A PASSION FOR PERFECTION

PFEIFFER VACUUM

IKR 360, IKR 360 C, IKR 361, IKR 361 C

Compact Cold Cathode Gauges

PKR 360, PKR 360 C, PKR 361, PKR 361 C

Compact FullRange® Gauges

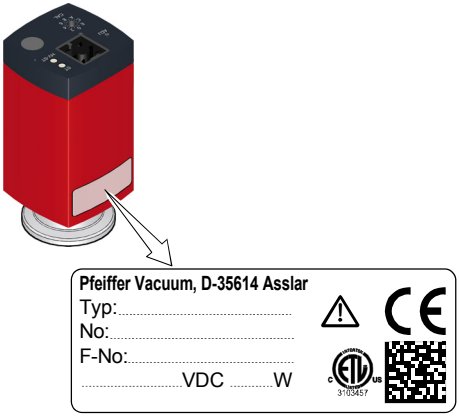
Operating Instructions

BG 5164 BEN (2015-02)

EN

Product Identification

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



Validity

This document applies to products with part numbers:

IKR 360 (low current)

PT T00 140 010	(DN 25 ISO-KF
PT T00 140 011	(DN 25 ISO-KF, ceramic, IKR 360 C
PT T00 150 010	(DN 40 ISO-KF)
PT T00 150 011	(DN 25 ISO-KF, ceramic, IKR 360 C)
PT T00 350 010	(DN 40 CF-F)
PT T00 350 011	(DN 40 CF-F, ceramic, IKR 360 C)

IKR 361 (high current)

PT T01 140 010	(DN 25 ISO-KF)
PT T01 140 011	(DN 25 ISO-KF, ceramic, IKR 361 C)
PT T01 150 010	(DN 40 ISO-KF)
PT T01 150 011	(DN 25 ISO-KF, ceramic, IKR 361 C)
PT T01 350 010	(DN 40 CF-F)
PT T01 350 011	(DN 40 CF-F, ceramic, IKR 361 C)

PKR 360 (low current)

PT T02 140 010	(DN 25 ISO-KF)
PT T02 140 011	(DN 25 ISO-KF, ceramic, PKR 360 C)
PT T02 150 010	(DN 40 ISO-KF)
PT T02 150 011	(DN 25 ISO-KF, ceramic, PKR 360 C)
PT T02 350 010	(DN 40 CF-F)
PT T02 350 011	(DN 40 CF-F, ceramic, PKR 360 C)

PKR 361 (high current)

PT T03 140 010	(DN 25 ISO-KF)
PT T03 140 011	(DN 25 ISO-KF, ceramic, PKR 361 C)
PT T03 150 010	(DN 40 ISO-KF)
PT T03 150 011	(DN 25 ISO-KF, ceramic, PKR 361 C)
PT T03 350 010	(DN 40 CF-F)
PT T03 350 011	(DN 40 CF-F, ceramic, PKR 361 C)

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 a IKR 36x gauges with vacuum connection DN 25 ISO-KF. They apply to the other gauges by analogy.

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

Intended Use

IKR 360, IKR 361

The Compact Cold Cathode Gauges IKR 360 and IKR 361 have been designed for vacuum measurement of gases in the pressure range of 1×10^{-9} … 1×10^{-2} mbar.

They are intended for operation in connection with a Pfeiffer Vacuum measurement unit for Compact Gauges or with another suitable controller.

PKR 360, PKR 361

The Compact FullRange® Gauges PKR 360 and PKR 361 have been designed for vacuum measurement of gases in the pressure range of 1×10^{-9} … 1000 mbar.

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

They are intended for operation in connection with a Pfeiffer Vacuum measurement unit for Compact Gauges or with another suitable controller.

Functional Principle

IKR 360, IKR 361

The gauge functions with a cold cathode ionization measurement circuit (according to the inverted magnetron principle).

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

PKR 360, PKR 361

The gauge consists of two separate measuring systems (the Pirani and the cold cathode system according to the inverted magnetron principle). They are combined in such a way that for the user, they behave like one measuring system.

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

Scope of Delivery

1× gauge
1× pin for adjusting settings via buttons
1× Operating Instructions German
1× Operating Instructions English
1× Safety Guide

Trademark

FullRange® Pfeiffer Vacuum GmbH

Contents

For cross-references within this document, the symbol (→ 🗎 XY) is used.

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.

Notice

<…> Labeling

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 with the product materials.

  Consider possible reactions (e.g. explosion) of the process media due to the heat generated by the product (PKR 36x only).

- 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 interventions (modifications, alterations etc.) on the product
- use the product with accessories not listed in the 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. ionization chamber, ignition aid, Pirani filament (PKR 36x only)), are not covered by the warranty.

2 Technical Data

Display range (air, N_2)	
IKR 36x	1×10^{-9} … 1×10^{-2} mbar
PKR 36x	1×10^{-9} … 1000 mbar
Measurement range (air, N_2)	
IKR 36x	1×10^{-8} … 1×10^{-2} hPa
PKR 36x	1×10^{-8} … 1000 hPa
Accuracy IKR (N_2)	
1×10^{-8} … 1×10^{-2} hPa	30% of reading
Accuracy PKR (N_2)	
1×10^{-8} … 100 hPa	30% of reading
100 … 1000 hPa	50% of reading
Repeatability (N_2)	
IKR, 1×10^{-8} … 1×10^{-2} hPa	5% of reading
PKR, 1×10^{-8} … 100 hPa	5% of reading
Gas type dependence	
IKR 36x	→ 17
PKR 36x	→ 19
Voltage range (analog output)	0 … +10.5 V
Display range	
IKR 36x	+1.5 … +8.5 V (dc)
PKR 36x	+1.397 … +8.6 V (dc)
Measurement range	
IKR 36x	+2.5 … +8.5 V (dc)
PKR 36x	+2.0 … +8.6 V (dc)
Voltage vs. pressure	
IKR 36x	1 V/decade, logarithmic
PKR 36x	0.6 V/decade, logarithmic
Error signal	
IKR 36x	<+0.5 V
PKR 36x	+9.5 … +10.5 V

Output impedance	2 × 4.7 Ω, short-circuit proof
Load impedance	≥10 kΩ, short-circuit proof
Step response time	pressure dependent
$p > 10^{-6}$ hPa	<100 ms
$p = 10^{-8}$ hPa	≈1 s
Gauge identification IKR 36x	5.1 kΩ referenced to supply common
Gauge identification PKR 36x	
Pirani only operation	11.1 kΩ referenced to supply common
Combined Pirani- / cold cathode operation	9.1 kΩ referenced to supply common
The following conditions must be fulfilled:	
Polarity	the polarity of pin 1 referenced to supply common is always positive
Measurement	
with constant current	measurement current 0.2 … 0.3 mA
with constant voltage	measurement voltage 2 … 3 V

Supply

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) and limited power source (LPS), Class 2. The connection to the gauge has to be fused [1].

[1] Pfeiffer Vacuum measurement and control units for Compact Gauges fulfill this requirement.

Supply voltage at the gauge [2]	Class 2 / LPS +14.5 … +30 V (dc)
Ripple	≤1 V_{pp}
Power consumption	≤2 W
Fuse to be connected [1]	≤1 AT
High voltage in the measuring chamber	
Ignition voltage	≤4.5 kV
Operating voltage	≤3.3 kV
Current in the measuring chamber	
IKR / PKR 361, High current	≤500 µA
IKR / PKR 361, Low current	≤100 µA
Electrical connection	Hirschmann compact connector type GO 6, 6-pin, male
Sensor cable	5-pin plus shielding
Cable length	≤75 m (0.14 mm^2/conductor) ≤100 m (0.34 mm^2/conductor) ≤300 m (1.0 mm^2/conductor)
Grounding concept	→ "Power Connection"
Vacuum connection – signal common	connected via 10 kΩ (potential difference ≤16 V)
Supply common – signal common	conducted separately; differential measurement is recommended

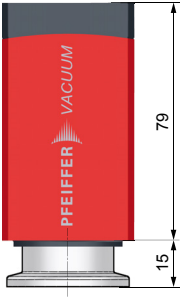
[2] The minimum voltage of the power supply unit must be increased proportionally to the length of the sensor cable.

Materials exposed to vacuum	
Vacuum connection	stainless steel (1.4435)
Measuring chamber	stainless steel (1.4435)
Pirani filament (PKR 36x)	W
Feedthrough, IKR/PKR 36x	
Isolation	glass, ceramic (Al_2O_3)
Ring	stainless steel (1.4435)
Anode, Pin	Ni alloy
Feedthrough, IKR/PKR 36x C	ceramic coated
Ionization chamber	stainless steel
Ignition aid	stainless steel (1.4310)
Internal volume	
DN 25 ISO-KF	≈19.9 cm^3
DN 40 ISO-KF	≈20.9 cm^3
DN 40 CF-F	≈25.2 cm^3
Permissible pressure (absolute)	1000 kPa limited to inert gases <55°C
Bursting pressure (absolute)	>1300 kPa

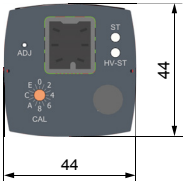
Permissible temperatures	
Operation	+5 °C … +55 °C
Pirani filament (PKR)	120 °C
Bakeout	≤150 °C [3)]
Storage	–40 °C … +70 °C
Relative humidity for 30 days a year	
$1×10^{-8}$ … $1×10^{-2}$ hPa	≤70% (non-condensing)
$1×10^{-7}$ … $1×10^{-2}$ hPa	≤95% (non-condensing)
Mounting orientation	any
Use	indoors only, altitude up to 6000 m NN
Degree of protection	IP 40

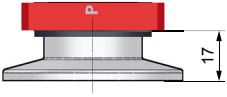
[3)] Without electronics unit.

Dimensions [mm]



DN 25 ISO-KF





DN 40 ISO-KF

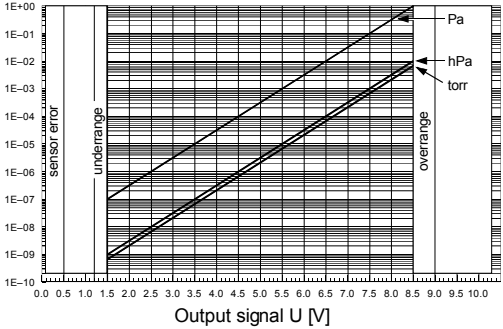
DN 40 CF-F

Weight

DN 25 ISO-KF	<280 g
DN 40 ISO-KF	<320 g
DN 40 CF-F	<570 g

2.1 Output Signal vs. Pressure

IKR 360, IKR 361 (display range 1.5 … 8.5 V)



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

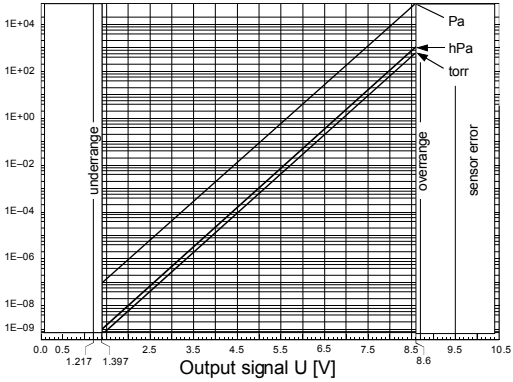
valid in the range 1×10^{-9} hPa < p < 1×10^{-2} hPa
7.5×10^{-10} Torr < p < 7.5×10^{-3} Torr
1×10^{-7} Pa < p < 1 Pa

	hPa	Pa	Torr
c	10.5	8.5	10.625

where p pressure
U output signal
c constant (pressure unit dependent)

PKR 360, PKR 361 (display range 1.397 … 8.6 V)

Pressure p



$p = 10^{1.667U-d}$ ⇔ $U = c + 0.6 \log p$

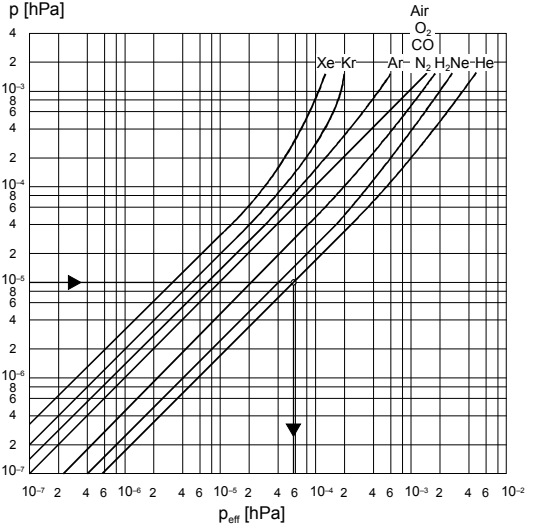
valid in the range 1×10^{-9} hPa < p < 1000 hPa
7.5×10^{-10} Torr < p < 750 Torr
1×10^{-7} Pa < p < 1×10^{5} Pa

	hPa	Pa	Torr
c	6.798	5.598	6.873
d	11.33	9.333	11.46

where p pressure
U output signal
c,d constant (pressure unit dependent)

2.2 Gas Type Dependence IKR 36x

Indicated pressure (gauge calibrated for air)



Indication range below 10^{-5} mbar

In the range below 10^{-5} the pressure indication is linear. For gases other than air, the pressure can be determined by means of a simple conversion formula:

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

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

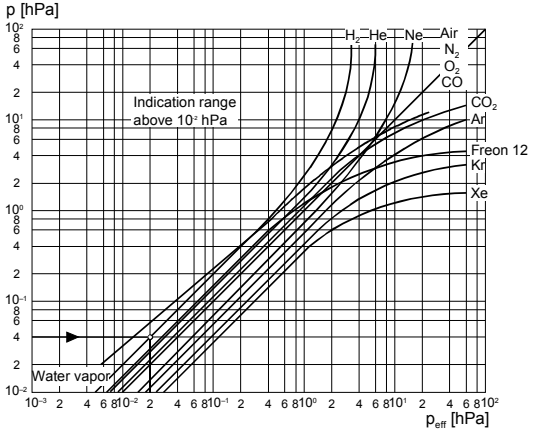
These conversion factors are average values.

A mixture of gases and vapors is often involved. In this case, accurate determination is only possible with a partial pressure measurement instrument, e.g. a quadrupole mass spectrometer.

2.3 Gas Type Dependence PKR 36x

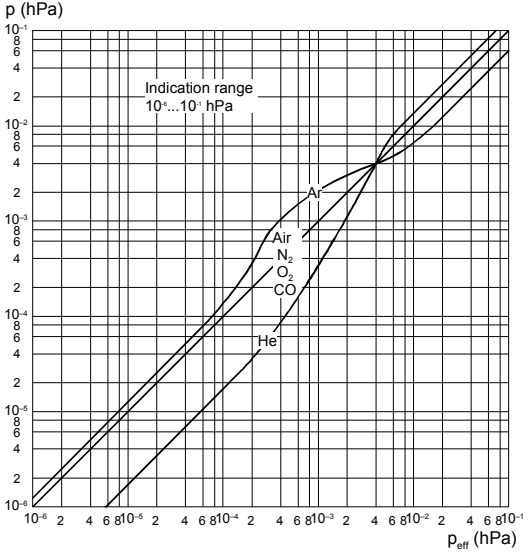
Indication range from 10^2 … 10^{-2} hPa (Pirani-only operation)

Indicated pressure (gauge calibrated for air)



Indication range from 10^{-6} … 0.1 hPa

Indicated pressure (gauge calibrated for air)



Indication range below 10^{-5} mbar

In the range below 10^{-5} the pressure indication is linear. For gases other than air, the pressure can be determined by means of a simple conversion formula:

p_{eff} = K × 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

These conversion factors are average values.

A mixture of gases and vapors is often involved. In this case, accurate determination is only possible with a partial pressure measurement instrument, e.g. a quadrupole mass spectrometer.

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: overpressure in the vacuum system >250 kPa

KF flange connections with elastomer seals (e.g. O-rings) cannot withstand such pressures. Process media can thus leak and possibly damage your health.

Use O-rings provided with an outer centering ring.

DANGER

DANGER: protective ground

Products that are not correctly connected to ground can be extremely hazardous in the event of a fault.

Electrically connect the gauge to the grounded vacuum chamber. This connection must conform to the requirements of a protective connection according to EN 61010:

- CF connections fulfill this requirement
- For gauges with a KF flange, use a conductive metallic clamping ring.

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.

Caution

Caution: dirt sensitive area

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

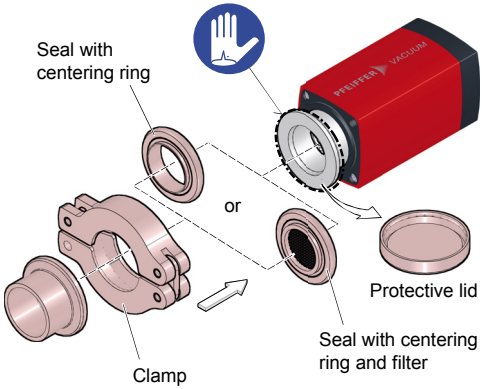
Always wear clean, lint-free gloves and use clean tools when working in this area.

Mount the gauge so that no vibrations occur. Vibrations at the gauge cause a deviation of the measured values.

The gauge may be mounted in any orientation. To keep condensates and particles from getting into the measuring chamber preferably choose a horizontal to upright position.

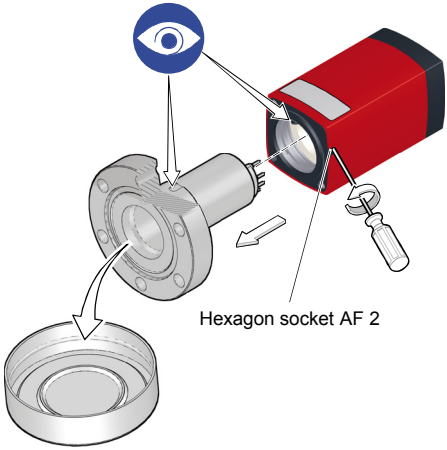
For potentially contaminating applications and to protect the measurement system against contamination, installation of the optional seal with centering ring and filter is recommended.

Remove the protective lid and connect the product to the vacuum system.




Keep the protective lid.

When making a CF flange connection, it may be advantageous to temporarily remove the electronics unit.



Keep the protective lid.

WARNING

WARNING: 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.

3.2 Power Connection

Make sure the vacuum connection is properly made (→ 22).

DANGER

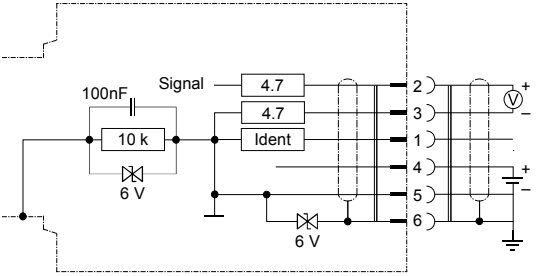
The gauge may only be connected to power supplies, instruments or control devices that conform to the requirements of a grounded protective extra-low voltage (PELV) and limited power source (LPS), Class 2. The connection to the gauge has to be fused. [4)]

Ground loops, differences of potential, or EMC problems may affect the measurement signal. For optimum signal quality, please do observe the following notes:

- Use an overall metal braided shielded cable. The connector must have a metal case.
- Connect the supply common with protective ground directly at the power.
- Use differential measurement input (signal common and supply common conducted separately).
- Potential difference between supply common and housing ≤16 V (overvoltage protection).

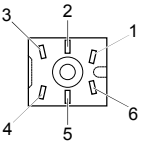
4) Pfeiffer Vacuum controllers fulfill these requirements.

If no sensor cable is available, make one according to the following diagram. Connect the sensor cable.



Electrical connection

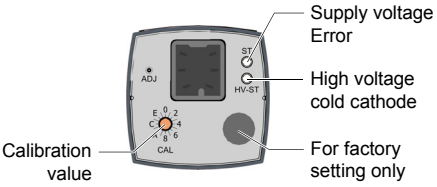
Pin 1 Gauge identification
Pin 2 Signal output (measuring signal)
Pin 3 Signal common
Pin 4 Supply (14.5 … 30 V (dc))
Pin 5 Supply common GND
Pin 6 Shielding



Female cable connector, soldering side

4 Operation

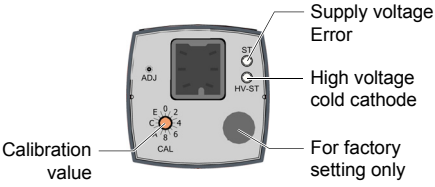
4.1 Status Indication IKR



LED		Meaning
<ST>	<HV-ST>	
off	off	No supply voltage
lit solid green	off	Supply voltage = ok, no high voltage in the measuring chamber
lit solid yellow	blinking green	Supply voltage = ok, pressure in the cold cathode range, cold cathode has not ignited
lit solid green	lit solid green	Cold cathode has ignited
blinking red	off	EEPROM error
lit solid yellow	lit solid green	Over- or underrange

Troubleshooting (→ 46).

4.2 Status Indication PKR



LED		Meaning
<ST>	<HV-ST>	
off	off	No supply voltage
lit solid green	off	Supply voltage = ok, Pirani active, no high voltage in the measuring chamber
lit solid yellow	blinking green	Supply voltage = ok, pressure in the cold cathode range, cold cathode has not ignited
lit solid green	lit solid green	Combined operation
lit solid red	off	Measurement system error
blinking red	off	EEPROM error
lit solid yellow	off	Overrange
lit solid yellow	lit solid green	Underrange

Troubleshooting (→ 🗎 46).

4.3 Put IKR 365x Into Operation

Caution

Turn on the gauge only at pressures <10^{-2} mbar to prevent excessive contamination.

If you are using a Pfeiffer Vacuum measurement unit for Compact Gauges with at least two gauge connections, the cold cathode gauge can be controlled, for example, by a Pirani gauge.

When the supply voltage is applied, the measuring signal is available at the signal output.

4.4 Put PKR 36x Into Operation

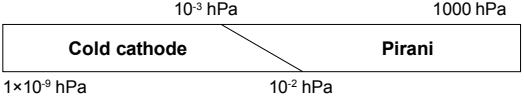
When the supply voltage is applied, the measuring signal is available at the signal output (→ 🗎 26).

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

Measurement Principle, Measuring Behavior

The gauge consists of two separate measuring systems (Pirani and cold cathode system according to the inverted magnetron principle). They are combined in such a way that for the user, they behave like one measuring system.

The optimum measuring configuration for the particular pressure range, in which measurement is performed, is used:



- The Pirani measuring circuit is always on
- The cold cathode measuring circuit is controlled by the Pirani circuit and is activated only at pressures $p < 1\times10^{-2}$ hPa

The identification output (pin 1) indicates the current status of the gauge:

		LED	
		<ST>	<HV-ST>
• $p > 1\times10^{-2}$ hPa: (Pirani-only operation)	Pin 1 = 11.1 kΩ	lid solid green	off
• $p < 1\times10^{-2}$ hPa: (Pirani-only operation, cold cathode not ignited)	Pin 1 = 11.1 kΩ	lid solid yellow	blinking green
• $p < 1\times10^{-2}$ hPa: (combined operation)	Pin 1 = 9.1 kΩ	lid solid green	lid solid green

As long as the cold cathode measuring circuit has not ignited, the measuring value of the Pirani is output as measuring signal (if $p < 5\times10^{-4}$ hPa: "Pirani-Underrange" is displayed).

4.5 Gas Type Dependence

The measurement value is gas dependent. The pressure reading applies to dry air, O_2, CO and N_2. For other gases, it has to be corrected:

- (IKR → 🗎 17)
- (PKR → 🗎 19).

If the gauge is operated with a Pfeiffer Vacuum controller, a calibration factor for correction of the actual reading can be applied (→ 🕮 of the corresponding controller).

4.6 Ignition Delay

An ignition delay occurs when cold cathode gauges are switched on. The delay time increases at low pressures and is typically:

1×10^{-5} … 1×10^{-2} hPa	<	1	second (typical)
1×10^{-7} … 1×10^{-5} hPa	<20		seconds (typical)
5×10^{-9} … 1×10^{-7} hPa	<	2	minutes (typical)
<5×10^{-9} hPa	<20		minutes (typical)

PKR 36x only

As long as the cold cathode measuring circuit has not ignited, the measuring value of the Pirani is output as measuring signal ("Pirani-Underrange" is displayed for pressures p < 5×10^{-4} hPa). The identification output (pin 1) indicates the Pirani-only operation.

If the gauge is activated at a pressure p < 3×10^{-9} hPa, the gauge cannot recognize whether the cold cathode system has ignited. It indicates "Pirani-Underrange").

Once flanged on, permanently leave the gauge in the operating mode irrespective of the pressure range. Like this, the ignition delay of the cold cathode measuring circuit is always negligible (<1 s), and thermal stabilizing effects are minimized.

4.7 Contamination

Gauge failures due to contamination or wear and tear, as well as expendable parts (e.g. ionization chamber, ignition aid, Pirani filament (PKR 36x)), are not covered by the warranty.

Gauge contamination is influenced by the process media used as well as any existing or new contaminants and their respective partial pressures. Continuous operation in the range of 10^{-4} mbar ... 10^{-2} mbar can cause severe contamination as well as reduced up-time.

Contamination of the gauge generally causes a deviation of the measured values:

- PKR 36x only: In the high pressure range (1×10^{-3} mbar … 0.1 mbar), the pressure reading is too high (contamination of the Pirani element). Readjustment of the Pirani → 🗎 36.
- In the low pressure range ($p < 1\times10^{-3}$ mbar), the pressure indication is usually too low (as a consequence of the contamination of the cold cathode system). In case of severe contamination, instabilities can occur (layers of the measuring chamber peel off). Contamination due to isolating layers can even lead to a complete failure of the discharge ("Underrange" is displayed).

Contamination can to a certain extent be reduced by:

- geometric protection (e.g. screenings, elbows) against particles that spread rectilinearly
- mounting the flange of the gauge at a place where the partial pressure of the pollutants is particularly low.

Special precautions are required for vapors deposited under plasma (of the cold cathode measuring system). While vapors occur it may even be necessary

- to temporarily switch of the gauge
- to temporarily seal off of the gauge from the vacuum chamber using a valve.

5 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.

Caution

Caution: dirt sensitive area

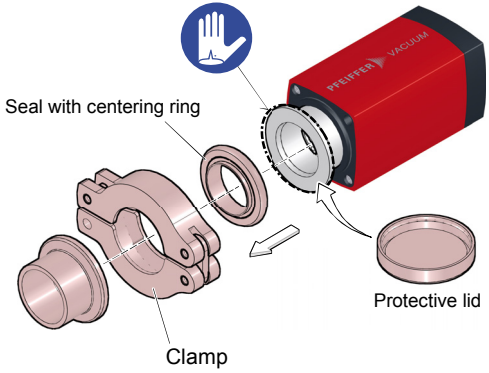
Touching the product or parts thereof with bare hands increases the desorption rate.

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

1. Vent the vacuum system.
2. Put the gauge out of operation and disconnect the sensor cable.

❸ Remove gauge from the vacuum system and install the protective lid.

When deinstalling the CF flange connection, it may be advantageous to temporarily remove the electronics unit (→ 🗎 25).



6 Maintenance, Repair

Gauge failures due to contamination and wear and tear, as well as expendable parts (e.g. ionization chamber, ignition aid, Pirani filament (PKR 36x)), are not covered by the warranty.

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

6.1 Adjusting the Gauge

IKR 36x

The gauge is factory-calibrated and requires no maintenance. In the event of a defect

- only replace the ionization chamber and ignition aid, or
- replace the measuring chamber cpl. (spare sensor).

PKR 36x

The cold cathode measuring circuit, which is dominant for low pressures (<1×10^{-3} mbar), is factory-calibrated and cannot be adjusted. The HV adjustment of the Pirani measuring circuit is carried out automatically by the gauge itself at pressures <1×10^{-5} mbar. The new zero point is saved non-volatile every 15 minutes. Any adjustment has a negligible effect on the pressure range between approx. 10^{-2} mbar and 10^{2} mbar.

If used under different climatic conditions, through extreme temperatures, aging or contamination the characteristic curve can be offset and a manually readjustment or a maintenance may become necessary.

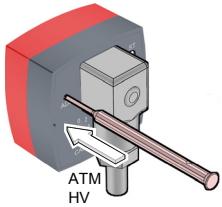
An adjustment via the <ADJ> button can become necessary (procedure → ❹, ❺), if pressure values <10^{-2} mbar are no longer output.

For adjusting the zero, operate the gauge under the same constant ambient conditions and in the same mounting orientation as normally.

1. If you are using a seal with centering ring and filter, check that they are clean or replace them if necessary (→ "Deinstallation").

2. Put the gauge into operation and operate it at atmospheric pressure for at least 10 minutes.

3. Press the <ADJ> button with a pin (max. ø1.1 mm) and the ATM adjustment is carried out: The Pirani sensor is adjusted to 1000 mbar (duration ≈5 s).



   ✓ If the pressure value 1000 mbar is output at the measurement value output, the adjustment has been successful. Otherwise, repeat the adjustment procedure.

4. Evacuate the vacuum system to $p < 10^{-5}$ mbar and wait at least 2 minutes.

5. Press the <ADJ> button with a pin and the HV adjustment is carried out (duration ≈5 s).

   ✓ If the pressure value 1×10^{-5} mbar is output at the measurement value output, the adjustment has been successful. Otherwise, repeat the adjustment procedure.

6.2 Cleaning the Gauge / Replacing Parts

In case of severe contamination or defective (e.g. Pirani filament rupture (PKR 36x)), replace the complete measuring chamber (Spare Parts → 50).

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.

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.

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. Consider possible reactions with the product materials (→ 13).

Precondition

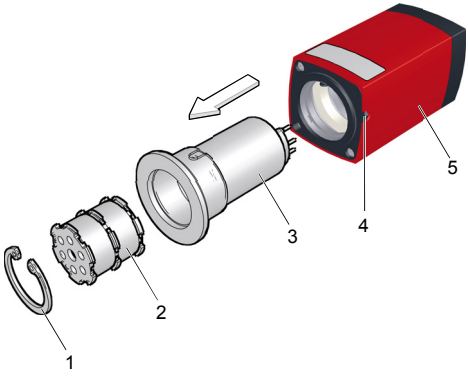
Gauge deinstalled.

6.2.1 Troubleshooting (measuring chamber)

If the cause of the fault is suspected to be in the measuring chamber, the following checks can be made with an ohmmeter.

Tools / material required

- Allen wrench AF 2
- Pliers for retaining ring
- Ohmmeter



❶ Unfasten the hexagon socket set screw (4) and remove the complete measuring chamber (3) from the electronics unit (5).

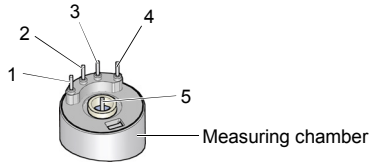
❷ Remove the retaining ring (1) as well as the ionization chamber (2) from the measuring chamber (3).

❸ Check the ionization chamber and the measuring chamber for contamination:

- Ionization chamber is contaminated only: Replace ionization chamber (→ 🗎 41)
- Measuring chamber is severely contaminated: Replace complete measuring chamber (→ 🗎 43).

❹ Using an ohmmeter, make following measurements on the contact pins.

Measurement between pins	👍	👎	Possible cause
1 + 4	≈40 Ω	≫40 Ω	Pirani filament rupture (PKR 36x only)
1 + 2	≈1078 Ω at 20 °C	≫1078 Ω at 20 °C	Pirani temperature sensor rupture (PKR 36x only)
5 + measuring chamber	∞	⋘∞	Contamination, short circuit cold cathode



All of theses faults can only be remedied by replacing the complete measuring chamber (→ 🗎 43).

❺ We recommend to perform a leak test (leak rate $<1\times10^{-9}$ hPa l/s).

6.2.2 Replacing Ionization Chamber and Ignition Aid

Precondition

Troubleshooting (measuring chamber) performed (→ 🗎 39).

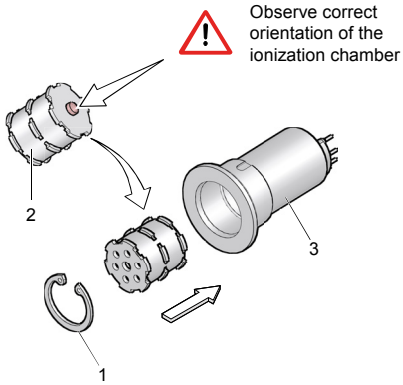
❶ Due to contamination remove the ignition aid with the removing tool (Accessories → 🗎 50).

❷ We recommend to rub the inside walls of the measuring chamber up to the groove for the retaining ring to a bright finish using a polishing cloth.

- The sealing surfaces must only be worked concentrically.
- Do not bend the anode.

❸ Insert the new ignition aid into the mounting tool and slide it onto the anode (Spare Parts → 🗎 50).

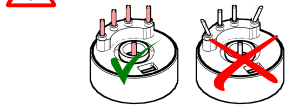
❹ Slide a new ionization chamber (2) into the measuring chamber (3) until the mechanical stop is reached and mount the retaining ring (1) (Spare Parts → 🗎 50).

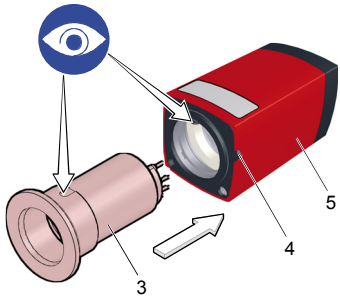


❺ We recommend to perform a leak test (leak rate $<1\times10^{-9}$ hPa l/s).

❻ Carefully slide the measuring chamber cpl. (3) (clean or new) into the electronics unit (5) until the mechanical stop is reached.

Pins aligned straight.





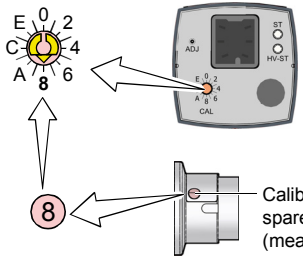
❼ Fasten the measuring chamber (3) by means of the hexagon socket set screw (4).

6.2.3 Replacing Measuring Chamber

Precondition

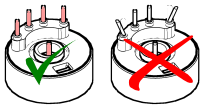
Troubleshooting (measuring chamber) performed (→ 🗎 39).

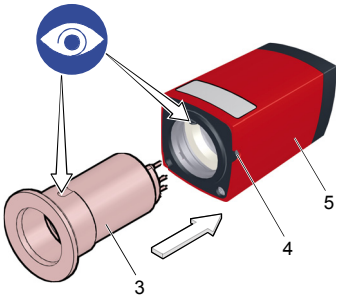
❶ Set the calibration value of the spare sensor with the <CAL> switch on the electronics unit (5).



❷ Carefully slide the measuring chamber cpl. (3) into the electronics unit (5) until the mechanical stop is reached.

Pins aligned straight.





❸ Fasten the measuring chamber (3) by means of the hexagon socket set screw (4).

❹ PKR 36x gauge only: Perform an ATM and HV adjustment of the Pirani measuring circuit via the <ADJ> button (→ 🗎 37).

☞ A recalibration of the PKR 36x gauge is not necessary.

❺ We recommend to perform a leak test (leak rate <1×10^{-9} hPa l/s) and a function test of the gauge on the leak detector.

WARNING

WARNING: 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.

6.3 Troubleshooting

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

Problem	LED <ST>	LED <HV-ST>	Possible cause	Correction
No voltage at signal output.	off	off	No supply voltage.	Turn on power supply.
Measuring signal unstable.	lid solid green	lid solid green	Gauge contaminated.	Replace ionization chamber or measuring chamber cpl.(→ 🗎 41, 43).
Voltage at signal output 0.15 V.	lid solid yellow	off	No high voltage in the measuring chamber.	Switch on the high voltage.
			Overpressure in the measuring chamber.	Evacuate the vacuum system to <10^{-2} hPa and switch the gauge off and on again via "HV ON".
Voltage at signal output 1.2 V.	lid solid yellow	blinking green	Gas discharge has not ignited.	Wait, until the gas discharge has ignited (≈5 minutes at a pressure of 10^{-9} hPa).
Voltage at signal output continually < 0.3 V.	blinking red	off	EEPROM error.	Switch the gauge off and on again after 5 s.
				Replace the gauge.
Signal continually at approx. 5×10^{-4} hPa.	lid solid green	lid solid green	Measuring chamber severely contaminated.	Replace the measuring chamber cpl. (→ 🗎 43).

Problem	LED <ST>	LED <HV-ST>	Possible cause	Correction
No voltage at signal output.	off	off	No supply voltage.	Turn on power supply.
Measuring signal unstable.	lid solid green	lid solid green	Gauge contaminated.	Replace ionization chamber or measuring chamber cpl (→ 🗎 41, 43).
Voltage at signal output does not drop under <4.82 V.	lid solid yellow	blinking green	Gas discharge has not ignited.	Wait, until the gas discharge has ignited (≈5 minutes at a pressure of 10^{-9} hPa).
Voltage at signal output continually > 5.6 V.	lid solid green	off	Pirani zero point shift.	Perform a HV adjustment via button (→ 🗎 37).
Voltage at signal output continually > 9.5 V.	lid solid red	off	Pirani defective.	Replace the measuring chamber cpl. (→ 🗎 43).
	blinking red	off	EEPROM error.	Switch the gauge off and on again after 5 s.
				Replace the gauge.
Signal continually at approx. 5×10^{-4} hPa.	lid solid green	lid solid green	Measuring chamber severely contaminated.	Replace the measuring chamber cpl. (→ 🗎 43).

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 Disposal

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.

9 Accessories

	Ordering No.
Connection cable for 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 GO6 WF, 6-pin, angled, female	B 4707 283 MA

10 Spare Parts

When ordering spare parts, always indicate:

- all information on the product nameplate
- description and ordering number

10.1 Ignition Aid for IKR 36x and PKR36x

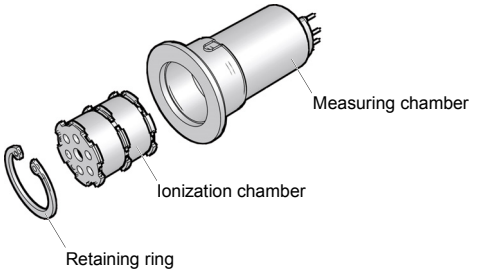
	Ordering No.
Ignition aid (set of 10 pieces)	BN 845 995-T
Mounting tool for ignition aid	PT 120 316-T

10.2 Ionization chamber for IKR 36x and PKR36x

	Ordering No.
Ionization chamber stainless steel	PT 120 312-T

10.3 Measuring Chamber Cpl. (Spare Sensor)

The measuring chamber cpl. is pre-assembled.



10.3.1 Measuring Chamber cpl. for IKR 36x

			Ordering No.
IKR 36x	PT T00 140 010 PT T01 140 010	DN 25 ISO-KF	PT 120 300-T
	PT T00 150 010 PT T01 150 010	DN 40 ISO-KF	PT 120 304-T
	PT T00 350 010 PT T01 350 010	DN 40 CF-F	PT 120 308-T

Ceramic coated			Ordering No.
IKR 36x C	PT T00 140 011 PT T01 140 011	DN 25 ISO-KF	PT 120 301-T
	PT T00 150 011 PT T01 150 011	DN 40 ISO-KF	PT 120 305-T
	PT T00 350 011 PT T01 350 011	DN 40 CF-F	PT 120 309-T

10.3.2 Measuring Chamber cpl. for PKR 36x

			Ordering No.
PKR 36x	PT T02 140 010 PT T03 140 010	DN 25 ISO-KF	PT 120 302-T
	PT T02 150 010 PT T03 150 010	DN 40 ISO-KF	PT 120 306-T
	PT T02 350 010 PT T03 350 010	DN 40 CF-F	PT 120 310-T

Ceramic coated			Ordering No.
PKR 36x C	PT T02 140 011 PT T03 140 011	DN 25 ISO-KF	PT 120 303-T
	PT T02 150 011 PT T03 150 011	DN 40 ISO-KF	PT 120 307-T
	PT T02 350 011 PT T03 350 011	DN 40 CF-F	PT 120 311-T

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 mm HG	1.332	1.332×10^{-3}	133.32	1.3332	0.1332	1

1 Pa = 1 N/m^2

ETL Certification

ETL LISTED

The products IKR 360, IKR 360 C, IKR 361, IKR 361 C, PKR 360, PKR 360 C, PKR 361, PKR 361 C

- conform to the UL Standard UL 61010-1
- are certified to the CAN/CSA Standard C22.2 No. 61010-1-12

EC Declaration of Conformity

CE

We, Pfeiffer Vacuum, hereby declare that the equipment mentioned below complies with the provisions of the Directive relating to electromagnetic compatibility 2004/108/EC and the Directive on the restriction of the use of certain hazardous substances in electrical and electronic equipment 2011/65/EU.

Compact Cold Cathode Gauges

IKR 360, IKR 360 C, IKR 361, IKR 361 C

Compact FullRange® Gauges

PKR 360. PKR 360 C, PKR 361, PKR 361 C

Standards

Harmonized and international / national standards and specifications:

- EN 61010-1:2010 (Safety requirements for electrical equipment for measurement, control and laboratory use)
- EN 61326-1:2013 (EMC requirements for electrical equipment for measurement, control and laboratory use)

Manufacturer / Signatures

Pfeiffer Vacuum GmbH, Berliner Straße 43, D-35614 Asslar

16 January 2015

Manfred Bender
Managing director

16 January 2015

Dr. Matthias Wiemer
Managing director

Notes

PFEIFFER VACUUM

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.

You are looking for a perfect vacuum solution? Please contact us:

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