

Bayard-Alpert Pirani Gauge

BPG400 BPG400-SD BPG400-SP



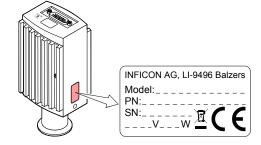


Instruction Sheet Incl. EU Declaration of Conformity

tima03e1-e (2016-04)

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



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)

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 353-500. They apply to the other gauges by analogy.

We reserve the right to make technical changes without prior

All dimensions in mm.

Intended Use

The BPG400, BPG400-SD and BPG400-SP 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 < 2.0×10⁻² mbar) and a Pirani measurement system (for p > 5.5×10^3 mbar). In the overlapping pressure range of $2.0 \times 10^2 \dots 5.5 \times 10^3$ 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.



Information on preventing extensive equipment and environmental damage



Information on correct handling or use. Disregard can lead to malfunctions or minor equipment damage

Personnel Qualifications



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

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

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. filament), are not covered by the

Technical Data

In some points, the technical data of BPG400-SD and BPG400-SP differ from those of BPG400, which are given below (\rightarrow "Technical Data" in \square [1] and

Measuring range (air, O₂, CO, N₂)

5×10⁻¹⁰ ... 1000 mbar continuous

15% of reading in the range of 1×10⁻⁸ ... 10⁻² mbar (after 5 min. stabilization)

5% of reading in the range of (after 5 min. stabilization)

Emission

Repeatability

Accuracy

Switching on threshold 2 4×10⁻² mbar Switching off threshold 3.2×10⁻² mbar Emission current 5 mA

p ≤ 7.2×10⁻⁶ mbar 7.2×10⁻⁶ mbar < p < 3.2×10⁻² mbar

Emission current switching 7.2×10⁻⁶ mbar $25 \mu A \Rightarrow 5 mA$ 3.2×10⁻⁵ mbar $5 \text{ mA} \Rightarrow 25 \mu\text{A}$

Degas

Current (p <7.2×10⁻⁶ mbar) ≈16 mA (P_{degas} ≈4.0 W) Control input signal 0 V/24 V(dc), high active <3 min, followed by

25 µA

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) Measuring range

Voltage vs. pressure

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

0 ... +10 V 0.774 ... 10 V (5×10⁻¹⁰ ... 1000 mbar) logarithmic. 0.75 V/decade

≈0.5 V (Pirani error)

Minimum load impedance $10~\text{k}\Omega$ Gauge identification

42 k Ω between Pin 10 and Pin 5 (gauge cable)

≈0.3 V (hot cathode error)

RS232C interface

Connector

9600 Baud Data rate Data format binary 8 data bits

one stop bit no parity bit no handshake

→ "Power Connection"

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

Display panel (353-501 353-503) Dimensions Pressure units

LCD matrix 32×16 pixels with background illumination 16.0 mm × 11.2 mm mbar (default), Torr Pa (Selecting the pressure unit $\rightarrow \square$ [1])

Supply



TOP 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 (PELV). The connection to the gauge has to be fused

Voltage at gauge Power consumption

Standard

Degas

24 V(dc) (20 ... 28 V(dc)) (ripple \leq 2 V_{pp})²⁾ ≤0.5 A ≤0.8 A

Emissions start (200 ms) Fuse required 1 Power consumption

≤1.4 A ≤1.25 AT ≤16 W

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 V(dc)) ≤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

D-Sub, 15-pin, male

≤30 m

Electrical connection

Materials on the vacuum side Housing, supports, screens stainless steel NiFe nickel plated Feedthroughs Insulator iridium, yttrium oxide (Y₂O₃) Cathode Cathode holde molvbdenum tungsten, copper Pirani element

Internal volume DN 25 ISO-KF ≈24 cm³ DN 40 CF-R $\approx 34 \text{ cm}^3$

Maximum admissable Pressure 2 bar (absolute)

Admissible temperatures -20 +70 °C Storage 0 ... +50 °C Operation

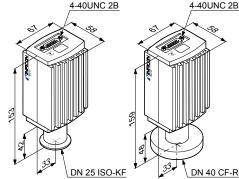
Relative humidity ≤65% (not condensable) During 60 days ≤85% (not condensable) indoors only

150 °C (without electronics

altitude up to 2000 m NN Type of protection IP 30

Dimensions [mm]

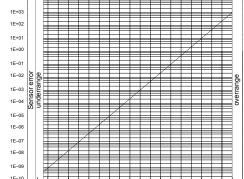
Bakeout



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

Measuring Signal vs. Pressure

Pressure p [mbar]



Measuring signal U[V]

$p = 10^{(U-7.75)/0.75+c}$ [V] [mbar] [V] [V] [Torr] -0.125

where pressure

measuring signal 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 × pressure indicated

Gas type	Calibration factor C	Gas type	Calibration factor C
He Ne Kr Ar	5.9 4.1 0.5 0.8	air, O ₂ , CO, N ₂ H ₂ Xe	1.0 2.4 0.4

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

Do not open any clamps while the vacuum system is pressurized. Use the type clamps which are suited to overpressure



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 ap-

propriate measures to ensure cleanliness and prevent damages.



! Caution

Caution: dirt sensitive area

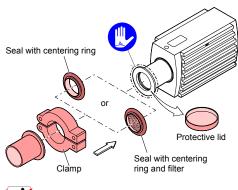
Touching the product or parts thereof with bare hands increases the desorption rate

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.

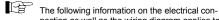
The gauge is supplied with a built-in grid. For potentially contaminating applications and to protect the electrodes against light and fast particles, installation of the optional baffle is recommended ($\rightarrow \square$ [1]).

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





Power Connection (BPG400)

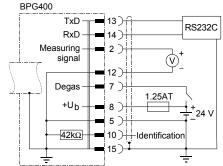


nection as well as the wiring diagram applies to BPG400 only ($\rightarrow \square$ [1] and [2] for details on the electrical connection and additional functions of BPG400-SD and -SP).

Make sure the vacuum connection is properly made

(→ "Vacuum Connection") If no connection cable is available, make one according

to the following diagram



Electrical connection

Pin 2 Signal output (measuring signal) 0 . +10 V Supply common, GND Degas on, active high +24 VDC Supply +24 VDC

Pin 10 Gauge identification Pin 12 Signal common, GND Pin 13 RŠ232C, TxD Pin 14 RS232C RxD

Pin 15 Shielding, housing, GND Pins 1, 3, 4, 6, 9 and 11 are

soldering side

15#:

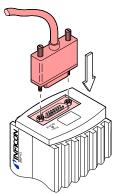
D-Sub. 15-pir



INFICON controllers fulfill these requirements

2) Consider the voltage drop on the sensor cable

Connect the sensor cable to the gauge.



3 Secure the cable connector with the lock screws

4 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]).

BPG400-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

Gas Type Dependence (BPG400)

The measurement value is gas dependent. The displayed reading applies to dry air, O2, CO, and N2. For other gases, it has to be converted (\rightarrow "Technical Data" and \square [1]).

Adjusting the Gauge



The adjustment of BPG400-SD and -SP (\rightarrow \square [1] and [2]) is slightly different from the procedure for BPG400, which is described below.

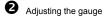
The gauge is factory calibrated. If used under different climatic conditions, at extreme temperatures, through aging or contamination and after exchanging the sensor, the characteristic curve can be offset and readjustment can become necessary. Only the Pirani element can be adjusted and only

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))
- Activate the gauge.



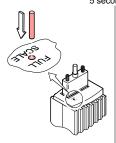
Operate the gauge for ≈10 minutes at atmospheric pressure. If the gauge was operated within the BA range, a cooling-down time of ≈30 minutes is to be expected (gauge temperature = environmental temperature).

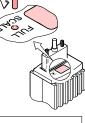


BPG400 without display 353-500 353-502

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









Automatic adjustment

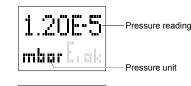


Adjustment completed



Display

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





(none) Pirani operation

- Emission 25 uA
- Emission 5 mA
- Degas
- 1000 mbar adjustment (Pirani)



- (green background illumination) Pirani sensor warning
- (red background illumination)
- Pirani sensor error (red background illumination)



BA sensor error (red background illumination)

mo Siqnal

Internal data connection failure (red background illumination)

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

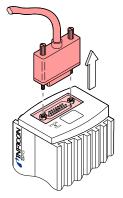


Caution: dirt sensitive area

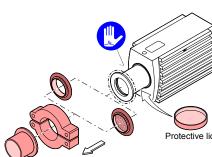
Touching the product or parts thereof with bare hands increases the desorption rate.

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

- Vent the vacuum system.
- 2 Put the gauge out off operation.
- Unfasten the lock screws and unplug the sensor cable. (If you are using BPG400-SD or -SP, unfasten and unplug the interface cable too ($\rightarrow \square$ [1] and [2]).



4 Remove the gauge from the vacuum system.



Maintenance, Troubleshooting

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



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

Further Information

Operating Manual

tina03d1 (German)

tina03e1 (English)

tima36d1 (German)

tima36e1 (English)

Bayard-Alpert Pirani Gauge BPG400, BPG400-SD,

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

INFICON AG, LI-9496 Balzers, Liechtenstein

INFICON AG, LI–9496 Balzers, Liechtenstein

[1] www.inficon.com

[2] www.inficon.com Instruction Sheet

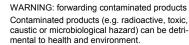
BPG400-SP



Returning the Product



! WARNING



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

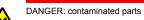
Products that are not clearly declared as "free of harmful substances" are decontaminated at the expense of the

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

Disposal



STOP DANGER



Contaminated parts can be detrimental to health

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 en-

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.

EU Declaration of Conformity



We, INFICON, hereby declare that the equipment mentioned below complies with the provisions of the Directive relating to electromag-netic compatibility 2014/30/EU and the Directive on the restriction of the use of certain hazardous substances in electrical and electronic equipment 2011/65/EU.

Bayard-Alpert Pirani Gauge

BPG400 BPG400-SD BPG400-SP

Standards

Harmonized and international/national standards and specifi-

- EN 61000-6-2:2005 (EMC: generic emission standard)
- EN 61000-6-3:2007 + A1:2011 (EMC: generic immunity
- EN 61010-1:2010 (Safety requirements for electrical equipment for measurement, control and laboratory use)
- EN 61326-1:2013 (EMC requirements for electrical equipment for measurement, control and laboratory use)

Manufacturer / Signatures

INFICON AG, Alte Landstraße 6, LI-9496 Balzers

15 February 2016

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