

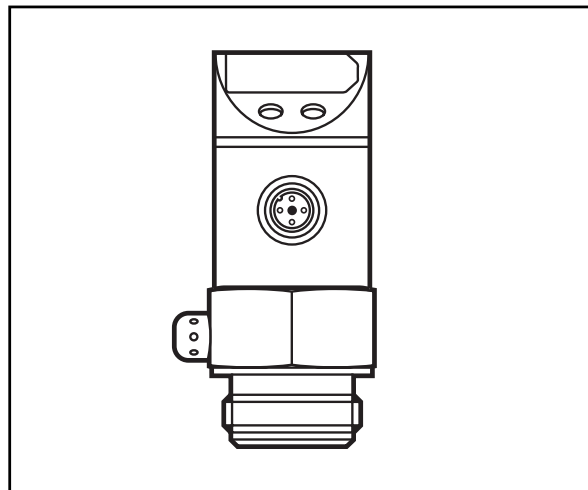


Bedienungsanleitung
Operating instructions
Notice utilisateurs

efector500[®]

Elektronischer Drucksensor
Electronic pressure
sensor
Capteur de pression
électronique

PF20



DEUTSCH

ENGLISH

FRANÇAIS

Safety instructions

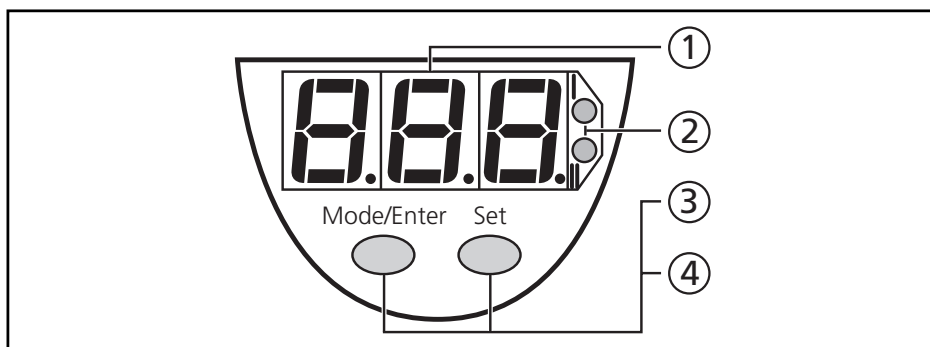


Please read the product description prior to installing the unit. Please check that the product is suitable for your application without any restrictions.

If the operating instructions or the technical data are not adhered to, personal injury and/or damage to property may occur.

Please check in all applications that the product materials (see Technical data) are compatible with the media to be measured.

Controls and visual indication



①	7-segment display	display of the system pressure, display of parameters and parameter values
②	2 x LED red	switching status; lights if output I / II has switched
③	Mode / Enter button	selection of the parameters and acknowledgement of the parameter values
④	Set button	setting of the parameter values (scrolling by holding pressed; incremental by pressing briefly)

Function and features

- The pressure sensor **detects the system pressure**,
- shows the current system pressure on its **display**,
- and generates **2 output signals** according to the set output configuration.

	Output 1	Output 2
Analog output (only output 2)		I: 4 ... 20 mA U: 0 ... 10 V
Switching function (output 1 and output 2; function can be selected for each output separately)	hysteresis function / N.O. (Hno)	
	hysteresis function / N.C. (Hnc)	
	window function / N.O. (Fno)	
	window function / N.C. (Fnc)	
Output polarity (applies to both switching outputs)	p-switching (PnP)	
	n-switching (nPn)	

Programming

By setting various parameters the evaluation of the measured signal is very variable and can thus be adapted to the respective application (→ page 23, 25).

EHEDG 3A

The unit is EHEDG 3A certified.

Applications

Order no.		Measuring range	Permissible overl. pressure	Bursting pressure
PF2053	bar	-1.0 ... 25	100	350
	PSI	-15 ... 363	1 450	5 070
	MPa	-0.1 ... 2.5	10	35
PF2054	bar	-0.5 ... 10	50	150
	PSI	-7 ... 145	725	2 175
	kPa	-50 ... 1000	5 000 (5MPa)	15 000 (15MPa)
PF2056	bar	-0.13 ... 2.50 ¹⁾	20	50
	PSI	-1.8 ... 36.3	290	725
	kPa	-13 ... 250	2 000 (2MPa)	5 000 (5MPa)
PF2057	mbar	-50 ... 1 000	10 000 (10bar)	30 000 (30bar)
	PSI	-0.7 ... 14.5	145	450
	kPa	-5.0 ... 100	1 000 (1MPa)	3 000 (3MPa)

¹⁾If 2 decimal points in the minus range are displayed, the 0 in front of the decimal point is omitted. Example: **-0.05** is displayed as **-.05**

Labels for the different units of display are enclosed with the unit. Stick the respective label on the sensor or fill in the blank label.



Avoid static and dynamic overpressure exceeding the given overload pressure.

Even if the bursting pressure is exceeded only for a short time the unit can be destroyed (danger of injuries)!

Operating modes

Run mode

Normal operating mode

When the supply voltage has been applied, the unit is in the Run mode. It monitors and generates output signals according to the set parameters.

The display shows the current system pressure (can be deactivated; → page 27).

The red LEDs indicate the switching state of the outputs.

Display mode

Indication of parameters and the set parameter values

When the "Mode/Enter" button is pressed briefly, the unit passes to the Display mode which allows parameter values to be read. The internal sensing, processing and output functions of the unit continue as if in Run mode.

- The parameter names are scrolled with each pressing of the "Mode/Enter" button.
- When the "Set" button is pressed briefly, the corresponding parameter value is displayed for 15s. After another 15s the unit returns to the Run mode.

Programming mode

Setting of the parameter values

While viewing a parameter value pressing the "Set" button for more than 5s causes the unit to enter the programming mode. You can alter the parameter value by pressing the "Set" button and confirm the new value by pressing the "Mode/Enter" button. The internal sensing, processing and output functions of the unit continue as if in Run mode with the original parameter values unless a new value is confirmed. The unit returns to the Run mode when no button has been pressed for 15s.

Installation



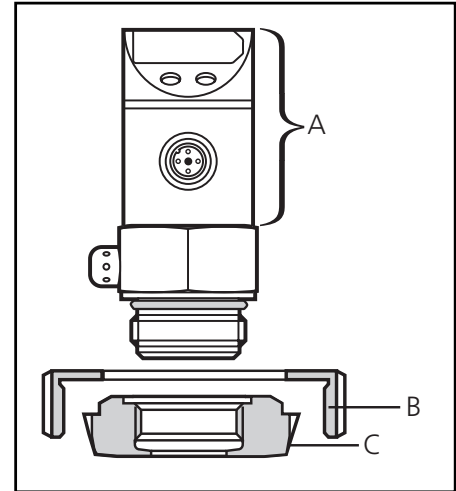
Before mounting and removing the sensor, make sure that no pressure is applied to the system.

Prozess adapter

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

Mount adapter (C) to the sensor first, then sensor + adapter to the process connection by means of a nut, a clamping flange or similar (B).

If you use a welding adapter: Weld the adapter first. Then mount the sensor.



A = freely rotatable housing

Mounting of the adapter

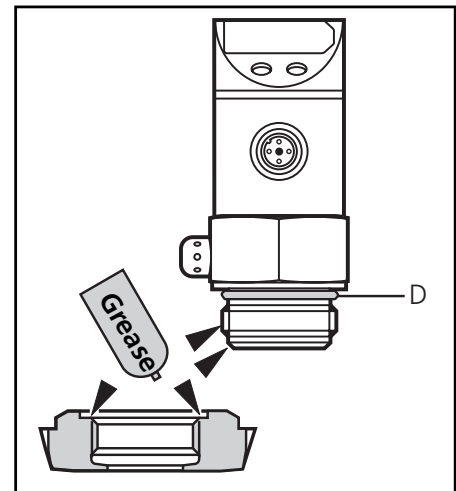
If it is not possible to slide the fixing element (B) down over the top of the sensor: slide it up over the bottom of the sensor before the adapter is mounted.



Sensor and adapter are only to be mounted once.

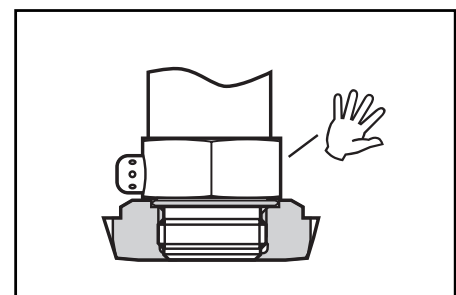
Step 1

Grease thread and sealing chamfer of the sensor and of the adapter with the greasing paste supplied. The greasing paste is food-grade (USDA-H1 84-201). Make sure that the O-ring (D) is correctly positioned.



Step 2

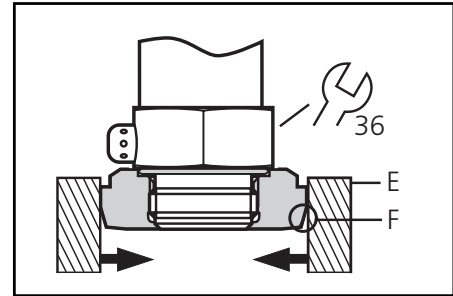
Screw the sensor into the adapter. Avoid mechanical influence on the sealing chamfers.



Step 3 → following page

Installation

Step 3 Clamp sensor and adapter into a clamping device (E). The sealing chamfers (F) must not be damaged. Tighten the sensor with a spanner until you can feel the end stop.



If you continue to turn, this can have adverse effect on the sealing.

Electrical connection



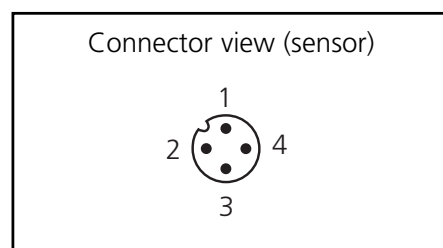
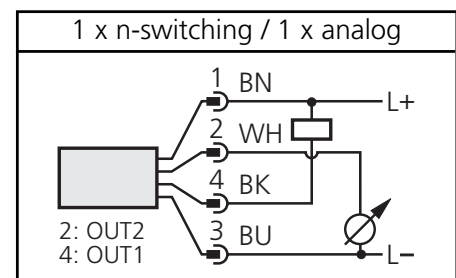
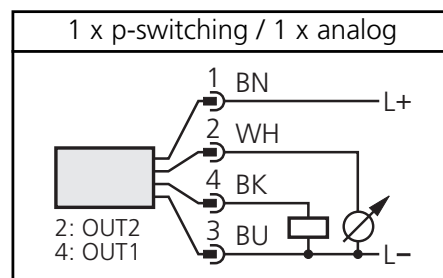
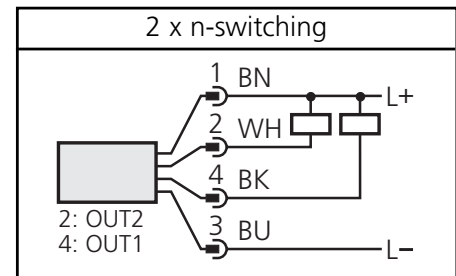
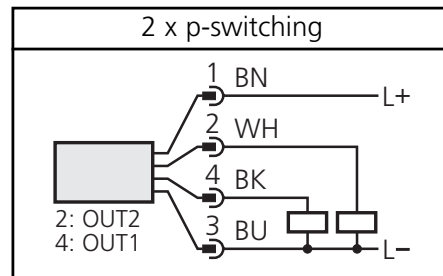
The unit must only be connected by an electrician.

The national and international regulations for the installation of electrical equipment must be observed.

Voltage supply to EN50178, SELV, PELV.

Disconnect power before connecting the unit.

Wiring:

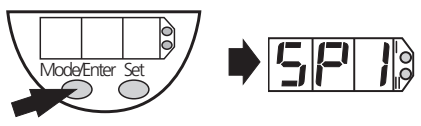
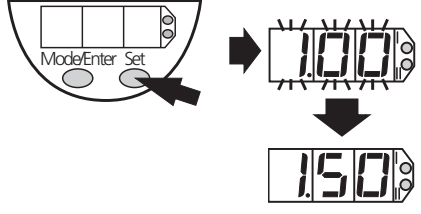
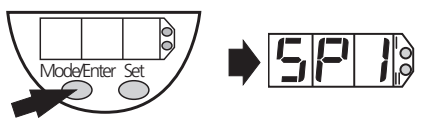


Core colours of ifm sockets:

- 1 = BN (brown),
- 2 = WH (white),
- 3 = BU (blue),
- 4 = BK (black).

Programming

Adjustable parameters
 → page 25
 Menu structur
 → fold out page

1		Press the Mode/Enter button several times until the respective parameter is displayed.
2		Press the Set button and keep it pressed. The current parameter value flashes for 5s, then the value is increased* (incremental by pressing briefly or scrolling by holding pressed).
3		Press the Mode/Enter button briefly (= acknowledgement). The parameter is displayed again, the set parameter value becomes effective .
4	<p>Change more parameters: Start again with step 1.</p> <p>Finish programming: Wait for 15s or press the Mode/Enter button until the current measured value is indicated again.</p>	

*Decrease the value: Let the display of the parameter value move to the maximum setting value. Then the cycle starts again at the minimum setting value.

Select the display unit **before** setting the switch points (SPx, rPx) or the limits for the analog output signal (ASP, AEP). This avoids rounding errors generated internally during the conversion of the units and enables exact setting of the values.

Timeout

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

Fast programming / series programming

The defined set of parameters can be stored by the programming / display unit PP2000 and then it can be transferred to other units. For programming: → operating instructions of the programming unit).

Locking / Unlocking

The unit can be electronically locked to prevent unwanted adjustment of the set parameters: Press both setting buttons for 10s (the unit must be in Run mode). Indication goes out briefly (acknowledgement of locking / unlocking).

Units are delivered from the factory in the unlocked state.

With the unit in the locked state **Loc** is indicated briefly when you try to change parameter values.

Installation and set-up / operation

After mounting, wiring and setting check whether the unit operates correctly

Faults displayed during operation

OL	overload = (above measuring range of the sensor)
UL	underload = (below measuring range of the sensor)
SC 1	(flashing) = short circuit in the switching output 1
SC 2	(flashing) = short circuit in the switching output 2
SC	(flashing) = short circuit in both switching outputs

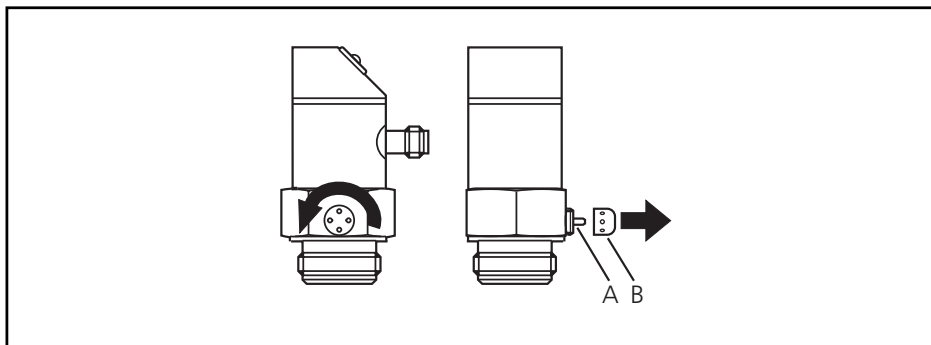
The short-circuited outputs are switched off.

Increased protection rate

The sensor is sufficiently protected against harsh ambient conditions (protection IP 67). The protection rating can be increased by a special accessory (order no. E30043).

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.

Technical information / Functioning / Parameters

Adjustable parameters

Menu structure → fold out page

<p>SP1 SP2</p>	<p>Switch-on point 1 / 2 Upper limit value at which the output changes its switching status. SP2 is active only if OU2 = Hno, Hnc, Fno or Fnc</p>																																																									
<p>rP1 rP2</p>	<p>Switch-off point 1 / 2 Lower limit value at which the output changes its switching status. rPx is always lower than SPx. The unit only accepts values which are lower than SPx. Changing the switch-on point also changes the switch-off point (the distance between SPx and rPx remains constant). If the distance is higher than the new switch point, it is automatically reduced (rPx is set to the minimum setting value). rP2 is active only if OU2 = Hno, Hnc, Fno or Fnc</p>																																																									
	<table border="1"> <thead> <tr> <th colspan="2">Setting range:</th> <th>SP1/SP2</th> <th>rP1/rP2</th> <th>in steps of</th> </tr> </thead> <tbody> <tr> <td rowspan="3">PF2053</td> <td>bar</td> <td>-0.8 ... 25</td> <td>-0.9 ... 24.9</td> <td>0.1</td> </tr> <tr> <td>PSI</td> <td>-12 ... 363</td> <td>-13 ... 362</td> <td>1</td> </tr> <tr> <td>MPa¹⁾</td> <td>-0.08 ... 2.5</td> <td>-0.09 ... 2.49</td> <td>0.01</td> </tr> <tr> <td rowspan="3">PF2054</td> <td>bar¹⁾</td> <td>-0.45 ... 9.99</td> <td>-0.50 ... 9.94</td> <td>0.01</td> </tr> <tr> <td>PSI</td> <td>-7 ... 145</td> <td>-7 ... 144</td> <td>1</td> </tr> <tr> <td>kPa</td> <td>-45 ... 999</td> <td>-50 ... 994</td> <td>1</td> </tr> <tr> <td rowspan="3">PF2056</td> <td>bar¹⁾</td> <td>-0.11 ... 2.5</td> <td>-0.12 ... 2.49</td> <td>0.01</td> </tr> <tr> <td>PSI</td> <td>-1.6 ... 36.3</td> <td>-1.7 ... 36.2</td> <td>0.1</td> </tr> <tr> <td>kPa</td> <td>-11 ... 250</td> <td>-12 ... 249</td> <td>1</td> </tr> <tr> <td rowspan="3">PF2057</td> <td>mbar</td> <td>-45 ... 999</td> <td>-50 ... 994</td> <td>1</td> </tr> <tr> <td>PSI</td> <td>-0.7 ... 14.5</td> <td>-0.7 ... 14.4</td> <td>0.1</td> </tr> <tr> <td>kPa</td> <td>-4.5 ... 99.9</td> <td>-5.0 ... 99.4</td> <td>0.1</td> </tr> </tbody> </table> <p>¹⁾If 2 decimal points in the minus range are displayed, the 0 in front of the decimal point is omitted. Example: -0.05 is displayed as -.05</p>	Setting range:		SP1/SP2	rP1/rP2	in steps of	PF2053	bar	-0.8 ... 25	-0.9 ... 24.9	0.1	PSI	-12 ... 363	-13 ... 362	1	MPa ¹⁾	-0.08 ... 2.5	-0.09 ... 2.49	0.01	PF2054	bar ¹⁾	-0.45 ... 9.99	-0.50 ... 9.94	0.01	PSI	-7 ... 145	-7 ... 144	1	kPa	-45 ... 999	-50 ... 994	1	PF2056	bar ¹⁾	-0.11 ... 2.5	-0.12 ... 2.49	0.01	PSI	-1.6 ... 36.3	-1.7 ... 36.2	0.1	kPa	-11 ... 250	-12 ... 249	1	PF2057	mbar	-45 ... 999	-50 ... 994	1	PSI	-0.7 ... 14.5	-0.7 ... 14.4	0.1	kPa	-4.5 ... 99.9	-5.0 ... 99.4	0.1
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<p>OU1</p>	<p>Configuration of output 1 4 switching functions can be set: - Hno = hysteresis / normally open - Hnc = hysteresis / normally closed - Fno = window function / normally open - Fnc = window function / normally closed</p>																																																									
<p>OU2</p>	<p>Configuration of output 2 4 switching functions and 2 analog signals can be set: - Hno = hysteresis / normally open - Hnc = hysteresis / normally closed - Fno = window function / normally open - Fnc = window function / normally closed - I = analog output 4 ... 20 mA - U = analog output 0 ... 10 V</p>																																																									

Technical information / Functioning / Parameters

ASP	Lower end of analog output Measured value for which the output signal is 4mA / 0V ASP is active only if OU2 = I or U			
AEP	Upper end of analog output Measured value for which the output signal is 20mA / 10V Minimum distance between ASP and AEP = 25% (scaling factor 4). AEP is active only if OU2 = I or U			
	Setting range:	ASP	AEP	in steps of
PF2053	bar	-1.0 ... 18.8	5.3 ... 25	0.1
	PSI	-15 ... 272	76 ... 363	1
	MPa ¹⁾	-0.10 ... 1.88	0.53 ... 2.50	0.01
PF2054	bar ¹⁾	-0.50 ... 7.49	2.00 ... 9.99	0.01
	PSI	-7 ... 109	29 ... 145	1
	kPa	-50 ... 749	200 ... 999	1
PF2056	bar ¹⁾	-0.13 ... 1.88	0.50 ... 2.50	0.01
	PSI	-1.8 ... 27.2	7.3 ... 36.3	0.1
	kPa	-13 ... 188	50 ... 250	1
PF2057	mbar	-50 ... 749	200 ... 999	1
	PSI	-0.7 ... 10.9	2.9 ... 14.5	0.1
	kPa	-5.0 ... 74.9	20.0 ... 99.9	0.1
¹⁾ If 2 decimal points in the minus range are displayed, the 0 in front of the decimal point is omitted. Example: -0.05 is displayed as -.05				
EF	Enhanced functions This menu item contains a submenu with additional parameters. You can access these parameters by pressing the SET button briefly.			
HI LO	Min-Max memory for system pressure <ul style="list-style-type: none"> • HI: displays the highest measured pressure • LO: displays the lowest measured pressure Erase the memory: <ul style="list-style-type: none"> - Press the "Mode/Enter" button until HI or LO is displayed. - Press the "Set" button and keep it pressed until "--" is displayed. - Then press the "Mode/Enter" button briefly. 			
COF	Calibration offset The internal measured value (operating value of the sensor) is offset against the real measured value. <ul style="list-style-type: none"> • setting range: -5 ... +5% of the value of the measuring range (with scaling as factory setting (ASP = 0% and AEP = 100%)) • in steps of 0.1% of the value of the measuring range 			
CAr	Calibration reset Resets the calibration set by COF to the value set at the factory <ul style="list-style-type: none"> - Press the "Mode/Enter" button until CAr is displayed. - Press the "Set" button and keep it pressed until "--" is displayed. - Then press the "Mode/Enter" button briefly. 			

Technical information / Functioning / Parameters

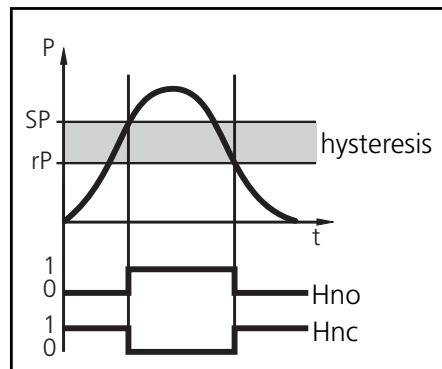
<p>dS1 dS2 dr1 dr2</p>	<p>Delay time for the switching outputs dSx = switch-on delay; drx = switch-off delay The output does not immediately change its switching status when the switching condition is met but when the delay time has elapsed. If the switching condition is no longer met when the delay time has elapsed, the switching state of the output does not change. • setting range: 0 / 0,10 ... 50s adjustable in steps 01s (0 = delay time not active) • indicated in seconds dS2 and dr2 are not active, if OU2 = I or U</p>
<p>P-n</p>	<p>Output polarity 2 options can be selected: - PnP = positive switching - nPn = negative switching This setting applies to both switching outputs</p>
<p>dAP</p>	<p>Damping for the switching outputs Pressure peaks of short duration or high frequency can be filtered out. dAP-value = response time between pressure change and change of the switching status in seconds (s). • setting range: 0 ... 4s (0 = dAP is not active) • in steps of 0.01s Correlation between switching frequency and dAP: $f_{\max} = \frac{1}{2 \times dAP}$</p>
<p>dAA</p>	<p>Damping for the analog output Pressure peaks of short duration or high frequency can be filtered out. dAA-value = response time between pressure change and change of the switching status in seconds (s). • setting range: 0 (= dAA is not active) / 0.1s / 0.5s / 2s dAA is active only if OU2 = I or U</p>
<p>d15</p>	<p>Setting of the display 9 options can be selected: d1 = damping stage 1 (update of the measured value every 50ms) d2 = damping stage 2 (update of the measured value every 200ms) d3 = damping stage 3 (update of the measured value every 600ms) ph = display of the measured peak value remains for a short time (peak hold) rd1, rd2, rd3, rph = damping stage 1, 2, 3, peak hold / display rotated 180° OFF = In the Run mode the display of the measured value is deactivated. If one of the buttons is pressed, the current measured value is displayed for 15s. If the Mode/Enter button is pressed once again, the Display mode is activated. The switching status LEDs remain active even if the display is deactivated. Damping only changes the update interval of the display. It has no effect on the outputs.</p>
<p>Uni</p>	<p>Display unit The measured value and the values for SPx / rPx can be displayed in the following units: bAr (= bar / mbar), PSI, PA (= MPa / kPa) Labels for the different units of display are enclosed with the unit. Stick the respective label on the sensor or fill in the blank label. Select the display unit before setting the switch points (SPx, rPx) and the limits for the analog output signal (ASP, AEP). This avoids rounding errors generated internally during the conversion of the units and enables exact setting of the values. Setting at the factory : Uni = bar.</p>

Technical information / Functioning / Parameters

Hysteresis

The hysteresis keeps the switching state of the output stable if the system pressure varies about the preset value. When the system pressure is rising, the output switches when the switch-on point has been reached (SPx); when the system pressure is falling again, the output switches back when the switch-off point (rPx) has been reached.

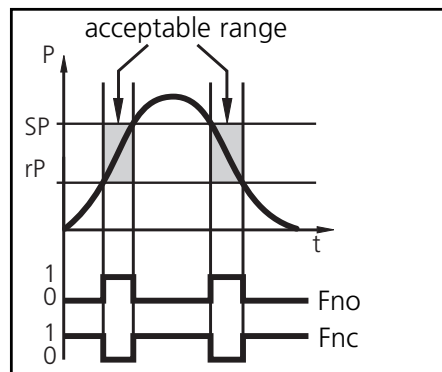
The hysteresis can be adjusted: First the switch-on point is set, then the switch-off point with the requested difference.



Window function

The window function enables the monitoring of a defined acceptable range. When the system pressure varies between the switch-on point (SPx) and the switch-off point (rPx), the output is switched (window function / NO) or not switched (window function / NC).

The width of the window can be set by means of the difference between SPx and rPx. SPx = upper value, rPx = lower value.

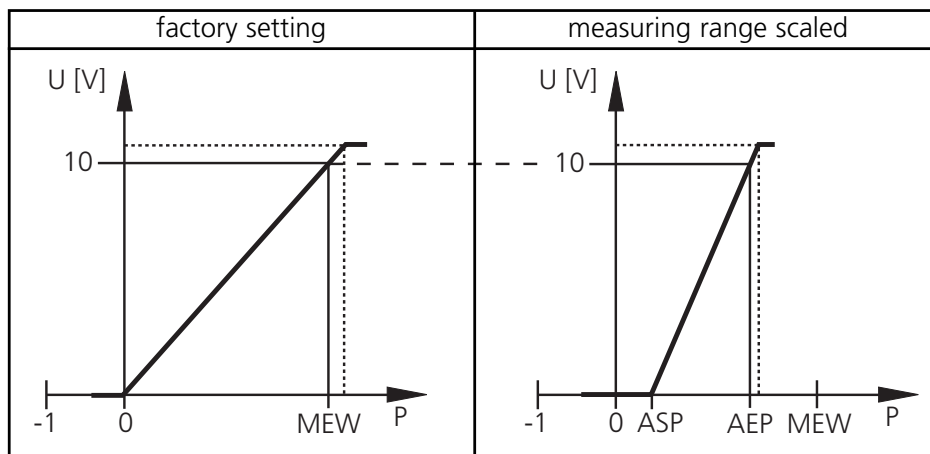


Technical information / Functioning / Parameters

Scaling the measuring range (analog output)

- With the parameter "Lower end of analog output" (**ASP**) you can select the measuring value for which the output signal is 4mA or 0V.
- With the parameter "Upper end of analog output" (**AEP**) you can select the measuring value for which the output signal is 20mA or 10 V.
- Minimum distance between ASP and AEP = 25 % of the final value of the measuring range. (scaling factor 4).

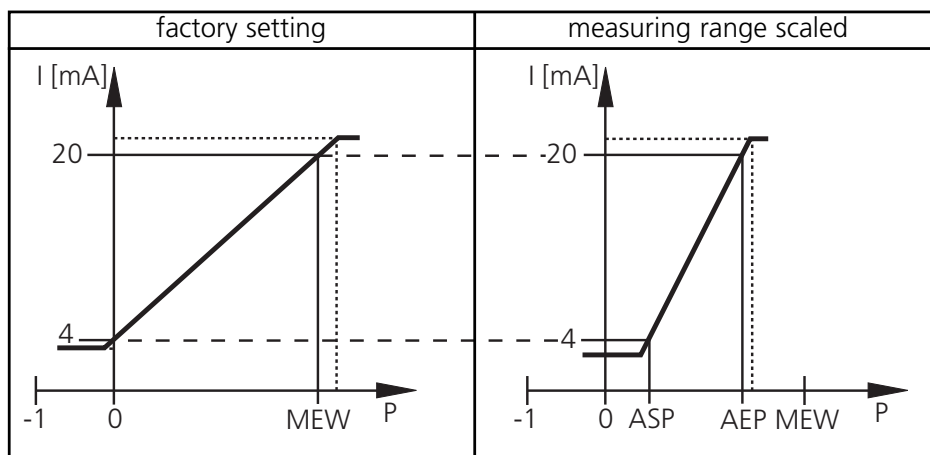
Voltage output 0 ... 10V



MEW = value of measuring range

The output signal is between 0 and 10V in the set measuring range.
It is also indicated:
System pressure above the measuring range: output signal > 10V.

Current output 4 ... 20mA



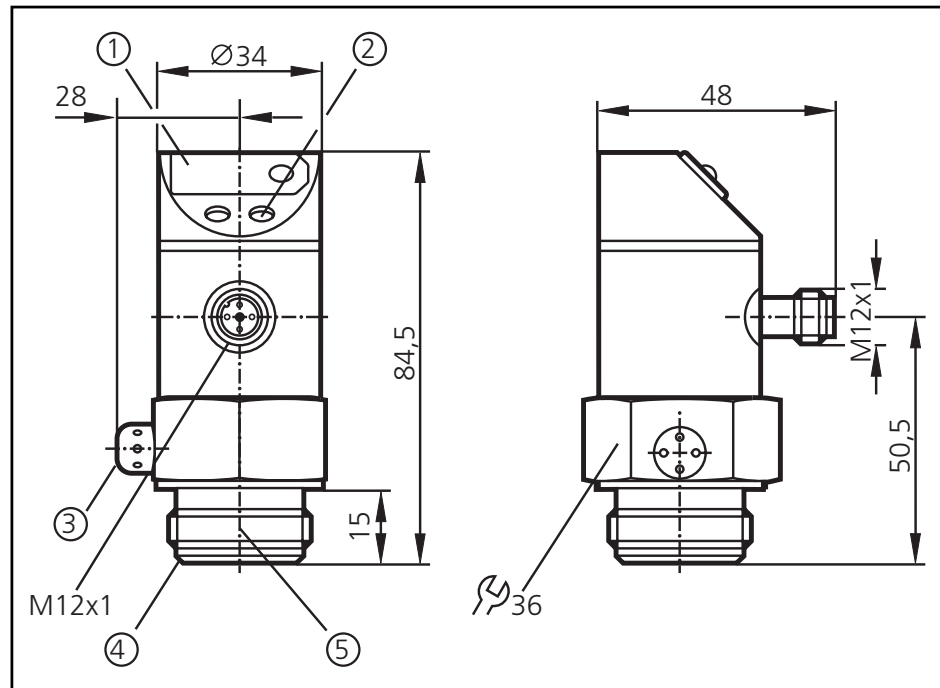
MEW = value of measuring range

The output signal is between 4 and 20mA in the set measuring range.
It is also indicated:

- System pressure above the measuring range: output signal > 20mA.
- System pressure below the measuring range: output signal drops to max. 3.2mA (depending on the scaling).

Technical information / Functioning / Parameters

Scale drawing



- 1: 7-segment display
- 2: programming button
- 3: filter cover
- 4: sealing edge
- 5: ifm thread for connection to ifm process adapter

Technical information / Functioning / Parameters

Technical data

Operating voltage [V]	20 ... 30 DC
Current consumption [mA]	< 60
Power-on delay time [s]	0.2
Current rating [mA]	2 x 250
Short-circuit protection, reverse polarity protection / overload protection	Integrated Watchdog
Voltage drop [V].	< 2
Min. response time switching outputs [ms]	3
Switching frequency [Hz]	170 ... 0.125
Analog output	4 ... 20 mA / 0 ... 10 V
Measuring range scalable (turn down 1:4 of the value of the measuring range)	
Max. load current output [Ω]	$(U_B - 10) \times 50$; 700 at $U_B = 24V$
Min. load with voltage output [Ω]	2000
Min. response time analog output [ms]	3
Accuracy / deviations (in% of the span) ¹⁾	
- Characteristics deviation (linearity, incl. hysteresis and repeatability ²⁾	< ± 0.6
- linearity	< ± 0.5
- hysteresis	< ± 0.1
- repeatability (with temperature fluctuations < 10K)	< ± 0.1
- Long-time stability (in% of the span per year)	< ± 0.1
- Temperature coefficients (TEMPCO) in the compensated temperature range 0 ... +80°C (in% of the span per 10 K)	
- greatest TEMPCO of the zero point	< ± 0.1
- greatest TEMPCO of the span	< ± 0.2
Materials (wetted parts)	stainless steel (316S12); ceramics; PTFE
Housing material	stainless steel (316S12); POCAN; PC (Macrolon); PA; EPDM/X (Santoprene); FPM (Viton)
Protection	IP 67 / III
Insulation resistance [$M\Omega$]	> 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 ... +80
Storage temperature [°C].	-40 ... +100
EMC	
IEC 1000/4/2 ESD:	4 / 8 KV
IEC 1000/4/3 HF radiated:	10 V/m
IEC 1000/4/4 Burst:	2 KV
IEC 1000/4/6 HF conducted:	10 V

¹⁾ all indications are referred to a turn down of 1:1

²⁾ limit value setting to DIN 16086