OPTIBAR P 3050 C Handbook

Compact pressure transmitter with recessed diaphragm

KROHNE

IMPRINT

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1.1 Intended use

CAUTION!
Responsibility for the use of the measuring devices with regard to suitability, intended use and corrosion resistance of the used materials against the measured fluid lies solely with the operator.

INFORMATION!
The manufacturer is not liable for any damage resulting from improper use or use for other than the intended purpose.

The pressure transmitter series **OPTIBAR** were designed and constructed to measure the absolute and gauge pressure of gases, vapours and liquids. The available measuring ranges and permitted maximum working pressures for each are indicated on the nameplate and described in the "Technical data" section. To observe the intended use, adhere to the following points:

- Observe the instructions in this document.
- Comply with the technical specifications (for details refer to *Technical limits* on page 6).
- Observe the permissible products (for details refer to *Permissible products* on page 6).
- Only suitably qualified personnel may install and operate the device.
- Observe the generally accepted standards of good practice.

CAUTION!
- *Any modification to the device, including drilling, sawing, trimming, welding and soldering of parts, or partially painting over or coating, is prohibited.*
- *Neither is it permitted to use the device as a climbing aid e.g. for installation purposes, as a holder for cables, pipes or other loads.*
- *The mounting or installation of parts is only permitted as described in this document, or insofar as it has been authorised by the manufacturer or a certified service partner.*

DANGER!
For devices used in hazardous areas, additional safety notes apply; please refer to the Ex documentation.

1.2 Technical limits

The device was constructed solely for use within the technical limits indicated on the nameplate and in the technical data. Applications outside of these limits are not permitted and could lead to significant risk of accident. For this reason, observe the following limits:

- Do not exceed or go below the maximum permissible pressure or vacuum.
- Do not exceed or go below the indicated permissible operating temperature range.
- Do not exceed or go below the indicated permissible ambient temperature.
- Observe the housing protection type during use (IP67 only with internally ventilated cable!).

1.3 Permissible products

The device is designed to measure the pressure of vaporous, gaseous and liquid media. Device variants featuring recessed diaphragms are not suitable for the measurement of products containing solids or viscous and paste-like products. Prior to using any corrosive or abrasive products, the operator must check the resistance of all parts in contact with the product.

1.4 Certification

CE marking

The device fulfils the statutory requirements of the following EC directives:

- Low Voltage Directive 2006/95/EC
- EMC directive 2004/108/EC
- EMC specification acc. to EN 61326/A1

The manufacturer certifies successful testing of the product by applying the CE mark.

Pressure Equipment Directive PED

Devices with a permissible pressure PS ≤ 200 bar (20 MPa) comply with Article 3 Section (3) and were not subject to a conformity assessment. These devices were designed and manufactured in accordance with sound engineering practice (SEP).

The CE marking on the device does not apply to the Pressure Equipment Directive.

DANGER!
For devices used in hazardous areas, additional safety notes apply; please refer to the Ex documentation.

1.5 Safety instructions from the manufacturer

1.5.1 Copyright and data protection

The contents of this document have been created with great care. Nevertheless, we provide no guarantee that the contents are correct, complete or up-to-date.

The contents and works in this document are subject to copyright. Contributions from third parties are identified as such. Reproduction, processing, dissemination and any type of use beyond what is permitted under copyright requires written authorisation from the respective author and/or the manufacturer.

The manufacturer tries always to observe the copyrights of others, and to draw on works created in-house or works in the public domain.

The collection of personal data (such as names, street addresses or e-mail addresses) in the manufacturer's documents is always on a voluntary basis whenever possible. Whenever feasible, it is always possible to make use of the offerings and services without providing any personal data.

We draw your attention to the fact that data transmission over the Internet (e.g. when communicating by e-mail) may involve gaps in security. It is not possible to protect such data completely against access by third parties.

We hereby expressly prohibit the use of the contact data published as part of our duty to publish an imprint for the purpose of sending us any advertising or informational materials that we have not expressly requested.

1.5.2 Disclaimer

The manufacturer will not be liable for any damage of any kind by using its product, including, but not limited to direct, indirect or incidental and consequential damages.

This disclaimer does not apply in case the manufacturer has acted on purpose or with gross negligence. In the event any applicable law does not allow such limitations on implied warranties or the exclusion of limitation of certain damages, you may, if such law applies to you, not be subject to some or all of the above disclaimer, exclusions or limitations.

Any product purchased from the manufacturer is warranted in accordance with the relevant product documentation and our Terms and Conditions of Sale.

The manufacturer reserves the right to alter the content of its documents, including this disclaimer in any way, at any time, for any reason, without prior notification, and will not be liable in any way for possible consequences of such changes.

1.5.3 Product liability and warranty

The operator shall bear responsibility for the suitability of the device for the specific purpose. The manufacturer accepts no liability for the consequences of misuse by the operator. Improper installation and operation of the devices (systems) will cause the warranty to be void. The respective "Standard Terms and Conditions" which form the basis for the sales contract shall also apply.

1.5.4 Information concerning the documentation

To prevent any injury to the user or damage to the device it is essential that you read the information in this document and observe applicable national standards, safety requirements and accident prevention regulations.

If this document is not in your native language and if you have any problems understanding the text, we advise you to contact your local office for assistance. The manufacturer can not accept responsibility for any damage or injury caused by misunderstanding of the information in this document.

This document is provided to help you establish operating conditions, which will permit safe and efficient use of this device. Special considerations and precautions are also described in the document, which appear in the form of underneath icons.

1.5.5 Warnings and symbols used

Safety warnings are indicated by the following symbols.

DANGER!
This information refers to the immediate danger when working with electricity.

DANGER!
This warning refers to the immediate danger of burns caused by heat or hot surfaces.

DANGER!
This warning refers to the immediate danger when using this device in a hazardous atmosphere.

DANGER!
These warnings must be observed without fail. Even partial disregard of this warning can lead to serious health problems and even death. There is also the risk of seriously damaging the device or parts of the operator's plant.

WARNING!
Disregarding this safety warning, even if only in part, poses the risk of serious health problems. There is also the risk of damaging the device or parts of the operator's plant.

CAUTION!
Disregarding these instructions can result in damage to the device or to parts of the operator's plant.

INFORMATION!
These instructions contain important information for the handling of the device.

LEGAL NOTICE!
This note contains information on statutory directives and standards.

- HANDLING
  This symbol designates all instructions for actions to be carried out by the operator in the specified sequence.

➲ RESULT
This symbol refers to all important consequences of the previous actions.

1.6 Safety instructions for the operator

WARNING!
In general, devices from the manufacturer may only be installed, commissioned, operated and maintained by properly trained and authorized personnel.
This document is provided to help you establish operating conditions, which will permit safe and efficient use of this device.

2.1 Scope of delivery

INFORMATION!
Inspect the cartons carefully for damages or signs of rough handling. Report damage to the carrier and to the local office of the manufacturer.

INFORMATION!
Do a check of the packing list to make sure that you have all the elements given in the order.

INFORMATION!
Look at the device nameplate to ensure that the device is delivered according to your order. Check for the correct supply voltage printed on the nameplate.

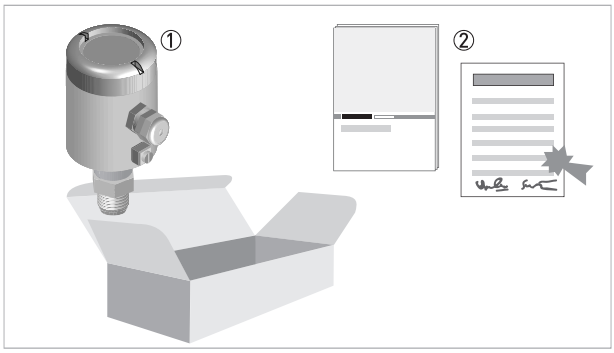


Figure 2-1: Scope of delivery

① Device in the version as ordered.
② Documentation (calibration protocol, factory and material certification (if ordered) and product documentation)

INFORMATION!
Assembly materials and tools are not part of the delivery. Use the assembly materials and tools in compliance with the applicable occupational health and safety directives.

2.2 Device description

The pressure gauges are designed solely for the direct measurement of process pressures and indirect level measurement in straight, symmetrical tanks. In addition to the main measuring parameters, it is also possible to measure the sensor temperature.

The device can be operated "on site" using a push button on the converter electronics (zero point, measurement span start and span end) or using the optionally available LCD display with four push buttons.

Depending on the measuring range and overload resistance, piezoresistive or thin film sensors may be used. The pressure is transmitted either directly or by way of a separating diaphragm and a liquid fill to a measuring diaphragm, which then distorts and reverses under the applied pressure. The measuring diaphragm features RTDs that change their resistance value based on the mechanical distortion, enabling the applied pressure to be inferred.

Communication takes place via an analogue 4...20 mA current signal in 2-wire technology.

The measuring device is supplied ready for operation. The factory settings for the operating data correspond to your order specifications.

The following versions with retracted diaphragm are available:

- Compact version with analogue output 4...20 mA
- Compact version with analogue output 4...20 mA and optional LCD display

Versions with flush mounted diaphragm are pending.

2.2.1 Device design

The following exploded drawing shows the general design of pressure transmitters.

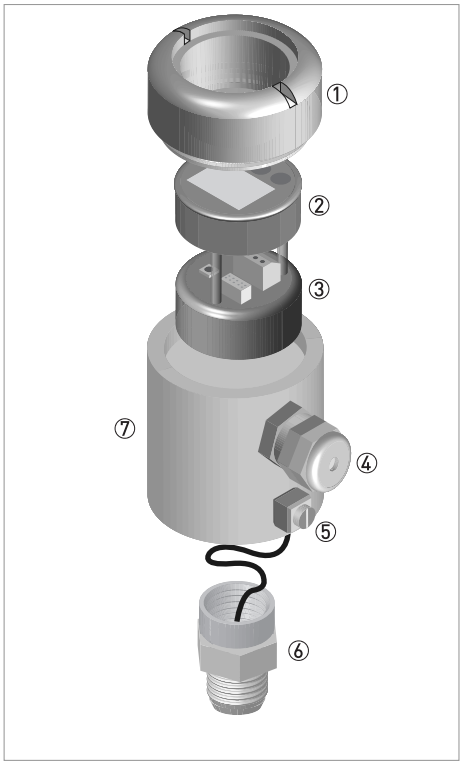


Figure 2-2: Device design

① Stainless steel lid
② Display unit (optional)
③ Converter module
④ Cable entry
⑤ Grounding screw
⑥ Process connection with built-in pressure cell
⑦ Stainless steel housing

2.2.2 Process connection variants

The following process connection variants are available:

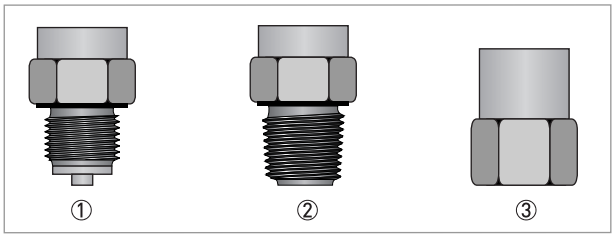


Figure 2-3: Process connection variants

① G½-B
② ½" NPT - male
③ ½" NPT - female

2.3 Nameplates

INFORMATION!
Look at the device nameplate to ensure that the device is delivered according to your order. Check for the correct supply voltage printed on the nameplate.

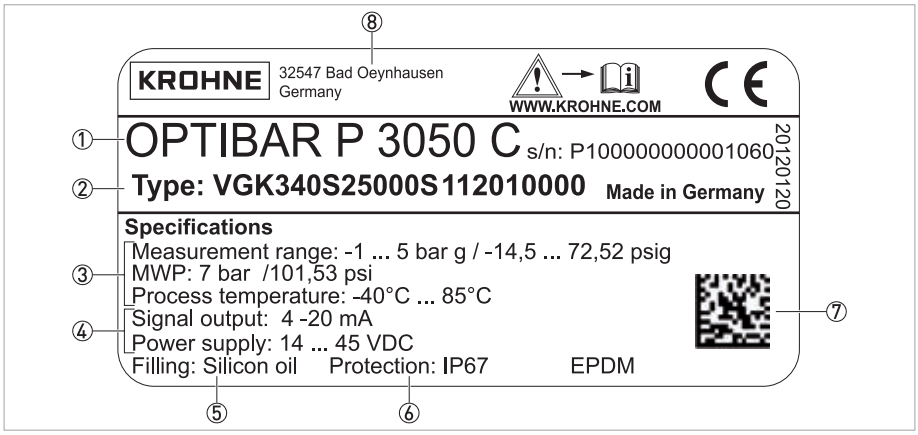


Figure 2-4: Example for a nameplate

① Product name and serial number
② Type code
③ Specifications for process conditions: measuring range, MWP (= Maximum Working Pressure) and process temperature limit
④ Electrical data: signal output and power supply
⑤ Filling oil
⑥ Protection category
⑦ Barcode
⑧ Manufacturer logo and address

3.1 Notes on installation

INFORMATION!
Inspect the cartons carefully for damages or signs of rough handling. Report damage to the carrier and to the local office of the manufacturer.

INFORMATION!
Do a check of the packing list to make sure that you have all the elements given in the order.

INFORMATION!
Look at the device nameplate to ensure that the device is delivered according to your order. Check for the correct supply voltage printed on the nameplate.

3.2 Storage

INFORMATION!
Observe the storage information found on the package. Labels on the original packing must always remain legible and may not be damaged.

- Store the device in a dry, dust-free location.
- Avoid continuous direct sunlight.
- Store the device in its original packing.
- Storage temperature: -20...+70°C / -4...+158°F

3.3 Transport

- Use original packing for transport and ensure that the package does not get crushed or damaged by sharp objects or other boxes.
- Do not throw or drop the device!
- Avoid temperatures below -20°C / -4°F and above +70°C / +158°F.
- Observe any transportation information found on the packing.
- When transporting by ship, use seaworthy outer packing.

3.4 Installation specifications

INFORMATION!
Observe the relevant directives, ordinances, standards and accident prevention regulations (e.g. VDE/VDI 3512, DIN 19210, VBG, Elex V, etc.).

The accuracy of the measurement is only guaranteed if the transmitter and accompanying impulse line(s), if any, have been correctly installed. In addition, extreme ambient conditions including large fluctuations in temperature, vibrations and shocks should be kept as far away as possible from the measuring equipment.

3.5 Installation

CAUTION!

- *Prior to installing the transmitter it is essential to verify whether the version of the device on hand completely fulfils the technical and safety requirements of the measuring point. This applies in particular to the measuring range, overpressure resistance, temperature, explosion protection and operating voltage.*
- *Check the materials used for the wetted parts (e.g. gasket, process connection, separating diaphragm etc.) for suitability as regards product resistance.*

3.5.1 Sealing and screwing-in

Connecting shank G:

A flat gasket in accordance with DIN EN 837-1 is required for sealing.

NPT thread connection:

Seal the thread with Teflon or other similar permissible, resistant sealing material.

Process connection for special connections:

Information regarding the installation of variants with special connections is available from the manufacturer on request.

3.5.2 Humidity

Use a suitable cable and tighten the cable gland in accordance with the recommended torque specifications. Protect the transmitter from penetrating moisture by dropping the cable down before the screw connection. Any liquids running along the cable will thus drip off before reaching the screw connection; refer to *Laying electrical cables correctly* on page 19. This is particularly important for unprotected installation outside or in rooms in which moisture is an issue (e.g. as a result of cleaning processes) or on cooled or heated containers.

3.5.3 Pressure connection via impulse line

Bear the following in mind when connecting the pressure connection via an impulse line:

- Select the shortest impulse line possible and lay without sharp bends.
- Avoid deposits and blockages in the impulse line. Accordingly, lay the impulse line so that such occurrences are impossible. Do not exceed a drop or rise of approx. 8% in the pipe.
- Ensure that the impulse line flows freely before the connection and rinse with compressed air or, even better, with the product itself.
- When measuring liquid, the impulse line must be completely purged of air.
- Run the impulse line so that trapped air (when measuring liquids) or condensate (when measuring gas) can flow back into the process line.
- Hot steam must not enter the process connection (the excess temperature will destroy the device). To avoid this situation, a suitable water trap (such as a U-tube filled with water prior to installation) can be installed upstream from the measuring device.
- Ensure that the connection is perfectly sealed!

3.5.4 Opening the device, installing and dismantling the graphic display

DANGER!
Check whether the ambient air around the signal converter is explosive. Opening the signal converter in an explosive atmosphere may result in ignition and explosion.

DANGER!
The product may cause the signal converter to become extremely hot. Possible risk of burning. For this reason, promptly shut off the process or isolate the signal converter sufficiently from the product prior to starting work and check that the converter has cooled down to room temperature.

DANGER!
For devices used in hazardous areas, additional safety notes apply; please refer to the Ex documentation.

Electrically, the graphic display is connected to the device using a plug connector on the connection board with the aid of a flying lead. The display is mechanically fixed by way of a spacer plugged into the connection board. For optimal readability, the display can be infinitely rotated on this bracket by 350°, adjusting to any of the pressure transmitter's possible installation positions.

Procedure

- Ensure that the signal converter has been de-energised!
- Remove the housing cover from the signal converter by hand.
  If the housing cover is stuck and cannot be moved by hand, use a suitable square material to carefully remove it. Place this tool in the flaring located in the housing cover. Take care not to damage the optionally available window cover! Use a lever action to now carefully apply greater torque to loosen it. As soon as the housing cover opens, put the tool away and turn the cover by hand until it opens.
- Ensure that no moisture gets into the device while it is open (drops, spray, liquid mist, etc. ...).
- If there is a display, it can be removed by pulling it forward gently. Pay attention to the connecting cable between the device and the display. To completely remove the display, the connecting cable must be carefully pulled out of the connector on the board.

➲ The connection board is now available for further work.

- To install the display and close the housing, follow the steps in reverse order.
  Note that the housing covers for devices with displays and devices without displays are different heights. Never attempt, even on a temporary basis, to install a housing cover for a blind device on a device with an installed display.

INFORMATION!
Each time a housing cover is opened, the thread should be cleaned and greased. Use only resin-free and acid-free grease.
Ensure that the housing gasket is properly fitted, clean and undamaged.

3.6 Ventilating the pressure sensor

In the case of gauge pressure transmitters, mechanical reasons make it necessary to charge the reference side of the pressure sensor with atmospheric pressure. Ventilation occurs in versions in IP65 via a special aerator fitted with a Gore-Tex® filter. Ensure that the ventilation opening is not covered or closed (e.g. covering over with paint not permitted).

For the IP 67 version, a vented cable fitted with a capillary tube must be used. In the process, ensure that the capillary tubes are vented in a dry room protected from moisture and that no dust or moisture can penetrate the capillary tube opening.

4.1 Safety instructions

DANGER!
All work on the electrical connections may only be carried out with the power disconnected. Take note of the voltage data on the nameplate!

DANGER!
Observe the national regulations for electrical installations!

DANGER!
For devices used in hazardous areas, additional safety notes apply; please refer to the Ex documentation.

WARNING!
Observe without fail the local occupational health and safety regulations. Any work done on the electrical components of the measuring device may only be carried out by properly trained specialists.

INFORMATION!
Look at the device nameplate to ensure that the device is delivered according to your order. Check for the correct supply voltage printed on the nameplate.

4.2 Notes for electrical cables

DANGER!
The device must be grounded to a spot in accordance with regulations in order to protect personnel against electric shocks.

DANGER!
Cables may only be connected when the power is switched off! Since the transmitter has no switch-off elements, overcurrent protection devices, lightning protection and/or energy isolating devices must be provided by the customer.

4.2.1 Requirements for signal cables provided by the customer

INFORMATION!
If the signal cable was not ordered, it is to be provided by the customer. The following requirements regarding the electrical values of the signal cable must be observed:

Specifications for standard signal cables

- 2 twisted double wire circuits
- 20 AWG twisted, tinned copper conductors
- Completely tinned copper shielding
- Casing colour: grey
- Colour of wires:
  Pair 1: black / red; pair 2: green / white
- Test voltage: ≥ 500 VAC RMS (750 VDC)
- Temperature range: -40...+105°C / -40...+221°F
- Capacity: ≤ 200 pF/m / 61 pF/ft
- Inductance: ≤ 0.7 µH/m / 0.2 µH/ft

4.2.2 Laying electrical cables correctly

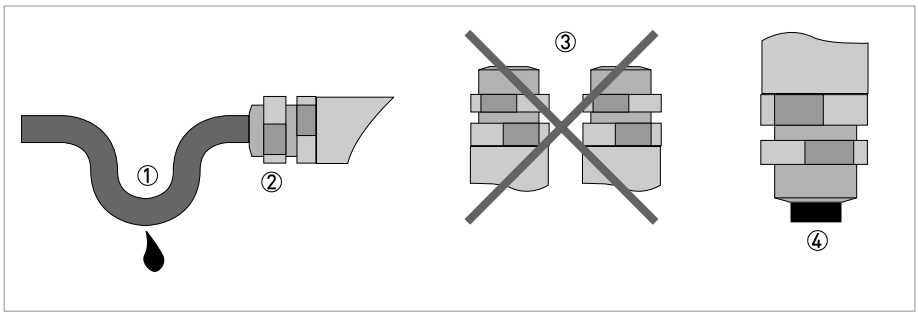


Figure 4-1: Protect housing from dust and water

① Lay the cable in a loop just before the housing.
② Tighten the screw connection of the cable entry securely.
③ Never mount the housing with the cable entries facing upwards.
④ Seal cable entries that are not needed with a plug.

4.2.3 Connection to the feed unit

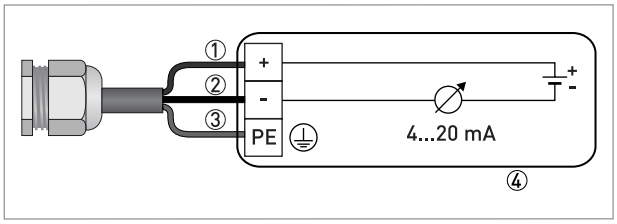


Figure 4-2: Connection to the feed unit

① Red
② Black
③ Green/yellow
④ Feed unit with load

4.3 Electrical connection

4.3.1 Tailoring the cables

Depending on the version supplied, the electrical connection requires an M16x1.5 cable connection (for cable diameters: 5...10 mm / 0.2...0.4") or M20x1.5 and ½"NPT (the latter via an adapter). The terminals in the terminal compartment are designed for wire widths of up to 1.5 mm². To ensure a proper connection, you should strip the cable 40...50 mm / 1.6...2".

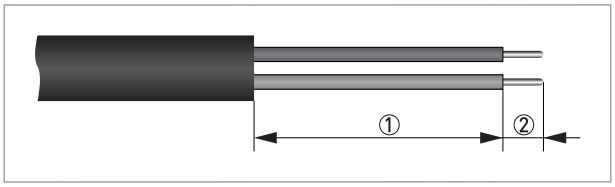


Figure 4-3: Stripping the cable

① 40...50 mm / 1.6...2"
② 5 mm / 0.2"

4.3.2 Connection in the terminal compartment

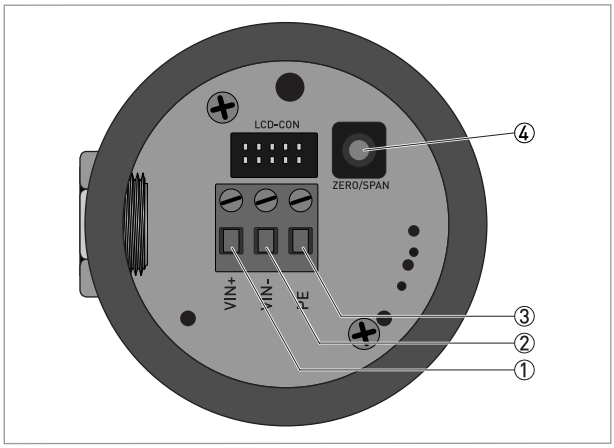


Figure 4-4: Connection in the terminal compartment

① (V_{in+}) signal terminals
② (V_{in-}) signal terminals
③ (PE) grounding terminal or equipotential bonding terminal
④ Push button for measurement span start and span end

CAUTION!
When using an intrinsically safe or grounded feed unit, do not connect PE!

4.4 Grounding the measuring device

DANGER!
There should be no difference in potential between the pressure sensor and the housing or protective earth of the transmitter!

- The pressure sensor must be properly grounded.
- When using an intrinsically safe or grounded feed unit, do not connect PE!
- Do not use the grounding cable to connect any other electrical devices to ground at the same time.
- The pressure transmitter is connected to ground by means of a functional grounding conductor.
- In hazardous areas, grounding is used at the same time for equipotential bonding.

A ground terminal is provided on the outside of the housing to accommodate wire widths of up to 1.5 mm^2.

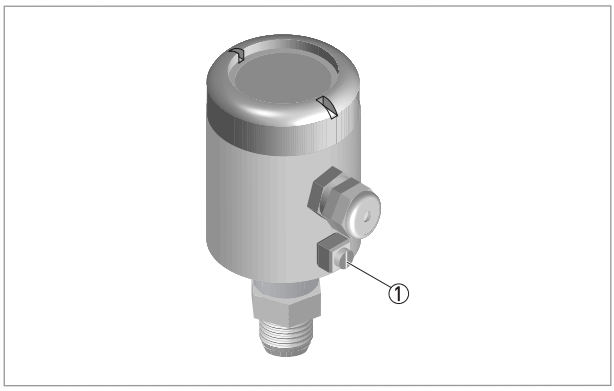


Figure 4-5: Position of the ground terminal on the housing

① Ground terminal

4.5 Description of the current output

The current output is a 2-wire 4...20 mA output.

Overload condition:

- Lower limit: 3.8 mA
- Upper limit: 20.5 mA

Alarm current:

- Low alarm current: 3.6 mA
- High alarm current: 21 mA

Standard setting: High alarm current
The transmitter works with voltages of 12...45 VDC, no load.

R_{Load} [KΩ] = (U_B [V] - 12 V) / alarm current max. [mA]
where U_B = supply voltage and R_{Load} = max. load resistance (load)

5.1 Start-up

The pressure transmitter may only be started up after it has been completely installed and checked by appropriately qualified personnel. Switch on the operating voltage for start-up. Prior to applying the operating voltage, it is crucial to check the correctness of the process connection and the electrical connection and ensure that the impulse line has been completely filled with the process medium. Then proceed with start-up. If available, the shut-off fixtures are to be activated in the following sequence (all valves are closed in the base setting):

- Open extraction shut-off valve, if any.
- Open shut-off valve, if any.

For shut-down reverse the order.

INFORMATION!
Please note that absolute pressure transmitters with measuring ranges ≤100 kPa abs. (1 bara) were affected by the externally present atmospheric pressure during transport and storage. A warm-up period of several hours following start-up is therefore required in order to reach the specified accuracy.

5.2 Factory settings and settings during reset

The pressure transmitter factory settings can be based on a measuring span specified by the customer in the order. This and other information is located on the device nameplate. If the customer has not specified any settings, the device always leaves the factory with the following settings:

Device parameter	Factory pre-setting
Lower range limit (zero point)	4 mA
Upper range limit (URL)	20 mA
Alarm current	High alarm 21 mA
Damping	0.1 s
Main display value [*]	Pressure value in % URL
Sensor temperature [*]	Indication in K
Write protection [*]	No
Language [*]	English
Contrast [*]	50%
Bargraph indication [*]	Yes

[*] only with optional LCD display

During a reset (which can be selected using the keyboard on the display), the pressure transmitter is automatically started with the above factory settings.

For a factory reset without LCD display, push the push button on the converter electronics for more than 30 seconds.

5.3 General setting options

Both the setting options and the procedure for setting the measuring device parameters differ greatly between the blind version and the version with display. With the display version, advanced setting and configuration options are available without requiring the push button on the converter electronics. For this reason, the settings for the respective versions are each described separately below.

5.4 Setting the blind device

To adjust the settings on the blind device you require access to the push button located on the converter electronics.

5.4.1 Position correction

The measuring device is set to be installed vertically (cover opens up) when it leaves the factory. Zero point shifts may occur when installing the pressure transmitter (e.g. slightly angular installation site or through pressure sensors etc.). These shifts must be rectified.

INFORMATION!
Prior to starting with the correction, ensure that the pressure transmitter has already reached its operating temperature (approx. 5 minutes operating time, where the pressure transmitter has already reached the ambient temperature).

5.4.2 Zero point and span start (4 mA)

Open the housing cover (for details refer to *Opening the device, installing and dismantling the graphic display* on page 16). The pressure span start (4 mA) is provided either from the process or from a pressure transducer. The pressure must be stable and extremely accurate (<< 0.15%). Hold the push button (①) down with a blunt object and release within 0.5...2 seconds. The span start set in this way is stored power failure proof.

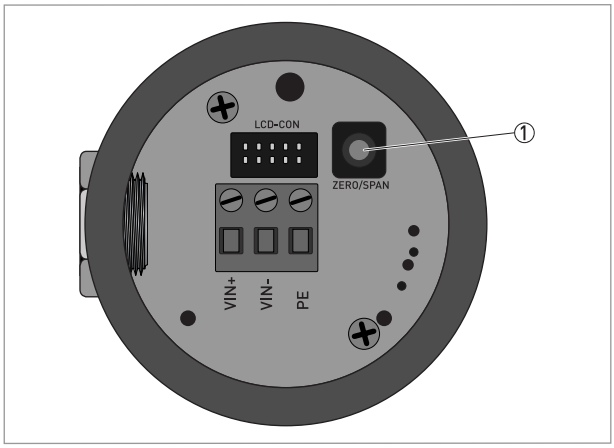


Figure 5-1: Zero point setting and position correction for devices without display

① Push button

5.4.3 Span end (20 mA)

Open the housing cover (for details refer to *Opening the device, installing and dismantling the graphic display* on page 16). The pressure span end (20 mA) is provided either from the process or from a pressure transducer. The pressure must be stable and extremely accurate (<< 0.15%). Hold the push button (①) down for at least 5 seconds using a blunt object and then release within 10 seconds. The span end set in this way is stored power failure proof.

5.4.4 Factory reset

Open the housing cover (for details refer to *Opening the device, installing and dismantling the graphic display* on page 16). Hold down the push button (①) for at least 30 seconds using a blunt object and then release it. The pressure transmitter now resets itself and loads the factory settings (see details on page 23).

5.5 Setting the version with display

5.5.1 Display and operating elements

The following illustrations show examples of the display while in measuring mode, in the selection menu and when configuring measurement values.

Display during measuring mode

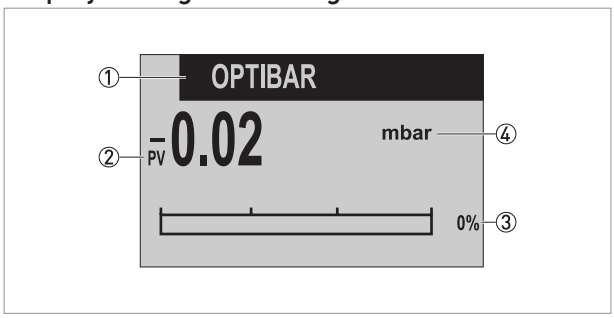


Figure 5-2: Example of display during normal measuring mode

① TAG ID
② Measured value
③ Bargraph indication in %
④ Unit of measured value

Display in selection menu

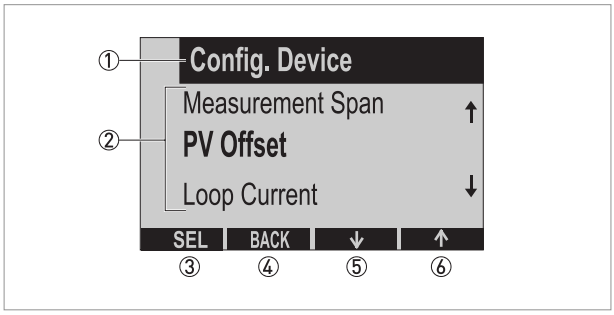


Figure 5-3: Example of display in the selection menu for device configuration

① Selected main menu
② List of possible submenus
③ Button for menu selection (SEL)
④ Button used to go back one level in the menu (BACK)
⑤ Button in the menu used to navigate down the list (↓)
⑥ Button in the menu used to navigate up the list (↑)

Display for configuration of settings

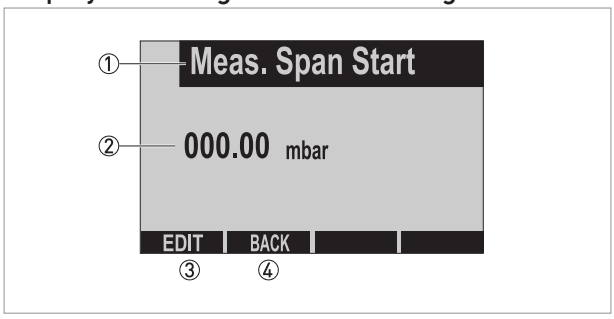


Figure 5-4: Example of display when editing the setting values

① Menu name of setting value
② Setting value to be edited and corresponding unit
③ Button to select editing mode (EDIT)
④ Button used to go back one level in the menu (BACK)

Navigation in the operating menu

	MENU		SEL		EDIT	
	→		→		→	
Normal operation		Config. menu		Editing menu		Edit
	←		←	↑↓	←	
	BACK		BACK	SAVE QUIT	BACK	

5.5.2 Structure of the operating menu

Measuring mode/menu	Function of the existing buttons
Display mode and normal mode	MENU: indicate menu
	BACK: back to indication
	• ↓: contrast darker
	• ↑: contrast lighter
Selection mode and configuration menu	SEL: select menus
	BACK: one level back
	↓: navigate down the list
	↑: navigate up the list
Editing menu	**Edit numerical value:**
	SEL: select digit position
	BACK: store
	↓: reduce value or browse character map
	↑: increase value or browse character map
	Confirm set numerical value:
	EDIT: back to editing mode
	BACK: one level back
	QUIT: reset to original value
	SAVE: save new value
	Selection from list or confirm action:
	SAVE: save selection
	BACK: one level back
	↓: navigate down the list
	↑: navigate up the list

5.5.3 Description of the function

Main menu		Description
	Submenu	

Config Device

Write Protection		Switches on/off write protection for the transmitter.
		Factory reset is possible despite write protection. Preset PIN: 3050
Proc. Pres. Read		Reads the active process pressure as measurement span start or measurement span end.
	Meas. Span. Start	Determines the active pressure as the new measurement span start.
	Meas. Span. End	Determines the active pressure as the new measurement span end.
Measurement Span		Provides setting options for the measurement span in terms of the unit and manually determines the measurement span start or end.
	Meas. Span Unit	Determines the measurement span unit.
		Available units: mbar; bar; pa; kpa; Mpa; Torr; psi; atm; gf/cm²; kgf/cm²; mm HG (0°C); in HG (0°C); mm H2O (4°C); mm H2O (68°F); in H2O (4°C); in H2O (60°F); in H2O (68°F); ft H2O (68°F)
	Meas. Span. Start	Manually determines the measurement span start.
	Meas. Span. End	Manually determines the measurement span end.
PV Offset		Determines the active pressure as the new zero point and shifts the upper/lower limit value by the new offset.
		Function only available with gauge pressure.
Loop Current		Provides setting options as regards the upper/lower current limit and the alarm current.
	Upper Limit	Manually determines the upper limit of the output current.
	Lower Limit	Manually determines the lower limit of the output current.
	High Alarm Value	Determines the high alarm value which is output as current.
	Low Alarm Value	Determines the low alarm value which is output as current.
	Alarm Current	Selection option as to whether the high alarm value or low alarm value should be output as alarm current.
Proc. Var. Unit		Provides the selection option for the process value unit on the local LCD display.
		Available units: mbar; bar; pa; kpa; Mpa; Torr; psi; atm; gf/cm²; kgf/cm²; mm HG (0°C); in HG (0°C); mm H2O (4°C); mm H2O (68°F); in H2O (4°C); in H2O (60°F); in H2O (68°F); ft H2O (68°F)
Sens. Temp. Unit		Provides the selection option for the unit of temperature on the local LCD display.
		Available units: K; °C; °F
Factory Reset		Resets all settings to those configured at the factory (see details on page 23).

Display

Display Value	Selection option of the displayed measured value.
Bargraph	Activates or deactivates the bar graph in the start view. The bar graph indicates the output in percent (0%...100%) of the measuring span.
Contrast	Setting option to increase or decrease the display contrast (between 30...100%).
Language	Selection of display language.
	Softkeys remain unaffected.
Version ODU	Indicates the active software version of the display module.
Version CCT	Indicates the active software version of the device.
Serial number	Indicates the device serial number.

Main menu / Submenu	Description

Diagnosis

Process Value	Indicates the active process value.
Sensor Temperature	Indicates the active sensor temperature
Output Current	Indicates the active output current.
Output in Percent	Indicates the output in percent of the measuring span.

Identification

Tag Name	Specifies the name of the device (maximum 16 characters).

6.1 Replacing the pressure sensor, the electronics and the display

DANGER!
All work on the electrical connections may only be carried out with the power disconnected. Take note of the voltage data on the nameplate!

DANGER!
Check whether the ambient air around the pressure transmitter is explosive. Opening the signal converter in an explosive atmosphere may result in ignition and explosion.

DANGER!
The product may cause the pressure transmitter to become extremely hot. Possible risk of burning. For this reason, promptly shut off the process or isolate the pressure transmitter sufficiently from the product prior to starting work and check that it has cooled down to room temperature.

WARNING!
Observe without fail the local occupational health and safety regulations. Any work done on the electrical components of the measuring device may only be carried out by properly trained specialists.

DANGER!
Observe the waiting period for Ex devices.

Pressure sensor and electronics

When used as intended in normal operation, the pressure transmitter is completely maintenance-free. For this type of device, the manufacturer makes no provision for repairs, replacement of electronics or measuring element for the user. To ensure safe operation, the entire device must be replaced in the event of damage to or failure of the pressure sensor or the electronics. The replaced device may not be repaired for reasons of safety. Please clearly mark the device as defective and dispose of it properly.

CAUTION!
Adhere to national disposal regulations. Proper disposal avoids negative consequences for people and the environment and allows valuable raw materials to be recycled.

Display

It is also not permitted to repair faulty displays. They must simply be replaced by a new display module. However, in this case, the reason for the damage or failure of the graphic display must be reported. If the failure is the result of overheating or overloading the device, the entire device must be marked clearly as defective, must be replaced and then disposed of properly. Repair is not permitted!

INFORMATION!
For detailed information please contact your local representative.

6.2 Spare parts availability

The manufacturer adheres to the basic principle that functionally adequate spare parts for each device or each important accessory part will be kept available for a period of 3 years after delivery of the last production run for the device.

This regulation only applies to spare parts which are subject to wear and tear under normal operating conditions.

6.3 Availability of services

The manufacturer offers a range of services to support the customer after expiration of the warranty. These include repair, maintenance, technical support and training.

INFORMATION!
For more precise information, please contact your local representative.

6.4 Repairs

Repairs may be carried out exclusively by the manufacturer or the manufacturer authorised specialist companies.

6.5 Returning the device to the manufacturer

6.5.1 General information

This device has been carefully manufactured and tested. If installed and operated in accordance with these operating instructions, it will rarely present any problems.

CAUTION!
Should you nevertheless need to return a device for inspection or repair, please pay strict attention to the following points:

- *Due to statutory regulations on environmental protection and safeguarding the health and safety of our personnel, manufacturer may only handle, test and repair returned devices that have been in contact with products without risk to personnel and environment.*
- *This means that the manufacturer can only service this device if it is accompanied by the following certificate (see next section) confirming that the device is safe to handle.*

CAUTION!
If the device has been operated with toxic, caustic, flammable or water-endangering products, you are kindly requested:

- *to check and ensure, if necessary by rinsing or neutralizing, that all cavities are free from such dangerous substances,*
- *to enclose a certificate with the device confirming that is safe to handle and stating the product used.*

6.5.2 Form (for copying) to accompany a returned device

Company:		Address:
Department:		Name:
Tel. no.:		Fax no.:
Manufacturer's order no. or serial no.:		
The device has been operated with the following medium:		
This medium is:	☐	water-hazardous
	☐	toxic
	☐	caustic
	☐	flammable
	☐	We checked that all cavities in the device are free from such substances.
	☐	We have flushed out and neutralized all cavities in the device.
We hereby confirm that there is no risk to persons or the environment through any residual media contained in the device when it is returned.		
Date:		Signature:
Stamp:		

6.6 Disposal

CAUTION!
Disposal must be carried out in accordance with legislation applicable in your country.

7.1 Measuring principle

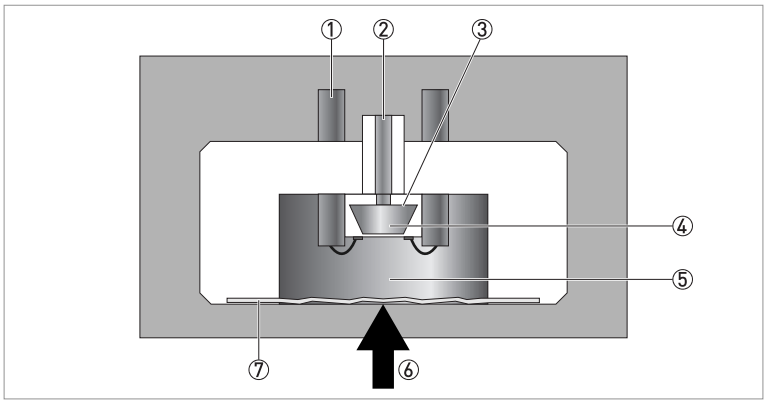


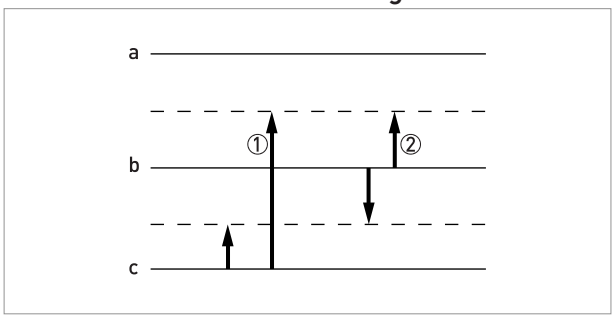
Figure 7-1: Measuring principle for pressure measurement

① Signal cables of measuring bridge
② Ventilation (only with gauge pressure transmitters)
③ Silicone cell
④ Silicone diaphragm with piezoresistive elements
⑤ Liquid fill
⑥ Process pressure "P"
⑦ Metal diaphragm

The process pressure is transmitted from the metal diaphragm (⑦) via the liquid fill behind it (⑤) directly to the silicone measuring cell (③). The embedded piezoresistive measuring elements on the silicone diaphragm (④) experience a corresponding strain which is then converted via a Wheatstone Bridge circuit to a voltage proportional to the applied process pressure.

Absolute pressure, gauge pressure and vacuum can be measured using this measuring principle.

Available measurement configurations



a: P_e = Effective pressure [2 bar]
b: P_{amb} = Ambient pressure [1.013 bar]
c: P_0 = Vacuum [0 bar]

① Absolute pressure [1.513 bara]
② Gauge pressure [0.5 barg]

Absolute pressure

During the production process, the sensor is evacuated on the negative side of the measuring cell and then sealed and referenced against a vacuum.
The pressure transmitter now measures the absolute pressure (①) compared to a "zero" pressure in an empty space (vacuum).

Gauge pressure

The back of the sensor is open to the atmosphere via air ventilation. The device is thus automatically referenced to the continuously changing ambient air pressure, indicating the gauge pressure (②) in the process compared to the respective atmospheric pressure.

7.2 Technical data

INFORMATION!

- *The following data is provided for general applications. If you require data that is more relevant to your specific application, please contact us or your local representative.*
- *Additional information (certificates, special tools, software,...) and complete product documentation can be downloaded free of charge from the website (Download Center).*

Measuring system

Measuring principle	Metallic diaphragm with piezoresistive measuring cell
Application range	Measurement of absolute and gauge pressure of gases, vapours and liquids
Measuring ranges	
Absolute pressure	Pressure ranges [bara]: 0…0.5; 0…1; 0…5; 0…10; 0…40; 0…100; 0…200
	Pressure ranges [psia]: 0…7.25; 0…14.5; 0…72.5; 0…145; 0…580; 0…2900
Gauge pressure	Pressure ranges [barg]: 0…0.2; 0…0.5; 0…1; 0…2; 0…5; 0…10; 0…20
	Pressure ranges [psig]: 0…2.9; 0…7.25; 0…14.5; 0…29; 0…72.5; 0…145; 0…290
Design	
Blind version	Position correction, zero and measurement span adjustment of span start (4 mA) and span end (20 mA) with push button on the converter electronics.
Version with display (optional)	LCD graphic display with 4 push buttons.
	Resolution: 128 x 64
	User languages: German, English and French (in preparation)

Measuring accuracy

Reference conditions acc. to IEC 60770	Ambient temperature (constant): +18...+30°C / +64...+86°F
	Relative humidity (constant): 30...80%
	Ambient pressure (constant): 950...1060 mbar / 14.8...15.4 psi
	Filling: silicone oil
Measuring accuracy	In relation to non-linearity, hysteresis and repeatability
	±0.1% of measuring span
Long-term stability acc. to DIN EN 61298-1	≤±0.1% within 1 year
Response time acc. to IEC 61298-1	T(95%) = 50 ms (incl. dead time)

Operating conditions

Temperature limits	
Operating temperature	Blind version: -40...+85°C / -40...+185°F
	With LCD graphic display: -20...+70°C / -4...+158°F
	Ambient temperatures below -10°C / +14°F may affect the readability of the display.
Process temperature	-40...+85°C / -40...+185°F
Storage temperature	-20...+70°C / -4...+158°F
Other conditions	
Protection category acc. to IEC 529 / EN 60529	Standard: IP65
	Optional: IP67 with internally ventilated cable for gauge pressure sensors

Installation conditions

Installation	Can be installed in any position, zero point or position correction may be required following installation.
	Maximum error through mounting position: <3.5 mbar / <0.05 psi
Dimensions and weights	For detailed information refer to section "Dimensions and weights".

Materials

Wetted parts	Stainless steel W.1.4404 (AISI 316L)
Non-wetted parts	Stainless steel W.1.4404 (AISI 316L)
	Internal housing cover gasket: EPDM
	Version with display: Makrolon®

Process connections

Standard	G½-B acc. to DIN EN 837-1
NPT versions	½"-14 NPT - female
	½"-14 NPT - male
Process connections with flush mounted diaphragm	In preparation

Electrical connection

Supply voltage	12...45 VDC
Output signal	4...20 mA, 2-wire
Damping	0.1 s
Max. load resistance (current output)	R_{Load} [KΩ] = (U_B [V] - 12 V) / alarm current max. [mA] with U_B = supply voltage
Initialisation time	10 s
Alarm current	Configurable as high alarm (21 mA) and low alarm (3.6 mA) using optional LCD display
Cable feedthroughs	M16 in plastic, nickel-plated brass or 316L stainless steel

Approvals and certificates

CE	The device fulfils the statutory requirements of the EC directives. The manufacturer certifies that these requirements have been met by applying the CE marking.
Electromagnetic compatibility (EMC)	Electromagnetic influence < 0.5% of measuring span
	EMC conformity for EN 61326-1 (05/2006)
NAMUR	NE 43

7.3 Pressure ranges

Gauge pressure

Order code	Pressure range	Maximum working pressure	Smallest calibratable span	Low pressure resistance $p_{abs.}$
	[bar] / [psi]	[bar]	[bar]	[bar]
1	-0.2...0.2 / -3...3	2.5	0.02	0.05
2	-0.5...0.5 / -7...7	2.5	0.05	0.05
3	-1...1 / -15...15	3	0.1	0.05
4	-1...2 / -15...145	4	0.2	0.05
5	-1...5 / -15...72	7	0.5	0.05
6	-1...10 / -15...145	15	1	0.05
7	-1...20 / -15...290	30	2	0.05

Absolute pressure

Order code	Pressure range	Maximum working pressure	Smallest calibratable span	Low pressure resistance $p_{abs.}$
	[bar] / [psi]	[bar]	[bar]	[bar]
N	0...0.5 / 0...7	2.5	0.05	0.05
P	0...1 / 0...15	3	0.01	0.05
R	0...5 / 0...72	7	0.5	0.05
S	0...10 / 0...145	15	1	0.05
T	0...50 / 0...725	100	5	0.05
U	0...100 / 0...1450	200	10	0.05
V	0...200 / 0...2900	300	20	0.05

7.4 Dimensions and weights

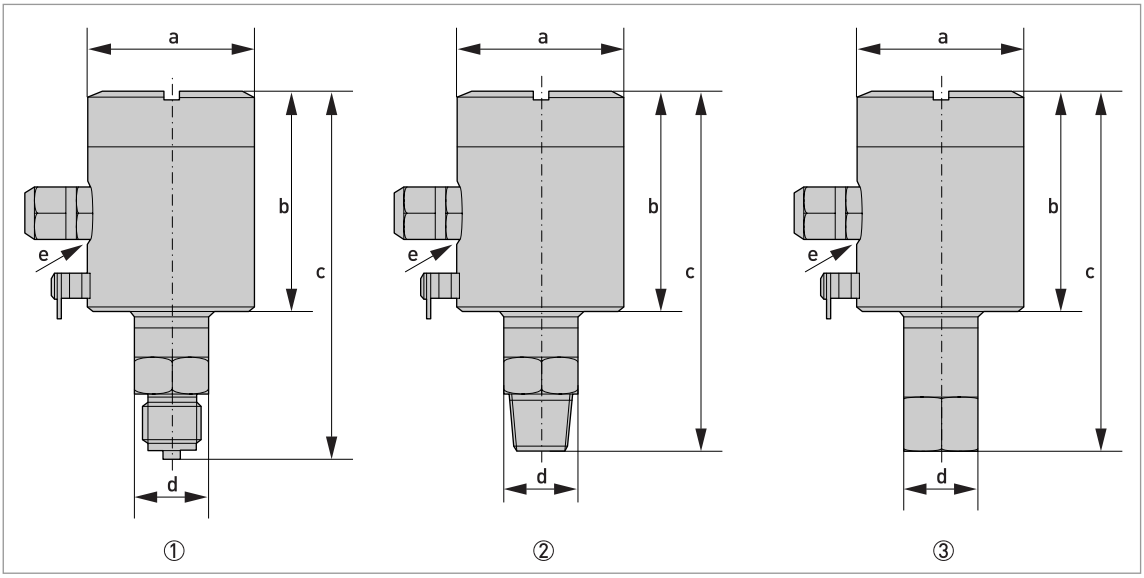


Figure 7-2: Dimensions for available process connection variants

d = WS27
e = M16x1.5

① G½
② ½" NPT - male
③ ½" NPT - female

Version	Dimensions			Weight
	a	b	c	
	[mm / "]			[g / lb]
Process connection G½				
Blind version	60 / 2.4	71 / 2.8	124 / 4.9	734 / 1.60
Version with display	60 / 2.4	79 / 3.1	132 / 5.2	834 / 1.80
Process connection ½" NPT - male				
Blind version	60 / 2.4	71 / 2.8	121 / 4.8	710 / 1.57
Version with display	60 / 2.4	79 / 3.1	129 / 5.1	810 / 1.78
Process connection ½" NPT - female				
Blind version	60 / 2.4	71 / 2.8	118 / 4.6	748 / 1.65
Version with display	60 / 2.4	79 / 3.1	126 / 5.0	834 / 1.80

KROHNE product overview

- Electromagnetic flowmeters
- Variable area flowmeters
- Ultrasonic flowmeters
- Mass flowmeters
- Vortex flowmeters
- Flow controllers
- Level meters
- Temperature meters
- Pressure meters
- Analysis products
- Products and systems for the oil & gas industry
- Measuring systems for the marine industry

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