Operating instructions
Electronic pressure sensor

UK

PI27xx

Contents

UK

1 Preliminary note

1.1 Symbols used

▶   Instruction

>   Reaction, result

[…]   Designation of keys, buttons or indications

→   Cross-reference

☒ Important note
Non-compliance may result in malfunction or interference.

ⓘ Information
Supplementary note.

2 Safety instructions

- The device described is a subcomponent for integration into a system.
  - The manufacturer is responsible for the safety of the system.
  - The system manufacturer undertakes to perform a risk assessment and to create a documentation in accordance with legal and normative requirements to be provided to the operator and user of the system. This documentation must contain all necessary information and safety instructions for the operator, the user and, if applicable, for any service personnel authorised by the manufacturer of the system.
- Read this document before setting up the product and keep it during the entire service life.
- The product must be suitable for the corresponding applications and environmental conditions without any restrictions.
- Only use the product for its intended purpose (→ Functions and features).
- Only use the product for permissible media (→ Technical data).
- If the operating instructions or the technical data are not adhered to, personal injury and/or damage to property may occur.
- The manufacturer assumes no liability or warranty for any consequences caused by tampering with the product or incorrect use by the operator.
- Installation, electrical connection, set-up, operation and maintenance of the product must be carried out by qualified personnel authorised by the machine operator.
- Protect units and cables against damage.

3 Functions and features

The unit measures and monitors the system pressure in a plant.

3.1 Applications

Type of pressure: relative pressure

Order no.	Measuring range		Permissible overload pressure		Bursting pressure	
	bar	psi	bar	psi	bar	psi
PI2793	-1...25	-14.4...362.7	100	1450	350	5075
PI2714	-1...16	-14.6...232	75	1085	250	3625
PI2794	-1...10	-14.5...145	50	725	150	2175
PI2715	-1...6	-14.5...87	30	435	100	1450
PI2795	-1...4	-14.5...58	30	435	100	1450
PI2796	-0.124...2.5	-1.8...36.27	20	290	50	725
PI2797	-0.05...1	-0.73...14.5	10	145	30	435
PI2799	-1...1	-14.5...14.5	10	145	30	435
	mbar	psi	mbar	psi	mbar	psi
PI2717	-100...1600	-1.46...23.2	15000	215	40000	580
	mbar	inH2O	bar	inH2O	bar	inH2O
PI2798	-12.4...250	-5.0..100.4	6	2400	30	12044
PI2789	-5...100	-2.00...40.16	4	1606	30	12044

> ⚠ Avoid static and dynamic overpressure exceeding the specified overload pressure by taking appropriate measures.
> The indicated bursting pressure must not be exceeded.
> Even if the bursting pressure is exceeded only for a short time, the unit may be destroyed. ATTENTION: Risk of injury!

> ⚠ Not suitable for use where the criteria for paragraph E1.2/63-03 of the 3-A standard 63-03 have to be met.

> ⚠ The units are vacuum resistant.

4 Function

- The unit displays the current system pressure.
- It generates output signals according to the operating mode and the parameter setting.
- It moreover provides the process data via IO-Link.
- The unit is laid out for fully bidirectional communication. So the following options are possible:
  - Remote display: reading and displaying the current system pressure.
  - Remote parameter setting: reading and changing the current parameter setting.
  - Using the FDT service program ifm Container, the current parameter settings can be stored and transferred to other units of the same type.

  The program library of the available DTM objects can be found at www.ifm. com.

  Device-specific parameter lists for IO-Link parameter setting are available at: www.ifm.com

4.1 Operating modes

The operating mode is defined by the wiring ($\rightarrow$ 6 Electrical connection) and automatically recognised by the unit.

4.1.1 2-wire operation

OUT2 (pin 2)	Analogue signal proportional to pressure 4…20 mA or 20...4 mA

4.1.2 3-wire operation

OUT1 (pin 4)	• Switching signal for system pressure limit • Communication via IO-Link
OUT2 (pin 2)	3 options: • Switching signal for system pressure limit • Analogue signal proportional to pressure 4...20 mA • Analogue signal proportional to pressure 20...4 mA

## 4.2 Switching function (only for 3-wire operation)

OUTx changes its switching status if it is above or below the set switching limits (SPx, rPx). The following switching functions can be selected:
- Hysteresis function / normally open: [OUx] = [Hno] (→ Fig. 1).
- Hysteresis function / normally closed: [OUx] = [Hnc] (→ Fig. 1).
  First the set point (SPx) is set, then the reset point (rPx) with the requested difference.
- Window function / normally open: [OUx] = [Fno] (→ Fig. 2).
- Window function / normally closed: [OUx] = [Fnc] (→ Fig. 2).
  The width of the window can be set by means of the difference between SPx and rPx. SPx = upper value, rPx = lower value.
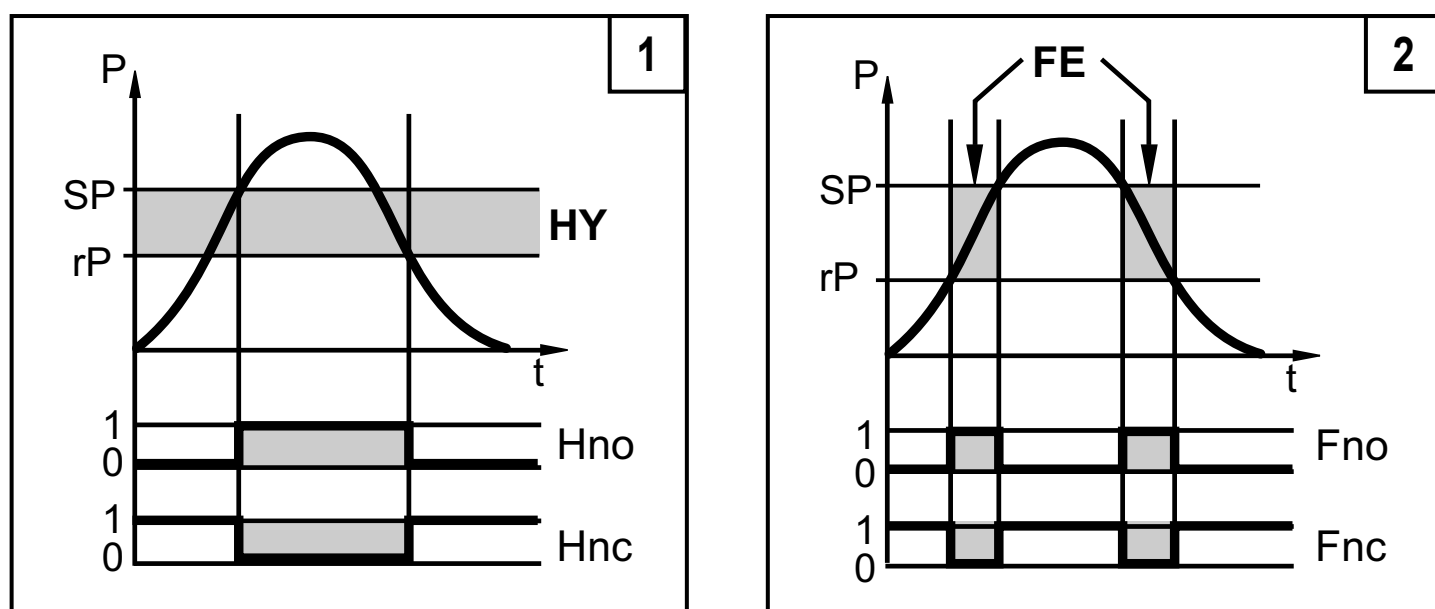
P = system pressure; HY = hysteresis; FE = window

4.3 Analogue function

The analogue output can be configured.

- [OU2] defines whether the set measuring range is provided as 4...20 mA ([OU2] = [I]) or as 20...4 mA ([OU2] = [InEG]).

Scaling can be set by means of the teach process or by entering a value for the parameters ASP and AEP.
- Teaching the analogue start point [tASP] or setting the parameter [ASP] defines at which measured value the output signal is 4 mA (20 mA with [InEG]).
- Teaching the analogue end point [tAEP] or setting the parameter [AEP] defines at which measured value the output signal is 20 mA (4 mA with [InEG]).

Minimum distance between [ASP] and [AEP] = 25 % of the final value of the measuring range (turn-down 1:4); for PI2799: 25 % of the measuring span.

Factory setting	Measuring range scaled
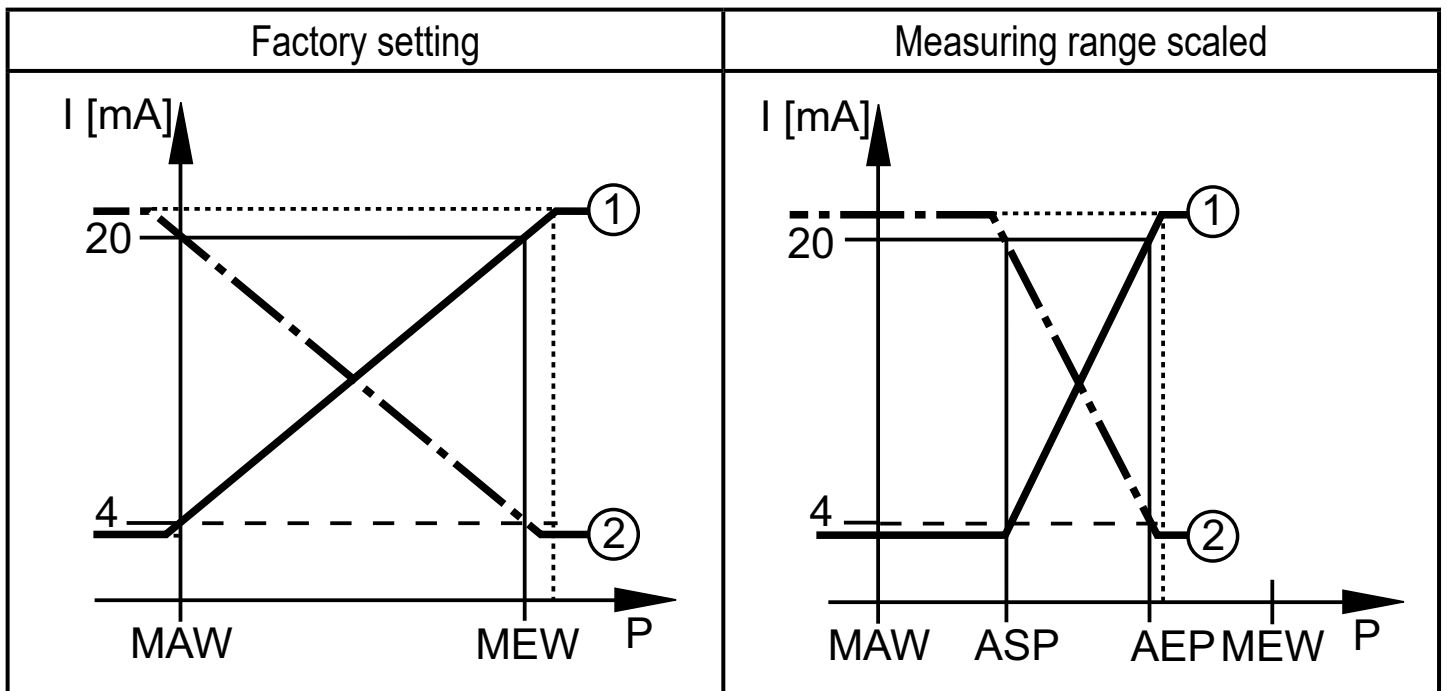
P = system pressure , MAW = initial value of the measuring range, MEW = final value of the measuring range

①: [OU2] = [I]; ②: [OU2] = [InEG]

In the set measuring range the output signal is between 4 and 20 mA ([OU2] = [I]) or between 20 and 4 mA ([OU2] = [InEG]).
It is also indicated:
- System pressure above the measuring range:
  - Output signal > 20 mA at [OU2] = [I].
  - Output signal 4 to 3.8 mA if [OU2] = [InEG].
- System pressure below the measuring range:
  - Output signal 4 to 3.8 mA if [OU2] = [I].
  - Output signal 20 mA at [OU2] = [InEG].

4.4 Customer-specific calibration

The customer-specific calibration changes the curve of measured values compared to the real measured values (shifting / change of the gradient; → 9.4.6 [CAL]).
- Two calibration points can be defined (CP1, CP2). The two points are independent of each other.
- The two calibration points must be within the scaled measuring range (→ 4.3 Pressure monitoring / analogue function).
- The zero point calibration [COF] influences the calibration of the curve of measured values. Recommendation: Set [COF] to 0 (→ 9.4.1 [COF]), then calibrate the curve of measured values.

After a change the calibration can be reset to factory setting (→ 9.5.2 [rES]).
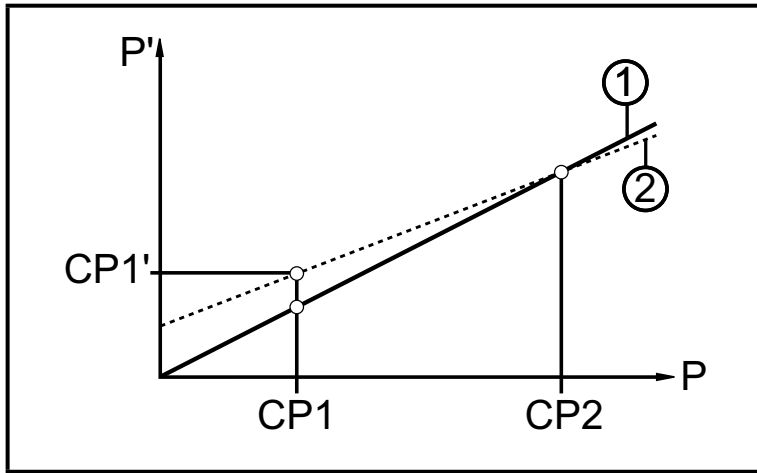
- P = measured pressure;
  P' = modified measured value
- CP1 = calibration point 1
  CP1' = modified measured value for CP1
- CP2 = calibration point 2;
- 1 = curve of measured values with factory setting
- 2 = curve of measured values after calibration

- P = measured pressure;
  P' = modified measured value
- CP1 = calibration point 1
  CP2 = calibration point 2
  CP2' = modified measured value for CP2
- 1 = curve of measured values with factory setting
- 2 = curve of measured values after calibration

- P = measured pressure
  P' = modified measured value
- CP1 = calibration point 1
  CP1' = modified measured value for CP1
- CP2 = calibration point 2
  CP2' = modified measured value for CP2
- 1 = curve of measured values with factory setting
- 2 = curve of measured values after calibration

UK
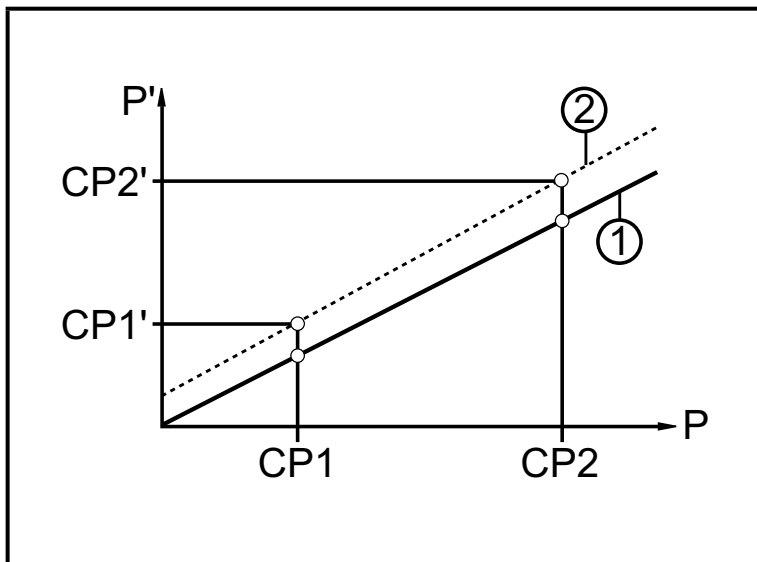
5 Installation

> ⚠ ▶ Before installing and removing the unit make sure that no pressure is applied to the system and there is no medium in the pipe. Please note when the system pressure is displayed in % of the span: "0" does not mean that no pressure is applied to the system!
>
> ▶ Note dangers related to external system / medium temperatures.

5.1 Units with G1 / Aseptoflex Vario process connection

▶ Insert the unit with process adapter into the process connection and tighten using a spanner.

> ℹ Information about available adapters at www.ifm.com.
>
> ▶ Observe the instructions of the adapter.
>
> ▶ Use a lubricating paste which is suitable and approved for the application.
>
> ▶ Tighten firmly. Recommended tightening torque: 35 Nm.
> Depends on the sealing type, the pressure load and the lubrication!

The unit can be fixed to different process connections.
Options are as follows:

1	**Installation using an adapter with sealing ring (hygiene-compliant)**
	Order no. E332xx / E333xx. ▶ To meet the hygiene regulations use a process adapter with leakage port. The adapters are supplied with EPDM O-ring (order no. E30054). More sealing rings are available as accessories: • FKM O-ring (order no. E30123) • PEEK sealing ring (order no. E30124). The PEEK sealing ring is long-term stable and maintenance-free. ▶ When you replace the PEEK sealing ring or change from a PEEK sealing ring to an O-ring, the process adapter also needs to be replaced with a new equivalent adapter.

2	**Installation using a welding adapter with sealing ring (hygiene-compliant)**
	▶ To meet the hygiene regulations use a process adapter with leakage port.
	▶ Make sure that the process adapter does not warp during welding. Use welding mandrel E30452.
	▶ The sealing edge must not be damaged by subsequent surface treatment (→ instructions in operating instructions of the adapter).
	The adapter is supplied with EPDM O-ring (order no. E30054). Another sealing ring is available as accessory:
	• FKM O-ring (order no. E30123).
3	**Installation using a process adapter with metal-to-metal seal**
	Order no. E337xx / E338xx
	[!] A long-term stable and maintenance-free fitting without bug traps in the metal-to-metal seal is only valid for once-only mounting.
	▶ If the sealing has to be installed several times, use a new adapter.
4	**Installation to G 1 flange / G 1 bush**
	The process is sealed with the sealing ring at the back of the process connection.
	▶ The sealing area at the flange / bush must be flush with the tapped hole and have a surface characteristic of min. Rz = 6.3.

5.2 Use in hygienic areas to 3-A
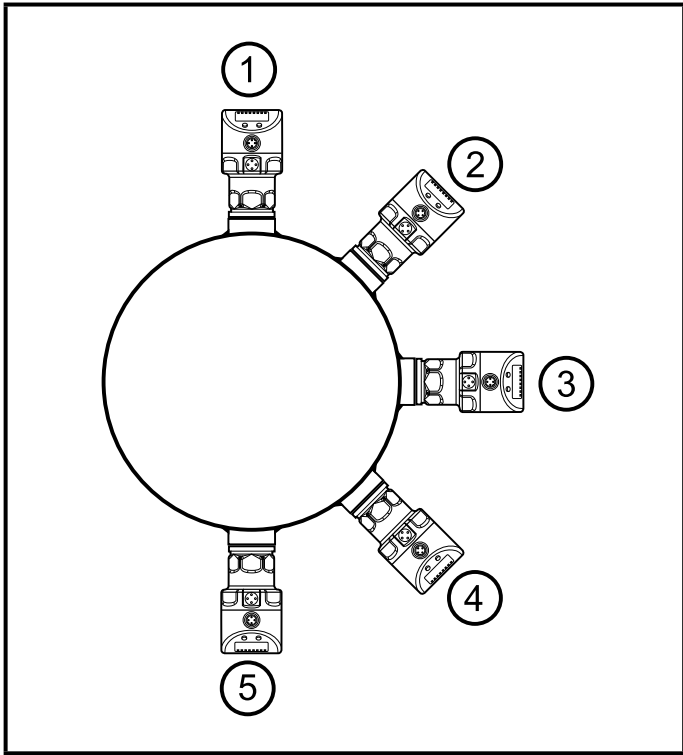
The following applies to units with 3-A certification:

▶ Only use adapters with 3-A certification for the process connection.

▶ Do not install the unit at the lowest point of the pipe or tank
(→ position 5) in order that the medium can run off the area of the measuring element.

5.3 Use in hygienic areas to EHEDG

[!] In case welded adapters are used, the food contact surface must be smooth (surface roughness Ra < 0.8 µm) and the welding has to be done according to EHEDG Guideline 9 and35.

[!] The sensor is suited for CIP (cleaning in process) when installed correctly.
   ▶ Observe the application limits (temperature and material resistance) according to the data sheet.

▶ Make sure that the sensor is integrated into the system according to EHEDG:

▶ Use self-draining installation.

▶ Only use process adapters permitted according to EHEDG with special seals required by the EHEDG position paper.

[!] The gasket of the system interface must not be in contact with the sealing point of the sensor.

▶ In case of structures in a tank, the installation must be flush mount. If not possible then direct water jet cleaning and cleaning of dead spaces must be possible.

▶ Leakage ports must be clearly visible and must be installed facing downwards for vertical pipes.
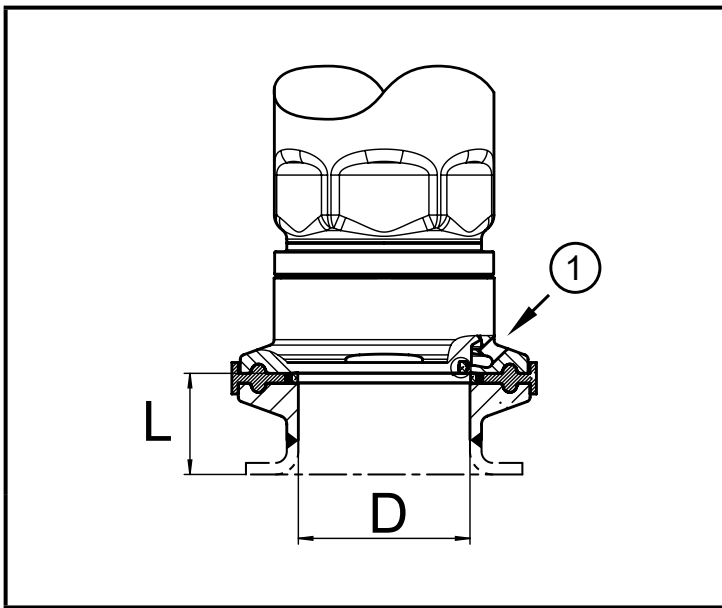
▶ To avoid dead space adhere to the dimensions:
L < (D).

1: Leakage port

5.4 Ventilation diaphragm

5.4.1 Function ventilation diaphragm

The ventilation diaphragm enables the relative pressure measurement since barometric and temperature-dependent pressure fluctuations between the measuring cell and the environment are compensated for.

The ventilation diaphragm is protected against damage by a screwed filter cover with circumferential ports.

[!] For a correct functioning of the diaphragm please take the following into account:

▶ Remove soiling and cleaning agents immediately using plenty of lime-deficient splash water.

[!] If the sensor is in a cooling stage:

▶ Avoid contact of the diaphragm with liquids:

> Avoids negative pressure in the measuring system resulting in a slightly falsified measured value and additional strain on the diaphragm.

13

5.4.2 Orientation

When the sensor is mounted in a vertical position, the condensate escapes through the ports in the filter cover due to gravity.

> [!] When the sensor is mounted in a horizontal position and the display is facing upwards or downwards, the escape of the condensate through the filter cover is reduced since it is at the highest or lowest position (→ Fig. Orientation of the filter cover).

▶ Recommendation:
Use accessories (→ 5.5, 4)to bring the ventilation diaphragm into a vertical position = ideal orientation (1).

> The condensate can escape faster due to gravity.
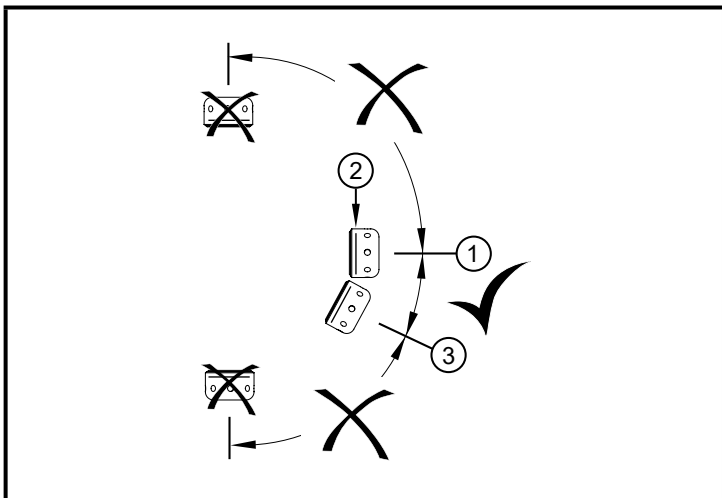
▶ Ideal orientation (1):
Filter cover in horizontal position.
The ventilation diaphragm (2)
in the filter cover is in a vertical position.

▶ Maximum inclination: 30° (3)

Fig.: Orientation filter cover

5.5 Filter cover

Replace filter cover:

1	Exchange the filter cover incl. GORE diaphragm (E30142).
2	Replace the filter cover with a closed version (E30148) (*)

Improve the protection of the filter cover:

3	Replace the filter cover with a version with a tube fitting and a vent tube that ends in a protected and dry area (E30139).
4	Set of accessories (E30467) with integrated replacement diaphragm (GORE), for high degree of soiling and / or high climate pollution. Function: (→ Installation instructions E30467)

!	▶ Avoid soiling and moisture during the replacement
	▶ Clean the thread carefully and without residues
	▶ Do not damage the adhesive area of the sensor
	▶ Observe the orientation of the filter cover (→ Installation instructions E30139 / 30467)
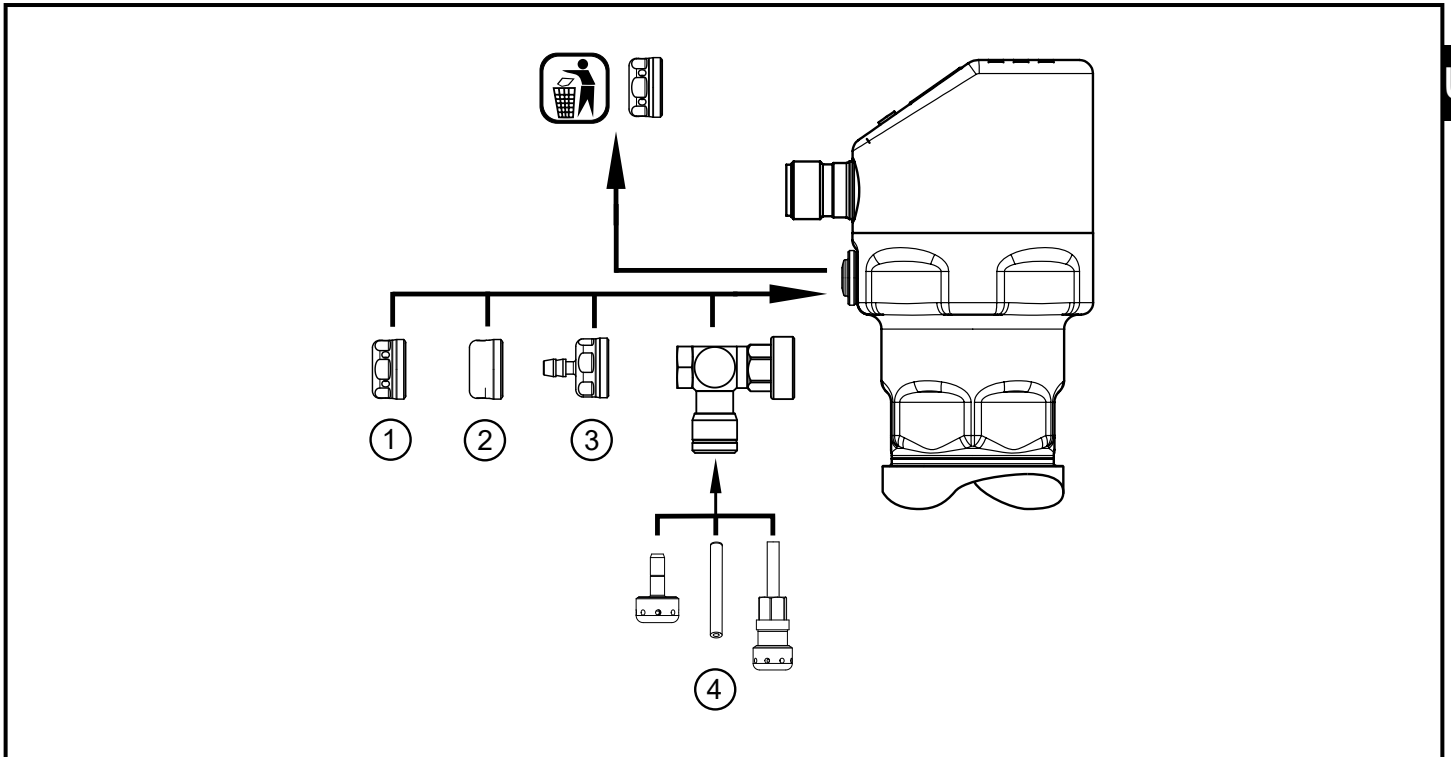
!	(*) When using the closed filter cover, there is no pressure compensation of the measuring cell any more. This results in measurement deviations caused by:

- fluctuations of the atmospheric pressure
- pressure fluctuations inside the unit in case of temperature changes (Δ 10 K ≤ 30 mbar).

6 Electrical connection

⚠ The unit must be connected by a qualified electrician.
The national and international regulations for the installation of electrical equipment must be adhered to.
Voltage supply according to EN 50178, SELV, PELV.

▶ Disconnect power.

▶ Connect the unit as follows:

6.1 Connection for 2-wire operation

Core colours	
BN	brown
WH	white

OUT: Analogue output 4...20 mA

Colours to DIN EN 60947-5-2

6.2 Connection for 3-wire operation

Core colours	
BK	black
BN	brown
BU	blue
WH	white

OUT1: Switching output or IO-Link

OUT2: Switching output or analogue output

Colours to DIN EN 60947-5-2

Wiring example

2 x pnp	2 x npn

Wiring example	
1 x pnp / 1 x analogue	1 x npn / 1 x analogue
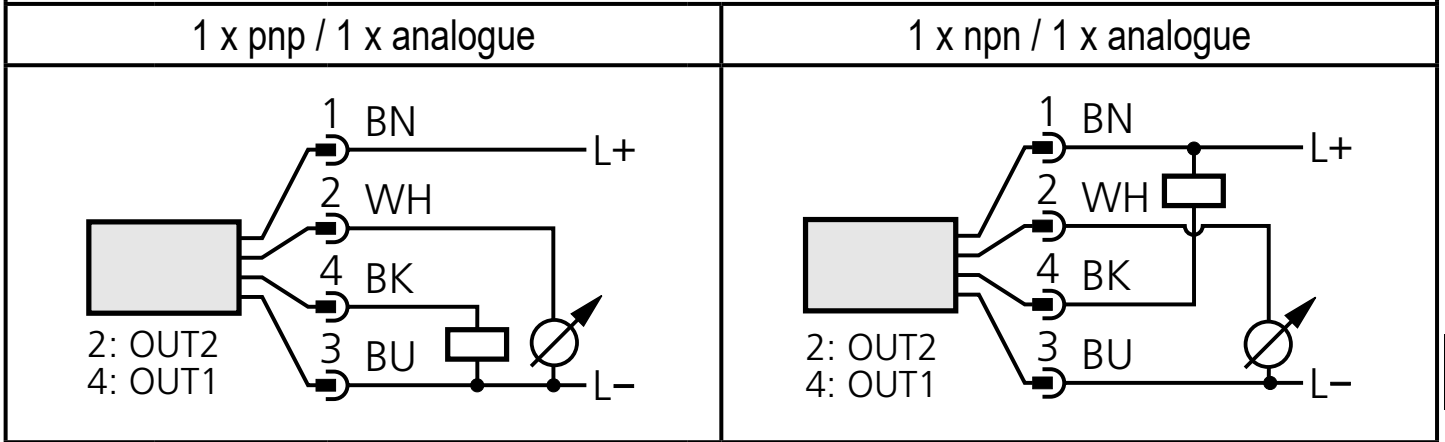
⚠ If analogue signal current (I) is selected in the menu under OU2 and the output is not connected (resistance = infinite), the error message W532 is displayed in intervals. The measuring result remains unaffected.

▶ Alternatively: Switch OU2 to switching output.

7 Operating and display elements
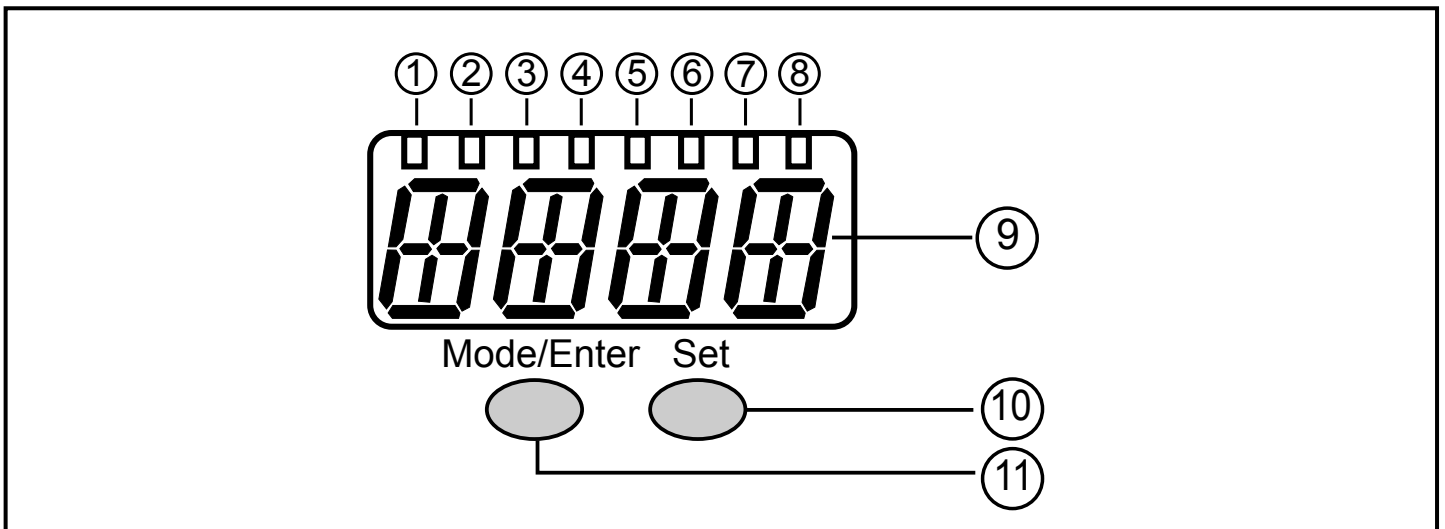
1 to 8: Indicator LEDs

- LED 1 to LED 5 = system pressure in the specified unit of measurement.
- LED 6 = system pressure in % of the set scaling of the analogue output (range ASP to AEP) if [OU2] is configured as analogue output.
  System pressure in % of the final value of the measuring range if [OU2] is configured as switching output.
- LED 7 = switching status OUT2 (on if output 2 is switched).
- LED 8 = switching status OUT1 (on if output 1 is switched).

9: Alphanumeric display, 4 digits

- Display of the current system pressure.
- Indication of the parameters and parameter values.

17

10: Set button
- Setting of the parameter values (scrolling by holding pressed, incrementally by pressing once).
11: Mode/Enter button
- Selection of the parameters and acknowledgement of the parameter values.

8 Menu

8.1 Menu structure: main menu
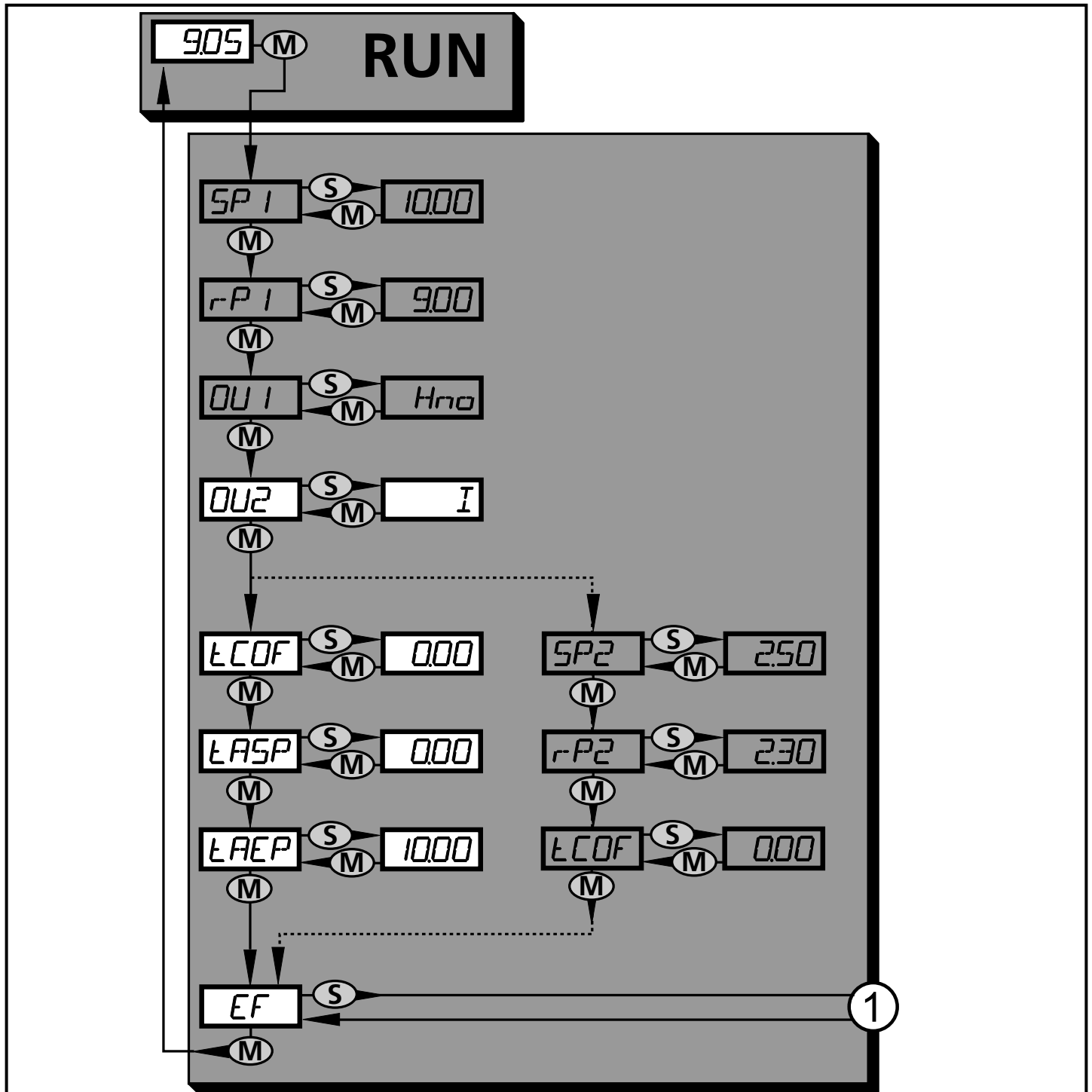
1: Change to menu level 2 (extended functions)

Menu items highlighted in grey (SP1) are not active in 2-wire operation

18

8.2 Explanation of the main menu

SP1/rP1*	Upper / lower limit for system pressure at which OUT1 switches.
OU1*	Output function for OUT1: • Switching signal for the pressure limits: hysteresis function [H ..] or window function [F ..], either normally open [. no] or normally closed [. nc].
OU2	Output function for OUT2: • Switching signal for the pressure limits: hysteresis function [H ..] or window function [F ..], either normally open [. no] or normally closed [. nc] (only available for 3-wire operation). • Analogue signal for the current system pressure: 4...20 mA [I], 20...4 mA [InEG].
tCOF	Teach zero-point calibration.
tASP	Teach analogue start point for system pressure: set measured value at which 4 mA is provided (20 mA if [OU2] = [InEG]).
tAEP	Teach analogue end point for system pressure: set measured value at which 20 mA is provided (4 mA if [OU2] = [InEG]).
SP2/rP2*	Upper / lower limit for system pressure at which OUT2 switches.
EF	Extended functions / opening of menu level 2.

* menu items not active in 2-wire operation

UK

8.3 Menu structure: level 2 (extended functions)
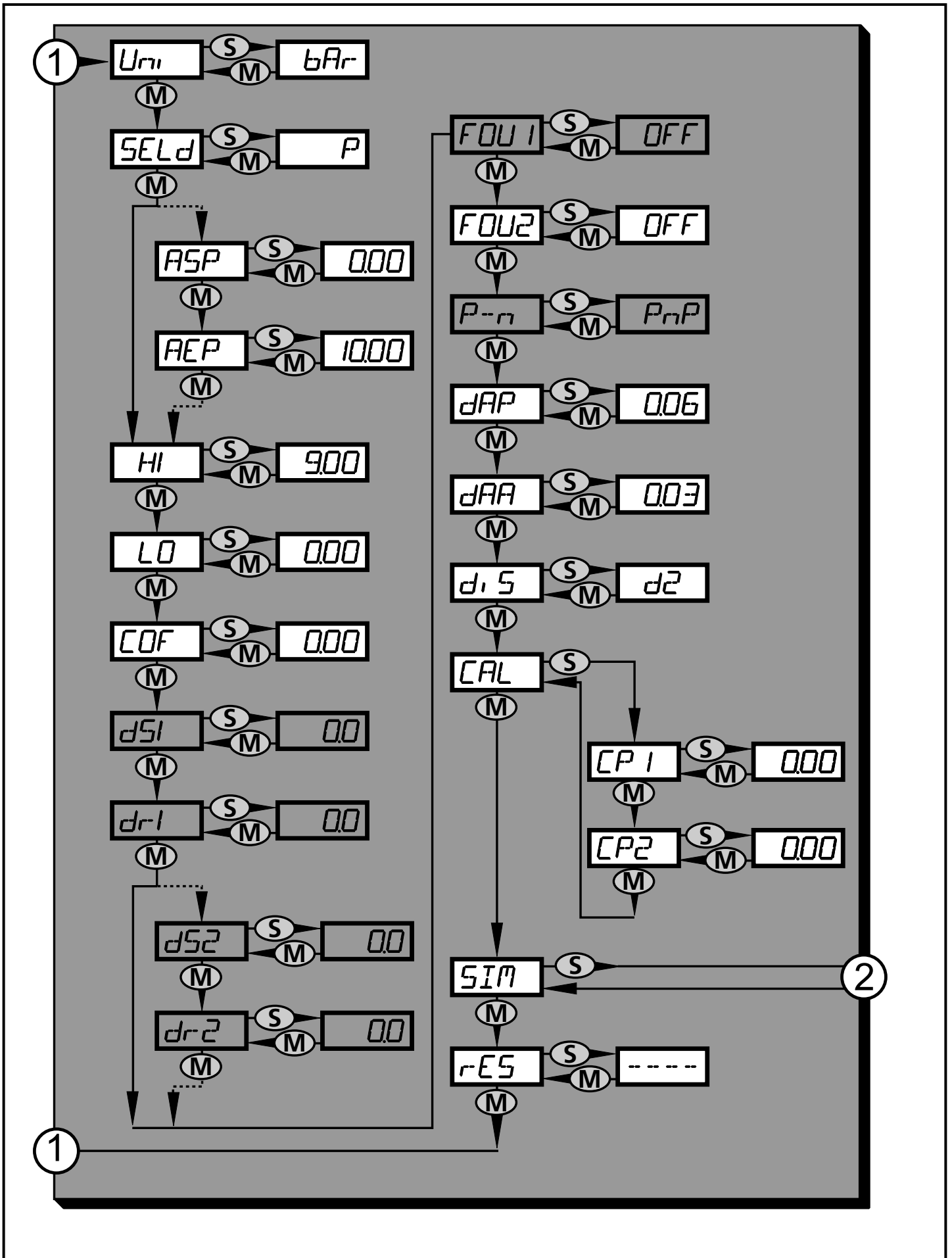
1: Change to the main menu, 2: Change to menu level 3 (simulation).
Menu items highlighted in grey (ASP) are not active in 2-wire operation

20

8.4 Explanation of menu level 2

Uni	Standard unit of measurement for system pressure.
SELd	Display mode: • Pressure in the unit set in [Uni]. • Pressure in % of the set scaling of the analogue output.
ASP	Analogue start point for system pressure: measured value at which 4 mA is provided (20 mA if [OU2] = [InEG]).
AEP	Analogue end point for system pressure: measured value at which 20 mA is provided (4 mA if [OU2] = [InEG]).
HI	Maximum value memory for system pressure.
LO	Minimum value memory for system pressure.
COF	Zero-point calibration.
dS1*	Switch-on delay for OUT1.
dr1*	Switch-off delay for OUT1.
dS2*	Switch-on delay for OUT2: only active if [OU2] = [Hnc], [Hno], [Fnc] or [Fno].
dr2*	Switch-off delay for OUT2; only active if [OU2] = [Hnc], [Hno], [Fnc] or [Fno].
FOU1*	Status of output 1 in case of an internal fault.
FOU2	Status of output 2 in case of an internal fault.
P-n*	Switching logic for the outputs: pnp or npn.
dAP	Damping for switching outputs and display.
dAA	Damping for analogue output (OUT2); also has an effect on the IO-Link process value.
diS	Update rate and orientation of the display.
CAL	Calibration function (setting the curve of measured values).
CP1	Calibration point 1
CP2	Calibration point 2
SIM	Change to menu level 3 (simulation).
rES	Restore factory setting.

UK

* menu items not active in 2-wire operation

8.5 Menu structure: level 3 (simulation)
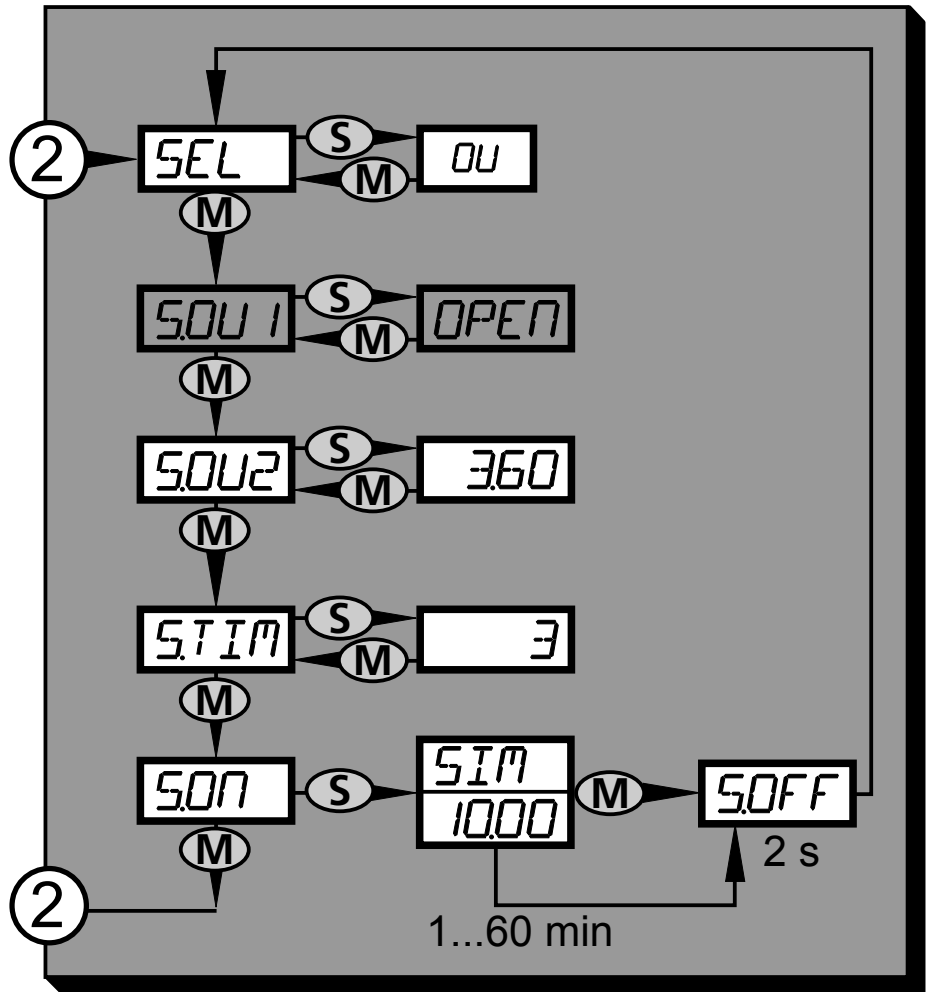
With setting SEL = OU	
With setting SEL = Proc	
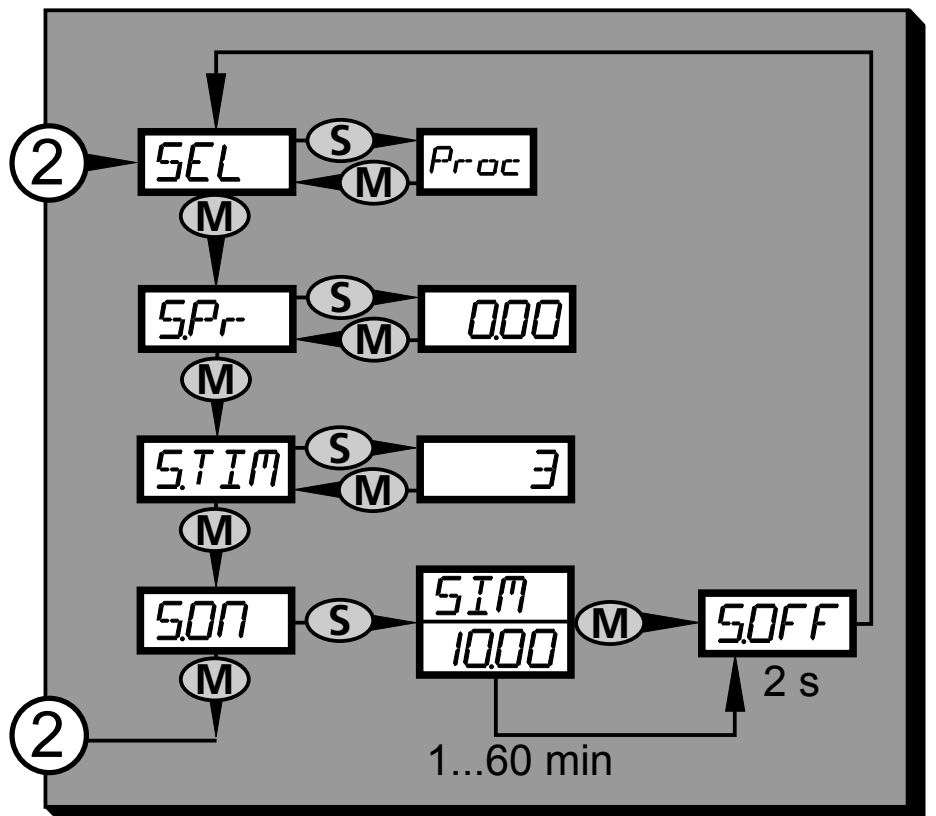
2: Change to menu level 2 (extended functions)
Menu items highlighted in grey (S.OU1) are not active in 2-wire operation

8.6 Explanation of menu level 3

With setting SEL = OU	
SEL	Status to be simulated: • Output functions [OU].
S.OU1*	Simulation values for OUT1, only active for 3-wire operation and if [SEL] = [OU]. • Output inactive [OPEN] or output active [CLOS].
S.OU2	Simulation values for OUT2, only active if [SEL] = [OU]. • For 3-wire operation and if OUT2 has been configured as switching output: output inactive [OPEN] or active [CLOS]. • If OUT2 is set as analogue output: analogue signal between 3.6 and 21.1 mA (depending on the set value → 9.6.2).
S.TIM	Time for the simulation process in minutes.
S.ON	Start of the simulation process. During the simulation process the display alternately shows [SIM] and the current operation indication (→ 9.6.4). If the simulation process is aborted (briefly press [Mode/Enter] or [Set]), [S.OFF] is indicated for 2 s, then [SEL] is active again.

* menu item not active in 2-wire operation

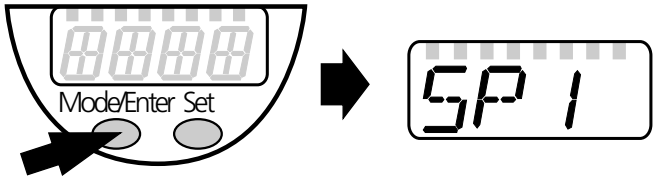| With setting SEL = Proc	
SEL	Status to be simulated: • Process value [Proc].
S.Pr	Simulation of a process value; only active if [SEL] = [Proc]. • Any value between initial value of the measuring range and final value of the measuring range.
S.TIM	Time for the simulation process in minutes.
S.ON	Start of the simulation process. During the simulation process the display alternately shows [SIM] and the current operation indication (→ 9.6.4). If the simulation process is aborted (briefly press [Mode/Enter] or [Set]) [S.OFF] is indicated for 2 s, then [SEL] is active again.

UK
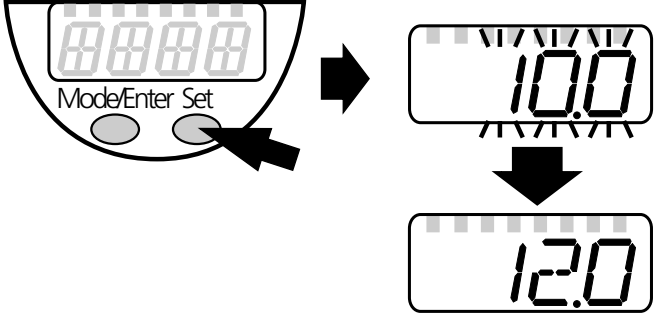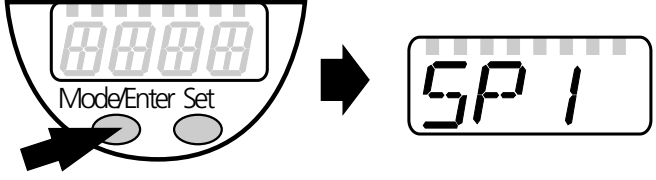
9 Parameter setting

During parameter setting the unit remains in the operating mode. It continues to monitor with the existing parameters until the parameter setting has been completed.

Exemptions: Changes to the parameters COF (→ 9.4.1), CP1 and CP2 (→ 9.4.7) take effect immediately.

9.1 Parameter setting in general

3 steps must be taken for each parameter setting:

1	**Select parameter** ▶ Press [Mode/Enter] until the requested parameter is displayed. If the main menu is protected by an access code, [Cod0] flashes in the display. ▶ Press and hold down [Set] until the valid code no. is displayed. ▶ Briefly press [Mode/Enter]. When delivered by ifm electronic: no access restriction.	
2	**Set parameter value** ▶ Press and hold down [Set]. > Current setting value of the parameter flashes for 5 s. > After 5 s: setting value is changed: incrementally by pressing the button once or continuously by keeping the button pressed.	
	Numerical values are incremented continuously. For reducing the value: let the display move to the maximum setting value. Then the cycle starts again at the minimum setting value.	
3	**Acknowledge parameter value** ▶ Briefly press [Mode/Enter]. > The parameter is displayed again. The new setting value is saved.	
Set other parameters ▶ Start again with step 1.		
Finish parameter setting ▶ Press [Mode/Enter] several times until the current measured value is displayed or wait for 15 s. > The unit returns to the operating mode.		

24

| | In 2-wire operation the menu items referring to switching functions are not active (→ 8 Menu structure); in addition, those parameter values of some menu items referring to switching functions cannot be selected. |

- If [SLoc] is displayed when attempting to change a parameter value, the sensor is locked by the software. This locking can only be removed with a parameter setting software.
- In case of parameter setting with the user interface of the ifm Container program, the values are directly set in the specified fields.

- For IO-Link parameter setting → device-specific parameter lists at: www.ifm.com
- Change from menu level 1 to menu level 2:

▶ Press [Mode/Enter] until [EF] is displayed.	*Mode/Enter Set* → **EF**
▶ Briefly press [Set]. > The first parameter of the submenu is displayed (here: [Uni]). If menu level 2 is protected by an access code, "Cod1" flashes in the display. ▶ Press and hold down [Set] until the valid code no. is displayed. ▶ Briefly press [Mode/Enter]. When delivered by ifm electronic: no access restriction.	*Mode/Enter Set* → **Uni**

- Locking / unlocking

  The unit can be locked electronically to prevent unintentional settings.

▶ Make sure that the unit is in the normal operating mode. ▶ Press [Mode/Enter] + [Set] for 10 s. > [Loc] is displayed.	*Mode/Enter Set* 10 s → **Loc**
During operation: [Loc] is briefly displayed if you try to change parameter values.	
For unlocking: ▶ Press [Mode/Enter] + [Set] for 10 s. > [uLoc] is displayed.	*Mode/Enter Set* 10 s → **uLoc**

On delivery: not locked.

- Timeout:

If no button is pressed for 15 s during parameter setting, the unit returns to the operating mode with unchanged values.

9.2 Configure display (optional)

▶ Select [Uni] and set the unit of measurement:
  - [bAr], [mbAr].
  - [MPA], [kPA].
  - [PSI] (only PI2793, PI2794, PI2795, PI2796, PI2797, PI2799).
  - [InHO] (only PI2789, PI2796, PI2797, PI2798, PI2799).
  - [mWS] (only PI2796, PI2797, PI2799).
  - [mmWS] (only PI2789 and PI2798).
	[Uni]

▶ Select [SELd] and set type of display:
  - [P]: system pressure in the unit set in Uni.
  - [P%]: system pressure in % of the set scaling of the analogue output; the following applies: 0% = ASP value / 100% = AEP value.
    If OU2 is configured as switching output, [ASP] and [AEP] are not active. In this case the following applies: 0% = initial value of the measuring range / 100% = final value of the measuring range.
If [SELd] = [P%], please note the following: "0" does not mean that no pressure is applied to the system!
	[SELd]

▶ Select [diS] and set the update rate and orientation of the display:
  - [d1]: update of the measured values every 50 ms.
  - [d2]: update of the measured values every 200 ms.
  - [d3]: update of the measured values every 600 ms.
  - [rd1], [rd2], [rd3]: display as with d1, d2, d3; rotated by 180°.
  - [OFF] = The measured value display is deactivated in the Run mode. When one of the buttons is pressed, the current measured value is displayed for 15 s. Pressing the [Mode/Enter] button again activates the display mode. The LEDs remain active even if the display is deactivated.
    Error messages are displayed even if the display is deactivated.
	[diS]

9.3 Set output signals

9.3.1 Set output functions

▶ Select [OU1] and set the switching function:
  - [Hno] = hysteresis function / normally open
  - [Hnc] = hysteresis function / normally closed
  - [Fno] = window function/normally open
  - [Fnc] = window function/normally closed
	[OU1]

▶ Select [OU2] and set the function: - [Hno] = hysteresis function / normally open - [Hnc] = hysteresis function / normally closed - [Fno] = window function/normally open - [Fnc] = window function/normally closed - [I] = current signal proportional to pressure 4…20 mA - [InEG] = current signal proportional to pressure 20…4 mA.	[OU2]

9.3.2 Set switching limits

UK

▶ Select [SP1] / [SP2] and set the value at which the output switches.	[SP1] [SP2]
▶ Select [rP1] / [rP2] and set the value at which the output switches off. rPx is always smaller than SPx. The unit only accepts values which are lower than the value for SPx.	[rP1] [rP2]

9.3.3 Scale analogue value for OUT2

▶ Set the minimum pressure requested in the system. ▶ Press [Mode/Enter] until [tASP] appears. ▶ Press and hold down [Set]. > Current setting value flashes. ▶ Release [Set] when the display stops flashing. > New setting value is displayed. ▶ Briefly press [Mode/Enter]. > The current system pressure is defined as start value for the analogue signal.	[tASP]
▶ Set the maximum pressure requested in the system. ▶ Press [Mode/Enter] until [tAEP] appears. ▶ Press and hold down [Set]. > Current setting value flashes. ▶ Release [Set] when the display stops flashing. > New setting value is displayed. ▶ Briefly press [Mode/Enter]. > The current system pressure is defined as end value for the analogue signal.	[tAEP]
ASP / AEP can only be set within defined limits (→ 12.1 Setting ranges). If settings are made with invalid pressure value, [UL] or [OL] is displayed. After acknowledgement by [Mode/Enter], [Err] flashes; the ASP value / AEP value is not changed.	

Alternatively: ▶ Select [ASP] and set the measured value at which 4 mA is provided (20 mA if [OU2] = [InEG]). ▶ Select [AEP] and set the measured value at which 20 mA is provided (4 mA if [OU2] = [InEG]). Minimum distance between ASP and AEP = 25 % of the final value of the measuring range (turn-down 1:4).	[ASP] [AEP]

9.4 User settings (optional)

9.4.1 Carry out zero point calibration

▶ Select [COF] and set a value between -5 % and 5 % of the final value of the measuring range. The internal measured value "0" is shifted by this value.	[COF]
Alternatively: automatic adjustment of the offset in the range 0 bar ± 5 %. ▶ Make sure that no pressure is applied to the system. ▶ Press [Mode/Enter] until [tCOF] appears. ▶ Press and hold down [Set]. > The current offset value (in %) flashes briefly. > The current system pressure is displayed. ▶ Release [Set]. ▶ Briefly press [Mode/Enter] (= to confirm the new offset value).	[tCOF]

9.4.2 Set output status in fault condition

▶ Select [FOU1] and set the value:
  - [On] = output 1 switches ON in case of an error.
  - [OFF] = output 1 switches OFF in case of an error.
  - [OU] = output 1 switches irrespective of the error as defined with the parameters SP1, rP1 and OU1.
▶ Select [FOU2] and set the value:
  - [On] = output 2 switches ON in case of a fault, the analogue signal goes to the upper final value.
  - [OFF] = output 2 switches OFF in case of a fault, the analogue signal goes to the lower final value.
  - [OU] = output 2 switches irrespective of the fault as defined with the parameters SP2, rP2, OU2. The analogue signal corresponds to the measured value.
	[FOU1]
	[FOU2]

Error indications → 10.3

9.4.3 Set delay time for the switching outputs

[dS1] / [dS2] = switch-on delay for OUT1 / OUT2. [dr1] / [dr2] = switch-off delay for OUT1 / OUT2. ▶ Select [dS1], [dS2], [dr1] or [dr2] and set a value between 0.1 and 50 s (at 0.0 the delay time is not active).	[dS1] [dr1] [dS2] [dr2]

9.4.4 Set output logic for the switching outputs

▶ Select [P-n] and set [PnP] or [nPn].	[P-n]

9.4.5 Set damping for the switching signal

▶ Select [dAP] and set a value between 0.00 and 30.00 s; (at 0.00 [dAP] is not active). dAP value = response time between pressure change and change of the switching status in seconds. [dAP] influences the switching frequency: f_{max} = 1 ÷ 2dAP. [dAP] also has an effect on the display.	[dAP]

9.4.6 Set damping for the analogue signal

▶ Select [dAA] and set a value between 0.01 and 99.99 s; (at 0.00 [dAA] is not active). dAA value = response time between pressure change and change of the analogue signal in seconds.	[dAA]

9.4.7 Calibrate curve of measured values

▶ Set a defined reference pressure between ASP and AEP in the system. ▶ Select [CAL]. ▶ Briefly press [Set]. > [CP1] is displayed. ▶ Press [Set] for 5 s. > The pressure measured by the unit is displayed. ▶ Press [Set] until the set reference pressure is indicated (measured pressure = reference pressure) or the corresponding analogue signal is provided on OUT2. Maximum correction value = ± 2 % of the final value of the measuring range. ▶ Briefly press [Mode/Enter]. > [CP1] is displayed. ▶ Briefly press [Mode/Enter]. > [CP2] is displayed. Continue with a) or b).	[CAL] [CP1]

a) Finish calibration: ▶ Briefly press [Mode/Enter]. > [CAL] is displayed. b) Change a 2nd point on the curve of measured values: ▶ Set a second defined reference pressure in the system. Minimum distance between the calibration points CP1 and CP2 = 5 % of the final value of the measuring range. ▶ Press [Set] for 5 s. > The pressure measured by the unit is displayed. ▶ Press [Set] until the set reference pressure is indicated (measured pressure = reference pressure) or the corresponding analogue signal is provided on OUT2. Maximum correction value = ± 2 % of the final value of the measuring range. ▶ Briefly press [Mode/Enter]. > [CP2] is displayed. ▶ Briefly press [Mode/Enter]. > [CAL] is displayed, the process is finished.	[CP2]

9.5 Service functions

9.5.1 Read min/max values for the system pressure

▶ Select [HI] or [LO] and briefly press [Set]. [HI] = maximum value, [LO] = minimum value. Delete memory: ▶ Select [HI] or [LO]. ▶ Press and hold down [Set] until [----] is displayed. ▶ Briefly press [Mode/Enter].	[HI] [LO]

9.5.2 Reset all parameters to factory setting

▶ Select [rES]. ▶ Press and hold down [Set] until [----] is displayed. ▶ Briefly press [Mode/Enter]. We recommend noting down your own settings before carrying out a reset (→ 13 Factory setting).	[rES]

9.6 Simulation function

9.6.1 Open menu level 3 (simulation)

▶ Select [EF] and briefly press [Set] (= to open menu level 2). ▶ Select [SIM] and briefly press [Set] (= to open menu level 3). > [SEL] is displayed.	[EF] [SIM]

9.6.2 Set simulation value

Output states
If [SEL] is active:
▶ Press and hold down [Set] until [OU] is displayed.
▶ Briefly press [Mode/Enter].
> [S.OU1] is displayed (in 2-wire operation [S.OU2] is displayed).
▶ Press [Set] to set the requested value:
   - [OPEN] = output 1 not active / open.
   - [CLOS] = output 1 active / closed.
▶ Briefly press [Mode/Enter].
> [S.OU2] is displayed.
▶ Press [Set] to set the requested value:
   • If [OU2] = [Hnc], [Hno], [Fnc] or [Fno] (not in 2-wire operation):
     - [OPEN] = output 2 not active / open.
     - [CLOS] = output 2 active / closed.
   • If [OU2] = [I] or [InEG]:
     - 3.60...21.10 mA in steps of 0.01 mA.
▶ Briefly press [Mode/Enter].
	[SEL]
	[S.OU1]
	[S.OU2]

Process value If [SEL] is active: ▶ Press and hold down [Set] until [Proc] is displayed. ▶ Briefly press [Mode/Enter]. > [S.Pr] is displayed. ▶ Press [Set] to set the requested pressure value. ▶ Briefly press [Mode/Enter].	[SEL] [S.Pr]

9.6.3 Set time for simulation

▶ Select [S.TIM] and set the value between 1...60 minutes.	[S.TIM]

9.6.4 Start simulation

▶ Select [S.ON].
▶ Press and hold down [Set] until the display alternately shows [SIM] and the current operation indication.
Current operation indication:
  - Current system pressure if [SEL] = [OU].
  - Simulated measured value set in [S.Pr] if [SEL] = [Proc].
After the simulation time has elapsed, [S.OFF] is displayed for 2 s, then [SEL].
	[S.ON]

Abort simulation: ▶ Briefly press [Mode/Enter] or [Set]. > [S.OFF] is displayed for 2 s, then [SEL].	

10 Operation

After power on, the unit is in the Run mode (= normal operating mode). It carries out its measurement and evaluation functions and provides output signals according to the set parameters.

Operation indication → chapter 7 Operating and display elements.

10.1 Read set parameters

▶ Press [Mode/Enter] until the requested parameter is displayed.

▶ Briefly press [Set].

> The unit displays the corresponding parameter value for approx. 15 s. After 15 s, it again displays the parameter, then it returns to the Run mode.

10.2 Change the display in the Run mode

▶ Briefly press [Set] in the Run mode.

> The unit displays the current measured value in the selected type of display for approx. 15 s:
  - System pressure in the unit set in Uni.
  - System pressure in % of the set scaling of the analogue output if [OU2] is configured as analogue output.
  - System pressure in % of the final value of the measuring range if [OU2] is configured as switching output

10.3 Self-diagnostics / error displays

The unit has many self-diagnostic options:

- It monitors itself automatically during operation.
- It indicates warnings and faults via IO-Link and via display (even if the display is deactivated).
- If a fault is found, the outputs are set according to the set parameters FOU1 and FOU2 (→ 9.4.2).

UK

Display	Warning	Error	Status LED	Type of fault	Corrective measures
*OFF		X		Supply voltage too low.	▶ Check / correct the supply voltage. ▶ In 2-wire operation: Check / correct the connected load.
SC1			OUT1 flashing	Excessive current switching output 1.	▶ Check switching output 1 for short circuit or excessive current; remove the fault.
SC2			OUT2 flashing	Excessive current switching output 2.	▶ Check switching output 2 for short circuit or excessive current; remove the fault.
SC	X		OUT1 and OUT2 flashing	Excessive current switching output 1 and switching output 2.	▶ Check switching outputs 1 and 2 for short circuit or excessive current; remove the fault.
PARA		X		Parameter setting outside the permissible range.	▶ Repeat parameter setting.
OL	X			Above the measuring range: measured value greater +5% VMR	▶ Check / reduce system pressure.
UL	X			Below the measuring range: measured value smaller +5% VMR	▶ Check / increase system pressure.
E100		X		Internal sensor error detected.	▶ Replace the unit.

* In case of undervoltage (fault no. W403) nothing is displayed.
** 2 = Out of Spec; 4 = Failure

33

Display	Warning	Error	Status LED	Type of fault	Corrective measures
W531	X			Analogue output at the upper limit (20.5 mA).	▶ Increase AEP value if possible (if [OU2] = [InEG] ASP value) or reduce system pressure.
Loc	X			Setting buttons on the unit locked, parameter change rejected.	▶ Unlock.
C.Loc	X			Parameter setting locked via pushbutton, parameter setting is active via IO-Link communication.	▶ Finish the IO-Link communication before parameters are set on the sensor.
S.Loc	X			Setting buttons locked via parameter setting software, parameter change rejected.	▶ Unlock sensor via parameter setting software.
W530	X			Analogue output at the lower limit (3.8 mA).	▶ Reduce ASP value if possible (if [OU2] = [InEG] AEP value) or increase system pressure.
W532	X			Load at analogue output too high.***	▶ Reduce load at output 2 or increase the supply voltage.
W203	X			Fault during the temperature compensation of the pressure measurement.	The unit uses a higher temperature coefficient (i.e. with reduced accuracy). ▶ Replace the unit.
W703	X			Medium temperature too high (> 150 °C).	Reduce the medium temperature.
W704	X			Medium temperature too low (< -30 °C).	Increase the medium temperature.
W161	X			Unit temperature too high (> 90 °C).	Unit outside the specification. ▶ Do not insulate the installation.

* In case of undervoltage (fault no. W403) nothing is displayed.
** 2 = Out of Spec; 4 = Failure

Display	Warning	Error	Status LED	Type of fault	Corrective measures
W162	X			Unit temperature too low (< -30 °C).	Unit outside the specification. ▶ Insulate the installation.

* In case of undervoltage (fault no. W403) nothing is displayed.

** 2 = Out of Spec; 4 = Failure

*** This message is only displayed for 3-wire operation. For 2-wire operation undervoltage is detected and displayed. If OU2 is not used for the application, the message can be suppressed by defining a switching function for OU2 (→ 9.3.1).

10.4 Setting ranges

		SP1 / SP2		rP1 / rP2		ASP		AEP		ΔP
		min	max	min	max	min	max	min	max	
PI2793	bar	-0.96	25.00	-1.00	24.96	-1.00	18.74	5.24	25.00	0.02
	psi	-13.8	362.7	-14.4	362.1	-14.4	271.8	76.2	362.7	0.3
	MPa	-0.096	2.500	-0.100	2.496	-0.100	1.874	0.524	2.500	0.002
PI2714	bar	-0.98	16.0	-1.0	15.98	-1.0	12.0	3.0	16.0	0.02
	psi	-14.2	232.0	-14.6	231.6	-14.6	174	43.6	232.0	0.2
	MPa	-0.098	1.6	-0.1	1.598	-0.1	1.2	0.3	1.6	0.002
PI2794	bar	-0.98	10.00	-1.00	9.98	-1.00	7.50	1.50	10.00	0.01
	psi	-14.2	145.0	-14.5	144.7	-14.5	108.7	21.8	145.0	0.1
	MPa	-0.098	1.000	-0.100	0.998	-0.100	0.750	0.150	1.000	0.001
PI2715	bar	-0.99	6.0	-1.0	5.99	-1.0	4.5	0.5	6.0	0.005
	psi	-14.4	87.0	-14.5	86.9	-14.5	65.3	7.3	87.0	0.1
	kPa	-99.0	600.0	-100.0	599.0	-100.0	450.0	50.0	600.0	0.5
PI2795	bar	-0.990	4.000	-1.000	3.990	-1.000	3.000	0.000	4.000	0.005
	psi	-14.35	58.00	-14.50	57.85	-14.50	43.50	0.00	58.00	0.05
	kPa	-99.0	400.0	-100.0	399.0	-100.0	300.0	0.0	400.0	0.5

ΔP = step increment

		SP1 / SP2		rP1 / rP2		ASP		AEP		ΔP
		min	max	min	max	min	max	min	max	
PI2796	bar	-0.120	2.500	-0.124	2.496	-0.124	1.880	0.500	2.500	0.002
	psi	-1.74	36.27	-1.80	36.21	-1.80	27.27	7.26	36.27	0.03
	kPa	-12.0	250.0	-12.4	249.6	-12.4	188.0	50.0	250.0	0.2
	inH$_2$O	-48	1004	-50	1002	-50	755	201	1004	1
	mWS	-1.22	25.49	-1.26	25.45	-1.26	19.17	5.10	25.49	0.01
PI2717	mbar	-96	1600	-100	1598	-100	1200	300	1600	2
	psi	-1.4	23.2	-1.44	23.16	-1.46	17.42	4.34	23.2	0.02
	kPa	-9.6	160.0	-10.0	159.8	-10.0	120.0	30	160.0	0.2
	inH$_2$O	-39	642.5	-40	641	-40	482.0	120.5	642.5	0.5
	mWS	-0.98	16.32	-1.02	16.28	-1.02	12.24	3.06	16.32	0.02
PI2799	mbar	-998	1000	-1000	998	-1000	500	-500	1000	1
	psi	-14.45	14.50	-14.50	14.45	-14.50	7.25	-7.25	14.50	0.05
	kPa	-99.8	100.0	-100.0	99.8	-100.0	50.0	-50.0	100.0	0.1
	inH$_2$O	-400	401	-401	400	-401	201	-201	401	1
	mWS	-10.18	10.20	-10.20	10.18	-10.20	5.10	-5.10	10.20	0.01
PI2797	mbar	-48	1000	-50	998	-50	750	200	1000	1
	psi	-0.70	14.50	-0.73	14.47	-0.73	10.88	2.90	14.50	0.01
	kPa	-4.8	100.0	-5.0	99.8	-5.0	75.0	20.0	100.0	0.1
	inH$_2$O	-19.2	401.6	-20.0	400.8	-20.0	301.2	80.4	401.6	0.4
	mWS	-0.49	10.20	-0.51	10.18	-0.51	7.65	2.04	10.20	0.01
PI2798	mbar	-12.0	250.0	-12.4	249.6	-12.4	187.4	50.0	250.0	0.2
	kPa	-1.20	25.00	-1.24	24.96	-1.24	18.74	5.00	25.0	0.02
	inH$_2$O	-4.8	100.4	-5.0	100.2	-5.0	75.2	20.1	100.4	0.1
	mmWS	-122	2550	-126	2546	-126	1912	510	2550	2
PI2789	mbar	-4.8	100.0	-5.0	99.8	-5.0	75.0	20.0	100.0	0.1
	kPa	-0.48	10.00	-0.50	9.98	-0.50	7.50	2.00	10.00	0.01
	inH$_2$O	-1.92	40.16	-2.00	40.08	-2.00	30.12	8.04	40.16	0.04
	mmWS	-49	1020	-51	1018	-51	765	204	1020	1

ΔP = step increment

11 Factory setting

	Factory setting	User setting
SP1	25% VMR *	
rP1	23% VMR *	
OU1	Hno	
OU2	I	
SP2	75% VMR *	
rP2	73% VMR *	
COF / tCOF	0.0	
ASP / tASP	0% VMR * PI2799: -1 bar	
AEP / tAEP	100% VMR*	
Uni	bAr / mbAr	
SELd	P	
dS1	0.0	
dr1	0.0	
dS2	0.0	
dr2	0.0	
FOU1	OU	
FOU2	OU	
P-n	pnp	
dAP	0.06	
dAA	0.03	
dis	d2	
CP1	0.00	
CP2	0.00	

* = the indicated percentage of the final value of the measuring range (VMR) of the respective sensor (for PI2799 the percentage of the measuring span) is set.

UK