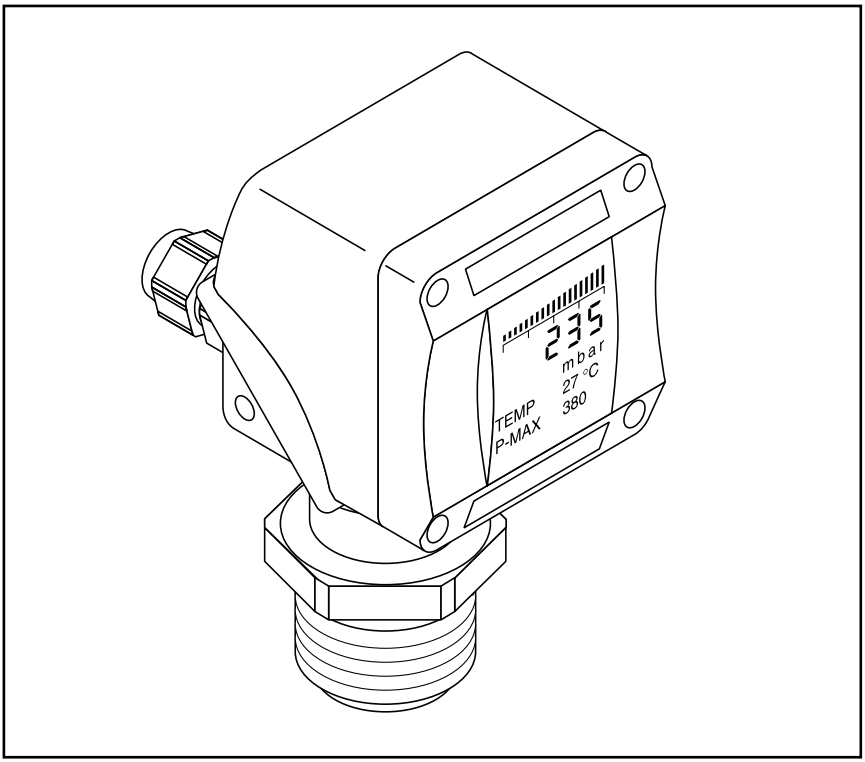
bürkert
Easy Fluid Control Systems

Pressure Transmitter Type 8326

Instruction Manual



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Contents

1 General Safety Instructions

Observe the national regulations about safety and accident prevention , as well as the safety instructions in this operating manual when operating the pressure transmitter.

Any operation not described in the following instructions must not be carried out.

If a failure cannot be repaired, the transmitter must be switched off.The operator then must make sure, that it is only switched on again after the failure has been repaired.

Repairs should only be carried out by the manufacturer. All other repairs or modifications of the transmitter are unauthorized.

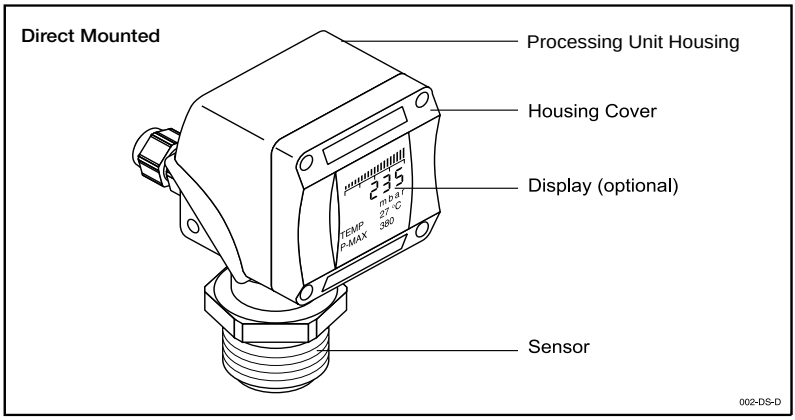
Other important safety guidelines can be found in the different sections of this instruction manual.

2 Product Description

The 8326 pressure transmitter can be used in level control applications as well as for pressure measurement applications in process industry. A variety of process connections, measurement ranges, main boards and display options result in a product for a wide range of applications.

2.1 Construction

The 8326 consists of a pressure sensor, a control interface unit and a housing cover with optional display. Due to this modular design, different transmitter versions can be mounted.



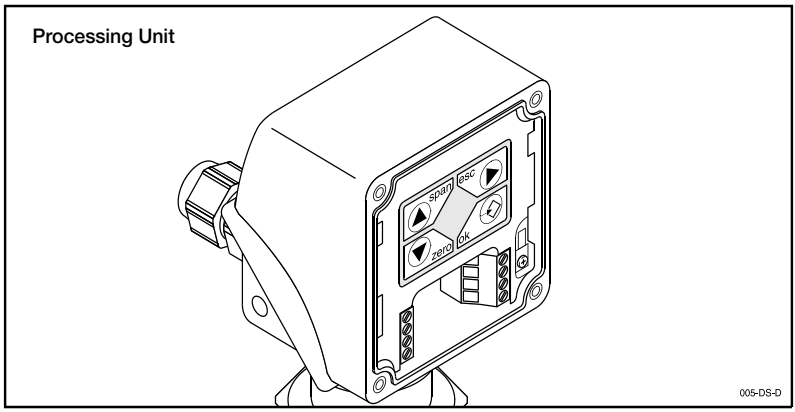
2.1.1 Pressure Transducer

The pressure transducer has a piezo-resistive or thinfilm measurement cell depending on the pressure range. The sensors are temperature compensated, and have a hermetically welded membrane which is "helium" leak-tested. The Pressure transducers do not have internal sealing elements.

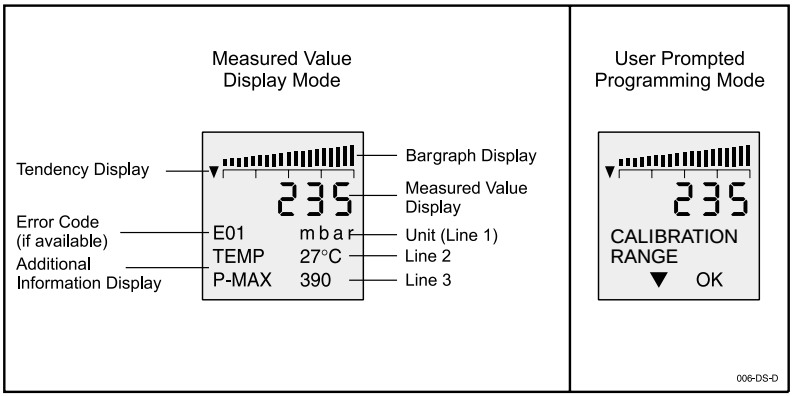
Pressure transducers further distinguish themselves from one another based on their pressure ranges and the different materials of wetted parts. Different process connections can be selected to serve a wide range of applications.

2.1.2 Processing Unit

The processing unit, which is integrated in the housing contains the terminal compartment and the keypad used for programming the transmitter. The four keys must be activated (unlocked) before use. During normal operation the keypad is locked to protect data and functions previously entered. The keypad is automatically locked when no key is hit for 10 minutes. The processing unit converts the digitalized signal from the measuring unit into a standard 4...20 mA current signal.



2.1.3 Display Unit



The measured-value indicator has four digits (in a 7-segment display) + symbols. Below it, is line 1 (16-segment display) 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 guided, clear-text prompts.

Transmitters with displays offer a larger number of programming and processing options. These options include alarm status, damping, signal inversion, tank linearization and diagnostic messages.

Information

Display units can be easily upgraded (see Section 4.2).

2.2 Function

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

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

2.2.1 Functions of Transmitters without Displays

- Calibration of zero and span under pressure (see 5.3)
- Calibration of zero and span without pressure (dry adjustment) (see 5.4)
- Setting the dampening / integrating the output signal 0-40 s (see 5.5)
- Reset to manufacturer's default values (see 5.6)

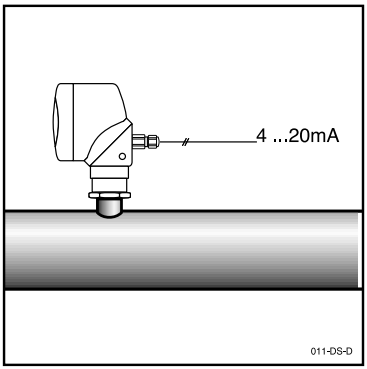
2.2.2 Functions of Transmitters with Displays

- Settable units of measurement (mbar, bar, psi, mA, %, m, mm WS) (see 6.5.1)
- Temperature and Min/Max values shown in display (see 6.5.1)
- Nominal pressure range of the sensor shown in display (see 6.5.1)
- Zero and span calibration (with/without pressure) (see 6.5.2)
- Setting of damping / integration of output signal 0-40 s (see 6.5.3)
- Inversion of the output current signal (see 6.5.3)
- Setting the output current value in case of alarm (3.6 mA or 21 mA) (see 6.5.3)
- Setting the limits of the output signal (see 6.5.3)
- Offset of the output signal (see 6.5.3)
- Mounting correction of the sensor
- Measuring circuit test function (see 6.5.6)
- Reset functions (see 6.5.6)
- Password activation (see 6.5.6)
- Selecting the language of the display (see 6.5.5)
- Entering of a table function for the linearization of the output signal (see 6.5.4)
- Entering the medium density (see 6.5.4)

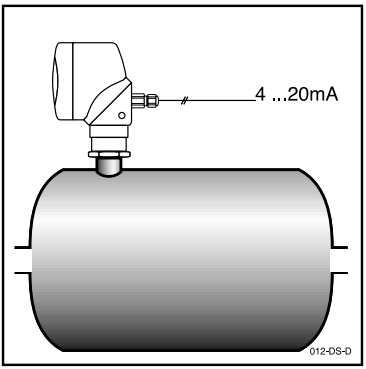
2.3 Installation Examples

The 8326 is primarily used to monitor the pressure in pipes, technical equipment and tanks. Depending on the pressure range pressures between 20 mbar up to 1000 bar can be measured. The pressure is measured using absolute (against a vacuum) or relative (against external or air pressure) measurement depending on the type of sensor selected.

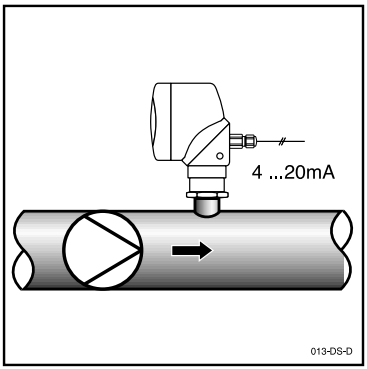
The 8326 is also used for hydrostatic pressure measurement within liquid filled pipes and containers.



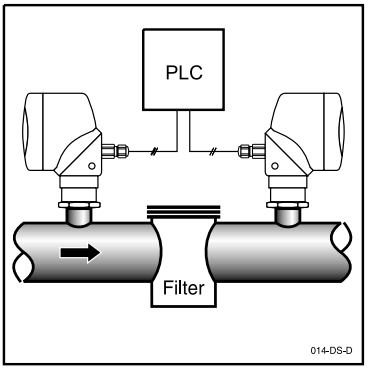
Process Pressure Measurement: Used to measure pressure of liquids or gases in pipelines.



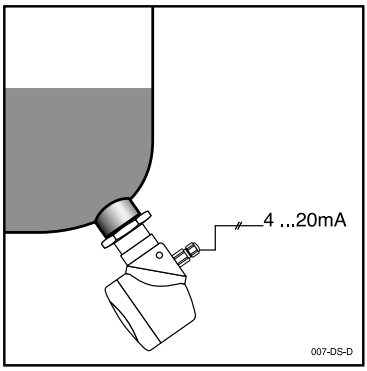
Process Pressure Measurement: Used to measure container pressure.



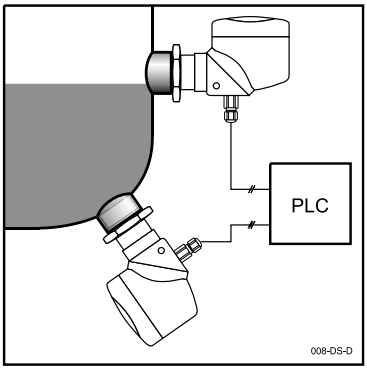
Process Pressure Measurement: Installed behind feed pumps for process control or monitoring of pump functions.



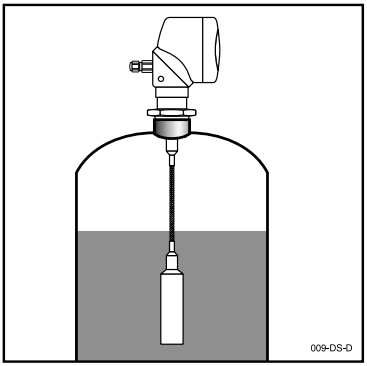
Process Pressure Measurement: Installed in front of and behind the filter. Uses the pressure differential for monitoring the function or accumulation of dirt in the filter. Both output signals are processed by a PLC or signal converter.



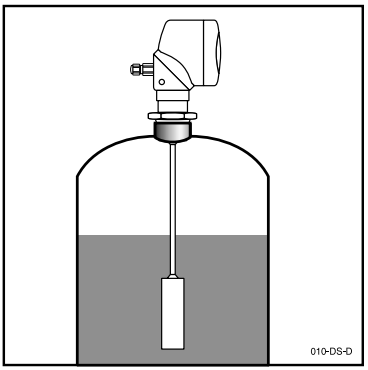
Level Control:
Externally mounted
(with front flat diaphragm)



Level Control:
Combined pressure and head pressure are measured by two externally mounted pressure transducers. The two signals are anylized 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.

3 Technical Data

3.1 Input-values

		/ overpressure limit /	Burst pressure
Pressure Ranges (Absolute pressure upon request)	0 ... 0.4 bar	2	2
	0 ... 1,6 bar	10	10
	0 ... 6 bar	35	35
	0 ... 16 bar	80	80
	0 ... 40 bar	80	400
	0 ... 100 bar	200	800
	0 ... 250 bar	500	1200
	0 ... 600 bar	1200	2400
	0 ... 1.000 bar	1500	3000
	others ... 1.000 bar		

3.2 Output-values

Output signal	4 ... 20 mA
Accuracy [% of span] (linearity, hysteresis, repeatability)	< 0.10 at ranges of > 40 bar < 0.15 at ranges of < 40 bar
Turn down behavior: (1/k) up to 1 : 5 1 : 5 to 1 : 20	 no changes of deviation the accuracy must be multiplied by the factor (turn down / 5) example for TD = 1:15, (k = 15) accuracy = 0.10 * (15/5) = 0.3
Overall deviation (at +10 °C ... +40 °C)	$\leq$ 0.15 % for pressure ranges of $\geq$ 40 bar (limit point calibration) < 0.2 % for pressure ranges of < 40 bar
Load	$R_A \leq (U_B – 12\ V)/0.023\ A$ with R_A in Ohm and U_B in Volt
Fault signal	3.6 mA or 21 mA, programmable
Integration time	0 s, 1 s, 5 s, 20 s, 40 s, programmable
Adjustment of the span	Up to Turn Down 1 : 20
Integrated lightning protection	optional
Zero point adjustment	0 ... 99 %

3.3 Construction

Process connections	G 1/2 B per DIN 16288 (1/2 NPT) G 1/2 B flush diaphragm with O-Ring (Ranges: 0 ... 6 to 0 ... 600 bar) G 1 B flush diaphragm with O-Ring according to EHEDG
Materials Housing	highly resistive, fiberglass-enforced plastic (PBT)
wetted parts:– standard	CrNi-steel 1.4571 (316 Ti) and 1.4542 (630 17.4 PH)
– with a flush diaphragm	CrNi-steel 1.4571 (316 Ti) and O-Ring: FPM
– EHEDG	CrNi-steel 1.4435 (316 L) and O-Ring: EPDM
Internal transmission fluid	– Standard – EHEDG-version is FDA approved
Electrical connection per EN 60 529/ IEC529	M 20 x 1.5 cable gland with internal terminal block (see 4.4)
Electric protection	Reverse polarity, overload and short circuit protection

3.4 Auxilliary Power

Power supply	12 ... 36 V DC

3.5 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
Ingress protection per EN 60 529	IP 65 (IP 67 upon request)
EMC per	EN 50 081-2, EN 50 082-2, NAMUR NE 21

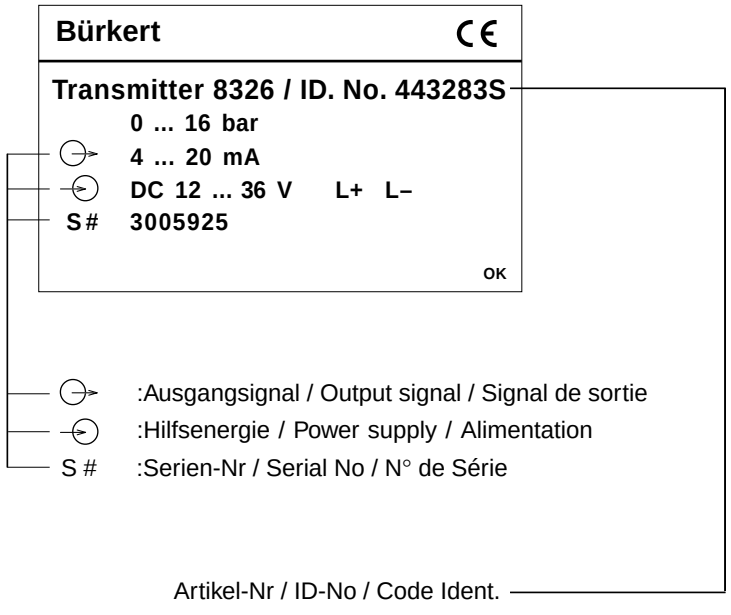
3.6 Process Conditions

Medium temperatures	– 30 °C ... + 100 °C
Max. wash-down temperatures	120 °C

Attention

The transmitter must not be subjected to the wash-down temperature for more than 10 minutes at a time! A maximum wash-down temperature of 105° C is allowed for devices installed in hazardous areas.
*(°F = (°C *1.8) + 32)*

3.7 Identification Plates



4 Installation

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

4.1 Pressure Transmitter Installation


Attention

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

Installation Using a Weld-on Adapter:

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

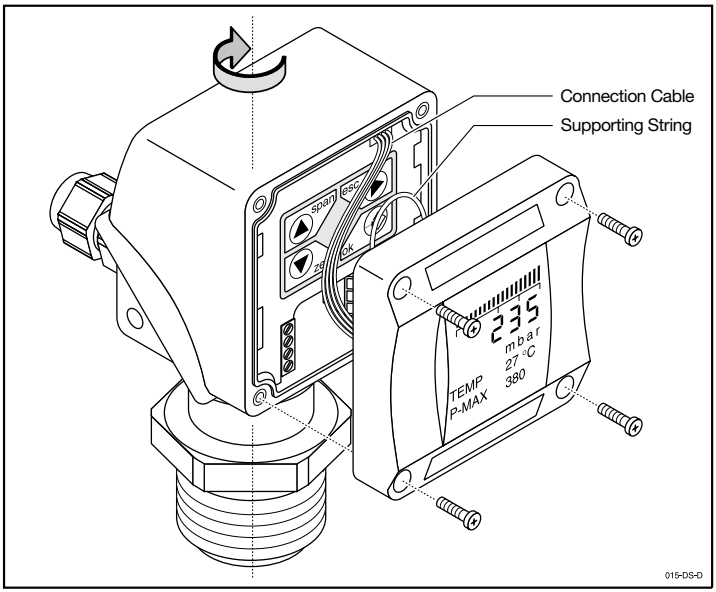
4.2 Display Unit Upgrades

The display unit can be easily upgraded at any time.

- Remove the housing cover and the supporting string.
- Attach the display unit's supporting string to the same place.
- Plug the display unit's connector into the appropriate jack.
  The display unit can be mounted at 90° angles.
- Fasten the display unit with screws.


Attention

When installing the display unit, make sure that the connection cable and the supporting string are not kinked or pinched. If the cable is damaged, correct function may be impaired.
On EX-Model the Ex-protection of the transmitter will no longer exist.



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 in 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.

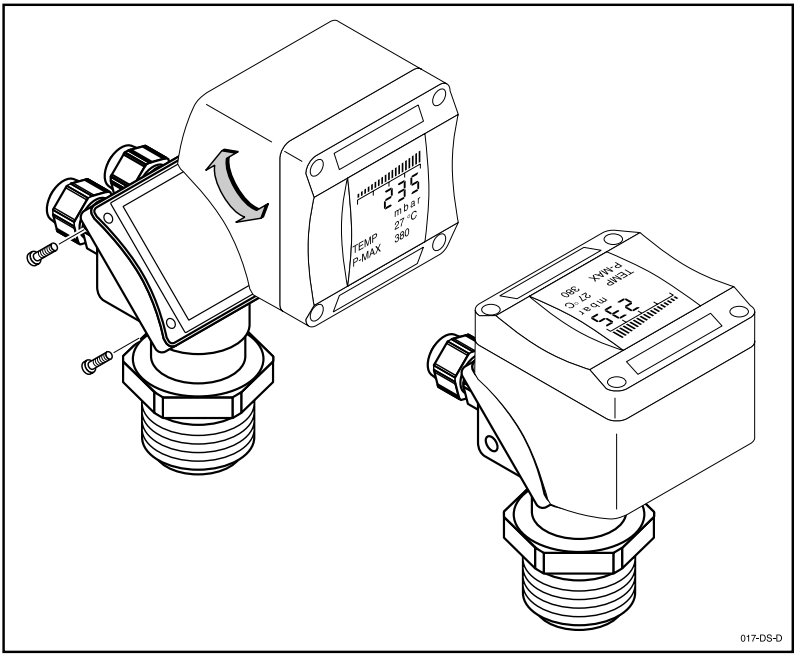
4.3 Housing Reconfiguration

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 by 180°.
- Re-tighten the screws.

Attention

When tightening the 4 hollow screws, *make sure that they are adequately and securely seated in order to ensure that the transmitter is properly sealed.*



4.4 Electrical Connection

Attention

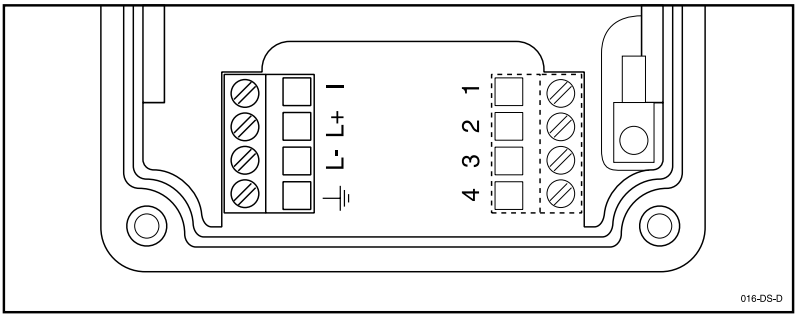
Please observe local installation regulations (Germany: VDE-Standard). The terminal voltage should not exceed 36 V (30 V for intrinsic safety transmitters).

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

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

It is suggested to use a model with integrated lightning protection for preventing damage due to voltage peaks.

Terminal Configuration



⏚ Ground

L- Negative

L+ Positive

I Test circuit; connect the ampere meter between terminals L+ and I

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

4.5 Pressure Compensation when using a Relative Pressure Sensor

A Goretex diaphragm is used to compensate for the atmospheric pressure under the IP 65 Protection Method.

A special cable with capillaries for relative pressurization is used for Ingress Protection IP 67.

5 Operation of Devices without Displays

5.1 Preparation

This unit can be programmed before or after installation.

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

The following 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
- Reset to manufacturer's defaults

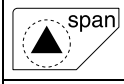
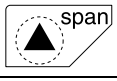
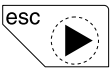
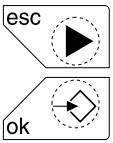
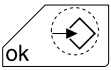
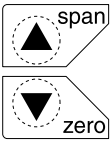
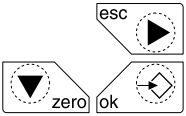
Information

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.

Information

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.

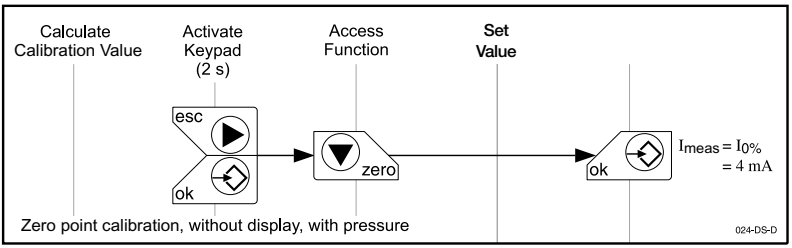
5.2 Key Functions

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

5.3 Calibration with Pressure

5.3.1 Zero Point Calibration

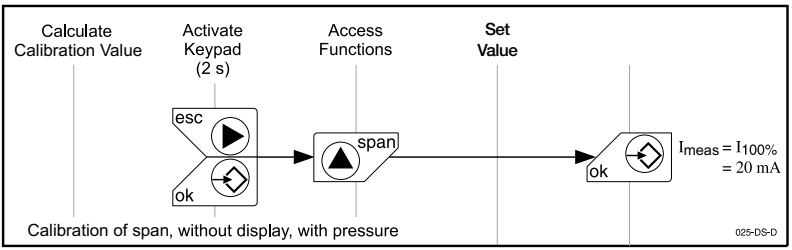
Make sure that the pressure to be used as the zero point (P 0 %), is present at the transmitterer diaphragm before calibration.



5.3.2 Span Calibration

Calibration of the measurement range (span).

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



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, then 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.

5.4 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:

5.4.1 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.

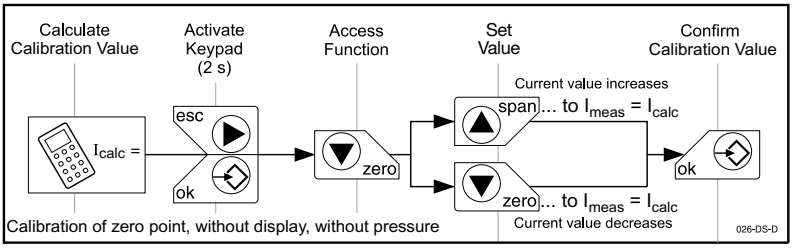
This produces the calculated current (value I_{calc}), which is entered in the transmitter and used to programm the zero point (0%).

Example:

A pressure transducer with 0 ... 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.

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

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



5.4.2 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.

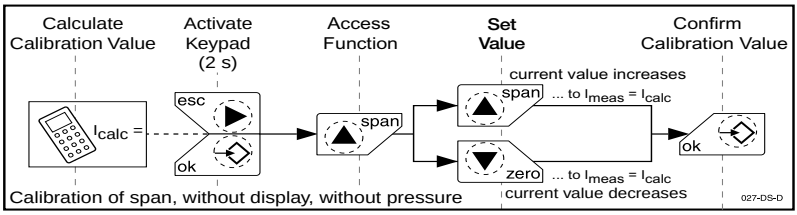
This produces the calculated current (value I_{calc}), which is entered in the transmitter and used to program the span end-point (100%).
The measurement range between zero point and span end-point will be stored as span.

Example:

A pressure transducer with 0 ... 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.

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

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



Information

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.

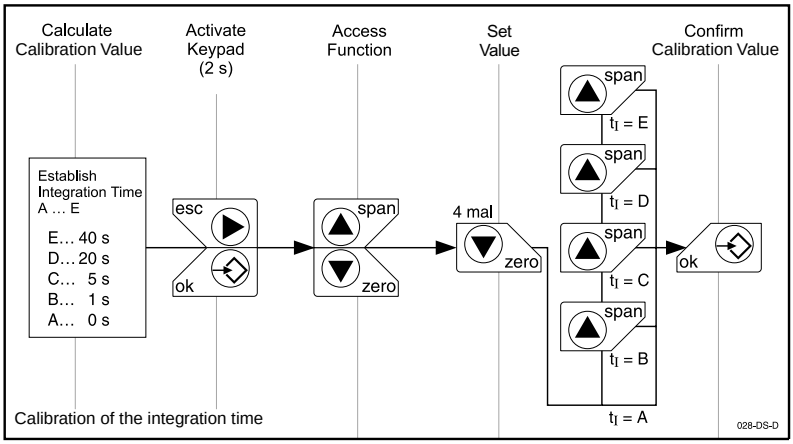
Important

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

5.5 Integration Time (Damping) Adjustment

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

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



5.6 Reset to Default

All default data settings are restored by simultaneously pressing the "zero", "esc" and the "ok" buttons for 2 seconds (see Para. 6.4).

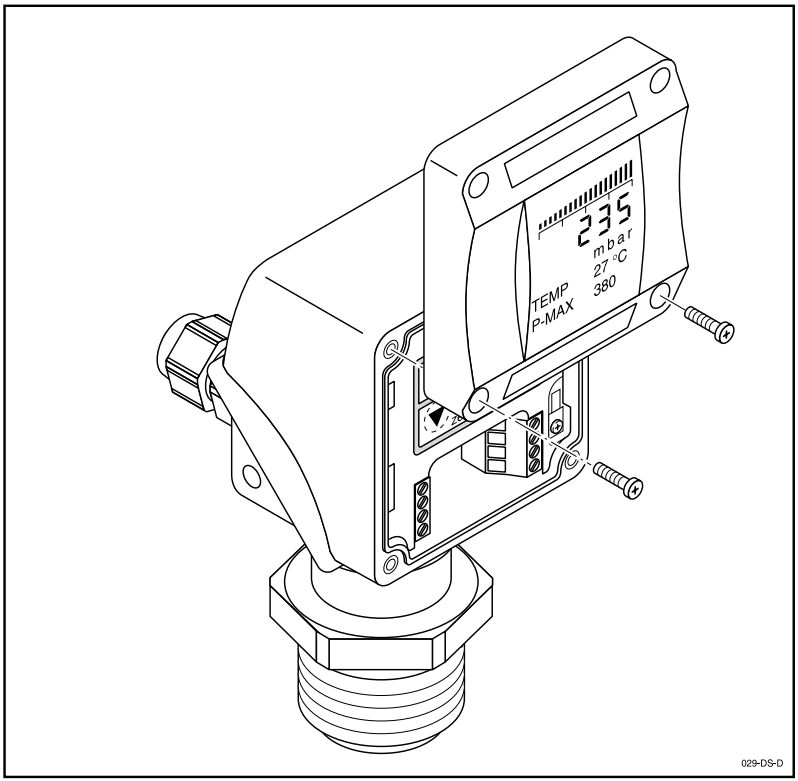
Important

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.

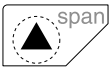
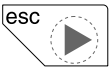
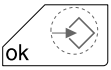
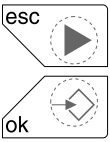
6 Operation of Transmitters with Displays

6.1 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.



6.2 Key Functions

Button	Functions		
	Main Menu	**Sub-menu**	**Edit Functions**
	back to the previous menu option	back to the previous menu option	increase value
	forward to next menu option	forward to next menu option	decrease value
	back to value display without saving	back to main menu without saving	back to the sub-menu without saving
	to the sub-menu	to the edit functions	save value
	activate keypad (push simultaneously; 2 s)		

6.3 The Programming Mode

The transmitter 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.

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.

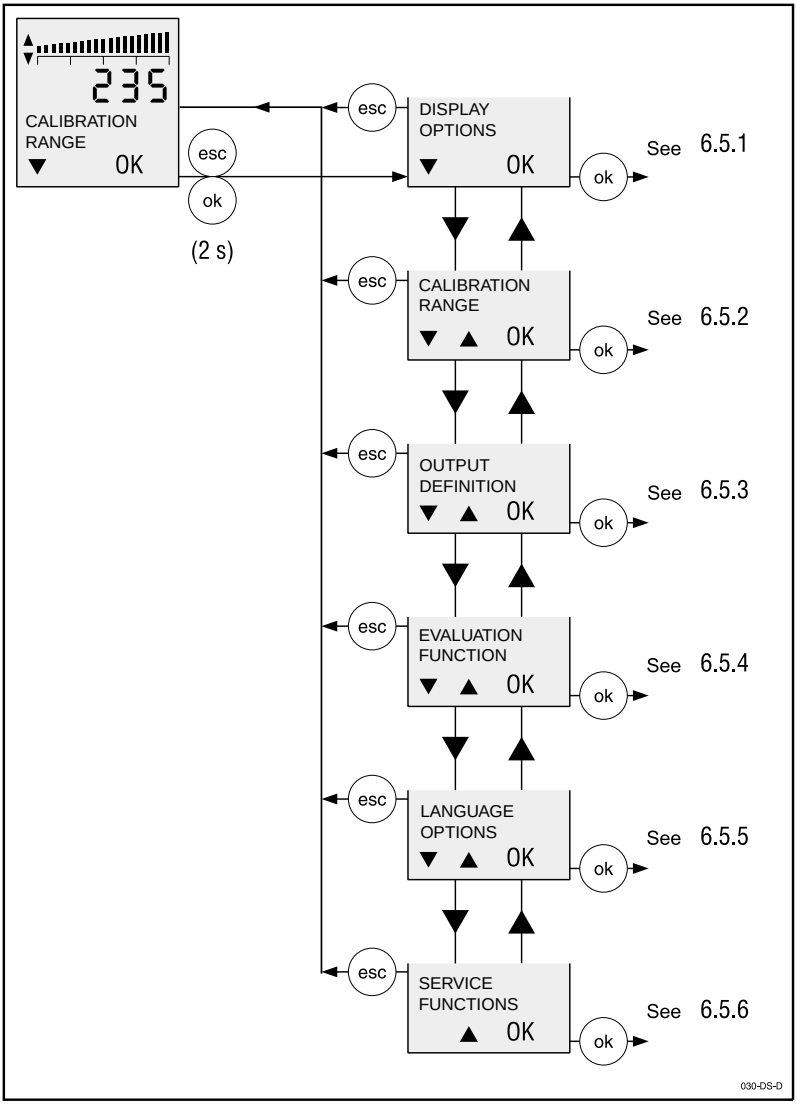
6.4 Default Data (factory setting)

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

Important

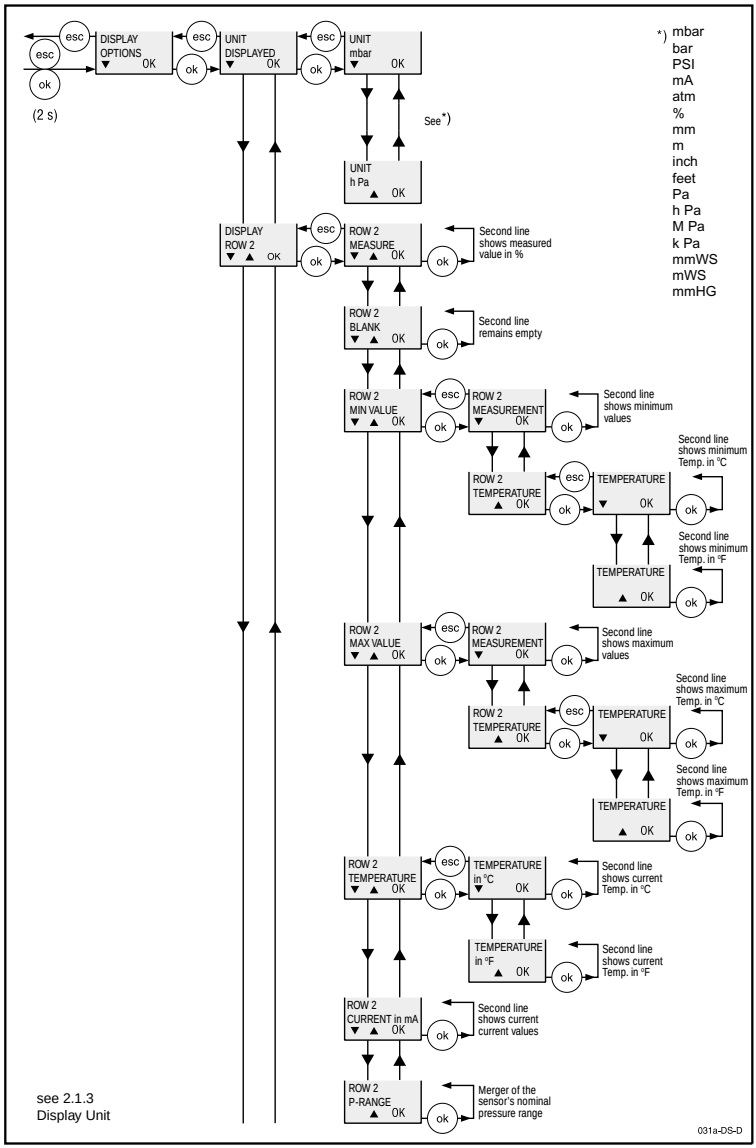
Calibrated special measurement ranges i. e. 4 bar on a 6 bar transmitter can be adjusted by factory pre-setting. A reset to default will reset the sensor back to its nominal range (i. e. 6 bar). The factory pre-setting gets lost.

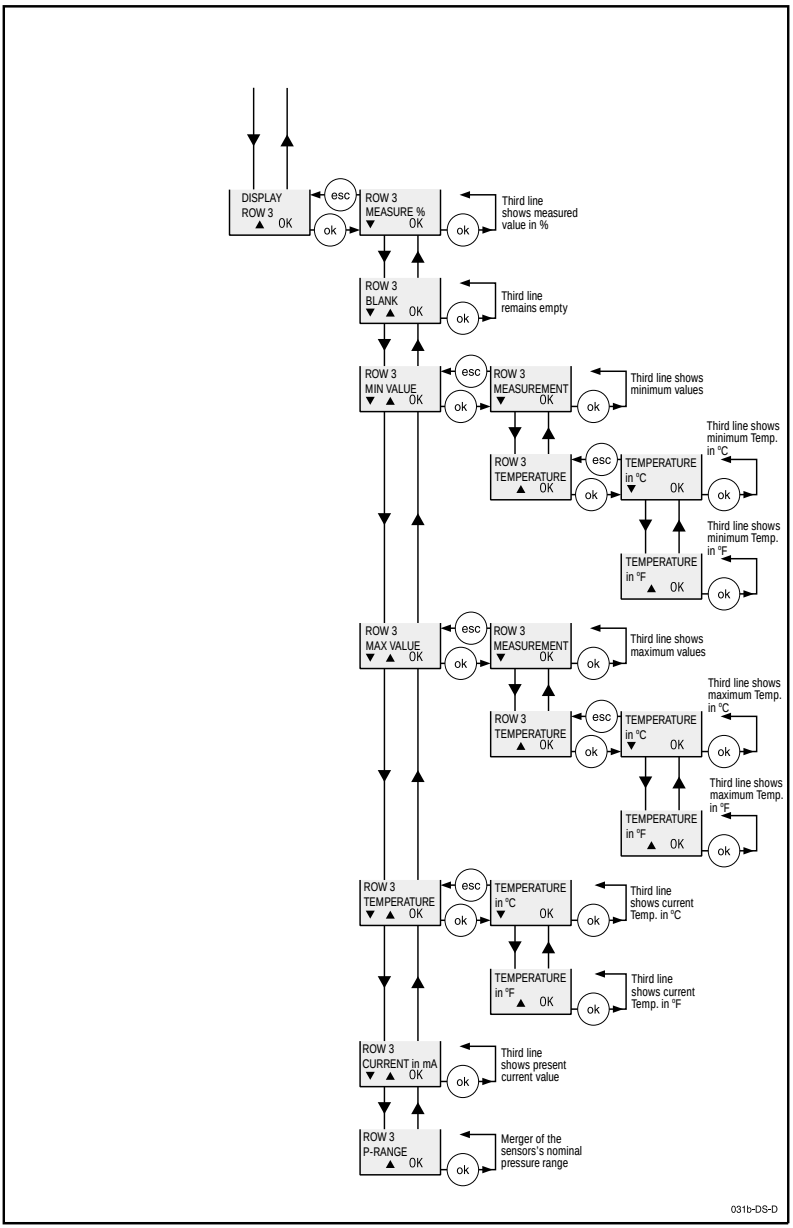
6.5 Main Menu



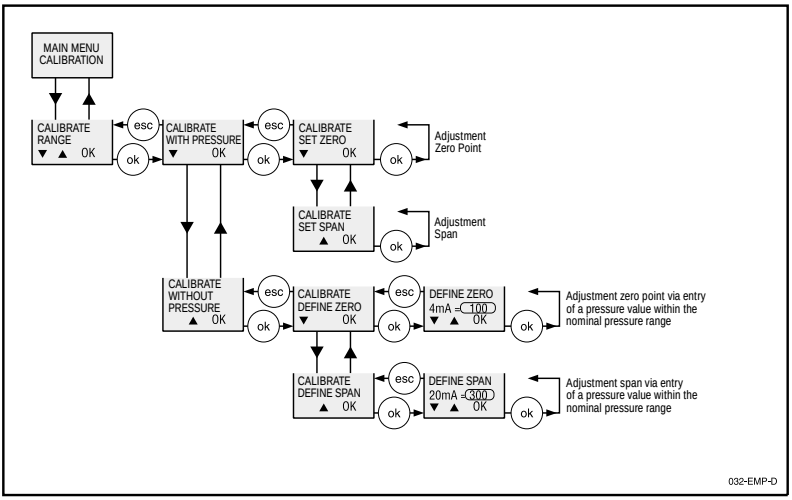
6.5.1 Main Menu: Display

The density of a medium must be entered to calculate the correct fill-level when displaying or adjusting the level in height units (e.g. mm, m, feet, inch)(see 6.5.4).





6.5.2 Main Menu: Calibration of zero and span (with / without pressure)



Information

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. An error signal occurs when the existing pressure lies outside of the sensor's nominal pressure range. The value is not saved in this case.

Important

A mounting correction should be performed before or after making an adjustment without pressure (dry adjustment) (see 6.5.6). The sensor must therefore be placed in the reference position for the measurement (installation site) without pressure on the diaphragm.

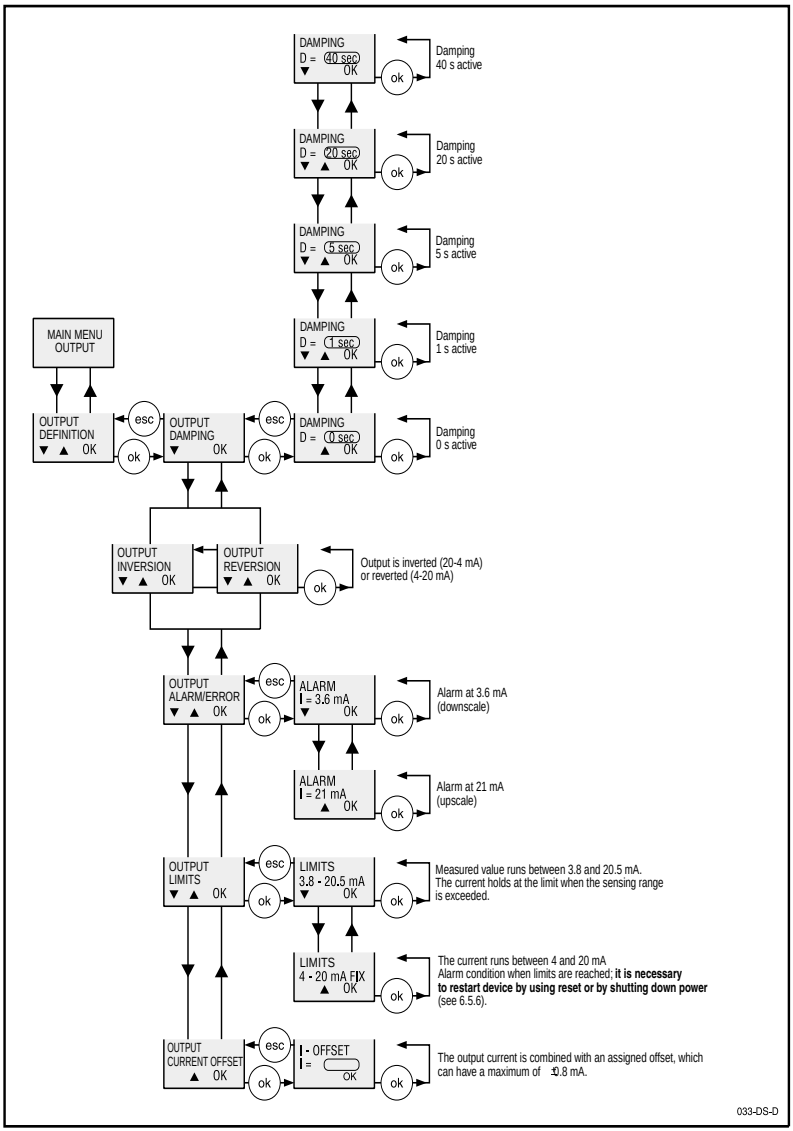
Information

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 span end- point.

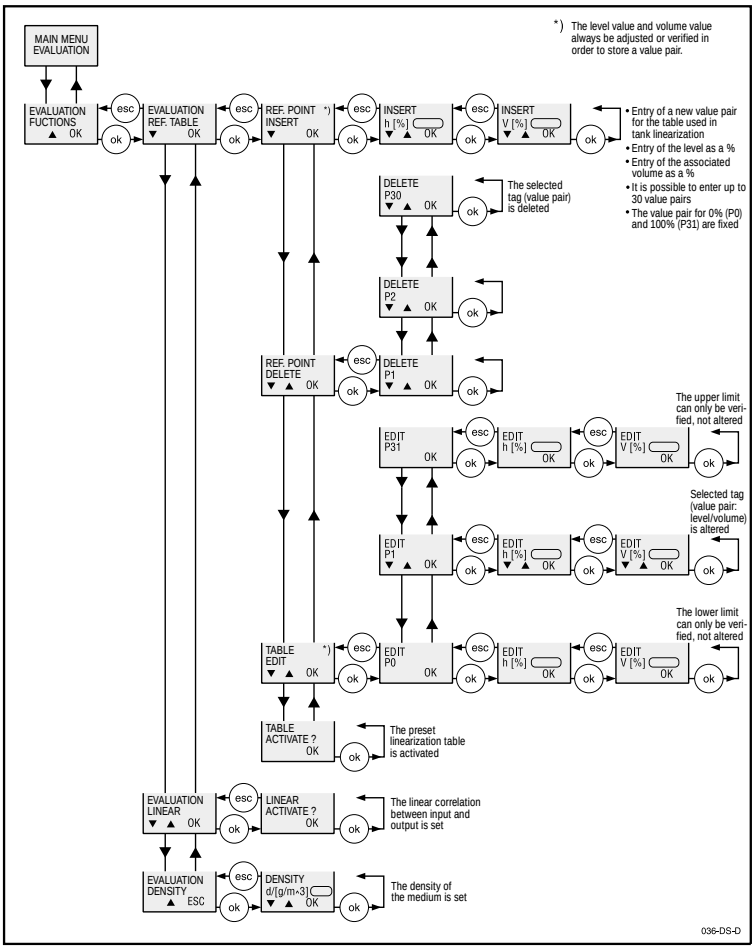
Important

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

6.5.3 Main Menu: Output



6.5.4 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 ... 20 mA output signal are converted into tank volumes using this value pair.

Information

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/cm3

Density correction: 0.9 g/cm3

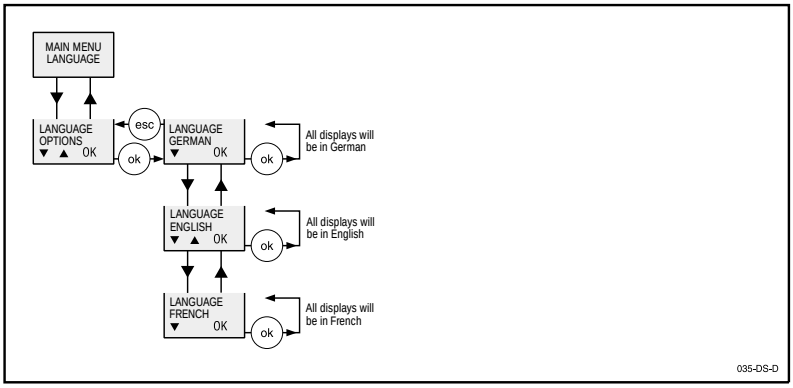
Span end point: $\frac{4000\ \text{mm} \cdot 1\ \text{g/cm}^3}{0.9\ \text{g/cm}^3} = 4444\ \text{mm}$

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.

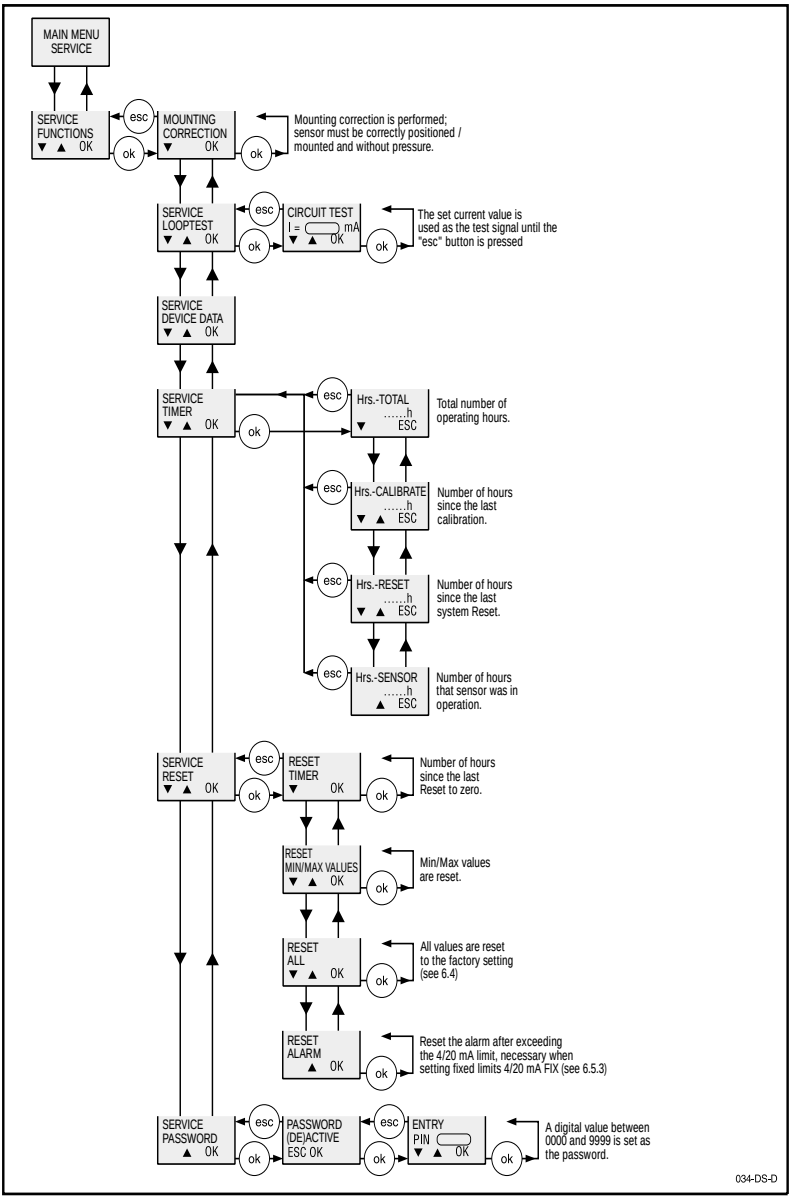
Important

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).

6.5.5 Main Menu: Language



6.5.6 Main Menu: Service



7 Diagnostics and Service

If a failure cannot be repaired, the transmitter must be switched off.The operator then must make sure, that it is only switched on again after the failure has been repaired.

Repairs should only be carried out by the manufacturer. All other repairs or modifications are unauthorized.

The following error messages can appear on devices with displays (see also para. 2.1.3):

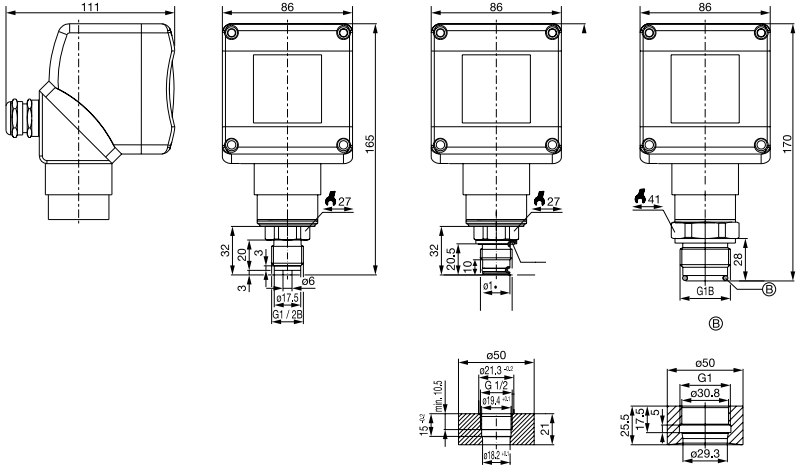
Error Code	Error	Error Correction Measures
E00	ROM-error	Return device to manufacturer
E01	Power supply error	Check power supply
E03	EEPROM communications error	Disconnect and reconnect power supply
E04	Sensor's temperature range was exceeded	Return sensor's temperature to specified limits
E06	Sensor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

8 Disposal

Please observe local guidlines and regulations when disposing of transmitters that are no longer serviceable.
Please turn any recycleable components in to the appropriate local organizations.

9 Appendix

9.1 Dimension Diagrams



9.2 Warranty Conditions

The pressure transmitter has a 12 month warranty in accordance with the ZVEI General Terms of Delivery.

Attention

Repairs may only be carried out by the manufacturer. All other repairs and device modifications are unauthorized and will void the warranty.

9.3 Glossary

Adjustment	Allocation of the signal output range (4 ... 20 mA) to the desired pressure measurement range or level measurement range.
Integration	Also 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 ... 20 mA to 20 ... 4 mA
Nom. pressure range	The operating pressure range for which the sensor was designed
Zero point	Start of the pressure measurement range
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 ... 20 mA output signal from a table of values (proximity process by means of up to 32 support points).
Defaults	The sensor parameters are pre-programmed by the manufacturer

9.4 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/mm^2	= 9.81 N/mm^2 = 9.81 MPa
1 bar	= 0.1 MPa
1 mbar	= 1 hPa (Hectopascal)
1 psi (pound per square inch)	= 6.895 · 10^3 Pa
1 bar	=33.5 feet of water

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