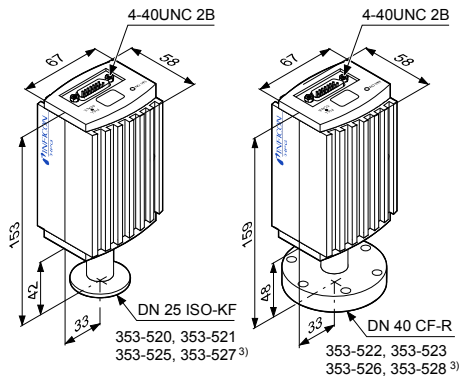




|                              |  |
|------------------------------|--|
| Materials on the vacuum side |  |
| Housing, supports, screens   | stainless steel  |
| Feedthroughs                 | NiFe nickel plated   |
| Insulator                    | glass  |
| Cathode                      | iridium, yttrium oxide (Y <sub>2</sub> O <sub>3</sub> )                |
| Cathode holder               | molybdenum, platinum   |
| Pirani element               | tungsten, copper   |
| Internal volume              | ≤20 cm <sup>3</sup> (DN 25 ISO-KF)<br>≤30 cm <sup>3</sup> (DN 40 CF-R) |
| Pressure max.                | ≤5 bar (absolute)  |
| Admissible temperatures      |  |
| Storage                      | -20 ... +70 °C   |
| Operation                    | 0 ... +50 °C   |
| Bakeout                      | 150 °C (without electronics unit, → [1])                               |
| Relative humidity            |  |
| Year's mean                  | ≤65% (not condensable)   |
| During 60 days               | ≤85% (not condensable)   |
| Use                          |  |
|                              | indoors only<br>altitude up to 2000 m NN                               |
| Degree of protection         |  |
|                              | IP 30  |

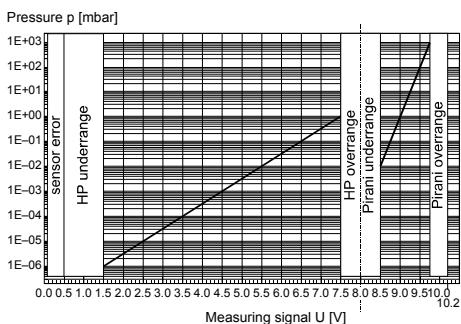
### Dimensions [mm]



<sup>3)</sup> Gauges with DeviceNet connector are 14 mm longer (→ [1] or [2]).

|                  |       |
|------------------|-------|
| Weight           |       |
| 353-520, 353-521 | 285 g |
| 353-522, 353-523 | 550 g |
| 353-525, 353-527 | 430 g |
| 353-526, 353-528 | 695 g |

### Measuring Signal vs. Pressure



### Measuring range hot cathode

$$p = 10^{U - c1} \Leftrightarrow U = c1 + \log p$$

### Measuring range Pirani

$$p = 10^{(4 \times (U - c2))} \Leftrightarrow U = c2 + 0.25 \log p$$

| U   | p      | c1    | c2    |
|-----|--------|-------|-------|
| [V] | [mbar] | 7.5   | 9     |
| [V] | [Torr] | 7.625 | 9.031 |
| [V] | [Pa]   | 5.5   | 8.5   |

Where  
 p pressure  
 U measuring signal  
 c1, c2 constant (depending on pressure unit)

Valid in range  
 Hot cathode Pirani 1.50 V ≤ U ≤ 7.50 V  
 8.50 V ≤ U ≤ 9.75 V

### Gas Type Dependence

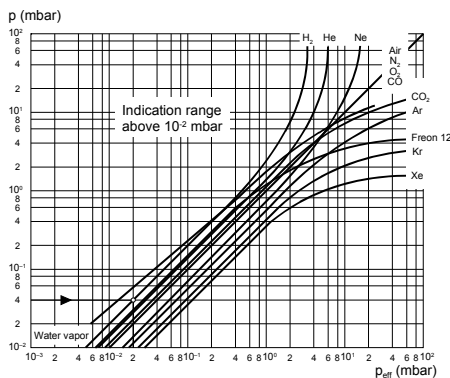
#### Hot cathode measuring range

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

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

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

#### Pirani measuring range



## Installation

### Vacuum Connection

**STOP DANGER**

**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.

**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 ring.

**STOP 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.

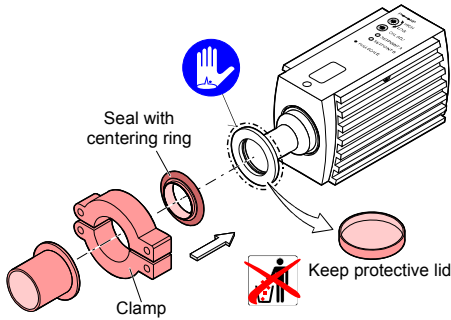
Always wear clean, lint-free gloves and use clean tools when working in this area.

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.

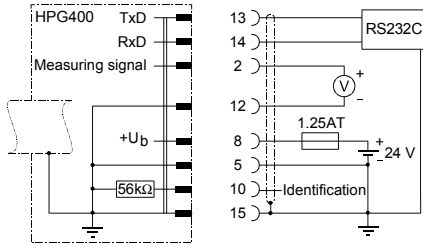


## Power Connection (HPG400)

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

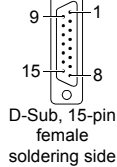
Make sure the vacuum connection is properly made (→ "Vacuum Connection").

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



Electrical connection

|  |  |
|--|--|
| Pin 2  | Signal output (measuring signal) 0 ... +10 V |
| Pin 5  | Supply common, GND                           |
| Pin 8  | Supply +24 VDC                               |
| Pin 10   | Gauge identification                         |
| Pin 12   | Signal common, GND                           |
| Pin 13   | RS232C, TxD                                  |
| Pin 14   | RS232C, RxD                                  |
| Pin 15   | Shielding, housing, GND                      |
| Pins 1, 3, 4, 6, 7, 9 and 11 are not connected internally. |  |



Connect the sensor cable to the gauge.

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 → "Technical Data" and [1]).

HPG400-SD and -SP can also be operated via the corresponding fieldbus interface (DeviceNet or Profibus) (→ [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.

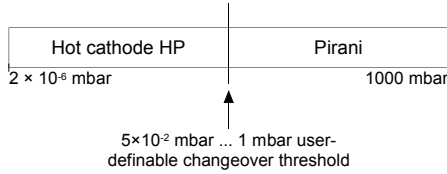
## Gas Type Dependence

The measurement value is gas dependent. The displayed reading applies to dry air, O<sub>2</sub> and N<sub>2</sub>. For other gases, it has to be converted (→ "Technical Data" and [1]).

## Measuring Range

The HPG400 covers the measuring range 2×10<sup>-6</sup> mbar ... 1000 mbar.

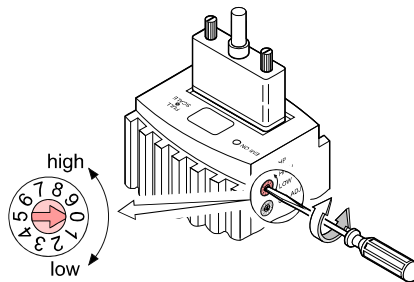
- The Pirani part permanently monitors the pressure.
  - The hot cathode part (controlled by the Pirani) is only switched on when the pressure drops below the changeover threshold. The hot cathode will be ready for operation after a few seconds heating time, when the <EMI ON> lamp is lit.
  - When the 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 ↔ 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 ↔ HP>) | Changeover threshold     |
|----------------------------|--------------------------|
| 0 or 1                     | 1 mbar (factory setting) |
| 2 or 3                     | 5×10 <sup>-1</sup> mbar  |
| 4 or 5                     | 2×10 <sup>-1</sup> mbar  |
| 6 or 7                     | 1×10 <sup>-1</sup> mbar  |
| 8 or 9                     | 5×10 <sup>-2</sup> 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 (→ [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 → [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 ... 3×10<sup>-3</sup> mbar is reached for the first time.

## Adjustment of the Pirani part at atmospheric pressure:

Put the gauge into operation.

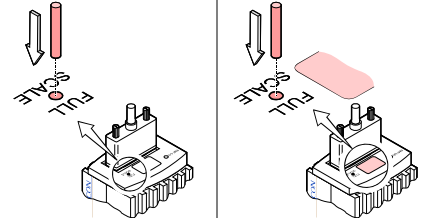


Operate the gauge for ≈10 minutes at atmospheric pressure. If the gauge was operated within the hot cathode range, a cooling-down time of ≈30 minutes is to be expected (gauge temperature = environmental temperature).

Adjust the gauge

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

Insert a pin (≈∅1.3×50mm) through the opening <FULL SCALE> and push the button inside for at least 5 seconds.



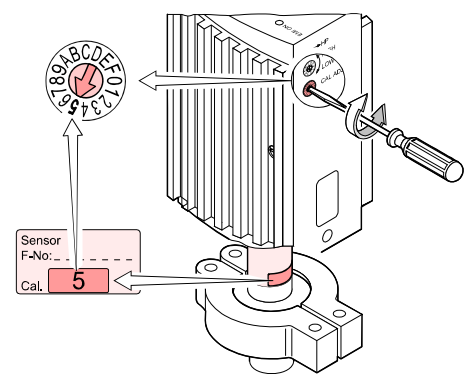
Automatic adjustment in progress.



Adjustment completed.

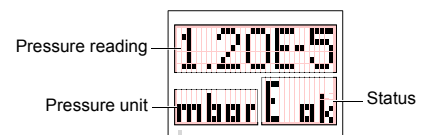
## Adjusting the Calibration Setting of the Hot Cathode Part

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 <sup>1)</sup>            |
|               | Fail IonG 8    | Hot cathode sensor warning <sup>1)</sup>       |
|               | Fail IonG 9    | Pirani sensor error                            |
|               | no Signal      | Internal data connection failure <sup>1)</sup> |

<sup>1)</sup> 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.

- 1** Vent the vacuum system.
- 2** Put the gauge out of operation.
- 3** 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])).
- 4** 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 (→ [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

**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 enclose a duly completed declaration of contamination <sup>1)</sup>


<sup>1)</sup> Form under [www.inficon.com](http://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

**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.

**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](http://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](http://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

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