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The addresses of our distribution partners are listed on our homepage www.bdsensors.com. It is possible to download data sheets, operating manuals, ordering codes and certificates, as well.

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1. General information

1.1 Information on the operating manual

This operating manual contains important information on proper usage of the device. Read this operating manual carefully before installing and starting up the pressure measuring device.






Adhere to the safety notes and operating instructions which are given in the operating manual. Additionally applicable regulations regarding occupational safety, accident prevention and national installation standards must be complied with!

This operating manual is part of the device, must be kept nearest its location, always accessible to all employees.


This operating manual is copyrighted. The contents of this operating manual reflect the version available at the time of printing. It has been issued to our best knowledge. However, errors may have occurred. BD SENSORS is not liable for any incorrect statements and their effects.

– Technical modifications reserved –

1.2 Symbols used

-  **DANGER!** – dangerous situation, which may result in death or serious injuries
-  **WARNING!** – potentially dangerous situation, which may result in death or serious injuries
-  **CAUTION!** – potentially dangerous situation, which may result in minor injuries
-  **CAUTION!** – potentially dangerous situation, which may result in physical damage
-  **NOTE** – tips and information to ensure a failure-free operation

1.3 Target group

 **CAUTION!** To avoid operator hazards and damages of the device, the following instructions have to be worked out by qualified technical personnel.


1.4 Limitation of liability

By non-observance of the operating manual, inappropriate use, modification or damage, no liability is assumed and warranty claims will be excluded.

1.5 Intended use

The precision pressure transmitters have been especially developed for food industry, pharmacy and biotechnology. The pressure transmitters are configurable via integrated display and operating module as standard. Optionally the device offers HART®-communication.

It is the operator's responsibility to check and verify the suitability of the device for the intended application. In addition it has to be ensured, that the medium is compatible with the media wetted parts. If any doubts remain, please contact our sales department in order to ensure proper usage. BD SENSORS is not liable for any incorrect selections and their effects!

 **WARNING!** – Danger through improper usage! Therefore prevent this and ensure a usage within the area of application specified in the data sheet.

1.6 Package contents

Please verify that all listed parts are included in the delivery and check for consistency specified in your order:

- precision pressure transmitter
- protective cap
- for mechanical pressure ports DIN 3852: o-ring (pre-mounted)
- product specific data sheet
- this operating manual

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.

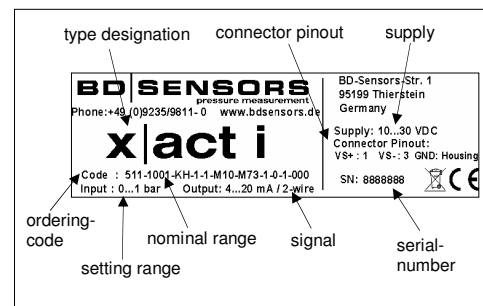














Fig. 1 manufacturing label


 The manufacturing label must not be removed from the device!


3. Mechanical installation


3.1 Mounting and safety instructions

-  **WARNING!** Install the device only when depressurized and currentless!
-  **WARNING!** This device may only be installed by qualified technical personnel who has read and understood the operating manual!
-  Handle this high-sensitive electronic precision measuring device with care, both in packed and unpacked condition!
-  There are no modifications/changes to be made on the device.
-  Do not throw the package/device!
-  To avoid damaging the diaphragm, remove packaging and protective cap directly before starting assembly. The delivered protective cap has to be stored!
-  Place the protective cap on the pressure port again immediately after disassembling.
-  Handle the unprotected diaphragm very carefully - it is very sensitive and may be easily damaged.
-  Do not use any force when installing the device to prevent damage of the device and the plant!
-  For installations outdoor and in damp areas following these instructions:
 - Choose an assembly position, which allows the flow-off of splashed water and condensation. Avoid permanent fluid at sealing surfaces!
 - When using a cable gland device, turn the outgoing cable downwards. If the cable has to be turned upwards, then point it downward so the moisture can drain.
 - Install the device in the way, so it is protected from sunrays. Direct sunrays can in the worst case, lead to overheating which affects or damages the functionality of the device. Furthermore an internal increase of pressure, can lead to temporary measurement errors.


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


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


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


 For installations outdoor and in damp areas following these instructions:


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 When installing the device to the pressurized system, the operator has to ensure the correct sealing.

 Check the intended resp. delivered seal for compatibility with the medium. If there is no compatibility, take a suitable seal.

 Take note that no assembly stress occurs at the pressure port, since this may cause a shifting of the characteristic curve.

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

 Provide a cooling line when using the device in steam piping.

 If there is any danger of damage by lightning or overpressure when the device is installed outdoor, we suggest putting a sufficiently dimensioned overpressure protection between the supply or switch cabinet and the device.

3.2 General installation steps

- Carefully remove the pressure measuring device from the package and dispose of the package properly.
- Go ahead as detailed in the specific instructions below.

3.3 Installation steps for DIN 3852

- Check to ensure the proper groove fitting of the o-ring and additionally to ensure no damage to the o-ring.
- Ensure that the sealing surface of the taking part is perfectly smooth and clean.
- Screw the device into the corresponding thread by hand.
- Tighten the devices with an open-end wrench (for G1 1/2": approx. 100 Nm).

3.4 Installation steps for G1" cone

- Screw the device into the corresponding thread by hand. (metallic sealing)
- Tighten the devices with an open-end wrench (approx. 80 Nm).

3.5 Installation steps for dairy pipe connections

- Check to ensure that the O-ring fits properly into the intended groove in the mounting part.
- Center the dairy pipe connection in the counterpart.
- Screw the cup nut onto the mounting part.
- Then tighten it with a hook wrench.

3.6 Installation steps for Clamp and Varivent® connections

- Use a suitable seal corresponding to the medium and the pressure input.
- Put the seal onto the corresponding mounting part.
- Center the Clamp or Varivent® connection on the fitting counterpart with seal.
- Then fit the device with a suitable fastening element (e. g. semi-ring or retractable ring clamp) according to the supplier's instructions.


3.7 Installation steps for DRD and connecting flanges

- Use a suitable seal corresponding to the medium and pressure input. (e.g. a fiber gasket).
- Put the seal between connecting flange and counter flange.
- Install the device with 4 resp. 8 screws (depending on flange version) on the counter flange.


3.8 Positioning of the display and operating module

The display and operating module is continuously rotatable so that clear readability is guaranteed even in unusual installation positions. To change the position go ahead as follows:

- Screw off the metal cap by hand.
- Turn the display and operating module carefully into the desired position by hand. Avoid overwinding the module.
- Before screwing on the cap again, the o-ring and sealing surfaces of the housing have to be checked for damage and if necessary have to be changed!
- Afterwards screw the metal cap on by hand and make sure that the housing is firmly locked again.

 Pay attention that no moisture can enter the device. Moreover, the seals and the sealing surfaces should not get dirty, as this may cause a reduction of the degree of protection depending on the case of application or place of installation. This can lead to a breakdown of the devices or to irreparable damages on the device.

4. Electrical Installation

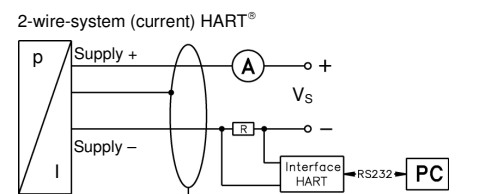
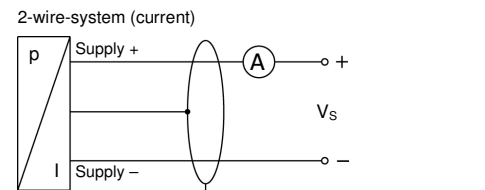
 **WARNING!** Install the device in currentless environments only!


Establish the electrical connection of the device according to the technical data shown on the manufacturing label, the following table and the wiring diagram.


Pin configuration:


Electrical connections	M12x1 (4-pin)	cable colours (DIN 47100)
Supply +	1	white
Supply -	3	brown
Ground	plug housing	yellow / green (shield)

Wiring diagrams:



 For the electrical connection a shielded and twisted multicore cable is recommended.

 If a transition is desired from a transmitter cable with gauge tube to a cable without gauge tube, we recommend our terminal box KL 1 or KL 2.

 Prevent the damage or removal of the PTFE filter which is fixed over the end of the air tube on devices with cable outlet and integrated air tube. An exception is a modification of the cable. In this case you must once more attach a PTFE filter assembly to the cable end. Humidity may otherwise enter the level transmitter through the gauge reference. This can lead to malfunctions and irreparable damages. Matching filter assemblies can be ordered from BD SENSORS. Proceed as follows to mount the PTFE filter assembly:

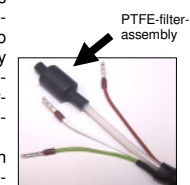



Fig. 2 PTFE-filter

- Push the plastic tube with the affixed PTFE filter over the end of the air tube.
- Put the shrinking tube over the pushed-on plastic tube and the air tube until the shrinking tube is relatively centred over the filter assembly.
- Bend the connecting lines back and make sure that they will not be damaged by the subsequent treatment of the shrinking tube.
- Heat the shrinking tube using a hot-air blower. The temperature must be between 90 °C and 110 °C for the tube beginning to shrink. Keep this temperature until the tube tightly encloses the filter assembly and the air tube. You must then stop the heat application immediately.

 Please note that the hot-air blower can cause damages on the air tube or the connection lines. To avoid this, you should heat the shrinking tube only as long as necessary.

5. HART®-communication (optionally)

The analogue output signal is overridden by an additional signal according to the HART®-specification. The device can be configured via a HART®-communication device. Therefore we suggest our programming kit CIS 150 (available as accessory). It consists of HART®-modem, connecting cables as well as configuration software and allows a simple and time-saving configuration of all parameters. (The software is compatible with all Windows®-systems from Windows 98 and higher.)

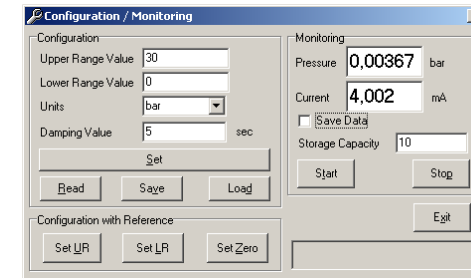


Fig. 3 configuration software

To ensure a trouble-free operation the following requirements should be fulfilled:

maximal cable length between device and power supply:

$$L_{max} = \frac{65 \cdot 10^6}{R_v \cdot C_v} - \frac{40 \cdot 10^3}{C_v}$$

whereas L_{max} maximum length of cable in [m]
 R_v resistance of the cable together with the load resistance in [Ω]
 C_v capacity of the cable in [pF/m]


resistance R:


$$R = \frac{U - 12}{0.024} \Omega$$


whereas U power supply in [V_{DC}]

The resistance must be at least 240 Ω.

6. Initial start-up

 **WARNING!** Before start-up, the user has to check for proper installation and for any visible defects.

 **WARNING!** The device can be started and operated by authorized personnel only, who have read and understood the operating manual!

 **WARNING!** The device has to be used within the technical specifications, only! (check the technical data in the enclosed data sheet!)

7. Operation

7.1 Display and operating module

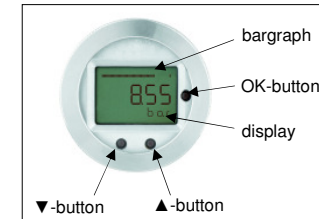



Fig. 4 touch pad

The indication of the measured value as well as the configuration of the individual parameters occurs through a menu via the display. The individual functions can be set with the help of three miniature push buttons located under the metal cap. Furthermore, a bargraph is shown in the display, indicating the current pressure input as percentage of the specified pressure range.

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 a Flash EPROM and therefore available again even after disconnecting from the supply voltage.

 Pay attention that no moisture can enter the device during configuration. Moreover, the seals and the sealing surfaces should not get dirty, as this may cause a reduction of the degree of protection depending on the case of application or place of installation. This can lead to a breakdown of the device or to irreparable damages on the device. Right after configuration, the metal cap has to be screwed on again.

7.2 Structure of the menu system

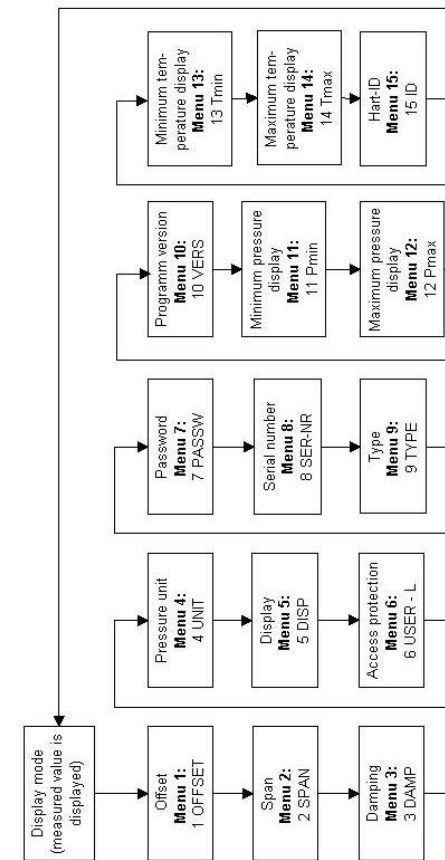


Fig. 5 menu system

7.3 Menu list

1 OFFSET	Setting of the initial value of the measuring range permissible range: $offset_{min} = initial\ value_{nom} - 0.1 \times (terminal\ value_{nom} - initial\ value_{nom})$ $offset_{max} = terminal\ value_{nom} - 0.1 \times (terminal\ value_{nom} - initial\ value_{nom})$
2 SPAN	Setting of the terminal value of the measuring range permissible range: exact i: $span_{min} = 0.1 \times (terminal\ value_{nom} - initial\ value_{nom})$ $span_{max} = terminal\ value_{nom} + 0.1 \times (terminal\ value_{nom} - initial\ value_{nom})$ exact ci: $span_{min} = 0.2 \times (terminal\ value_{nom} - initial\ value_{nom})$ $span_{max} = terminal\ value_{nom} + 0.2 \times (terminal\ value_{nom} - initial\ value_{nom})$
3 DAMP	Setting of the damping permissible range: from 0 up to 100 sec
4 UNIT	Setting of the pressure unit permissible units: bar, mbar, g/cm ² , kg/cm ² , Pa, kPa, Torr, atm, mmWS (mm H20), mmHg, PSI ⓘ a conversation of all pressure related parameters is carried out automatically
5 DISP	Setting of the display meaning of the permissible numbers: "1": 1. line: measured pressure 2. line: set pressure unit "2": 1. line: output signal 2. line: mA "3": 1. line: measured temperature 2. line: °C "4": 1. line: measured pressure 2. line: changes between set pressure unit / output signal in mA "5": 1. line: measured pressure 2. line: changes between set pressure unit / measured temperature in °C "6": 1. line: measured pressure 2. line: changes between set pressure unit / output signal in mA / measured temperature in °C
6 USER-L	Configuration of the access protection For security reasons, it is necessary to enter the password before configuring the access protection. Confirm it with the OK-button. The default setting for the password is "0000". meaning of the permissible numbers: "1": the complete menu system is locked "2": following menus are unlocked: offset, span, damping and access protection "3": following menus are unlocked: offset, span, damping, showing the type and program version, access protection "4": the complete menu system is unlocked
7 PASSW	Configuration of the password For security reasons, it is necessary to enter the current password before the configuration of the new one. Confirm with the OK-button. The default setting for the password is "0000". Then set the new password and confirm with the OK-button ⓘ A master password has been permanently implemented in case the password has been lost. BD SENSORS will forward it to you on request, in case you have forgotten your password.
8 SER-NR	Displaying of the serial number
9 TYPE	Displaying of the type of device
10 VERS	Displaying of the program version
11 P_{MIN}	Minimum pressure display (low pressure) The minimum pressure applied during measuring is shown in the display. To delete the saved value, keep holding down the OK-button.
12 P_{MAX}	Maximum pressure display (high pressure) The maximum pressure applied during measuring is shown in the display. To delete the saved value, keep holding down the OK-button.
13 T_{MIN}	Minimum temperature display (low temperature) The minimum temperature during measuring is shown in the display. To delete the saved value, keep holding down the OK-button.
14 T_{MAX}	Maximum temperature display (high temperature) The minimum temperature during measuring is shown in the display. To delete the saved value, keep holding down the OK-button.
15 ID	HART-ID (has to be set for devices with HART[®]-communication in the multi-drop mode, only) Set the desired ID-Nr. (between "0" and "15") and confirm with the OK-button. A configuration of this number is only necessary, if the device will be run in multi-drop mode (connection of several devices with HART [®] -communication). If the value is set to "0", the multi-drop mode is deactivated and the device operates in the analogue mode.

- **▲-button:** with this button you move forward in the menu system or increase the displayed value; it will also lead you to the operating mode (beginning with menu item "1 Offset")
- **▼-button:** with this button you move back in the menu system or decrease the displayed value; it will also lead you to the operating mode (beginning with menu item "15 ID")
- **OK-button:** this button is used to confirm the menu items and the values set

To configure the different menu items, set the desired values by pushing the ▼- or ▲-buttons. Confirm the setting with the OK-button. To save the configured values or to leave a menu item, you also have to push the OK-button.

ⓘ If a parameter is configurable by a value, each digit may be configured separately. That means after activating such a menu item (e. g. "1 Offset") by pushing the OK-button, the first digit of the currently set value will start to blink. Now scroll up or down to the desired digit via the ▼- or ▲-button and confirm it with the OK-button. After that, the next digit will start to blink. Configure it in the same way. In the menu items "offset" and "span", the decimal point will then start to blink and it is also possible to change its position by using the ▼- or ▲-button. By confirming the position with the OK-button, the total value will be stored if permissible. If the value is out of range, an error message (e. g. Error 03) will appear in the display and the set value will **not** be stored. If you intend to set a negative value, the first digit has to be configured with the ▼-button.

8. Error handling

8.1 Error messages

ERROR 03	set value is too high (e. g. damping > 100)
ERROR 04	set value is too low (e. g. damping < 0)
ERROR 09	set value of the "offset" is too high
ERROR 10	set value of the "offset" is too low
ERROR 11	set value of "span" is too high
ERROR 12	set value of "span" is too low
ERROR 13	"offset" or "span" out of range
ERROR 14	set value of the "span" is too low
ERROR 20	wrong password
ERROR 21	ID number out of range

8.2 More errors and possible corrections

Malfunction	Possible cause	Error detection / corrective
display does not work	falsely connected	inspect the connections
	line break	inspect all connecting lines of the device (including the connector plugs)
	defective energy supply	inspect the power supply and the applied supply voltage at the transmitter
no output signal	wrong connected	inspect the connection
	line break	inspect all line connections necessary to supply the device (including the connector plugs)
	defective amperemeter (signal input)	inspect the amperemeter (fine-wire fuse) or the analogue input of the PLC
analogue output signal too low	load resistance too high	verify the value of the load resistance
	supply voltage too low	verify the output voltage of the power supply
	defective energy supply	inspect the power supply and the applied supply voltage at the device
small shift of output signal	diaphragm is highly contaminated	careful cleaning with non-aggressive cleaning solution and a soft brush or sponge; incorrect cleaning can cause irreparable damages on diaphragm or seals
	diaphragm is calcified or coated with deposit	if possible it is recommended to send the device to BD SENSORS for decalcification or cleaning
large shift of output signal	diaphragm is damaged (caused by overpressure or manually)	check the diaphragm; if it is damaged, please send the device to BD SENSORS for repair
measured value (display and analogue output) deviates from the nominal value	high pressure / pressure peaks	a recalibrated or replaced of the pressure port by BD SENSORS is necessary
	mechanical damage to diaphragm	
constant output signal at 4 mA	wrong ID-number	ensure in the menu item "ID" that the set value for the ID-number is "0000"

If you detect an error, please try to eliminate it by using this table or send the device to our service address for repair.

- ! Improper action and opening can damage the device. Therefore repairs on the device may only be executed by the manufacturer!

9. Placing out of service

⚠ WARNING! Disassemble the device only in current and pressure less condition! Check before disassembly, if it is necessary to drained off the media before dismantling!

⚠ WARNING! Depending on the medium, it may cause danger for the user. Comply therefore with adequate precautions for purification.

10. Maintenance

In principle, this device is maintenance-free. If desired, the housing of the device can be cleaned when switched of using a damp cloth and non-aggressive cleaning solutions.

Depending on the measuring medium, however, the diaphragm may be polluted or coated with deposit. If the medium is known for such tendencies, the user has to set appropriate cleaning intervals. After placing the device out of service correctly, the diaphragm can usually be cleaned carefully with a non-aggressive cleaning solution and a soft brush or sponge. If the diaphragm is calcified, it is recommended to send the device to BD SENSORS for decalcification. Please read therefore the chapter "Repair" below.

- ! An incorrect cleaning can cause irreparable damages on the diaphragm. Never use spiky objects or pressured air for cleaning the diaphragm.

11. Service / Repair

11.1 Recalibration

During the life-time 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.

11.2 Return

Before every return of your device, whether for recalibration, decalcification, modifications or repair, it is necessary to contact us to ensure a fast handling of your request. Please inform us by sending an email to: return@bdsensors.de. Include the number of devices sent and request a RMA. Then clean the device and pack it shatterproof before send it to BD SENSORS indicating the RMA.

12. Disposal

The device must be disposed according to the European Directives 2002/96/EG and 2003/108/EG (on waste electrical and electronic equipment). Waste of electrical and electronic equipment may not be disposed by domestic refuse!



- ⚠ WARNING! Depending on the measuring medium, deposit on the device may cause danger for the user and the environment. Comply with adequate precautions for purification and dispose of it properly.