Certificate of quality and completeness

Type	: ……
Serial number	: ……
Power supply	: ……
Range	: ……
Pressure overload	: ……
Accuracy	: ……
Technical inspection of offset	: ……
Technical inspection of range	: ……
Display data	: ……
Manufacture date	: ……
Warranty period	: ……
Signature:	: ……

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BD SENSORS®

Operating instructions for

Pressure sensor, PCB+ type, two wires, 4 … 20 mA

Description

Pressure sensors of the PCB+ type are used to measure very small pressures (relative and differential ones). The measured pressure is sensed by a semiconductor strain-gauge sensor or a ceramic capacitive sensor. The sensors are designed for gases. In case of a semiconductor sensor, gases have to be non-aggressive and dry.
The sensors are not manufactured in the EX design.
The sensors are adjusted at the factory. Further calibration has to be performed according to calibration instructions.

Selected technical parameters:

Pressure ranges:	0.6 kPa to 100 kPa	
Accuracy:	0.5% (1%) of range according to range and type of used sensor	
Supply voltage range:	19 to 31 VDC (12 to 31 VDC for sensor without display)	
Influence of supply voltage on accuracy:	max 0.05% of range / 10 V	
Output signal:	4 to 20 mA, two wires (max. load ((Un (V) - 19) / 0.02) Ω)	
Influence of load resistance:	max.0.05% of range / 10 V	
Power polarity reversal resistance and short circuit resistance at the output:	permanent.	
	semiconductor sensor	capacitive sensor
Operating range of temperatures :	-40°C to 80°C	0°C to 60°C
Compensated range of temperatures :	0°C to 60°C	10°C to 40°C
Influence of temperature in the compensated range of temperatures		
a. zero:	0.1 … 1.8% of range / 10°C	depends on the pressure range and the sensor type
b. range:	0.1 … 1.8% of range / 10°C	depends on the pressure range and the sensor type
Material of the box:ABS		

Fig. 1 Mechanical dimensions:

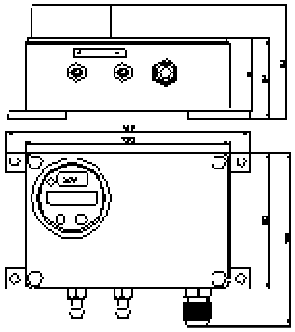
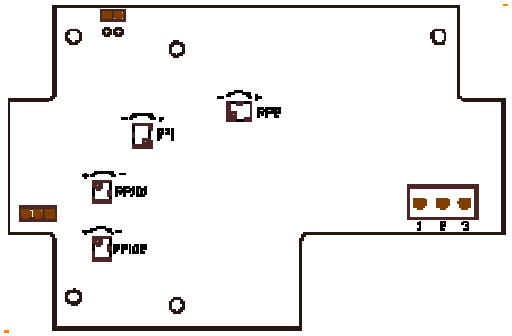


Fig. 2: Location of terminal blocks and adjusting elements on the printed circuit board (view with the removed cover of the sensor in a vertical position)



Mechanical assembly

The sensor should be fixed using four clips on the housing. The sensor cannot be placed in an immediate proximity of interference sources (transformers, transmitters, motors) and heat sources. Shocks or vibrations at the installation site can cause an error. Correctly, the sensor has to be mounted in a vertical position (pressure inlets oriented down). In this position, the sensors are adjusted at the factory. This position prevents a condensate from the penetration into the sensor. WARNING! Prior to mounting, make sure that there is no liquid in the threaded insert of the closed valve. Remaining liquid has to be removed properly. The sensor cannot be mounted if there is liquid in the thread.

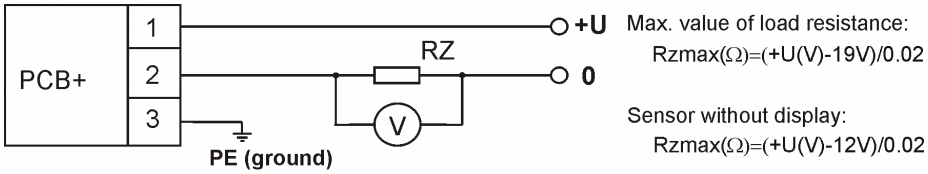
Connection of the measured pressure (using 1/4“ hose)

The higher pressure is connected to the "+" inlet, the lower pressure to the "-" inlet. In case of a risk of water vapor condensation, condensation loops have to be created on the hoses. The version of the sensor for measuring the relative pressure includes only a single inlet. Blowing into pressure inlets is not allowed. Sensors to be used up to 100 mbar can be damaged or destroyed by air pressure from lungs.

Commissioning

Remove the cover of housing. Connect electrical power using the connection terminals (see Fig. 2). Thread the outlets through the cable gland. The sensor is equipped with the polarity reversal protection.

Fig. 3 Electrical schematics (DC supply U = 19-31 V; without display U = 12 - 31 V)



Display

The display shows data in pressure units or according to user's request. The user can adjust the range of the display. After switching on, the output signal can be measured. When changing the output signal, two circumstances have to be taken into account.

1) The starting time is 5 minutes. After that time, the output signal has to be stable at the zero differential pressure and the constant temperature.
2) For measuring ranges below 100 mbar, the shift of zero occurs due to the change of the sensor position. After passing the starting time, the error can be reset by zero-setting potentiometers RP2 or RP101.

Settings

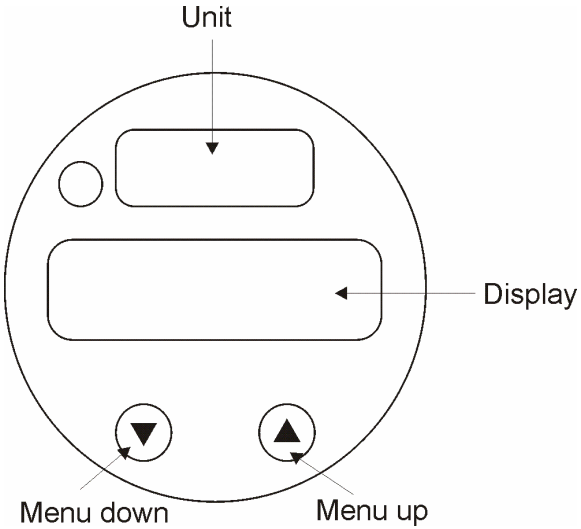
In general

When designing the display, a simple operation and a customer control were primarily emphasized. Particular functions are set by two buttons on the front side via the system of menus.

The settings are permanently saved in the Flash-EPROM memory and can be password-protected against an unauthorized manipulation.

The indicator of measured values (or individual menus) comprises a four-digit seven-segment display with the height of digits being 7.62 mm.

Location of control elements and the display



Unit

The unit of the displayed measured value is determined at the time of ordering. By default, bar, mbar and m v.s. are considered (to be specified when ordering). Nevertheless, the unit can be selected later by attaching one of the enclosed stickers.

Display of measured values and settings menu

In the center, there is the four-digit display showing the measured value and supporting the configuration. The measured value is displayed in units defined by the user and depends on the scale and adjusted settings.

Control elements for setting the functions

For the control, two buttons located under a foil can be used. The user moves forward in the menu system or increases the values on the display by the "▲" button . The "▼" button is used to decrease the values and to move backward in the menu system.

The menu system is closed. By scrolling the particular menu settings forward and backward, the desired set-point can be achieved.

By pressing the buttons for a longer time (> 5 seconds), the pulse rate is increased.

By simultaneous pressing of both the buttons,

- the display mode is changed to the configuration mode,
- the adjusted value is saved

or

- the display mode is restored.

☝ **ATTENTION: Adjusted parameters are changed** just after changing the display mode.

Erasing the display at a different offset of the pressure sensor
(regardless of the measuring range of the pressure sensor, the pressure reference is necessary)

During the lifetime of the pressure sensor, the offset (nominally set at 4,000 mA) may shift. This phenomenon can cause that the display shows a signal value which differs from the adjusted beginning of the measuring range. The control software of the display considers this phenomenon and offers a function to eliminate this phenomenon.

- The PAof menu should be selected. Both the buttons should simultaneously be pressed.
- The number 0247 should be entered to select the special function.
- Both the buttons should be pressed simultaneously again. The following sample value appears on the display.
- Now, the pressure sensor has to be pressurized via the pressure reference. The pressure has to correspond to the beginning value of the measuring range.

- When pressing both the buttons simultaneously afterwards, the current output signal of the sensor is saved as an offset. From this moment, the adjusted beginning of the measuring range (zero-point) appears on the display, although the sensor signal is shifted in the offset.

☝ **ATTENTION:** Please note that the output signal remains unaffected by this change. Furthermore, the shift of the range value ("Full Scale") is performed simultaneously with the shift of the offset.

Change of the display at different range of pressure sensor
(regardless of the measuring range of the pressure sensor, the pressure reference is necessary)

During the lifetime of the pressure sensor, the value of the range being nominally at 20,000 mA e.g., might be shifted. This phenomenon could cause that the display shows a signal value which differs from the adjusted boundary of the measuring range. In the control software of the display, this phenomenon was considered and a function eliminating this phenomenon was implemented.

- The PAof menu should be selected.
- Both the buttons should simultaneously be pressed.
- The number 0238 should be entered to select the special function.
- Both the buttons should be pressed simultaneously again. The following sample value appears on the display.

- Now, the pressure sensor has to be pressurized via the pressure reference. The pressure has to correspond to the ending value of the measuring range.
- When pressing both the buttons simultaneously afterwards, the current output signal of the sensor is saved as a voltage signal. From this moment, the adjusted ending of the measuring range (end-point) appears on the display, although the sensor signal is shifted in the voltage signal.

☝ **ATTENTION:** Please note that the output signal remains unaffected by this change.

Entering the data of the basic adjustment of the mechanism ("Load Defaults")

The control system of the display is equipped with the possibility to re-create the adjustment of the mechanism. That way pre-made changes related to the compensation of the offset or the voltage can be performed retroactively.

- To load the basic adjustment, the PAof menu should be selected.
- Then, both the buttons should simultaneously be pressed.
- The number 0729 should be entered to select the special function.
- Both the buttons should be pressed simultaneously again. The following sample value appears on the display,

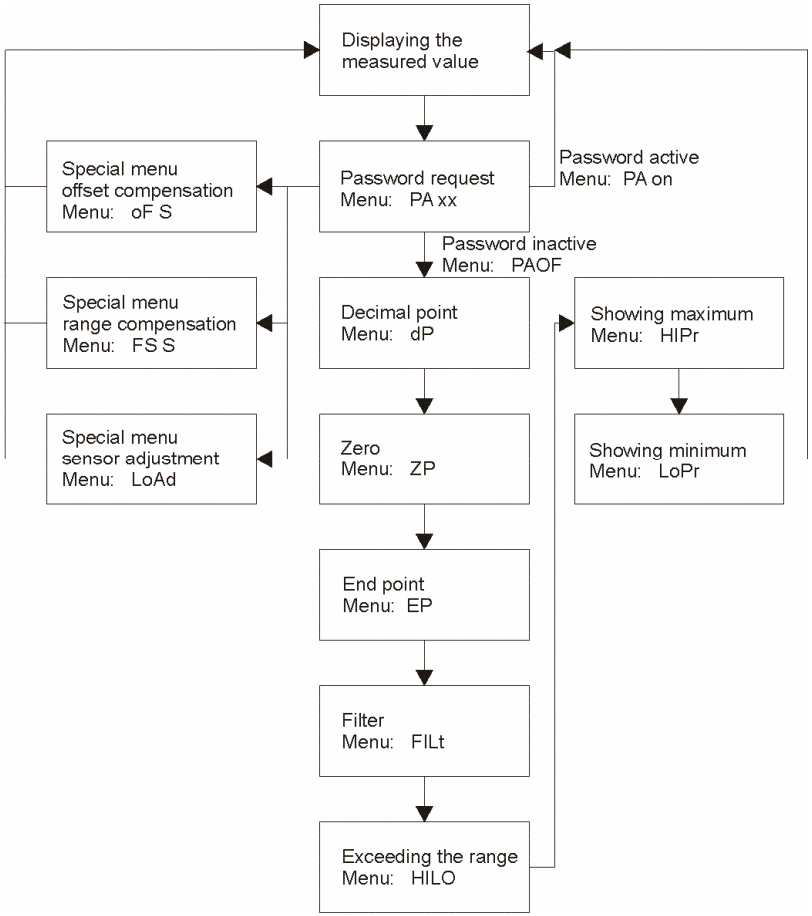
- If both the buttons are simultaneously pressed again, the basic adjustment of the mechanism is activated again.

Restrictions on entering a password

Dealing with special functions for the compensation of the offset, the range, recording the basic adjustment and password change, various codes have been entered to call the function.

☝ **ATTENTION:** Please note that these codes cannot be used as passwords.

Structure of the menu system



Adjustment of the access security - secured status

If the password is activated, the user is asked to enter the unlock code after pressing both the control buttons to make settings in the menu system.

Adjustment of the password security - unsecured status

If not activate, the password can be activated by pressing both the buttons simultaneously and entering a predetermined secret number. In settings of the mechanism, 5 is the secret number. To change this number, both the buttons should be pressed simultaneously in this menu. Then, the number 0835 should be adjusted by the cursor. Afterwards, both the buttons should be pressed simultaneously again, and the secret number within 0 and 9999 should be adjusted by cursor buttons. The number is confirmed by pressing the cursor buttons simultaneously. That way, the new password is adjusted. To activate the password protection, instructions given in the PAon menu should be followed.

Adjustment of decimal point

After pressing of both the buttons simultaneously, position of the decimal point can be adjusted. The desired position can be selected using "▲" or "▼" buttons. Pressing both the buttons simultaneously, the settings are closed.

Adjustment of zero

Pressing both the buttons simultaneously, zero can be adjusted. The adjusted value is shown when the electrical output signal of the pressure sensor corresponds to 4 mA (zero). Pressing both the buttons simultaneously, the settings are closed.

Adjustment of the ending value

After pressing both the buttons simultaneously, the ending point can be adjusted. The programmed value is shown when the electrical output signal of the pressure sensor corresponds to 20 mA (the ending point). Pressing both the buttons simultaneously, the settings are closed.

Adjustment of attenuation (filter)

After pressing both the buttons simultaneously, the time interval for updating the displayed value can be adjusted. The range of the adjustment is from 0.3 to 30 seconds. To close the configuration, both the buttons should be pressed simultaneously.

Activation of report about exceeding the range

After pressing both the buttons simultaneously, the report about exceeding or failing to meet the display range can be activated. Only the "ON" status or the "OFF" status can be selected. Pressing both the buttons simultaneously, the settings are closed.

High-Pressure

After pressing both the buttons simultaneously, the maximum pressure saved during the measurement is displayed. If both the buttons are within one-second interval pressed again, the saved value is deleted. Please note that the value does not stay saved when the power supply is interrupted (current loop).

Low-Pressure

After pressing both the buttons simultaneously, the minimum pressure saved during the measurement is displayed. If both the buttons are within one-second interval pressed again, the saved value is deleted. Please note that the value does not stay saved when the power supply is interrupted (current loop).

Transport and storage

The range of storage temperatures: -10°C to +50°C
When transporting, make sure that both the inputs of differential pressure sensors are open.

Calibration instructions

Required equipment: pressure gauge: (e.g., high-precision digital pressure gauge)
pressure source: (e.g., a pump, a bag)
power supply: according to the design of the pressure gauge
measuring device: mA-meter for measuring the output signal.

Output settings

1) The sensor should be connected to the corresponding power supply (see operating instructions). Instead of a load resistor and a voltmeter, a suitable mA-meter of the accuracy class at least 2 times better than the sensor should be connected.
2) After switching on, the starting time should be let to pass (see operating instructions).
3) **Adjusting zero (trimmers RP2 or RP101)**
When adjusting zero, both the pressure inputs have to be open. The output current is adjusted to 4 mA by the RP2 trimmer or the RP101 trimmer (only one of them is available).
4) **Adjusting range (trimmers RP1 or RP102)**
The nominal pressure is set on the pressure source. This pressure is connected to the inlet "+" (at over-pressure) or to the inlet "-" (at under-pressure). The output current is adjusted to 20mA by the RP2 trimmer or the RP101 trimmer (only one of them is available). If necessary, the procedure according to points 3) and 4) is repeated.