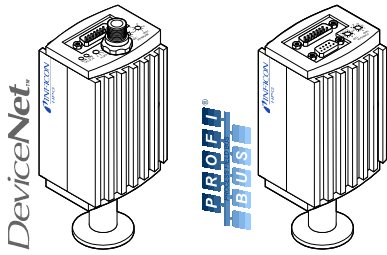


High Pressure / Pirani Gauge

With Fieldbus Interface

HPG400-SD
HPG400-SP



Instruction Sheet

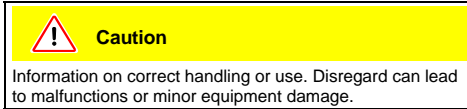
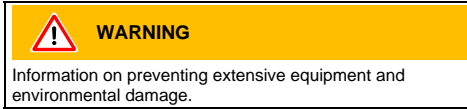
tima32e1-a (2004-05)

Intended Use

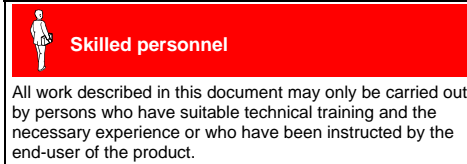
The High Pressure / Pirani Gauges of the type HPG400-SD and -SP have been designed for vacuum measurement of non-flammable gases and gas mixtures in a pressure range of 2×10^{-6} ... 1 mbar. The control range of the gauge allows a trend display from <1 mbar (5×10^{-2} mbar) ... 1000 mbar.

Safety

Symbols Used



Personnel Qualifications



General Safety Instructions

All safety instructions given in [1] and [2] apply to the sensor types described in this document, too.

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.

HPG400-SD DeviceNet

DeviceNet™

General Information

The HPG400-SD gauge has a fieldbus interface that conforms to the DeviceNet standard (→ [8]).

Via this interface, the following and further data are exchanged in the standardized DeviceNet Protocol (→ [3], [8]):

- Pressure reading
- Pressure unit (mbar, Torr, Pa)
- Gauge adjustment
- Status and error messages

Two adjustable switching functions are integrated in the gauge. The corresponding relay contacts are available at the sensor cable connector.

The basic sensor and sensor electronics of the HPG400-SD type are the same as in the standard HPG400 (→ [1], [2]).

Technical Data HPG400-SD

General technical data of the sensor and sensor electronics → [1], [2].

Fieldbus Interface

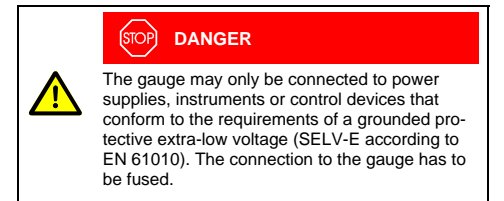
Fieldbus name	DeviceNet
Standard applied	→ [8]
Communication protocol, data format	→ [3], [8]
Interface, physical	CAN bus

HPG400-SD DeviceNet parameters

Data rate (adjustable via "RATE" switch)	125 kbaud 250 kbaud 500 kbaud "P" (programmable 125 kbaud, 250 kbaud, 500 kbaud via DeviceNet) (→ [3])
Node address (MAC ID) (adjustable via "ADDRESS, MSD, LSD" switches)	0 ... 63 _{dec} "P" (programmable 0 ... 63 via DeviceNet) (→ [3])

DeviceNet connector	Micro-Style, 5 pins, male
Cable	Shielded special DeviceNet cable, 5 conductors (→ [8], [6])
Cable length, system wiring	According to DeviceNet specifications (→ [8], [6])

Supply Voltages



Supply voltage at the sensor connector, Pin 8	+24 VDC (+20 ... 28 V)
Power consumption	<16 W

DeviceNet operation requires an additional, separate power supply.

Supply voltage at the DeviceNet connector, Pin 2	+24 VDC (+11 ... 25 V)
Power consumption	<2 W
The gauge is protected from reversed polarity of the supply voltage.	

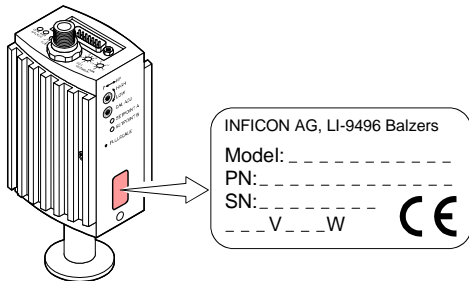
About this document

This document is a supplement to the standard Instruction Sheet enclosed with the HPG400 ([1]). It contains specific information on using the HPG400-SD and HPG400-SP gauge types in connection with a fieldbus interface and should be used together with the standard Instruction Sheet.

The symbol (→ [XY]) refers to documents and files listed under "Further Information".

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 the following part numbers:

HPG400-SD (DeviceNet):
353-527 (DN 25 ISO-KF)
353-528 (DN 40 CF-R)

HPG400-SP (Profibus):
353-525 (DN 25 ISO-KF)
353-526 (DN 40 CF-R)

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

If not indicated otherwise in the legends, the illustrations in this document apply to the vacuum connection DN 25 ISO-KF. They apply to other vacuum connections by analogy.

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

All dimensions in mm.

Trademarks

DeviceNet™ Open DeviceNet Vendor Association, Inc.

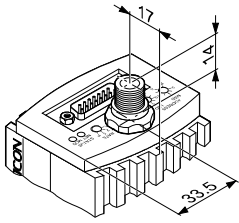
Sensor Cable Connection

For reasons of compatibility, the expression "sensor cable" is used in this document, although the pressure reading of the SD-type gauge is normally transmitted via the DeviceNet interface.

Connector	D-Sub, 15 pins, male
Cable	Max. 15 conductors, shielded
Cable length (cross section/conductor)	≤35 m (0.25 mm ²) ≤50 m (0.34 mm ²) ≤100 m (1.0 mm ²)
Switching functions	2 Setpoints adjustable via potentiometers (Setpoints A and B), one floating, normally open contact per setpoint
Relay contact rating	≤60 VDC, ≤0.5 A
Gauge identification	56 kΩ between Pin 10 (sensor cable) and GND
Grounding principle	→ "Electrical Connection"

Dimensions [mm]

Housing and vacuum connection → [1], [2]

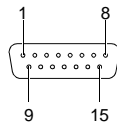
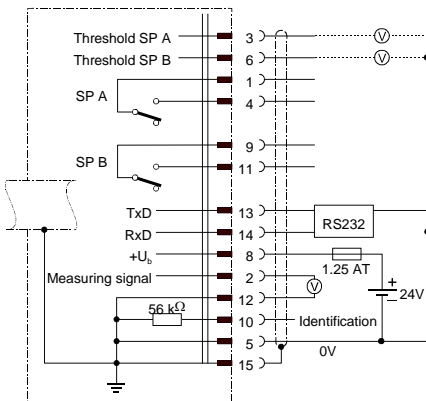


Weight	
353-527	430 g
353-528	695 g

Electrical Connection

Make sure the vacuum connection is properly made (→ [1], [2], "Vacuum Connection").

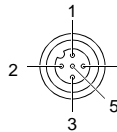
1 If no sensor cable is available, make one according to the diagram.



D-Sub, 15 pins, female soldering side

Pin 1	Relay switching function A, COM contact	
Pin 2	Signal output (measuring signal)	0 ... +10 V
Pin 3	Threshold (Setpoint) A	0 ... +10 V
Pin 4	Relay switching function A, N.O. contact	
Pin 5	Supply common, GND	
Pin 6	Threshold (Setpoint) B	0 ... +10 V
Pin 7	Not connected	
Pin 8	Supply voltage	+24 V
Pin 9	Relay switching function B, COM contact	
Pin 10	Gauge identification	
Pin 11	Relay switching function B, N.O. contact	
Pin 12	Signal common, GND	
Pin 13	RS232 TxD	
Pin 14	RS232 RxD	
Pin 15	Shielding, housing, GND	

2 If no DeviceNet cable is available, make one according to the following indications:

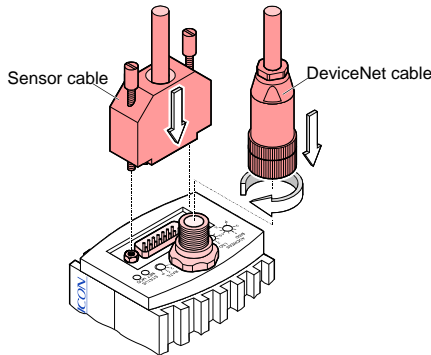


Micro-Style, 15 pins, (DeviceNet), female soldering side

Pin 1	Drain	
Pin 2	Supply (DeviceNet interface only)	+24 VDC
Pin 3	Supply common (DeviceNet interface only)	GND
Pin 4	CAN_H	
Pin 5	CAN_L	

3 Connect the sensor cable to the gauge.

4 Connect the DeviceNet cable to the gauge.



5 Secure the sensor cable connector on the gauge using the lock screws.

6 Lock the DeviceNet cable connector.

The gauge can now be put into operation.

Operation

Caution



Caution: data transmission errors

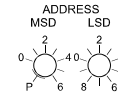
If the gauge is operated via an RS232 interface (e.g. INFICON Vacuum Gauge Controller VGC4XX) and the DeviceNet at the same time, data transmission errors may occur.

The gauge must not be operated via an RS232 interface and the DeviceNet at the same time.

Operating Software

Before the gauge is put into operation, it has to be configured for the DeviceNet. A configuration tool and the device specific EDS file (Electronic Data Sheet) are required for this purpose. This software can be downloaded via internet (→ [5]).

Node Address Setting



Set the node address (0 ... 63_{dec}) via the "ADDRESS" "MSD" and "LSD" switches. The node address is polled by the firmware when the gauge is switched on. If the setting deviates from the stored value, the new value is taken over into the NVRAM. If a setting higher than 63 is made, the previous node address setting remains valid. If the MSD switch is in the "P" position, the node address is programmable via the DeviceNet (→ [3]).

Data Rate Setting



By means of the "RATE" switch, the data rate can be set to 125 ("1"), 250 ("2") or 500 kbaud ("5").

If the switch is in any of the "P" positions, the data rate is programmable via the DeviceNet (→ [3]).

The admissible data rate depends on several factors (system parameters, cable lengths etc. → [8]).

Adjusting the Gauge

→ Adjustment and settings.

Setting the Switching Functions

→ Adjustment and settings.

The gauge is now ready for operation.

Status Lights



"STATUS MOD" (gauge status):

Light status	Meaning
Dark	No supply
Flashing red/green	Selftest
Green	Normal operation
Red	Non recoverable error

"STATUS NET" (network status):

Light status	Meaning
Dark	Gauge not online: – Selftest not yet concluded – No supply, → "STATUS MOD" light
Flashing green	Gauge online but no connection: – Selftest concluded, but no connection to other nodes established – Gauge not assigned to any master
Green	Gauge online; necessary connections established
Flashing red	One or several input/output connections in "timed out" status
Red	Communication error. The gauge has detected an error that impedes communication via the network (e.g. two identical node addresses (MAC ID) or "Bus-off")



(2004-05)

HPG400-SP Profibus



General Information

The HPG400-SP gauge has a fieldbus interface that conforms to the Profibus DPV1 standard (→ [9]).

Via this interface, the following and further data are exchanged in the standardized Profibus protocol (→ [1], [2]):

- Pressure reading
- Pressure unit (mbar, Torr, Pa)
- Gauge adjustment
- Status and error messages

Two adjustable switching functions are integrated in the gauge. The corresponding relay contacts are available at the sensor cable connector.

The basic sensor and sensor electronics of the HPG400-SP type are the same as in the standard HPG400 (→ [1], [2]).

Technical Data HPG400-SP

General technical data of the sensor and sensor electronics → [1], [2].

Fieldbus Interface

Fieldbus name	Profibus
Standard applied	→ [9] (Profibus DPV1)
Communication protocol, data format	→ [4], [9]
Interface, physical	RS485
HPG400-SP Profibus parameters	
Data rate	≤12 Mbaud (→ [4], [9])
Node address (adjustable via hexadecimal "ADDRESS, MSD, LSD" switches or programmable via Profibus, → [2], [4])	00 ... 7D _{hex} (0 ... 125 _{dec})
Profibus connection	D-Sub, 9 pins, female
Cable	Shielded special Profibus cable (→ [7], [9])
Cable length, system wiring	According to Profibus specifications (→ [7], [9])

Supply Voltages

STOP 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 (SELV-E according to EN 61010). The connection to the gauge has to be fused.

The power consumption of the HPG400-SP is higher than that of the standard HPG400.

Supply voltage at sensor cable connector, Pin 8	+24 VDC (+20 ... 28 V)
Power consumption	<18 W

Sensor Cable Connection

For reasons of compatibility, the expression "sensor cable" is used in this document, although the pressure reading of the SP-type gauge is normally transmitted via the Profibus interface.

Connector	D-Sub, 15 pins, male
Cable	Max. 15 conductors, shielded
Cable length (cross section/conductor)	≤35 m (0.25 mm ²) ≤50 m (0.34 mm ²) ≤100 m (1.0 mm ²)

Switching functions	2 Setpoints adjustable via potentiometers (Setpoints A and B), one floating, normally open contact per setpoint
Relay contact rating	≤60 VDC, ≤0.5 A
Gauge identification	56 kΩ between Pin 10 (sensor cable) and GND
Grounding principle	→ "Electrical Connection"

Dimensions

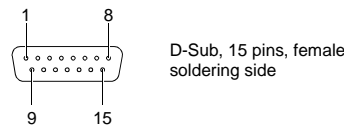
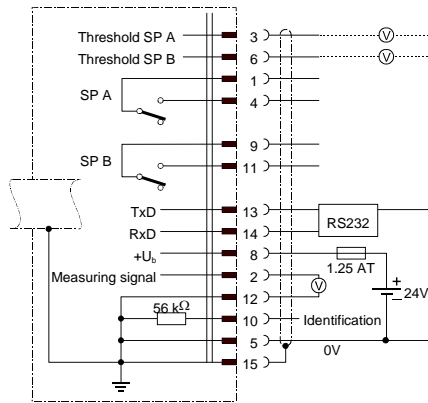
Housing and vacuum connection → [1], [2]

Weight	
353-525	430 g
353-526	695 g

Electrical Connection

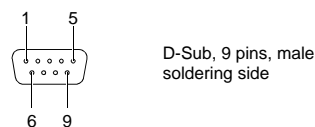
Make sure the vacuum connection is properly made (→ [1], [2], "Vacuum Connection").

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



Pin 1	Relay switching function A, COM contact
Pin 2	Signal output (measuring signal) 0 ... +10 V
Pin 3	Threshold (Setpoint) A 0 ... +10 V
Pin 4	Relay switching function A, N.O. contact
Pin 5	Supply common, GND
Pin 6	Threshold (Setpoint) B 0 ... +10 V
Pin 7	Not connected
Pin 8	Supply voltage +24 V
Pin 9	Relay switching function B, COM contact
Pin 10	Gauge identification
Pin 11	Relay switching function B, N.O. contact
Pin 12	Signal common, GND
Pin 13	RS232 TxD
Pin 14	RS232 RxD
Pin 15	Shielding, housing, GND

2 If no Profibus cable is available, make one according to the following indications:



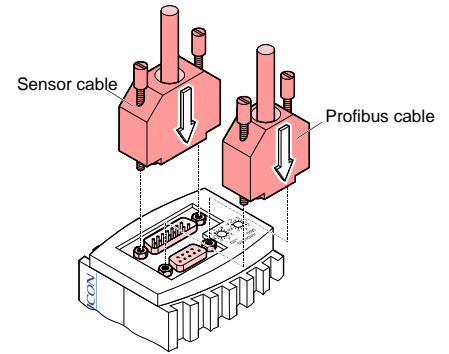
Pin 1	Not connected
Pin 2	Not connected
Pin 3	RxD/TxD-P
Pin 4	CNTR-P 1)
Pin 5	DGND 2)
Pin 6	VP 2)
Pin 7	Not connected
Pin 8	RxD/TxD-N
Pin 9	Not connected

1) Only to be connected if an optical link module is used.

2) Only required as line termination for devices at both ends of bus cable (→ [9]).

3 Connect the sensor cable to the gauge.

4 Connect the Profibus cable to the gauge.



5 Secure the sensor cable connector on the gauge using the lock screws.

6 Lock the Profibus cable connector.

✓ The gauge can now be put into operation.

Operation

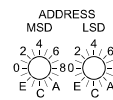
Caution

Caution: data transmission errors
If the gauge is operated via an RS232 interface (e.g. INFICON Vacuum Gauge Controller VGC4XX) and the Profibus at the same time, data transmission errors may occur.
The gauge must not be operated via an RS232 interface and the Profibus at the same time.

Operating Software

For operating the gauge via the Profibus network, prior installation of the gauge specific GSD file is required. This software can be downloaded via internet (→ [5]).

Note Address Setting



The node address (0 ... 125_{dec}) is set in hexadecimal form (00 ... 7D_{hex}) via the "ADDRESS", "MSD", and "LSD" switches. The node address is polled by the firmware when the gauge is switched on. If the setting deviates from the stored value, the new value is taken over into the NVRAM. If a value >7D_{hex} (>125_{dec}) is entered, the node address setting currently stored in the device remains valid but it can now be defined via Profibus ("Set slave Address", → [4]).

Adjusting the Gauge

→ "Adjustment and settings".

Setting the Switching Functions

→ "Adjustment and settings".

✓ The gauge is now ready for operation.

Adjustment and Settings

For HPG400-SD and HPG400-SP gauge

Adjusting the Gauge (Full Scale)

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 <math>< 9.75\text{ V}</math> or the display reading is <math>< \text{atmosphere}</math>
- when venting the vacuum system, the output voltage reaches 9.75 V before the measured pressure has reached atmosphere.

(For more details → [2], "Maintenance, Repair").

- 1 If you are using a seal with centering ring and filter, check that they are clean or replace them if necessary (→ [1], [2], "Deinstallation").

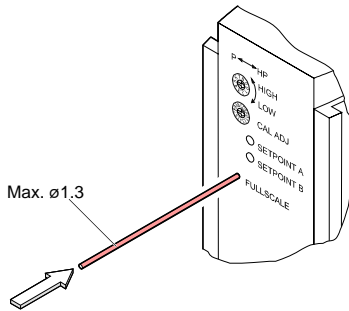
- 2 Put the gauge into operation.



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).

- 3 Adjusting the gauge:

Insert a Pin (≈1.3 mm) through the opening marked "FULL SCALE" and push the button inside for at least 5 seconds.



The gauge is now automatically adjusted. The adjustment takes ≈4 s.

✓ The gauge is now adjusted.

Setting the Switching Functions

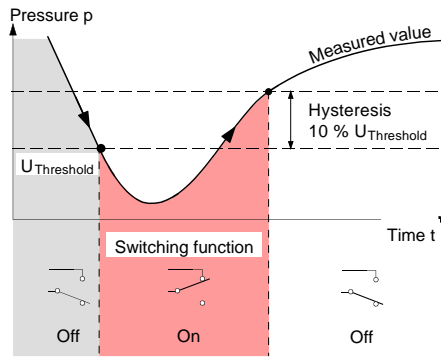
The threshold values of switching functions A and B can be set within the pressure range 2×10^6 mbar ... 100 mbar via potentiometers "SETPOINT A" and "SETPOINT B".

For the corresponding threshold voltages, the following equation applies:

$$U_{\text{Threshold}} = 10 / 9 \times (\log p_{\text{Setpoint}} - c + 6)$$

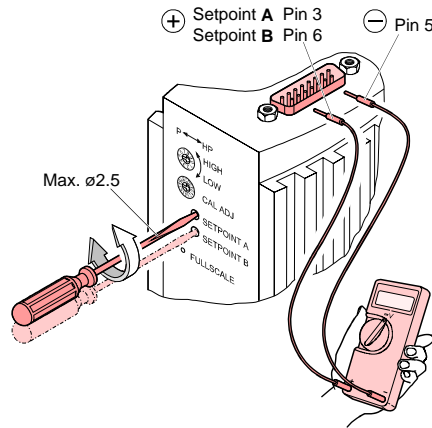
Constant c depends on the pressure unit,

Where	p	c
	[mbar]	0
	[Torr]	-0.125
	[Pa]	2



The hysteresis of the switching functions is 10% of the threshold setting.

- 1 Put the gauge into operation.
- 2 Connect the (+) lead of a voltmeter to the threshold measurement point of the selected switching function ("Setpoint A" Pin 3, "Setpoint B" Pin 6) and its (-) lead to Pin 5.



- 3 Using a screwdriver (max. ø2.5 mm), set the threshold of the selected switching function (Setpoint A, B) to the desired value $U_{\text{Threshold}}$

✓ The setting of the switching functions is now concluded. A functional check of the switching functions (On/Off) is only possible via fieldbus interface (→ [3] for HPG400-SD, → [4] for HPG400-SP) or by measuring the relay contacts with a continuity checker/ohmmeter (→ "Electrical Connection", sensor cable connector).

Further Information

- [1] www.inficon.com
Instruction Sheet
High Pressure / Pirani Gauge HPG400
tima31e1
INFICON AG, LI-9496 Balzers, Liechtenstein
- [2] www.inficon.com
Operating Manual
High Pressure / Pirani Gauge
HPG400, HPG400-SD, HPG400-SP
tina31e1
INFICON AG, LI-9496 Balzers, Liechtenstein
- [3] www.inficon.com
Communication Protocol
DeviceNet™ High Pressure / Pirani Gauge
HPG400-SD
tira03e1
INFICON AG, LI-9496 Balzers, Liechtenstein
- [4] www.inficon.com
Communication Protocol
Profibus
Bayard-Alpert Pirani Gauge BPG400-SP
High Pressure / Pirani Gauge HPG400-SP
tira36e1
INFICON AG, LI-9496 Balzers, Liechtenstein
- [5] www.inficon.com
("Semiconductor and Vacuum coating processes,
Vacuum Gauges")
Product descriptions and downloads
INFICON AG, LI-9496 Balzers, Liechtenstein
- [6] www.odva.org
Open DeviceNet Vendor Association, Inc.
DeviceNet™ Specifications
- [7] www.profibus.com
Profibus user organization
- [8] European Standard for DeviceNet EN 50325
- [9] European Standard for Profibus EN 50170



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