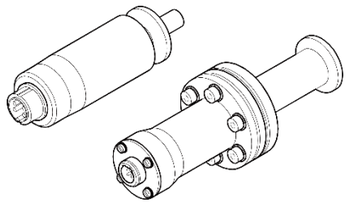
Pirani Gauge

PSG010, PSG017, PSG018

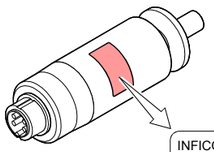


Operating Manual
Incl. EU Declaration of Conformity

tinb71e1-a (2023-09)

Product Identification

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



INFICON AG, LI-9496 Balzers
Model: .....
PN: .....
SN: .....

Validity

This document applies to products with the following part numbers:

PSG010 (W filament)	
350-400	(DN 10 ISO-KF)

PSG017 (Ni filament)	PSG018 (W filament)	
350-430	350-420	(DN 16 ISO-KF)
350-431	350-424	(DN 16 CF-F)
	350-423	(DN 40 CF-F)

The part number (PN) can be taken from the product nameplate.

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

All dimensions are indicated in mm.

Intended Use

The Pirani Gauges PSG010, PSG017 and PSG018 have been designed for vacuum measurement of gases in the pressure range of 8×10^{-4} … 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.

The gauges can be operated in connection with the INFICON VGC094 total pressure gauge controller.

Safety

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.

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.

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.
- 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.

Liability and Warranty

INFICON 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 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.

Technical Data

Measurement principle	thermal conductance according to Pirani
Display range (air, O_2, CO, N_2)	8×10^{-4} … 1000 mbar
Measurement range (air, O_2, CO, N_2)	1×10^{-2} … 100 mbar
Accuracy PSG010	up to factor 2 of reading in the range of ≥100 mbar ≈±20% of reading in the range of 1×10^{-1} … 10 mbar up to factor 2 of reading in the range of ≤10^{-2} mbar
Accuracy PSG018	
At room temperature and cable length <20m	≈±10% of reading in the range of 1×10^{-2} … 100 mbar
At 0 … +70°C and within the entire range of specified cable length	≈±20% of reading in the range of 1×10^{-2} … 100 mbar
Within the entire specified range of temperatures and cable length	≈±35% of reading in the range of 1×10^{-2} … 100 mbar
Repeatability with air	
PSG010, PSG017	≈±2% of reading in the range of 1×10^{-2} … 100 mbar
PSG018	≈±5% of reading in the range of 1×10^{-2} … 100 mbar

Materials PSG010	
Inside wall of measurement chamber, flange	AlMgSi
Electrical feedthrough	FPM
Filter	sintered bronze
Filament / filament holder	W / Ni
Materials PSG017	
Inside wall of measurement chamber, flange, diaphragm	stainless steel
Electrical feedthrough	Al_2O_3
Filament / filament holder	Ni / Ni
Materials PSG018	
Inside wall of measurement chamber, flange, diaphragm	stainless steel
Electrical feedthrough	Al_2O_3
Filament / filament holder	W / Ni

Radiation resistance	
PSG010	–
PSG017, PSG018	1×10^{6} Gy

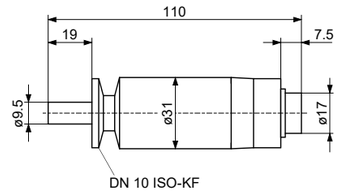
Overpressure	≤9 bar (limited to inert gases)
Cable length	
Gauge - controller	depending on the measurement unit

Admissible Temperatures	
Operation	
PSG010	0 … +70°C
PSG017	0 … +120 °C [1]
PSG018	0 … +120 °C [1]
Bakeout	
PSG010	+100 °C
PSG017, PSG018	+250 °C [2]
Filament	
PSG010, PSG018	+130 °C
PSG017	+70 °C
Storage	–40 … +80 °C

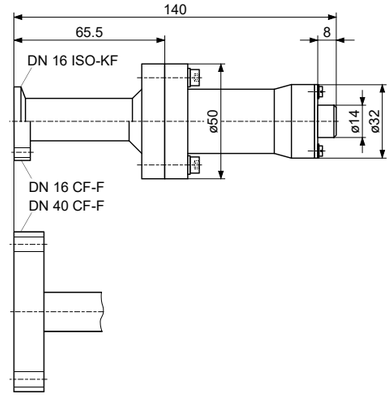
Relative humidity	≤80% at temperatures ≤+31 °C, decreasing to 50% at +40 °C
Mounting orientation	any
Use	indoors only altitudes up to 2000 m
Pollution degree	2
Protection category	IP40

Dimensions [mm]

PSG010



PSG017, PSG018

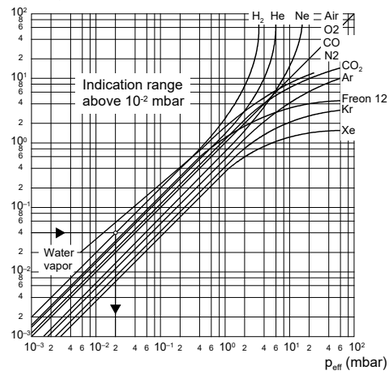


Weight	
PSG010	≈0.14 kg
PSG017, PSG018	≤1.2 kg

Gas Type Dependence

Indicated pressure (gauge calibrated for air)

p (mbar)



Calibration factors for pressure range below 1 mbar

p_{eff} = C × indicated pressure

Gas type	Calibration factor C	Gas type	Calibration factor C
He	0.8	H_2	0.5
Ne	1.4	air, O_2, CO, N_2	1.0
Ar	1.7	CO_2	0.9
Kr	2.4	water vapor	0.5
Xe	3.0	Freon 12	0.7

Installation

Vacuum Connection

DANGER
Leaking process media
High-intensity mechanical, chemical or thermal impacts can cause leaks in the measuring sensor. Process media can thus leak and possibly cause hazards, if overpressure is in the vacuum system.
- Avoid high-intensity mechanical, chemical or thermal impacts and overpressure in the vacuum system.
- Take appropriate measures (e.g. shut off gas supply, extraction, leak test) to avoid hazards or damage due to leaking process media.

DANGER
Overpressure in the vacuum system >1 bar
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
Overpressure in the vacuum system >2.5 bar
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.

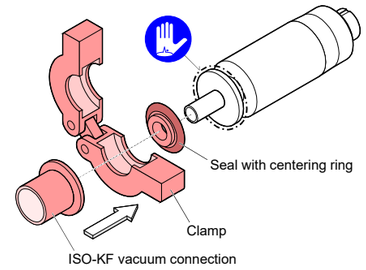
DANGER
Protective ground
Incorrectly grounded products can be extremely hazardous in the event of a fault.
The gauge must be electrically connected to the grounded vacuum chamber. This connection must conform to the requirements of a protective connection according to EN 61010:
- CF connection fulfill this requirement
- For gauges with a KF flange, use a conductive metallic clamping ring

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
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.

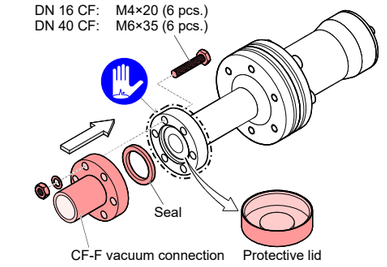
The gauge may be mounted in any orientation. To keep condensates and particles from getting into the measuring chamber preferably choose a horizontal to upright position.

ISO-KF flange



CF-F flange

Hex. bolts with nuts
DN 16 CF: M4×20 (6 pcs.)
DN 40 CF: M6×35 (6 pcs.)

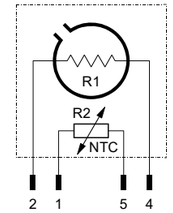


Power Connection

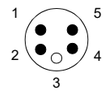
Before connecting or disconnecting the product, turn off the control system.

The gauge is connected to the controller via a measurement cable (→ "Accessories").

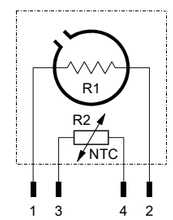
PSG010



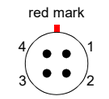
R1: Filament
R2: Temp. compensator



PSG017, PSG018



Connections viewed from the outside



R1: Filament
R2: Temp. compensator

[1] With high-temperature cable.

[2] With high-temperature cable or without cable.

tinb71e1-a (2023-09)
Original: English

Operation

After connection the gauge is ready for operation.

When the gauge is operated for the first time, a zero adjustment should be performed.

It is advisable to operate the gauge continuously, irrespective of the pressure.

PSG017 and PSG018: If the diaphragm is removed in order to achieve shorter response times, sudden pressure changes should be avoided in order to protect the filament.

The sensitivity of the nickel filament of the PSG017 gauge is not the same as the sensitivity of the tungsten filament of the PSG010 and PSG018 gauges.

Measurement cables influence the accuracy of measurement. If cables with lengths over 20 m are used, we strongly recommend adjusting the gauge together with the cable. For details refer to the operating instructions of the corresponding controller.

Adjustment

The gauge is factory calibrated. For most applications, it needs to be realigned. This allows to correct measurement errors caused by spread between units, temperature and the influence of the cable length. The gauge is aligned according to the operating instructions of the measurement unit used.

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

Gas Type Dependence

The measurement value is gas dependent. The reading applies to dry air, N_2. O_2 and CO. For other gases, it has to be converted (→ Technical Data and operating instructions of the corresponding controller).

In the pressure range below 1 mbar this can be done by entering the corresponding calibration factor on the controller(→ Operating instructions of the corresponding controller).

Deinstallation

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

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

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.
3. Unplug the sensor cable.

   Before connecting or disconnecting the product, turn off the control system.
4. Remove the gauge from the vacuum system and cover the vacuum connection with the protective lid.

Maintenance, Troubleshooting

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

Realignment at the measurement unit can become necessary in the following events:

- Altering
- Contamination
- After cleaning

Cleaning

DANGER

Contaminated parts

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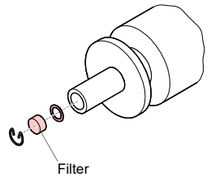
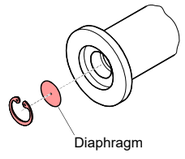
Precondition: Gauge deinstalled

1. Clean or replace the filter (PSG010) …



… or clean the diaphragm (PSG017, PSG018).



2. Clean the gauge / replace parts.

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 (see "Technical data").

- Fill the measurement chamber with a solvent and allow it to work for some time. Repeat this procedure if necessary.
- Pour the solvent out.
- Rinse the vacuum chamber and the filter with alcohol for several times in order to remove all solvent residues.
- Dry at ≈70 °C.

3. Insert the filter (PSG010), resp. diaphragm (PSG017, PSG018).

Troubleshooting

Fault	Possible cause	Remedy
Pressure readings supplied by gauge too high	Gauge contaminated	Minor deviations can be compensated by realignment at the measurement unit
		Clean the gauge
	Filter contaminated (PSG010)	Clean or replace it
No useful indication	Filament broken (an unbroken filament has a resistance of ≈100 Ω)	Replace the gauge
	Gauge cable defective, interrupted, or short-circuit	Repair or replace the cable

Spare Parts

	Ordering No.
Filter	B 4161 2003 G

Storage

Caution

Vacuum component

Inappropriate storage leads to an increase of the desorption rate and/or may result in mechanical damage of the product.

Cover the vacuum ports of the product with protective lids or grease free aluminum foil. Do not exceed the admissible storage temperature range (→ "Technical Data")

Returning the Product

WARNING

Forwarding contaminated products

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

Products returned to INFICON 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.inficon.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.

Disposal

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

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 recycled.
- Other components

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

Literature

[1] www.inficon.com
Operating Manual
VGC094
tinb68e1
INFICON AG, LI-0496 Balzers, Liechtenstein

EU & UKCA Declaration of Conformity

We, INFICON, hereby declare that the equipment mentioned below comply with the provisions of the following EU directives and UK regulations:

- 2014/35/EU, OJ L 96/357, 29.3.2014
  (LV Directive; directive relating to electrical equipment designed for use within certain voltage limit)
- 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)
- S.I. 2016/1101, 11.2016
  (The electrical equipment (safety) regulations 2016)
- S.I. 2016/1091, 11.2016
  (The electromagnetic compatibility regulations 2016)
- S.I. 2012/3032, 12.2012
  (The restriction of the use of certain hazardous substances in electrical and electronic equipment regulations 2012)

Products

Pirani Gauge

PSG010, PSG017, PSG018
(Operation with VGC094)

Standards

Harmonized and international/national standards and specifications:

- EN 61000-3-2:2014, Class A
  (EMC: limits for harmonic current emissions)
- EN 61000-3-3:2013
  (EMC: limitation of voltage changes, voltage fluctuations and flicker)
- EN 61000-6-1:2007
  (EMC: generic immunity for residential, commercial and light-industrial environments)
- EN 61000-6-2:2005
  (EMC: generic immunity standard for industrial environments)
- EN 61000-6-4:2007 + A1:2011
  (EMC: generic emission standard)
- EN 61010-1:2010 + A1:2019 + A1:2019/AC:2019
  (Safety requirements for electrical equipment for measurement, control and laboratory use)
- EN 61010-2-030:2010
  (Safety requirements for electrical equipment for measurement, control and laboratory use)
- EN 61326-1:2013; Group 1, Class A
  (EMC requirements for electrical equipment for measurement, control and laboratory use)

Manufacturer / Signatures

INFICON AG, Alte Landstraße 6, LI-9496 Balzers

26 July 2023	26 July 2023
Rolf Enderes	Dr. Roberto Salemme
Director Development & Software	Product Manager

INFICON
LI–9496 Balzers
Liechtenstein
Tel +423 / 388 3111
Fax +423 / 388 3700
reachus@inficon.com
www.inficon.com