strong> lamp flashes.</td>
</tr>
</tbody>
</table>

If the error message persists after several test sequences have been run, please contact your local Pfeiffer Vacuum service center.

### EPROM test

Test of the program memory.

<table>
<thead>
<tr>
<th>Test sequence</th>
</tr>
</thead>
<tbody>
<tr>
<td>The test runs automatically one time:</td>
</tr>
<tr>
<td>⇨ Test in process</td>
</tr>
<tr>
<td>⇨ Test finished, no error found. After the test, a four-digit checksum (hexadecimal format) is displayed.</td>
</tr>
<tr>
<td>⇨ Test finished, error(s) found. After the test, a four-digit checksum (hexadecimal format) is displayed. The <strong>Error</strong> lamp flashes.</td>
</tr>
</tbody>
</table>

If the error message persists after several test sequences have been run, please contact your local Pfeiffer Vacuum service center.
**EEPROM test**

Test of the parameter memory.

**Test sequence**

- The test runs automatically one time:
  - Test in process (very briefly).
  - Test finished, no error found.
  - Test finished, error(s) found.
    - The Error lamp flashes.

If the error message persists after several test sequences have been run, please contact your local Pfeiffer Vacuum service center.

---

**Display test**

Test of the display.

**Test sequence**

- The test runs automatically one time:
  - First, all display elements are lit at the same time, ...
  - ... and then, each element is lit individually.

- Stop the test sequence and activate one element after another by pressing the key once per element.

*)
A/D converter test 0

Test of channel 0 of the analog/digital converter (with a reference voltage at the signal input of the sensor connector (→ § 20)).

If the signal input is open, the TPG 261 displays a default value that may easily fluctuate because of the high sensitivity of the open measurement circuit.

<table>
<thead>
<tr>
<th>Test sequence</th>
</tr>
</thead>
<tbody>
<tr>
<td>A/D converter test 0</td>
</tr>
<tr>
<td>⇒ Measuring signal in Volt.</td>
</tr>
</tbody>
</table>

A/D converter test 1

Test of channel 1 of the analog/digital converter (with a reference voltage at the signal input of the sensor connector (→ § 20)).

If the signal input is open, the TPG 261 displays a default value that may easily fluctuate because of the high sensitivity of the open measurement circuit.

<table>
<thead>
<tr>
<th>Test sequence</th>
</tr>
</thead>
<tbody>
<tr>
<td>A/D converter test 1</td>
</tr>
<tr>
<td>⇒ Gauge identification voltage.</td>
</tr>
<tr>
<td>⇒ No gauge connected.</td>
</tr>
</tbody>
</table>
I/O test

Test of the relays of the TPG 261. The program tests their switching function.

Caution

Caution: The relays switch irrespective of the pressure
Starting a test program may cause unwanted effects in connected control systems.
Disconnect all sensor and control system lines to ensure that no control commands or messages are triggered by mistake.

The relays switch on and off cyclically. The switching operations are indicated optically and can be heard.

The contacts of the switching functions 1 \ldots 4 are connected to the relay connector (→ 22), the contacts of the error relay to the control connector (→ 21) on the rear of the housing. Check their function with an ohmmeter.

<table>
<thead>
<tr>
<th>Test sequence</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image" alt="Test sequence image" /></td>
</tr>
</tbody>
</table>

The test runs automatically one time:

- All relays deactivated
- Switching function relay 1
- Switching function relay 2
- No function
Test of the RS232C interface. The TPG 261 repeats each sign transmitted by the communicating HOST.

The data transferred from/to the TPG 261 can be displayed by the computer only (→ 64).

Test sequence

The test runs automatically.
5 Communication (Serial Interface)

5.1 RS232C Interface

The serial interface is used for communication between the TPG 26x 1) and a computer. A terminal can be connected for test purposes.

When the TPG 26x is put into operation, it starts transmitting measured values in intervals of 1 s. As soon as the first character is transferred to the TPG 26x, the automatic transmission of measured values stops. After the necessary inquiries or parameter modifications have been made, the transmission of measured values can be started again with the COM command (→ 71).

Connection diagram
connection cable

Pin assignment of the 9-pole D-Sub connector and RS232 interface cable → 23.

5.1.1 Data Transmission

The data transmission is bi-directional, i.e. data and control commands can be transmitted in either direction.

Data format

1 start bit
8 data bits
No parity bit
1 stop bit
No hardware handshake

1) Communication structure and procedures are identical for both controllers TPG 261 and TPG 262. Therefore the term TPG 26x is used in this chapter.
The following abbreviations and symbols are used:

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>HOST</td>
<td>Computer or terminal</td>
<td></td>
<td></td>
</tr>
<tr>
<td>[...]</td>
<td>Optional elements</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ASCII</td>
<td>American Standard Code for Information Interchange</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;ETX&gt;</td>
<td>END OF TEXT (CTRL C)</td>
<td>3</td>
<td>03</td>
</tr>
<tr>
<td></td>
<td>Reset the interface</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;CR&gt;</td>
<td>CARRIAGE RETURN</td>
<td>13</td>
<td>0D</td>
</tr>
<tr>
<td></td>
<td>Go to beginning of line</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;LF&gt;</td>
<td>LINE FEED</td>
<td>10</td>
<td>0A</td>
</tr>
<tr>
<td></td>
<td>Advance by one line</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;ENQ</td>
<td>ENQUIRY</td>
<td>5</td>
<td>05</td>
</tr>
<tr>
<td></td>
<td>Request for data transmission</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;ACK&gt;</td>
<td>ACKNOWLEDGE</td>
<td>6</td>
<td>06</td>
</tr>
<tr>
<td></td>
<td>Positive report signal</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;NAK&gt;</td>
<td>NEGATIVE ACKNOWLEDGE</td>
<td>21</td>
<td>15</td>
</tr>
<tr>
<td></td>
<td>Negative report signal</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

"Transmit": Data transfer from HOST to TPG 26x  
"Receive": Data transfer from TPG 26x to HOST

Flow Control

After each ASCII string, the HOST must wait for a report signal (<ACK><CR><LF> or <NAK> <CR><LF>).  
The input buffer of the HOST must have a capacity of at least 32 bytes.
### 5.1.2 Communication Protocol

#### Transmission format

Messages are transmitted to the TPG 26x as ASCII strings in the form of mnemonic operating codes and parameters. All mnemonics comprise three ASCII characters.

Spaces are ignored. `<ETX>` (CTRL C) clears the input buffer in the TPG 26x.

<table>
<thead>
<tr>
<th>HOST</th>
<th>TPG 26x</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mnemonics [and parameters]</td>
<td>-</td>
<td>Receives message with &quot;end of message&quot;</td>
</tr>
<tr>
<td><code>&lt;CR&gt;</code>[<code>&lt;LF&gt;</code>]</td>
<td>-</td>
<td>Positive acknowledgment of a received message</td>
</tr>
</tbody>
</table>

#### Reception format

When requested with a mnemonic instruction, the TPG 26x transmits the measurement data or parameters as ASCII strings to the HOST.

`<ENQ>` must be transmitted to request the transmission of an ASCII string. Additional strings, according to the last selected mnemonic, are read out by repetitive transmission of `<ENQ>`.

If `<ENQ>` is received without a valid request, the ERROR word is transmitted.
### Reception protocol

<table>
<thead>
<tr>
<th>HOST</th>
<th>TPG 26x</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mnemonics [and parameters]</td>
<td>&lt;CR&gt;[&lt;LF&gt;]</td>
<td>Receives message with &quot;end of message&quot;</td>
</tr>
<tr>
<td>&lt;ACK&gt;&lt;CR&gt;&lt;LF&gt;</td>
<td>Positive acknowledgment of a received message</td>
<td></td>
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<tr>
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<td>Requests to transmit data</td>
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<tr>
<td>Measurement values or parameters</td>
<td>&lt;CR&gt;&lt;LF&gt;</td>
<td>Transmits data with &quot;end of message&quot;</td>
</tr>
</tbody>
</table>

The strings received are verified in the TPG 26x. If an error is detected, a negative acknowledgment <NAK> is output.

### Error processing

The strings received are verified in the TPG 26x. If an error is detected, a negative acknowledgment <NAK> is output.

### Error recognition protocol

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<th>TPG 26x</th>
<th>Explanation</th>
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</thead>
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<td>&lt;CR&gt;[&lt;LF&gt;]</td>
<td>Receives message with &quot;end of message&quot;</td>
</tr>
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Mnemonics [and parameters] | <CR>[<LF>] | Receives message with "end of message" |
| Positive acknowledgment of a received message |
## 5.2 Mnemonics

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5.2.1 Measurement Mode

Measurement data gauge 1 or 2

Transmit: \( PRx \ <CR>[<LF>] \)
- Measurement value \( x = 1 \) → Gauge 1
- Measurement value \( x = 2 \) → Gauge 2

Receive: \(<ACK><CR><LF>\)
Transmit: \(<ENQ>\)
Receive: \( x,sx.xxxxEsxx <CR><LF> \)
- Measurement value \(^1\) [in current pressure unit]
- Status, \( x = \)
  - 0 → Measurement data okay
  - 1 → Underrange
  - 2 → Overrange
  - 3 → Sensor error
  - 4 → Sensor off (IKR, PKR, IMR, PBR)
  - 5 → No sensor
    (output: 5,2.0000E-2 [mbar])
  - 6 → Identification error

\(^1\) Values always in exponential format. For logarithmic gauges, the 3\(^{rd}\) and 4\(^{th}\) decimal are always 0.
Measurement data gauges 1 and 2

Transmit: PRX <CR><LF>
Receive: <ACK><CR><LF>
Transmit: <ENQ>
Receive: x,sx.xxxxEsxx,y,sy.yyyyEsyy <CR><LF>

Measurement value gauge 2 1)
[in current pressure unit]
Status gauge 2
Measurement value gauge 1 1)
[in current pressure unit]
Status gauge 1, x =
0 → Measurement data okay
1 → Underrange
2 → Overrange
3 → Sensor error
4 → Sensor off (IKR, PKR, IMR, PBR)
5 → No sensor
(output: 5,2.0000E-2 [mbar])
6 → Identification error

1) Values always in exponential format.
For logarithmic gauges, the 3rd and 4th decimal are always 0.
Continuous output of measurement values (RS232)

Transmit: \[
\text{COM} [\text{.},x] <\text{CR}>[<\text{LF}>]
\]
\[
\quad \text{Mode } x = \begin{cases} 
0 & \rightarrow 100 \text{ ms} \\
1 & \rightarrow 1 \text{ s (default)} \\
2 & \rightarrow 1 \text{ min.}
\end{cases}
\]

Receive: \[
<\text{ACK}><\text{CR}><\text{LF}>
\]
\[
<\text{ACK}> \text{ is immediately followed by the continuous output of the measurement value in the desired interval.}
\]

Receive: \[
\text{x},\text{sxxxxx},y,\text{syyyyy}<\text{CR}><\text{LF}>
\]
\[
\quad \text{Measurement value gauge 2} \quad 1) \\
\quad \text{[in current pressure unit]}
\]
\[
\quad \text{Status gauge 2}
\]
\[
\quad \text{Measurement value gauge 1} \quad 1) \\
\quad \text{[in current pressure unit]}
\]
\[
\quad \text{Status gauge 1}, x = \\
\quad 0 \rightarrow \text{Measurement data okay} \\
\quad 1 \rightarrow \text{Underrange} \\
\quad 2 \rightarrow \text{Overrange} \\
\quad 3 \rightarrow \text{Sensor error} \\
\quad 4 \rightarrow \text{Sensor off (IKR, PKR, IMR, PBR)} \\
\quad 5 \rightarrow \text{No sensor} \\
\quad \text{(output: 5,2.0000E-2 [mbar])} \\
\quad 6 \rightarrow \text{Identification error}
\]

1) Values always in exponential format.
For logarithmic gauges, the 3rd and 4th decimal are always 0.
Turning a gauge on/off

Transmit: \textbf{SEN} \{,x,x\} <CR><LF>

- Gauge 2, \( x = \)
  - 0 \( \rightarrow \) No status change
  - 1 \( \rightarrow \) Turn gauge off
  - 2 \( \rightarrow \) Turn gauge on

Receive: \textbf{<ACK>}<CR><LF>
Transmit: <ENQ>
Receive: x,x <CR><LF>

- Status gauge 2, \( x = \)
  - 0 \( \rightarrow \) Gauge cannot be turned on/off
  - 1 \( \rightarrow \) Gauge turned off
  - 2 \( \rightarrow \) Gauge turned on

Gauge identification

Transmit: \textbf{TID} <CR><LF>

Receive: \textbf{<ACK>}<CR><LF>
Transmit: <ENQ>
Receive: x,x <CR><LF>

- Identification gauge 2, \( x = \)
  - TPR (Pirani Gauge or Pirani Capacitive gauge \(^1\))
  - IKR9 (Cold Cathode Gauge \(10^{-9}\))
  - IKR11 (Cold Cathode Gauge \(10^{-11}\))
  - PKR (FullRange CC Gauge)
  - PBR (FullRange BA Gauge)
  - IMR (Pirani / High Pressure Gauge)
  - CMR (Linear gauge)
  - noSEn (no SEnsor)
  - noid (no identifier)

Receive: x,x <CR><LF>

- Identification gauge 1

\(^1\) TPR and PCR have identical identifiers. There is no distinction made in communication and in data evaluation, since pressure ranges of these gauges are approximately the same.
Measurement channel change

Transmit:  \textbf{SCT} [.x] \textasciicircum{<CR>}[<LF>]

\begin{itemize}
  \item Display channel, \( x = \)
  \begin{itemize}
    \item 0 \rightarrow \text{Gauge 1}
    \item 1 \rightarrow \text{Gauge 2}
  \end{itemize}
\end{itemize}

Receive: \textasciicircum{<ACK>}[<CR>][<LF>]

Transmit: \textasciicircum{<ENQ>}

Receive: \textasciicircum{x}[<CR>][<LF>]

\begin{itemize}
  \item Display channel
\end{itemize}

Error status

Transmit: \textbf{ERR} \textasciicircum{<CR>}[<LF>]

Receive: \textasciicircum{<ACK>}[<CR>][<LF>]

Transmit: \textasciicircum{<ENQ>}

Receive: \textasciicircum{xxxx}[<CR>][<LF>]

\begin{itemize}
  \item \( xxxx = \)
  \begin{itemize}
    \item 0000 \rightarrow \text{No error}
    \item 1000 \rightarrow \text{Error}
    \item 0100 \rightarrow \text{NO HWR}
    \item 0010 \rightarrow \text{PAR}
    \item 0001 \rightarrow \text{SYN}
  \end{itemize}
\end{itemize}

Controller error (See display on front panel)

No hardware

Inadmissible parameter

Syntax error

The ERROR word is cancelled when read out. If the error persists, it is immediately set again.
Reset

Transmit: \texttt{RES [,x] <CR>[<LF>]}  
\hspace{1cm} x = 1 \rightarrow \text{Cancels currently active error and returns to measurement mode}

Receive: \texttt{<ACK><CR><LF>}
Transmit: \texttt{<ENQ>}
Receive: \texttt{[x]x,[x]x,... <CR><LF>}
\hspace{1cm} \text{List of all present error messages, } xx =
\hspace{1.5cm} 0 \rightarrow \text{No error}
\hspace{1.5cm} 1 \rightarrow \text{Watchdog has responded}
\hspace{1.5cm} 2 \rightarrow \text{Task fail error}
\hspace{1.5cm} 3 \rightarrow \text{EPROM error}
\hspace{1.5cm} 4 \rightarrow \text{RAM error}
\hspace{1.5cm} 5 \rightarrow \text{EEPROM error}
\hspace{1.5cm} 6 \rightarrow \text{DISPLAY error}
\hspace{1.5cm} 7 \rightarrow \text{A/D converter error}
\hspace{1.5cm} 9 \rightarrow \text{Gauge 1 error (e.g. filament rupture, no supply)}
\hspace{1.5cm} 10 \rightarrow \text{Gauge 1 identification error}
\hspace{1.5cm} 11 \rightarrow \text{Gauge 2 error (e.g. filament rupture, no supply)}
\hspace{1.5cm} 12 \rightarrow \text{Gauge 2 identification error}
5.2.2 Parameter Mode

5.2.2.1 Switching Function Parameters

Threshold value setting, allocation

Transmit: \( SPx, y, x.xxxEsxx, x.xxxxEsxx \) <CR><LF>

Upper threshold \(^1\)
[in current pressure unit]
(default = depending on gauge)

Lower threshold \(^1\)
[in current pressure unit]
(default = depending on gauge)

Switching function assignment, \( y = \)
0 → Meas. channel 1
1 → Meas. channel 2
1 → Switching function 1
2 → Switching function 2
3 → Switching function 3
4 → Switching function 4

\(^1\) Values can be entered in any format. They are internally converted into the floating point format.

Receive: <ACK><CR><LF>
Transmit: <ENQ>
Receive: \( y, x.xxxEsxx, x.xxxxEsxx \) <CR><LF>

Upper threshold
[in current pressure unit]

Lower threshold
[in current pressure unit]

Switching function assignment
Switching function status

Transmit: `SPS <CR>[<LF>]`
Receive: `<ACK><CR><LF>`
Transmit: `<ENQ>`
Receive: `x,x,x,x <CR><LF>`

- Status switching function 4 `SP4` 1)
- Status switching function 3 `SP3` 1)
- Status switching function 2 `SP2` 1)
- Status switching function 1 `SP1` 1)

1) x = 0 → off
   1 → on

5.2.2.2 Gauge Parameters

Measurement value filter

Transmit: `FIL [x,x] <CR>[<LF>]`
Receive: `<ACK><CR><LF>`
Transmit: `<ENQ>`
Receive: `x,x <CR><LF>`

- Gauge 2 x = 0 → fast
  1 → medium (default)
  2 → slow

- Gauge 1
- Filter time constant gauge 2
- Filter time constant gauge 1
Calibration factor

Transmit:  **CAL [x.xxx,x.xxx] <CR>[<LF>]**  

<table>
<thead>
<tr>
<th>Gauge 2</th>
<th>log. 0.100 ... 9.990</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(default = 1.000)</td>
</tr>
<tr>
<td></td>
<td>lin. 0.500 ... 2.000</td>
</tr>
<tr>
<td></td>
<td>(default = 1.000)</td>
</tr>
</tbody>
</table>

Receive:  <ACK><CR><LF>
Transmit:  **<ENQ>**
Receive:  **x.xxx,x.xxx <CR><LF>**

**Calibration factor gauge 2**

**Calibration factor gauge 1**

Measurement range (F.S.) of linear gauges

- The full scale value of the measurement range (Full Scale) of linear gauges has to be defined by the user; the full scale value of logarithmic gauges is automatically recognized.

Transmit:  **FSR [x,x] <CR>[<LF>]**

<table>
<thead>
<tr>
<th>Gauge 2, x =</th>
</tr>
</thead>
<tbody>
<tr>
<td>0  -&gt; 0.01 mbar</td>
</tr>
<tr>
<td>1  -&gt; 0.1 mbar</td>
</tr>
<tr>
<td>2  -&gt; 1 mbar</td>
</tr>
<tr>
<td>3  -&gt; 10 mbar</td>
</tr>
<tr>
<td>4  -&gt; 100 mbar</td>
</tr>
<tr>
<td>5  -&gt; 1000 mbar (default)</td>
</tr>
<tr>
<td>6  -&gt; 2 bar</td>
</tr>
<tr>
<td>7  -&gt; 5 bar</td>
</tr>
<tr>
<td>8  -&gt; 10 bar</td>
</tr>
<tr>
<td>9  -&gt; 50 bar</td>
</tr>
</tbody>
</table>

Receive:  <ACK><CR><LF>
Transmit:  **<ENQ>**
Receive:  **x,x <CR><LF>**

**Measurement range gauge 2**

**Measurement range gauge 1**
Offset correction (linear gauges)

Transmit: \texttt{OFC} \[,x,x\] <CR>[<LF>] (\texttt{OFS})
\begin{itemize}
  \item \texttt{Gauge 2}, \( x = \)
  \item \( 0 \rightarrow \text{off (default)} \)
  \item \( 1 \rightarrow \text{on} \)
  \item \( 2 \rightarrow \text{auto (offset measurement)} \)
\end{itemize}

Receive: \texttt{<ACK><CR><LF>}
Transmit: \texttt{<ENQ>}
Receive: \texttt{x,x <CR><LF>}
\begin{itemize}
  \item \texttt{Gauge 2}
  \item \texttt{Gauge 1}
\end{itemize}

Offset display (linear gauges)

Transmit: \texttt{OFD} \[sx.xxxxEsxx,sx.xxxxEsxx\] <CR>[<LF>]
\begin{itemize}
  \item \texttt{Gauge 2 Offset 1) [in current pressure unit] (default = 0.0000)}
  \item \texttt{Gauge 1}
\end{itemize}

1) Values can be entered in any format. They are internally converted into the floating point format.

Receive: \texttt{<ACK><CR><LF>}
Transmit: \texttt{<ENQ>}
Receive: \texttt{sx.xxxxEsxx,sx.xxxxEsxx <CR><LF>}
\begin{itemize}
  \item \texttt{Gauge 2}
  \item \texttt{Gauge 1}
\end{itemize}
Underrange control

Transmit: \texttt{PUC [,x,x] <CR>[<LF>]}

- Gauge 2, \( x = 0 \rightarrow \) off (default)
- \( 1 \rightarrow \) on
- Gauge 1

Receive: \texttt{<ACK><CR><LF>}
Transmit: \texttt{<ENQ>}
Receive: \texttt{x,x <CR><LF>}
- Gauge 2
- Gauge 1

Degas

Transmit: \texttt{DGS [,x,x] <CR>[<LF>] (DEG)}

- Gauge 2, \( x = \)
  - 0 \( \rightarrow \) Degas off (default)
  - 1 \( \rightarrow \) Degas on (3 min.)
- Gauge 1

Receive: \texttt{<ACK><CR><LF>}
Transmit: \texttt{<ENQ>}
Receive: \texttt{x,x <CR><LF>}
- Degas status gauge 2
- Degas status gauge 1
5.2.2.3 Gauge Control

Transmit: \texttt{SCx [,x,y,xxEsxx,y.yyEsyy] <CR>[<LF>]}

- OFF threshold
- ON threshold
- Controlling source for gauge deactivation, \(x =\)
  - 0 \(\rightarrow\) no control
  - 1 \(\rightarrow\) automatic deactivation
  - 2 \(\rightarrow\) manual deactivation (default)
  - 3 \(\rightarrow\) external deactivation
  - 4 \(\rightarrow\) self control

Controlling source for gauge activation, \(x =\)
- 0 \(\rightarrow\) no control
- 1 \(\rightarrow\) automatic activation
- 2 \(\rightarrow\) manual activation (default)
- 3 \(\rightarrow\) external activation
- 4 \(\rightarrow\) hot start

Controlled gauge, \(x =\)
- 1 \(\rightarrow\) Gauge 1
- 2 \(\rightarrow\) Gauge 2

Receive: \texttt{<ACK><CR><LF>}
Transmit: \texttt{<ENQ>}
Receive: \texttt{x,y,xxEsxx,y.yyEsyy <CR><LF>}

- OFF threshold
- ON threshold
- Controlling source for deactivating the gauge
- Controlling source for activating the gauge
5.2.2.4 General Parameters

Pressure unit

Transmit: \texttt{UNI [x] <CR>[<LF>]}
- Pressure unit, x =
  0 \rightarrow \text{mbar/bar} \hspace{0.5cm} \text{(default)}
  1 \rightarrow \text{Torr}
  2 \rightarrow \text{Pascal}

Receive: \texttt{<ACK><CR><LF>}
Transmit: \texttt{<ENQ>}
Receive: \texttt{x <CR><LF>}
- Pressure unit

Transmission rate

Transmit: \texttt{BAU [x] <CR>[<LF>]}
- Transmission rate, x =
  0 \rightarrow \text{9600 baud} \hspace{0.5cm} \text{(default)}
  1 \rightarrow \text{19200 baud}
  2 \rightarrow \text{38400 baud}

As soon as the new baud rate has been entered, the report signal is transmitted at the new transmission rate.

Receive: \texttt{<ACK><CR><LF>}
Transmit: \texttt{<ENQ>}
Receive: \texttt{x <CR><LF>}
- Transmission rate

Display resolution

Transmit: \texttt{DCD [x] <CR>[<LF>]}
- Resolution, x =
  2 \rightarrow \text{Display x.x (2 digits)} \hspace{0.5cm} \text{(default)}
  3 \rightarrow \text{Display x.xx (3 digits)}

Receive: \texttt{<ACK><CR><LF>}
Transmit: \texttt{<ENQ>}
Receive: \texttt{x <CR><LF>}
- Resolution
Save parameters to EEPROM

Transmit: \texttt{SAV [,x] <CR><LF>}
\hspace{1cm}
x = 0 \rightarrow \text{Save default parameters}
1 \rightarrow \text{Save user parameters}

Receive: \texttt{<ACK><CR><LF>}

Display changeover

Transmit: \texttt{DIC [,x] <CR><LF>}
\hspace{1cm}
\text{Measurement display behavior when a Pirani gauge or a Pirani Capacitance gauge is combined with a linear gauge with 1000 mbar F.S., } x = 
0 \rightarrow \text{manual (default)}
1 \rightarrow \text{automatic}

Receive: \texttt{<ACK><CR><LF>}
Transmit: \texttt{<ENQ>}
Receive: \texttt{x <CR><LF>}
\hspace{1cm}
\text{Measurement display behavior}

5.2.2.5 Test Parameters

(For service personnel)

Firmware version

Transmit: \texttt{PNR <CR><LF>}
Receive: \texttt{<ACK><CR><LF>}
Transmit: \texttt{<ENQ>}
Receive: \texttt{302-510-x <CR><LF>}
\hspace{1cm}
x = \text{Modification index}
\hspace{1cm}(- = \text{original version})
\hspace{1cm}
\text{Firmware number}
Watchdog control

Transmit: \texttt{WDT \[,x\] <CR>[<LF>]}

\[
\begin{array}{c}
x = 0 \rightarrow \text{Manual error acknowledgement} \\
1 \rightarrow \text{Automatic error acknowledgement 1)} \\
(\text{default})
\end{array}
\]

1) If the watchdog has responded, the error is automatically acknowledged and cancelled after 2 s.

Receive: \texttt{<ACK><CR><LF>}
Transmit: \texttt{<ENQ>}
Receive: \texttt{x <CR><LF>}

\text{Watchdog control}

Torr lock

Transmit: \texttt{TLC \[,x\] <CR>[<LF>]}

\[
\begin{array}{c}
x = 0 \rightarrow \text{off (default)} \\
1 \rightarrow \text{on}
\end{array}
\]

Receive: \texttt{<ACK><CR><LF>}
Transmit: \texttt{<ENQ>}
Receive: \texttt{x <CR><LF>}

\text{Torr lock status}

Keylock

Transmit: \texttt{LOC \[,x\] <CR>[<LF>]}

\[
\begin{array}{c}
x = 0 \rightarrow \text{off (default)} \\
1 \rightarrow \text{on}
\end{array}
\]

Receive: \texttt{<ACK><CR><LF>}
Transmit: \texttt{<ENQ>}
Receive: \texttt{x <CR><LF>}

\text{Keylock status}
### RAM test

Transmit: `RAM <CR>[<LF>]`

Receive: `<ACK><CR><LF>`

Transmit: `<ENQ>` Starts the test (duration <1 s)

Receive: `xxxx <CR><LF>`

- ERROR word

### EPROM test

Transmit: `EPR <CR>[<LF>]`

Receive: `<ACK><CR><LF>`

Transmit: `<ENQ>` Starts the test (duration ≈5 s)

Receive: `xxxx,yyyy <CR><LF>`

- Check sum (hex)
- ERROR word

### EEPROM test

Transmit: `EEP <CR>[<LF>]`

Receive: `<ACK><CR><LF>`

Transmit: `<ENQ>` Starts the test (duration <1 s)

- Do not keep repeating the test (EEPROM life).

Receive: `xxxx <CR><LF>`

- ERROR word

### Display test

Transmit: `DIS [,x] <CR>[<LF>]`

- `x = 0` → Stops the test – display according to current operating mode (default)
- `1` → Starts the test – all LEDs on

Receive: `<ACK><CR><LF>`

Transmit: `<ENQ>`

Receive: `x <CR><LF>`

- Display test status
ADC test

Transmit:  ADC <CR>[<LF>]
Receive:   <ACK><CR><LF>
Transmit:  <ENQ>
Receive:   [x]x.xxxx,[x]x.xxxx,x.xxxx,x.xxxx <CR><LF>

ADC channel 4 identification
Gauge 2
[0.0000 ... 5.0000 V]

ADC channel 3
Gauge 1 identification
[0.0000 ... 5.0000 V]

ADC channel 2
Measurement signal
gauge 2
[0.0000 ... 11.0000 V]

ADC channel 1
Measurement signal
gauge 1
[0.0000 ... 11.0000 V]
Caution: The relays switch irrespective of the pressure.
Starting a test program may cause unwanted effects in connected control systems.
Disconnect all sensor cables and control system lines to ensure that no control commands or messages are triggered by mistake.

Transmit: \textbf{IOT \text{[,x,yy] <CR><LF>}}

- Relay status (in hex format), yy =
  - 00 \rightarrow All relays deactivated
  - 01 \rightarrow Switching function relay 1 activated
  - 02 \rightarrow Switching function relay 2 activated
  - 04 \rightarrow Switching function relay 3 activated
  - 08 \rightarrow Switching function relay 4 activated
  - 10 \rightarrow Gauge relay CH1 activated
  - 20 \rightarrow Gauge relay CH2 activated
  - 40 \rightarrow Error relay activated
  - 7F \rightarrow All relays activated

- x =
  - 0 \rightarrow Test stopped
  - 1 \rightarrow Test runs

Receive: \textbf{<ACK><CR><LF>}
Transmit: \textbf{<ENQ>}
Receive: \textbf{x,yy <CR><LF>}

- Relay status
- I/O test status

I/O test
Operator key test

Transmit: TKB <CR>[<LF>]
Receive: <ACK><CR><LF>
Transmit: <ENQ>
Receive: xxxx <CR><LF>

<table>
<thead>
<tr>
<th>Key</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Key 4</td>
<td>x = 0 → Not pushed</td>
</tr>
<tr>
<td></td>
<td>1 → Pushed</td>
</tr>
<tr>
<td>Key 3</td>
<td></td>
</tr>
<tr>
<td>Key 2</td>
<td></td>
</tr>
<tr>
<td>Key 1</td>
<td></td>
</tr>
</tbody>
</table>

RS232 test

Transmit: RST <CR>[<LF>]
Receive: <ACK><CR><LF>
Transmit: <ENQ> Starts the test (repeats each character, test is interrupted with <CTRL> C)
5.2.3 Example

"Transmit (T)" and "Receive (R)" are related to Host.

S: **TID** <CR> [<LF>]
E: Request for gauge identification

S: **<ACK>** <CR> <LF>
E: Positive acknowledgement

S: **<ENQ>**
E: Request for data transmission

S: **TPR,CMR** <CR> <LF>
E: Gauge identifications

S: **SEN** <CR> [<LF>]
E: Request for gauge statuses

S: **<ACK>** <CR> <LF>
E: Positive acknowledgement

S: **<ENQ>**
E: Request for data transmission

S: **0,0** <CR> <LF>
E: Gauge statuses

S: **SP1** <CR> [<LF>]
E: Request for parameters of switching function 1 (setpoint 1)

S: **<ACK>** <CR> <LF>
E: Positive acknowledgement

S: **<ENQ>**
E: Request for data transmission

S: **0,1,0000E-09,9,0000E-07** <CR> <LF>
E: Thresholds

S: **SP1,1,6.80E-3,9.80E-3** <CR> [<LF>]
E: Modification of parameters of switching function 1 (setpoint 1)

S: **<ACK>** <CR> <LF>
E: Positive acknowledgement

S: **FOL,1,2** <CR> [<LF>]
E: Modification of filter time constant (syntax error)

S: **<ACK>** <CR> <LF>
E: Positive acknowledgement

S: **0001** <CR> <LF>
E: ERROR word

S: **FIL,1,2** <CR> [<LF>]
E: Modification of filter time constant

S: **<ACK>** <CR> <LF>
E: Positive acknowledgement

S: **<ENQ>**
E: Request for data transmission

S: **1,2** <CR> <LF>
E: Filter time constants
6 Maintenance

The product requires no maintenance.

Cleaning the TPG 261

For cleaning the outside of the TPG 261, a slightly moist cloth will usually do. Do not use any aggressive or scouring cleaning agents.

DANGER

Caution: mains voltage
Contact with live parts is extremely hazardous when liquids penetrate into the unit.
Make sure no liquids penetrate into the equipment.
## 7 Troubleshooting

### Signalization of errors

<table>
<thead>
<tr>
<th>Error</th>
<th>Possible cause and remedy/acknowledgement</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image" alt="Error" /></td>
<td>and the error relay opens (→ § 21).</td>
</tr>
</tbody>
</table>

### Error messages

<table>
<thead>
<tr>
<th>Error</th>
<th>Possible cause and remedy/acknowledgement</th>
</tr>
</thead>
</table>
| ![SE888](image) | Interruption or instability in sensor line or connector (Sensor error).  
_relu.Senal_  
If the problem persists, _nareda_ or _nareda_ is displayed. |
| ![AE888](image) | The TPG 261 has been turned on too fast after power off.  
_relu.AutoR_  
If the watchdog is set to _AutoR_, the TPG 261 acknowledges the message automatically after 2 s (→ § 57).  
Relax it has tripped because of a severe electric disturbance or an operating system error.  
_relu.AutoR_  
If the watchdog is set to _AutoR_, the TPG 261 acknowledges the message automatically after 2 s (→ § 57). |
| ![RA888](image) | Main memory (RAM) error.  
_relu.Banal_  |
| ![EP888](image) | Program memory (EPROM) error.  
_relu.Banal_ |
Possible cause and remedy/acknowledgement

Parameter memory (EEPROM) error.
⇒ Acknowledge with the key.

Possible cause and remedy/acknowledgement

Display driver error.
⇒ Acknowledge with the key.

Possible cause and remedy/acknowledgement

A/D converter error.
⇒ Acknowledge with the key.

Possible cause and remedy/acknowledgement

Operating system (Task Fail) error.
⇒ Acknowledge with the key.

Technical support

If the problem persists after the message has been acknowledged for several times and/or the gauge has been exchanged, please contact your local Pfeiffer Vacuum service center.

8 Repair

Return defective products to your nearest Pfeiffer Vacuum service center for repair.

Pfeiffer Vacuum assumes no liability and the warranty becomes null and void if repair work is carried out by the end-user or third parties.
9 Storage

Caution: electronic component
Inappropriate storage (static electricity, humidity etc.) can damage electronic components.
Store the product in an antistatic bag or container. Observe the corresponding specifications in the technical data (→ 9).

10 Disposal

WARNING
Caution: substances detrimental to the environment
Products or parts thereof (mechanical and electric components, operating fluids etc.) can be detrimental to the environment.
Dispose of such substances in accordance with the relevant local regulations.

Separating the components

<table>
<thead>
<tr>
<th>Non-electronic components</th>
<th>Electronic components</th>
</tr>
</thead>
<tbody>
<tr>
<td>Such components must be separated according to their materials and recycled.</td>
<td>Such components must be separated according to their materials and recycled.</td>
</tr>
</tbody>
</table>

After disassembling the product, separate its components according to the following criteria:
A: Conversion Tables

Weights

<table>
<thead>
<tr>
<th></th>
<th>kg</th>
<th>lb</th>
<th>slug</th>
<th>oz</th>
</tr>
</thead>
<tbody>
<tr>
<td>kg</td>
<td>1</td>
<td>2.205</td>
<td>68.522×10⁻³</td>
<td>35.274</td>
</tr>
<tr>
<td>lb</td>
<td>0.454</td>
<td>1</td>
<td>31.081×10⁻³</td>
<td>16</td>
</tr>
<tr>
<td>slug</td>
<td>14.594</td>
<td>32.174</td>
<td>1</td>
<td>514.785</td>
</tr>
<tr>
<td>oz</td>
<td>28.349×10⁻³</td>
<td>62.5×10⁻³</td>
<td>1.943×10⁻³</td>
<td>1</td>
</tr>
</tbody>
</table>

Pressures

<table>
<thead>
<tr>
<th></th>
<th>N/m², Pa</th>
<th>bar</th>
<th>mbar</th>
<th>Torr</th>
<th>at</th>
</tr>
</thead>
<tbody>
<tr>
<td>N/m², Pa</td>
<td>1</td>
<td>10×10⁻⁶</td>
<td>10⁻³</td>
<td>7.5×10⁻³</td>
<td>9.869×10⁻⁶</td>
</tr>
<tr>
<td>bar</td>
<td>100×10⁻³</td>
<td>1</td>
<td>1</td>
<td>750.062</td>
<td>0.987</td>
</tr>
<tr>
<td>mbar</td>
<td>10⁻³</td>
<td>1</td>
<td>750.062×10⁻³</td>
<td>0.987×10⁻³</td>
<td></td>
</tr>
<tr>
<td>Torr</td>
<td>133.322</td>
<td>1.333×10⁻³</td>
<td>1.333</td>
<td>1</td>
<td>1.316×10⁻³</td>
</tr>
<tr>
<td>at</td>
<td>101.325×10⁻³</td>
<td>1.013</td>
<td>1.013×10⁻³</td>
<td>760</td>
<td>1</td>
</tr>
</tbody>
</table>

Pressure units used in the vacuum technology

<table>
<thead>
<tr>
<th></th>
<th>mbar</th>
<th>Pascal</th>
<th>Torr</th>
<th>mmWs</th>
<th>psi</th>
</tr>
</thead>
<tbody>
<tr>
<td>mbar</td>
<td>1</td>
<td>100</td>
<td>750.062×10⁻³</td>
<td>10.2</td>
<td>14.504×10⁻³</td>
</tr>
<tr>
<td>Pascal</td>
<td>10⁻³</td>
<td>1</td>
<td>7.5×10⁻³</td>
<td>0.102</td>
<td>0.145×10⁻³</td>
</tr>
<tr>
<td>Torr</td>
<td>1.333</td>
<td>133.322</td>
<td>1</td>
<td>13.595</td>
<td>19.337×10⁻³</td>
</tr>
<tr>
<td>mmWs</td>
<td>9.81×10⁻²</td>
<td>9.81</td>
<td>7.356×10⁻²</td>
<td>1</td>
<td>1.422×10⁻³</td>
</tr>
<tr>
<td>psi</td>
<td>68.948</td>
<td>6.895×10⁻³</td>
<td>51.715</td>
<td>703</td>
<td>1</td>
</tr>
</tbody>
</table>

Linear measures

<table>
<thead>
<tr>
<th></th>
<th>mm</th>
<th>m</th>
<th>inch</th>
<th>ft</th>
</tr>
</thead>
<tbody>
<tr>
<td>mm</td>
<td>1</td>
<td>10⁻³</td>
<td>39.37×10⁻³</td>
<td>3.281×10⁻³</td>
</tr>
<tr>
<td>m</td>
<td>10⁻³</td>
<td>1</td>
<td>39.37</td>
<td>3.281</td>
</tr>
<tr>
<td>inch</td>
<td>25.4</td>
<td>25.4×10⁻³</td>
<td>1</td>
<td>8.333×10⁻²</td>
</tr>
<tr>
<td>ft</td>
<td>304.8</td>
<td>0.305</td>
<td>12</td>
<td>1</td>
</tr>
</tbody>
</table>

Temperature

<table>
<thead>
<tr>
<th></th>
<th>Kelvin</th>
<th>Celsius</th>
<th>Fahrenheit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kelvin</td>
<td>1</td>
<td>°C+273.15</td>
<td>(°F+459.67)×5/9</td>
</tr>
<tr>
<td>Celsius</td>
<td>K-273.15</td>
<td>1</td>
<td>5/9×°F-17.778</td>
</tr>
<tr>
<td>Fahrenheit</td>
<td>9/5×K-459.67</td>
<td>9/5×(°C+17.778)</td>
<td>1</td>
</tr>
</tbody>
</table>
**B: Default Settings**

The following values are activated when the default settings are loaded (→ 54):

<table>
<thead>
<tr>
<th>Default</th>
<th>User</th>
</tr>
</thead>
<tbody>
<tr>
<td>1x10^-11 mbar</td>
<td></td>
</tr>
<tr>
<td>9x10^-11 mbar</td>
<td></td>
</tr>
<tr>
<td>normal</td>
<td></td>
</tr>
<tr>
<td>1.00 (log)</td>
<td></td>
</tr>
<tr>
<td>1.000 (lin)</td>
<td></td>
</tr>
<tr>
<td>1000 mbar</td>
<td></td>
</tr>
<tr>
<td>off</td>
<td></td>
</tr>
<tr>
<td>0x10^-2 mbar</td>
<td></td>
</tr>
<tr>
<td>off</td>
<td></td>
</tr>
<tr>
<td>mbar</td>
<td></td>
</tr>
<tr>
<td>9600</td>
<td></td>
</tr>
<tr>
<td>2 Digit</td>
<td></td>
</tr>
<tr>
<td>Hand</td>
<td></td>
</tr>
<tr>
<td>Auto</td>
<td></td>
</tr>
<tr>
<td>off</td>
<td></td>
</tr>
<tr>
<td>off</td>
<td></td>
</tr>
</tbody>
</table>
C: Firmware Update

If your TPG 261 firmware needs updating, e.g. for implementing a new gauge type, please contact your local Pfeiffer Vacuum service center.

User parameters

Most of the settings you may have defined in the Parameter and Test mode will not be affected by a firmware update. To be sure, note your parameter settings before upgrading the firmware (→ 94).

Preparing the TPG 261 for a program transfer

1. Turn the TPG 261 off.

2. Connect the TPG 261 with the serial COM1 (COM2) interface of your PC via a 9-pole D-Sub extension cable (→ 23) (the firmware of the TPG 261 cannot be loaded from a Mac).

3. With a pin (ø<2 mm), depress the switch on the top of the unit, under the housing, and turn the TPG 261 on.

After power on, the display remains dark.
Program transfer

In the following instructions, the index \( n \) is used instead of the actual index.


2. If you have not connected the TPG 261 to the COM1 interface:
   - Open the batch file `Update 302-510-n.bat` ...
   - … edit the interface …
   - … and save the new setting.


⇒ The new firmware is transmitted to the TPG 261.
Starting the TPG 261 with the updated firmware

If the program transfer was successful, quit the Update mode by turning the TPG 261 off.

Wait at least 10 s before turning the TPG 261 on again in order for it to correctly initialize itself.

The TPG 261 is now ready for operation. To be sure, check that the current parameter settings are identical with the previously defined settings (→ § 94).
D: Literature

Instruction Sheet
Compact Pirani Gauge TPR 261
BG 805 105 BE
Pfeiffer Vacuum GmbH, D–35614 Asslar, Deutschland

Operating Instructions
Compact Pirani Gauge TPR 265
BG 805 177 BE
Pfeiffer Vacuum GmbH, D–35614 Asslar, Deutschland

Operating Instructions
Pirani-Messröhre TPR 280
BG 805 178 BE
Pfeiffer Vacuum GmbH, D–35614 Asslar, Deutschland

Operating Instructions
Pirani-Messröhre TPR 281
BG 5179 BE
Pfeiffer Vacuum GmbH, D–35614 Asslar, Deutschland

Operating Instructions
Compact Pirani Capacitance Gauge PCR 260
BG 805 180 BE
Pfeiffer Vacuum GmbH, D–35614 Asslar, Deutschland

Instruction Sheet
Compact Cold Cathode Gauge IKR 251
BG 805 110 BN
Pfeiffer Vacuum GmbH, D–35614 Asslar, Deutschland

Instruction Sheet
Compact Cold Cathode Gauge IKR 261
BG 805 113 BN
Pfeiffer Vacuum GmbH, D–35614 Asslar, Deutschland
Instruction Sheet
Compact Cold Cathode Gauge IKR 270
BG 805 115 BE / A
Pfeiffer Vacuum GmbH, D–35614 Asslar, Deutschland

Instruction Sheet
Compact FullRange™ Gauge PKR 251
BG 805 119 BN
Pfeiffer Vacuum GmbH, D–35614 Asslar, Deutschland

Instruction Sheet
Compact FullRange™ Gauge PKR 261
BG 805 122 BN
Pfeiffer Vacuum GmbH, D–35614 Asslar, Deutschland

Instruction Sheet
Compact Process Ion Gauge IMR 265
BG 805 132 BE
Pfeiffer Vacuum GmbH, D–35614 Asslar, Deutschland

Instruction Sheet
Compact FullRange™ BA Gauge PBR 260
BG 805 131 BE
Pfeiffer Vacuum GmbH, D–35614 Asslar, Deutschland

Instruction Sheet
Compact Capacitance Gauge
CMR 261 … CMR275
BG 805 133 BE
Pfeiffer Vacuum GmbH, D–35614 Asslar, Deutschland

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BG 805 127 BN
Pfeiffer Vacuum GmbH, D–35614 Asslar, Deutschland
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Declaration of Conformity

We, Pfeiffer Vacuum, hereby declare that the equipment mentioned below complies with the provisions of the Directive relating to electrical equipment designed for use within certain voltage limits 73/23/EEC and the Directive relating to electromagnetic compatibility 89/336/EEC.

Product

SingleGauge™
Single-Channel Measurement and Control Unit for Compact Gauges
TPG 261

Part number
PTG28030

Standards
Harmonized and international/national standards and specifications:
- EN 61010-1 (Safety requirements for electrical equipment for measurement, control and laboratory use)
- EN 50081-1 (Electromagnetic compatibility generic emission standard)
- EN 50082-2 (Electromagnetic compatibility generic immunity standard)

Signature
Pfeiffer Vacuum GmbH, Asslar
9 May 2001

Wolfgang Dondorf
Managing director