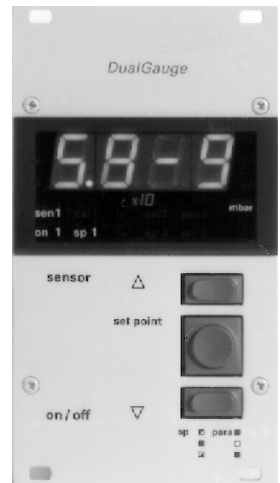


TPG 252 A

Vacuum measurement and control unit
for Compact Gauges

DualGauge™



Intended use

The DualGauge™ (TPG 252 A) is used together with Pfeiffer Vacuum Compact Gauges for total pressure measurement. The products must be operated as described in the respective manuals.

Product identification

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

Pfeiffer Vacuum, D-35614 Asstar		
Typ:	-----	
No:	-----	
F-No:	-----	
__ V	__ Hz	__ VA

Validity

This document applies to products with part numbers

PT G28 270	(230 V~)
PT G28 272	(120 V~)
PT G28 273	(100 V~)

The part number can be taken from the product nameplate.

This document is based on firmware number

BG 509 727 -C

If your unit does not function as described in this document, please check that it is equipped with the above firmware version (or higher) (→ Appendix C).

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



Trademarks

DualGauge™	Balzers AG
FullRange™	Balzers AG

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
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For cross-references within this document, the symbol (→  XY) is used, for cross-references to other documents, the symbol (→  [Z]).

1 Safety

1.1 General safety instructions

- Take the necessary precautions when doing installation, maintenance or repair work (→  12, 65, 77, 79).
- According to EN 61010, voltages above 30 V~ or 60V= present a hazard of contact. Make sure to take the corresponding safety measures (→  12, 13, 79).

Communicate the safety instructions to all other users.

1.2 Symbols used



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.



DANGER

Information on preventing any kind of physical injury.



WARNING

Information on preventing extensive equipment and environmental damage.



Note

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



Press this key briefly.



Press this key additionally.



Press these keys simultaneously.



The result is O.K.



The result is not as expected.



Waiting time, reaction time, duration of test



Tip, recommendation



Lamp / display is lit



Lamp / display flashes



Lamp / display is dark

<set point>

Lettering

«sen1»

LED display

«.8.8.8.»

7-segment display

»on« / »off«

State of a switching function (e.g. relay)

1.3 Liability and warranty

Pfeiffer Vacuum assumes no liability and the warranty becomes null and void if the end-user or third parties make any kind of modifications to the product which exceed the work mentioned in the product documentation.

Since the individual electronic components are delicate, appropriate measures must be taken to protect them from static electricity. Modules must be stored in anti-static bags or containers.

Damage resulting from disregard of the above warning may lead to a revocation of the warranty.

2 Design

2.1 Front panel

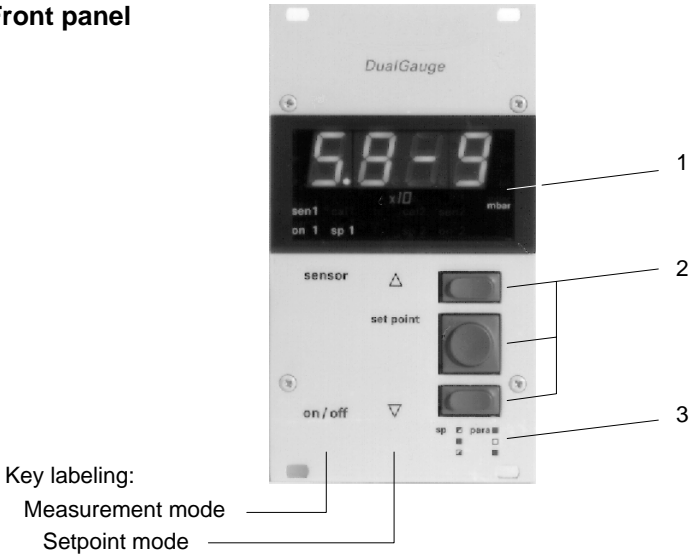



Fig. 2-1 Front panel

1	Display	Meaning	
	sen 1	sen 2	Sensor 1, 2 → 24
	cal 1	cal 2	Calibration factor sensor 1, 2 → 48
	on 1	on 2	Sensor 1, 2 on → 25
	sp 1	sp 2	Setpoint sensor 1, 2 → 26
	hi	lo	Upper / lower threshold → 26
	mbar/bar		Pressure units → 45
	Torr		
	Pa		
	err	Error	→ 71
2	Control keys		
3	Pressing two keys simultaneously → 29, 30		

2.2 Compatible gauges

Comprehensive list of gauge types →  56

Pirani Gauge



Compact Pirani Gauge
(Pirani gauge)

Cold Cathode Gauge



Compact Cold Cathode Gauge
(cold cathode gauge)

FullRange™ CC Gauge



Compact FullRange™ CC Gauge
(Pirani/cold cathode gauge)

Process Ion Gauge



Compact Process Ion Gauge ¹⁾
(Pirani/high pressure gauge)

Capacitance Gauge



Compact Capacitance Gauge ¹⁾
(capacitive sensor)

Piezo Gauge



Compact Piezo Gauge
(piezoresistive sensor)

Sensor X

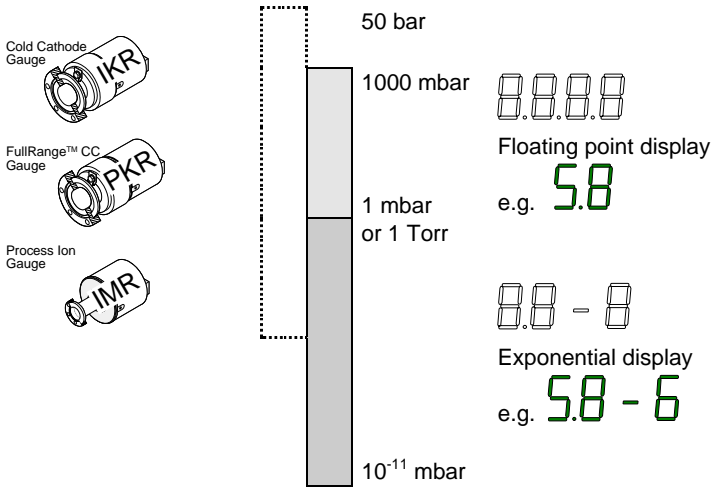


Any of the above gauges ¹⁾
or no sensor at all

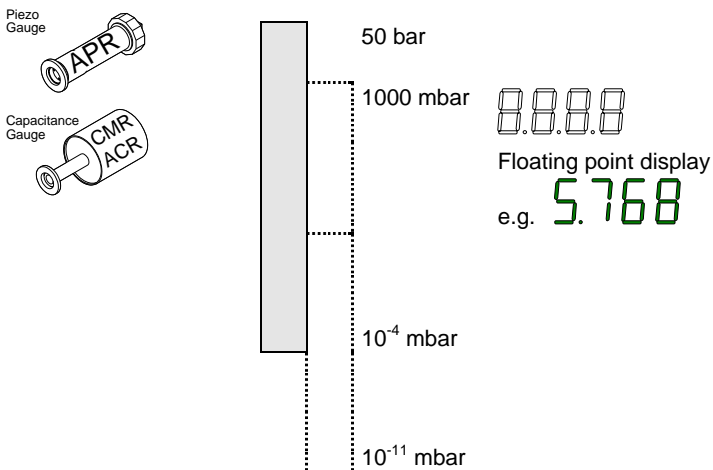
¹⁾ Restrictions →  15.

2.3 Display formats

Logarithmic gauges




Linear gauges



 **Note**

The unit switches automatically between exponential and floating point display.

When Pascal is selected as pressure unit, only exponential display is available (→  45).

When the IMR gauge is used, the pressure is indicated only with 1 digit accuracy in Pirani mode.

2.4 Rear panel

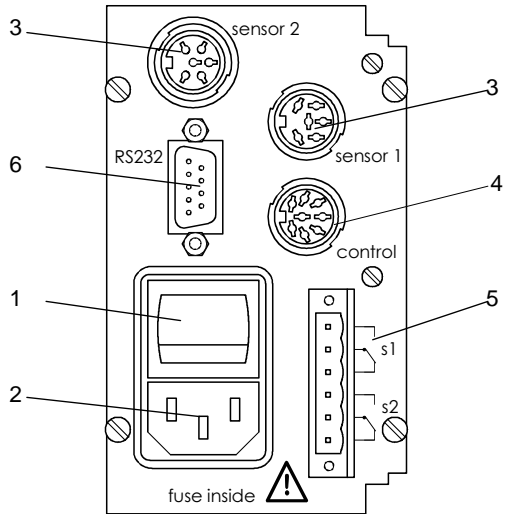




Fig. 2-2 Rear panel

- | | | |
|---|---|------|
| 1 | Mains switch | → 13 |
| 2 | Mains power connector | → 17 |
| 3 | Connectors for gauges | → 14 |
| 4 | Connectors for external control signal and analog outputs | → 14 |
| 5 | Relay output | → 14 |
| 6 | Serial interface | → 46 |

3 Installation


DANGER



Caution: possibly damaged product

Putting a damaged product into operation can be extremely dangerous.


Make sure the product is not damaged. If you assume that the product is damaged make sure it is not put into operation again.


It can be assumed that the equipment is not safe to operate when:


- it has sustained any visible damages
- it no longer functions
- it has been stored for a longer period under unfavorable conditions
- it has been subjected to severe transport stress

3.1 Installing the equipment

... in a rack

The product has been designed for installation in a 19" rack frame built according to the DIN 41 494 standard (→  74).



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. the EN 60204-1 regulations for switch cabinets.

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

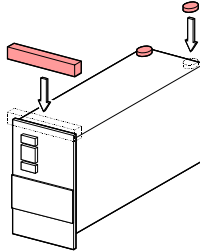
Take the appropriate safety measures (→  14, 79) when voltages above 30 V~ or 60 V= are applied at the connector <s1> or <s2> .

 **Note**



The temperature inside the rack must not exceed 50 °C.

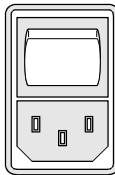
... as desktop unit



If you intend to use the DualGauge™ as desktop unit, attach the two enclosed rubber feed to and slide the enclosed rubber bar on its front panel from below.

3.2 Connections


3.2.1 Mains power connector




WARNING



Before connecting the DualGauge™ to the mains power supply, verify that the power rating (indicated on the product nameplate) agrees with the local mains power specifications. If they do not agree convert the voltage of the unit according to the instructions in Appendix A.

**DANGER**

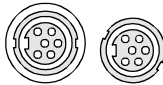


The power connector may only be plugged into a socket with protective ground. Use only 3-pole mains power cables with the protective ground connected correctly. This protection must not be nullified by using an extension cable without ground conductor.

To assure continuous grounding protection, connect the mains power cable before connecting any other cables. In the same way, disconnect all other cables before unplugging the mains power cable.

If the unit is installed in a rack, the mains voltage must be supplied and turned on via a central distributor.

3.2.2 <sensor 1>, <sensor 2> connector



Here, you can connect either:

- a Pirani gauge
- a cold cathode gauge
- a Compact FullRange™ CC Gauge
- a Pirani/high pressure gauge
- a linear gauge

DANGER

Since the IMR 260 and CMR 27x have a higher power consumption than other gauges, only one of these types can be connected and operated in combination with any other gauge type. ¹⁾

Always turn the unit off before connecting or disconnecting a gauge.

3.2.3 <control> connector



Use this connector to:

- turn the Pirani/high pressure gauge on/off e.g. via an external signal
- further evaluate the analog measurement signals
- evaluate any error signals

Use the enclosed connector (Pin assignments → 61).



3.2.4 <s1>, <s2> connector



Use this relay output if you want to use the switching functions for external control.

¹⁾ Two IMR 260 may be connected. The DualGauge™ ensures that only one IMR 260 is operated at a time.

 **DANGER**

Take the appropriate safety measures (→  79) and consider the technical data (→  56, 61). When the DualGauge™ is used as desktop unit a maximum voltage of 30 V~ or 60 V= may be connected (protective low voltage).

 **Skilled personnel**

Use the enclosed connector and screw it to the connector of the unit. The connector may only be plugged in or unplugged when the power line is idle.



4 Operation

4.1 Initial start up



WARNING



Before turning the unit on, make sure that the operating voltage of the equipment agrees with the local mains power. Also verify that the unit is correctly grounded, that all the gauges and cables are correctly installed (→  12) and take the technical data (→  56) into consideration.



DANGER



Any break in the protective grounding inside or outside the unit, and any loosening of the grounding connection can make the unit dangerous to operate. Intentional interruption of the grounding line is not admissible.

4.2 Power on

The mains switch is located on the rear panel. Turn on stand-alone units from that power switch, rack mounted units from the central power distributor.

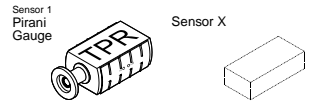
After power on the unit:


- runs through a self-diagnostics routine
- identifies the gauges connected
- activates the parameters effective when it was last turned off
- switches to measurement mode (on sensor 1)
- adjusts the parameters (if any other gauges were connected in the meantime)
- displays a pressure indication, a status indication, or an error message


 **Note**



Status indications « $0r$ » and « ur » as well as error messages « E_r » are output according to the pressure unit and calibration factor settings. The indications in this document refer to the pressure unit mbar and a calibration factor of 1.00.



Turning the unit on






- 


The unit displays, for instance, «**1.3 - 2**» (1.3×10^{-2}) or «**130**» (floating point format). The measured value is within the measurement range of the gauge.
- 

The unit displays «**ur - 4**». The pressure in the vacuum system is lower than the lower limit of the measurement range of the connected Pirani gauge or the gauge is no longer aligned (→  1, 2, 3, 4).
- 

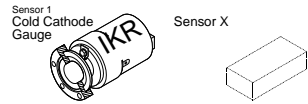
The unit displays «**or**». The pressure in the vacuum system is higher than the upper limit of the measurement range of the connected Pirani gauge or the gauge is no longer aligned (→  1, 2, 3, 4).
- 
















The unit displays «**noSE**». No gauge is connected (at the <sensor 1> connector).
- 

The unit displays «**Er - 4**». In addition, the «err» lamp flashes. The Pirani gauge has an error (→  72).
- 

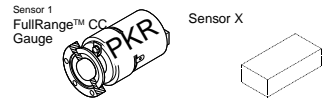
The unit displays «**dt**». In addition, the «err» lamp flashes. You have turned the unit back on too quickly after turning it off (→  24).











Turning the unit on



-  The unit displays «OFF». A connected cold cathode gauge is not turned on (→  25).
-  The unit displays, for instance, «2.8 - 6» (2.8×10^{-6}). The measured value is within the measurement range of the gauge.
-  The unit displays «ur - 9». The pressure in the vacuum system is lower than the lower limit of the measurement range of the connected cold cathode gauge or the gas discharge has not ignited yet (→  5, 6, 7, 8).
-  The unit displays «ur + 1». The pressure in the vacuum system is lower than the lower limit of the measurement range of the connected cold cathode gauge or the gas discharge has not ignited yet (→  9).
-  The unit displays «or - 2». The pressure in the vacuum system is higher than the upper limit of the measurement range of the connected cold cathode gauge.
-  The unit displays «noSE». No gauge is connected (at the <sensor 1> connector).
-  The unit displays «Er - 9». In addition, the «err» lamp flashes. The cold cathode gauge has an error (→  72).
-  The unit displays «Er + 1». In addition, the «err» lamp flashes. The cold cathode gauge has an error (→  72).
-  The unit displays «dt». In addition, the «err» lamp flashes. You have turned the unit back on too quickly after turning it off (→  24).

Turning the unit on



-  The unit displays, for instance, «2.8 - 6» (2.8×10^{-6}) or «130» (floating point format). The measured value is within the measurement range of the gauge.
-  The unit displays «ur - 9». The pressure in the vacuum system is lower than the lower limit of the measurement range of the connected Compact FullRange™ CC Gauge (→  10, 11, 12, 13).
-  The unit displays «ur - 4» and the green lamp on the gauge is lit. The measured value is lower than 5×10^{-4} mbar and the gas discharge of the connected Compact FullRange™ CC Gauge has not ignited yet.
-  The unit displays «or». The pressure in the vacuum system is higher than the upper limit of the measurement range of the connected Compact FullRange™ CC Gauge.
-  The unit displays «nose». No gauge is connected (at the <sensor 1> connector).
-  The unit displays «Er - 9», «Er - 4» or «Er». In addition, the «err» lamp flashes. The Compact FullRange™ CC Gauge has an error (→  72).
-  The unit displays «dt». In addition, the «err» lamp flashes. You have turned the unit back on too quickly after turning it off (→  24).


Turning the unit on



Sensor 1
Process Ion
Gauge





Sensor X







- 


The unit displays «OFF». A connected Pirani/high pressure gauge is not turned on (→  25).
- 


The unit displays, for instance, «1-2» (1×10^{-2}) or «30» (floating point format). The measured value is within the Pirani measurement range of the gauge.
- 



The unit displays, for instance, «2.8-6» (2.8×10^{-6}). The measured value is within the measurement range of the gauge (hot ionization mode).
- 


The unit displays «UR-2». The pressure in the vacuum system is lower than the lower limit of the measurement range of the gauge in Pirani adjustment mode (→  14).
- 

The unit displays «UR-6». The pressure in the vacuum system is lower than the lower limit of the measurement range of the connected Pirani/high pressure gauge (→  14).
- 

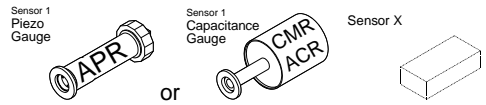
The unit displays «OR». The pressure in the vacuum system is higher than the upper limit of the measurement range of the connected gauge (Pirani mode).
- 


The unit displays «NOSE». No gauge is connected (at the <sensor 1> connector).
- 


The unit displays «Er-6». In addition, the «err» lamp flashes. The gauge has an error (→  72).
- 


The unit displays «dt». In addition, the «err» lamp flashes. You have turned the unit back on too quickly after turning it off (→  24).


Turning the unit on





- 

The unit displays, for instance, «123.4» (floating point format). The measured value is within the measurement range of the gauge.
- 

The unit displays «UR». The pressure in the vacuum system is lower than the lower limit of the measurement range of the connected gauge or not within the offset range (→ 50).
- 

The unit displays «OR». The pressure in the vacuum system is higher than the upper limit of the measurement range of the connected linear gauge or not within the offset range (→ 50).
- 

The unit displays «noSE». No gauge is connected (at the <sensor 1> connector).
- 

The unit displays «Er». In addition, the «err» lamp flashes. The linear gauge has an error (→ 72).
- 

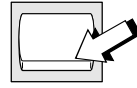
The unit displays «dt». In addition, the «err» lamp flashes. You have turned the unit back on too quickly after turning it off (→ 24).

4.3 Power off

Turn the unit off with the power switch (or centrally via the power distributor, for rack mounted units).

Turning the unit back on

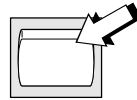
Wait at least 10 seconds before turning the unit back on.



turning the unit off



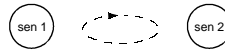
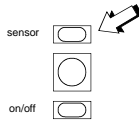
10 seconds



turning the unit back on

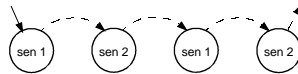
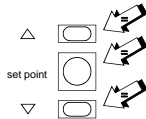
4.4 Selecting a gauge

Select the gauge the pressure of which you want to display by pressing the <sensor> key <sensor> ¹⁾



4.5 Displaying the connected gauges

When the unit is in the measurement mode, you can display the types of gauges connected by briefly pressing all three keys together.



The types of gauges connected will be displayed for approx. 1 second each in the sequence shown above. When the display has run through, the unit returns to measurement mode.

¹⁾ The <sensor> and <> keys are identical


Display codes and their meaning


«P 1 r»	Pirani gauge
«PE 9»	Cold cathode gauge with a lower measurement range limit of 10^{-9} mbar
«PE 11»	Cold cathode gauge with a lower measurement range limit of 10^{-11} mbar
«Co 9»	FullRange™ CC Gauge with a lower measurement range limit of 10^{-9} mbar
«Ion»	Pirani/high pressure gauge with a lower measurement range limit of 10^{-6} mbar
«L in»	Linear gauge
«noSE»	No gauge connected
«no id»	Gauge not identified

4.6 Turning a gauge on / off


This function is available for the following gauges:

- Pirani gauge
- Cold cathode gauge
- Compact FullRange™ CC Gauge
- Pirani/high pressure gauge
- Linear gauge

Any attempt to turn off another gauge results in the display of the type of the gauge connected (→  25).

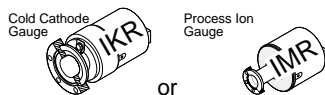


WARNING

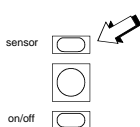


Turning a gauge on / of may affect the status of the relay.

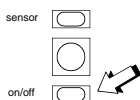
Turning a gauge on / off



When the unit is in measurement mode, each connected cold cathode and Pirani/high pressure gauge can be turned on / off manually if the following two conditions are met: the entry lock function is disabled (→ 45) and the gauge control is set to «**Hand**» (→ 53).



First select the gauge by pressing the <sensor> key.



Turn the gauge on / off by pressing the <on/off> key.¹⁾ When the gauge is on, the «on 1» / or «on 2» lamp is lit.

Note

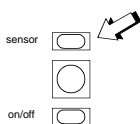


To prevent unnecessary contamination of the cold cathode gauges, turn them on at pressures $<10^{-2}$ mbar only.

4.7 Displaying the threshold values

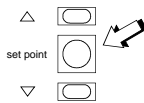
The unit has one switching function with two adjustable threshold values per gauge. The switching function is used for controlling the behavior of the relay output.

In the measurement mode, you can display the threshold values of the switching functions for the individual gauges.



To select the gauge of which you wish to display the switching function values, press the <sensor> key.

¹⁾ The <on/off> and <> keys are identical



Then press and hold down the <set point> key; the unit is now in the switching function mode.

Each time the key is pressed, the display changes from the upper to the lower threshold or vice versa. The indicators «sp...» and «hi» or «lo» are flashing to show which threshold value is being displayed.



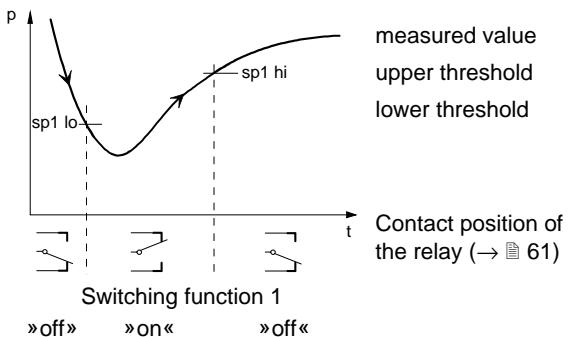
When the <set point> key is released, the display returns to the measurement mode.

Display codes and their meaning

- «sp 1» «lo» lower threshold of the switching function for gauge 1
- «sp 1» «hi» upper threshold of the switching function for gauge 1
- «sp 2» «lo» lower threshold of the switching function for gauge 2
- «sp 2» «hi» upper threshold of the switching function for gauge 2

Note

Take account of the display formats (→ 9).



Definitions (sp lo),
(sp hi)

The Setpoint low (sp1 lo) defines the pressure at which Switching function 1 is activated when the pressure is dropping.


The Setpoint high (sp1 hi) defines the pressure at which Switching function 1 is deactivated when the pressure is rising.

For Switching function 2 the above definitions apply by analogy.

4.8 Adjusting the threshold values

Note



The threshold values can only be adjusted when the entry lock is disabled. If the lock function is enabled «LOC» is displayed when attempting to adjust a threshold value (→  45).



WARNING

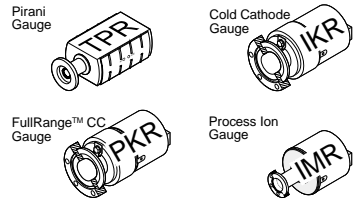


If other gauges were connected previously, the threshold values may have been adjusted automatically.

Any threshold value entered that is outside the measurement range will be changed so that it corresponds to the lower (upper) measurement range limit.

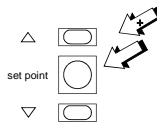
If both threshold values entered are outside the measurement range, they will be modified correspondingly, and the minimum hysteresis will be taken into account (→ sections 4.8.1 and 4.8.2).

4.8.1 Logarithmic gauges



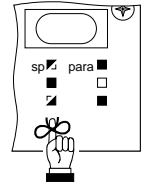
If you want to modify a threshold value, you must first display it (→ 26).

Increasing a displayed threshold value



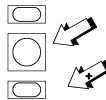
additionally press:

- < > to increase the threshold value



or

Decreasing a displayed threshold value



- < > to decrease the threshold value


Exponential display
(threshold value <1 mbar)


Briefly tapping the < > or > < key changes the mantissa value by 0.1 for each tap.

If you keep pressing the key, the mantissa value scrolls automatically in steps of 1.0.

Depending on the calibration factor entered (→ 48), the adjustment range for a particular threshold value can go above or below the measurement range for the gauge by a factor 10.

When the two keys are released, the changed threshold is automatically stored in nonvolatile memory.


Note




The minimum hysteresis between the lower and upper threshold value must be a minimum of 10% of the lower threshold value. This prevents unstable states. If you should define the upper threshold value lower than the lower threshold value, the minimum hysteresis is entered automatically.


Floating point display
(threshold value ≥ 1 mbar)


Briefly tapping the < > or < > key changes the second visible digit from the left by 1 for each tap.

If you keep pressing the key, the first visible digit scrolls.

Depending on the calibration factor entered (\rightarrow  48), the adjustment range for a particular threshold value can go above or below the measurement range for the gauge by a factor 10.

When the two keys are released, the changed threshold is automatically stored in nonvolatile memory.



Note



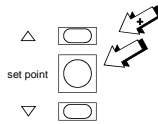
The minimum hysteresis between the lower and upper threshold value must be a minimum of 10% of the lower threshold value. This prevents unstable states. If you define the upper threshold value lower than the lower threshold value, the minimum hysteresis is automatically applied.

4.8.2 Linear gauges



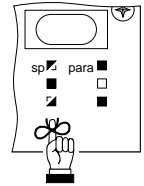
If you want to change a threshold value, you must first display it (\rightarrow  26).

Increasing a displayed threshold value



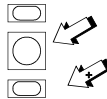
additionally press:

- < > to increase the threshold value



or

Decreasing a displayed threshold value



- < > to decrease the threshold value

Briefly tapping the < > key or < > key changes the second digit from the right by 1 for each tap.

If you keep pressing the key, the third digit from the right scrolls.

Depending on the calibration factor entered (→ 48), the adjustment range for a particular threshold value can go above or below the measurement range for the gauge by a factor 2.

When the two keys are released, the changed threshold is automatically stored in nonvolatile memory.

 **Note**

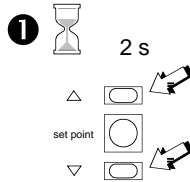


The minimum hysteresis between the lower and upper threshold value must be a minimum of 1% of the upper threshold value (Full scale range). This prevents unstable states. If you should define the upper threshold value lower than the lower threshold value, the minimum hysteresis is entered automatically.

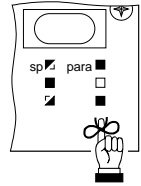
4.9 Adjusting other parameters












4.9.1 General procedure

Selecting the parameter mode

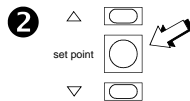


Press the <> and <> keys for 2 seconds to change from measurement to parameter mode. This enables you – depending on the connected gauges – to adjust the following parameters:



- pressure unit (→  45)
- entry lock function (→  45)
- transmission rate of the RS232C interface (→  46)
- display-change mode (→  47)
- measured value filter (→  47)
- calibration factor (→  48)
- measurement range of the linear gauge (→  50)
- offset correction (→  52)
- offset value (→  52)
- gauge control (→  53)
- gauge underrange control (→  54)

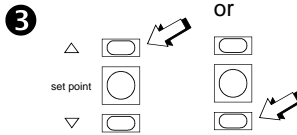
Selecting the parameters to be modified



Press the <set point> as often as necessary.

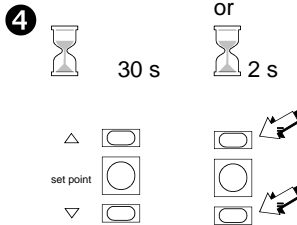
When you keep pressing the key, the name (Unit, LOC, etc.) for the current parameter is displayed. First the parameter valid for both gauges (Unit, LOC, bAUd) and then the individual parameters for gauges 1 and 2 are displayed.

Selecting the settings



Select the possible settings by pressing the < > or < > key as often as necessary.

Returning to the measurement mode



Return to the measurement mode by:

- not pressing any key for 30 seconds or
- pressing the < > and < > keys together for 2 seconds.

The modified parameter settings are automatically stored in non-volatile memory.

4.9.2 Setting the parameters








On the following pages you will find parameter settings for configurations which are often used.

Parameter settings



**combined
with**



Unit	Pressure unit (→  45)
LOC	Entry lock function (→  45)
BAUD	Transmission rate setting (→  46)
F1 1	Filter time constant gauge 1 (→  47)
CAL 1	Calibration factor gauge 1 (→  48)
F1 2	Filter time constant gauge 2 (→  47)
CAL 2	Calibration factor gauge 2 (→  48)

Parameter settings

Cold Cathode
Gauge



Sensor 1

**combined
with**

Cold Cathode
Gauge



Sensor 2

Unit	Pressure unit (→ 45)
LOC	Entry lock function (→ 45)
BAUD	Transmission rate setting (→ 46)
F I 1	Filter time constant gauge 1 (→ 47)
CAL 1	Calibration factor gauge 1 (→ 48)
PC 1	Gauge control 1 (→ 53)
PU 1	Gauge underrange control 1 (→ 54)
F I 2	Filter time constant gauge 2 (→ 47)
CAL 2	Calibration factor gauge 2 (→ 48)
PC 2	Gauge control 2 (→ 53)
PU 2	Gauge underrange control (→ 54)

Parameter settings

FullRange™ CC
Gauge










Sensor 1

**combined
with**

FullRange™ CC
Gauge



Sensor 2

Unit	Pressure unit (→  45)
LOC	Entry lock function (→  45)
BAUD	Transmission rate setting (→  46)
F1 1	Filter time constant gauge 1 (→  47)
CAL 1	Calibration factor gauge 1 (→  48)
F1 2	Filter time constant gauge 2 (→  47)
CAL 2	Calibration factor gauge 2 (→  48)

Parameter settings

Process Ion
Gauge



Sensor 1

**combined
with**

Process Ion
Gauge



Sensor 2

Unit	Pressure unit (→ 45)
LOC	Entry lock function (→ 45)
BAUD	Transmission rate setting (→ 46)
F I 1	Filter time constant gauge 1 (→ 47)
CAL 1	Calibration factor gauge 1 (→ 48)
IC 1	Gauge control 1 (→ 53)
F I 2	Filter time constant gauge 2 (→ 47)
CAL 2	Calibration factor gauge 2 (→ 48)
IC 2	Gauge control 2 (→ 53)

Parameter settings

Capacitance
Gauge



Sensor 1

**combined
with**

Piezo
Gauge



Sensor 2

Unit	Pressure unit (→ 45)
LOC	Entry lock function (→ 45)
BAUD	Transmission rate setting (→ 46)
F1 1	Filter time constant gauge 1 (→ 47)
CAL 1	Calibration factor gauge 1 (→ 48)
FS 1	Measurement range gauge 1 (→ 50)
OFF 1	Offset correction gauge 1 (→ 52)
OFFd 1	Offset value gauge 1 (→ 52)
F1 2	Filter time constant gauge 2 (→ 47)
CAL 2	Calibration factor gauge 2 (→ 48)
FS 2	Measurement range gauge 2 (→ 50)
OFF 2	Offset correction gauge 2 (→ 52)
OFFd 2	Offset value gauge 2 (→ 52)

Parameter settings

Pirani
Gauge



Sensor 1

**combined
with**

Cold Cathode
Gauge



Sensor 2








Unit	Pressure unit (→ 45)
LOC	Entry lock function (→ 45)
BAUD	Transmission rate setting (→ 46)
F I 1	Filter time constant gauge 1 (→ 47)
CAL 1	Calibration factor gauge 1 (→ 48)
F I 2	Filter time constant gauge 2 (→ 47)
CAL 2	Calibration factor gauge 2 (→ 48)
PC 2	Gauge control 2 (→ 53)
PU 2	Gauge underrange control 2 (→ 54)

Parameter setting



**combined
with**



Unit	Pressure unit (→  45)
LOC	Entry lock function (→  45)
BAUD	Transmission rate setting (→  46)
F1 1	Filter time constant gauge 1 (→  47)
CAL 1	Calibration factor gauge 1 (→  48)
F1 2	Filter time constant gauge 2 (→  47)
CAL 2	Calibration factor gauge 2 (→  48)

Parameter settings

Cold Cathode
Gauge



Sensor 1

**combined
with**

FullRange™ CC
Gauge



Sensor 2

Unit	Pressure unit (→ 45)
LOC	Entry lock function (→ 45)
BAUD	Transmission rate setting (→ 46)
F I 1	Filter time constant gauge 1 (→ 47)
CAL 1	Calibration factor gauge 1 (→ 48)
PC 1	Gauge control 1 (→ 53)
PU 1	Gauge underrange control 1 (→ 54)
F I 2	Filter time constant gauge 2 (→ 47)
CAL 2	Calibration factor gauge 2 (→ 48)

Parameter settings

Capacitance Gauge



or

Piezo Gauge



**combined
with**

Pirani Gauge



Unit	Pressure unit (→ 45)
LOC	Entry lock function (→ 45)
BAUD	Transmission rate setting (→ 46)
F1 1	Filter time constant gauge 1 (→ 47)
CAL 1	Calibration factor gauge 1 (→ 48)
FS 1	Measurement range gauge 1 (→ 50)
OFC 1	Offset correction gauge 1 (→ 52)
OFd 1	Offset value gauge 1 (→ 52)
F1 2	Filter time constant gauge 2 (→ 47)
CAL 2	Calibration factor gauge 2 (→ 48)

Parameter settings



Unit	Pressure unit (→ 45)
LOC	Entry lock function (→ 45)
BAUD	Transmission rate setting (→ 46)
F I 1	Filter time constant gauge 1 (→ 47)
CAL 1	Calibration factor gauge 1 (→ 48)
FS 1	Measurement range gauge 1 (→ 50)
OF C 1	Offset correction gauge 1 (→ 52)
OF d 1	Offset value gauge 1 (→ 52)
F I 2	Filter time constant gauge 2 (→ 47)
CAL 2	Calibration factor gauge 2 (→ 48)
PC 2	Gauge control 2 (→ 53)
PU 2	Gauge underrange control 2 (→ 54)

Parameter settings

Capacitance
Gauge



Sensor 1

or

Piezo
Gauge



Sensor 1

**combined
with**

FullRange™ CC
Gauge



Sensor 2

Unit	Pressure unit (→ 45)
LOC	Entry lock function (→ 45)
BAUD	Transmission rate setting (→ 46)
F1 1	Filter time constant gauge 1 (→ 47)
CAL 1	Calibration factor gauge 1 (→ 48)
FS 1	Measurement range gauge 1 (→ 50)
OFF 1	Offset correction gauge 1 (→ 52)
OFF 1	Offset value gauge 1 (→ 52)
F1 2	Filter time constant gauge 2 (→ 47)
CAL 2	Calibration factor gauge 2 (→ 48)

4.9.3 Selecting the pressure unit

Changing the pressure unit affects:

- the display
- the switching functions (threshold display)
- the analog outputs of the units
- RS232C interface (display always in mbar)

bar mbar / bar

Torr Torr

Pa Pascal

The current pressure unit setting is indicated by the lamp «mbar», «Torr» or «Pa».

Display range for different pressure units

The selection of pressure units depends on the gauges used. The DualGauge™ allows for a particular pressure unit only, if the entire measurement range can be displayed in that pressure unit.

Logarithmic gauges

Measurement range	mbar / bar	Torr	Pascal
10 ⁻¹¹ mbar ... 1000 mbar	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>

Linear gauges

Full Scale value (defined measurement range)	mbar / bar	Torr	Pascal
1 mbar	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
10 mbar	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
100 mbar	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
1000 mbar	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2 mbar	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
5 mbar	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
10 mbar	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
50 mbar	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Conversion table → 86

4.9.4 Enabling the entry lock function

The entry lock function has been included to prevent inadvertent entries.

OFF

Entry lock function disabled:
All operating steps are possible.

ON

Entry lock function enabled:
The following operating steps are not possible:

- Adjusting the threshold values
- Turning a gauge on / off

When the entry lock function is enabled, «LOC» is displayed when the threshold value is changed or a gauge is turned on / off.


4.9.5 Setting the transmission rate BAUD

The DualGauge™ can be controlled via the (RS232C) serial interface. It also offers the possibility of transferring measurement data and changing parameters.

300
1200
2400
4800
9600
19200

The transmission rate can be set between 300 and 19200 baud.



Communication protocol
DualGauge™ →  18.

4.9.6 Selecting the display change mode *DISP*

The automatic display-change mode («sen 1» ⇒ «sen 2» or «sen 2» ⇒ «sen 1») is available for the combination Compact Pirani gauge and linear gauge (1000 mbar Full Scale) only.

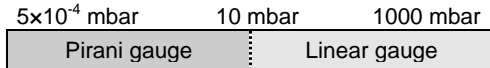
Auto

Automatic display-change when the measured value of the linear gauge rises above or drops below 10 mbar

Hand

Manual display-change

Combination Pirani - linear gauge (1000 mbar) (automatic display change):



4.9.7 Adjusting the measured value filter *FI*

The measured value filter allows for a better evaluation of unstable or disturbed measurement signals. It affects:

- the display
- the switching functions
- the analog outputs of the unit
- the RS232C interface

nor

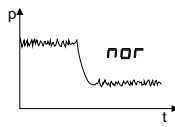
Normal filter time (320 ms)

SLO

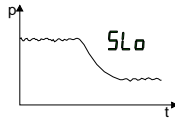
Slow filter time (2.6 s)

FAST

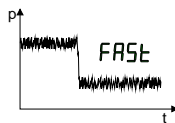
Fast filter time (35 ms)



Standard setting with a good relationship between the reaction time and the sensibility of display and switching functions with regard to changes in the measured value.



Select this setting if you wish that the display and the switching functions do not react to small variations of the measured value. The unit will, however, react slower to changes in the measured value.



Select this setting if you wish that the display and the switching functions react fast to changes in the measured value. The unit will, however, be more sensitive to disturbances with regard to the measured values.

The filter for gauge 2 («F I 2») is adjusted in the same way.

4.9.8 Adjusting the calibration factor CAL

The calibration factor allows the measured value to be calibrated for gases other than N₂. It affects:

- the display
- the switching functions (threshold display) ¹⁾
- the analog outputs of the unit
- the RS232C interface ¹⁾



WARNING



The status indications «OR» and «UR» as well as the error messages «ER» are output according to the pressure unit and calibration factor settings. The indications in this document refer to the pressure unit mbar and a calibration factor of 1.00.

¹⁾ For Compact Process Ion Gauges in the hot cathode measurement range only

4.9.8.1 Logarithmic gauges

9.99

max. calibration factor ($\times 9.99$)

0.10

min. calibration factor ($\times 0.10$)

Briefly tapping the < > or < > key changes the value of the mantissa by 0.01 for each tap.

If you keep pressing the key, the value scrolls automatically in steps of 0.1.

If the calibration factor does not equal 1.00, the «cal1» and / or the «cal2» lamp is lit.

The calibration factor for gauge 2 («CAL2») is adjusted in the same way.

4.9.8.2 Linear gauges

2.000

max. calibration factor ($\times 2.000$)

0.500

min. calibration factor ($\times 0.500$)

Briefly tapping the < > or < > key changes the value of the mantissa by 0.001 for each tap.

If you keep pressing the key, the value scrolls automatically in steps of 0.01.

If the calibration factor does not equal 1.000 the «cal1» and / or «cal2» lamp is lit.

The calibration factor for gauge 2 («CAL2») is adjusted in the same way.

4.9.9 Adjusting the measurement range of a linear gauge FS

In order for the correct measured value of a linear gauge to be displayed it is necessary to save the full scale value of the measurement range of that gauge as parameter. The measurement range is adjusted by indicating the upper limit (full scale) value.

1	«mbar»
10	«mbar»
100	«mbar»
1000	«mbar»
2	«bar»
5	«bar»
10	«bar»
50	«bar»

4.9.10 Offset function (zero) of a linear gauge

The offset function allows for zeroing to the value being measured within -5 ... +110 % of the set full scale value.


The offset function affects:

- the display
- the switching functions (threshold display)
- the analog outputs of the unit
- the RS232C interface

This function can be used for two different purposes:

Zero adjustment

There are two methods for adjusting the zero of a linear gauge. Note, however, that the actual pressure must be lower than the lower limit of the measurement range of the gauge:


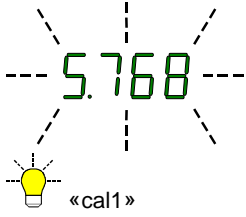
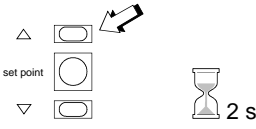
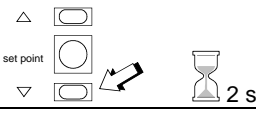


- Set the zero by adjusting the „ZERO“ potentiometer of the gauge →  15, 16, 17
- With the offset function of the measurement and control unit set the current pressure reading to zero

The advantage of the second method is that no direct access to the potentiometer of the gauge is required.

Zeroing at any pressure

The pressure reading of the measurement and control unit can be set to zero at any pressure within the measurement range of a linear gauge. All subsequent readings will then be relative to that offset value and may therefore be positive or negative. This method allows for monitoring of pressure variations during a process.

4.9.10.1 Displaying and adjusting the offset value **OFd**

Action	Result
Select « OFd » menu (→  32)	 <p>«cal1» (Last offset value saved)</p>
 <p>or</p> 	 <p>The value being measured (without offset) is accepted as new offset value.</p>
	<p>The new offset value is saved by returning to the measurement mode (→  32).</p>

The offset value of gauge 2 is adjusted in the same way.

4.9.10.2 Enabling the offset correction function of a linear gauge **OFc**

ON

The offset correction function is enabled

OFF

The offset correction function is disabled

With the offset correction function enabled, the saved offset value is subtracted from the value being measured.

Example

Measured value	Offset value saved	Display when <i>DFC=on</i>	Display when <i>DFC=off</i>
«10.3»	«10.3»	« 0 »	«10.3»
«17.4»	«10.3»	« 7.1 »	«17.4»
« 7.4 »	«10.3»	«29.»	« 7.4 »

WARNING

For readjusting the zero point of the gauge, set *DFC* to *OFF*.

4.9.11 Adjusting the gauge control *PC* or *IL*

WARNING

Turning a gauge on / of may affect the status of the relay.

Controlling gauge


- Pirani gauge
- Cold cathode gauge
- Compact FullRange™ CC Gauge
- Pirani/high pressure gauge
- Linear gauge

Controlled gauge


- Pirani gauge
- Cold cathode gauge
- Compact FullRange™ CC Gauge
- Pirani/high pressure gauge
- Linear gauge



Auto

automatic control by fixed threshold values
(→  58)


Extern

external control via the <control> connector
(→  15, 56)


Hand

manual control with the <on/off> key

4.9.12 Adjusting the gauge underrange control PU



WARNING



Turning a gauge on / of may affect the status of the relay.

This function is available for the following gauge:

- Pirani gauge
- Cold cathode gauge
- Compact FullRange™ CC Gauge
- Pirani/high pressure gauge
- Linear gauge



There is a number of possible causes of an underrange (e.g. «UR - 9»):

- the pressure in the vacuum system is lower than the lower limit of the measurement range
- the measurement element has not ignited (yet)
- the discharge has failed
- a defect has occurred

off

An underrange state is interpreted as an admissible measured value. «UR - 9» is displayed. The switching function remains »on«.

on

An underrange state is interpreted as an inadmissible measured value.

«UR - 9» is displayed. The switching function changes to »off«.

 **Note**


In the «ON» setting, the evaluation of the switching function is suppressed for approx. 10 seconds when the cold cathode gauge is turned on and each time after an underrange has occurred. During this time, the switching function remains »off«.




If chances are that the pressure in the vacuum chamber is under the lower limit of the measurement range of the gauge, it is advisable to select «OFF».


The underrange control of cold cathode gauge 2 («PU 2») is adjusted in the same way.

5 Technical data

Ambient conditions	Admissible temperature storage	-40 °C ... +65 °C
	operation	+ 5 °C ... +50 °C
	Relative humidity	max. 80 % at temperatures up to +31 °C, decreasing to 50 % at +40 °C
	Use	indoors only altitude up to 2000 m

Compatible gauges	Number of gauges	2
-------------------	------------------	---


Note




Since the IMR 260 and CMR 27x have a higher power consumption than other gauges, only one of these types can be connected and operated in combination with any other gauge type. ¹⁾

Types


Compact Pirani Gauges	TPR 250, TPR 260, TPR 261, TPR 265
Compact Cold Cathode Gauges	IKR 250, IKR 251, IKR 260, IKR 261, IKR 270
Compact FullRange™ CC Gauges	PKR 250, PKR 251, PKR 260, PKR 261
Compact Process Ion Gauges	IMR 260
Compact Capacitance Gauges	CMR 261, CMR 262, CMR 263, CMR 264, CMR 271, CMR 272, CMR 273, CMR 274, ACR 261, ACR 262, ACR 263, ACR 274


¹⁾ Two IMR 260 gauges can be connected. The electronics ensure that only one of them is operated at a time.

Compact Piezo Gauges APR 250, APR 260,
APR 261, APR 265,
APR 266, APR 267

Measurement	Measurement range, measurement error, reproducibility	depending on the gauge used (→  1 ... 17)
	Measurement error of measurement unit amplification error	≤ 0.2 % of the current input voltage
	offset error	≤ 20 mV
	Measurement rate	100 per s
	Display rate	4 per s
	Filter time constants	
	normal	320 ms ($f_g = 0.5$ Hz)
	fast	35 ms ($f_g = 4.5$ Hz)
	slow	2.6 ms ($f_g = 0.06$ Hz)

Switching functions	Number of switching functions	1 per gauge
	Type of contact	isolated changeover con- tact (contact open → switching function »off« or measurement unit turned off)
	Maximum load	240 V~; 5 A; 1200 VA 200 V=; 5 A; 40 W






DANGER

If the DualGauge™ is used as desktop unit, a maximum of 30 V~ or 60 V= may be applied (protective low voltage).

Uptime	mechanical	5×10^7 cycles
	electrical	1×10^5 cycles (at maximum load)
Reaction time		≤ 15 ms, if the threshold value is close to the meas- ured value (at higher dif- ferences, take the filter time constant into con- sideration)

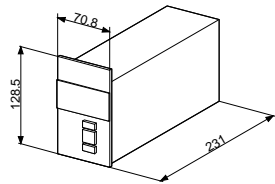
Error signal	Error signal (error contact)	
	Type of contact	potential free normally open (contact open ⇒ error or measurement unit turned off)
	Maximum load	50 V~; 1.5 A 50 V=; 1.5 A; 40 W
	Uptime	
	mechanical	5×10 ⁷ cycles
	electrical	1×10 ⁵ cycles (at maximum load)
Gauge supply	Voltage	20.5 ... 30 V unstabilized ripple max. 1 V _{pp}
	Current	≤ 200 mA per gauge protected with PTC element, self-resetting at power-off
Turning the cold cathode gauge on / off	manually	with <on/off> key
	automatically	with Pirani gauge, Full-Range™ CC Gauge, linear gauge (1 mbar Full Scale) at p ≤ 6.0×10 ⁻³ mbar at p ≥ 8.0×10 ⁻³ mbar
	externally	at <control> connector; internal pull-up 3.3 kΩ to 5 V control via - TTL signal - open collector - relay contact high: ≥ 2.0 V or input open ⇒ gauge off low: ≤ 0.8 V ⇒ gauge on

Turning the Pirani/high pressure gauge on / off	<p>manually automatically</p> <p>hot cathode on hot cathode off</p> <p>externally</p>	<p>with <on/off> key with Pirani gauge, Full-Range™ CC Gauge, linear gauge (10 mbar, 100 mbar Full Scale)</p> <p>$p \leq 1.0 \times 10^{-1}$ mbar $p \geq 1.5 \times 10^{-1}$ mbar</p> <p>at <control> connector; internal pull-up 3.3 kΩ to 5 V control via</p> <ul style="list-style-type: none"> - TTL signal - open collector - relay contact <p>high: ≥ 2.0 V or input open ⇒ gauge off</p> <p>low: ≤ 0.8 V ⇒ gauge on</p>
Analog output signal	<p>Voltage range</p> <p>Internal resistance R_i</p> <p>Relationship between measurement signal and pressure</p>	<p>0 V ... +10 V</p> <p>660 Ω</p> <p>(→  1 ... 17)</p>
Standards applied	<p>Safety</p> <p>protection class</p> <p>contamination degree</p> <p>EMC</p>	<p>EN61010-1 : 1993 (IEC 1010)</p> <p>I</p> <p>II</p> <p>emission EN 50081-1</p> <p>immunity EN 50082-2</p>

Power specifications	Voltage	230 V~, +10 %, -14 % 208 V~, +10 %, -14 % 120 V~, +10 %, -14 % 100 V~, ±10 %
	Frequency	50 ... 60 Hz
	Power consumption	17 VA
	Overvoltage category	II
	Fuses F1, F2	incorporated in the unit 230 V~: 0.1 AT, 250 V; ø5x20 mm 208 V~: 0.1 AT, 250 V; ø5x20 mm 120 V~: 0.2 AT, 250 V; ø5x20 mm 100 V~: 0.2 AT, 250 V; ø5x20 mm

Waiting time	Minimum waiting time between turning the unit off and back on	10 seconds
--------------	---	------------

Dimensions



Use	As desktop unit or for rack installation	
-----	--	--

Weight	Weight	1.4 kg
--------	--------	--------

Pin assignments

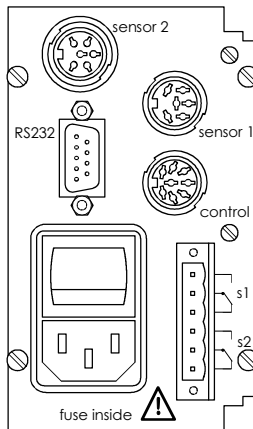
Skilled personnel

Cables may only be made and adapted by persons with suitable training in electro-technics.

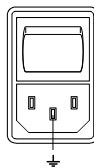
DANGER

Take account of the Technical data to prevent any hazard, equipment damage or overload.

Rear panel



Mains power connector

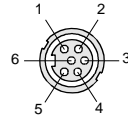


<sensor 1> connector

Amphenol C91B, 6-pole, female

Pin assignment

- Pin 1: Identification
- Pin 2: GND
- Pin 3: Measurement signal +
- Pin 4: Measurement signal –
- Pin 5: Screen ¹⁾
- Pin 6: V_{cc}

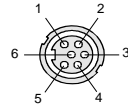


View to DualGauge™

<sensor 2> connector

Amphenol C91B, 6-pole, female

Pin assignment:
see <sensor 1>



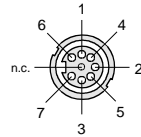
View to DualGauge™

<control> connector

Amphenol C91B, 7-pole, female

Pin assignment

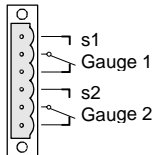
- Pin 1: Analog output gauge 2
- Pin 2: Analog output gauge 1
- Pin 3: Error (Error)
- Pin 4: Gauge 1 on/off
- Pin 5: GND / screen ¹⁾
- Pin 6: Gauge 2 on/off
- Pin 7: Error (Error)



View to DualGauge™

Relay connector

Phoenix Combicon, 6-pole, male



View to DualGauge™

 **Note**



The contacts are shown in idle position.
Switching function = »off«.



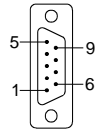
¹⁾ Use screened cables only (electromagnetic compatibility).

Serial connector


RS232C, D-Sub, 9-pole, male

Pin assignment:

- Pin 1: not assigned
- Pin 2: RXD
- Pin 3: TXD
- Pin 4: DTR
- Pin 5: SGND
- Pin 6: not assigned
- Pin 7: RTS
- Pin 8: CTS
- Pin 9: not assigned
- Housing: screen¹⁾



View to DualGauge™

1)  Use screened cables only (electromagnetic compatibility).

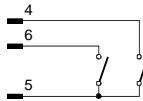
Details with regard to the <control> connector

External control of the cold cathode or Pirani/high pressure gauge.

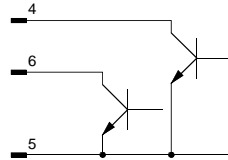
WARNING

Pin 5 of the DualGauge™ is directly connected to protective ground. Therefore, protective measures must be taken to protect the unit from earth currents.

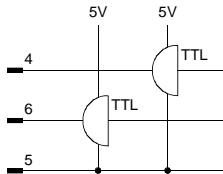
a)



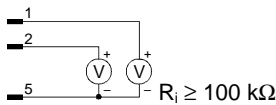
b)



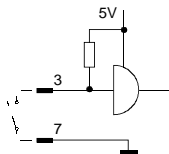
c)



Evaluation of the analog output voltage



Evaluation of the Error signal



6 Maintenance and care

The DualGauge™ Vacuum measurement and control unit requires no maintenance. For maintenance of the gauges please refer to the corresponding documents 1 ... 17.



WARNING



Turn the unit off and remove all cables (the mains cable at last), before doing any of the work described below.

Cleaning the outside

For cleaning the outside of the unit, a slightly humid cloth will usually do. Do not use under any circumstances an aggressive or scouring cleaning agent. Before putting the unit into operation again, allow it to dry thoroughly.

Cleaning the inside



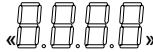
Skilled personnel



In a very dusty environment, the dust inside the unit should be periodically removed (Opening the unit → Appendix A). Carefully remove the dust with dry compressed air.

7 Status indications

Visualization of status messages



«err» lamp dark
(Error contact = »closed«)

Specification of the status message on the display.

Note



Status messages are for information only. They do not release any error messages. For details regarding gauge specific indications → 1 ... 17.






WARNING














The status indications «**Dr**» and «**ur**» as well as the error messages «**Er**» are output according to the pressure unit and calibration factor setting. The indications in this document refer to the pressure unit mbar and a calibration factor of 1.00.

Status indications

Display	Possible cause	Correction
« Auto » is displayed when the <on/off> key is pressed.	In automatic gauge control mode, you have attempted to switch the cold cathode gauge or the Pirani/high pressure gauge on or off.	Gauge control (→ 53).
« Errn » is displayed when the <on/off> key is pressed.	In external gauge control mode, you have attempted to switch the cold cathode gauge or the Pirani/high pressure gauge on or off.	Gauge control (→ 53).

Display	Possible cause	Correction
«LOC» is displayed when the <on/off> key is pressed.	You have attempted to switch the cold cathode gauge or the Pirani/high pressure gauge on or off with the entry lock function enabled.	Entry lock function (→  45).
«LOC» is displayed when the <set point> key is pressed together with the <> or <> key.	You have attempted to change the threshold value with the entry lock function enabled.	Entry lock function (→  45).
«no Id»	Gauge identification error.	Check the corresponding connection cable. Use an appropriate gauge (→  56).
«noSE»	No gauge connected	Switch the unit off, connect a gauge, and switch the unit on again. (The unit can also be operated with only one gauge connected).
«Co G» is displayed when the <on/off> key is pressed.	You have attempted to turn off the FullRange™ CC Gauge.	The FullRange™ CC Gauge cannot be turned off.
«Lin» is displayed when the <on/off> key is pressed.	You have attempted to turn off a linear gauge.	Linear gauges cannot be turned off.
«Pir» is displayed when the <on/off> key is pressed.	You have attempted to turn off the Pirani gauge.	The Pirani gauge cannot be turned off.
«UR»	Linear gauge: The measured	–

Display	Possible cause	Correction
	value is under the lower limit of the measurement range of the connected gauge.	(Standard case when used for high vacuum measurement)
	Incorrect HV adjustment	Adjustment →  15, 16, 17
«UR - 2»	Pirani/high pressure gauge: Measurement result below lower limit of Pirani measurement range.	Quit Pirani adjustment mode of the gauge →  14.
«UR - 4»	Pirani: Measurement result below measurement range of connected gauge.	– (Standard case when used for high vacuum measurement)
	Pirani: Incorrect HV adjustment	Adjustment →  1, 2, 3, 4
	FullRange™ CC Gauge: The gas discharge has not yet ignited.	Wait until the gas discharge ignites →  10, 11, 12, 13.
«UR - 6»	Pirani/high pressure gauge: Measurement result below lower limit of measurement range.	–
«UR - 9»	FullRange™ CC Gauge: Measurement result below lower limit of measurement range.	– (Standard case when used for ultra high vacuum measurement).
	Cold cathode gauge: Measurement result below lower limit of	(Adjusting the gauge underrange

Display	Possible cause	Correction
	<p>measurement range.</p> <p>The gas discharge may not have ignited yet.</p> <p>Gauge severely contaminated (isolating layers).</p>	<p>control →  54 ff)</p> <p>Wait until the gas discharge ignites →  5, 6, 7, 8</p> <p>Cleaning the gauge →  5, 6, 7, 8</p>
«ur t l»	<p>Cold cathode gauge:</p> <p>Measurement result below lower limit of measurement range.</p> <p>The gas discharge may not have ignited yet.</p> <p>Gauge severely contaminated (isolating layers).</p>	<p>-</p> <p>(Standard case when used for ultra high vacuum measurement)</p> <p>(Adjusting the gauge underrange control →  54 ff)</p> <p>Wait until the gas discharge ignites →  9.</p> <p>Cleaning the gauge →  9.</p>
«0 r »	<p>Linear gauge:</p> <p>Measurement result above the upper limit of the measurement range.</p>	-
	<p>Pirani / Pirani/high pressure gauge / FullRange™ CC Gauge:</p> <p>Measurement result above upper limit of Pirani measurement range.</p>	-
	<p>Incorrect ATM adjustment</p>	<p>(Adjustment →  1, 2, 3, 4, 10, 11, 12, 13, 14)</p>

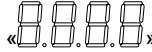
Display	Possible cause	Correction
«0 r - 2»	Cold cathode gauge: Measurement range above upper limit of measurement range.	Turn the cold cathode gauge off (risk of contamination). Automatic control with a Pirani gauge.

8 Error messages

Visualization of error messages



«err» lamp flashing
(Error contact = »open«)



Specification of the error message on the display.

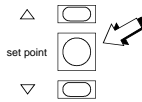


WARNING



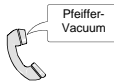
The status indications «0r» and «ur» as well as the error messages «Er» are output according to the pressure unit and calibration factor setting. The indications in this document refer to the pressure unit mbar and a calibration factor of 1.00.

Acknowledging of error messages






After you have acknowledged the error message:





















- the unit returns to the measurement mode, if the error has been corrected
- the error is displayed again if it has not been corrected
- the next error is displayed, if there are any further errors.



If you cannot correct the error yourself, please contact your nearest Pfeiffer Vacuum Service Center.

Display	Possible cause	Acknowledgement / Correction
No status indication when the unit is turned on.	Power cable interrupted.	Check the power cable.
	Fuse defective.	Replace the fuse (→ 77).
	The voltage rating of the unit does not agree with the local line voltage.	Adapt the equipment voltage (→ 77).

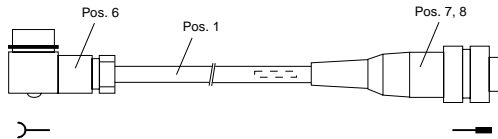
Display	Possible cause	Acknowledgement / Correction
«Er-4»	Pirani: No power supply, measurement element defective	Check supply and cable. Service gauge or replace it →  1, 2, 3, 4.
	FullRange™ CC Gauge: No power supply.	Check supply and cable.
«Er-6»	Pirani/high pressure gauge: No power supply, Pirani measurement element defective, filament defective.	Check supply and cable. Service gauge or replace it →  14.
«Er-9»	Cold cathode gauge: No power supply.	Check supply and cable.
«Er-11»	Cold cathode gauge: No power supply.	Check supply and cable.
«Er»	FullRange™ CC Gauge: Pirani measurement element defective.	Service gauge or replace it →  10, 11, 12, 13.
	Linear gauge: No power supply.	Check supply and cable.

Display	Possible cause	Acknowledgement / Correction
«SE 1» «SE 2»	Line break in the connection cable to the corresponding gauge or the connection cable to the gauge has been disconnected during operation	Check the corresponding connection cable.   If the error has not been corrected: «noSE» or «noId»
«dt»	Severe electric disturbance or error of the operating system (watchdog error).	  1)
	You have turned the unit back on too quickly after turning it off.	 
«EE»	EEPROM error (parameter memory)	 
«EP»	EPROM error (program memory)	 
«rA»	RAM error (random access memory)	 
«Io»	Keyboard error	 
«So»	Operating system error (Stack overflow error)	 
«tF»	Operating system error (task Fail error)	 
«Id»	Operating system error (Idle error)	 

1) The error message is automatically acknowledged when this option is selected (→ 82).

9 Accessories

	Ordering number
19" rack frame DIN 41 494	PT 544 083 -T
Cable for connection to Compact Gauge	
3 m complete	PT 448 250 -T
6 m complete	PT 448 251 -T
10 m complete	PT 448 252 -T
Other lengths on request	



	Ordering number
Measurement cable for Compact Gauge	
Pos. 1 Cable, 5 poles plus screen, 0.25 mm ² conductor	B 4590 198 BE
Cable, 5 poles plus screen, 0.34 mm ² conductor	B 4590 198 CD
Pos. 6 Socket Hirschmann GO 6 WF, 6-pole, angular, female	B 4707 283 MA
Pos. 7 Connector Amphenol C91B, 6-pole, male	B 4722 126 CC
Pos. 8 Crimp contact (6 pieces required)	B 4722 841 CA


10 Spare parts

When ordering spare parts, always indicate:


- all information on the product nameplate
- description and ordering number according to the spare parts list

	Ordering number
Fuses F1, F2	
0.1 AT, 250 V, ø5x20 mm	B 4666 416
0.2 AT, 250 V, ø5x20 mm	B 4666 422
Connector Amphenol C91B, 7-pole, male <control>	B 4722 107 CC
Connector Phoenix Combicon, 6-pole, female <s1>,<s2>	B 4717 900 WE
Cable housing for Phoenix Combicon <s1>,<s2>	B 4717 900 3E


11 Disposal




DANGER



Caution: mains voltage
Turn the unit off and disconnect all cables (the mains power cable last), before disassembling the unit.



WARNING



Caution: substances detrimental to the environment
Products, operating materials etc. may require disposal in accordance with special regulations.
Dispose of such products in accordance with the relevant local regulations.

Separating the components

After disassembling the product, separate its components and according to their materials and have them recycled.

Appendix

A: Adapting the equipment voltage, exchanging the fuses

**DANGER**

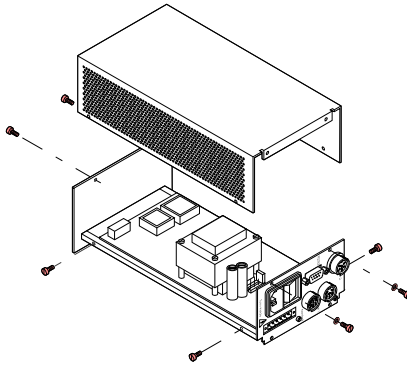
Disconnect all cables (the power cable last) before opening the unit.

Material / tools required

- Screw driver No. 3
- Screwdriver for recessed-head screws No. 1
- Possibly two fuses (ratings → 60)

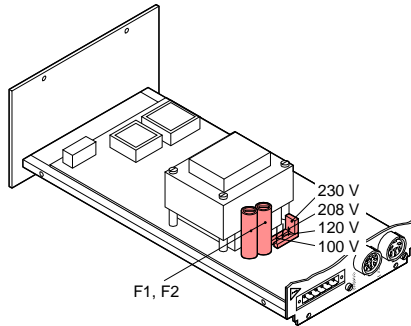
Procedure

Remove the cover (eight screws altogether).



Adapting the equipment voltage

- Set the jumper to the desired voltage.
- Check the two fuses F1, F2 and exchange them if necessary (ratings → 60).
- Change the voltage indication on the nameplate on the left side of the unit




Exchanging the fuses

- Exchange the two fuses F1, F2 (ratings → 60)

Placing the equipment cover

- Place the cover.
- Fasten it with the eight screws.

STOP
DANGER



In order to ensure proper ground connection, use the two lock washers when re-installing the back panel. Use the original screws only.

B: Dangerous voltages at the <s1>, <s2> connector



DANGER



According to EN 61010, voltages above 30 V~ or 60 V= present a hazard of contact.



Skilled personnel

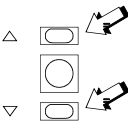


If such voltages are supplied to the <s1> or <s2> connector, the following instructions must be adhered to under any circumstances.

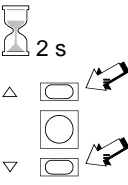
- The relevant rules and regulations for the respective application must be respected. In particular, conductors, isolation and fuses must be dimensioned correctly and mounted professionally.
- Depending on the voltage supplied, cables providing a double isolation must be used.
- The supplied connector is admitted for 250 V~. The enclosed cable housing must be used; however, it does not provide double isolation.
- Therefore, the current-carrying connector must be protected against accidental contact. This is achieved by installing the unit in such a way that access to its back side (<s1>, <s2> connectors) is only possible by means of a tool or a key.
- The plug must be screwed onto the socket of the unit.
- The protective cover (e.g. door of the switch cabinet) must be marked with a corresponding warning sign.
- Before performing any work at the <s1>, <s2> connectors, make sure it is idle.
- A voltage presenting a hazard of contact and a protective low voltage must not be applied to the <s1>, <s2> connectors at the same time.
- The current-carrying connector must not be accessible when withdrawn.

C: Test programs






Access to test mode














Action	Keys	Result
Access to test mode	 while turning the unit on until «bG» is displayed.	Unit in test mode (Test ❶)

Quitting the test mode












Quitting the test mode	 (or turn the unit off)	Unit returns to measurement mode.
------------------------	---	-----------------------------------

Next test


Next test		❶ → ❷ → ❸ → ...
❶ Display program number		bG (light writing)
❷ Display test dI-t	Start or stop test 	-88.88 88.88 → 88.88
❸ RAM test rR-t	Start test 	run In progress PASS Passed Er Error
❹ EPROM test EP-t	Start test 	run In progress PASS Passed Er Error
❺ EEPROM test EE-t	Start test 	PASS Passed Er Error

<p>⑥ A/D converter test Ad-0</p>	<p>Start test △ </p>	<p>8888 Measured value ¹⁾</p>
<p>Ad-1</p>	<p>Start test △ </p>	<p>8888 Measured value ¹⁾</p>
<p>Ad-2</p>	<p>Start test △ </p>	<p>8888 Measured value ¹⁾</p>
<p>Ad-3</p>	<p>Start test △ </p>	<p>8888 Measured value ¹⁾</p>
<p>⑦ Relay or I/O test</p>	<p> The relays switch irrespective of the pressure. Remove any cables that may be connected to <s1> or <s2>.</p>	
	<p> Take the necessary safety measures when using this function for checking the current circuits connected. (See also Appendix B).</p>	
<p>Io-t</p>	<p>Start / stop test △ </p>	<p>r 1-H...r 5-L The 5 relays cyclically switch ON / OFF twice.</p>
<p>r 1-H</p>	<p>▽ </p>	<p>Switching contact <sensor 1> = ON</p>
<p>r 1-L</p>	<p>▽ </p>	<p>Switching contact <sensor 1> = OFF</p>
<p>r 2-H</p>	<p>▽ </p>	<p>Switching contact <sensor 2> = ON</p>
<p>r 2-L</p>	<p>▽ </p>	<p>Switching contact <sensor 2> = OFF</p>
<p>r 3-H</p>	<p>▽ </p>	<p>Error contact closed (no error)</p>
<p>r 3-L</p>	<p>▽ </p>	<p>Error contact open (error)</p>


¹⁾ Displayed figure × 5 = voltage at the AD current converter (mV)


r4-H	▽ 	Supply contact <sensor 1> = ON
r4-L	▽ 	Supply contact <sensor 1> = OFF
r5-H	▽ 	Supply contact <sensor 2> = ON
r5-L	▽ 	Supply contact <sensor 2> = OFF
INPUT PE-CTRL 1	HIGH level (≥2.0 V)	 «sp1»
	LOW level (≤0.8 V)	 «sp1»
INPUT PE-CTRL 1	HIGH level (≥2.0 V)	 «sp2»
	LOW level (≤0.8 V)	 «sp2»
⊗ Watchdog error control		In case of Error: err
dt-c	△  on	Error contact = »open« Acknowledgement:  <small>set point</small>
	△  off	Error contact = »open« Automatic acknow- ledgment of the display; Error contact = »closed«


D: Literature


-  [1] www.bi.balzers.com/library/
 Operating manual
 Compact Pirani Gauge TPR 250
 BG 803 005 BE / D
 Balzers Instruments, FL-9496 Balzers,
 Liechtenstein
-  [2] www.bi.balzers.com/library/
 Operating manual
 Compact Pirani Gauge TPR 260 / 261
 BG 803 015 BE / A
 Balzers Instruments, FL-9496 Balzers,
 Liechtenstein
-  [3] www.pfeiffer-vacuum.de
 Operating manual
 Compact Pirani Gauge TPR 261
 BG 805 175 BE
 Pfeiffer Vacuum GmbH, D-35614 Asslar,
 Deutschland
-  [4] www.pfeiffer-vacuum.de
 Operating manual
 Compact Pirani Gauge TPR 265
 BG 805 174 BE
 Pfeiffer Vacuum GmbH, D-35614 Asslar,
 Deutschland
-  [5] www.bi.balzers.com/library/
 Operating manual
 Compact Cold Cathode Gauge IKR 250
 BG 803 006 BE / E
 Balzers Instruments, FL-9496 Balzers,
 Liechtenstein
-  [6] www.pfeiffer-vacuum.de
 Operating manual
 Compact Cold Cathode Gauge IKR 251
 BG 803 151 BE
 Pfeiffer Vacuum GmbH, D-35614 Asslar,
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-  [7] www.bi.balzers.com/library/
 Operating manual
 Compact Cold Cathode Gauge IKR 260
 BG 803 007 BE / E
 Balzers Instruments, FL-9496 Balzers,
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-  [8] www.pfeiffer-vacuum.de
 Operating manual
 Compact Cold Cathode Gauge IKR 261
 BG 805 153 BE
 Pfeiffer Vacuum GmbH, D-35614 Asslar,
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-  [9] www.pfeiffer-vacuum.de
 Operating manual
 Compact Cold Cathode Gauge IKR 270
 BG 805 008 BE
 Pfeiffer Vacuum GmbH, D-35614 Asslar,
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-  [10] www.bi.balzers.com/library/
 Operating manual
 Compact FullRange™ Gauge PKR 250
 BG 803 016 BE / C
 Balzers Instruments, FL-9496 Balzers,
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-  [11] www.pfeiffer-vacuum.de
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 Compact FullRange™ CC Gauge PKR 251
 BG 805 155 BE
 Pfeiffer Vacuum GmbH, D-35614 Asslar,
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-  [12] www.bi.balzers.com/library/
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 Compact FullRange™ Gauge PKR 260
 BG 803 017 BE / A
 Balzers Instruments, FL-9496 Balzers,
 Liechtenstein
-  [13] www.pfeiffer-vacuum.de
 Operating manual
 Compact FullRange™ CC Gauge PKR 261
 BG 805 157 BE
 Pfeiffer Vacuum GmbH, D-35614 Asslar,
 Deutschland
-  [14] www.pfeiffer-vacuum.de
 Operating manual
 Compact Process Ion Gauge IMR 260
 BG 805 038 BE
 Pfeiffer Vacuum GmbH, D-35614 Asslar,
 Deutschland

-  [15] Operating manual
 Compact Capacitance Gauge ACR 261,
 ACR 262, ACR 263, ACR 274
 BG 803 011 BN / B
 Balzers Instruments, FL-9496 Balzers,
 Liechtenstein

-  [16] www.pfeiffer-vacuum.de
 Operating manual
 Compact Capacitance Gauge CMR 261,
 CMR 262, CMR 263, CMR 264, CMR 271,
 CMR 272, CMR 273, CMR 274, CMR 275
 BG 805 161 BE
 Pfeiffer Vacuum GmbH, D-35614 Asslar,
 Deutschland

-  [17] www.pfeiffer-vacuum.de
 Operating manual
 Compact Piezo Gauge APR 250, APR 260,
 APR 262, APR 265, APR 266, APR 267
 BG 805 035 BE
 Pfeiffer Vacuum GmbH, D-35614 Asslar,
 Deutschland

-  [18] www.pfeiffer-vacuum.de
 Communication protocol
 DualGauge™
 BG 805 098 BE
 Pfeiffer Vacuum GmbH, D-35614 Asslar,
 Deutschland

E: Conversion of pressure units

	bar	mbar	μ bar	Pa	kPa	Torr	mTorr ¹⁾	psi
bar	1	10^3	10^6	10^5	10^2	750	750×10^3	14.5
mbar	10^{-3}	1	10^3	10^2	0.1	0.75	750	14.5×10^{-3}
μ bar	10^{-6}	10^{-3}	1	0.1	10^{-4}	7.5×10^{-4}	0.75	14.5×10^{-6}
Pa	10^{-5}	10^{-2}	10	1	10^{-3}	7.5×10^{-3}	7.5	14.5×10^{-5}
kPa	10^{-2}	10	10^4	10^3	1	7.5	7.5×10^3	14.5×10^{-2}
Torr	1.33×10^{-6}	1.33	1.33×10^3	133	0.133	1	1000	19.3×10^{-3}
mTorr	1.33×10^{-6}	1.33×10^{-3}	1.33	0.133	1.33×10^{-4}	10^{-3}	1	19.3×10^{-6}
psi	6.89×10^{-2}	68.9	68.9×10^3	6890	6.89	51.7	51.7×10^3	1

¹⁾ mTorr = micron = μ

Declaration of conformity

Product

TPG 252 A

Vacuum measurement and control unit for Compact Gauges

DualGauge™

EU Declaration of conformity as defined by the listed guidelines

We herewith declare that the above product complies with the provisions of the listed guidelines.

Guidelines, harmonized standards, national standards in languages and specifications which have been applied:

72/23/EEC (7/93)

89/336/EEC (7/93)

EN 61010-1: 1993

EN 50081-1: 1992

EN 50082-2: 1995

Signature

Asklar, 13.7.99



Wolfgang Dondorf
Managing director

