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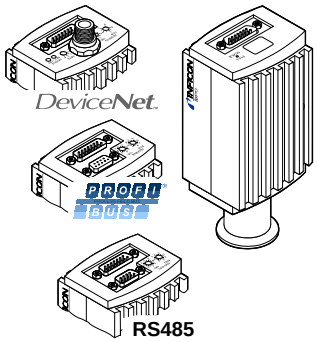
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Bayard-Alpert Pirani Gauge

BPG400
BPG400-SD
BPG400-SP
BPG400-SR

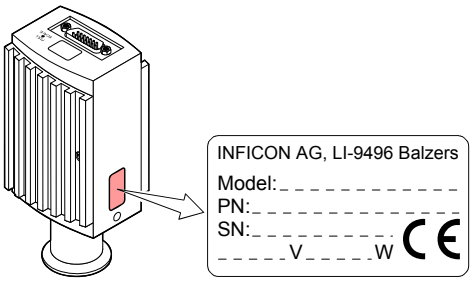


Instruction Sheet
Incl. EC Declaration of Conformity

tima03e1-c (2010-04)

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.



Validity

This document applies to products with the following part numbers (PN):

BPG400 (without display)
353-500 (DN 25 ISO-KF)
353-502 (DN 40 CF-R)

BPG400 (with display)
353-501 (DN 25 ISO-KF)
353-503 (DN 40 CF-R)

BPG400-SD (with DeviceNet interface and switching functions)
353-507 (DN 25 ISO-KF)
353-508 (DN 40 CF-R)

BPG400-SP (with Profibus interface and switching functions)
353-505 (DN 25 ISO-KF)
353-506 (DN 40 CF-R)

BPG400-SR (with RS485 interface and switching functions)
353-509 (DN 25 ISO-KF)
353-513 (DN 40 CF-R)

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

If not indicated otherwise in the legends, the illustrations in this document correspond to the gauge with part number 353-500. They apply to the other gauges by analogy.

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

All dimensions in mm.

Intended Use

The BPG400, BPG400-SD, BPG400-SP and BPG400-SR gauges have been designed for vacuum measurement of gases in the pressure range of 5×10^{-10} … 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 VGC103 or VGC40x Vacuum Gauge Controller or with another instrument or control device.

Functional Principle

Over the whole measuring range, the gauge has a continuous characteristic curve and its measuring signal is output as logarithm of the pressure.

The gauge functions with a Bayard-Alpert hot cathode ionization measurement system (for $p < 2.0\times10^{-2}$ mbar) and a Pirani measurement system (for $p > 5.5\times10^{-3}$ mbar). In the overlapping pressure range of 2.0×10^{-2} … 5.5×10^{-3} mbar, a mixed signal of the two measurement systems is output. The hot cathode is switched on by the Pirani measurement system only below the switching threshold of 2.4×10^{-2} mbar (to prevent filament burn-out). It is switched off when the pressure exceeds 3.2×10^{-2} mbar.

Trademark

DeviceNet™ Open DeviceNet Vendor Association, Inc.

Safety

Symbols Used

STOP 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

In some points, the technical data of BPG400-SD, BPG400-SP and BPG400-SR differ from those of BPG400, which are given below (→ "Technical Data" in 🕮 [1] and [2]).

Measuring range (air, O_2, CO, N_2)	5×10^{-10} … 1000 mbar continuous
Accuracy	15% of reading in the range of 1×10^{-8} … 10^{-2} mbar (after 5 min. stabilization)
Repeatability	5% of reading in the range of 1×10^{-8} … 10^{-2} mbar (after 5 min. stabilization)

Emission	
Switching on threshold	2.4×10^{-2} mbar
Switching off threshold	3.2×10^{-2} mbar
Emission current	
$p \le 7.2\times10^{-6}$ mbar	5 mA
7.2×10^{-6} mbar < p < 3.2×10^{-2} mbar	25 µA
Emission current switching	
25 µA ⇒ 5 mA	7.2×10^{-6} mbar
5 mA ⇒ 25 µA	3.2×10^{-5} mbar

Degas	
Current ($p < 7.2\times10^{-6}$ mbar)	≈16 mA (P_{degas} ≈4.0 W)
Control input signal	0 V/24 V, high active
Duration	<3 min, followed by automatic stop

In degas mode, the BPG400 keeps supplying pressure readings, the tolerances of which can be higher than during normal operation.

Output signal (measuring signal)	0 … +10 V
Measuring range	0.774 … 10 V (5×10^{-10} … 1000 mbar)
Voltage vs. pressure	logarithmic, 0.75 V/decade
Error signal (→ 🕮 [1])	≈0.3 V (hot cathode error) ≈0.5 V (Pirani error)
Minimum load impedance	10 kΩ

Gauge identification	42 kΩ between Pin 10 and Pin 5 (gauge cable)

RS232C interface	
Data rate	9600 Baud
Data format	binary 8 data bits one stop bit no parity bit no handshake
Connector	→ "Power Connection"

Further information on the RS232C interface → 🕮 [1]

Display panel (353-501, 353-503)	LCD matrix, 32×16 pixels, with background illumination
Dimensions	16.0 mm × 11.2 mm
Pressure units	mbar (default), Torr, Pa (Selecting the pressure unit → 🕮 [1])

Supply

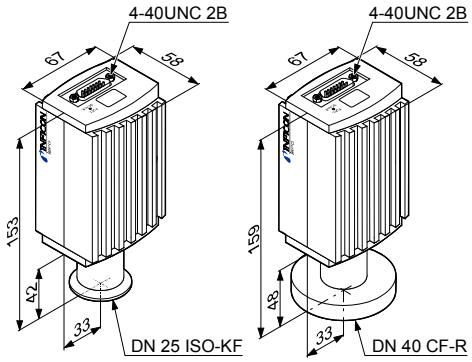
STOP DANGER
The gauge must only be connected to power supplies, instruments or control devices that conform to the requirements of a grounded protective extra-low voltage (SELV). The connection to the gauge has to be fused [1].

Voltage at gauge	24 VDC (20 … 28 VDC) (ripple ≤2 V_{pp}) [2]
Power consumption	
Standard	≤0.5 A
Degas	≤0.8 A
Emissions start (200 ms)	≤1.4 A
Fuse required [1]	≤1.25 AT
Power consumption	≤16 W

[1] INFICON controllers fulfill these requirements.
[2] Consider the voltage drop on the sensor cable.

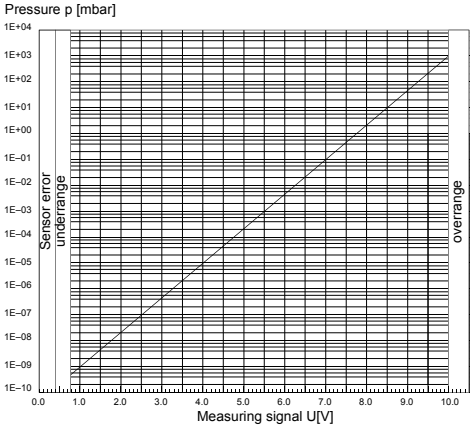
Electrical connection	D-Sub, 15-pin, male
Sensor cable	
For analog values only, without degas function	4 conductors, shielded
For analog values, with degas function	5 conductors, shielded
All functions, incl. RS232C interface	7 conductors, shielded
Cable length (24 VDC)	≤35 m (4/5/7x0.25 mm²) ≤50 m (4/5/7x0.34 mm²) ≤100 m (4/5/7x1.0 mm²)
For operation with RS232C interface	≤30 m
Materials on the vacuum side	
Housing, supports, screens	stainless steel
Feedthroughs	NiFe nickel plated
Insulator	glass
Cathode	iridium, yttrium oxide (Y_2O_3)
Cathode holder	molybdenum
Pirani element	tungsten, copper
Internal volume	
DN 25 ISO-KF	≈24 cm^3
DN 40 CF-R	≈34 cm^3
Maximum admissable Pressure	2 bar (absolute)
Admissible temperatures	
Storage	–20 … +70 °C
Operation	0 … +50 °C
Bakeout	150 °C (without electronics unit)
Relative humidity	
Year's mean	≤65% (not condensable)
During 60 days	≤85% (not condensable)
Use	indoors only altitude up to 2000 m NN
Type of protection	IP 30

Dimensions [mm]



Weight	
353-500, 353-501	≈285 g
353-502, 353-503	≈550 g
353-505, 353-507	
353-509	≈430 g
353-506, 353-508	
353-513	≈695 g

Measuring Signal vs. Pressure



$$p = 10^{(U-7.75)/0.75+c}$$

U	p	c
[V]	[mbar]	0
[V]	[Pa]	2
[V]	[Torr]	-0.125

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

Gas Type Dependence

For gases other than air, the pressure in the indication range $p < 10^{-3}$ mbar can be determined by a simple conversion:

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

Gas type	Calibration factor C	Gas type	Calibration factor C
He	5.9	air, O_2, CO, N_2	1.0
Ne	4.1	H_2	2.4
Kr	0.5	Xe	0.4
Ar	0.8		

Installation

Vacuum Connection

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.

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

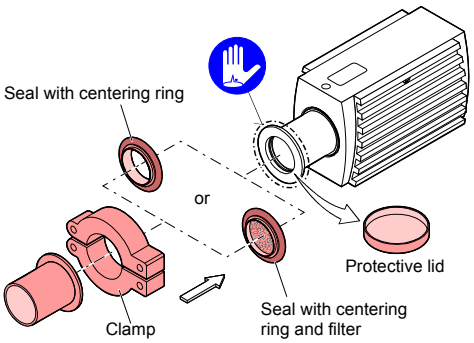
Touching the product or parts thereof with bare hands increases the desorption rate.

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 grid. For potentially contaminating applications and to protect the electrodes against light and fast particles, installation of the optional baffle is recommended (→ 🕮 [1]).

Remove the protective lid and install the product to the vacuum system, preferably without applying vacuum grease.



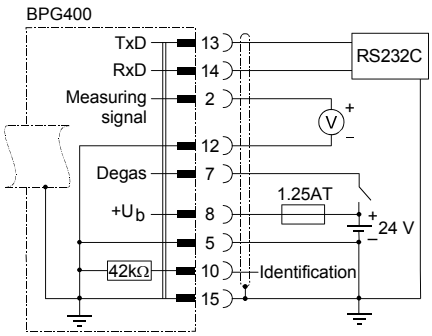
Keep the protective lid.

Power Connection (BPG400)

The following information on the electrical connection as well as the wiring diagram applies to BPG400 only (→ 🕮 [1] and [2] for details on the electrical connection and additional functions of BPG400-SD, -SP and -SR).

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

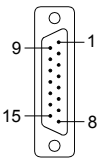
❶ If no connection cable is available, make one according to the following diagram.



Electrical connection

Pin 2	Signal output (measuring signal) 0 … +10 V
Pin 5	Supply common, GND
Pin 7	Degas on, active high +24 VDC
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, 9 and 11 are not connected internally.

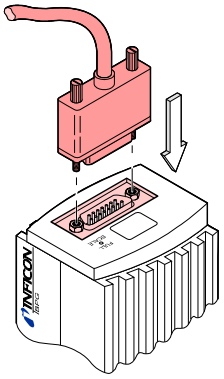


D-Sub, 15-pin female, soldering side

tima03e1-c (2010-04)

Original: German tima03d1-c (2010-04)

❷ Connect the sensor cable to the gauge.



❸ Secure the cable connector with the lock screws.

❹ 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]).

BPG400-SD, -SP and -SR can also be operated via the corresponding fieldbus interface (DeviceNet, Profibus or RS485 → 🕮 [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 (BPG400)

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

Adjusting the Gauge

The adjustment of BPG400-SD, -SP and -SR (→ 🕮 [1] and [2]) is slightly different from the procedure for BPG400, 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 <10 V or the display reading is <atmosphere
- when venting the vacuum system, the output voltage reaches 10 V before the measured pressure has reached atmosphere (Gauges with display will show the error "5" at atmosphere (Pirani sensor warning)).

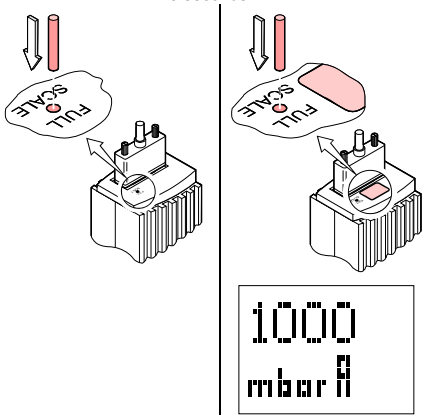
❶ Activate the gauge.

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

❷ Adjusting the gauge

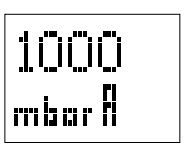
BPG400 without display 353-500 353-502	BPG400 with display 353-501 353-503

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



≈10 s

Automatic adjustment

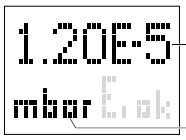


Adjustment completed



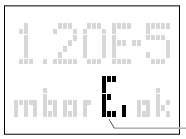
Display

(BPG400 with part numbers 353-501 and 353-503)



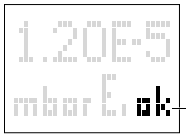
Pressure reading

Pressure unit



Function display

(none) Pirani operation
E Emission 25 µA
E. Emission 5 mA
D Degas
A 1000 mbar adjustment (Pirani)

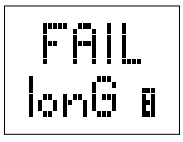


Error display

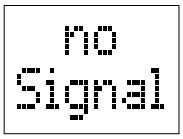
ok no error
(green background illumination)

5 Pirani sensor warning
(red background illumination)

8 Pirani sensor error
(red background illumination)



8 BA sensor error
(red background illumination)



Internal data connection failure
(red background illumination)

Deinstallation

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

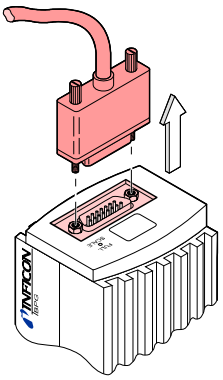
Touching the product or parts thereof with bare hands increases the desorption rate.

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

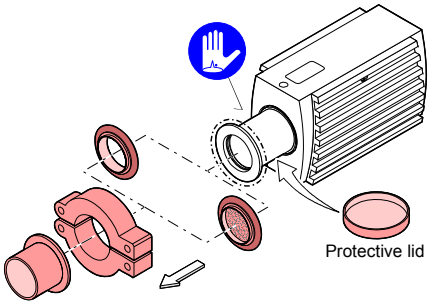
❶ Vent the vacuum system.

❷ Put the gauge out off operation.

❸ Unfasten the lock screws and unplug the sensor cable. (If you are using BPG400-SD, -SP or -SR, unfasten and unplug the interface cable too (→ 🕮 [1] and [2]).



❹ Remove the gauge from the vacuum system.



Maintenance, Troubleshooting

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 (filament), are not covered by the warranty.

Returning the Product

WARNING

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

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

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
Operating Manual
Bayard-Alpert Pirani Gauge BPG400, BPG400-SD, BPG400-SP, BPG400-SR
tina03d1 (German)
tina03e1 (English)
INFICON AG, LI–9496 Balzers, Liechtenstein

🕮 [2] www.inficon.com
Instruction Sheet
Bayard-Alpert Pirani Gauge BPG400-SD, BPG400-SP, BPG400-SR
tima36d1 (German)
tima36e1 (English)
INFICON AG, LI–9496 Balzers, Liechtenstein

Declaration of Contamination

The service, repair, and/or disposal of vacuum equipment and components will only be carried out if a correctly completed declaration has been submitted. Non-completion will result in delay.
This declaration may only be completed (in block letters) and signed by authorized and qualified staff.

1 Description of product
Type _____
Part number _____
Serial number _____

2 Reason for return
_____
_____
_____

3 Operating fluid(s) used
(Must be drained before shipping.)
_____
_____

4 Used in copper process
no ❑ yes ❑ → Seal product in plastic bag and mark it with a corresponding label.

5 Process related contamination of product:

toxic	no ❑ 1)	yes ❑
corrosive	no ❑ 1)	yes ❑
biological hazard	no ❑	yes ❑ 2)
explosive	no ❑	yes ❑ 2)
radioactive	no ❑	yes ❑ 2)
other harmful substances	no ❑ 1)	yes ❑

1) or not containing any amount of hazardous residues that exceed the permissible exposure limits

2) Products thus contaminated will not be accepted without written evidence of decontamination.

The product is free of any substances which are damaging to health. yes ❑

6 Harmful substances, gases and/or by-products

Please list all substances, gases, and by-products which the product may have come into contact with:

Trade/product name manufacturer	Chemical name (or symbol)

Precautions associated with substance	Action if human contact

7 Legally binding declaration:

We hereby declare that the information on this form is complete and accurate and that we will assume any further costs that may arise. The contaminated product will be dispatched in accordance with the applicable regulations.

Organization/company _____
Address _____
Post code, place _____
Phone _____ Fax _____
Email _____
Name _____
Company stamp

This form can be downloaded from our website.
Copies: Original for addressee
1 copy for accompanying documents
1 copy for file of sender

EC Declaration of Conformity

CE

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

Products

Bayard-Alpert Pirani Gauge
BPG400
BPG400-SD
BPG400-SP
BPG400-SR

Standards

Harmonized and international/national standards and specifications:

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

Manufacturer / Signatures

INFICON AG, Alte Landstrasse 6, LI-9496 Balzers

12 April 2010
Dr. Urs Wälchli
Managing Director

12 April 2010
Claudio Christoffel
Product Manager

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