Operating Manual
Incl. EU Declaration of Conformity

PSG500/-S, PSG502-S, PSG510-S, PSG512-S

Pirani Standard Gauge

tinb99e1 (2025-11)

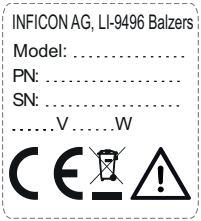
Table of Contents

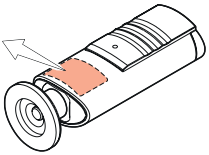
Symbol for cross-references within this document: → 🗎 XY
Symbol for references to literature list: → 🕮 [Z]

1 General

1.1 Product Identification

In all communications with INFICON, please specify the information on the product nameplate.





1.2 Validity

This document applies to products with the following part numbers:

PSG500	PSG500-S	(W filament)
350-160	350-180	(DN 16 ISO-KF)
350-162	350-182	(DN 16 CF R)
350-161	350-181	(⅛" NPT)
350-164	350-184	(8 VCR®)
350-165	350-185	(4 VCR®)
350-163	350-183	(½" tube)
350-166	–	(7/16-20 UNF)
350-167	350-187	(DN 16 ISO KF, long tube)
350-168	–	(DN 16 CF-R, long tube)

PSG502-S	(Ni filament)
350-240	(DN 16 ISO-KF)
350-241	(⅛" NPT)
350-244	(8 VCR®)
350-245	(4 VCR®)
350-247	(DN 16 ISO KF, long tube)
PSG510-S	**(W filament)**
350-210	(DN 16 ISO-KF)
PSG512-S	**(Ni filament)**
350-310	(DN 16 ISO-KF)

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

If not indicated otherwise in the legends, the illustrations in this document correspond to the gauge with part number 350-160. They apply to gauges with other part numbers by analogy.

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

All dimensions in mm.

1.3 Intended Use

The Pirani Standard Gauges PSG500/-S, PSG502-S, PSG510-S and PSG512-S have been designed for vacuum measurement of gases in the pressure range of 5×10^{-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.

They can be operated in connection with an INFICON controller or with another controller.

1.4 Trademarks

VCR® Swagelok Marketing Co.

2 Safety

2.1 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.

Symbol printed on the product nameplate: Consultation of operating manual required

Notice

<...> Labeling

2.2 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.

2.3 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 (Pirani filament 110 … 200 °C).
- 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.

2.4 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 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. Pirani filament) are not covered by the warranty.

3 Technical Data

Measurement principle	thermal conductance acc. to Pirani
Measurement range (air, O_2, CO, N_2)	5×10^{-4} … 1000 mbar
Accuracy (N_2)	
1×10^{-3} … 100 mbar	±15% of reading
5×10^{-4} … 1×10^{-3} mbar	±50% of reading
100 … 1000 mbar	±50% of reading
Resolution	1% of reading
Repeatability	
1×10^{-3} … 100 mbar	2% of reading
Output signal (measurement signal)	
Voltage range	0 … +10.3 V (dc)
Measurement range	+1.9 … +10.0 V (dc)
Voltage vs. pressure	1.286 V/decade, logarithmic
Error signal	0 … +0.5 V
Filament rupture	+0.1 V
Output impedance	2×4.7 Ω
Minimum loaded impedance	10 kΩ, short-circuit proof
Response time	80 ms
Gauge identification	27.0 kΩ, referenced to supply common
Voltage at pin 4	≤5 V
Adjustment	one tactile switch for ATM and HV adjustment

Switching function (SP1, SP2)	
Threshold value indication and setting	one tactile switch at measurement value output. Press briefly for threshold indication. Keep pressing or press repeatedly for threshold setting.
Setting range	2×10^{-3} … 500 mbar
Hysteresis	10% above lower threshold
Relay contact	30 V, 0.5 A (dc), floating
closed	at low pressure (LED is lit)
open	at high pressure, error, missing supply

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].

Supply voltage	
At the gauge	+14 … +30 V (dc)
Ripple	≤1 V_{pp}
Current consumption (max. starting current)	<500 mA
Power consumption	≤1 W
Fuse to be connected [1]	1 AT (slow)
Receptacle	FCC 68/RJ45, 8-pin, male
Sensor cable	8-pin, plus shielding
Cable length	≤100 m (8×0.14 mm^2)

[1] INFICON controllers fulfill these requirements.

Grounding concept	→ "Power Connection"
Vacuum connection–signal common	connected via 1 MΩ (voltage difference <15 V)
Supply common–signal common	conducted separately, for differential measurement

Materials exposed to vacuum	
PSG500/-S, PSG502-S	DIN 1.4301, DIN 1.4305, DIN 1.4435, glass, Ni, NiFe
PSG510-S, PSG512-S	Al_2O_3 (ceramics), Ni, DIN 1.4435, DIN 1.4305, DIN 1.3981
Filament	
PSG500/-S, PSG510-S	W
PSG502-S, PSG512-S	Ni

Internal volume	
DN 16 ISO-KF	≈1.5 cm^3
DN 16 CF-R	≈1.5 cm^3
⅛" NPT	≈2 cm^3
8 VCR	≈2 cm^3
4 VCR	≈2 cm^3
½" tube	≈2 cm^3
7/16-20 UNF	≈1.5 cm^3
DN 16 ISO-KF, long tube	≈10 cm^3
DN 16 CF-R, long tube	≈10 cm^3

Admissible pressure (absolute)	10 bar, limited to inert gases

Admissible temperature	
Operation	+5 … +60 °C
Vacuum connection	
DN 16 ISO-KF	80 °C [2) 3)]
DN 16 CF-R	80 °C [2) 3)]
⅛" NPT	80 °C [2)]
8 VCR	80 °C [2)]
4 VCR	80 °C [2)]
½" tube	80 °C [2)]
7/16-20 UNF	80 °C [2)]
Filament	+110 … +200 °C [4)]
Storage	–20 … +65 °C
Relative humidity	≤80% at temperatures ≤+31 °C, decreasing to 50% at +40 °C
Use	indoors only, altitude up to 2000 m NN
Mounting orientation	any
Pollution degree	2
Degree of protection	IP40

Weight	
DN 16 ISO-KF	≈80 g
DN 16 CF-R	≈100 g
⅛" NPT	≈70 g
8 VCR	≈130 g
4 VCR	≈100 g
½" tube	≈70 g
7/16-20 UNF	≈80 g
DN 16 ISO-KF, long tube	≈130 g

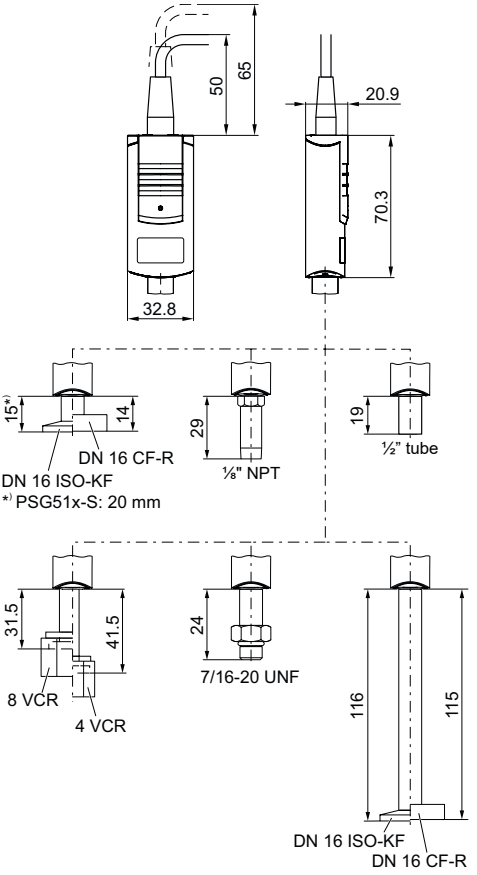
[2)] In horizontal mounting orientation

[3)] 250 °C with long tube.

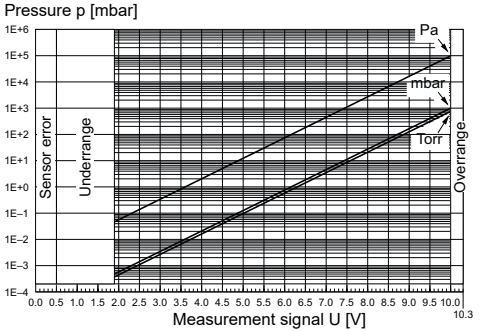
[4)] Depending on operating temperature and pressure.

Weight	
DN 16 CF-R, long tube	≈140 g

Dimensions [mm]



3.1 Measurement Signal vs. Pressure



$p = 10^{(U-c)/1.286} \quad \Leftrightarrow \quad U = c + 1.286 \times \log_{10} p$

valid in the range: 5×10^{-4} mbar <p< 1000 mbar
3.75×10^{-4} Torr <p< 750 Torr
$5\times10_{-2}$ Pa <p< $1\times10_{5}$ Pa

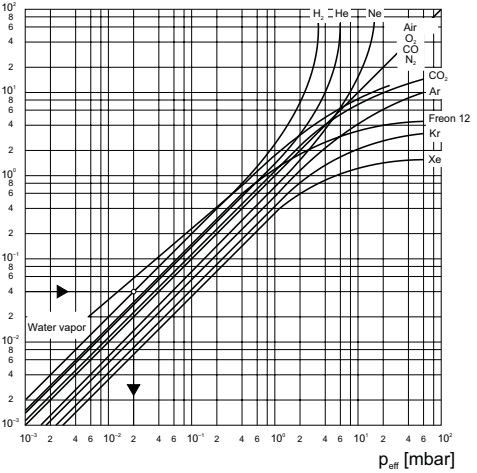
U	p	c
[V]	[mbar]	6.143
[V]	[µbar]	2.287
[V]	[Torr]	6.304
[V]	[mTorr]	2.448
[V]	[micron]	2.448
[V]	[Pa]	3.572
[V]	[kPa]	7.429

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

3.2 Gas Type Dependence

Indicated pressure (gauge calibrated for air)

p [mbar]



Correction factors for pressure range below 1 mbar

p_{eff} = C × pressure reading

Gas type	Correction factor C	Gas type	Correction 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

4 Installation

4.1 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 of 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

Products that are not correctly connected to ground 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, NPT, VCR® and UNF connections fulfill this requirement.
- For gauges with a KF connection, use a conductive metallic clamping ring.
- For gauges with a ½" tube, take appropriate measures to fulfill this requirement.

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 and possibly use a seal with a centering ring and filter. If adjustment should be possible after the gauge has been installed, be sure to install it so that the button can be accessed with a pin.

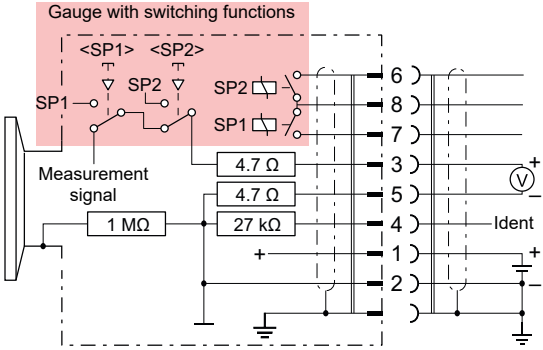
Remove the protective lid and connect the product to the vacuum system.

Keep the protective lid.

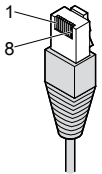
4.2 Power Connection

Make sure the vacuum connection is properly made.

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



Pin 1	Supply
Pin 2	Supply common, GND
Pin 3	Measurement signal or thresholds SP1/2
Pin 4	Gauge identification
Pin 5	Signal common
Pin 6, 8	Relay SP2, closing contact
Pin 7, 8	Relay SP1, closing contact



FCC 68 / RJ45, 8-pin

5 Operation

When the supply voltage is applied, the measurement signal is available between pins 3 and 5.

Allow a stabilization period of at least 10 minutes. Therefore it is advisable to operate the gauge continuously, irrespective of the pressure.

After initial installation and every reinstallation, a adjustment should be performed in high vacuum and at atmospheric pressure after the stabilization period has elapsed.

5.1 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.

If the gauge is operated with an INFICON controller, a correction factor for correction of the actual reading can be applied. (→ Opertating Manual of the corresponding controller).

5.2 Adjusting the Gauge

Due to long time operation or contamination, a zero drift could occur and zero adjustment may become necessary.

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

The gauge is adjusted to default values. However, it can also be adjusted to other pressure values, if the exact pressure value is known (reference measurement).

Perform the adjustment with air, O_2, CO or N_2.

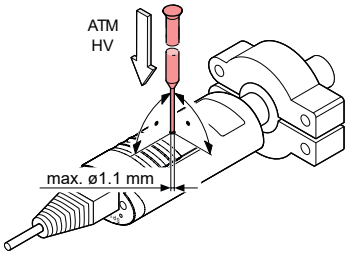
No pressure changes may be made during the adjustment (duration ≤6 s).

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

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

3 Evacuate to p << 10^{-4} mbar (recommended) or to a pressure in the range of 10^{-4} … 10^{-2} mbar and wait at least 2 minutes.

4 Press the button with a pin and the HV adjustment is carried out: The gauge is adjusted to 1.2×10^{-4} mbar (1.1 V (dc)) by default. By pressing the button >5 s the pressure value is increased toward 1×10^{-2} mbar until the button is released or the limit is reached.

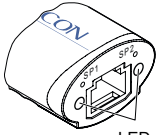


5 Vent the vacuum system to atmospheric pressure and then wait at least 3 minutes.

6 Press the button with a pin (max. ø1.1 mm) and the ATM adjustment is carried out: The gauge is adjusted to 1000 mbar (10 V (dc)) by default. By pressing the button >5 s the pressure value is increased towards 1200 mbar (or, by pressing it again, decreased towards 500 mbar) until the button is released or the limit is reached.

5.3 Switching Functions (PSG5xx-S only)

The setpoints are adjustable within a pressure range of 2×10^{-3} … 500 mbar (voltage range 2.67 … 9.61 V (dc)). Each switching function provides a floating relay contact.

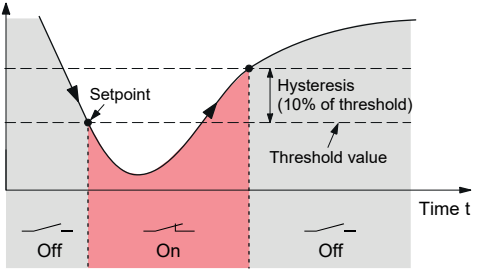


LED

The status of the switching function is indicated by a LED.

State	LED	Relay
Off	off	deenergized
On	on	energized

Measurement signal (pressure p)



5.3.1 Adjusting the Setpoints

DANGER

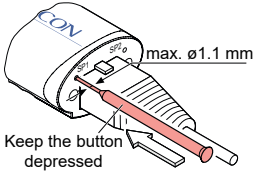
Malfunction

If processes are controlled via the signal output, keep in mind that by pushing the <SP> button the measurement signal is suppressed and the corresponding threshold value is output instead. This can cause malfunctions.

- Push the <SP> button only if you are sure that no malfunction will cause.

The status of the relay and lamp is not affected by pressing the button.

1 Push the <SP1> button with a pin (max. ø1.1 mm): The gauge changes to the switching function mode and outputs the current lower threshold value at the measurement value output for about 5 s. When the button is kept depressed for more than 5 s, the threshold setting is modified until the button is released or until the limit of the setting range is reached.



2 When the button is pressed again within 5 s the threshold setting is adjusted in the reverse direction.

3 Release the button. The gauge resumes operation after 5 s and the connected controller displays the current measurement value.

The upper threshold is 10% above the lower one (hysteresis).

The adjustment procedure is the same as for setpoint SP1.

6 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.

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

7 Maintenance, Repair

In case of severe contamination or a malfunction, the sensor can be replaced.

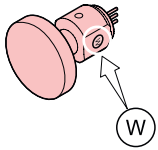
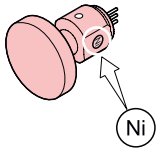
Gauge failures due to contamination or wear and tear, as well as expendable parts (e.g. Pirani filament) are not covered by the warranty.

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

8 Spare Parts

When ordering spare parts, always indicate:

- all information on the product nameplate
- description and ordering number according to the spare parts list

Sensor	for gauge	Ordering Number
	350-160, 350-180	350-820
	350-240	350-800

9 Returning the Product

⚠ WARNING

Forwarding contaminated products

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

- Products returned should preferably be free of harmful substances. Adhere to the forwarding regulations of all involved countries and forwarding companies 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.

10 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 disposed of.

- Other components

  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	1000	1	1×10^{5}	1000	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	1000	10	1	7.5
Torr mm Hg	1.33	1.33×10^{-3}	133.32	1.33	0.133	1
1 Pa = 1 N/m^2						

Literature

🕮 [1] Operating Manual
Pirani Gauge Display PGD500
tinb33e1
INFICON AG, LI-9496 Balzers, Liechtenstein

🕮 [2] Operating Manual
Single-, Two- & Three-Channel Measurement and Control Unit
VGC501, VGC502, VGC503
tina96e1
INFICON AG, LI-9496 Balzers, Liechtenstein

CE EU Declaration of Conformity

Manufacturer: INFICON AG, Alte Landstraße 6, LI-9496 Balzers

This declaration of conformity is issued under the sole responsibility of the manufacturer.

Products: PSG500/-S, PSG502-S, PSG510-S, PSG512-S

The products of the declaration described above are in conformity with following Union harmonization legislation:

- 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)

Harmonized and international/national standards and specifications:

- EN 61000-6-2:2005
  (EMC: generic immunity standard for industrial environments)
- EN 61000-6-3:2007 + A1:2011
  (EMC: generic emission standard for residential and commercial environments)
- EN 61010-1:2010 + A1:2019 + A1:2019/AC:2019
  (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)
- EN IEC 63000:2018
  (RoHS: technical documentation)

Signed for and on behalf of: INFICON AG, Alte Landstraße 6, LI-9496 Balzers

Balzers, 2025-11-18

William Opie
Managing Director

Balzers, 2025-11-18

Noemi Riederer
Product Manager

UKCA Declaration of Conformity

Manufacturer: INFICON AG, Alte Landstraße 6, LI-9496 Balzers

This declaration of conformity is issued under the sole responsibility of the manufacturer.

Products: PSG500/-S, PSG502-S, PSG510-S, PSG512-S

The products of the declaration described above are in conformity with the relevant UK Statutory Instruments:

- S.I. 2016/1091, 11.2016
  (Regulation relating to electromagnetic compatibility 2016)
- S.I. 2012/3032, 12.2012
  (Regulation on the restriction of the use of certain hazardous substances in electrical and electronic equipment 2012)

Harmonized and international/national standards and specifications:

- EN 61000-6-2:2005
  (EMC: generic immunity standard for industrial environments)
- EN 61000-6-3:2007 + A1:2011
  (EMC: generic emission standard for residential and commercial environments)
- EN 61010-1:2010 + A1:2019 + A1:2019/AC:2019
  (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)
- EN IEC 63000:2018
  (RoHS: technical documentation)

Signed for and on behalf of: INFICON AG, Alte Landstraße 6, LI-9496 Balzers

Balzers, 2025-11-18

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TINB99E1