

INSTRUCTION SHEET

EN

Translation of the original instructions

IKR 270

Compact Cold Cathode Gauge, All-metal

BG 5115 BDE / A (2018-10)

PFEIFFER VACUUM

Validity

This document applies to products with part numbers:
Hirschmann connector

PT R21 251 (DN 40 CF-F flange short type)
PT R21 261 (DN 40 CF-F flange long type)

FCC connector

PT T14 358 002 (DN 40 CF-F flange short type)
PT T14 858 002 (DN 40 CF-F flange long type)

The part number can be taken from the product nameplate.

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

About this document

This document describes the installation and operation of the products listed above.

For further information please refer to the Operating Instructions which is separately available [1].

Intended use

The above Compact Cold Cathode Gauges have been designed for vacuum measurement of gases in a pressure range of 5×10^{-11} ... 1×10^{-2} hPa.

The gauge with Hirschmann connector can be operated in connection with a Pfeiffer Vacuum controller for compact gauges or with another appropriate controller.

The gauge with FCC connector can be operated in connection with an appropriate controller.

Functional Principle

The Compact Cold Cathode Gauge IKR 270 functions with a cold cathode ionization measurement circuit (according to the inverted magnetron principle).

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

Safety

Symbols Used



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.



Information on preventing any kind of physical injury.



Information on preventing extensive equipment and environmental damage.



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



Note

General Safety Information

- Adhere to the applicable regulations and take the necessary precautions for the process media used.
- Consider possible reactions between the materials (→ Technical Data) and the process media.
- 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.



Magnetic fields

Strong magnetic fields can disturb electronic devices like heart pacemakers or impair their function.



Maintain a safety distance of ≥ 10 cm between the magnet and the heart pacemaker or prevent the influence of strong magnetic fields by anti-magnetic shielding.

Communicate the safety instructions to all other users.

Responsibility and Warranty

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

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

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 (e.g. seals), are not covered by the warranty.

Installation

Vacuum Connection



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.



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.



The gauge must be electrically 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.



Electric arcing
Helium may cause electric arcing with detrimental effects on the electronics of the product.
Before performing any tightness tests put the product out of operation and remove the electronics unit.

The gauge may be mounted in any orientation. A horizontal to upright orientation is to be preferred, to keep condensates and particles from getting in.

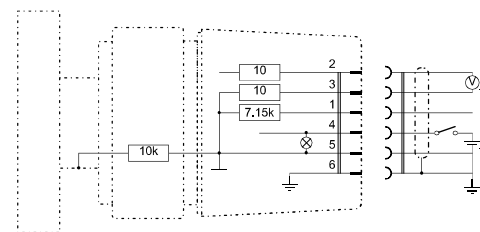
When making CF flange connections, it can be advantageous to temporarily remove the magnet (→ [1]).

The space necessary can be gathered from the diagram (→ "Technical Data").

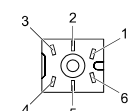
Power Connection

Make sure that the gauge is correctly flanged (see above).
If no sensor cable is available, make one according to the diagram.

Hirschmann Connector

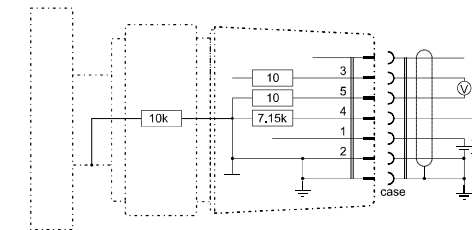


Electrical connection
Pin 1 Identification
Pin 2 Signal output (measuring signal)
Pin 3 Signal common
Pin 4 Supply
Pin 5 Supply common
Pin 6 Screening

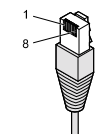


Hirschmann 6-pin soldering side

FCC Connector



Electrical connection
Pin 1 Supply
Pin 2 Supply common
Pin 3 Signal output (measuring signal)
Pin 4 Identification
Pin 5 Signal common case
Pin 6, 7, 8: n.c.



8-pin FCC68 connector

Operation

When voltage is being supplied to the gauge, the measuring signal is available between pins 2 and 3 (Hirschmann connector), or between pins 3 and 5. (→ Technical data for the relationship between the measuring signal and the pressure).

The green lamp on the gauge indicates the operating state:
Supply voltage present.
No supply voltage.



Turn on the gauge only at pressures $< 10^{-2}$ hPa to prevent excessive contamination.
If you are using a Pfeiffer Vacuum measurement unit with at least two gauge connections, the cold cathode gauge can be controlled, for example, by a Pirani gauge.

Gas Type Dependence

The measurement value is gas dependent. The display applies to dry air, N_2 , O_2 , and CO (→ technical data). For other gases, it has to be converted (→ technical data). This can be done by entering the corresponding calibration factor on the Pfeiffer Vacuum measurement unit. (→ respective [1]).

Ignition delay

When the cold cathode gauge is switched on, an ignition delay occurs. The delay time increases at low pressures and for clean, degassed gauges it is typically:

10^7 hPa \approx 0.1 minute
 10^8 hPa \approx 1 minute
 10^9 hPa \approx 5 minutes
 10^{10} hPa \approx 20 minutes
 5×10^{11} hPa \approx 30 minutes

The ignition is a static process. Already a small amount of depositions on the inner surfaces can have a strong influence on it.

Adjusting the Gauge

The gauge is factory calibrated and ready for use. It cannot be readjusted.

Technical Data

Measurement principle	Cold cathode ionization measurement circuit (according to the inverted magnetron principle)
Measurement range (air, N_2)	5×10^{-11} ... 1×10^{-2} hPa
Accuracy	1×10^{-9} ... 1×10^{-3} hPa $\approx \pm 30$ % beyond this range up to factor 2
Repeatability	1×10^{-9} ... 1×10^{-3} hPa $\approx \pm 5$ %
Output signal (measuring signal)	≈ 0 V ... $\approx +10.5$ V
Measurement range	1.96 V ... 8.6 V
Voltage vs. pressure	logarithmic, 0.8 V / decade
Error signal	< 0.5 V (no supply)

Output impedance	2×10 Ω
Minimum load	10 k Ω , short-circuit proof
Response time	pressure dependent
$p > 10^6$ hPa	< 10 ms
$p = 10^8$ hPa	≈ 1 s

Gauge identification	7.15 k Ω resistance referenced to supply common
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Supply

	The gauge may only be connected to supply or measurement units that conform to the requirements of a grounded protective extra-low voltage (PELV). The connection to the gauge has to be fused ¹⁾ .
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Voltage at the gauge	14.5 ... 30.0 V= (ripple max. 1 V _{pp})
Power consumption	≤ 2 W
Fuse ¹⁾	≤ 1 AT

Electrical connection	PT R21 xxx	Hirschmann compact connector type GO 6, 6-pin, male
	PT T14 xxx xxx	FCC68 connector, 8-pin
Cable	PT R21 xxx	5-pin plus screen
	PT T14 xxx xxx	5-pin plus screen
Cable length max.	PT R21 xxx	100 m (0.25 mm ² conductor) 150 m (0.34 mm ² conductor) 500 m (1.0 mm ² conductor)
	PT T14 xxx xxx	50 m (0.14 mm ² conductor)

Operating voltage (in the measuring chamber)	≤ 3.3 kV
Operating current (in the measuring chamber)	≤ 100 μ A

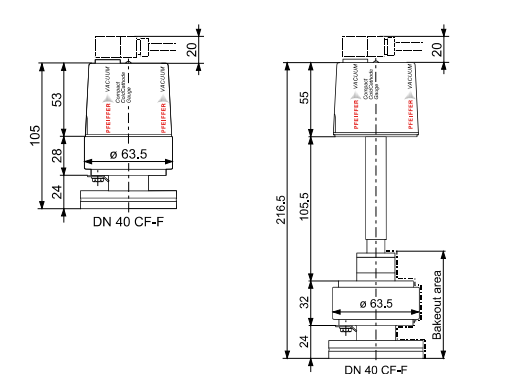
Grounding concept	→ "Electrical Connection"
Vacuum flange - measuring common	connected via 10 k Ω (max. voltage differential with resp. to safety ± 50 V with resp. to accuracy ± 10 V)
Supply common - signal common	conducted separately; for cable lengths (≥ 10 m) differential measuring is recommended

Materials on the vacuum side	
Feedthrough isolation	ceramic (Al_2O_3)
Internal seal	Ag
Flange	stainless steel (1.4306 / AISI 304L)
Anode	Mo
Ignition aid	stainless steel (1.4310 / AISI 301)
Internal volume	≈ 20 cm ³
Pressure max.	≤ 1000 kPa (absolute), limited to inert gases and temperatures < 100 °C

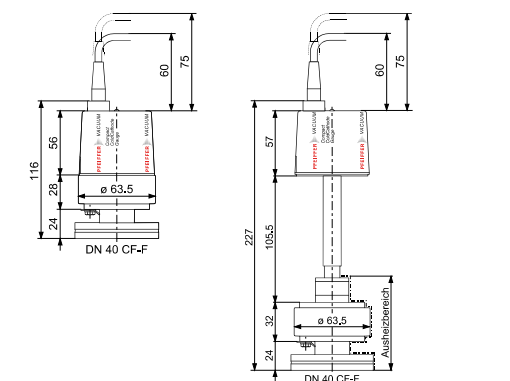
Admissible temperatures	-40 °C ... +65 °C
Storage	
Operation of all types of long types	+5 °C ... +55 °C 250 °C in bakeout area, see dimension drawing
Bakeout short types	250 °C ²⁾ (without electronics unit)
long types	250 °C ²⁾ in bakeout area, see dimension drawing
Relative humidity	max. 80% up to +31 °C decreasing to 50 % at +40 °C
Application	for indoor use only altitude up to 2000 m
Type of protection	IP 40

²⁾ Any magnetic shielding (accessory) must be removed.

Dimensions [mm]



FCC connector



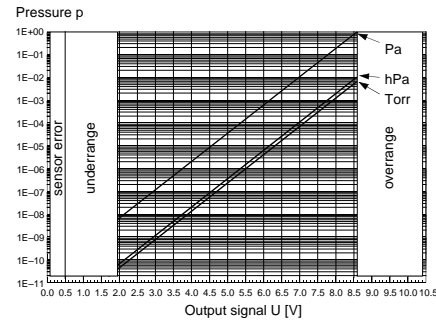
Weight	950 g (DN 40 CF-F flange short type) 1100 g (DN 40 CF-F flange long type)
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¹⁾ Pfeiffer Vacuum controllers for compact gauges fulfill this requirement.

Output Signal vs. Pressure



$$U = c + 0.8 \times \log_{10} p \quad \Leftrightarrow \quad p = 10^{1.25 \times U - d}$$

U	p	c	d
[V]	[hPa]	10.2	12.75
[V]	[µbar]	7.8	9.75
[V]	[Torr]	10.3	12.875
[V]	[mTorr]	7.9	9.875

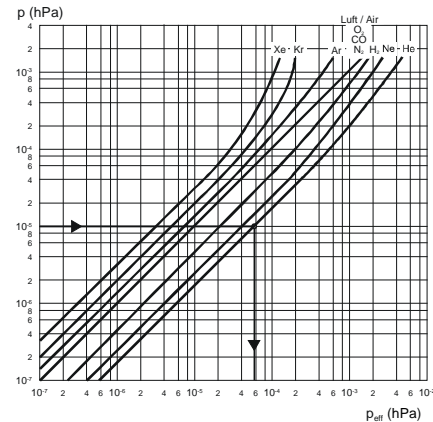
U	p	c	d
[V]	[micron]	7.9	9.875
[V]	[Pa]	8.6	10.75
[V]	[kPa]	11.0	13.75

where:

U	output signal	valid in the range	5 × 10 ⁻¹¹ hPa < p < 1 × 10 ⁻² hPa
p	pressure		
c, d	constants (dependent on pressure unit)		3.75 × 10 ⁻¹¹ Torr < p < 7.5 × 10 ⁻³ Torr 5 × 10 ⁻⁹ Pa < p < 1 Pa

Gas Type Dependence

Indicated pressure
(Gauge calibrated for air)



Indication range below 10⁻⁵ hPa

In the range below 10⁻⁵ hPa the pressure indication is linear. For gases other than air the pressure can be determined by means of a simple conversion formula:

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

where: gas type	K
air (N ₂ , O ₂ , CO)	1.0
Xe	0.4
Kr	0.5
Ar	0.8
H ₂	2.4
Ne	4.1
He	5.9

Maintenance, Troubleshooting


→ [1]

If the gauge is operated under high pressures or under dirty conditions, it must be regularly cleaned.

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

Returning the Product

WARNING



Forwarding contaminated products
Products returned to Pfeiffer Vacuum for service or repair should preferably be free of harmful substances (e.g. radioactive, toxic, caustic or microbiological).

Adhere to the forwarding regulations of all involved countries and forwarding companies and enclose a completed declaration of contamination¹⁾.


¹⁾ 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.

When returning a product for service, put it in a tight and impact resistant package.


Disposal

WARNING



Substances detrimental to the environment
Products, operating materials etc. may require disposal in accordance with special regulations. Dispose of environmentally detrimental substances according to local regulations.

DANGER



Contaminated parts
Contaminated parts can be detrimental to your 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.

Separating the parts

After disassembly of the product separate the parts into the following categories for disposal:

- Components with exposure to process gases**
Components which have been exposed to radioactive, toxic, caustic, or microbiological process gases must be disposed of in accordance with the relevant national regulations.
Components which have been exposed to other process gases must be separated according to their materials and recycled.
- Components without exposure to process gases**
Such components must be separated according to their materials and recycled.

Conversion Table

	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	1.332	1.332 × 10 ⁻³	133.32	1.3332	0.1332	1	
mm HG							1

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

Further Information

- [1] www.pfeiffer-vacuum.com
Operating Instructions IKR 270
BG 5008 BDE (German)
BG 5008 BEN (English)
BG 5008 BFR (English)

EU Declaration of Conformity



We, Pfeiffer Vacuum, hereby declare that the equipment mentioned below comply with the provisions of the following Directives:

- 2014/30/EU, OJ L 96/79, 29.3.2014 (EMC Directive; Directive relating to electromagnetic compatibility)
- 2011/65/EU, OJ L 174/88, 1.7.2011 (RoHS Directive; Directive on the restriction of the use of certain hazardous substances in electrical and electronic equipment)

Product

IKR 270

Standards

Harmonized and international/national standards and specifications:

- EN 61000-6-2:2005 (EMC: generic immunity standard)
- EN 61000-6-3:2007 + A1:2011 (EMC: generic emission standard)
- EN 61010-1:2010 (Safety requirements for electrical equipment for measurement, control and laboratory use)
- EN 61326-1:2013; Group 1, Class B (EMC requirements for electrical equipment for measurement, control and laboratory use)

Manufacturer / Signatures

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Asslar, 25. October 2018

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