

APR 250, APR 260, APR 262, APR 265, APR 266, APR 267

Compact Piezo Gauge

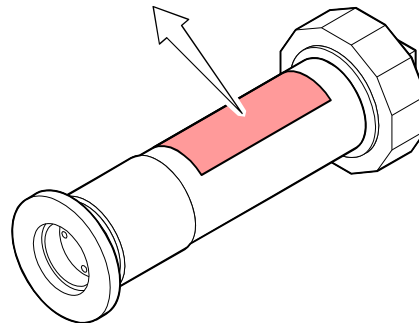
Operating Instructions



Product Identification

In all communications with Pfeiffer Vacuum, please specify the information given on the product nameplate. For convenient reference transfer this information into the diagram below.

Pfeiffer Vacuum, D-35614 Asslar	
Typ:	CE
No:	
F-No:	
..... V W	



Validity

This document applies to products with part number

P 5215 102 TF	(APR 250 DN 16 ISO-KF	100 kPa)
P 5215 112 TF	(APR 260 DN 16 ISO-KF	100 kPa)
P 5215 114 TF	(APR 260 DN 16 CF-F	100 kPa)
P 5215 120 TF	(APR 262 G1/4"	200 kPa)
P 5215 126 TF	(APR 265 G1/4"	500 kPa)
P 5215 132 TF	(APR 266 G1/4"	1000 kPa)
P 5215 133 TF	(APR 266 4 VCR male	1000 kPa)
P 5215 138 TF	(APR 267 G1/4"	5000 kPa)

The part number (No) can be taken from the product nameplate.

If not indicated otherwise in the legends, the illustrations in this document correspond to the gauge with the vacuum connection DN 16 ISO-KF. They apply to gauges with other vacuum connections by analogy

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

Intended Use

The Compact Piezo Gauges have been designed for vacuum measurement in a pressure range of 0.1 hPa ... 5500 kPa, depending on the configuration.

The gauges can be used with a Pfeiffer Vacuum measurement unit for compact gauges or with another evaluation unit.

Functional Principle



Over the entire measurement range, the measuring signal is linearly dependent on the pressure.

A piezoresistive pressure sensor is used as the measuring element. The measurement is not dependent on the type of gas being measured.



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



1 Safety

1.1 Symbols Used



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.

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 Safety Information

- Adhere to the applicable regulations and take the necessary precautions for the process media used.
Consider possible reactions between the materials (→ 5) and the process media.
Consider possible reactions of the process media due to the heat generated by the product.
- Adhere to the applicable regulations and take the necessary precautions for all work you are going to do and consider the safety information in this document.
- Before you begin to work, find out whether any vacuum components are contaminated. Adhere to the relevant regulations and take the necessary precautions when handling contaminated parts.

Pass on the safety information to other users.

1.4 Liability and Warranty

Pfeiffer Vacuum assumes no liability and the warranty becomes null and void if the custodian or third parties

- disregard the information in this document
- use the product in a non-conforming manner
- make any kind of changes (modifications, alterations etc.) to the product
- use the product with accessories not listed in the corresponding product documentation.

The custodian assumes the responsibility in conjunction with the process media used.



2 Technical Data

		APR 250	APR 260	APR 262	APR 265	APR 266	APR 267
Storage temperature	[°C]	-40 ... +80	-40 ... +80	-40 ... +80	-40 ... +80	-40 ... +80	-40 ... +80
Operating temperature	[°C]	+10 ... +80	+10 ... +80	+10 ... +80	+10 ... +80	+10 ... +80	+10 ... +80
Bakeout temperature	[°C]	80	80	80	80	80	80
Relative humidity		max. 80% at temperatures up to +31 °C, decreasing to 50 % at +40 °C					
Use		indoors only, altitude up to 2000 m (6600 ft.)					
Measurement range	[hPa]	0.1 ... 1100	0.1 ... 1100	0.2 ... 2200	0.5 ... 5500	1 ... 11000	5 ... 55000
Full scale	[hPa]	1000	1000	2000	5000	10000	50000
Accuracy	[%F.S.]	2	1	2	2	2	2
Linearity and hysteresis	[%F.S.]	<0.5	<0.2	<0.5	<0.5	<0.5	<0.5
Zero stability	[%F.S. / year]	<0.5	<0.3	<0.5	<0.5	<0.5	<0.5
Stability of sensibility	[% / year]	<0.5	<0.2	<0.2	<0.2	<0.2	<0.2
Thermal zero drift	[%F.S.]	<0.5	<0.2	<0.5	<0.5	<0.5	<0.5
Thermal sensitivity drift	[%F.S.]	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Admissible overpressure	[kPa]	300	300	500	750	1500	7500
Output signal measurement range	[V]	1.0 ... 9.8	1.0 ... 9.8	1.0 ... 9.8	1.0 ... 9.8	1.0 ... 9.8	1.0 ... 9.8
Error signal	[V]	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4
Minimum load (short-circuit proof)	[kΩ]	10	10	10	10	10	10
Materials exposed to the vacuum		stainless steel (1.4435)					
Internal volume							
DN 16 ISO-KF	[cm ³]	2	2	–	–	–	–
DN 16 CF-F	[cm ³]	–	6	–	–	–	–
G ¹ / ₄ "	[cm ³]	–	–	0.5	0.5	0.5	0.5
4 VCR	[cm ³]	–	–	–	–	1.0	–

Supply

DANGER

The gauges may only be connected to supply or measurement units that conform to the requirements of a grounded protective extra-low voltage (SELV). The connection to the gauge has to be fused.

Voltage at the gauge	13.0 ... 30.0 VDC (max. ripple 1 V _{pp})
Power consumption	≤0.2 W
Fuse (to be switched in)	≤1 AT
Type of protection	IP 65

The minimum voltage of the power supply must be increased proportionally to the length of the measurement cable.

Voltage at the supply unit with maximum cable length	16.0 ... 30.0 VDC (max. ripple 1 V _{pp})
Electrical connection	Hirschmann compact connector type GO 6, 6 contacts, pins
Cable	5-pin plus screening
Maximum cable length	50 m (0.34 mm ² conductor cross section)



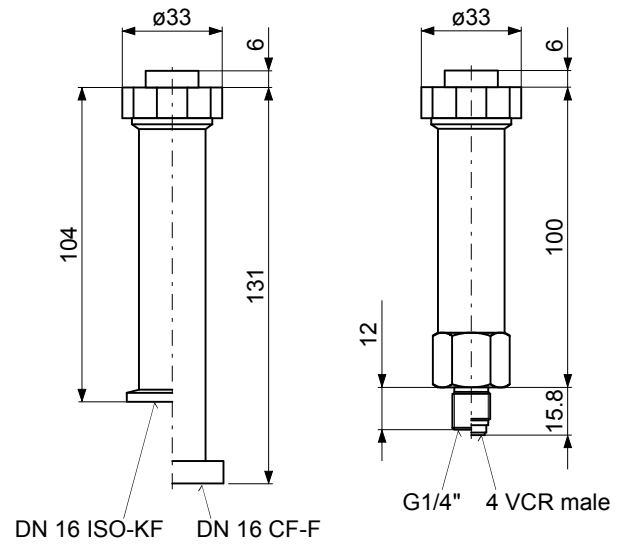
Output signal (measuring signal)

Voltage range	≈0 V ... ≈+13.5 V
Relationship voltage-pressure	linear (→ Appendix)
Error signal	<0.4 V (sensor error) >9.8 V (overrange)
Output impedance	≤10 Ω
Normal load	100 kΩ
Minimum load	10 kΩ, short-circuit proof
Response time	<10 ms

Grounding concept	→ Figure 1
Supply common-signal common	conducted separately; differential measurement recommended for cable lengths ≥10 m

Gauge identification	13.2 kΩ ± 1%
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Dimensions [mm]



Weight	120 g (ISO-KF flange and G1/4") 150 g (CF-F flange) 200 g (4 VCR flange)
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3 Installation

3.1 Vacuum Connection



Caution



Caution: vacuum component

Dirt and damages impair the function of the vacuum component.

When handling vacuum components, take appropriate measures to ensure cleanliness and prevent damages.

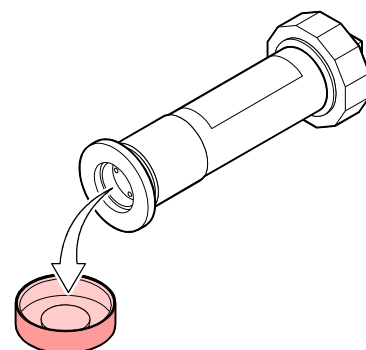
The gauge can be mounted in any orientation. However, it should be mounted so that any particles present cannot penetrate into the measuring chamber.

See the dimension drawings for space requirements (→ 5 f.).

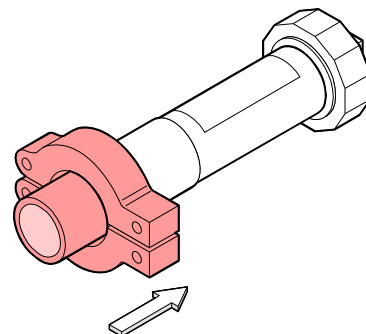
- 1 Remove the protective cap.



Keep the protective lid



- 2 Make the flange connection.



DANGER



DANGER: overpressure in the vacuum system >250 kPa
KF flange connections with elastomer sealing rings (e.g. O-rings) cannot withstand such pressures. Process media can thus leak and possibly damage your health.

Use sealing rings provided with an outer centering ring.



DANGER




DANGER: overpressure in the vacuum system >100 kPa
If clamps are opened incorrectly, injury can be caused by catapulted parts and your health can be damaged by leaking process gases.

Use the type of clamps which can only be opened and closed by means of a tool (e.g. hose clip clamping ring).



STOP
DANGER



The gauge must be electrically connected to the grounded vacuum chamber. The connection must conform to the requirements of a protective connection according to EN 61010:

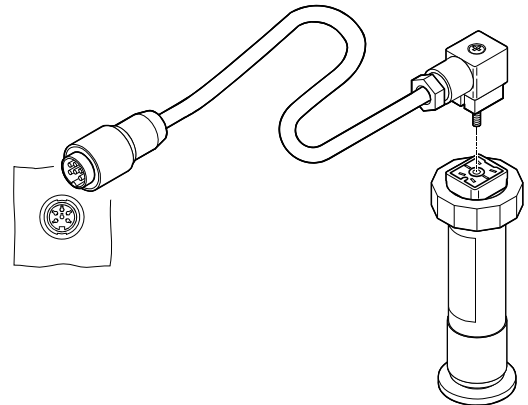
- CF and VCR flanges fulfill this requirement
- For gauges with KF flanges, use a a conductive metallic clamping ring

3.2 Electrical Connection


3.2.1 Use With a Pfeiffer Vacuum Measurement Unit

If the gauge is used with a Pfeiffer Vacuum measurement unit for Compact gauges, a corresponding connection cable is required (→ 14).

- Secure the connector on the gauge with a screw.



!
Caution



Set the full scale value of the gauge used on your evaluation unit (→ corresponding 14).

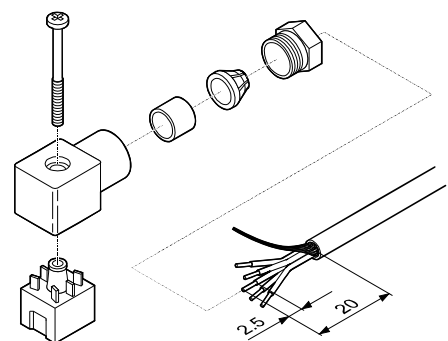
3.2.2 Use With Another Evaluation Unit

The gauge can also be operated with other evaluation units. In this case, an individual connection cable must be made.

For cable lengths up to 10 m (with a conductor cross section of 0.34 mm²), the measuring signal can be read directly between the positive signal output (pin 2) and the supply common (pin 5) without the degree of accuracy being lowered. For longer measurement cable lengths, we recommend a differential measurement between the signal output and the signal common (pin 3) (as a result of the voltage drop along the supply cable ground lead, the common mode signal is approx. 1.0 V for the maximum admissible cable length).

Procedure

- 1 Prepare the connection socket (ordering number → 14).



2 Solder the connection cable according to the diagram.

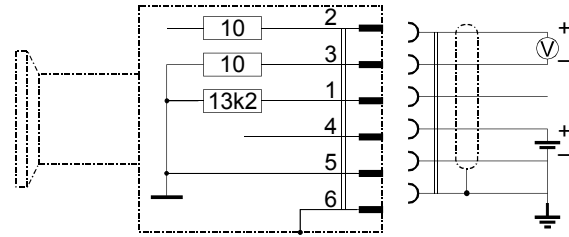
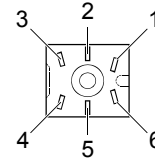


Figure 1: Electrical connection

- Pin 1 identification
- Pin 2 signal output (measuring signal)
- Pin 3 signal common
- Pin 4 supply
- Pin 5 supply common
- Pin 6 screen

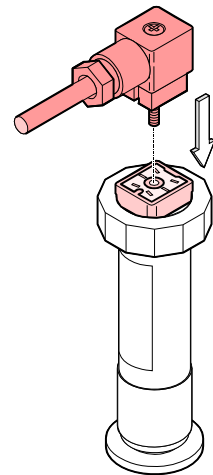


WARNING

The supply common (pin 5) and the screen (pin 6) must be connected to the supply unit with protective ground. Incorrect connection, incorrect polarity, or inadmissible supply voltages can damage the gauge.

3 Reassemble the connection socket.

4 Plug in the connection socket.
Secure the connector on the gauge with the screw.



4 Operation

As soon as the required voltage is applied, the measuring signal is available between pins 2 and 3 (→ Appendix for the relationship between the measuring signal and the pressure).



The measuring signal is not dependent on the type of gas being measured (absolute pressure measurement).



5 Maintenance

STOP DANGER



DANGER: contaminated parts
Contaminated parts can be detrimental to health.
Before you begin to work, find out whether any parts are contaminated. Adhere to the relevant regulations and take the necessary precautions when handling contaminated parts.

5.1 Aligning the Gauge (Zero Alignment)

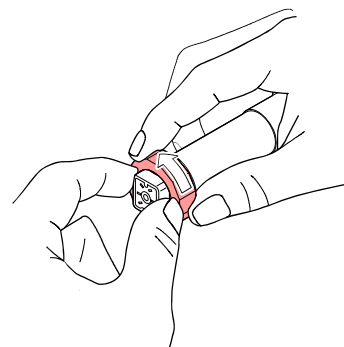
The gauge is factory-calibrated. Realignment is usually not necessary. If realignment should nevertheless be required, proceed as follows:

Tools / material required

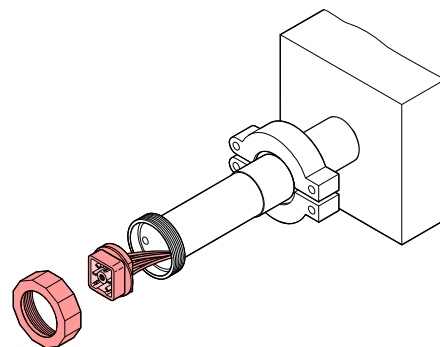
- Screw driver No. 1
- Vacuum pump with a final pressure $\ll 0.1$ hPa

Procedure

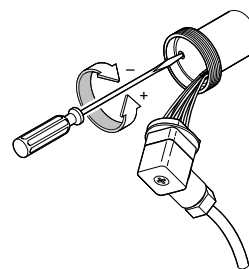
- Loosen the union nut.
 - Lift the connection terminal.



- Evacuate: $p \ll 0.1$ hPa.



- Correct alignment:
Display = 0 ($U = 1$ V).



- Reassemble the gauge in reverse order.




5.2 Cleaning the Gauge

Tools / material required

- Cleaning alcohol

STOP
DANGER

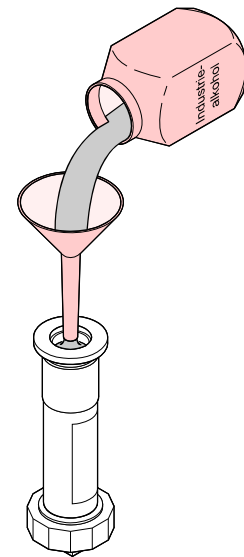


DANGER: cleaning agents
 Cleaning agents can be detrimental to health and environment.
 Adhere to the relevant regulations and take the necessary precautions
 when handling and disposing of cleaning agents.

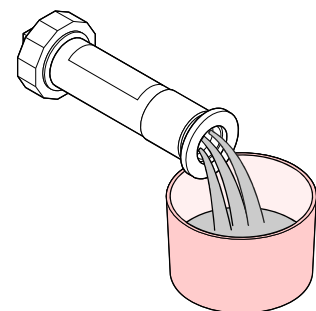
Procedure

- 1 Remove the gauge from the vacuum system (→ 13).

- 2
 - Fill it with cleaning alcohol.
 - Allow the alcohol to work for 5 minutes.



- 3 Pour the alcohol out of the measuring chamber.



- 4 Allow the measuring chamber to dry for at least 10 minutes.

- 5 Reinstall the gauge (→ 7).



5.3 Troubleshooting

Problem	Possible cause	Remedy
Measuring signal constantly < 0.5 V.	No supply.	Switch on the supply unit.
	Supply voltage too low.	Increase the supply voltage (→ 5).
	Gauge defective.	Replace the gauge.
Measuring signal constantly in the range 0.4 ... 0.6 V (underrange).	Pressure in the vacuum chamber < measurement range.	–

6 Deinstallation

 **DANGER**



DANGER: contaminated parts

Contaminated parts can be detrimental to health.

Before you begin to work, find out whether any parts are contaminated. Adhere to the relevant regulations and take the necessary precautions when handling contaminated parts.

 **Caution**



Caution: vacuum component

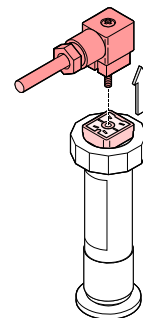
Dirt and damages impair the function of the vacuum component.

When handling vacuum components, take appropriate measures to ensure cleanliness and prevent damages.

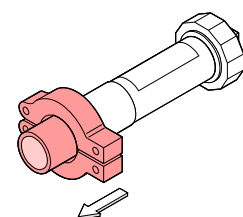
Procedure

1 Deactivate the gauge.

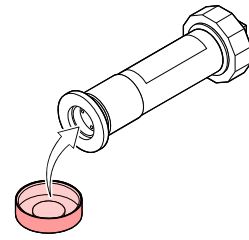
2 Unplug the connector.



3 Remove the gauge from the vacuum system.



- 4 Place the protective cap.



7 Accessories

	Ordering number
Connection cable to Pfeiffer Vacuum measurement unit for Compact gauges	
3 m	PT 448 250-T
6 m	PT 448 251-T
10 m	PT 448 252-T
Connection socket, Hirschmann GO 6 WF, 6-pin, angled, female	B 4707 283 MA

8 Decommissioning



WARNING



WARNING: substances detrimental to the environment

Products, operating materials etc. may have to be specially decommissioned.

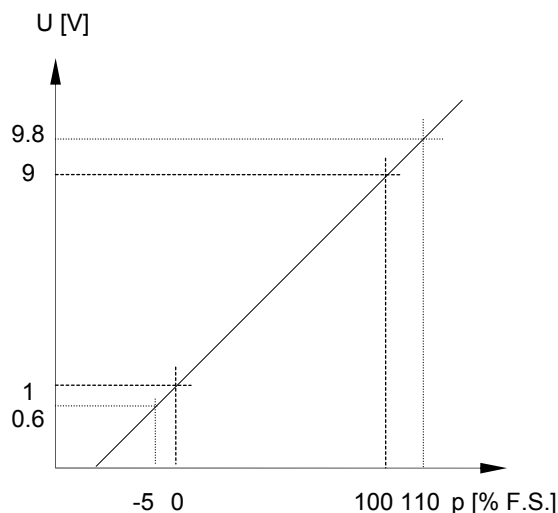
For environmentally compatible disposal, please contact your nearest Pfeiffer Vacuum Service Center.



Appendix

A: Relationship Measuring Signal vs. Pressure

Measuring signal U [V]	Pressure p
0 ... 0.4	Sensor error
0.4 ... 0.6	Underrange
0.6	-5% F.S.
1.0	0% F.S.
1.8	10% F.S.
2.6	20% F.S.
...	...
8.2	90% F.S.
9.0	100% F.S.
9.8	110% F.S.
9.8...13.5	Overrange



General:
$$U = 1V + \left(0.8V \times \frac{p \times 10}{F.S.} \right)$$

where

U	measuring signal	}	(same pressure unit)
p	pressure measured		
F.S.	full scale of the gauge used (→ 5)		

B: Conversion of Pressure Units

	mbar	bar	Pa	hPa	kPa	Torr mm HG
mbar	1	1×10^{-3}	100	1	0.1	0.75
bar	1×10^3	1	1×10^5	1×10^3	100	750
Pa	0.01	1×10^{-5}	1	0.01	1×10^{-3}	7.5×10^{-3}
hPa	1	1×10^{-3}	100	1	0.1	0.75
kPa	10	0.01	1×10^3	10	1	7.5
Torr mm HG	1.332	1.332×10^{-3}	133.32	1.3332	0.1332	1

$1 \text{ Pa} = 1 \text{ N/m}^2$



**Vacuum solutions
from a single source**

Pfeiffer Vacuum stands for innovative and custom vacuum solutions worldwide, technological perfection, competent advice and reliable service.

**Complete range
of products**

From a single component to complex systems: We are the only supplier of vacuum technology that provides a complete product portfolio.

**Competence in
theory and practice**

Benefit from our know-how and our portfolio of training opportunities! We can support you with your plant layout and provide first-class on-site-service worldwide.

**Are you looking for a
perfect vacuum solution?
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