EN

BD SENSORS® pressure measurement

Operating Manual

Digital Pressure Gauge

BAROLI 02, BAROLI 02 P, BAROLI 05, BAROLI 05 P

READ THOROUGHLY BE FORE USING THE DEVICE
KEEP FOR FUTURE REFERENCE

ID: BA_BAROLI_E_SRO | Version: 07.2021.0

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1. General and safety-related information on this operating manual

This operating manual enables safe and proper handling of the product, and forms part of the device. It should be kept in close proximity to the place of use, accessible for staff members at any time.

All persons entrusted with the mounting, installation, putting into service, operation, maintenance, removal from service, and disposal of the device must have read and understood the operating manual and in particular the safety-related information.

Complementary to this operating manual the current data sheet has to be adhered to.

Download the data sheet by accessing www.bdsensors.cz or request it: sale@bdsensors.cz | phone: +420 572 411 011

In addition, the applicable accident prevention regulations, safety requirements, and country-specific installation standards as well as the accepted engineering standards must be observed.

1.1 Symbols used

Warning word	- Type and source of danger - Measures to avoid the danger

Warning word	Meaning
DANGER	- Imminent danger! - Non-compliance **will result in** death or serious injury.
WARNING	- Possible danger! - Non-compliance **may result in** death or serious injury.
CAUTION	- Hazardous situation! - Non-compliance **may result in** minor or moderate injury.

NOTE - draws attention to a possibly hazardous situation that may result in property damage in case of non-compliance.

✓ Precondition of an action

1.2 Staff qualification

Qualified persons are persons that are familiar with the mounting, installation, putting into service, operation, maintenance, removal from service, and disposal of the product and have the appropriate qualification for their activity.

This includes persons that meet at least one of the following three requirements:

- They know the safety concepts of metrology and automation technology and are familiar therewith as project staff.
- They are operating staff of the measuring and automation systems and have been instructed in the handling of the systems. They are familiar with the operation of the devices and technologies described in this documentation.
- They are operating staff of the measuring and automation systems and have been instructed in the handling of the systems. They are familiar with the operation of the devices and technologies described in this documentation.

All work with this product must be carried out by qualified persons!

1.3 Intended use

The above-mentioned digital pressure gauges are intended for on-site display of the applied system pressure. It has to be used only for this purpose, considering the following information. The display housing is rotatable, thus ensuring an easy reading even under unfavourable mounting conditions.

Devices with EHEDG certified process connection have been developed especially for applications in food and pharmaceutical industry. The process connection is hygienic and can be sterilized.

Permissible measuring and cleaning media are gases or liquids, which are compatible with the media wetted parts of the device (according to data sheet) and your system. This must be ensured for the application.

The user must check whether the device is suited for the selected use. In case of doubt, please contact our sales department: info@bdsensors.cz | phone: +420 572 411 011

BD SENSORS assumes no liability for any wrong selection and the consequences thereof!

The technical data listed in the current data sheet are engaging and must absolutely be complied with. If the data sheet is not available, please order or download it from our homepage: http://www.bdsensors.cz

1.4 Incorrect use

WARNING	**Danger through incorrect use** - Only use the device in permissible media and in accordance with its intended use. - Do not use the device as a ladder or climbing aid. - The device must not be altered or modified in any way. - BD SENSORS is not liable for damage caused by improper or incorrect use.

1.5 Limitation of liability and warranty

Failure to observe the instructions or technical regulations, improper use and use not as intended, and alteration of or damage to the device will result in the forfeiture of warranty and liability claims.

1.6 Safe handling

NOTE - Do not use any force when installing the device to prevent damage of the device and the plant!

NOTE - Treat the device with care both in the packed and unpacked condition!

NOTE - Do not throw or drop the device!

NOTE - Excessive dust accumulation and complete coverage with dust must be prevented!

NOTE - The device is state-of-the-art and is operationally reliable. Residual hazards may originate from the device if it is used or operated improperly.

1.7 Scope of delivery

Check that all parts listed in the scope of delivery are included free of damage, and have been delivered according to your purchase order:

- digital pressure gauge
- mounting instruction

1.8 UL approval (for devices with UL marking)

The UL approval was effected by applying the US standards, which also conform to the applicable Canadian standards on safety.
Observe the following points so that the device meets the requirements of the UL approval:

- only indoor usage
- maximum operating voltage: according to data sheet
- use only batteries with UL certification

2. Product identification

The device can be identified by its manufacturing label. It provides the most important data. By the ordering code the product can be clearly identified. For identification of the firmware the program version will appear for about 1 second in the display after starting up the device. Please hold it ready for inquiry calls.

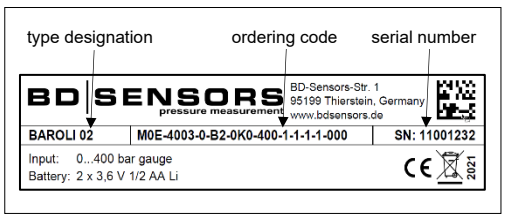


Fig. 1 Example of manufacturing label

NOTE - The manufacturing labels must not be removed!

3. Mounting

3.1 Mounting and safety instructions

DANGER	**Danger of death from airborne parts, leaking fluid, electric shock** - Always mount the device in a depressurized condition!
WARNING	**Danger of death from improper installation** - This device may only be installed by qualified technical personnel who has read and understood the operating manual!

NOTE - Handle this electronic precision measuring device carefully in packed as well as in unpacked condition!

NOTE - Handle the unprotected diaphragm very carefully - it is very sensitive and may be easily damaged.

NOTE - The device may not be thrown!

NOTE - Do not remove the packaging or protective caps of the device until shortly before the mounting procedure, in order to exclude any damage to the diaphragm and the thread! Protective caps must be kept! Dispose of the packaging properly!

NOTE - Place the protective cap on the pressure port again immediately after disassembling.

NOTE - In hydraulic systems, position the device in such a way that the pressure port points upward (venting).

NOTE - Provide a cooling line when using the device in steam lines.

NOTE - When installing the device, avoid high mechanical stresses on the pressure port! This will result in a shift of the characteristic curve or to damage, in particular at very small pressure ranges.

NOTE - The permissible tightening torque depends on the conditions on site (material and geometry of the mounting point). The specified tightening torques for the digital pressure gauge must not be exceeded!

NOTE - The display and the plastic housing are equipped with rotational limiters. Do only rotate the display or the housing within the limit.

NOTES - for mounting outdoors or in a moist environment:

- Please note that your application does not show a dew point, which causes condensation and can damage the device. There are specially protected devices for these operating conditions. Please contact us in such case.
- Select the mounting position such that splashed and condensed water can drain off. Stationary liquid on sealing surfaces must be excluded!
- Mount the device such that it is protected from direct solar radiation. In the most unfavourable case, direct solar radiation leads to the exceeding of the permissible operating temperature.
- A device with gauge reference in the housing (small hole next to the electrical connection) must be mounted such that the gauge reference is protected against dirt and humidity. If the device is exposed to liquid admission, the gauge reference will be blocked, and the equalization of air pressure will be prevented. In this condition, a precise measurement is impossible and damage to the device may occur.

3.2 Conditions for devices with EHEDG certificate

Install the device according to the requirements given in EHEDG Guidelines 8, 10 and 37. That is to mount the device in a self-draining orientation. The device should be installed flush to the process area. If mounting in a T-piece, the ratio between the depth of the upstand (L) and the diameter (D) of the upstand shall be L/D<1. If welded adapters are used, the food contact surface must be smooth, and the welding has to be done according to EHEDG Guideline 9 and 35. Suitable pipe couplings and process connections must be applied according to the EHEDG Position Paper. (List the available ones.)

3.3 Mounting steps for connections according to DIN 3852

NOTE - Do not use any additional sealing material such as yarn, hemp or Teflon tape!

✓ The O-ring is undamaged and seated in the designated groove.

✓ The sealing face of the mating component has a flawless surface. (R_Z 3.2)

1 Screw the device into the corresponding thread by hand.

2 Devices equipped with a knurled ring:
only tighten by hand

3 Devices with a spanner flat made of steel must be tightened using a suitable open-end wrench. Permissible tightening torques for digital pressure gauge:

G1/4":	approx. 5 Nm	G1/2":	approx. 10 Nm
G3/4":	approx. 15 Nm	G1":	approx. 20 Nm
G1 1/2":	approx. 25 Nm		

3.4 Mounting steps for connections according to EN 837

✓ A suitable seal for the medium and the pressure to be measured is available. (e.g. a copper seal)

✓ The sealing face of the mating component has a flawless surface. (R_Z 6.3)

1 Screw the device into the corresponding thread by hand.

2 Then tighten it using an open-end wrench. Permissible tightening torques for digital pressure gauge:
G1/4": approx. 20 Nm
G1/2": approx. 50 Nm

NOTE – note the permitted pressure according to EN 837:

G1/4" EN 837	p ≤ 600 bar	Counterpart has to be of steel according to DIN 17440 with strength R_p 0.2 ≥ 190 N/mm²
G1/2" EN 837	p ≤ 1000 bar	
G1/4" EN 837	p > 600 bar, p ≤ 1000 bar	Counterpart has to be of steel according to DIN 17440 with strength R_p 0.2 ≥ 260 N/mm²
G1/2" EN 837	p > 1000 bar, p ≤ 1600 bar	

NOTE - Please refer to data sheet or contact sales department at BD|SENSORS regarding max. permitted pressure of device.

3.5 Mounting steps for NPT connections

✓ Suitable fluid-compatible sealing material, e.g. PTFE tape, is available.

1 Screw the device into the corresponding thread by hand

2 Then tighten it using an open-end wrench. Permissible tightening torques for digital pressure gauge:
1/4" NPT: approx. 30 Nm; 1/2" NPT: approx. 70 Nm

3.6 Mounting steps for dairy pipe connections

✓ The O-ring is undamaged and seated in the designated groove.

✓ Chapter "3.2" have been noticed.
EHEDG conformity is only ensured in combination with an approved seal for codes M73, M75, M76. This is e.g.:
ASEPTO-STAR k-flex upgrade seal by Kieselmann GmbH

1 Centre the dairy pipe connection in the counterpart.

2 Screw the cup nut onto the mounting part.

3 Then tighten it using a hook wrench.

3.7 Mounting steps for Clamp and Varivent® connections

✓ A suitable seal for the measured fluid and the pressure to be measured is available.

✓ Chapter "3.2" have been noticed.
EHEDG conformity is only ensured in combination with an approved seal. This is e.g.:
for Clamp connections - codes C61, C62, C63:
T-ring seal from Combifit International B.V.
for Varivent® connections - codes P40, P41:
EPDM-O-ring which is FDA-listed
Note, that P40 can only be used for tank flanges.

1 Place the seal onto the corresponding mounting part.

2 Centre the clamp connection or Varivent® connection above the counterpart with seal.

3 Then fit the device with a suitable fastening element (e. g. semi-ring or retractable ring clamp) according to the supplier's instructions.

3.8 Mounting steps for flange connections

✓ A suitable seal for the measured fluid and the pressure to be measured is available. (e.g. a fiber seal)

1 Put the seal between connecting flange and counter flange

2 Install the device with 4 resp. 8 screws (depending on flange version) on the counter flange.

3.9 Positioning of the display module

In order to ensure easy readability even when the device is installed in an awkward location, the display can be rotated into the desired position. Its rotational capability is illustrated below. Note rotation limits.

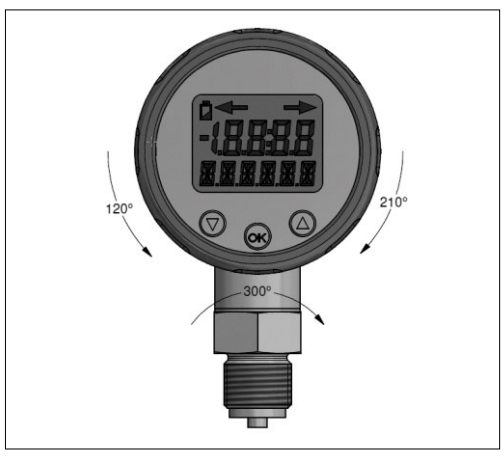


Fig. 2 Rotatability

4. Supply / changing the batteries

The digital pressure gauge is supplied by two 3.6 V-lithium-batteries (type 1/2 AA). Stored values/parameters are also kept after changing the batteries.

If the symbol for low batteries is indicated in the display, it is necessary to replace them as soon as possible with two new ones of the same type in order to ensure a good readability of the values.

The battery case is located under the black, circular plastic cap on the top of the housing.

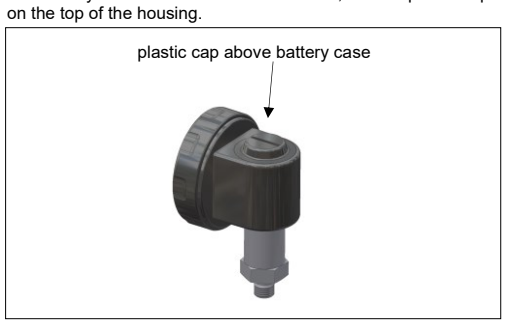


Fig. 3 Battery case

To change the batteries, go ahead as follows - this has only to be done in switched-off condition.

1 turn the plastic cap 45° anti clockwise by a coin (e.g. 2 € coin) as far as possible

2 hold the count tight and lever the plastic cap out of the housing with help of the count

3 take the cap off and change the batteries

4 lock the device properly

NOTE - An incorrect usage may cause a leak out of batteries and so a damage the device!

NOTE - Never combine batteries of different types or old with new ones!

NOTE - Make sure that the batteries are connected correctly with the corresponding contacts in the battery case.

NOTE - Never try to charge batteries, demount them, or short-circuit them.

NOTE - Keep the batteries away from heat and unshielded flame.

5. Commissioning

DANGER	**Danger of death from airborne parts, leaking fluid, electric shock** - Operate the device only within the specification! (according to data sheet)

✓ The device has been installed properly.

✓ The device does not have any visible defect.

6. Operation

6.1 Control and display elements

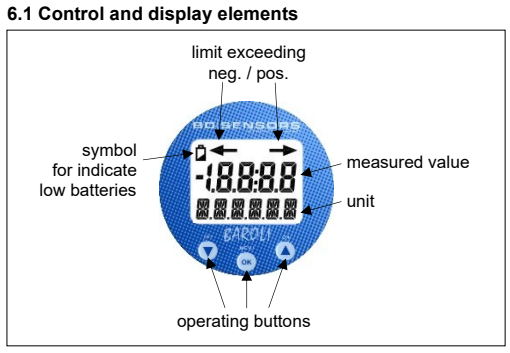


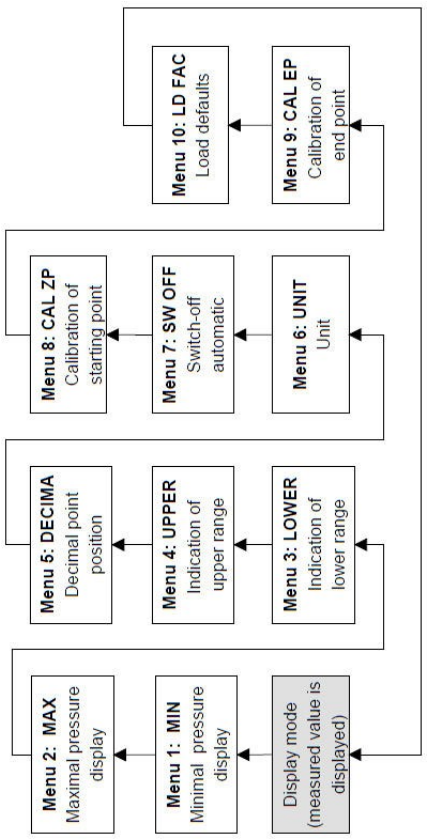
Fig. 4 Touch pad

The indication of the measured value as well as the configuration of the individual parameters occurs menu-driven via the LC display. The individual functions can be set with the help of three miniature push buttons located in the front.

The menu system is a closed system allowing you to scroll both forward and backward through the individual set-up menus to navigate to the desired setting item. All settings are permanently stored in an EEPROM and therefore available again even after a battery change.

Button functions	
▲	**switch the device on** in operating mode: - move forward in the menu system - increase the displayed value
▼	**switch the device off** in operating mode: - move backwards in the menu system - reduce the displayed value
OK	**enter operating mode** in operating mode: - select the individual menu item - confirm the set value

7.2 Structure of the menu system



7.3 Menu list

1 P MIN	**Minimum pressure display** ▼–button: puts the current pressure as minimum value ▲–button: puts the value on zero
2 P MAX	**Maximum pressure display** ▼–button: puts the current pressure as maximum value ▲–button: puts the value on zero
3 LOWER	**Displaying of the lower range** This value was determined on the order and cannot be changed.
4 UPPER	**Displaying of the upper range** This value was determined on the order and cannot be changed.
5 DECIMA	**Setting of the decimal point position** Depending on the nominal pressure range and on the set unit, only a limited number of positions after the decimal point can be displayed.
6 UNIT	**Setting of the pressure unit** Permissible units: bar, mbar, PSI, InHg, cmHg, mmHg, hPa, kPa, Mpa, mH_2O, InH_2O. Along with the unit, the decimal point position has probably to be changed in order to get a correct indication of the measured value. Besides, depending on the nominal pressure range, perhaps not all available units can be used.
7 SW OFF	**Configuration of the switch-off automatic** Meaning of the permissible number: "0": switch-off automatic is turned off "1" – "5": automatic switch-off in 1 to 5 minutes
8 CAL ZP	**Calibration of initial point** If you detect a shifting of the measured value deviating from the offset, the display can be re-calibrated. For this, a pressure reference is necessary if the offset differs from the ambient pressure. The used pressure must be identical to the starting point of the pressure measuring range. For reading the new pressure into the device, push the ▲-button. Please note the following characteristic: -1 … x bar: the offset is calibrated at -0.9 bar; during calibration we check whether the device will be within tolerance at -1 bar (in theory); for re-calibration a pressure reference of -0.9 bar is necessary 0 … x bar abs.: the offset is calibrated at 0.1 bar abs.; during calibration we check whether the device will be within tolerance at 0 bar abs.; for re-calibration, a pressure reference of 0.1 bar is necessary If the re-calibration leads to a worsening of the original calibration, e. g. as a result of a defect pressure reference, the defaults can be re-set by the menu item "LD FAC" according to your order
9 CAL EP	**Calibration of end point** If you detect a shifting of the measured value deviating from the end point, the display can be re-calibrated. For this, a pressure reference is necessary if the offset differs from the ambient pressure. The used pressure must be identical to the end point of the pressure measuring range. For reading the new pressure into the device, push the ▲-button. If the re-calibration leads to a worsening of the original calibration, e. g. as a result of a defect pressure reference, the defaults can be re-set by the menu item "LD FAC" according to your order.
10 LD FAC	**Load defaults** To load the defaults, you have to push the ▲-button. After the action "LOADED" and "OK" appears in the display for a short time. The configuration mode will be left automatically.

To configure the different menu items, set the desired values by pushing the "▼" or "▲" buttons. Confirm the setting with the "OK" button and the menu item will start blinking to indicate that you can start the configuration. To save the configured values or to leave a menu item, you also have to push the "OK" button.

Changes of the adjustable parameters become only effective after pushing the OK button and leaving the menu item. After leaving the menu system, all parameters will be checked against each other and in reference to the characteristics of the device. If the message "OK" appears in the display for some seconds, the configuration was successfully.

If the message "ERROR" appears, at least one of the set values is out of the permissible range. For example, an error will occur if a device with a nominal pressure range of 400 bar should be set on 4 positions after the decimal point. If an error has been detected, the lastly runnable parameters will be set again.

After configuring the unit, the conversion of the pressure range (in menus UPPER and LOWER) into the new unit will only occur after leaving the complete menu system. Besides, depending on the number of displayed figures of the respective nominal pressure range, probably not all available units (in menu UNIT) can be used.

8. Maintenance

⚠ **DANGER**	**Danger of death from airborne parts, leaking fluids, electric shock** - Always service the device in a depressurized and de-energized condition!
⚠ **WARNING**	**Danger of injury from aggressive fluids or pollutants** - Depending on the measured medium, this may constitute a danger to the operator. - Wear suitable protective clothing e.g. gloves, safety goggles.

If necessary, clean the housing of the device using a moist cloth and a non-aggressive cleaning solution.

During the cleaning processes, note the compatibility of the cleaning media used in combination with the media-wetted materials of the pressure measuring devices. Permissible concentrations and temperatures must be observed. Verification/ validation by the user is essential.

For EHEDG certified devices in tanks, the cleaning device must be positioned in such a way that the sensor is directly assessed and wetted for cleaning. The device has been developed for Cleaning in Place (CIP) applications and must not be dismantled for cleaning.

Deposits or contamination may occur on the diaphragm/ pressure port in case of certain media. Depending on kind and quality of the process, suitable cyclical maintenance intervals must be specified by the operator. As part of this, regular checks must be carried out regarding corrosion, damage of diaphragm/seal(s) and signal shift. A periodical replacement of the seal(s) may be necessary.

If the diaphragm is calcified, it is recommended to send the device to BD SENSORS for decalcification. Please note the chapter "Service / repair" below.

NOTE - Wrong cleaning or improper touch may cause an irreparable damage on the diaphragm. Therefore, never use pointed objects or pressured air for cleaning the diaphragm.

9. Removal from service

⚠ **DANGER**	**Danger of death from airborne parts, leaking fluids, electric shock** - Disassemble the device in a depressurized and de-energized condition!
⚠ **WARNING**	**Danger of injury from aggressive media or pollutants** - Depending on the measured medium, this may constitute a danger to the operator. - Wear suitable protective clothing e.g. gloves, goggles.

NOTE - After dismounting, mechanical connections must be fitted with protective caps.

10. Service / repair

Information on service / repair:

- www.bdsensors.cz
- info@bdsensors.cz
- Service phone: +420 572 411 011

10.1 Recalibration

During the lifetime of a transmitter, the value of offset and span may shift. As a consequence, a deviating signal value in reference to the nominal pressure range starting point or end point may be transmitted. If one of these two phenomena occurs after prolonged use, a recalibration is recommended to ensure furthermore high accuracy.

10.2 Return

⚠ **WARNING**	**Danger of injury from aggressive media or pollutants** - Depending on the measured medium, this may constitute a danger to the operator. - Wear suitable protective clothing e.g. gloves, goggles.

Before every return of your device, whether for recalibration, decalcification, modifications or repair, it has to be cleaned carefully and packed shatter-proofed. You have to enclose a notice of return with detailed defect description when sending the device. If your device came in contact with harmful substances, a declaration of decontamination is additionally required. Appropriate forms can be downloaded from our homepage. Download these by accessing www.bdsensors.com or request them:
info@bdsensors.cz | phone: +420 572 411 011

In case of doubt regarding the fluid used, devices without a declaration of decontamination will only be examined after receipt of an appropriate declaration!

11. Disposal

⚠ **WARNING**	**Danger of injury from aggressive media or pollutants** - Depending on the measured medium, this may constitute a danger to the operator. - Wear suitable protective clothing e.g. gloves, goggles.

The device must be disposed of according to the European Directive 2012/19/EU and 16/2022 coll. (waste electrical and electronic equipment). Waste equipment must not be disposed of in household waste!

NOTE - Dispose of the device properly!

12. Warranty terms

The warranty terms are subject to the legal warranty period of 24 months, valid from the date of delivery. If the device is used improperly, modified or damaged, we will rule out any warranty claim. A damaged diaphragm will not be accepted as a warranty case. Likewise, there shall be no entitlement to services or parts provided under warranty if the defects have arisen due to normal wear and tear.

13. EU declaration of conformity / CE

The delivered device fulfils all legal requirements. The applied directives, harmonised standards and documents are listed in the EC declaration of conformity, which is available online at: http://www.bdsensors.cz.

Additionally, the operational safety is confirmed by the CE sign on the manufacturing label.

Notes: