

High Pressure / Pirani Gauge HPG400

HPG400-SD HPG400-SP PROFI

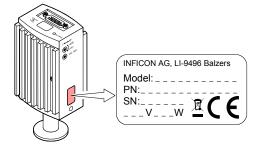
CE

Instruction Sheet Incl. EC Declaration of Conformity

(2011-10)tima31e1-b

Product Identification

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



Validity

This document applies to products with part number:

HPG400 (without display)

353-520 (DN 25 ISO-KF) 353-522 (DN 40 CF-R)

HPG400 (with display)

353-521 (DN 25 ISO-KF)

353-523 (DN 40 CF-R)

HPG400-SD (with DeviceNet interface and switching functions)

353-527 (DN 25 ISO-KF) 353-528 (DN 40 CF-R)

HPG400-SP (with Profibus interface and switching functions)

353-525 (DN 25 ISO-KF) 353-526 (DN 40 CF-R)

The part number (PN) can be taken from the product name-

If not indicated otherwise in the legends, the illustrations in this document correspond to the gauge with part number 353-520. They apply to the other types of the HPG400 family by analogy

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

All dimensions in mm

Intended Use

The High Pressure / Pirani Gauges of the type HPG400, HPG400-SD and -SP gauges have been designed for vacuum measurement of gases and gas mixtures in a pressure range of 2×10⁻⁶ ... 1 mbar. The control range of the gauge allows trend display from <1 mbar to 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 Vacuum Gauge Controller VGC4xx or with other control devices

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

The HPG400 functions with a hot cathode ionization manometer, which is controlled by the built-in Pirani manometer (control range). The hot cathode is switched on only below the changeover threshold of ≈1 mbar (to prevent filament burn-out). For pressures above this threshold, the Pirani signal is output.

Trademark

DeviceNet™ Open DeviceNet Vendor Association, Inc.

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 ne cessary 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 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

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

Technical Data



In some points, the technical data of HPG400-SD and -SP differ from those of HPG400, which are given below (\rightarrow "Technical Data" in \square [1] and [2]).

Measuring range (air, N₂)

2×10⁻⁶ ... 1 mbar 1×10⁻² ... 1000 mbar Hot cathode Pirani (control range)

Accuracy 10⁻⁵ ... 1 mbar

±15% of reading, valid between 10⁻⁵ mbar and changeover threshold setting

 $(\langle P \leftrightarrow HP \rangle)$

Repeatability 10⁻⁵ ... 10⁻¹ mbar 10⁻¹ ... 100 mbar (after 10 min. stabilization) ±2% of reading ±30% of reading

Emission of hot cathode

Changeover threshold (selectable steps)

1 mbar, 5×10^{-1} mbar, 2×10^{-1} mbar, 1×10^{-1} mbar, 5×10^{-2} mbar (<P \leftrightarrow HP>) rising continuously

Emission current from 1 mbar to 2×10⁻⁶ mbar 130 µA Anode voltage

180 VDC

Output signal

(measuring signal)

Voltage range 0 ... +10.2 V

Measuring range

Hot cathode 1.5 ... 7.5 V 8.5 ... 9.75 V Pirani Overrange hot cathode 7.5 V ≤ U ≤ 8 V Underrange hot cathode $0.5 \text{ V} \le \text{U} \le 1.5 \text{ V}$ Overrange Pirani 9.75 V ≤ U ≤ 10.2 V Underrange Pirani $8 \text{ V} \leq \text{U} \leq 8.5 \text{ V}$ logarithmic Relationship voltage-pressure Hot cathode 1 V/decade 0.25 V/decade

Error signal ($\rightarrow \square$ [1])

Pirani

≈0.3 V Hot cathode Pirani ≈0.5 V

Minimum load impedance 10 k Ω , short-circuit proof

Gauge identification 56 kΩ between Pin 10 and Pin 5 (sensor cable)

RS232C interface → "Power Connection" 9600 baud binary Data format

8 data bits one stop bit, no parity bit

no handshake

LCD matrix, 32×16 pixels Display panel (353-521, 353-523) with background illumination 16.0 mm × 11.2 mm Dimensions Pressure units mbar (default), Torr, Pa

Further information on the RS232C interface $\rightarrow \square$ [1]

Selecting the pressure unit $\rightarrow \square$ [1]

Supply



STOP DANGER

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

24 VDC (20 ... 28 VDC) ripple ≤2 V_{pp}) ²⁾ Voltage at gauge

Current consumption Standard

≤0.5 A Emission start (200 ms) Fuse required 1) Power consumption

1.25 AT ≤16 W (HPG400)

≤30 m

Electrical connection Sensor cable

For analog values only For all functions Cable length (24 VDC)

4 conductors, shielded 7 conductors, shielded ≤35 m (0.25 mm²/conductor) ≤50 m (0.34 mm²/conductor)

≤100 m (1.0 mm²/conductor)

D-Sub 15-pin, male

For operation with RS232 (e.g. VGC4xx)

¹⁾ INFICON gauge controllers fulfill these requirements.

²⁾ Consider the voltage drop in the supply lines.

Materials on the vacuum side

Housing, supports, screens

Feedthroughs Insulator

Cathode Cathode holder Pirani element Internal volume

Pressure max.

stainless steel NiFe nickel plated alass

≤5 bar (absolute)

iridium, yttrium oxide (Y2O3) molybdenum, platinum tungsten, copper

≤20 cm³ (DN 25 ISO-KF) ≤30 cm³ (DN 40 CF-R)

Admissible temperatures Storage −20 ... +70 °C 0 ... +50 °C Operation 150 °C (without electronics Bakeout

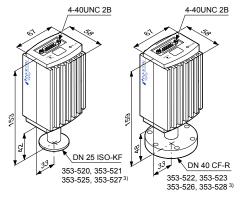
unit, $\rightarrow \square$ [1]) Relative humidity

Year's mean ≤65% (not condensable) During 60 days ≤85% (not condensable)

indoors only Use altitude up to 2000 m NN

Degree of protection IP 30

Dimensions [mm]

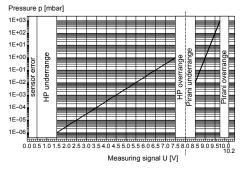


Gauges with DeviceNet connector are 14 mm longer $(\rightarrow \square [1] \text{ or } [2]).$

Weight	
353-520, 353-521	
353 522 353 523	

285 g 550 g 353-525, 353-527 430 g 353-526, 353-528

Measuring Signal vs. Pressure



Measuring range hot cathode



Measuring range Pirani

p = 10 ^{(4 × (U - c2))}		⇔	U = c2 + 0.25 log p		
U	p	c1		c2	
[V]	[mbar]	7.5		9	•
[V]	[mbar] [Torr]	7.62	5	9.031	
[V]	[Pa]	5.5		8.5	

Where pressure p U measuring signal c1, c2 constant (depending on pressure unit) Valid in range Hot cathode $1.50 \text{ V} \le \text{U} \le 7.50 \text{ V}$

8.50 V ≤ U ≤ 9.75 V

Gas Type Dependence

Hot cathode measuring range

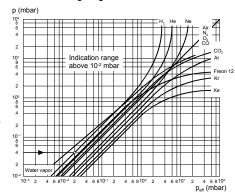
For gases other than air, the pressure in the measuring range p < 10⁻¹ mbar can be determined by a simple conversion:

Pirani

p _{eff} =	K × pressure indicated

Where	Gas type	K (mean values)
	Air (N ₂ , O ₂)	1.0
	Xe	0.4
	Kr	0.5
	Ar	0.8
	H ₂	2.4
	Ne	4.1
	He	5.9

Pirani measuring range



Installation

Vacuum Connection



(STOP) DANGER

DANGER: overpressure in the vacuum system

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.



STOP DANGER

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



DANGER

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



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.

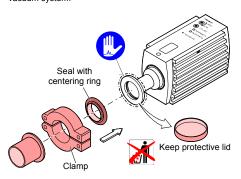
Always wear clean, lint-free gloves and use clean tools when working in this area.



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.

The gauge is supplied with a built-in baffle.

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



Power Connection (HPG400)

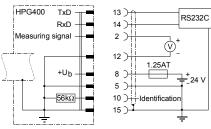


The following information on the electrical connection as well as the wiring diagram apply to HPG400 only ($\rightarrow \square$ [1] and [2] for details on the electrical connection and additional functions of HPG400-SD and -SP).



Make sure the vacuum connection is properly made $(\rightarrow$ "Vacuum Connection").

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



Electrical connection

Pin 2 Pin 5	Signal output (measuring signal supply common, GND	gnal) 0 +10 V
	Supply +24 VDC	9 4.9 1
	Gauge identifcation	" : <u>:</u>
	Signal common, GND	::
	RS232C, TxD	15₩:₩8
	RS232C, RxD	[8]
Pin 15	Shielding, housing, GND	D-Sub, 15-pin
Pins 1, 3, 4, 6, 7, 9 and 11		female
are not connected internally. soldering sid		

- Connect the sensor cable to the gauge.
- 3 Secure the cable connector with the lock screws.
- Connect the sensor cable to the controller.

Operation

When the voltage is supplied, the measuring signal is available between pins 2 (+) and 12 (–) (Relationship Measuring Signal – Pressure \rightarrow "Technical Data" and \square [1]).

HPG400-SD and -SP can also be operated via the corresponding fieldbus interface (DeviceNet or Profibus) ($\rightarrow \square$ [1] and [2]) for further details and functions).

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

Gas Type Dependence

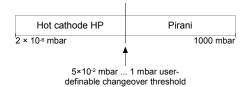
The measurement value is gas dependent. The displayed reading applies to dry air, O_2 and N_2 . For other gases, it has to be converted (\rightarrow "Technical Data" and \square [1]).

Measuring Range

The HPG400 covers the measuring range 2×10^{-6} mbar ... 1000 mbar.

- · The Pirani part permanently monitors the pressure.
- The hot cathode part (controlled by the Pirani) is only switched on when the pressure drops below the changeover threshold. The hot cathode will be ready for operation after a few seconds heating time, when the <EMI ON> lamp is lit.
- When the pressure rises above the changeover threshold, the hot cathode is switched off and the <EMI ON> lamp turns off.

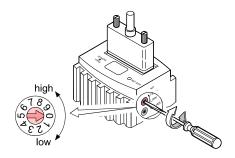
In the upper pressure range, the Pirani reading and in the lower pressure range, the hot cathode reading is output.



Selecting the Changeover Threshold

The HPG400 has five user-definable changeover thresholds. It is thus possible to prevent the changeover range from being situated within the process pressure range. The factory setting of the threshold is 1 mbar. Another changeover threshold can be selected via the <P \leftrightarrow HP> switch. Since the contamination of the hot cathode part is reduced at low pressures, the lowest possible changeover threshold should be selected.

Switch position ($P \leftrightarrow HP$)	Changeover threshold
0 or 1	1 mbar (factory setting)
2 or 3	5×10 ⁻¹ mbar
4 or 5	2×10 ⁻¹ mbar
6 or 7	1×10 ⁻¹ mbar
8 or 9	5×10 ⁻² mbar



Since the switch position is only polled upon activation of the gauge, the changeover threshold should be selected before the gauge is turned on.

Adjusting the Gauge (HPG400)

The adjustment of HPG400-SD and -SP ($\rightarrow \square$ [1] and [2]) is slightly different from the procedure for HPG400, which is described below.

The gauge is factory calibrated. If used under different climatic conditions, at extreme temperatures, through aging or contamination and after exchanging the sensor, the characteristic curve can be offset and readjustment can become necessary. Only the Pirani element can be adjusted and only at atmosphere.

Readjustment becomes necessary if

- at atmosphere the output voltage is <9.75 V or the display reading is <atmosphere
- when venting the vacuum system, the output voltage reaches 9.75 V before the measured pressure has reached atmosphere (Gauges with display will show the error "5" at atmosphere (Pirani sensor warning)).

(For more details $\rightarrow \square$ [1], "Maintenance, Repair").

Adjustment of the Pirani part under high vacuum conditions:

The Pirani part is automatically adjusted by the hot cathode part when the gauge is activated and the pressure range $1\dots3\times10^3$ mbar is reached for the first time.

Adjustment of the Pirani part at atmospheric pressure:

0

Put the gauge into operation.

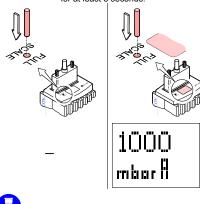


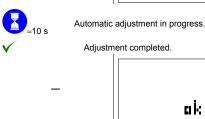
Operate the gauge for ≈10 minutes at atmospheric pressure. If the gauge was operated within the hot cathode range, a cooling-down time of ≈30 minutes is to be expected (gauge temperature = environmental temperature).



HPG400 without display 353-520 353-522 HPG400 with display 353-521 353-523

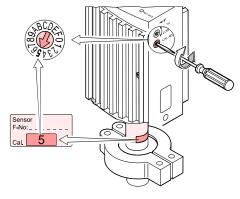
Insert a pin (≈ø1.3×50mm) through the opening <FULL SCALE> and push the button inside for at least 5 seconds.





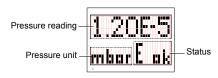
Adjusting the Calibration Setting of the Hot Cathode Part

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



Display

(HPG400 with part numbers 353-521 and 353-523)



Parameter	Display	Description
Reading	0 1000	mbar, Torr, Pa
Pressure unit	mbar, Torr, Pa	Factory setting: mbar
Status	(none)	Pirani operation
	E	Emission hot cathode on
	A	Adjustment at atmospheric pressure in progress
	ok	Normal operation, no error
	Fail IonG 5	Pirani sensor warning 1)
	Fail IonG 8	Hot cathode sensor warning 1)
	Fail lonG 9	Pirani sensor error
	no Signal	Internal data connection failure 1)

¹⁾ Background illumination red (in normal operation green).

Deinstallation



STOP DANGER



DANGER: contaminated parts

Contaminated parts can be detrimental to health and environment.

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



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.

- Vent the vacuum system.
- Put the gauge out of operation.
- Unfasten the lock screws and unplug the sensor cable. (If you are using HPG400-SD or -SP, unfasten and unplug the interface connector, too (→ □ [1] and [2]).
- Remove the gauge from the vacuum system and install the protective lid.

Maintenance, Repair

In case of severe contamination or a malfunction, the sensor can be replaced $(\rightarrow \square \square [1])$.



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

Returning the Product

<u>/!\</u>



WARNING



WARNING: forwarding contaminated products Contaminated products (e.g. radioactive, toxic, caustic or biological 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 ¹⁾

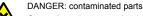
Products that are not clearly declared as "free of harmful substances" are decontaminated at the expense of the customer.

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

Disposal



DANGER



Contaminated parts 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 recycled.

Other components

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

Further Information

[1] www.inficon.com
Operating Manual
High Pressure / Pirani Gauge
HPG400, HPG400-SD, HPG400-SP
tina31d1 German
tina31e1 English
INFICON AG, LI-9496 Balzers, Liechtenstein

[2] www.inficon.com
Instruction Sheet
High Pressure / Pirani Gauge
HPG400-SD, HPG400-SP
tima32d1 German
tima32e1 English
INFICON AG, LI-9496 Balzers, Liechtenstein

EC Declaration of Conformity



We, INFICON, hereby declare that the equipment mentioned below complies with the provisions of the Directive relating to electromagnetic compatibility 2004/108/EC.

High Pressure / Pirani Gauge

HPG400 HPG400-SD HPG400-SP

Standards

Harmonized and international/national standards and specifications:

- EN 61000-6-2:2005 (EMC: generic immunity standard)
- EN 61000-6-3:2007 (EMC: generic emission standard)
- EN 61010-1:2001 (Safety requirements for electrical equipment for measurement, control and laboratory use)
- EN 61326:2006 (EMC requirements for electrical equipment for measurement, control and laboratory use)

Manufacturer / Signatures

INFICON AG, Alte Landstraße 6, LI-9496 Balzers

11 October 2011

11 October 2011

Un Watchl.

1. tarlet

Dr. Urs Wälchli Managing Director Claudio Christoffel Product Manager



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

Form under www.inficon.com