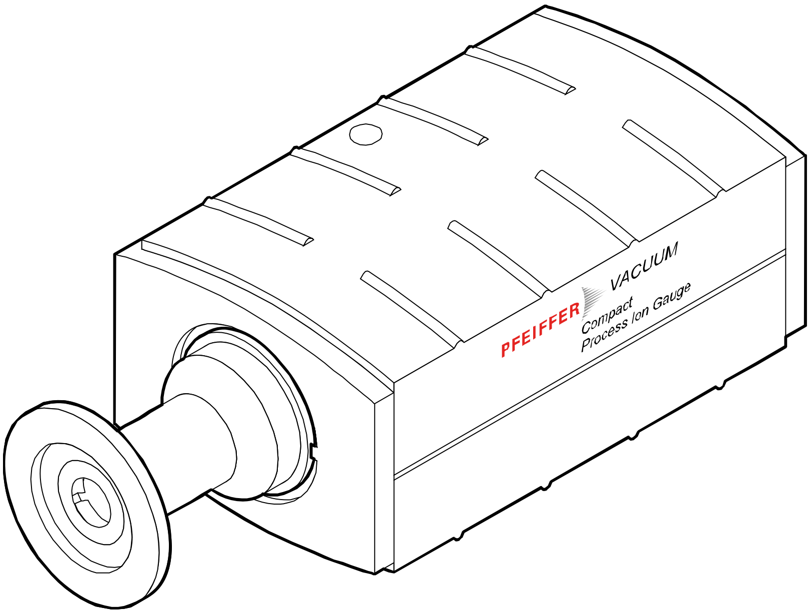


OPERATING INSTRUCTIONS

EN

Translation of the original instructions

IMR 265

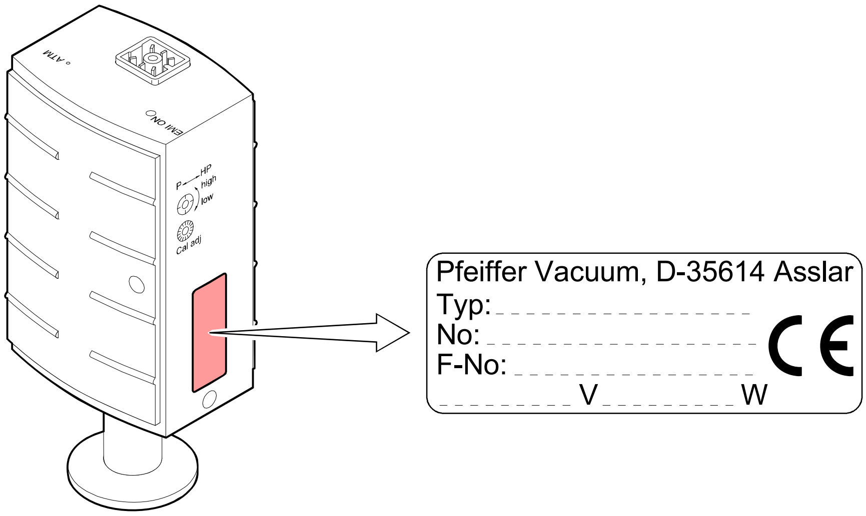
Compact Process Ion Gauge

BG 5172 BEN / B (2017-02)

PFEIFFER VACUUM

Product Identification

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



Validity

This document applies to products with part number

PT R26 500 (flange DN 25 ISO-KF)
PT R26 501 (flange DN 40 ISO-KF)
PT R26 502 (flange DN 16 CF-F)
PT R26 503 (flange DN 40 CF-F)
PT R26 504 (flange DN 16 ISO-KF)
PT R26 505 (with 3/4" tube)

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

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

Intended Use

The IMR 265 Compact Process Ion Gauge has been designed for vacuum measurement of non-flammable gases and gas mixtures in a pressure range 2×10^{-6} … 1000 hPa, measurement in the range of ≈1 … 1000 hPa serving as trend indication (control range).

It must not be used for measuring flammable or combustible gases in mixtures containing oxidants (e.g. atmospheric oxygen) within the explosion range.

The gauge is a part of the Pfeiffer Vacuum Compact Gauge family and can be operated in connection with a Pfeiffer Vacuum measurement and control unit for Compact Gauges or with another control device.

Functional Principle

Over the whole measuring range, the measuring signal is output as logarithm of the pressure.

The IMR 265 functions with a HP high pressure hot cathode ionization manometer, which is controlled by the built-in Pirani manometer (control range). The hot cathode is switched on only below the switching threshold of 5×10^{-2} hPa (to prevent filament burn-out). For pressures above this threshold, the Pirani signal is output.

Contents

For cross-references within this document, 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 General Safety Instructions

- Adhere to the applicable regulations and take the necessary precautions for the process media used.

  Consider possible reactions between the materials (→ 🗎 6) and the process media.

  Consider possible reactions (e.g. explosion) of the process media due to 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 instructions in this document.

- Before beginning to work, find out whether any vacuum components are contaminated. Adhere to the relevant regulations and take the necessary precautions when handling contaminated parts.

Communicate the safety instructions to all other users.

1.4 Liability and Warranty

Pfeiffer Vacuum assumes no liability and the warranty becomes null and void if the end-user or third parties

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

The end-user assumes the responsibility in conjunction with the process media used.

Gauge failures due to contamination or wear and tear, as well as expendable parts (filament), are not covered by the warranty.

2 Technical Data

Measurement	Measuring range (air, N_2)	
	Hot cathode	2×10^{-6} … 1 hPa
	Pirani (control range)	1×10^{-2} … 1000 hPa
	Repeatability	(after 10 min. stabilization)
	10^{-5} … 10^{-1} hPa	≈ 2% measurement
	10^{-1} … 100 hPa	≈30% measurement
	Gas type dependence	→ Appendix C
Emission	Switching threshold (selectable from 5 defined setpoints)	1 hPa 5×10^{-1} hPa 2×10^{-1} hPa 1×10^{-1} hPa 5×10^{-2} hPa (default)
	Emission current continually rising	
	From 1 hPa	4 µA
	To 2×10^{-6} hPa	130 µA
	Anode voltage	180 V
Output signal	Voltage rating	0 … 10.2 V
	Measuring range	
	Hot cathode	1.5 … 7.5 V
	Pirani	8.5 … 9.75 V
	Overrange hot cathode	7.5 V < U < 8.0 V
	Underrange hot cathode	0.5 V < U < 1.5 V
	Overrange Pirani	9.75 V < U < 10.2 V
	Underrange Pirani	8.0 V < U < 8.5 V
	Relationship voltage-pressure	→ Appendix B logarithmic
	Hot cathode	1.00 V / decade
	Pirani	0.25 V / decade
	Error signals	→ 🗎 21
	0.3 V	• hot cathode error
	0.5 V	• Pirani error • electronics unit not correctly mounted to sensor
	Minimum load	10 kΩ, short circuit proof
Identification of the gauge	Resistor (Pin 1, U_{max} = 4.25 V)	15.2 kΩ referenced to supply common
Adjustment	Pirani	
	HV	automatic by hot cathode circuit in range 1 … 3×10^{-3} hPa
	ATM (<ATM> button)	via <ATM> button (keep button depressed for at least 5 seconds) at atmospheric pressure
	Hot cathode	calibration setting with 16 position switch according to label

Supply

STOP DANGER

The gauge may only be connected to power supplies, instruments or control devices that conform to the requirements of a grounded protective extra-low voltage (PELV). The connection to the gauge has to be fused [1].

Voltage at gauge	20 … 30 VDC [2] max. ripple 1 V_{pp}
Power consumption	
Standard	≤0.5 A
Emissions start (<200 ms)	≤1.4 A
Power consumption	≤16 W
Fuse necessary [1]	≤1.25 AT
Voltage at the power supply for maximum cable length	21 … 30 V max. ripple 1 V_{pp}

Sensor cable

Electrical connection	Hirschmann compact connector type GO 6, 6 poles, male
Tightening torque	≤0.2 Nm
Cable	5 poles plus screening
Cable length max.	35 m (0.25 mm² conductor) 50 m (0.34 mm² conductor) 100 m (1.0 mm² conductor)

Grounding concept

Vacuum flange-supply common	direct electrical connection
Signal common-supply common	conducted separately; only differential measurement possible due to high power consumption

Vacuum

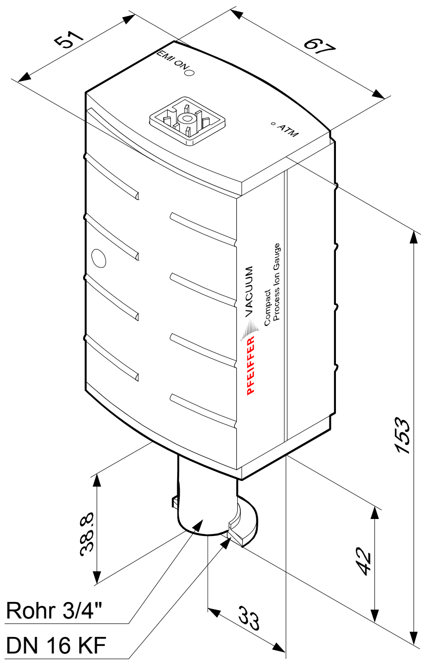
Materials on the vacuum side	
Housing, anode holder, screens	stainless steel
Feedthrough	NiFe nickel plated
Isolator	glass
Cathode	iridium, yttrium oxide
Cathode holder	molybdenum, platinum
Pirani element	tungsten, copper, glass
Internal volume	
DN 25 ISO-KF	≤24 cm^3
DN 40 ISO-KF	≤24 cm^3
DN 40 CF-R	≤34 cm^3
Pressure max.	500 kPa (absolute), (only for inert gases and temperatures <100 °C)

[1] Pfeiffer vacuum measurement and control units for Compact Gauges fulfill these requirements.

[2] The minimum voltage of the power supply must be increased proportionally to the [illegible] cable.

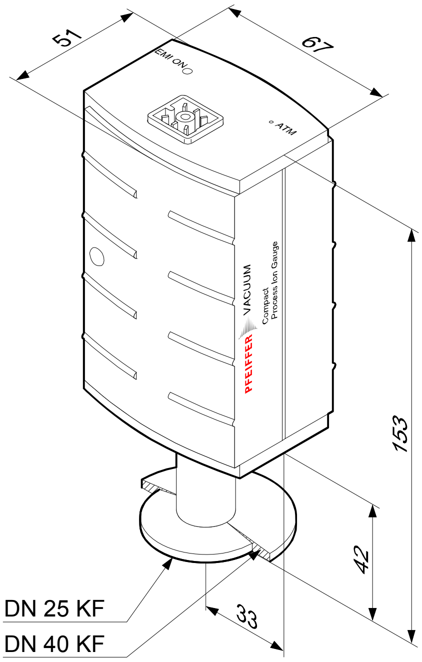
Environment	Admissible temperatures	
	Storage	-20 … 70 °C
	Operation	0 … 50 °C
	Bakeout	+ 50 °C (with electronics unit) + 80 °C (at the flange, with electronics unit) +150 °C (without electronics unit)
	Relative humidity	
	Year's mean	≤65% (no condensation)
	During 60 days	≤85% (no condensation)
	Use	indoors only altitude up to 2000 m NN
	Degree of protection	IP 30

Dimensions [mm]	DN 16 ISO-KF flange and 3/4" tube	



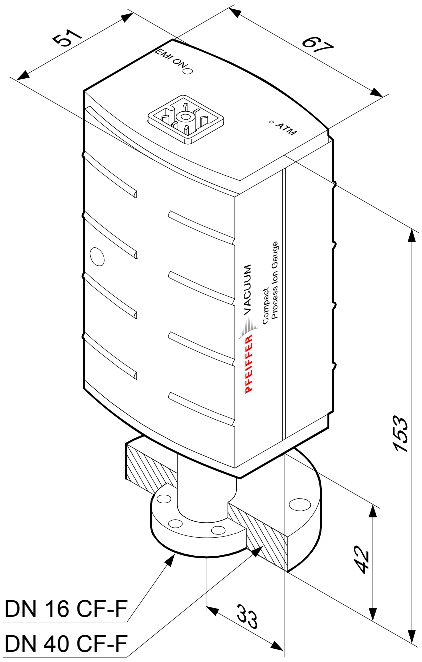
Weight	≈285 g

DN 25 ISO-KF and DN 40 ISO-KF flange



Weight	≈315 g

DN 16 CF-F and DN 40 CF-F flange



Weight	≈300 … 550 g

3 Installation

3.1 Vacuum Connection

DANGER

DANGER: overpressure in the vacuum system >100 kPa

Injury caused by released parts and harm caused by escaping process gases can result if clamps are opened while the vacuum system is pressurized.

Do not open any clamps while the vacuum system is pressurized. Use the type clamps which are suited to overpressure.

DANGER

DANGER: hazardous voltages

Incorrectly grounded products can be extremely hazardous in the event of a fault.

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

- CF flanges fulfill this requirement.
- For gauges with a KF flange, use a conductive metallic clamping ring.
- For the 3/4" tube, take appropriate measures to fulfill this requirement.

Caution

Caution: vacuum component

Dirt and damages impair the function of the vacuum component.

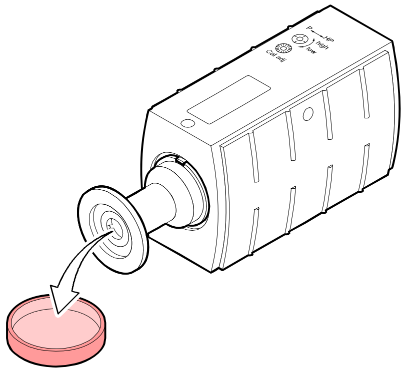
When handling vacuum components, take appropriate measures to ensure cleanliness and prevent damages.

- The gauge should be mounted so that no vibrations occur.
- The gauge may be mounted in any direction. However, no particles and condensates should penetrate into the measuring chamber.
- See dimensional drawings (→ 🗎 7) for space requirements.
- If the flange connection can only be made without the electronics unit, remove the electronics unit (→ 🗎 11).
- The sensor can be baked out at up to 150 °C. For temperatures above 50 °C the electronics unit must be removed (→ 🗎 11).

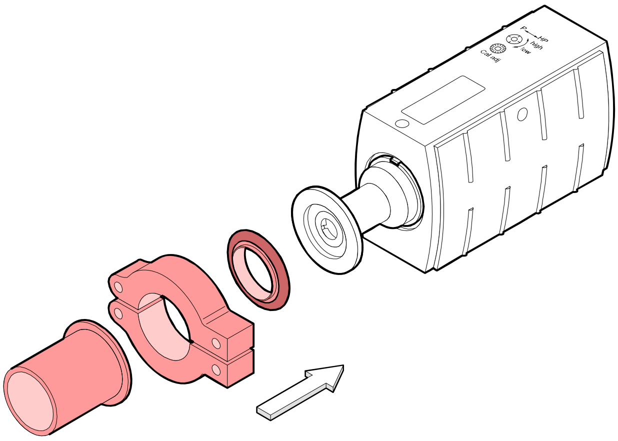
Procedure

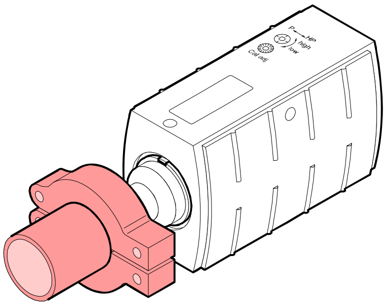
❶ Remove the protective cap.

Notice:
Store the protective cap and reinstall it when deinstalling the gauge.



❷ Establish the flange connection.





Install the gauge in such a way that there is sufficient clearance for adjustment (→ 🗎 16, 18, 19).

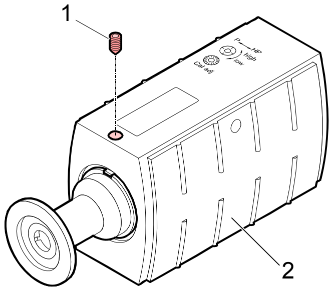
3.1.1 Removing and Installing the Electronics Unit

Tools / material required

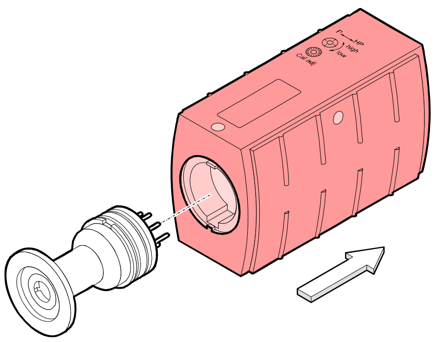
- Allen wrench AF 2.5

Removal

a) Carefully unfasten the hexagon socket set screw (1) on the side of the electronics unit (2). Make sure not to lose the hexagon socket set screw.

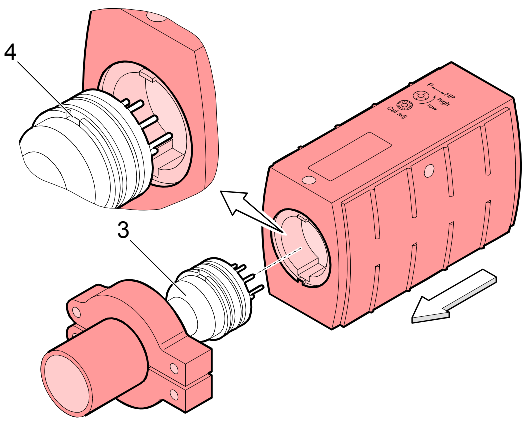


b) Remove the electronics unit **without twisting it.**



Mounting

a) Place the electronics unit on the sensor (3) (be careful to correctly position the pins and the guide notch (4)).



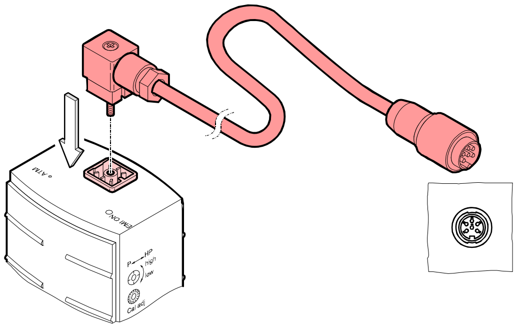
b) Slide the electronics unit up to the mechanical stop and lock it with the hexagon socket set screw (1).

3.2 Power Connection

3.2.1 Use With a Measurement and Control Unit for Compact Gauges

If the gauge is used with a Pfeiffer Vacuum measurement and control unit for Compact Gauges, a corresponding sensor cable is required (→ 🗎 23).

- Plug in the connector on the gauge and secure it with the screw (tightening torque ≤0.2 Nm).
- Connect the other end of the cable to the measurement and control unit and secure it.



3.2.2 Use With Other Control Devices

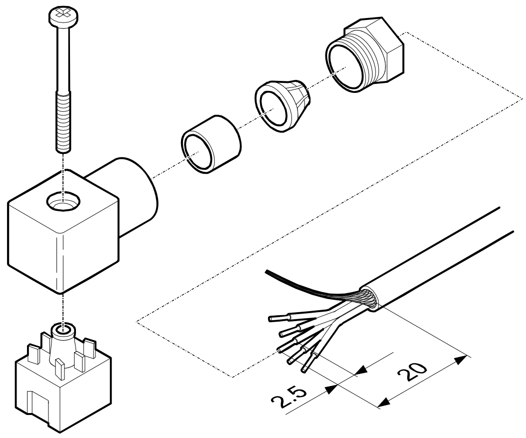
The gauge can also be used with other control devices. In such a case, an individual sensor cable can be made (connector → 🗎 23).

Due to the high power consumption, only differential measurement between the signal output (pin 2) and the signal common (pin 3) is possible.

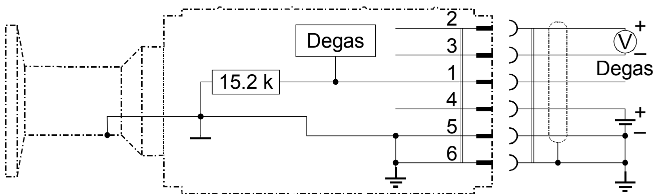
Procedure

❶ Open the connector (ordering number → 🗎 23).

❷ Prepare the cable.

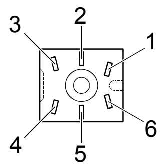


❸ Solder the sensor cable according to the diagram.



Power connection

Pin 1	identification (U ≤4.25 V)
Pin 2	signal output (measuring signal)
Pin 3	signal common GND
Pin 4	supply
Pin 5	supply common GND
Pin 6	screening



Connector, soldering side

WARNING

The supply common (pin 5) and the screen (pin 6) must be connected at the power supply with protective ground.

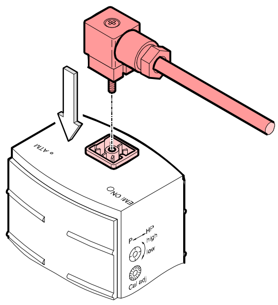
Incorrect connection, incorrect polarity or inadmissible supply voltages can damage the gauge.

❹ Reassemble the connector.

❺ Equip the other end of the cable with a connector which matches the control device.

❻ Plug in the connector.

Secure the connector on the gauge with the screw (tightening torque ≤0.2 Nm).



❼ Connect the other end of the cable to the control device.

4 Operation

When the supply voltage is fed, the measuring signal is available between pins 2 and 3. Over the whole measuring range, the measuring signal is output as logarithm of the pressure (relationship between output signal and pressure → Appendix B).

Allow for a stabilizing time of approx. 10 min. Once the gauge has been switched on, permanently leave it on irrespective of the pressure.

4.1 Measuring Principle, Measuring Behavior

The IMR 265 consists of two separate measuring systems (high pressure (HP) hot cathode and Pirani).

High pressure (HP) hot cathode

The HP hot cathode measuring system is based on the electrode arrangement shown in Figure 1, which grants sensitivity, linearity, and stability even at high pressures.

The measuring principle of this system is based on gas ionization. Electrons emitted by the hot cathode (F) ionize a number of molecules proportional to the pressure in the measuring chamber. The ion collector (IC) collects the thus generated ion current I_+ and feeds it to the electrometer amplifier of the measuring instrument. The ion current is dependent on the emission current I_e, the gas type, and the gas pressure p according to the following relationship:

$$I_+ = I_e \times p \times C$$

Factor C represents the sensitivity of the gauge. It is generally specified for N_2.

The lower measurement limit is 2×10^{-6} hPa.

In order for the entire range of 2×10^{-6} hPa … 1 hPa to be covered, the emission current is continually increased from 4 µA at 1 hPa to 130 µA at 2×10^{-6} hPa (no transients due to switching of the emission current).

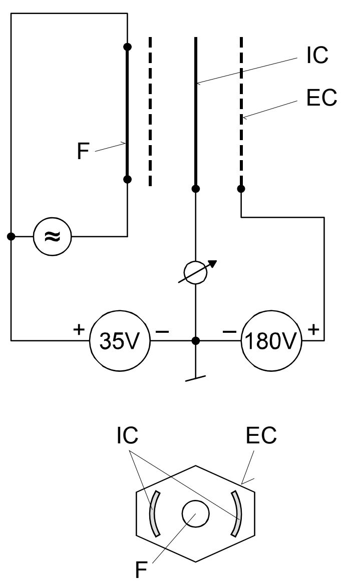


Figure 1

Diagram of the HP measuring system
- F hot cathode (filament)
- IC ion collector
- EC electron collector (anode grid)

Pirani (control range)

Within certain limits, the thermal conductance of gases is pressure dependent. This physical phenomenon is used for pressure measurement in the thermal conductance vacuum meter according to Pirani. A self-adjusting bridge is used as measuring circuit. A thin tungsten wire is used as sensor element. Wire resistance and thus temperature are kept constant through a suitable control circuit. The electric power supplied to the wire is a measure for the thermal conductance and thus the gas pressure. The basic principle of the self adjusting bridge circuit is shown in Figure 2.

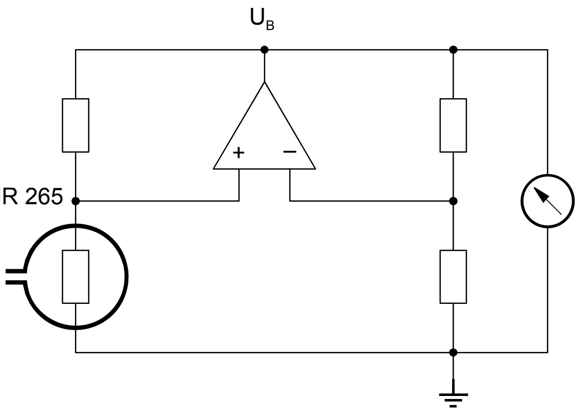
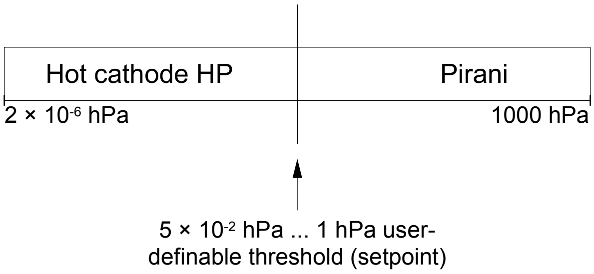


Figure 2

The bridge voltage U_B is a measure for the gas pressure and is further processed electronically (linearization, digitizing).

Measuring range Switching threshold

The IMR 265 covers the measuring range 2×10^{-6} ... 1000 hPa.



- The Pirani permanently monitors the pressure.
- The hot cathode (controlled by the Pirani) is activated only at pressures <1 ... 5×10^{-2} hPa (threshold can be set with a switch).

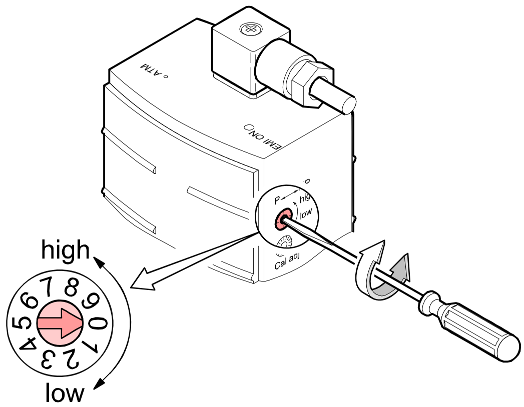
If the measured pressure is higher than the setpoint (which can be selected with a switch within the range of 1 ... 5×10^{-2} hPa), the hot cathode remains off and the Pirani value is output as signal (→ Appendix B).

When the pressure measured by the Pirani drops below the threshold, the hot cathode is activated. This is indicated by a green lamp. After warming up of the measuring system, the hot cathode value is output. When the pressure rises above the set threshold, the hot cathode is deactivated, and the Pirani value is output again.

Selecting the setpoint

The IMR 265 has five definable switching thresholds. It is thus possible to prevent the switching range from being situated within the process pressure range. The factory setting of the threshold is 5×10^{-2} hPa. Another setpoint can be selected via the <P ↔ HP> switch. Since the contamination of the hot cathode system is reduced at low pressures, the lowest possible setpoint should be selected.

> **⚠ Caution**
>
> Since the switch position is only polled upon activation of the gauge, the setpoint should be selected before the gauge is turned on.



Switch position	Corresponding setpoint
0; 1	1 hPa
2; 3	5×10^{-1} hPa
4; 5	2×10^{-1} hPa
6; 7	1×10^{-1} hPa
8; 9	5×10^{-2} hPa (default)

Accuracy

The gauge is factory-calibrated. Adjustment may become necessary due to use in different climatic conditions, extreme temperatures, contamination or aging (→ 🗎 18).

The accuracy is reduced in the pressure range above 1×10^{-1} hPa and below 1×10^{-5} hPa.

Gas type dependence

The output signal is gas type dependent. The characteristic curves (→ Appendix B) are accurate for dry air, N_2 and O_2. They can be mathematically converted for other gases (→ Appendix C).

If you are using a Pfeiffer Vacuum measurement and control unit for Compact Gauges, you can enter a calibration factor to correct the displayed measured value (→ 🕮 of the corresponding measurement unit).

Contamination

Gauge failures due to contamination or wear and tear, as well as expendable parts (filament), are not covered by the warranty.

The IMR 265 is designed in such a way that contamination by process products is minimal. The baffle and the closed internal design of the measuring system as well as the heat generated by the measuring system contribute to this.

The IMR 265 is factory-adjusted in such a way that the hot cathode is switched on at $\approx 5\times10^{-2}$ hPa. The gauge can also be switched externally by the supply voltage, control by the Pirani still being insured.

In case of severe contamination, the measuring system should be replaced (→ 🗎 21).

4.2 Operational Principle of the Gauge

The measuring currents of the HP hot cathode/Pirani sensors are converted into a pressure dependent frequency by a current/frequency-converter. A microcontroller converts this frequency signal into a digital value of the measured pressure. This value is output as analog measuring signal of 0 … 10.2 V at (pin 2 / pin 3), the valid pressure range being 1.5 … 7.5 V (HP hot cathode) and 8.5 … 9.75 V (Pirani).

In addition to converting the measuring signal, the microcontroller's functions include monitoring of the emission and calculation of the total pressure based on the measurements of the two sensors.

5 Maintenance

5.1 Maintenance

DANGER

DANGER: contaminated parts

Contaminated parts can be detrimental to health and environment.

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

5.2 Adjusting the Gauge

The gauge is factory-calibrated. Through use in different climatic conditions, installation position, aging, contamination, exchange of the sensor (→ 🗎 21) a shifting of the characteristic curve can occur and readjustment may thus become necessary.

Adjustment is necessary when

- at atmospheric pressure, the output signal is <9.75 V (pressure indication <1000 hPa)
- during venting, the output voltage of 9.75 V [1)] (pressure indication 1000 hPa) is reached before the pressure reading corresponds to atmosphere

  [1)] The output voltage is limited to 10.2 V by the software.

The following steps have to be performed:

- HV adjustment Pirani
- ATM adjustment Pirani

HV adjustment Pirani

When the gauge is activated, the Pirani measuring circuit is automatically adjusted by the hot cathode circuit (when the pressure reaches the range $p = 1 \ldots 3\times10^{-3}$ hPa for the first time).

ATM adjustment Pirani

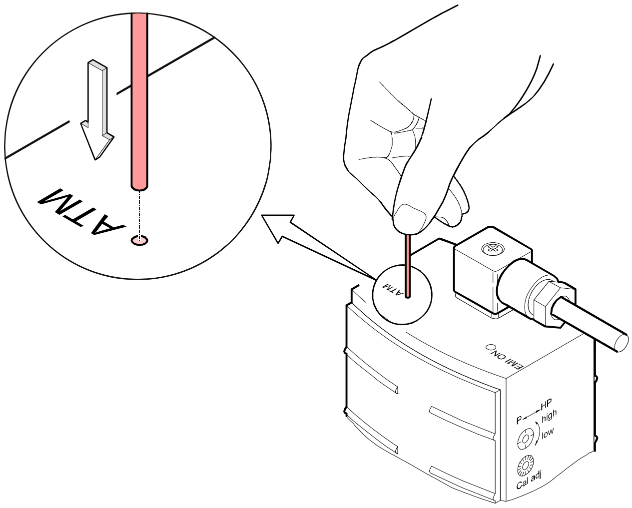
Required tools

- Pin approx. ø1.3 × 50 mm (e.g. a bent open paper clip)

Procedure

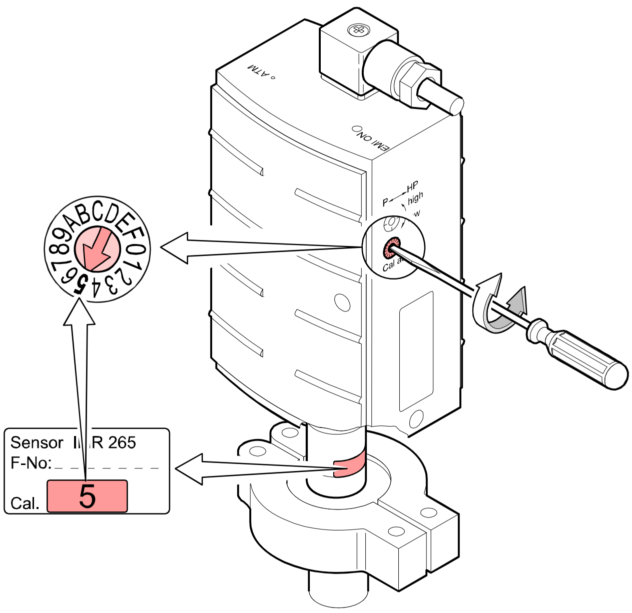
❶ Operate the gauge at atmospheric pressure for approx. 10 minutes. If the gauge was operated before in the hot cathode range, a cooling-down time of approx. 30 minutes is to be expected (gauge temperature = ambient temperature)..

❷ Insert the pin through the opening marked <ATM> and push the button inside for at least 5 s.



5.3 Adjusting the Calibration Setting of the Hot Cathode System

The sensor is factory calibrated. The calibration setting of the hot cathode range 0 … F is printed on the label. Correct this value with the <Cal adj> switch to adjust the electronics to the sensor. Before operating the gauge for the first time or after replacing the sensor, check the calibration setting and adjust it if necessary.



5.4 Cleaning the Gauge

The sensor (except for the baffle) cannot be cleaned. In case of severe contamination, it has to be replaced (→ 🗎 21). It can be assumed that the sensor is severely contaminated if the measured values are no longer stable. Symptoms of contamination are visible dirt and change of color.

A slightly damp cloth normally suffices for cleaning the outside of the gauge. Do not use any aggressive or scouring cleaning agents.

Caution

Make sure that no liquids get inside the product. Allow the gauge to dry thoroughly before putting it into operation again.

5.5 Replacing the Baffle

The baffle can be replaced in case of severe contamination .

Caution

Caution: dirt sensitive area

Touching the product or parts thereof with bare hands increases the desorption rate.

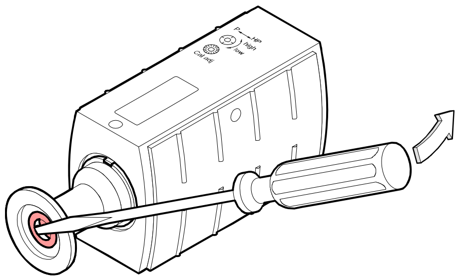
Always wear clean, lint-free gloves and use clean tools when working in this area.

Tools / materials required

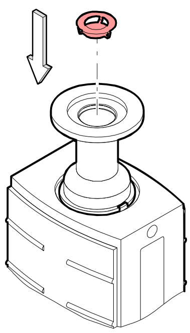
- New baffle (→ 🗎 23)
- Screw driver No. 1
- Stick (e.g. pencil)

Procedure

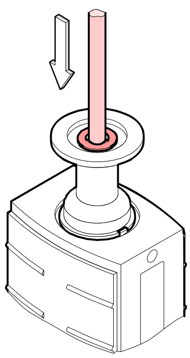
a) Carefully remove the baffle with the screw driver.



b) Carefully place the new baffle on the sensor opening.



c) Using a stick, carefully press the baffle down in the middle until it catches.



5.6 Replacing the Sensor

Replacement is necessary, when

- the sensor is severely contaminated
- the sensor is defective, e.g. filament broken.

Gauge failures due to contamination or wear and tear, as well as expendable parts (filament), are not covered by the warranty.

Tools / materials required

- Allen wrench AF 2.5
- Spare sensor (→ 🗎 24)

Procedure

a) Deinstall the gauge (→ 🗎 22).
b) Remove the electronics unit from the faulty sensor and mount it on the new sensor (→ 🗎 11).
c) Install the gauge (→ 🗎 9).
d) Adjust the calibration setting of the hot cathode system (→ 🗎 19).
e) Put the gauge into operation.
f) Adjust the gauge (→ 🗎 18).

5.7 What to Do in Case of Problems

Problem	Possible cause	Correction
No measuring signal	No supply voltage	Turn on the power supply
	Sensor cable defective or not correctly plugged in	Check sensor cable
	Gauge in undefined condition	Turn gauge off and on again (reset)
Measuring signal 0.3 V	Hot cathode error (sensor faulty)	Replace sensor (→ 🗎 21)
Measuring signal 0.5 V	Pirani error (sensor faulty)	Replace sensor (→ 🗎 21)
	Electronics unit not correctly mounted on sensor	Check connection

In case of an error, it may be helpful to first turn the supply voltage off and on again after 5 s.

6 Deinstallation

DANGER

DANGER: contaminated parts

Contaminated parts can be detrimental to health and environment.

Before beginning 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.

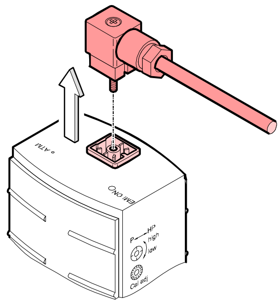
When handling vacuum components, take appropriate measures to ensure cleanliness and prevent damages.

Procedure

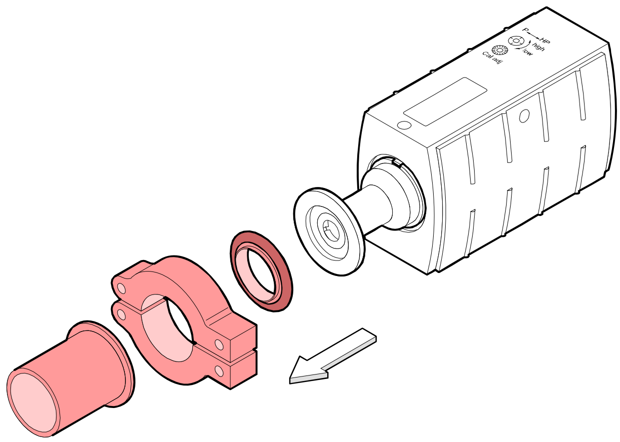
❶ Vent the vacuum system.

❷ Take gauge out of operation.

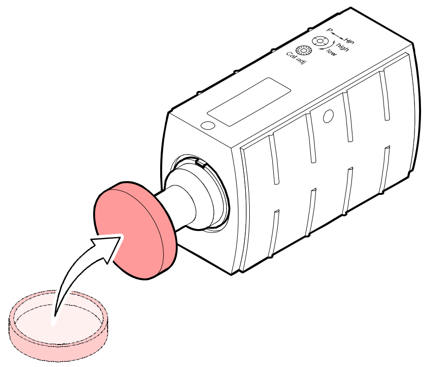
❸ Unplug connection cable.



❹ Remove gauge from the vacuum system.

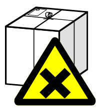


❺ Place the protective cap.



7 Returning the Product

WARNING



WARNING: forwarding contaminated products

Contaminated products (e.g. radioactive, toxic, caustic or microbiological hazard) can be detrimental to health and environment.

Products returned to Pfeiffer Vacuum should preferably be free of harmful substances. Adhere to the forwarding regulations of all involved countries and forwarding companies and enclose a duly completed declaration of contamination *).

*) Form under www.pfeiffer-vacuum.com

Products that are not clearly declared as "free of harmful substances" are decontaminated at the expense of the customer.

Products not accompanied by a duly completed declaration of contamination are returned to the sender at his own expense.

8 Options

	Ordering number
Sensor cable for connection to Pfeiffer Vacuum measurement and control unit for Compact Gauges	
3 m	PT 448 250–T
6 m	PT 448 251–T
10 m	PT 448 252–T
Hirschmann connection socket GO 6 WF, 6 poles, angled, female	B 4707 283 MA
Baffle	PT 120 125–T

9 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
Sensor IMR 265, DN 25 ISO-KF flange (Allen wrench included)	PT 120 111–T
Sensor IMR 265, DN 40 ISO-KF flange (Allen wrench included)	PT 120 112–T
Sensor IMR 265, DN 16 CF-F flange (Allen wrench included)	PT 120 113–T
Sensor IMR 265, DN 40 CF-F flange (Allen wrench included)	PT 120 114–T
Sensor IMR 265, DN 16 ISO-KF flange (Allen wrench included)	PT 120 115–T
Sensor IMR 265, 3/4" tube (Allen wrench included)	PT 120 116–T
Electronics unit IMR 265 (Allen wrench included)	PT 120 110–T

10 Disposal

STOP DANGER

DANGER: contaminated parts

Contaminated parts can be detrimental to health and environment.

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

WARNING

WARNING: substances detrimental to the environment

Products or parts thereof (mechanical and electric components, operating fluids etc.) can be detrimental to the environment.

Dispose of such substances in accordance with the relevant local regulations.

Separating the components

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

Contaminated components

Contaminated components (radioactive, toxic, caustic, or biological hazard etc.) must be decontaminated in accordance with the relevant national regulations, separated according to their materials, and disposed of.

Other components

Such components must be separated according to their materials and recycled.

Appendix

A: Conversion Table for 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 Pa = 1 N/m^2

B: Relationship Output Signal – Pressure

Conversion formulae

Output range hot cathode:

$$p = 10^{U-c_1} \quad \Leftrightarrow \quad U = c_1 + \log_{10} p$$

Output range Pirani:

$$p = 10^{4(U-c_2)} \quad \Leftrightarrow \quad U = c_2 + 0.25 \log_{10} p$$

U	p	c_1	c_2
[V]	[hPa]	7.5	9
[V]	[µbar]	4.5	8.25
[V]	[Torr]	7.625	9.031
[V]	[mTorr]	4.625	8.281

U	p	c_1	c_2
[V]	[micron]	4.625	8.281
[V]	[Pa]	5.5	8.5
[V]	[kPa]	8.5	9.25

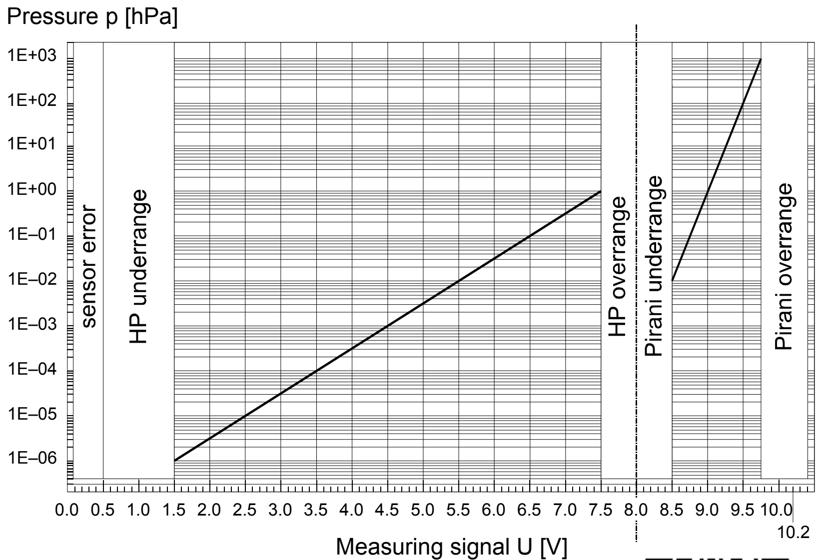
where

p Pressure
U Output signal
c1, c2 Constants (dependent on pressure unit)

valid in the ranges

Hot cathode:
1.50 V ≤ U ≤ 7.50 V
Pirani:
8.50 V ≤ U ≤ 9.75 V

Conversion curve



Conversion table

Output signal U [V]		Pressure p [hPa]	Pressure p [Torr]	Pressure p [Pa]
0 … 0.5		sensor error		
0.5 … 1.5	HP Hot cathode ionization system	underrange		
1.5	HP Hot cathode ionization system	1.0×10^{-6}	7.5×10^{-7}	1.0×10^{-4}
2.5	HP Hot cathode ionization system	1.0×10^{-5}	7.5×10^{-6}	1.0×10^{-3}
3.5	HP Hot cathode ionization system	1.0×10^{-4}	7.5×10^{-5}	1.0×10^{-2}
4.5	HP Hot cathode ionization system	1.0×10^{-3}	7.5×10^{-4}	1.0×10^{-1}
5.5	HP Hot cathode ionization system	1.0×10^{-2}	7.5×10^{-3}	1
6.5	HP Hot cathode ionization system	1.0×10^{-1}	7.5×10^{-2}	10
7.5	HP Hot cathode ionization system	1	7.5×10^{-1}	100
7.5 … 8.0		overrange		
8.0 … 8.5	Pirani system	underrange		
8.5	Pirani system	1.0×10^{-2}	7.5×10^{-3}	1
8.75	Pirani system	1.0×10^{-1}	7.5×10^{-2}	10
9.0	Pirani system	1	7.5×10^{-1}	100
9.25	Pirani system	10	7.5	1000
9.5	Pirani system	100	75	10000
9.75	Pirani system	1000	750	100000
9.75 … 10.2		overrange		

C: Gas Type Dependence

Below 10^{-1} hPa
HP hot cathode measuring range

For gases other than air, the pressure can be determined by means of a simple conversion formula:

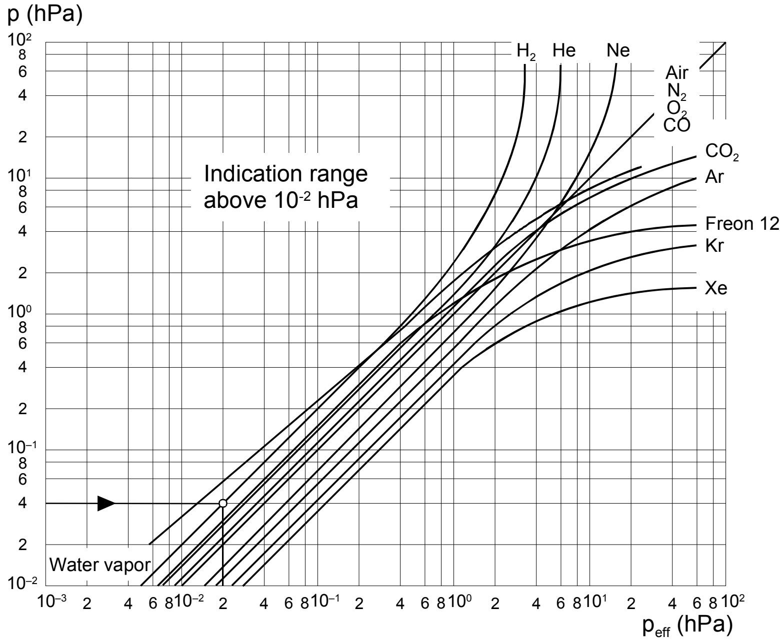
$$p_{eff} = C \times \text{indicated pressure}$$

where

Gas type	C
Air (N_2, O_2)	1.0
Xe	0.4
Kr	0.5
Ar	0.8
H_2	2.4
Ne	4.1
He	5.9

These conversion factors are mean values.

Above 10^{-2} hPa
Pirani measuring range



Caution

A mixture of gases and vapors is often involved. In this case, accurate determination is only possible with a partial-pressure measuring instrument.

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