PROCESSAUTOMATION

Manual

BARCON

Hydrostatic Pressure Transmitter LHC
Process Pressure Transmitter PPC

PEPPERL+FUCHS

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1 Declaration of conformity

The pressure transmitters LHC and PPC have been developed and manufactured with regard to the applicable European standards and directives.

Note

An appropriate declaration of conformity can be demanded from the manufacturer.

The manufacturer of the product, Pepperl+Fuchs GmbH, D-68301 Mannheim, operates a certificated quality assurance system in accordance with ISO 9001.

CE

ISO**9001**

2 Symbols used in this document

Warning

This symbol warns of danger.

If this instruction is not heeded, there is a danger of the injury or death of personnel and damage to property or even its destruction.

Attention

This symbol warns of a possible fault.

If the instruction given in this warning is not heeded, the device and any plant or systems connected to it could develop a fault or even fail completely.

Note

This symbol directs attention to important information.

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3 Safety

3.1 Intended use

Warning

The protection of operating personnel and plant is not guaranteed if the equipment is used for a purpose for which is was not intended.

The pressure transmitters LHC and PPC must only be operated by authorised specialist personnel in accordance with these operating instructions.

3.2 General safety instructions

Warning

Observe the national safety and accident prevention regulations, as well as the following safety instructions in this operating manual when working with the pressure transmitters.

Do not carry out any operation on the equipment unless it is described in the following instructions.

Attention

The connection of the devices and maintenance work under power must only be carried out by a qualified electrical specialist.

If faults cannot be eliminated, the devices are to be taken out of operation and protected against further unintentional operation.

Repairs must only be carried out by the manufacturer. Access inside the device and modifications to it are not permissible and render the guarantee null and void.

The operator is responsible for complying with local safety regulations.

Note

Other important safety guidelines are located in the individual sections of this instruction manual.

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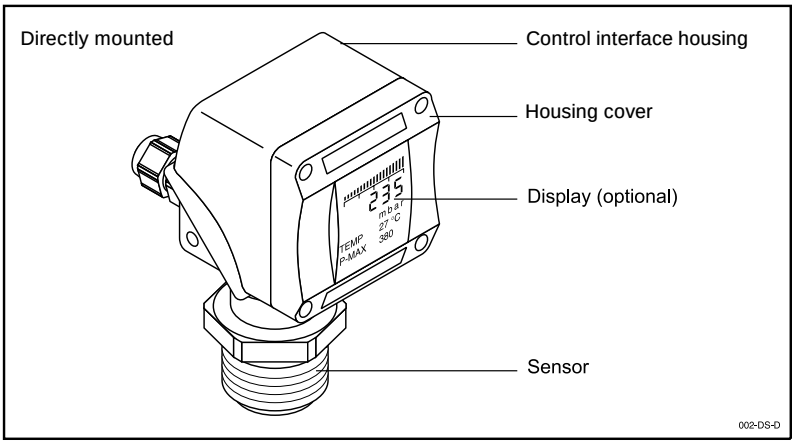
4 Product description

The pressure transmitters LHC und PPC can be used in level control as well as pressure measurement in process applications. A variety of process connections, measurement ranges, electronic interfaces and display options offer a product for a wide range of applications.

4.1 Construction

The pressure transmitters consists of a pressure sensor, a control interface unit and a housing cover with optional display. Different modular configurations are available allowing a variety of designs (see model number key in section 12.1).



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4.1.1 Pressure transmitter

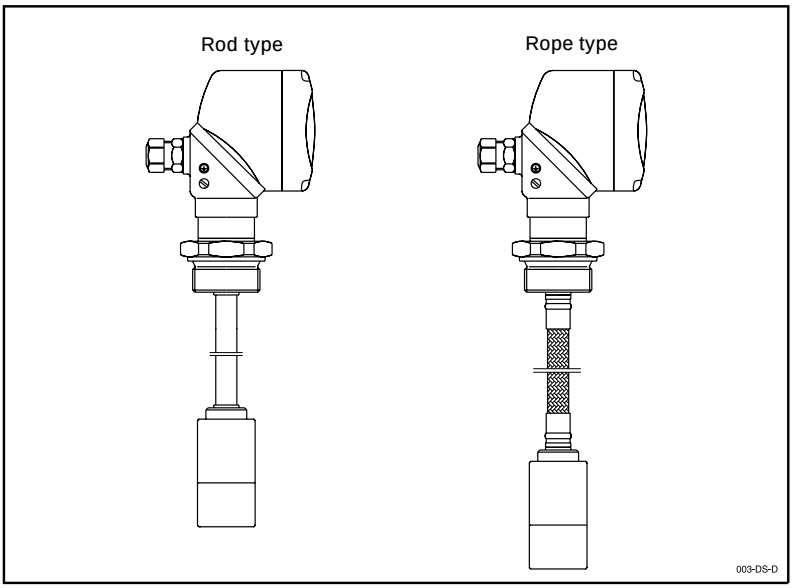
The pressure transmitter has a piezo-resistive or thinfilm measurement cell (DMS) depending on the pressure range. The sensors are temperature compensated, and have a fully welded membrane which is "helium" leak-tested. Pressure transmitters do not have internal seals.

Pressure transmitters further distinguish themselves from one another based on their ranges and the types of media-touching materials. Different versions of process connections can be selected for a wide range of application conditions.

The three main designs of pressure transmitters used in process applications are rod type, rope type and externally mounted.

Warning

Please note that rope type transmitters have a minimum bending radius of at least 22 cm.



4.1.2 Control interface unit

The control interface unit contains the terminal compartment and the keypad used in programming the device. The four keys must be active (unlocked) before use. The keypad is locked during normal operation to protect data and functions previously entered. The keypad automatically locks after 10 minutes of disuse. The control interface converts the sensor's digital signal into a standard 4 mA ... 20 mA current signal.

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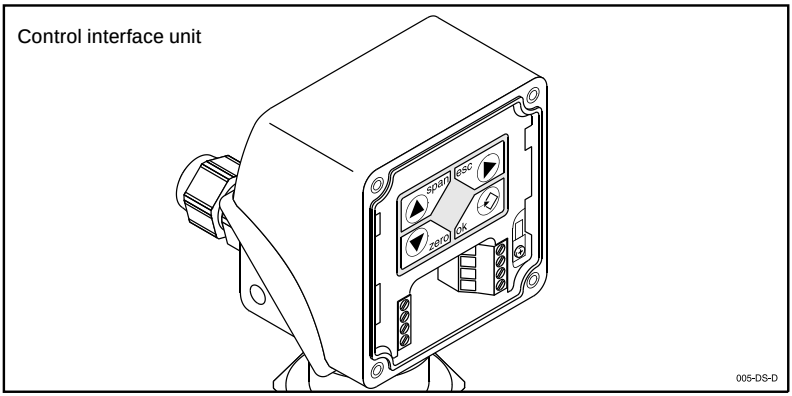
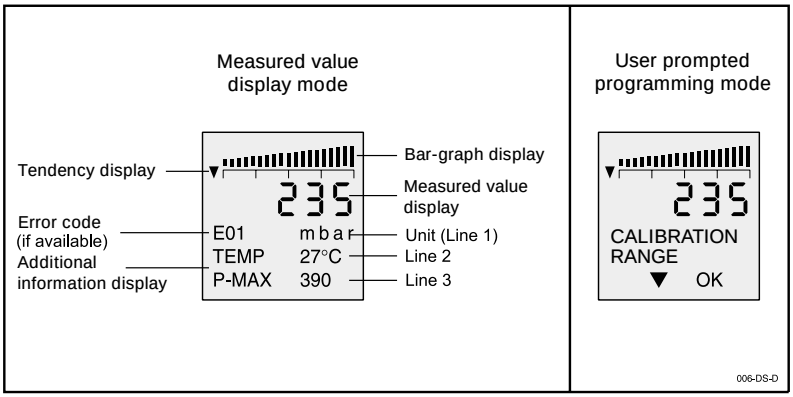


4.1.3 Display unit



The measured value indicator has four digits (in a 7-segment display) + symbols. Below it, line 1 (16-segment display) is used to display error codes and the signal's unit of measure. The unit of measure can be selected by the operator.

Additional information is displayed in lines 2 and 3 (16-segment display). The operator can enter commands in the programming mode on the display unit by means of menu driven, clear-text prompts.

Devices with displays clearly offer a higher number of programming and control interface options. These options include alarm status, dampening, signal inversion, tank linearization and diagnostic messages

Note

Display units can be easily upgraded (see section 6.2).

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4.2 Function

The mode of operation for signal conversion is the same for all versions. The pressure transmitter converts the existing pressure into an electrical signal. Microelectronics further process the input signal and produce a proportional 4 mA ... 20 mA standard signal.

The display-version allows programming (parameterization) and the display of expanded functions such as inversion, dampening, alarm status and linearization.

4.2.1 Functions of devices without displays

- Calibration of zero and span with pressure (see section 7.3)
- Calibration of zero and span without pressure (dry adjustment) (see section 7.4)
- Setting the dampening/integrating the output signal 0 s ... 40 s (see section 7.5)
- Reset to manufacturer's default values (see section 7.6)
- Mounting correction of the sensor (beginning with software version 1.04) (see section 7.4)

4.2.2 Functions of devices with displays

- Optional units of measure for measured values (mbar, bar, psi, mA, %, m, mm WS) (see section 8.5.1)
- Volume-related unit - measured value (adjustable) (l, kg, m³, gal, lb) (see section 8.5.1)
- Temperature and Min/Max values shown in display (see section 8.5.1)
- Nominal pressure range of the sensor shown in display (see section 8.5.1)
- Zero and span calibration (with/without pressure) (see section 8.5.2)
- Dampening setting/integration of output signal 0 s ... 40 s (see section 8.5.3)
- Inversion of the output current signal (see section 8.5.3)
- Alarm output current value setting (3.6 mA or 21 mA) (see section 8.5.3)
- Setting the limits of the output signal (see section 8.5.3)
- Offset of the output signal (see section 8.5.3)
- Mounting correction of the sensor (see section 8.5.6)
- Measuring circuit test function (see section 8.5.6)
- Reset functions (see section 8.5.6)
- Password activation (see section 8.5.6)
- Selecting the language of the display (see section 8.5.5)
- Entry of a table function for the linearization of the output signal (see section 8.5.4)
- Entry of medium consistency (see section 8.5.4)

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4.2.3 Functions of devices with HART® communication

- Optional units of measure for measured values (mbar, bar, psi, mA, %, m, mm WS) (see section 9.2.3)
- Volume-related unit - measured value (adjustable) (l, kg, m³, gal, lb) (see section 9.2.3)
- Temperature and Min/Max values shown in display (see section 9.2.9)
- Nominal pressure range of the sensor shown in display (see section 9.2.9)
- Zero and span calibration (with/without pressure) (see section 9.2.4)
- Dampening setting/integration of output signal 0 s ... 40 s (see section 9.2.5)
- Inversion of the output current signal (see section 9.2.5)
- Alarm output current value setting (3.6 mA or 21 mA) (see section 9.2.5)
- Setting the limits of the output signal (see section 9.2.5)
- Mounting correction of the sensor (see section 9.2.7)
- Reset functions (see section 9.2.7)
- Password activation (see section 9.2.5)
- Measuring circuit test function/simulation (see section 9.2.8)
- Entry of a table function for the linearization of the output signal (see section 9.2.6)
- Entry of medium consistency (see section 9.2.6)
- Cyclic measurement and transfer of the measured value (see section 9.2.4)
- Entry of measuring stations-description and tag number (see section 9.2.3)
- Cyclic measurement and transfer of the present current, measured and temperature values (see section 9.2.9)
- Indication and representation of the variation of the measured value with time (recorder function) (see section 9.2.10).

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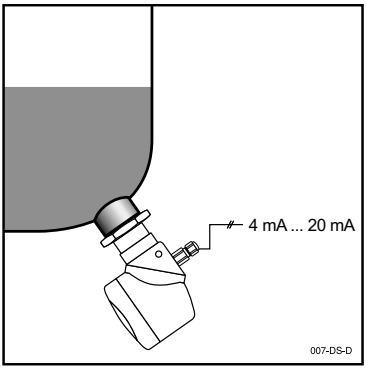
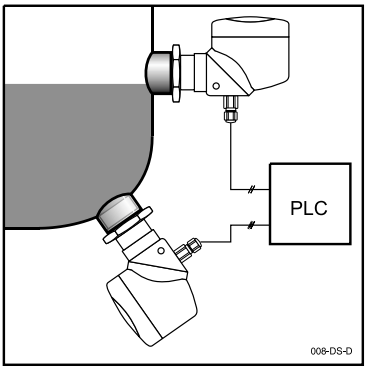
4.3 Installation examples

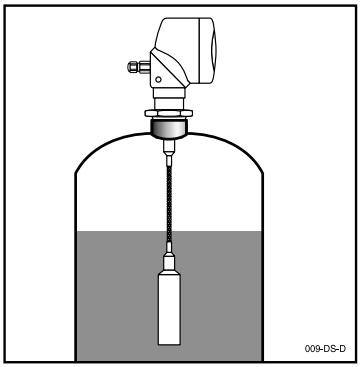
The pressure transmitter LHC is primarily used to detect the hydrostatic pressure of liquids in tanks. The measured pressure is provided as a height proportion or level control signal. The pressure is measured using absolute (against a vacuum) or relative (against external or air pressure) measurement depending on the type of sensor selected.



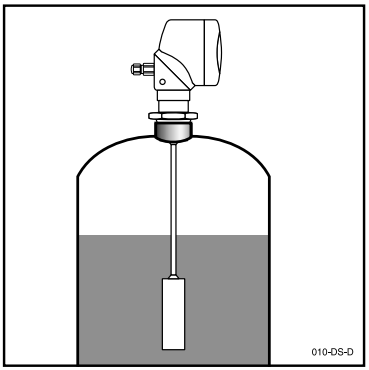
Level control:
Externally mounted
(with front flat diaphragm)



Level control:
Combined pressure and head pressure are measured by two externally mounted pressure transmitters. The two signals are analysed and the differential is calculated by a PLC or suitable signal converter.



Level control:
Rope type suspended from top of tank.



Level control:
Rod type installed through top of tank.

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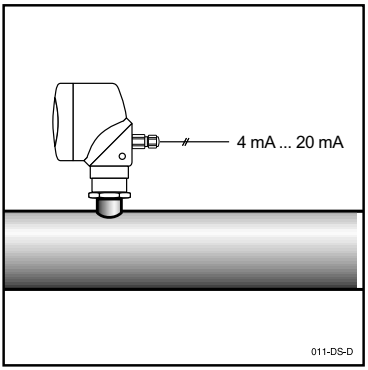
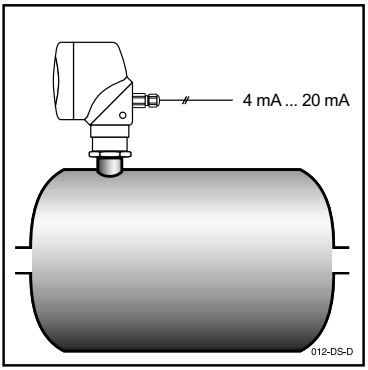
The pressure transmitter PPC is also used for process pressure measurement within pipes and containers.

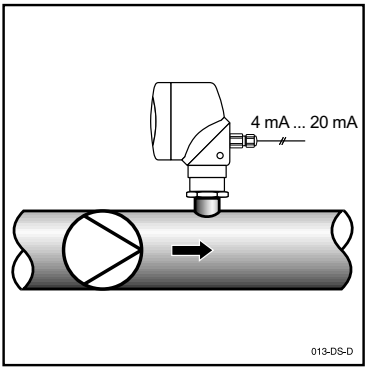
Pressures between 20 mbar and 1000 bar can be measured, depending on the measuring range selected. The pressure is either measured as an absolute value (relative to a vacuum), or as a relative value (relative to atmospheric pressure).



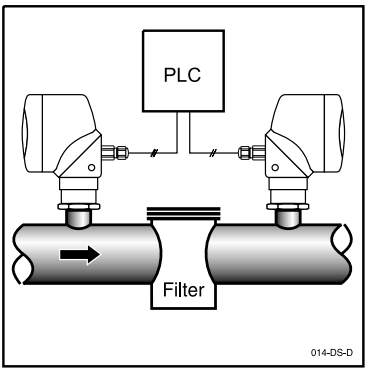
Process pressure measurement: Used to measure pressure of liquids or gases in pipelines



Process pressure measurement: Used to measure container pressure.



Process pressure measurement: Installed behind feed pumps for process control or monitoring pump



Process pressure measurement: Units installed upstream and downstream of the filter. The pressure differential is used to monitor the function/accumulation of dirt in the filter. Both output signals are processed by a PLC or signal converter.

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5 Technical data

For additional technical data for intrinsic safety devices see section 5.7.

5.1 Physical input values

Pressure range in bar (feet of water) (absolute pressure upon request)	Overload pressure in bar	Bursting pressure in bar
0 ... 0.4 (0 ... 13.4)	2	2
0 ... 1.6 (0 ... 53.6)	10	10
0 ... 6 (0 ... 201)	35	35
0 ... 16 (0 ... 536)	80	80
0 ... 40 (0 ... 1340)	80	400
0 ... 100 (0 ... 3350)	200	800
0 ... 250 (0 ... 8375)	500	1200
0 ... 600 (0 ... 20100)	1200	2400
0 ... 1000 (0 ... 33500)	1500	3000
-1 ... 0* (-33.5 ... 0)	2	2
-1 ... +0,6* (-33.5 ... +20.1)	10	10
-1 ... +3* (-33.5 ... +100.5)	35	35
-1 ... +5* (-33.5 ... +167.5)	35	35
-1 ... +15* (-33.5 ... +502.5)	80	80
*only relative pressure		
Do not exceed the nominal pressure!		

5.2 Physical output values

Output signal	4 mA ... 20 mA
Non-Linearity KA [% of span] (Linearity, including hysteresis and repeatability)	0.10 by measuring range > 40 bar) 0.15 by measuring range < 40 bar)
Response to turn down up to turn down 1 : 5 for turn down 1 : 5 ... 1 : 20	no change in KA KA should be multiplied by the factor (Turn down/5)
Measurement accuracy (+10 ... +40 °C)	better than 0.15 % of the span for measuring range > 40 bar (Limit point setting) better than 0.2 % of the span for measuring range < 40 bar (Limit point setting)

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Load	$R_A \leq (U_B - 12V)/23\ mA$ (with R_A in Ω and U_B in V)
Fault signal	3.6 mA or 21 mA, programmable
Integration time	0 s, 1 s, 5 s, 20 s, 40 s, programmable
Adjustment of span	up to turn down 1 : 20
Zero point adjustment	0 % ... 99 %
Integrated lightning protection	optional

5.3 Construction

Warning

Take into consideration the chemical reliability if using rod and rope versions.

LHC Process connections for the externally mounted version	G1" A 1" NPT G1 ½" A 1 ½" NPT } with front flat diaphragm; stainless steel 1.4571
LHC Process connections for rod or rope version	G1 ½" A in stainless steel 1.4571 1 ½" NPT in stainless steel 1.4571 Milk pipe DN40 Triclamp 2" Flange DN50 PN40 Flange ANSI 2", 150 psi (others upon request)
PPC process connections	G ½" A, Manometer connection DIN 16288 ½" NPT G ½" B, O-ring flush with front face G 1" B, O-ring flush with front face (others upon request)
Material of media-touching parts	Stainless steel 1.4571 and 1.4542 Stainless steel 1.4571 and O-ring NBR Hastelloy C (diaphram only)
Sensor fill medium	Standard filling Filling for food applications Filling for oxygen applications (oil-free)
Housing	Plastic, PBT, crastin, glasfiber enforced with 4 function keys

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Electrical connection	Cable access M20 x 1.5 with internal terminal block V1-plug (optional) see section 6.4
Protection class	III
Electrical protection methods	Reverse polarity protected, lightning protection, short circuit protection.

5.4 Auxiliary power

Power supply	12 V ... 36 V 12 V ... 30 V (external versions)

5.5 Ambient conditions

Ambient Temperature	– 40 °C ... + 85 °C (– 20 °C ... + 70 °C with display)
Storage Temperature	– 40 °C ... + 85 °C (– 35 °C ... +80 °C with display)
Climate Class	D per DIN IEC 654-1
Protection class per EN 60529	IP65 (IP67 upon request)
EMC per	EN 50081-2, EN 50082-2, NAMUR NE 21

5.6 Process conditions

Warning

A maximum cleaning temperature of 100 °C can be used for devices installed within hazardous areas.

Temperature of medium depending on sensor	
Standard devices	– 30 °C ... + 100 °C
Devices for food applications	– 10 °C ... + 100 °C
Devices for oxygen applications (oil-free)	– 30 °C ... + 60 °C
Maximum cleaning temperature	120 °C, max. 10 min.

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5.7 Intrinsic safety data

5.7.1 General data

Approvals/Certification	All information on approvals and certification can be found under www.pepperl-fuchs.com
Conformity to intrinsic safety standards	The hydrostatic pressure sensor meets the requirements of EN 50014:1992, EN 50020:1994 and EN 50284:1997.
Ignition protection method/explosion group	EEx ia IIC
EC Design Test Certification	DMT 99 ATEX E070
Device markings	⟨Ex⟩ II 1/2 G EEx ia IIC T6/T4
Ambient temperature	– 40 °C ≤ T_a ≤ + 60 °C for T6 – 40 °C ≤ T_a ≤ + 70 °C for T4
Nominal values terminal +, - V1-plug: Pin1 (+) Pin 2 (-)	I_i = 93 mA for T6 I_i = 100 mA for T4 U_i = 30 V DC P_i = 697 mW for T6 P_i = 750 mW for T4 C_i < 9 nF L_i negligibly small
Temperature of medium	– 40 °C ... + 60 °C für T6 – 40 °C ... + 105 °C für T4
Pressure range: externally mounted version PPCM externally mounted version LHCM rod version LHCR rope version LHCS	 0 ... 1000 bar 0 ... 1000 bar 0 ... 16 bar 0 ... 16 bar
Test circuit terminal +, I (not available on V1-plug)	only for connection onto certified intrinsically safe ampere meter

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5.7.2 Display EMP-□P-□

Warning

With ambient temperatures below -20 °C use suitable cables only.

Important

All information on approvals and certification can be found under www.pepperl-fuchs.com

Approvals/Certification	All information on approvals and certification can be found under www.pepperl-fuchs.com
Ignition protection method/explosion group	EEx ia IIC
EC Design Test Certification	DMT 99 ATEX E090 U
Device markings	⟨Ex⟩ II 2 G EEx ia IIC T6/T5/T4
Ambient temperature	– 40 °C ≤ T_a ≤ see EC Design Test Certification
Maximum values:	I_i = 115 mA U_i = 9,2 V DC P_i see EC Design Test Certification C_i < 2 µF L_i negligibly small only for connection onto certified intrinsically safe ampere meter

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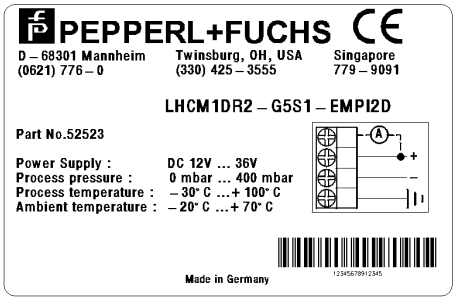
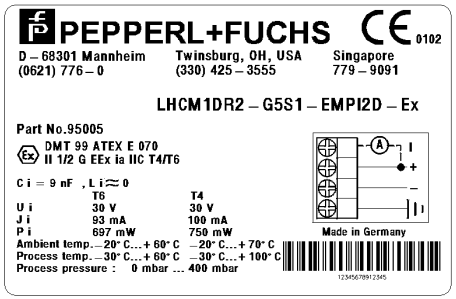
5.8 Identification plates

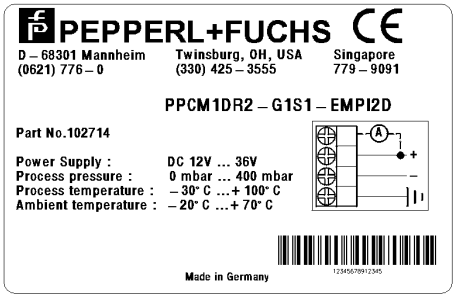
Pressure transmitter LHC non external version



Pressure transmitter LHC external version



Process pressure transmitter PPC non external version



Display EMP-□P-□

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6 Installation

The device should be installed/operated in accordance with the provisions of ElexV, the Device Safety Regulation, this operating manual and generally recognized industry standards.

6.1 Pressure transmitter installation

Warning

The pressure transmitter's diaphragm should not come into contact with hard or sharp objects.

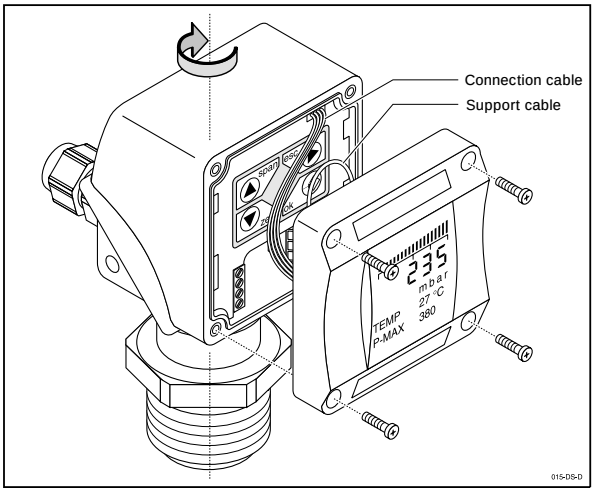
Installation using welding support:

- Insert a filler piece (a pressure transmitter dummy) into the welding support.
- Weld the support into the container/pipe wall (section-weld process).
- Remove the filler piece.
- Install the pressure transmitter in the welding support.

6.2 Display unit upgrades

The display unit can be easily upgraded at any time.

- Remove the housing cover and the support cable.
- Attach the support cable of the display unit to the same site.
- Plug the connector of the display unit into the appropriate jack. The display unit can be mounted at 90° angles.
- Fasten the display unit with screws.



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All functions are programmable once the pressure transmitter has been upgraded with a display unit. The adjusted parameters are stored after the display unit is removed.

The display unit can be rotated through about 300°, so that it can be read under various installation conditions. The housing cover with built-in display can be fastened to the housing at all four side positions.

Warning

When attaching the indicator unit, make sure that the connection/power supply cable and the support cable do not become kinked or trapped between the mating components.

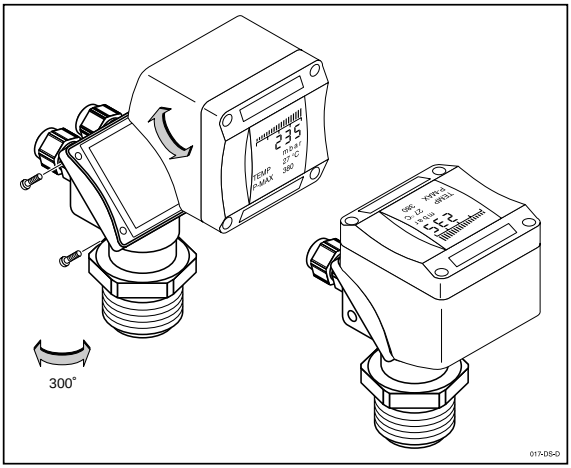
In the event of damage to the supply cable, the correct functioning of the unit may be impaired. In the case of Ex-protected units, the indicator unit will have to be replaced.

Use only display EMP-□P-□ with EC Design Test Certification DMT 99 ATEX E090 U when later upgrading the display unit.

6.3 Housing reconfiguration

Rotate the housing of the display unit in order to be able to read the display from above when the pressure transmitter is installed in an upright position.

- Loosen the 4 internal hexagonal screws.
- Lightly lift off the housing with the display unit.
- Carefully turn the housing through 180°.
- Re-tighten the screws.



Note

To guarantee correct sealing of the unit when tightening the 4 hexagonal-recess screws, make sure that the screws are securely seated.

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6.4 Electrical connection

Attention

Please observe local installation regulations. (Germany: VDE-Standard).

The terminal voltage should not exceed 36 V (30 V for intrinsic safety devices).

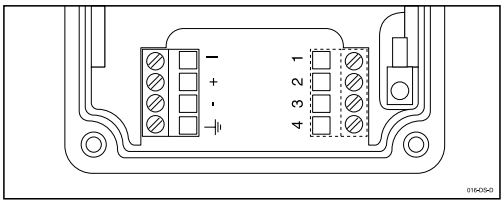
Connect the pressure transmitter only with certificated intrinsic safety measuring devices.

The supply voltage is between 12 V DC and 36 V DC (12 V DC and 30 V DC for intrinsic safety devices). The power supply and the output signal are conducted across a two-wire cable (max. 12 mm outer diameter, max. 14 AWG) and connected in accordance with the pin configuration.

Auxiliary power can be supplied by a power unit, a transmitter power supply or by means of a PLC connection.

PEPPERL+FUCHS suggests using a design with integrated lightning protection for preventing damage due to voltage spikes.

Terminal configuration:



Terminal connection for power supply 2-wire transmitter (4 mA ... 20 mA)

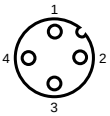
- \- Negative
- \+ Postive
- ⏚ Ground
- I Test circuit; connect the ampere meter between terminals + and I

Note

The internal resistance of the multimeter must be < 100 Ω.

The unit must be properly grounded in order to guarantee EMC resistance.

V1-plug (optional)



Pin 1: positve (+)
Pin 2: negative (-)
Pin 3: not connected
Pin 4: not connected

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6.5 Pressure compensation when using a relative pressure sensor

A Goretex diaphragm is used to compensate for the atmospheric pressure under the IP65 protection method.

A special cable with capillaries for relative pressurization is used for protection method IP67.

Note

Please consider that all versions with aluminium housing and conduit connection (version ...-EMC...) require a protection class ≥ IP20 after connection of the housing with the conduit system.

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7 Operation of devices without displays

7.1 Preparation

This unit can be programmed before or after installation.

- Connect an ampere meter to the output of the device (between terminals I and +).
- Note that after each action, a brief oscillation/deflection of 20 mA occurs (verification of a successful action).

The following device functions can be programmed without a display unit:

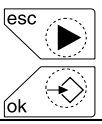
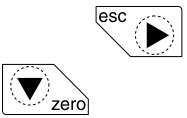
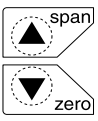
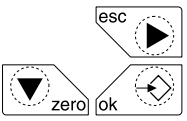
- Zero point adjustment with a full or empty container (with/without pressure)
- Span adjustment with a full or empty container (with/without pressure)
- Integration time
- Mounting correction of the sensor (beginning with software version 1.04)
- Reset to manufacturer's defaults.

Note

An error signal is caused by a current surge (21 mA or 3.6 mA; 5 sec) when the zero point or span setting fall outside of the sensor's nominal pressure range during adjustments with existing pressure. No values are stored.

The keypad becomes inactive after 10 min. of disuse. All settings will default to previously stored values. Only settings that have been confirmed with the "OK" function are stored.

7.2 Key functions

Function 1		Function 2	
	Basic setting, store span (2 sec.)		Action: upward, increase value
	Basic setting, store zero point (2 sec.)		Action: downward, decrease value
	Exit key or programming mode (2 sec.)		Activate keys (push simultaneously for 2 sec.)
	Verification (store; 2 sec.)		Mounting correction of the sensor (push simultaneously for 2 sec.)
	Basic setting Integration time/ dampening (push simultaneously for 2 sec.)		Reset to default (push simultaneously for 2 sec.)

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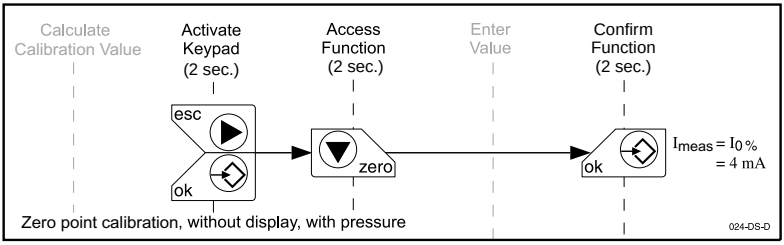
7.3 Calibration with pressure

7.3.1 Zero point calibration

Note

Determine if the pressure to be used as the zero point (P 0 %), is present at the transmitter diaphragm before calibration.

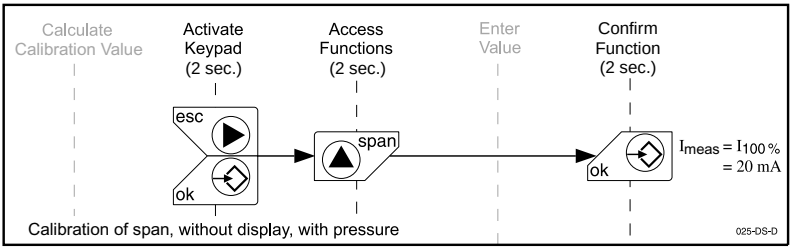


7.3.2 Span calibration

Calibration of the measurement range (span).

Note

Ensure that the pressure to be used as the span end-point (P 100 %) is present at the transmitter diaphragm.



Note

A change in the zero point has no effect on the calibrated span.

However, if the span end-point is higher than the peak value of the sensor's nominal pressure range, the span end-point is fixed at this peak value and the span is reduced accordingly.

A change in the span setting has no effect on the zero point. The zero point and span end-point must fall within the sensor's nominal pressure range.

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Note

A mounting correction is unnecessary when making an adjustment with pressure (wet adjustment). Otherwise, the mounting correction must be performed before saving the zero point and the span end point.

7.4 Calibration without pressure

Determine the current reference values for the zero point and the span to be entered in the transmitter before calibration. This is done as follows:

7.4.1 Zero point calibration

- Determine the hydrostatic pressure of the liquid's surface that meets the zero point.
- Adjust this pressure in proportion to the sensor's nominal pressure range.
- Multiply this proportion by 16 mA and add 4 mA to the result.

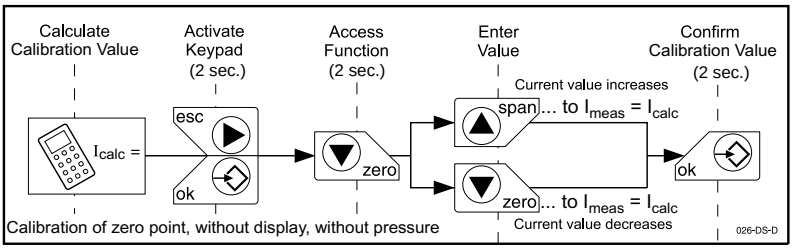
This produces the calculated current (value I_{calc}), which is entered in the transmitter and used to programm the zero point (0 %).

Example:

A pressure transducer with 0 mbar ... 400 mbar (nominal pressure) needs to be programmed.The liquid's surface (with a density of 1) is 1 m above the diaphragm at the zero point producing a pressure of 100 mbar.

$$I_{calc} = \frac{\textbf{zero point pressure (0 \%) 100 mbar}}{\textbf{sensors nominal pressure 400 mbar}} \cdot \textbf{16 mA} + \textbf{4 mA} = \textbf{8 mA}$$

This means that the device's current value must be set to 8 mA when performing a dry (empty) calibration.



7.4.2 Span calibration

- Determine the hydrostatic pressure of the liquid's surface, which corresponds to the span end-point.
- Calculate the difference of the pressure value between span end-point and zero point and divide this difference by the nominal pressure range of the sensor.
- Multiply this proportion by 16 mA and add 4 mA to the result.

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This produces the calculated current (value I_{calc}), which is entered in the transmitter and used to program the span end-point (100 %).

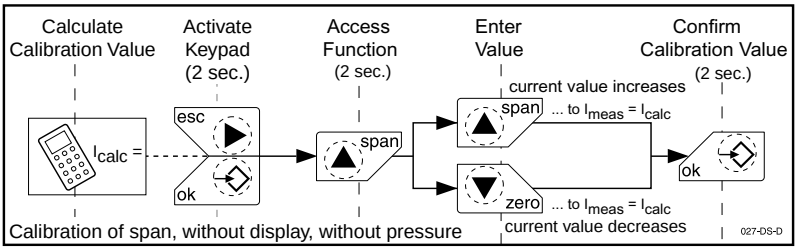
The measurement range between zero point and span end-point will be stored as span.

Example:

A pressure transducer with 0 mbar ... 400 mbar (nominal pressure) is to be programmed. The liquid's surface (with a density of 1) is 1 m above the diaphragm at the zero point. The maximum (span end-point) should be 3 m. The measurement range (span) is 200 mbar.

$$I_{calc} = \frac{\textbf{pressure difference (span) (300 mbar - 100 mbar)}}{\textbf{sensors nominal pressure 400 mbar}} \cdot \textbf{16 mA} + \textbf{4 mA} = \textbf{12 mA}$$

This means that the output must be set to 12 mA during programming.



Note

A change in the zero point has no effect on the adjusted span.

However, if the span end-point is higher than the peak value of the sensor's nominal pressure range, then the span end-point is fixed at this peak value and the span is reduced accordingly.

A change in the span setting has no effect on the zero point. The zero point and span end-point must fall within the sensor's nominal pressure range.

Important

A test/correction of the zero point is suggested after adjusting the span in order to maintain optimum accuracy.

Important

A mounting correction should be performed before or after making an adjustment without pressure (dry adjustment) (see section 7.4.3). The sensor must therefore be placed in the reference position for the measurement (installation site) without pressure on the diaphragm.

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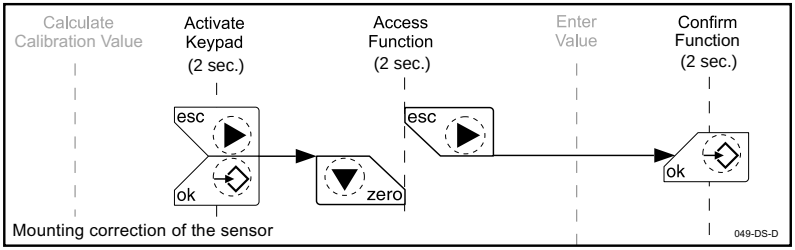
7.4.3 Mounting correction of the sensor

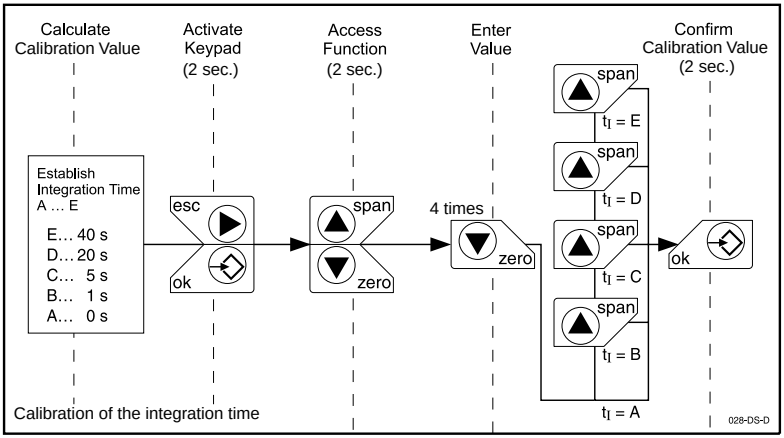
The position of the measuring cell is entered by simultaneously depressing (2 sec.) the "zero" and "esc" buttons.



7.5 Integration time (dampening) adjustment

The following integration time settings can be used: 0, 1, 5, 20 and 40 sec..

The sensor's measured values can then be averaged using the adjusted integration time.



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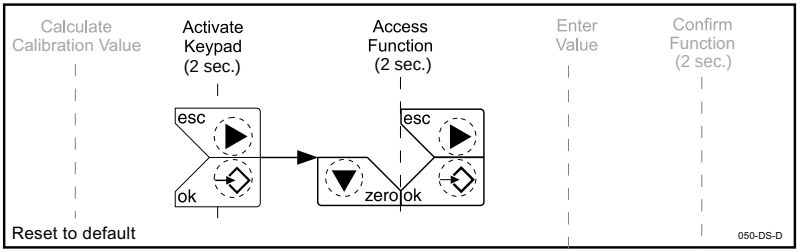
7.6 Reset to default

All default data settings are restored by simultaneously pressing the "zero", "esc" and the "ok" buttons for 2 sec. (see section 8.4).



Important

Calibrated special measurement ranges i. e. 4 bar on a 6 bar transmitter can be adjusted by factory pre-setting. A reset to default will reset the sensor back to its nominal range (i. e. 6 bar). The factory pre-setting gets lost.

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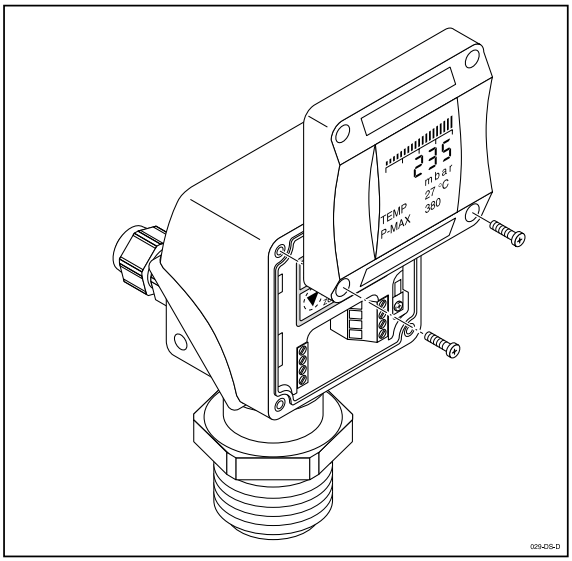
8 Operation of devices with displays

8.1 The display

In order to program the device, remove the display with a screwdriver and re-attach it to the housing as shown in the diagram below.



8.2 Key functions

Button	Functions		
	Main menu	**Sub menu**	**Edit functions**
span	back to previous menu option	back to previous menu option	increase value
zero	forward to next menu option	forward to next menu option	decrease value
esc	back to value display without saving	back to main menu without saving	back to sub menu without saving
ok	to sub menu	to edit functions	save value
esc + ok	activate keypad (push simultaneously; 2 sec.)		

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8.3 The programming mode

The device can be programmed before or after installation.

The keypad is activated and the device can be programmed by simultaneously pressing the "esc" and "ok" keys (for 2 sec.). This method is used to access the main menus. Each main menu has one or more sub-menus and each sub-menu may have its own sub-menus.

Note

The keypad becomes inactive after 10 min. of disuse. All settings will default to previously stored values. Only settings that have been confirmed with the "OK" function are stored.

A change in the starting measurement (zero point) has no effect on the measurement span. Likewise, a change in the span has no effect on the starting measurement.

An error signal occurs when the zero point or span settings fall outside of the sensor's nominal pressure range during calibration with pressure. Nothing is saved.

8.4 Default data (factory setting)

Function		Default
Display	Unit of measurement (Line 1)	Pressure display (in bar)
	Line 2	Temperature display (in °C)
	Line 3	Sensor's nominal pressure range (in bar)
Calibration	zero 4 mA	nom. pressure range start
	span 20 mA	nom. pressure range end
Output	Damping	0 s
	Inversion	no
	Fault	21 mA (upscale)
	Limits	3.8 mA ... 20.5 mA
	I-offset	0 mA
Service password		no active password
Service mounting correction		not activated
Language		English
Evaluation	linear	yes
	density	1 g/cm^3

Important

Calibrated special measurement ranges i. e. 4 bar on a 6 bar transmitter can be adjusted by factory pre-setting. A reset to default will reset the sensor back to its nominal range (i. e. 6 bar). The factory pre-setting gets lost.

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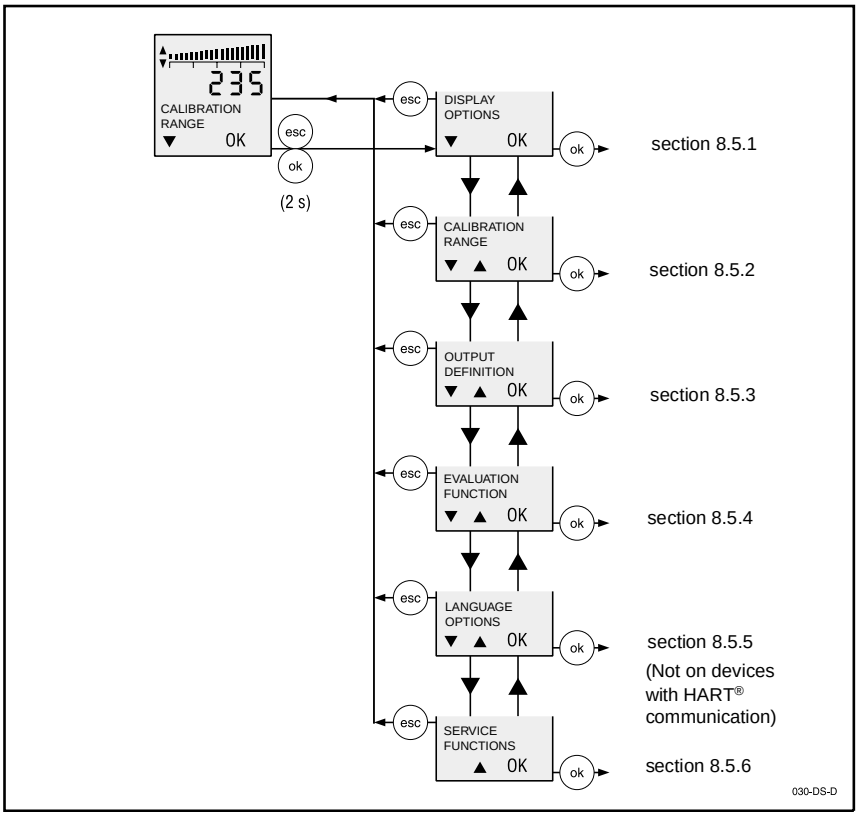
8.5 Main menu



8.5.1 Main menu: display

Note

The density of a medium must be entered to calculate the correct fill-level when displaying or adjusting the level in hight units (e. g. mm, m, feet, inch)(see section 8.5.4).

Important

For volume-based units it is necessary to enter the reference value (100% = 0.0, value range 0 ... 3000.0).

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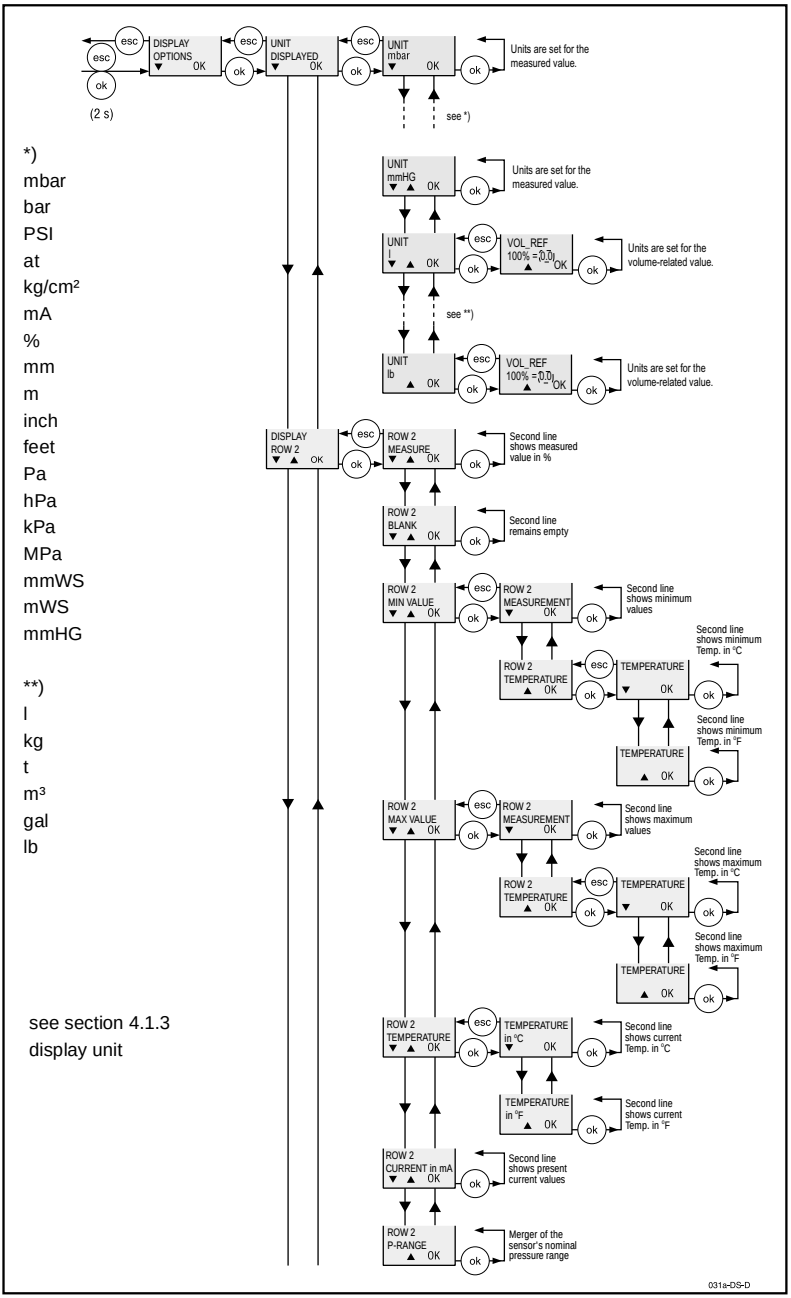

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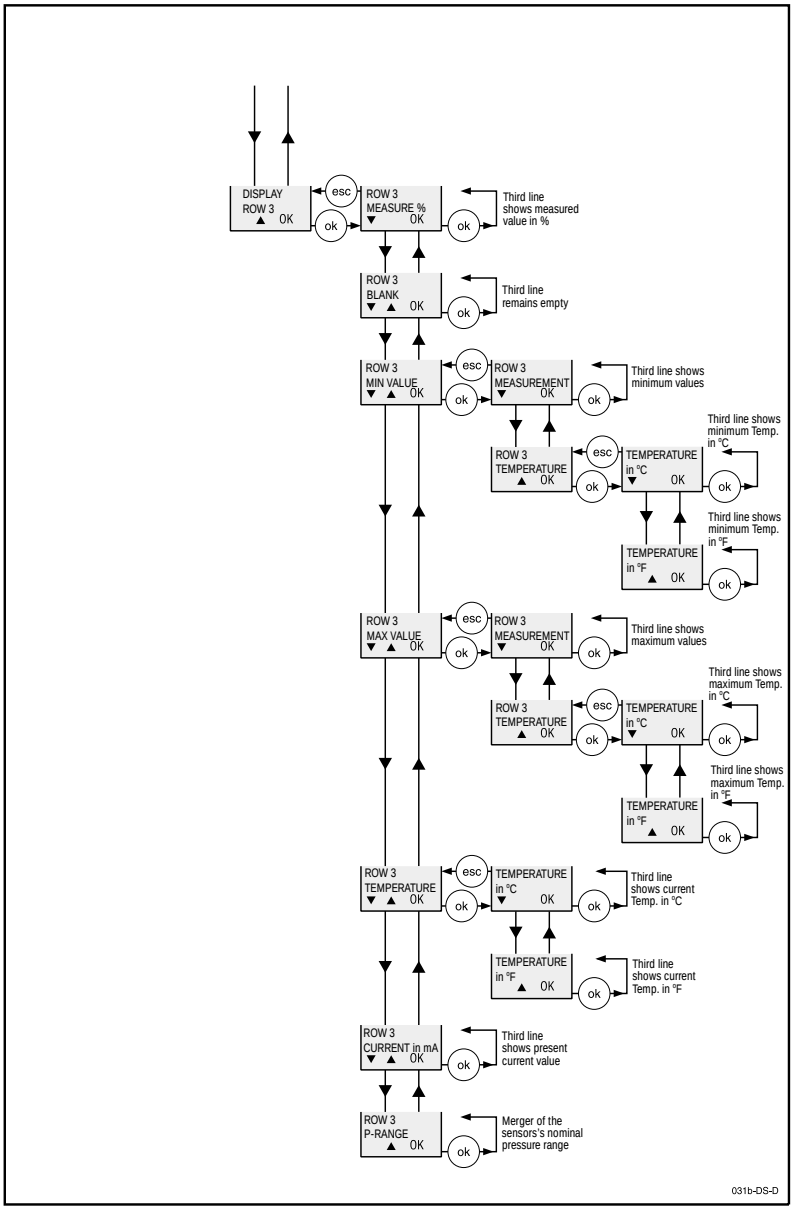

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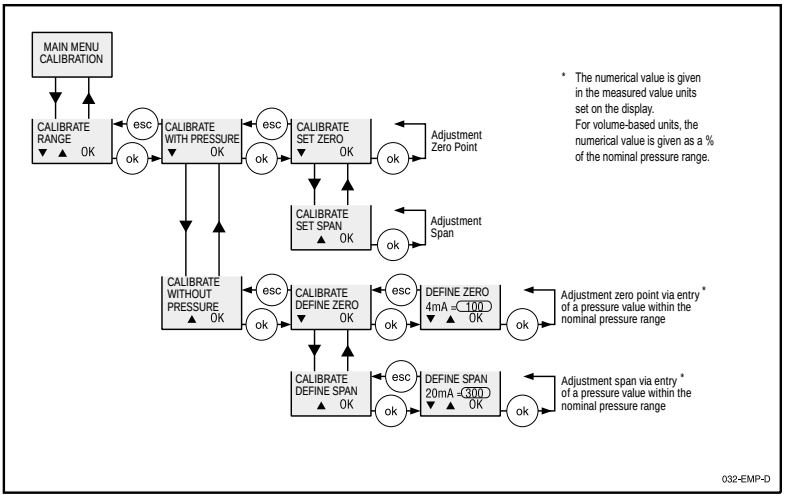
8.5.2 Main menu: calibration of zero and span (with/without pressure)



A single pressure value is set for the zero point or the span end-point within the sensor's nominal pressure range, and assigned to the associated output current signal when making adjustments with existing pressure (wet adjustment). An error signal occurs when the existing pressure lies outside the sensor's nominal pressure range. The value is not saved in this case.

A mounting correction is unnecessary when making an adjustment with pressure. Otherwise, the mounting correction must be performed before saving the zero point and span end point.

A mounting correction should be performed before or after making an adjustment without pressure (dry adjustment) (see section 8.5.6). The sensor must therefore be placed in the reference position for the measurement (installation site) without pressure on the diaphragm. An adjustment of the physical units takes place without pressure.

On process pressure sensors (-1 bar ... xx bar), the value shown on the display is always related to the physical pressure value. The current output is related to the zero point and the span.

A test/correction of the zero point is suggested after adjusting the span in order to maintain optimum accuracy.

Important

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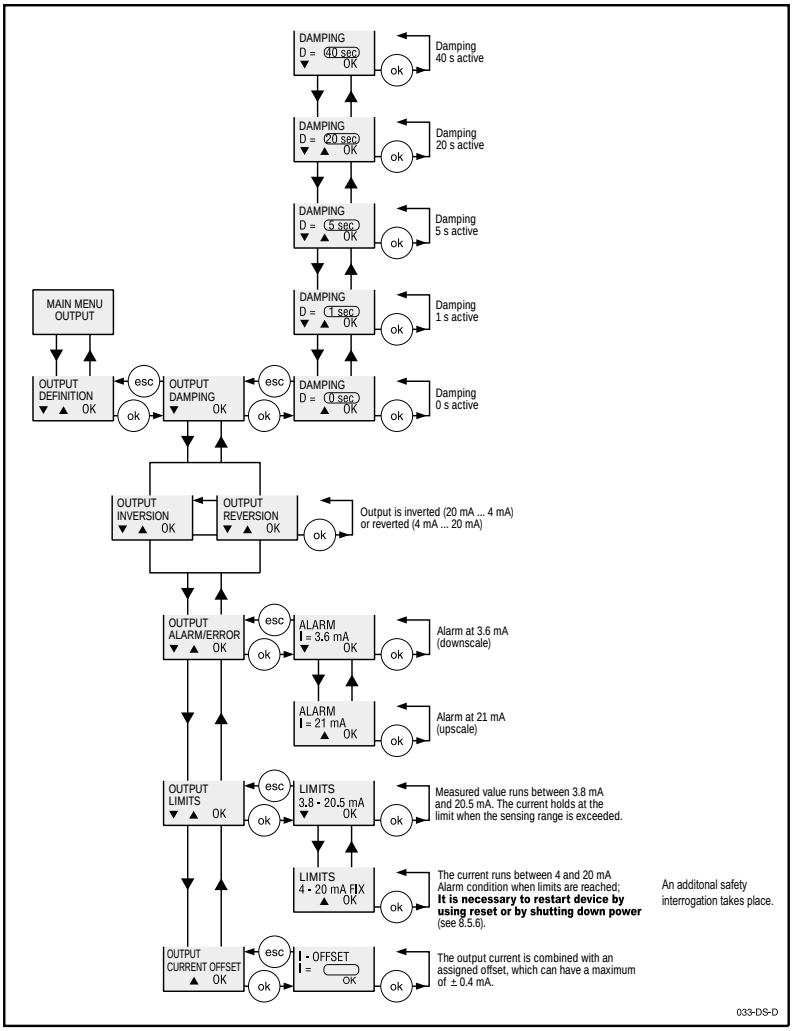
8.5.3 Main menu: output



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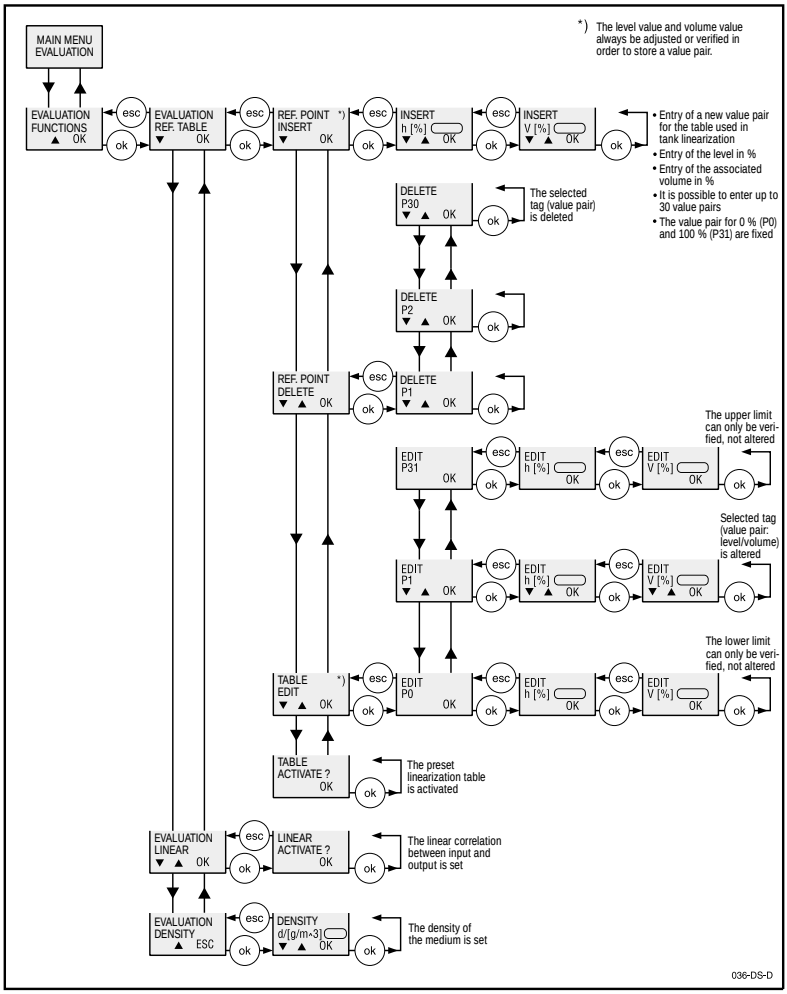
8.5.4 Main menu: evaluation



Enter height values, which are each assigned a volumetric value of measure for tank linearization. The linearization and the assignment of the 4 mA ... 20 mA output signal are converted into tank volumes using this value pair.

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Note

Please check the following if "Wrong Entry" appears in the Evaluation menu:

- *Whether or not more than 32 value pairs are entered in the table for tank linearization (please note: P 0 and P 31 are fixed at 0 % and 100 % respectively)*
- *Whether or not an existing height value was tried to be stored again. Please enter correct values.*

Example:

Level 100 %:	4000 mm
Density:	1 g/cm^3
Densitiy correction:	0.9 g/cm^3

Span end point: $\frac{4000 \text{ mm} \cdot 1 \text{ g/cm}^3}{0.9 \text{ g/cm}^3} = 4444 \text{ mm}$

The span (end-point) must be re-calibrated (with or without pressure) to 4000 mm in order to prevent a 4000 mm level tank from being overfilled.

Important

A change or correction in the density causes a change in the span end-point's unit of measure (mm, m, inch, feet). The span end-point must be re-calibrated when changing the medium to be measured (due to a change in density).

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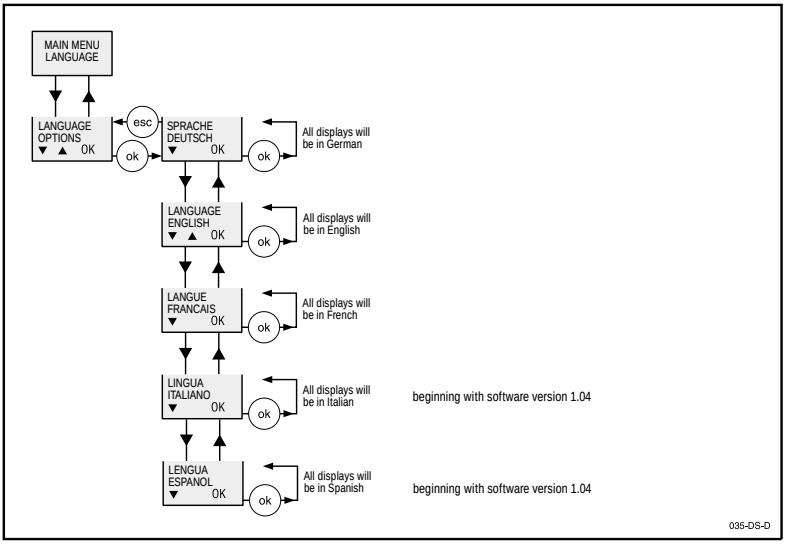
8.5.5 Main menu: language



On devices with HART® communication, the language cannot be selected. The display language is always English.

Note

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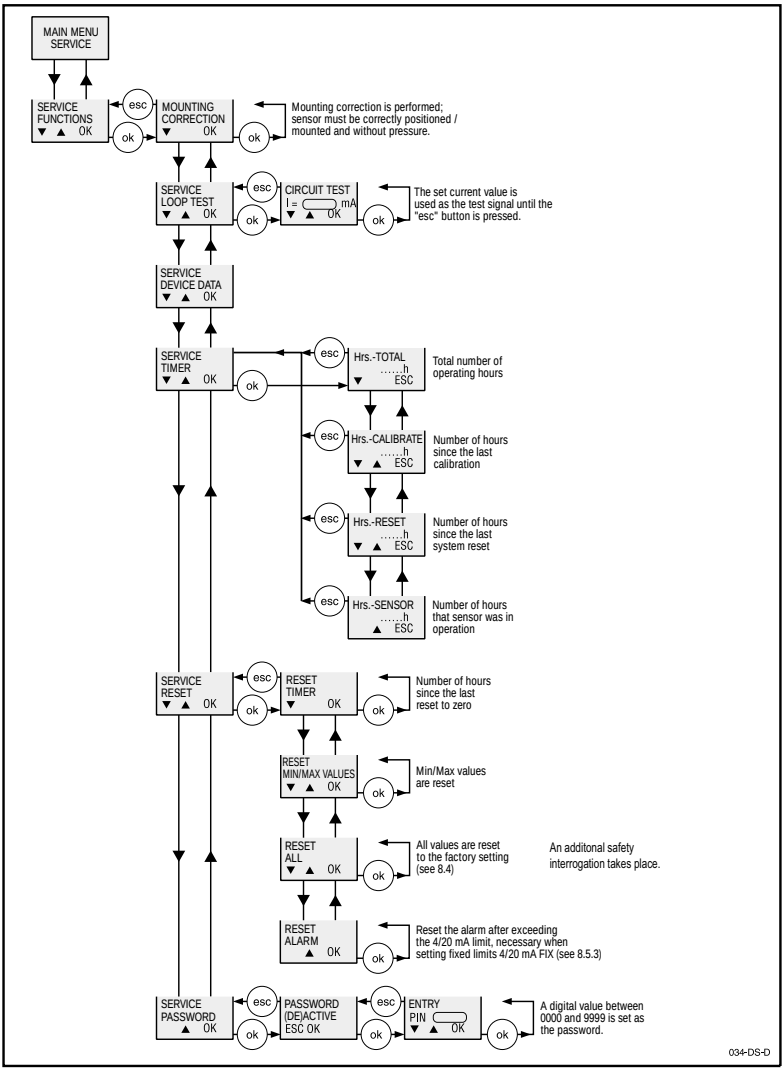
8.5.6 Main menu: service



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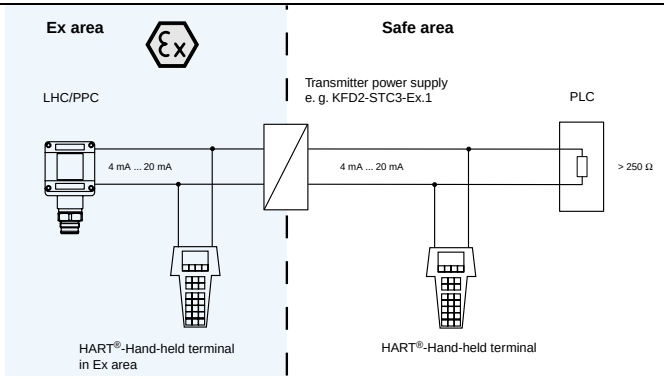
9 Operation of devices with HART® communication

9.1 HART® connection options

Devices with HART® functionality can be operated with a HART® Hand-held terminal or using a PC with **PACT**ware™ and HART® Modem or with a HART® qualified Remote-I/O system (e. g. HART® Multiplexer or RPI system from Pepperl+Fuchs).

9.1.1 Connection HART® Hand-held terminal

The LHC and PPC pressure transducers can be operated with the standard menus of the HART® Hand-held terminal. A special DD (Device Description) is not required. A specified DD can be ordered from Pepperl+Fuchs.



Connection with HART® modem in the Ex-area.

Attention

The terminal resistance in the loop must be at least 250 Ω.

Note

A description of the HART® Hand-held terminal and its operation can be found in the manual on the device.

Please find further information about the connection of HART® qualified Remote-I/O systems in corresponding system descriptions.

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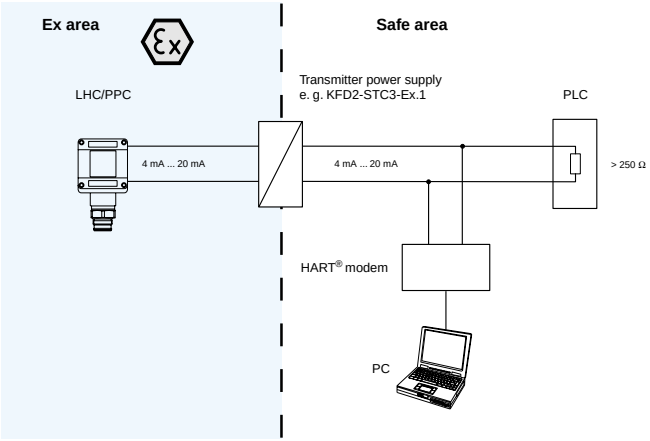
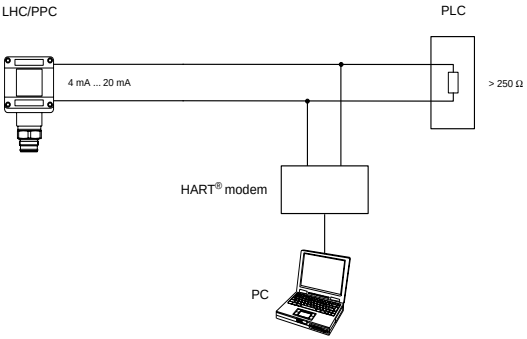
9.1.2 Connection of the HART® modem for operation via a PC

The HART® modem connects the pressure transmitter with HART® functionality to the RS232 C serial interface of a personal computer. This enables the pressure transmitter to be remotely operated using the **PACT**ware™ program.

A corresponding HART® modem can be ordered from Pepperl+Fuchs.



Connection with HART® modem in the Ex-area.



Connection with HART® modem

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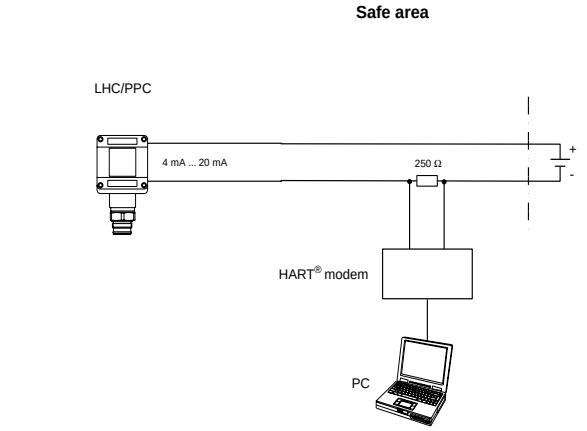
If the resistances of the devices that are connected to the power supply/signal line (voltage source) are less than 250 Ω, a minimum resistance of 250 Ω must be installed in the power supply line.



Connection with HART® modem

The sum of the internal capacitances and inductances of the components used must not exceed the highest permissible values of the ia IIC circuit.

STOP

Warning

Please take into consideration the intrinsic safety data (see section 5.7) and note the permissible cable length at devices with HART® communication.

Note

*The **PACT**ware™ software required to operate the devices is described in section 9.2.*

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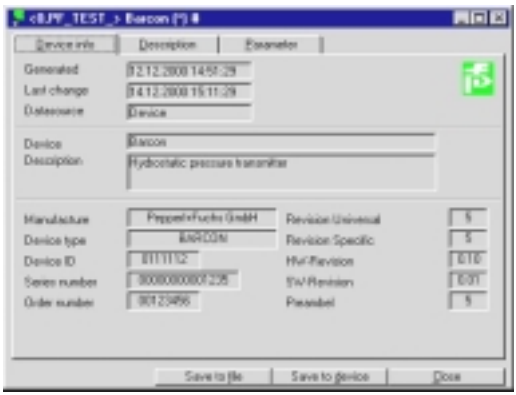
9.2 Operation via PC using the PACTware™ program

The **PACT**ware™ program with the requested device driver (FDT) can be ordered from Pepperl+Fuchs. An integration in other HART® management systems or FDT management systems is possible.

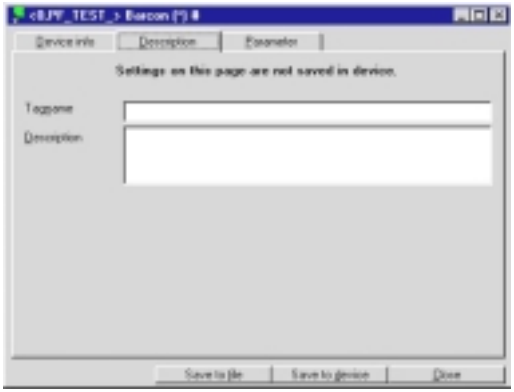
The description of the **PACT**ware™ program and the instruction can be found in the software manual.

9.2.1 Register card - Device info



Device information is shown in the fields on the register card "Device info". This information cannot be changed.

9.2.2 Register card - Description



A description of the currently selected device is shown in the fields on the register card "Description". These can be edited and saved in the device or in a file.

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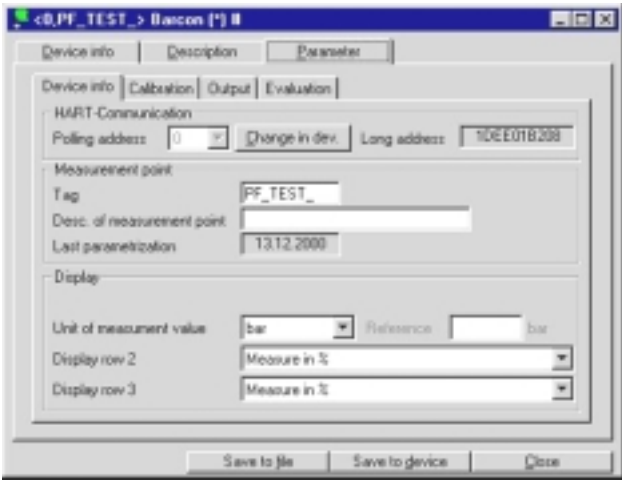
9.2.3 Register card - General parameters



Polling address

Address of the BARCON device in the "short integer" format.

Measuring piont

- Tag: Name of measuring point
- Measuring point description: Information about measuring point
- Parameterization dated on: Date of last parameterization

Units - measured values

Units of the measured values:

- mbar, bar PSI, at, kg/cm², mA, %, mm, m, inch, feet, Pa, kPa, Mpa, mmWS, mmHG

Volume reference units

- l, kg, t, m³, gal, lb

Note

When displaying or calibrating values in units of height (e. g. mm, m, feet, inches), the corresponding value of the density of the medium must be entered to enable conversion to the correct filling level (see also section 9.2.6).

Reference value

The reference value of the volume-based units is only active when the volume units have been activated.

- 100% = 0.0 (value range 0 ... 3000.0).

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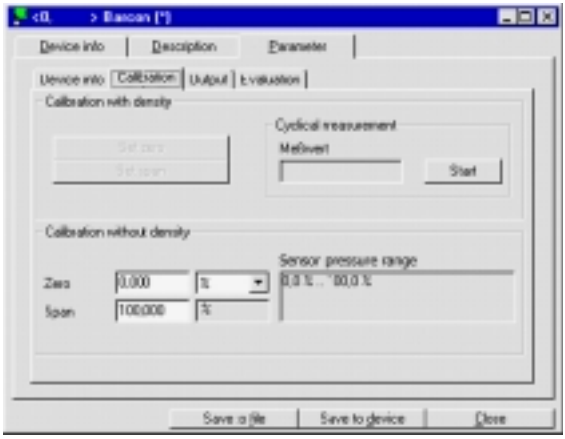
Information in line 2 and 3:

Additional information in second and third line of the display.

- Measured value in %
- Empty
- Minimum value of measured value, maximum value of measured value
- Minimum value of temperature in °C, maximum value of temperature in °C
- Minimum value of temperature in F, maximum value of temperature in F
- Temperature in °C
- Temperature in F
- Current in mA
- P-Range

9.2.4 Register card - Parameter calibration



Measured value, cyclic measurement

Display of the current measured value for the calibration with pressure (Automatically updated).

Calibration with pressure

The calibration with pressure is only possible when the cyclic measurement is activated.

Setting the zero point:
Before calibrating, make sure that the pressure on the pressure transmitter is the value you wish to set as the zero point (P 0 %).

Setting the measuring range (span):
Make sure that the pressure on the pressure transmitter is the value you wish to set as the span end value (P 100 %). The measuring range between the zero point and the span end value is saved as the span.

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Note

When calibrating with pressure, a pressure value within the nominal pressure range of the sensor is set for the zero point or span end point and assigned to the associated output current signal. If the pressure lies outside the nominal pressure range of the sensor, a fault signal results. The value is then not saved.

Important

A change in the zero point has no effect on the set span. However, if due to a change in the zero point, the span end point represents a value in excess of highest value of the nominal pressure range of the sensor, the span end point remains at this highest value and the span is correspondingly reduced. A change in the span setting has no effect on the zero point.

Calibration without pressure, zero point

Setting the zero point:

- Input of the pressure value within the pressure range of the sensor (nominal pressure range)

Setting the measuring range (span):

- Input of a span value within the pressure range of the sensor (nominal pressure range)

Note

When calibrating with pressure (wet calibration), the mounting correction can be dispensed with, but this must be carried out before the zero point and span point are saved.

Important

When calibrating without pressure (dry calibration), a sensor mounting correction should be carried out before or after the calibration (see also section 9.2.7). For this, the sensor must be placed at the reference position for the measurement (mounting position) and must not be under pressure.

Sensor pressure range

Display of the sensor pressure range

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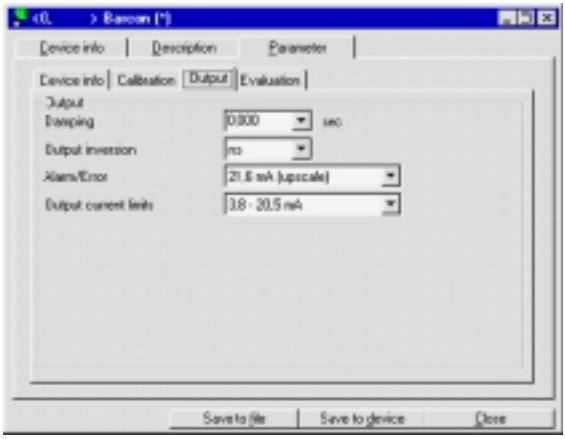
9.2.5 Register card - Parameter output



Damping (Integration value)

The measured values registered by the sensor are averaged over the set integration time. The following integration times can be set:

- 0, 1, 5, 20 and 40 sec.

Inverted output

The output signal is inverted or de-inverted.

- inverted 20 ... 4 mA
- de-inverted 4 ... 20 mA

Alarm

Data - current values set for alarm messages:

- 21.0 mA (upscale) or
- 3.6 mA (downscale).

Current output limits

Data - ranges in which the current output is set.

- 3.8 ... 20.5 mA
  If the measuring range is exceeded, the current remains at the limiting value.
- 4 ... 20 mA
  If the range is exceeded during an alarm, it is necessary to carry out a restart using Reset, or to interrupt the power supply (see also section 9.2.7).

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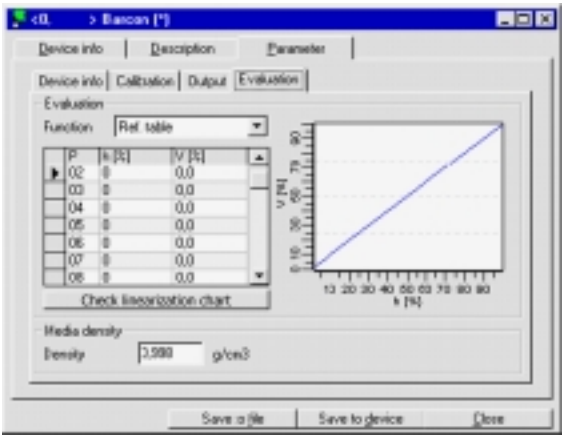
9.2.6 Register card - Parameter evaluation



Density of the filling medium

Data for the density of the medium in g/cm³

In the event of a correction or change of the density value, the associated value of the span end points will also change, due to the dependent measurement quantities (mm, m, inches, feet). Under some circumstances, in the event of a change in the medium (Density change), a new calibration must be undertaken for the span end point.

Note

Evaluation of the process value

Data on the relationship between values of height (level) and volume, which are graphically represented.

- Linear function:
  A linear relationship is set between values of height and volume.
- Table:
  The values in the table provide a linear relationship between height and volume.

For measurements in a tank, values of height (level) are input and a volume is assigned to each value. These pairs of values are used to determine the linear relationship and to assign the 4 mA ... 20 mA output signal to values of tank volume (P 0 and P 31 are fixed at 0 % and 100 %).

Check linearization chart

The input linearization chart is subject to a plausibility check.

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9.2.7 Menu item - Service

You can open the service window under "Device data" in the "Service" menu item or in the "Context" menu (right mouse button) for the device that is selected in the navigation window (project view).

Password

This is used to activate or deactivate the password function.The same numerical value between 0000 and 9999 must be entered in both interrogation fields. If a password is activated, changes in the settings for devices with a display can only be made on entering the password. On devices without a display, no values can be changed on the device.

Activation of mounting correction

The mounting correction is carried out.The sensor must first be in the mounting position and be unpressurised.

Elapsed hours meter (Display only)

- STD-TOTAL: Total operating hours
- STD-CALIB: Operating hours since last calibration
- STD-RESET: Operating hours since last reset
- STD-SENSOR: Sensor reset operating hours

Reset

This is used to reset certain device functions.

- Operating hours: Reset operating hours
- 4 - 20 mA limits: Reset the alarm after the 4 ... 20 mA limits have been exceeded
- MIN/MAX VALUE: Reset the MIN/MAX values on the display
- Reset All: Reset all set values to the factory (or default) settings (see section 8.4)

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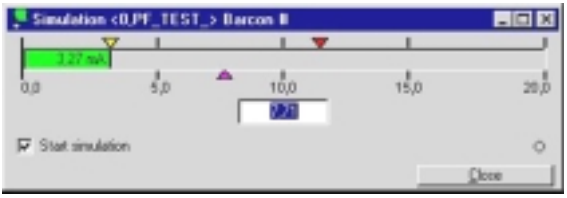
Important

Special measuring ranges, such as 4 bar, with a 6 bar pressure transmitter are achieved by means of a factory-set turn down. On Reset, the appropriate basic range (6 bar in the example) is reset. The factory setting of the special measuring range is then lost.

9.2.8 Menu item - Simulation

You can open the simulation window under "Device data" in the "Simulation" menu item or in the "Context" menu (right mouse button) for the device that is selected in the navigation window (project view).



During online operation, the measured value is output as a current.

Attention

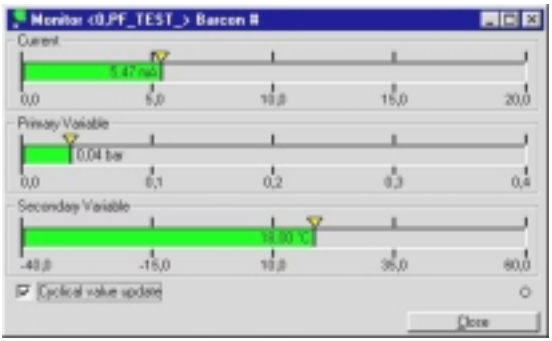
A set current value is output as a test signal until online operation is selected.

Note

Before changing and storing the parameter setting menu item "Simulation" has to be closed.

9.2.9 Menu item - Measuring value

You can open the measuring value window under "Device data" in the "Measuring value" menu item or in the "Context" menu (right mouse button) for the device that is selected in the navigation window (project view).



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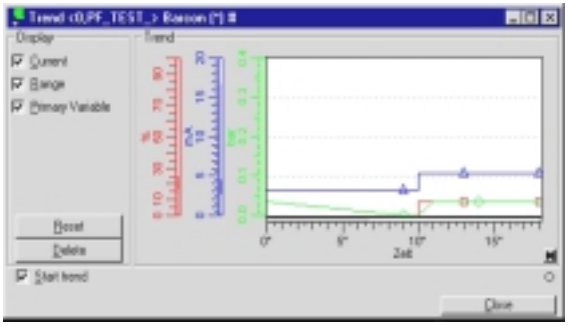
BARCON indicated current values (temperature, measuring values, output current) continuously.

Note

Before changing and storing the parameter setting menu item "Measuring value" has to be closed.

9.2.10 Menu item - Trend

You can open the trend window under "Device data" in the "Trend" menu item or in the "Context" menu (right mouse button) for the device that is selected in the navigation window (project view).



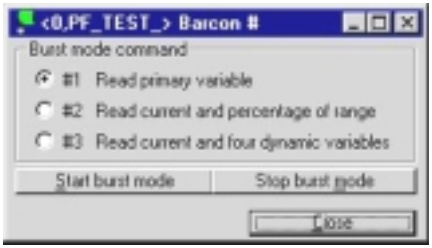
This display provides information on the variation of the measured value with time (recorder function). The scale can be changed by clicking on the time or the scaling axis.

Note

Before changing and storing the parameter setting menu item "Trend" has to be closed.

9.2.11 Menu item - Burst mode

You can open the burst mode window under "Device data" in the "Burst mode" menu item or in the "Context" menu (right mouse button) for the device that is selected in the navigation window (project view).



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In the burst mode BARCON sends current values (pressure, % value, output current) to the master on a cyclic basis.

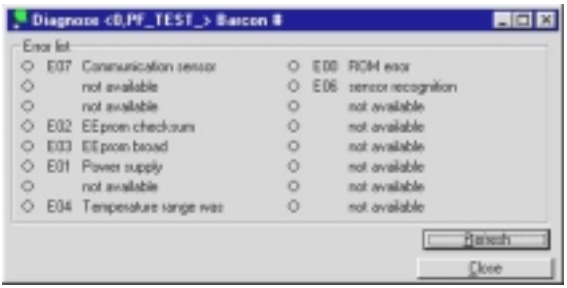
- Current
- %-value and current
- Pressure, temperature and current

If Burst mode is active a parameterization is not possible.

Note

9.2.12 Menu item - Diagnosis

You can open the diagnosis window under "Device data" in the "Diagnosis" menu item or in the "Context" menu (right mouse button) for the device that is selected in the navigation window (project view).



Possible errors and their short description are indicated (see section 11.2).

Before changing and storing the parameter setting menu item "Diagnosis" has to be closed.

Note

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10 Dismantling, packing and re-packing

If the device is to be stored for later re-use, the device should be packed in such a way as to ensure protection from shock. Optimum protection is afforded by the original packaging.

Disposal

Electronic waste is classified as special refuse. Please observe local guidelines and regulations when disposing of devices that are no longer serviceable.

Note *Please supply any recyclable components to the appropriate local organizations.*

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11 Guarantee and service

11.1 Guarantee conditions

The guarantee period for the pressure transmitter is 12 months in accordance with the common terms of delivery.

Repairs should only be performed by the manufacturer. All other repairs or alterations are unauthorized. They will cause the loss of all warranty claims.

11.2 Diagnostics and service

If the fault cannot be corrected, the device should be taken out of operation and stored to prevent re-installation.

Repairs should only be performed by the manufacturer. All other repairs or alterations are unauthorized.

The following error messages can appear on devices with displays (see also section 4.1.3):

Error code	Error	Error correction measures
E00	ROM-error	Return device to manufacturer
E01	Power supply error	Test power supply
E03	EEPROM communications error	Disconnect and reconnect power supply
E04	Sensor's temperature range was exceeded	Return sensor's temperature to specified limits
E06	Sensor recognition	Disconnect and reconnect power supply
E07	General communications error in the device between the sensor and the control interface unit	Check the connection in the device between the sensor and the control interface unit
E08	E²PROM error	Return device to manufacturer

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12 Appendix

12.1 Model number key

Hydrostatic pressure transmitter LHC

Design
M External mount type
R Rod type (extended version optional)
S Rope type (extended version optional)

Pressure measurement range
1 D Range 0 ... 0.4 bar
2 B Range 0 ... 1.6 bar
2 E Range 0 ... 6 bar
3 B Range 0 ... 16 bar
S x Special range (customer specified defaults)

Pressure type/accuracy
R 2 Accuracy is better than < 0.2 % of nominal measurement range

Process connections for external mount type
G 5 G 1 1/2 A with diaphragm, stainless steel 1.4571
N 5 1 1/2" NPT with diaphragm, stainless steel 1.4571
G 3 G 1 A with diaphragm, stainless steel 1.4571
N 3 1" NPT with diaphragm, stainless steel 1.4571

Process connections for rod and rope type
G 5 G 1 1/2 A, stainless steel 1.4571
N 5 1 1/2" NPT, stainless steel 1.4571
M 4 Milk pipe DN40
T 2 Triclamp 2"
F 1 Flange DN50 PN40
A 2 Flange ANSI 2", 150 PSI

Material in contact with medium
S Stainless steel 1.4571
H Hastelloy C4 (diaphragm only)

Sensor fill medium
1 Standard filling
2 Filling for food applications

Housing and cable glands
P Plastic with cable connection M20 x 1.5
A Aluminium with cable connection M20 x 1.5
C Aluminium with cable connection ¾"

Electrical output
I 2 2-wire 4 … 20 mA
2 L 2-wire 4 … 20 mA with OV protection
I H 2-wire 4 … 20 mA HART
H L 2-wire 4 … 20 mA HART with OV protection
P A PROFIBUS PA
P L PROFIBUS PA with OV protection

Display
B Basic version without display
D Display version

Approvals
Ex Ex approval EEx ia II C T6

L	H	C					-				-	E	M					-	

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Process pressure transmitter PPC

Design
M External mount type
Pressure measuring range
1 D Range 0 bar ... 0.4 bar
2 B Range 0 bar ... 1.6 bar
2 E Range 0 bar ... 6 bar
3 B Range 0 bar ... 16 bar
3 D Range 0 bar ... 40 bar
4 A Range 0 bar ... 100 bar
4 C Range 0 bar ... 250 bar
4 E Range 0 bar ... 600 bar
5 D Range 0 bar ... 1000 bar
A A Range -1 bar ... 0 bar (only with relative pressure cell R2)
A E Range -1 bar ... +0.6 bar (only with relative pressure cell R2)
A D Range -1 bar ... +3 bar (only with relative pressure cell R2)
A K Range -1 bar ... +5 bar (only with relative pressure cell R2)
A P Range -1 bar ... +15 bar (only with relative pressure cell R2)
S x Special range (customer specified defaults)
Pressure type/accuracy
R 2 Accuracy < 0,2 %, relative pressure
A 2 Accuracy < 0,2 %, absolute pressure (measuring range <16 bar)
Process connections for external mount type
G 1 G 1/2 manometer connection DIN 16288
N 1 1/2" NPT
O 1 G 1/2" with O-ring (> 1.6 bar)
O 3 G 1" with O-ring (< 1.6 bar)
Material in contact with medium
S Stainless steel 1.4571
Sensor filling medium
1 Standard filling
2 Filling for food applications
Housing and cable glands
P Plastic with cable connection M20 x 1.5
A Aluminium with cable connection M20 x 1.5
C Aluminium with cable connection ¾"
Electrical output
I 2 2-wire 4 mA … 20 mA
2 L 2-wire 4 mA … 20 mA with OV protection
I H 2-wire 4 mA … 20 mA HART
H L 2-wire 4 mA … 20 mA HART with OV protection
P A PROFIBUS PA
P L PROFIBUS PA with OV protection
Display
B Basic version without display
D Display version
Approvals
Ex Ex-approval EEx ia II C

P	P	C						-					-	E	M					-	

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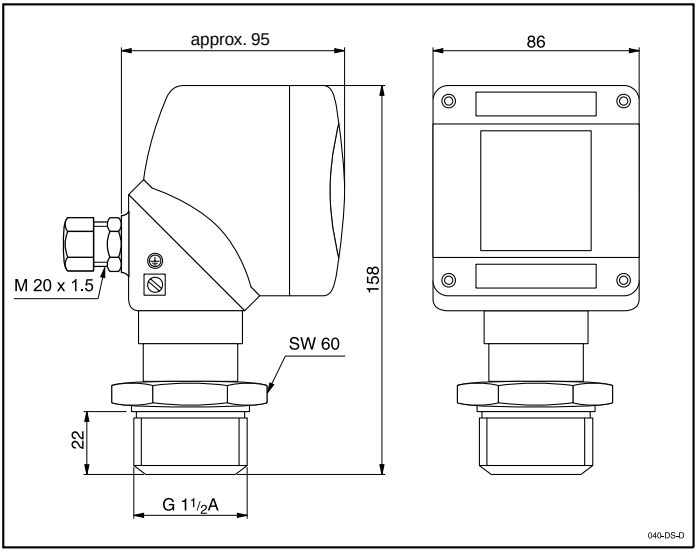
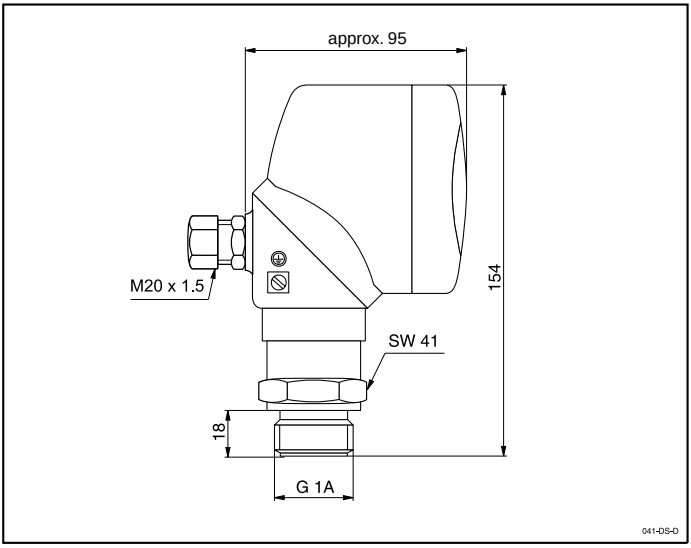
12.2 Dimensional drawings

Hydrostatic pressure transmitter LHC mounting version





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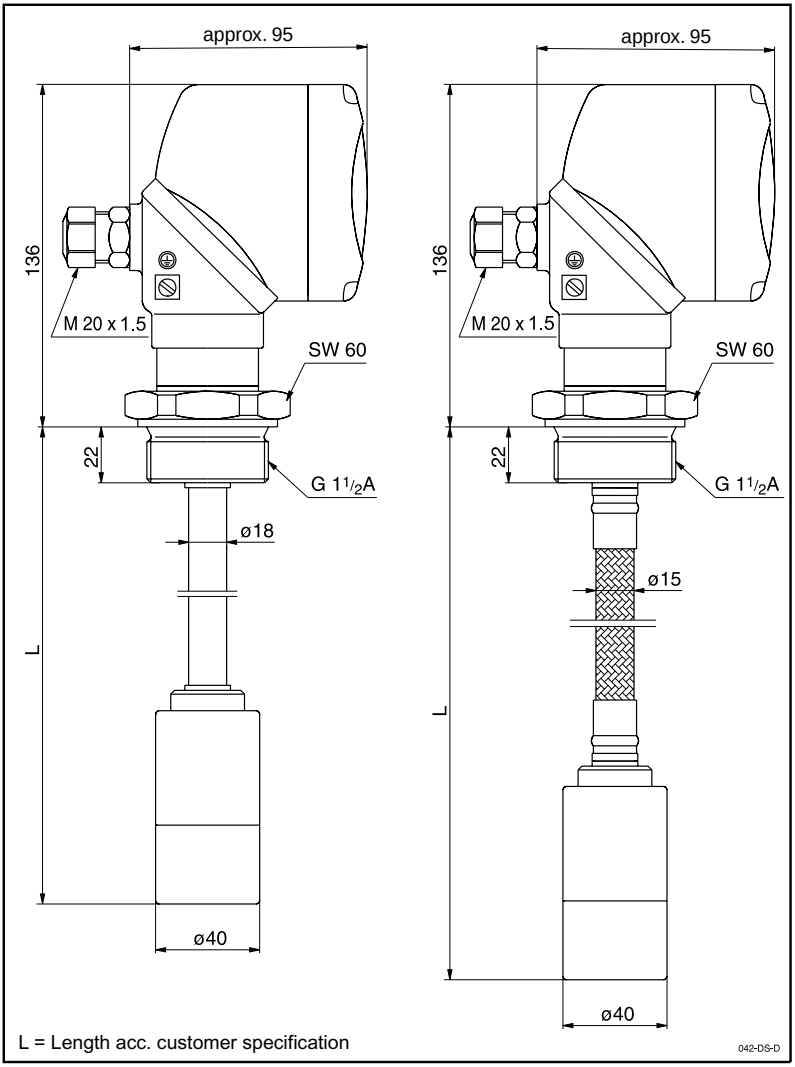
Hydrostatic pressure transmitter LHC rod and rope version



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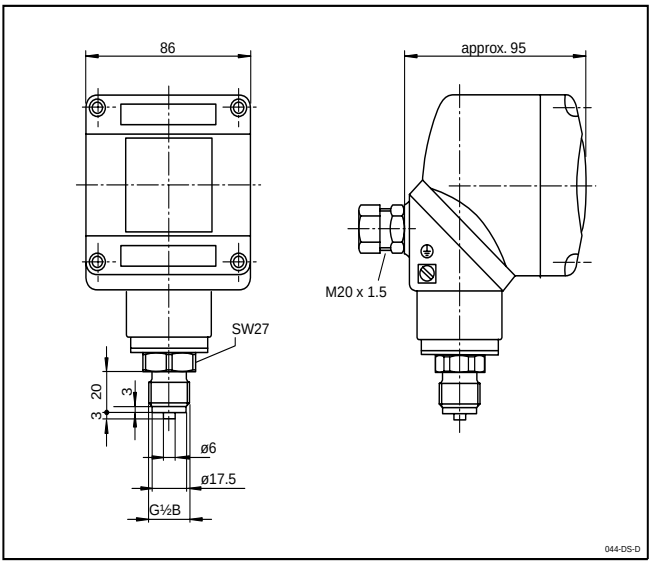
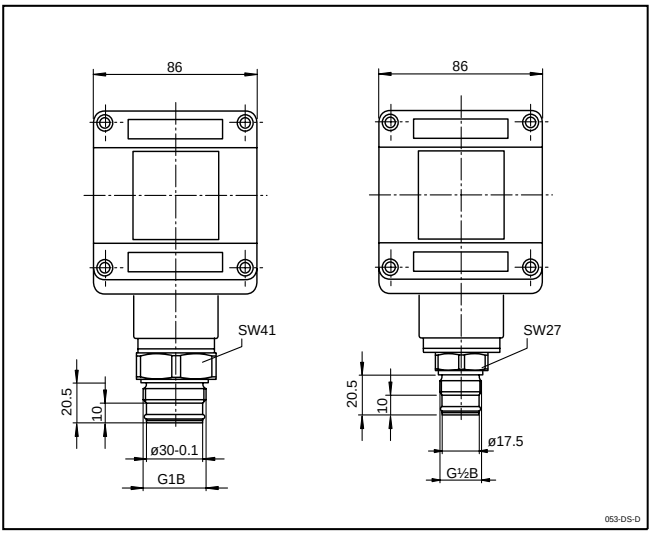
Pressure transmitter PPC mounting version with G½B manometer connection



Pressure transmitter PPC mounting version with G½B and G1B, O-ring flush with front face



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12.3 Glossary

Calibration	Allocation of the signal output range (4 mA ... 20 mA) to the desired pressure measurement range or level measurement range.
Defaults	The sensor parameters are pre-programmed by the manufacturer
Integration/Damping	Timely communication of the measurement signal; rise time of the current output signal after a signal surge.
Inversion	Conversion of the output signal from 4 mA ... 20 mA to 20 mA ... 4 mA
Nom. pressure range	The operating pressure range for which the sensor was designed
Parameterization	Also configuration: programming of the relevant parameters and the pressure measurement range specific to the application and measurement location.
Span	The programmed pressure measurement range
Span end point	The highest pressure value of the programmed measurement span (end-point of the span)
Tank linearization	Determination of approximate volume/pressure ratio values with non-linear correlations based on varying container designs For example, a non-linear correlation exists between the fill level and the volume in spherical containers. During linearization, the non-linear volume is assigned the 4 mA ... 20 mA output signal from a table of values (proximity process by means of up to 32 support points).
Zero point	Start of the pressure measurement range

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12.4 Units of pressure measurement

1 atm (atmospheres)	= 760 mm Hg = 760 Torr
	= 1.033 kp/cm^2 = 0.1013 MPa
1 Torr	= 133.3 Pa
1 kp/mm²	= 9.81 N/mm² = 9,81 MPa
1 bar	= 0.1 MPa = 33.5 feet of water
1 mbar	= 1 hPa (Hektopascal)
1 psi (pound per square inch)	= 6.895 x 10³ Pa
1 Pa	= 1.0 x 10^5 bar
1 mmHG	= 1.333 mbar

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One Company, Two Divisions.

Factory Automation Division

Product Range

- Digital and analogue sensors
- in different technologies
  - Inductive and capacitive sensors
  - Magnetic sensors
  - Ultrasonic sensors
  - Photoelectric sensors
- Incremental and absolute rotary encoders
- Counters and control equipment
- Identification Systems
- AS-Interface

Areas of Application

- Machine engineering
- Conveyor or transport
- Packaging and bottling
- Automotive industry

Process Automation Division

Product Range

- Signal conditioners
- Intrinsically safe interface modules
- Remote Process Interface (RPI)
- Intrinsically safe field bus solutions
- Level control sensors
- Process measuring and control systems engineering at the interface level
- Intrinsic safety training

Areas of Application

- Chemical industry
- Industrial and community sewage
- Oil, gas and petrochemical industry
- PLC and process control systems
- Engineering companies for process systems

Service Area

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