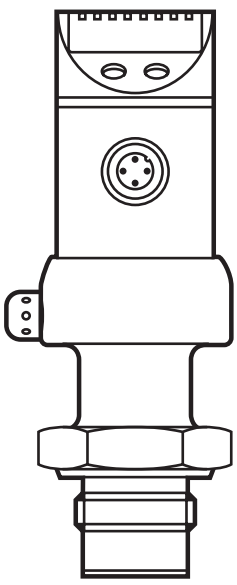
ifm electronic

CE

# Operating instructions
# Electronic pressure sensor
# efectorsoo®
# PI299x

UK



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# Contents

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# 1 Preliminary note

## 1.1 Symbols used

▶ Instruction

> Reaction, result

[…] Designation of buttons, switches or indications

→ Cross-reference

Important note
Non-compliance can result in malfunctions or interference.

# 2 Safety instructions

- Read this ducument before installing the unit. Ensure that the product is suitable for your application without any restrictions.
- Non-adherence to the operating instructions or technical data can lead to personal injury and/or damage to property.
- In all applications check compliance of the product materials (→ chapter 12 Technical data) with the media to be measured.
- For units with cULus approval and the scope of validity cULus → chapter 6 Electrical connection.

# 3 Functions and features

The pressure sensor detects the system pressure of machines and installations.

## 3.1 Applications

Type of pressure: relative pressure

| Order no. | Measuring range | | Permissible overload pressure | | Bursting pressure | |
|---|---|---|---|---|---|---|
| | bar | PSI | bar | PSI | bar | PSI |
| PI2993 | -1...25 | -14.4...362.7 | 100 | 1 450 | 200 | 2 900 |
| PI2994 | -1...10 | -14.5...145 | 50 | 725 | 150 | 2 175 |
| PI2995 | -1...4 | -14.5...58 | 30 | 435 | 100 | 1 450 |
| PI2996 | -0,124...2,5 | -1.8...36.24 | 20 | 290 | 50 | 725 |
| | mbar | PSI | bar | PSI | bar | PSI |
| PI2997 | -50...1 000 | -0.73...14.5 | 10 | 145 | 30 | 435 |

MPa = bar ÷ 10 / kPa = bar × 100

Static and dynamic overpressures exceeding the indicated overload pressure are to be avoided 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 can be destroyed.
NOTE: Risk of injury!

# 4 Function

## 4.1 Processing of the measured signals

- The unit displays the current system pressure.
- It generates 2 output signals according to the parameter setting.

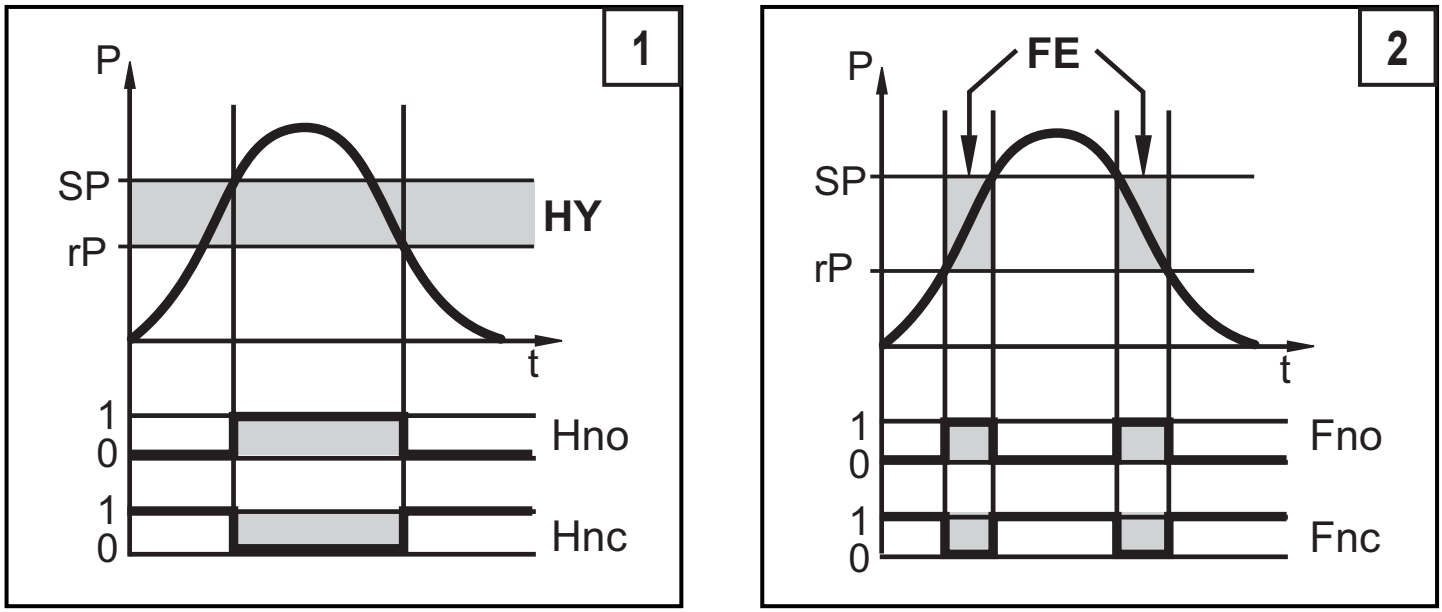
| | |
|---|---|
| **OUT1** | 2 selection options<br>• switching signal for pressure limit values.<br>• diagnostic signal (in case of a fault output 1 becomes inactive). |
| **OUT2** | 4 selection options<br>• analogue signal 4...20 mA<br>• analogue signal 20...4 mA<br>• analogue signal 0...10 V<br>• analogue signal 10...0 V |

## 4.2 Pressure monitoring / switching function

OUT1 changes its switching state if it is above or below the set switching limits (SP1, rP1). The following switching functions can be selected:

- Hysteresis function / normally open: [OU1] = [Hno] (→ fig. 1).
- Hysteresis function / normally closed: [OU1] = [Hnc] (→ fig. 1).
  First the set point (SP1) is set, then the reset point (rP1) at the requested distance.
- Window function / normally open: [OU1] = [Fno] (→ fig. 2).
- Window function / normally closed: [OU1] = [Fnc] (→ fig. 2).
  The width of the window can be set by means of the distance between SP1 and rP1. SP1 = maximum value, rP1 = minimum value.






P = system pressure; HY = hysteresis; FE = window

## 4.3 Pressure monitoring/ analogue function

The analogue signal can be set.

- [OU2] defines whether the set measuring range is provided as a 4...20 mA signal ([OU2] = [I]), a 20...4 mA signal ([OU2] = [InEG]), a 0...10 V signal ([OU2] = [U]) or a 10...0 V signal ([OU2] = [UnEG]).

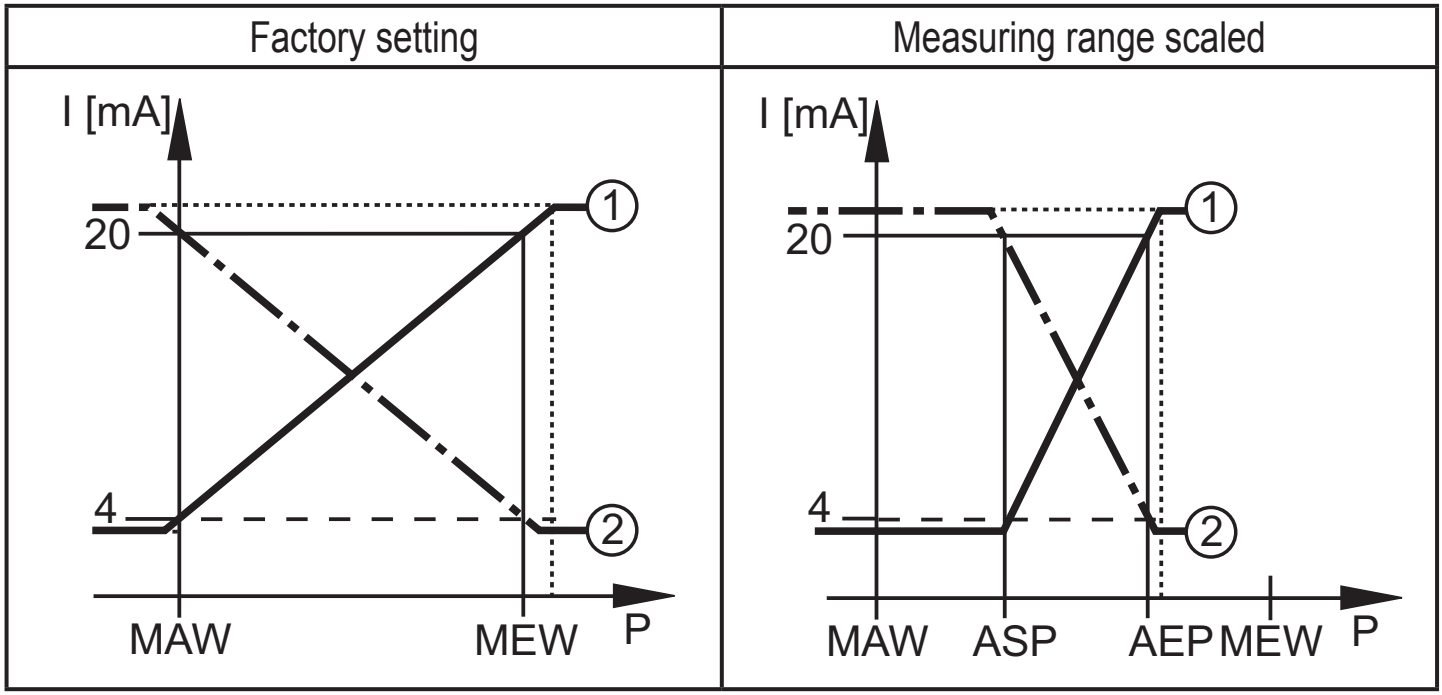
Scaling can also be set by means of the teaching process or by entering a value for the ASP and AEP parameters.

- By teaching the analogue start point (tASP) or setting the parameter ASP you define the measured value at which the output signal is 4 mA / 0 V (20 mA / 10 V at [InEG] / [UnEG]).

- By teaching the analogue end point (tAEP) or setting the parameter AEP you define the measured value at which the output signal is 20 mA / 10 V (4 mA / 0 V at [InEG] / [UnEG]).

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

**Current output**



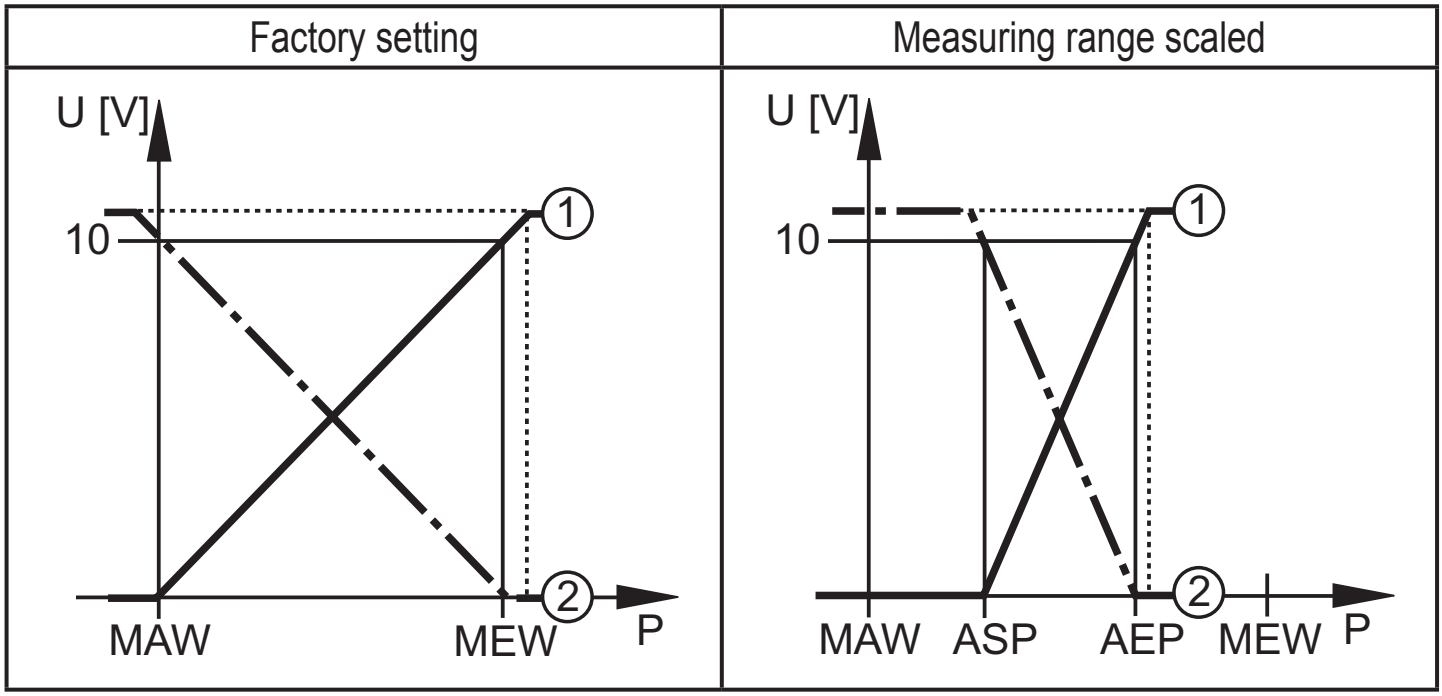

P = system pressure, MAW = initial value of the measuring range, MEW = final value of the measuring range

①: [OU2] = [I]; ②: [OU2] = [InEG]

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 if [OU2] = [I].
  - output signal between 4 and 3.8 mA if [OU2] = [InEG].
- System pressure below the measuring range:
  - output signal between 4 and 3,8 mA if [OU2] = [I].
  - output signal > 20 mA if [OU2] = [InEG].

**Voltage output**




P = system pressure, MAW = initial value of the measuring range, MEW = final value of the measuring range

①: [OU2] = [U]; ②: [OU2] = [UnEG]

The output signal is between 0 and 10 V ([OU2] = [U]) or between 10 and 0 V ([OU2] = [UnEG]) in the set measuring range.
It is also indicated:

- System pressure above the measuring range:
  - output signal > 10 V if [OU2] = [U].
- System pressure below the measuring range:
  - output signal > 10 V if [OU2] = [UnEG].

## 4.4 Diagnostic function

Output 1 is used as a diagnostic output according to DESINA specification if OU1 = dESI.

- If there is no fault, the output is switched and carries UB+ (if P-n = PnP) or UB- (if P-n = nPn).
- In case of malfunctions the output becomes inactive. The following malfunctions are detected:
  - undervoltage (starting with 18V); overvoltage (starting with 33V);
  - temperature at the process connection too high (> 150°C) / too low (< -30°C);
  - intrinsic temperature of the unit too high (> 100°C) / too low (< -30°C);
  - RAM fault.

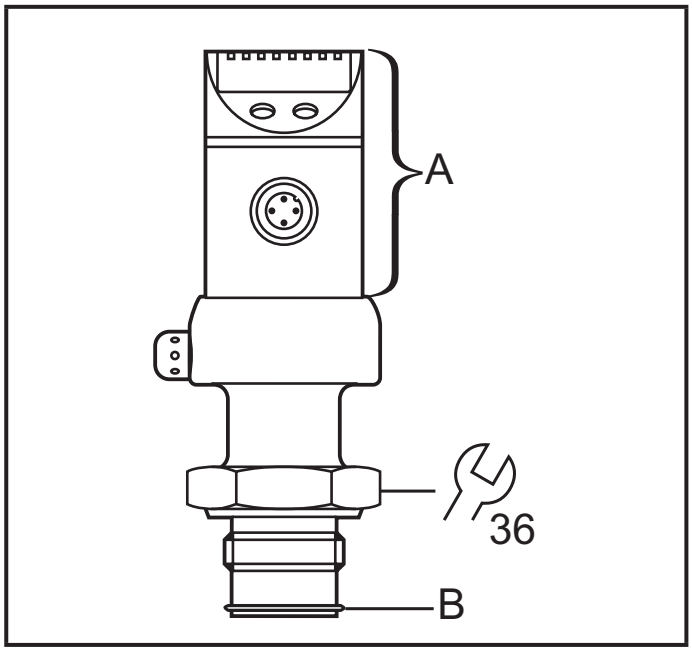
# 5 Installation

Ensure that no pressure is applied to the installation while mounting or removing the sensor. Please note: Display „0%“ does not mean that the system is free of pressure!

Horizontal mounting recommended for high medium temperatures.

- ▶ Screw the sensor into a G ¾ process fitting.
- ▶ Tighten the sensor with a spanner until you can feel the end stop.

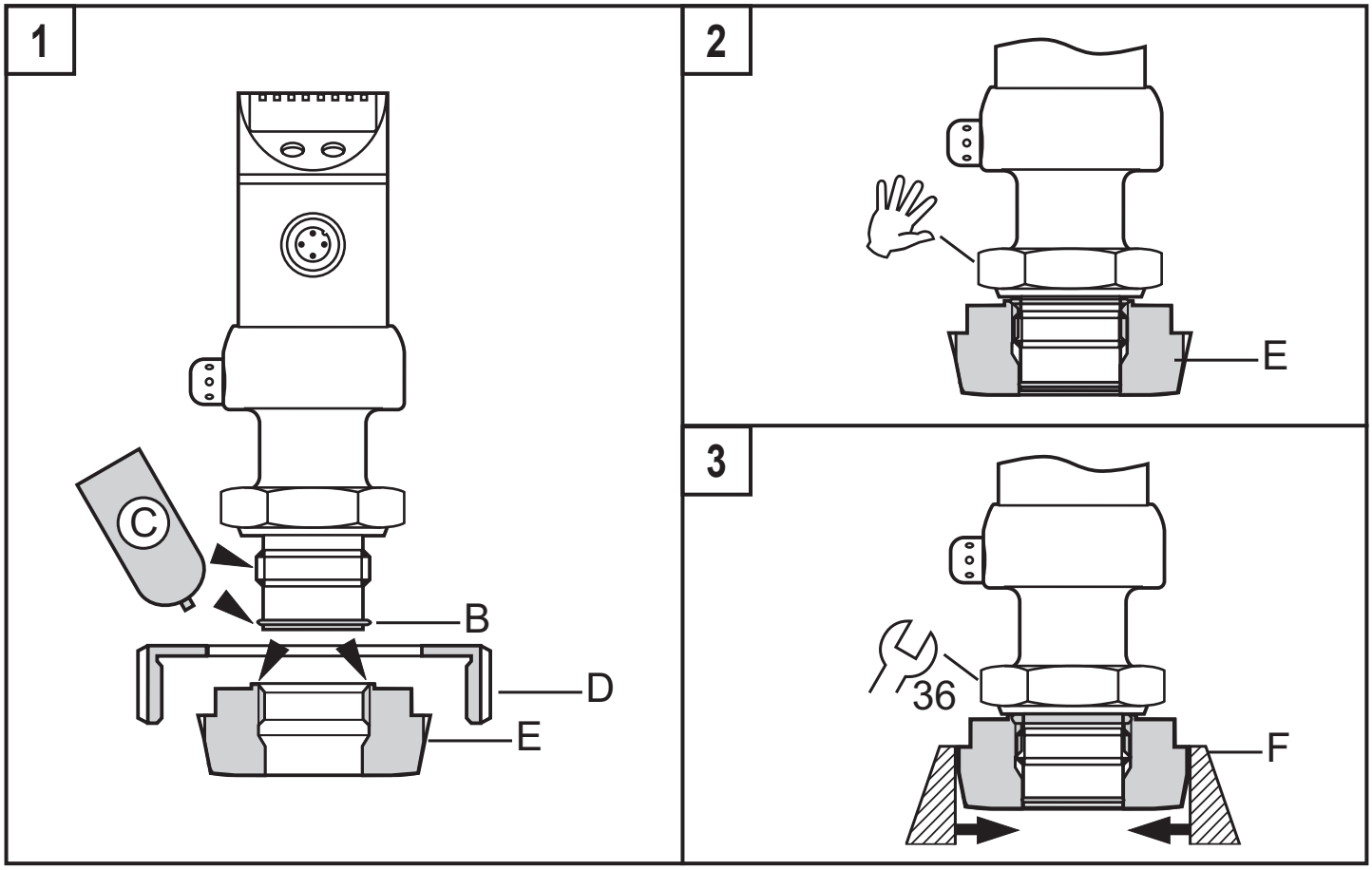
You can replace the Viton O-ring (B) by the supplied EPDM O-ring.




A = freely rotatable housing

The unit is adaptable for various G ¾ process fittings. G ¾ process adapters to be ordered separately as accessories.

## Mounting

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- ▶ Slightly grease the threads and sealing areas of the sensor and adapter with lubricating paste (C).
  The paste must be suitable and approved for the application and compatible with the elastomers used.
  Recommendation: Klüber paste UH1 84-201 with USDA-H1 approval for the food industry.
- ▶ Make sure that the O-ring (B) is correctly positioned.
- ▶ Screw the unit into the adapter (E) until it is hand-tight (fig. 2). Do not damage the sealing chamfers.
- ▶ Clamp sensor and adapter into a clamping device (F); (fig. 3). Tighten the clamping device only slightly so that the adapter does not warp.
- ▶ Tighten the sensor using a spanner until you can feel the end stop.
- ▶ Fix the unit + adapter to the process connection by means of a coupling nut, a clamp flange or the like (D); (fig 1).

### Welding adapter

- ▶ First weld the adapter, then mount the sensor. Follow the instructions included with the adapter.

# 6 Electrical connection

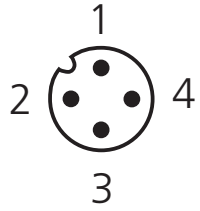
The unit must be connected by a qualified electrician.
The national and international regulations for the installation of electrical equipment must be adhered to.
Voltage supply to EN50178, SELV, PELV.

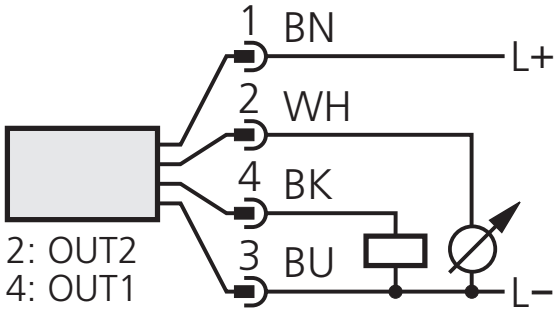
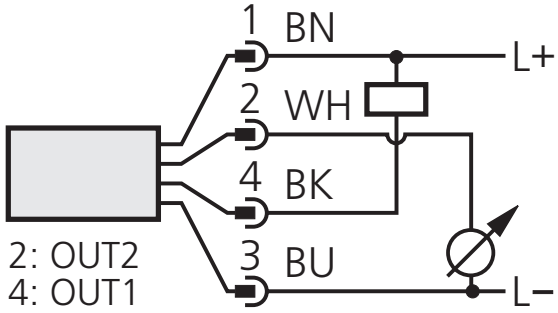
For units with cULus approval and the scope of validity cULus: The device shall be supplied from an isolating transformer having a secondary Listed fuse rated as noted in the following table.

| Overcurrent protection | | |
|---|---|---|
| Control-circuit wire size | | Maximum protective device rating Ampere |
| AWG | ($mm^2$) | |
| 26 | (0.13) | 1 |
| 24 | (0.20) | 2 |
| 22 | (0.32) | 3 |
| 20 | (0.52) | 5 |
| 18 | (0.82) | 7 |
| 16 | (1.3) | 10 |

The Sensor shall be connected only by using any R/C (CYJV2) cord, having suitable ratings.

- ▶ Disconnect power.
- ▶ Connect the unit as follows:




| OUT1 p-switching | OUT1 n-switching |
|---|---|
|  |  |

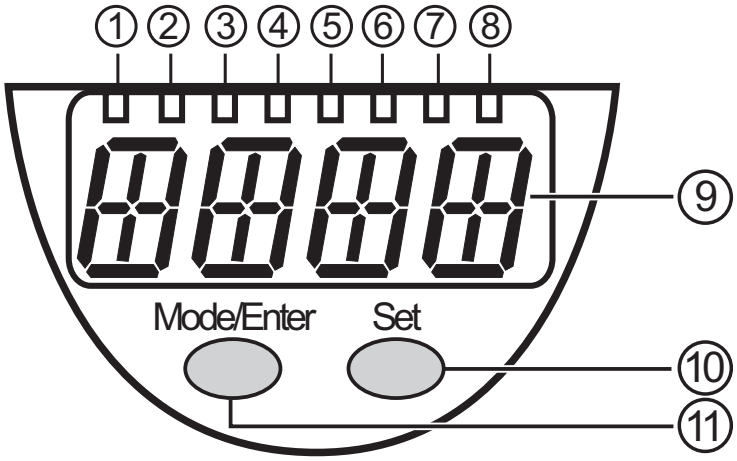




| | |
|---|---|
| **Pin 1** | Ub+ |
| **Pin 3** | Ub- |
| **Pin 4 (OUT1)** | • binary switching output for pressure monitoring<br>• diagnostic output if [OU1] = [dESI] |
| **Pin 2 (OUT2)** | • analogue output for system pressure |

Core colours of ifm sockets:
1 = BN (brown), 2 = WH (white), 3 = BU (blue), 4 = BK (black)

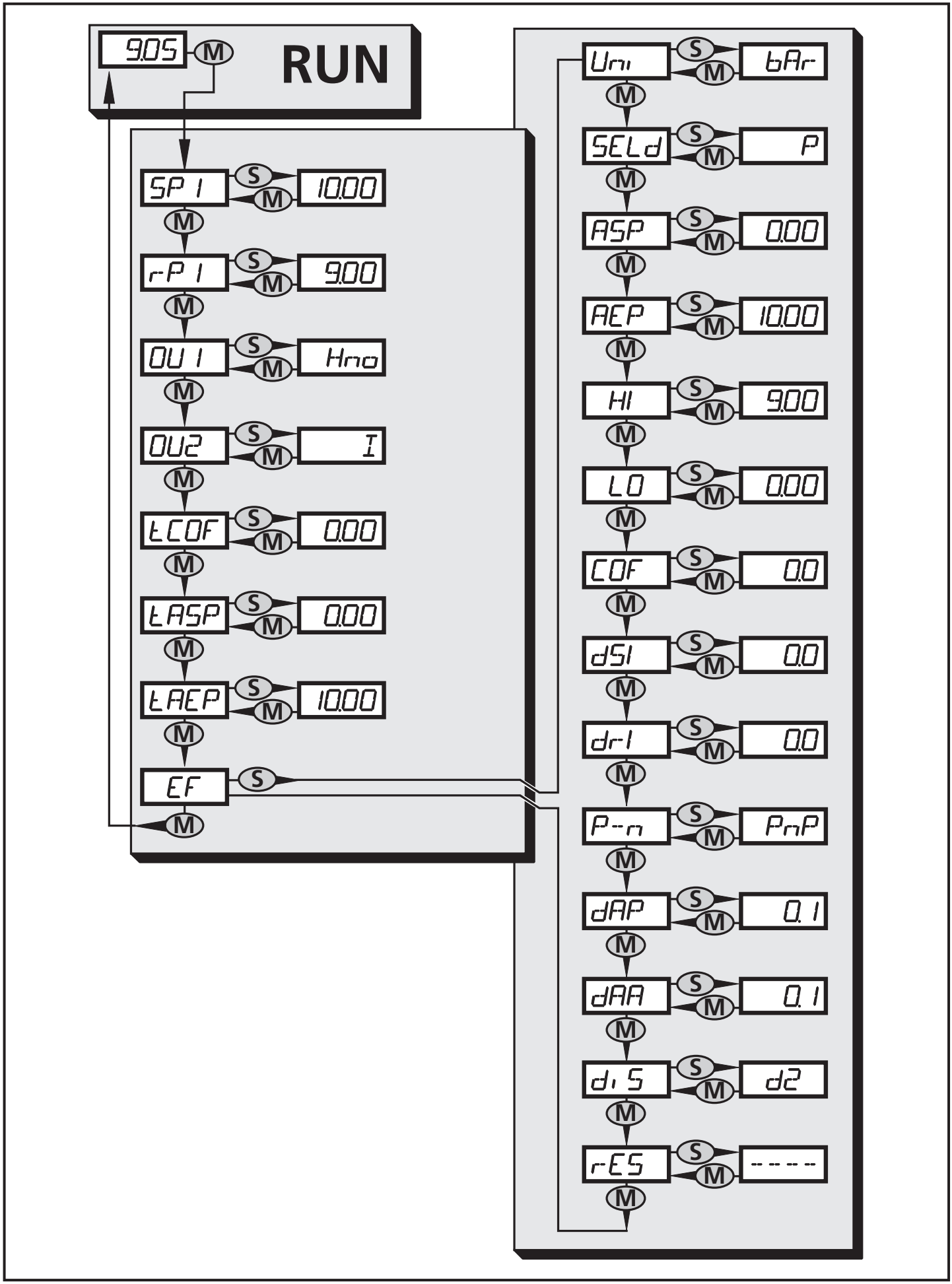
# 7 Operating and display elements




| 1 to 8: Indicator LEDs |
|---|
| - LED 1 to LED 6 = system pressure in unit of measurement as indicated on the label. LEDs 5 to 6 not used for units with 3 adjustable units of measurement.<br>- LED 7 not used.<br>- LED 8 = switching state of the output (LED lights if output 1 is switched). |
| **9: Alphanumeric display, 4 digits** |
| - Indication of the current system pressure.<br>- Indication of the parameters and parameter values. |
| **10: Set pushbutton** |
| - Setting of the parameter values (scrolling by holding pressed, incremental by pressing briefly). |
| **11: Mode/Enter pushbutton** |
| - Selection of the parameters and acknowledgement of the parameter values. |

# 8 Menu

## 8.1 Menu structure



## 8.2 Menu explanation

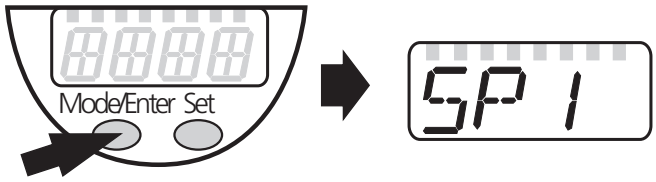
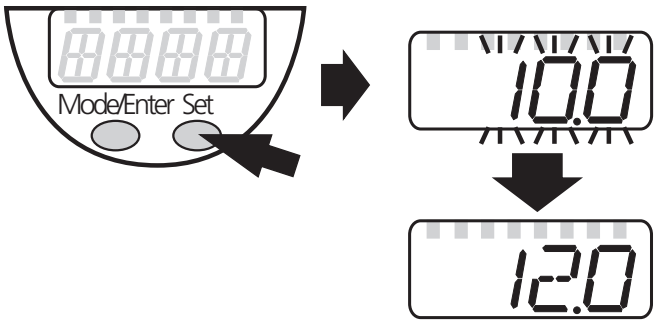
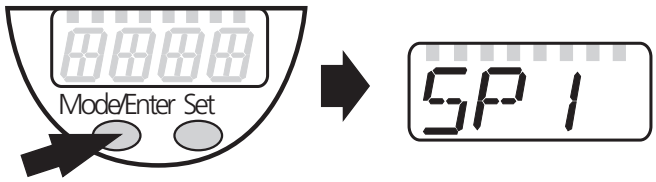
| | |
|---|---|
| SP1/rP1 | Maximum / minimum value for system pressure, at which output 1 changes its switching status. |
| OU1 | Output function for OUT1:<br>• Switching signal for the limit values: hysteresis function [H ..] or window function [F ..], normally open [. no] or normally closed [. nc] each.<br>• Diagnostic signal [dESI]. |
| OU2 | Output function for OUT2:<br>• Analogue signal for the current system pressure: 4...20 mA [I], 20...4 mA [InEG], 0...10 V [U], 10...0 V [UnEG]. |
| tCOF | Teaching zero-point calibration. |
| tASP | Teaching analogue start point for the system pressure: set value at which 4 mA / 0 V are output (20 mA / 10 V on [OU2] = [InEG] / [UnEG]). |
| tAEP | Teaching analogue end point for the system pressure: set value at which 20 mA / 10 V are output (4 mA / 0 V on [OU2] = [InEG] / [UnEG]). |
| EF | Extended functions / Opening menu level 2. |
| Uni | Standard unit of measurement for the system pressure. |
| SELd | Display mode:<br>• Pressure in the unit set in [Uni].<br>• Pressure in % of the set scaling of the analogue output. |
| ASP | Analogue start point for the system pressure: measured value at which 4 mA / 0 V are output (20 mA / 10 V on [OU2] = [InEG] / [UnEG]). |
| AEP | Analogue end point for the system pressure: measured value at which 20 mA / 10 V are output (4 mA / 0 V on [OU2] = [InEG] / [UnEG]). |
| HI | Maximum value memory for the system pressure. |
| LO | Minimum value memory for the system pressure. |
| COF | Zero point calibration. |
| dS1 | Switch-on delay for OUT1. |
| dr1 | Reset delay for OUT1. |
| P-n | Output polarity for OUT1: pnp or npn. |
| dAP | Damping for the switching output (OUT1). |
| dAA | Damping for the analogue output (OUT2). |
| diS | Update rate and orientation of the display. |
| rES | Restore the factory setting. |

# 9 Parameter setting

During the parameter setting process the unit remains in the operating mode. It continues its monitoring function with the existing parameters until parameter setting has been terminated.

## 9.1 Parameter setting general

Each parameter setting requires 3 steps:

<table>
<tr><td>1</td><td>Selecting parameter<br>▶ Press [Mode/Enter] until the requested parameter is displayed.</td><td> 
</td></tr>
<tr><td rowspan="2">2</td><td>Setting the parameter value<br>▶ Press [Set] and keep the buton pressed.<br>> Current setting value of the parameter bit flashes for 5 s.<br>> After 5 s: Setting value is changed: incremental by pressing briefly or scrolling by holding pressed.</td><td> 
</td></tr>
<tr><td colspan="2">The numerical values are incremented continuously. If the value is to be reduced: Let the display move to the maximum setting value. Then the cycle starts again at the minimum setting value.</td></tr>
<tr><td>3</td><td>Acknowledge parameter value<br>▶ Press [Mode/Enter] briefly.<br>> The parameter is displayed again. The new setting value is stored.</td><td> 
</td></tr>
<tr><td colspan="3">Set more parameters<br>▶ Start again with step 1.</td></tr>
<tr><td colspan="3">Finishing parameter setting<br>▶ Press [Mode/Enter] several times until the current measured value is displayed or wait for 15 s.<br>> The unit returns to the operating mode.</td></tr>
</table>

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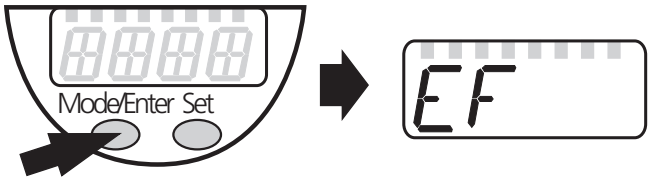
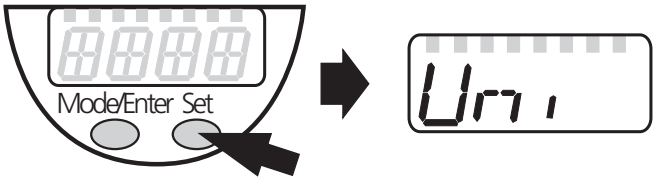
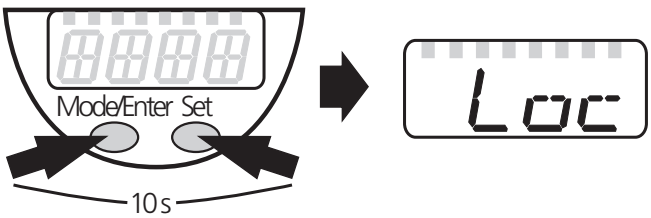
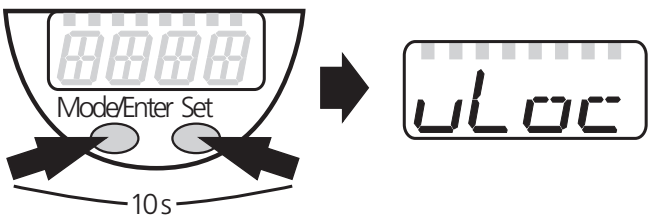
- Changing from menu level 1 to menu level 2:

| | |
|---|---|
| ▶ Press [Mode/Enter] until [EF] is displayed. |  |
| ▶ Press [Set] briefly.<br>> The first parameter of the submenu is displayed (here: [Uni]).<br>If menu level 2 is protected by an access code, „Cod1“ flashes in the display.<br>▶ Press [Set] and keep it pressed until the valid code no. is displayed.<br>▶ Press [Mode/Enter] briefly.<br>Delivery by ifm electronic: no access restriction. |  |

- Locking / unlocking
  The unit can be locked electronically to prevent unintentional wrong settings.

| | |
|---|---|
| ▶ Ensure that the unit is in the normal operating mode.<br>▶ Press [Mode/Enter] + [Set] for 10 s.<br>> [Loc] is displayed. |  |
| During operation: [Loc] is displayed briefly when you try to change parameter values. | |
| For unlocking:<br>▶ Press [Mode/Enter] + [Set] for 10 s.<br>> [uLoc] is displayed. |  |

On delivery: Unlocked.

- Timeout:

| |
|---|
| If no button is pressed for 15 s while the parameters are being set, the unit returns to the operating mode with unchanged values. |

## 9.2 Configuring the display (optional)

| | |
|---|---|
| ▶ Select [Uni] and set the unit of measurement:<br>- [bAr], [mbAr],<br>- [MPA], [kPA],<br>- [PSI],<br>- InHO] (only PI2996 and PI2997),<br>- [mWS] (only PI2996 and PI2997). |  |
| ▶ Select [SELd] and set the display mode:<br>- [P]: Pressure in the unit set in Uni.<br>- [P%]: percentage value (pressure in % of the set scaling of the analogue output. The following applies: 0% = ASP value; 100% = AEP value).<br>NOTE: Display „0%“ does not mean that the system is free of pressure. |  |
| ▶ Select [diS] and set update rate and orientation of the display:<br>- [d1]: Update of the measured value every 50 ms.<br>- [d2]: Update of the measured value every 200 ms.<br>- [d3]: Update of the measured value every 600 ms.<br>- [rd1], [rd2], [rd3]: Display like d1, d2, d3; rotated by 180°.<br>- [OFF]: The display is deactivated in the operating mode. If one of the buttons is pressed, the current measured value is displayed for 15 s. Another press of the Mode/Enter button opens the Display mode. The LEDs remain active even if the display is deactivated. |  |

## 9.3 Setting the output signal

### 9.3.1 Setting the output function

| | |
|---|---|
| ▶ Select [OU1] and set the switching function:<br>- [Hno] = hysteresis function / normally open,<br>- [Hnc] = hysteresis function / normally closed,<br>- [Fno] = window function / normally open,<br>- [Fnc] = window function / normally closed.<br>As an alternative: configure OUT1 as diagnostic output:<br>▶ Select [OU1] and set [dESI]. |  |
| ▶ Select [OU2] and set the anologue function:<br>- [I] = current signal proportional to the pressure 4…20 mA,<br>- [InEG] = current signal proportional to the pressure 20…4 mA,<br>- [U] = voltage signal proportional to the pressure 0...10 V,<br>- [UnEG] = voltage signal proportional to the pressure 10...0 V. |  |

### 9.3.2 Setting the switching limits

| | |
|---|---|
| ▶ Select [SP1] and set the value at which OUT1 switches. | SP 1 |
| ▶ Select [rP1] and set the value at which OUT1 switches back.<br>rP1 is always lower than SP1. The unit only accepts values which are lower than SP1. | rP 1 |

### 9.3.3 Scaling the analogue value

| | |
|---|---|
| ▶ Set the requested minimum pressure in the system.<br>▶ Press [Mode/Enter] until [tASP] is displayed.<br>▶ Press [Set] and keep the buton pressed.<br>> The currently set value flashes.<br>▶ Release [Set] when the display stops flashing.<br>> The new set value is displayed.<br>▶ Press [Mode/Enter] briefly.<br>> The current system pressure is defined to be the start value for the analogue signal. | tASP |
| ▶ Set the requested maximum pressure in the system.<br>▶ Press [Mode/Enter] until [tAEP] is displayed.<br>▶ Press [Set] and keep the buton pressed.<br>> The currently set value flashes.<br>▶ Release [Set] when the display stops flashing.<br>> The new set value is displayed.<br>▶ Press [Mode/Enter] briefly.<br>> The current system pressure is defined to be the end value for the analogue signal. | tAEP |
| ASP / AEP can only be taught within defined limits (→ 12.1 setting ranges). If the teaching process is carried out at an invalid pressure, [UL] or [OL] is displayed. After acknowledgement by [Mode/Enter], [Err] flashes, the ASP value / AEP value is not changed. | |
| As an alternative:<br>▶ Select [ASP] and set measured value at which 4 mA / 0 V are output (20 mA / 10 V at [OU2] = [InEG] / [UnEG]).<br>▶ Select [AEP] and set measured value at which 20 mA / 10 V are output (4 mA / 0 V at [OU2] = [InEG] / [UnEG]).<br>Minimum distance between ASP and AEP = 25 % of the final value of the measuring range (scaling factor 1:4). | ASP<br>AEP |

## 9.4 User settings (optional)

### 9.4.1 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 amount. |  |
| As an alternative:<br>Automatic adaptation offset (setting range 0 bar ±5%); e.g. in the event of a deviation of the mounting location of the sensor and the zero point level for level measurement.<br>▶ Make sure that no pressure is applied to the system.<br>▶ Press [Mode/Enter] until [tCOF] is displayed.<br>▶ Press [Set] and keep the buton pressed.<br>> The current offset value (in %) briefly flashes, then the current system pressure (in the selected display unit) is displayed.<br>▶ Release [Set].<br>▶ Press [Mode/Enter] briefly to confirm the new offset value. |  |

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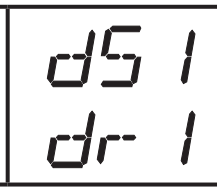
### 9.4.2 Setting the delay time for OUT1

| | |
|---|---|
| [dS1] = switch-on delay / [dr1] = switch-off delay.<br>▶ Select [dS1] or [dr1] and set the value between 0.1 and 50.0 s (at 0.0 the delay time is not active). |  |

### 9.4.3 Setting the output polarity for OUT1

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

### 9.4.4 Setting the damping for the switching signal

| | |
|---|---|
| ▶ Select [dAP] and set value between 0.1 and 100.0 s (at 0.0 = [dAP] is not active).<br>dAP value = response time between pressure change and change of the switching status in seconds.<br>[dAP] influences the switching frequency: $f_{max}$ = 1 ÷ 2dAP.<br>[dAP] also affects the display. |  |

### 9.4.5 Setting the damping for the analogue signal

| | |
|---|---|
| ▶ Select [dAA] and set value between 0.1 and 100.0 s (at 0.0 = [dAA] is not active).<br>dAA value = response time between pressure change and change of the analogue signal in seconds. |  |

## 9.5 Service functions

### 9.5.1 Reading the min./max. values for the system pressure

| | |
|---|---|
| ▶ Select [HI] or [LO], press [Set] briefly.<br>[HI] = maximum value, [LO] = minimum value.<br>Delete memory:<br>▶ Select [HI] or [LO].<br>▶ Press [SET] until [----] is displayed.<br>▶ Press [MODE/ENTER] briefly. |  |

### 9.5.2 Reset all parameters to the factory setting

| | |
|---|---|
| ▶ Select [rES]<br>▶ Press [SET] until [----] is displayed.<br>▶ Press [MODE/ENTER] briefly.<br>It makes sense to note down your own settings before executing the function (→ 13 Factory preset). |  |

# 10 Operation

After power on of the supply voltage the unit is in the Run mode (= normal operation). It carries out its measurement and evaluation functions and generates output signals according to the set parameters.

Operating indicators → chapter 7 Operating and display elements.

## 10.1 Read the set parameter values

▶ Press [Mode/Enter] until the requested parameter is displayed.
▶ Press [Set] briefly.
> The unit displays the corresponding parameter value for about 15 s. After another 15 s the unit returns to the Run mode.

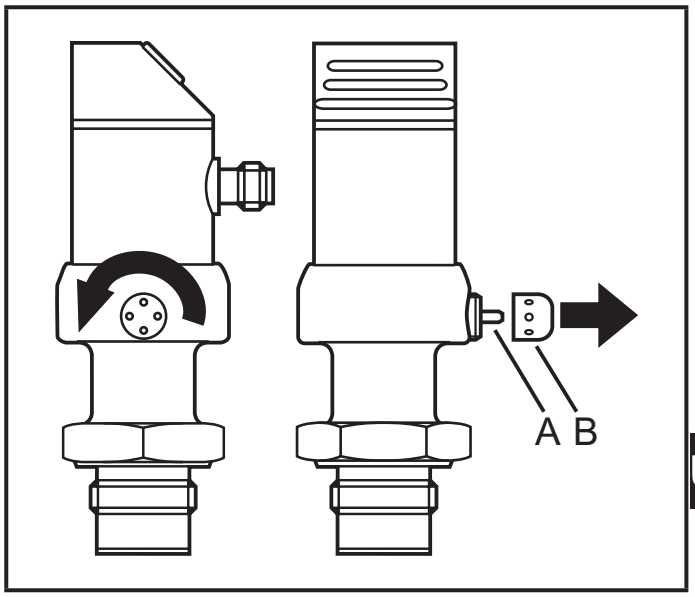
## 10.2 Fault indication

| | |
|---|---|
| [OL] | Overload pressure (measuring range exceeded). |
| [UL] | Underpressure range (measuring range below the minimum value). |
| [SC1] | Short circuit in OUT1; the output is switched off as long as the short circuit exists. |
| [Err] | Internal fault, invalid input. |

The faults SC1 and Err are indicated even if the display is deactivated.

## 10.3 Cleaning of the filter cover

If viscous and residues producing media clog the filter cover of the sensor (and thus reduce the measuring accuracy slightly), you can clean it.

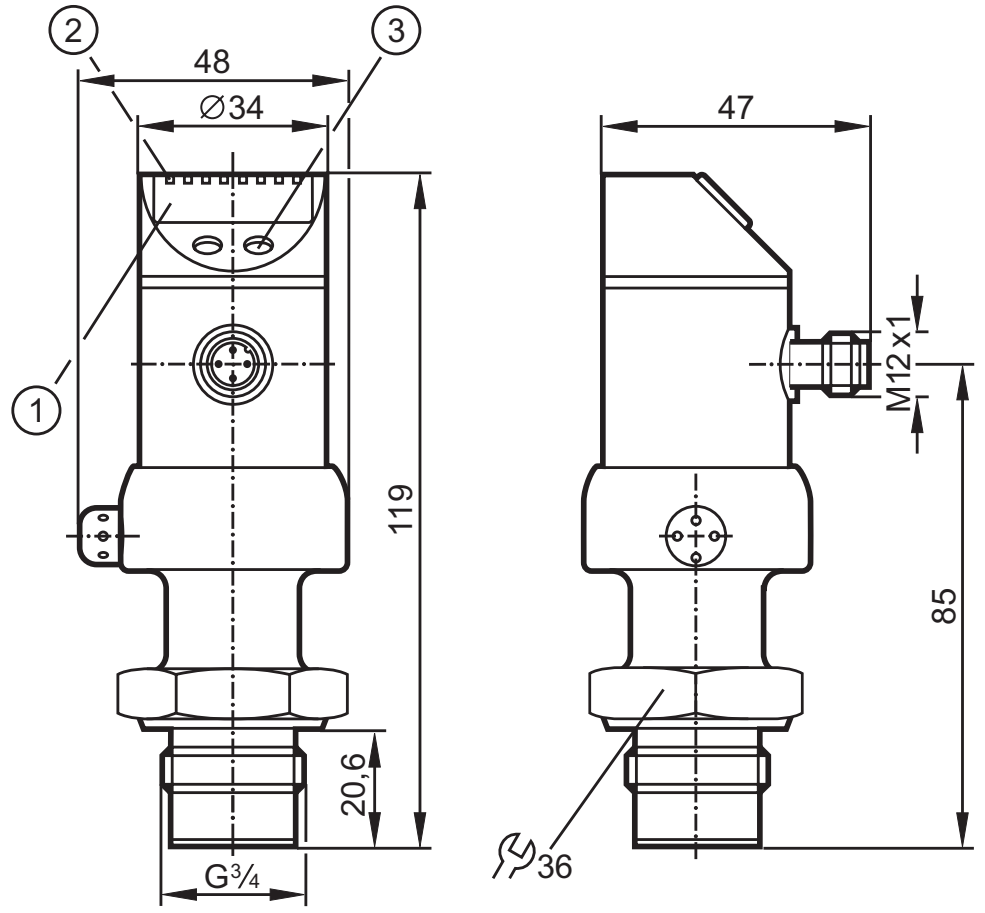



- ▶ Unscrew the filter cover (B) (use a pair of pliers with plastic-covered jaws for this).
- ▶ Clean the cover thoroughly.

The vent (A) should only be cleaned by skilled personnel and with utmost care. Possible medium residues must not be compressed and pressed into the vent. This could clog the filter system and reduce the measuring accuracy of the sensor.

- ▶ Screw the filter cover again tightly.

# 11 Scale drawing




Dimensions are in millimeters
1: display
2: LED's
3: programming button

# 12 Technical data

| | |
|---|---|
| Operating voltage [V] | 18...32 DC |
| Current consumption [mA] | < 50 |
| Current rating [mA] | 250 |
| Short-circuit / reverse polarity / overload protection, integrated watchdog | |
| Voltage drop [V] | < 2 |
| Power-on delay time [s] | 0.5 |
| Min. response time switching outputs [s] | 0.1 |
| Switching frequency [Hz] | 6 |
| Analogue output | 4...20 mA / 20...4 mA / 0...10 V / 10...0 V |
| Max. load current output [Ω] | (Ub - 10) x 50 |
| Min. load with voltage output [Ω] | 2000 |
| Step response time analogue output [ms] | 25 |

Accuracy / deviation (in % of the span)[1)]
- Characteristics deviation (linearity. incl. hysteresis and repeatability)[2)] ..... < ± 0.2
- Linearity ..... < ± 0.15
- Hysteresis ..... < ± 0.15
- Repeatability (with temperature fluctuations < 10 K) ..... < ± 0.1
- Long-term stability (in % of the span per year) ..... < ± 0.1
- Temperature coefficient (TC) in the compensated temperature range 0 ... 70°C (in % of the span per 10 K)
  - Greatest TC of the zero point ..... < ± 0.05
  - Greatest TC of the span ..... < ± 0.15

Materials (wetted parts)
..... stainless steel 316L / 1.4435, surface characteristics: Ra < 0.4 / Rz 4
ceramics (99.9 % Al2O3); PTFE
Housing materials ..... stainless steel 316L / 1.4404;
PC (Makrolon); PBT (Pocan); PEI; FPM (Viton); PTFE
Protection ..... IP 67 / IP 69K
Protection class ..... III
Insulation resistance [MΩ] ..... > 100 (500 V DC)
Shock resistance [g] ..... 50 (DIN / IEC 68-2-27, 11ms)
Vibration resistance [g] ..... 20 (DIN / IEC 68-2-6, 10 - 2000 Hz)
Switching cycles min. ..... 100 million
Operating temperature [°C] ..... -25 ... +80
Medium temperature [°C] ..... -25...125 (145 max. 1h)
Storage temperature [°C] ..... -40...+100
EMC EN 61000-4-2 ESD: ..... 4 / 8 KV
EN 61000-4-3 HF radiated: ..... 10 V/m
EN 61000-4-4 Burst: ..... 2 KV
EN 61000-4-5 Surge: ..... 0.5 / 1 KV
EN 61000-4-6 HF conducted: ..... 10 V

[1)] all indications are referred to a turn down of 1:1
[2)] limit value setting to DIN 16086

## 12.1 Setting ranges

| | | SP1 | | rP1 | | ASP | | AEP | | ΔP |
|---|---|---|---|---|---|---|---|---|---|---|
| | | min | max | min | max | min | max | min | max | |
| **PI2993** | 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 |
| **PI2994** | 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 |
| **PI2995** | 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 |
| **PI2996** | 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 |
| | $inH_2O$ | -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 |
| **PI2997** | 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 |
| | $inH_2O$ | -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 |

ΔP = increments

# 13 Factory setting

| | Factory setting | User setting |
|---|---|---|
| OU1 | Hno | |
| OU2 | I | |
| SP1 | 25% VMR* | |
| rP1 | 23% VMR* | |
| ASP / tASP | 0% VMR* | |
| AEP / tAEP | 100% VMR* | |
| COF / tCOF | 0.0 | |
| dS1 | 0.0 | |
| dr1 | 0.0 | |
| P-n | pnp | |
| dAP | 0.1 | |
| dAA | 0.1 | |
| Uni | bAr / mbAr | |
| SELd | P | |
| dis | d2 | |

* = the indicated percentage of the final value of the measuring range (VMR) of the corresponding sensor in bar / mbar is set.

More information at www.ifm.com