Intended Use
The BCG450-SD and BCG450-SP gauges have been designed for vacuum measurement of gases in the pressure range $5 \times 10^{-10}$ ... 1500 mbar. They must not be used for measuring flammable or combustible gases in mixtures containing oxidants (e.g. atmospheric oxygen) within the explosion range.

Safety
Symbols Used
- **DANGER** Information on preventing any kind of physical injury.
- **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.

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 (e.g. filament), are not covered by the warranty.

Validity
This document applies to products with the following part numbers:
- **BCG450-SD (DeviceNet):**
  - 353-557 (DN 25 ISO-KF)
  - 353-558 (DN 40 CF-R)
  - 353-552 (DN 25 ISO-KF, with baffle)
- **BCG450-SP (Profibus):**
  - 353-554 (DN 25 ISO-KF)
  - 353-556 (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 correspond to the vacuum connection DN 25 ISO-KF. They apply to other vacuum connections by analogy.

Trademarks
DeviceNet™ Open DeviceNet Vendor Association, Inc.
TripleGauge™ INFICON AG, Balzers
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-pin, male
Cable: Max. 15 conductors, shielded
Cable length, (conductor cross section per conductor): ≤35 m (0.25 mm²), ≤50 m (0.34 mm²), ≤100 m (1.0 mm²)

Switching functions:
- 2 Setpoints adjustable via potentiometers (Setpoints A and B), one floating, normally open contact per setpoint
- Supply
- Threshold (setpoint) A
- Threshold (setpoint) B
- Relay switching function A, n.o. contact
- Relay switching function B, com contact
- Relay switching function B, n.o. contact
- Gauge identification
- Relay switching function B, n.o. contact

Relay contact rating: ≤0 VDC, ≤0.5 ADC

Atmosphere switching function

Gauge identification

Grounding principle: "Power Connection"

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

Power Connection

Sensor Cable Connection

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

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

Electrical Connection

Pin 1: Relay switching function A, n.o. contact
Pin 2: Measuring signal output 0 ... +10,13 V
Pin 3: Threshold (setpoint) A 0 ... +10 V
Pin 4: Relay switching function A, com contact
Pin 5: Supply common 0 V
Pin 6: Threshold (setpoint) B 0 ... +10 V
Pin 7: Degas on, active high 0 V/+24 V
Pin 8: Supply +24 V
Pin 9: Relay switching function B, n.o. contact
Pin 10: Gauge identification
Pin 11: Relay switching function B, com contact
Pin 12: Measuring signal common
Pin 13: Do not connect
Pin 14: Do not connect
Pin 15: Do not connect

1) Do not connect pin 3 and pin 6 for normal operation of the gauge. These pins are reserved for adjustment of the setpoint potentiometers ("Setting the Switching Functions")
2) Reprogrammable for atmosphere switching function via fieldbus interface (→ [2]).

Connect the sensor cable to the gauge and secure it using the lock screws.

DeviceNet Cable Connection

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

Pin 1: Drain
Pin 2: Supply +24 VDC
Pin 3: Supply common
Pin 4: CAN_H
Pin 5: CAN_L

Connect the DeviceNet cable to the gauge and lock the cable connector.

Data Rate Setting

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

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

Adjusting the Gauge

Gauge adjustment is carried out automatically, no manual adjustment is required (adjustment of the atmosphere sensor → [2]).

Adjusting the Switching Functions

→ Adjustment and settings.

Status Lights

"STATUS MOD" (gauge status):

Light status Meaning
Dark No supply
Flash red (soldering side) Selftest
Green Normal operation
Red Non recoverable error
Flash red Recoverable error (e.g. missing DeviceNet power supply).

"STATUS NET" (network status):

Light status Meaning
Dark Gauge not online:
- Selftest not yet concluded
- No supply, → "STATUS MOD" light
Flash 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
Flash red One or several input/output connections in "time 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")

Operation

Caution: data transmission errors

The attempt to operate the BPG450-SD with the RS232C interface causes data transmission errors.

The BPG450-SD must not be operated with the RS232C interface.

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 (→ [3]).

Node Address Setting

Set the node address (0 ... 63dec) via the "ADDRESS" "MSD" and "LSD" switches (DeviceNet only). The node address is programmable via the DeviceNet (→ [3]).

Degas

Measuring

Threshold

Common (power GND) 24V supply

Ground (housing, vacuum connection)

Electrical Connection

Pin 1:
Pin 2:
Pin 3:
Pin 4:
Pin 5:
Pin 6:
Pin 7:
Pin 8:
Pin 9:
Pin 10:
Pin 11:
Pin 12:
Pin 13:
Pin 14:
Pin 15:

Gauge adjustment is carried out automatically, no manual adjustment is required (adjustment of the atmosphere sensor → [2]).

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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 (→ [3]).

Node Address Setting

Set the node address (0 ... 63dec) via the "ADDRESS" "MSD" and "LSD" switches (default 63dec). The node address is polled to other nodes established "time out" status

Status Lights

"STATUS MOD" (gauge status):

Light status Meaning
Dark No supply
Flash red (soldering side) Selftest
Green Normal operation
Red Non recoverable error
Flash red Recoverable error (e.g. missing DeviceNet power supply).

"STATUS NET" (network status):

Light status Meaning
Dark Gauge not online:
- Selftest not yet concluded
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Flash green Gauge online but no connection:
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- Gauge not assigned to any master
Green Gauge online; necessary connections established
Flash red One or several input/output connections in "time 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")

Operation

Caution: data transmission errors

The attempt to operate the BPG450-SD with the RS232C interface causes data transmission errors.

The BPG450-SD must not be operated with the RS232C interface.

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 (→ [3]).

Node Address Setting

Set the node address (0 ... 63dec) via the "ADDRESS" "MSD" and "LSD" switches (default 63dec). 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]).
**General Information**

The BCG450-SP gauge has a fieldbus interface that conforms to the Profibus DPV1 standard (→ [1], [2]).

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

- Pressure reading
- Pressure unit (mbar, Torr, Pa)
- Degas function
- Status and error messages

Two adjustable switching functions are integrated in the gauge. With the built-in atmosphere switching function an atmospheric pressure threshold can be programmed (→ [2]). The corresponding relay contacts are available at the sensor cable connector.

The basic sensor and sensor electronics of the BCG450-SP type are the same as in the standard BCG450 (→ [1], [2]).

**Technical Data BCG450-SP**

<table>
<thead>
<tr>
<th>General technical data of the sensor and sensor electronics (→ [1], [2])</th>
</tr>
</thead>
</table>

**Fieldbus Interface**

Fieldbus name Profibus

Standard applied (→ [1], [2])

Communication protocol, data format RS485

Interface, physical (default 5Chex)

Profibus Parameters

- Data rate ≤12 Mbaud (→ [4], [9])
- Node address 00 ... 7D<sub>Max</sub> (0 ≤ 125<sub>Max</sub>)

Profibus connection

- Cable D-Sub, 9-pin, female
- Cable length, system wiring (default 5Chex)

<table>
<thead>
<tr>
<th>Table: Supply Voltages</th>
</tr>
</thead>
</table>

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

**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-pin, male

Cable Max. 15 conductors, shielded

Cable length, (conductor cross section per conductor) ≤35 m (0.25 mm<sup>2</sup>)

Switching functions 2

Relay contact rating ≤60 VDC, ≤0.5 ADC

Atmosphere switching function (→ [2])

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

Grounding principle (→ "Power Connection")

**Dimensions**

<table>
<thead>
<tr>
<th>Housing and vacuum connection (→ [1], [2])</th>
</tr>
</thead>
</table>

Weight

- 353-554: -445 g
- 353-556: -710 g

**Power Connection**

**Sensor Cable Connection**

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

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

Connect the sensor cable to the gauge and secure the sensor cable connector using the lock screws.

<table>
<thead>
<tr>
<th>Profibus Cable Connection</th>
</tr>
</thead>
</table>

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

- Pin 1 do not connect
- Pin 2 do not connect
- Pin 3 RxD/TxD-P
- Pin 4 CNTR-P
- Pin 5 DGND
- Pin 6 VP
- Pin 7 not connected internally
- Pin 8 RuDi/TxD-N
- Pin 9 not connected internally

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

Connect the Profibus cable to the gauge and secure the Profibus cable connector using the lock screws.

**Operation**

<table>
<thead>
<tr>
<th>Caution</th>
</tr>
</thead>
</table>

Caution: data transmission errors

The attempt to operate the BPG450-SP with the RS232C interface causes data transmission errors. The BPG450-SD must not be operated with the RS232C interface.

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 (→ [4]).

**Note Address Setting**

The node address (0 ≤ 125<sub>Max</sub>) is set in hexadecimal form (00 ... 7D<sub>Max</sub>) via the "ADDRESS", "MSD", and "LSD" switches (default 5Chex). 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 >125<sub>Max</sub> (7D<sub>Max</sub>) 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

Gauge adjustment is carried out automatically, no manual adjustment is required (adjustment of the atmosphere sensor (→ [2]).

Adjusting the Switching Functions

(→ "Adjustment and settings")
Adjustment and Settings

For BCG450-SD and BCG450-SP gauges.

Adjusting the Gauge

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. However, this adjustment is carried out automatically during operation by the gauge itself. No manual adjustment is required (adjustment of the atmosphere sensor → [2]).

Setting the Switching Functions

The threshold values of switching functions A and B 1) can be set within the pressure range $1 \times 10^{-9}$ mbar … $100$ mbar via potentiometers "SETPOINT A" and "SETPOINT B". For the corresponding threshold voltages $U_{\text{threshold}}$, the following equation applies:

$$U_{\text{threshold}} = 0.75 \times (\log p_{\text{Setpoint}} - c) + 7.75$$

Constant $c$ depends on the pressure unit (→ [1], [2]).


The hysteresis of the switching function 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 a ground contact nearby (eg. grounded locking screw nut of connector or vacuum connection of the gauge).

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

A functional check of the switching functions (On/Off) is only possible via fieldbus interface (→ [3] for BCG450-SD, → [4] for BCG450-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
   TripleGauge™ BCG450
tima40d1 German
   tima40e1 English
   INFICON AG, LI–9496 Balzers, Liechtenstein

2. www.inficon.com
   Instruction manual
   TripleGauge™ BCG450, BCG450-SD, BCG450-SP
tina40d1 German
   tina40e1 English
   INFICON AG, LI–9496 Balzers, Liechtenstein

3. www.inficon.com
   Communication protocol
   DeviceNet™ BCG450-SD
tira40e1 English
   INFICON AG, LI–9496 Balzers, Liechtenstein

4. www.inficon.com
   Communication protocol
   Profibus BCG450-SP
tira41e1 German
   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 organisation

8. European Standard for DeviceNet EN 50325

9. European Standard for Profibus EN 50170