

Operating instructions Electronic pressure sensor PI27xx





Contents

1	Preliminary note	4
	1.1 Symbols used	4
2	Safety instructions	4
3	Functions and features	5
	3.1 Applications	5
4	Function	6
	4.1 Operating modes	6
	4.1.1 2-wire operation	6
	4.1.2 3-wire operation	6
	4.2 Switching function (only for 3-wire operation)	7
	4.3 Analogue function	7
	4.4 Customer-specific calibration	8
5	Installation	.10
	5.1 Units with G1 / Aseptoflex Vario process connection	.10
	5.2 Use in hygienic areas to 3-A	.12
	5.3 Use in hygienic areas to EHEDG	.12
	5.4 Ventilation diaphragm	.13
	5.4.1 Function ventilation diaphragm	.13
	5.4.2 Orientation	.14
	5.5 Filter cover	.14
6	Electrical connection	.16
	6.1 Connection for 2-wire operation	.16
	6.2 Connection for 3-wire operation	.16
7	Operating and display elements	.17
8	Menu	.18
	8.1 Menu structure: main menu	.18
	8.2 Explanation of the main menu	.19
	8.3 Menu structure: level 2 (extended functions)	.20
	8.4 Explanation of menu level 2	.21
	8.5 Menu structure: level 3 (simulation)	.22
	8.6 Explanation of menu level 3	.23
9	Parameter setting	.24
	9.1 Parameter setting in general	.24
	9.2 Configure display (optional)	.26

9.3 Set output signals	
9.3.1 Set output functions	
9.3.2 Set switching limits	27
9.3.3 Scale analogue value for OUT2	27
9.4 User settings (optional)	
9.4.1 Carry out zero point calibration	
9.4.2 Set output status in fault condition	
9.4.3 Set delay time for the switching outputs	
9.4.4 Set output logic for the switching outputs	
9.4.5 Set damping for the switching signal	29
9.4.6 Set damping for the analogue signal	29
9.4.7 Calibrate curve of measured values	29
9.5 Service functions	
9.5.1 Read min/max values for the system pressure	
9.5.2 Reset all parameters to factory setting	
9.6 Simulation function	30
9.6.1 Open menu level 3 (simulation)	
9.6.2 Set simulation value	31
9.6.3 Set time for simulation	31
9.6.4 Start simulation	31
10 Operation	
10.1 Read set parameters	
10.2 Change the display in the Run mode	
10.3 Self-diagnostics / error displays	
10.4 Setting ranges	
11 Factory setting	

1 Preliminary note

1.1 Symbols used

- Instruction
- > Reaction, result
- [...] Designation of keys, buttons or indications
- \rightarrow Cross-reference



Important note

Non-compliance may result in malfunction or interference.



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 (\rightarrow Functions and features).
- Only use the product for permissible media (\rightarrow 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.	Measuri	ng range	Permi overload	ssible pressure	Bursting	pressure	
	bar	psi	bar	psi	bar	psi	
PI2793	-125	-14.4362.7	100	1450	350	5075	
PI2714	-116	-14.6232	75	1085	250	3625	
PI2794	-110	-14.5145	50	725	150	2175	
PI2715	-16	-14.587	30	435	100	1450	
PI2795	-14	-14.558	30	435	100	1450	
PI2796	-0.1242.5	-1.836.27	20	290	50	725	
PI2797	-0.051	-0.7314.5	10	145	30	435	
PI2799	-11	-14.514.5	10	145	30	435	
	mbar	psi	mbar	psi	mbar	psi	
PI2717	-1001600	-1.4623.2	15000	215	40000	580	
	mbar	inH2O	bar	inH2O	bar	inH2O	
PI2798	-12.4250	-5.0100.4	6	2400	30	12044	
PI2789	-5100	-2.0040.16	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 420 mA • Analogue signal proportional to pressure 204 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: $[OUx] = [Hno] (\rightarrow Fig. 1).$
- 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: $[OUx] = [Fno] (\rightarrow Fig. 2)$.
- 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 [\overrightarrow{AEP}] = 25 % of the final value of the measuring range (turn-down 1:4); for PI2799: 25 % of the measuring span.



 ${\sf P}$ = 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; \rightarrow 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 (\rightarrow 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 (\rightarrow 9.5.2 [rES]).



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

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.



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:

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	UK			
	$(\rightarrow$ 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 tanned 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



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).</p>

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 limedeficient 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.

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 (\rightarrow 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 Observe the attraction of a state of a stateo

- 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



6.2 Connection for 3-wire operation



Wiring example		
1 x pnp / 1 x analogue	1 x npn / 1 x analogue	
1 BN 2 WH 4 BK 3 BU 4: OUT1 4: OUT1	1 BN 2 WH 4 BK 2: OUT2 4: OUT1 4: OUT1	

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.

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: 420 mA [I], 204 mA [InEG]. 	UK
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

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]).	JK
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.	

* menu items not active in 2-wire operation

8.5 Menu structure: level 3 (simulation)



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 (\rightarrow 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 (\rightarrow 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.		

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 (\rightarrow 9.4.1), CP1 and CP2 (\rightarrow 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. 	Mode/Enter Set		
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. 	Mode/Enter Set		
	Numerical values are incremented continu display move to the maximum setting valu minimum setting value.	ously. For reducing the value: let the e. Then the cycle starts again at the		
3	 Acknowledge parameter value Briefly press [Mode/Enter]. The parameter is displayed again. The new setting value is saved. 	Mode/Enter Set		
 Set other parameters ▶ Start again with step 1. 				
Fini	 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. 			



In 2-wire operation the menu items referring to switching functions are not active (\rightarrow 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:



• 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.
 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.

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]
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 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 420 mA [InEG] = current signal proportional to pressure 204 mA. 	[OU2]
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9.3.2 Set switching limits

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

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]
Alte ► ► ► ► ► ► ► ► ► ► ► ► ► ► ► ► ► ► ►	ernatively: 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 management value. 	[FOU1] [FOU2]
	to the measured value.	

Error indications \rightarrow 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].

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: $f_{max} = 1 \div 2dAP$.

[dAP] also has an effect on the display.

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	[CAL]
	provided on OUT2.	[CP1]
	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.	
Co	ontinue with a) or b).	

[P-n]

[dAP]

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 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. 	[CP2]
provided on OUT2. Maximum correction value = ± 2 % of the final value of the measuring	
 Briefly press [Mode/Enter]. 	
> [CP2] is displayed.	
 Briefly press [Mode/Enter]. 	
> [CAL] is displayed, the process is finished.	

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]
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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]
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9.6 Simulation function

9.6.1 Open menu level 3 (simulation)

	Select [EF] and briefly press [Set] (= to open menu level 2).	1661
	Select [SIM] and briefly press [Set] (= to open menu level 3).	
>	[SEL] is displayed.	

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: [GU2] = [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]: 3.6021.10 mA in steps of 0.01 mA. Briefly press [Mode/Enter].	[SEL] [S.OU1] [S.OU2]	UK
 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 160 minutes.	[S.TIM]
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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 \rightarrow 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).

Display	Warning	Error	Status LED	Type of fault	Corrective measures
*OFF		Х		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		Х		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		Х		Internal sensor error detected.	 Replace the unit.

* 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
W531	Х			Analogue output at the upper limit (20.5 mA).	 Increase AEP value if possible (if [OU2] = [InEG] ASP value) or reduce system pressure.
Loc	Х			Setting buttons on the unit locked, parameter change rejected.	► Unlock.
C.Loc	Х			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	Х			Setting buttons locked via parameter setting software, parameter change rejected.	Unlock sensor via parameter setting software.
W530	Х			Analogue output at the lower limit (3.8 mA).	Reduce ASP value if possible (if [OU2] = [InEG] AEP value) or increase system pressure.
W532	Х			Load at analogue output too high.***	 Reduce load at output 2 or increase the supply voltage.
W203	Х			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	Х			Medium temperature too high (> 150 °C).	Reduce the medium temperature.
W704	Х			Medium temperature too low (< -30 °C).	Increase the medium temperature.
W161	Х			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	Х			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 (\rightarrow 9.3.1).

10.4 Setting ranges

			SP2	rP1/	rP2	AS	SP	A	EP	
		min	max	min	max	min	max	min	max	ΔΡ
93	bar	-0.96	25.00	-1.00	24.96	-1.00	18.74	5.24	25.00	0.02
279	psi	-13.8	362.7	-14.4	362.1	-14.4	271.8	76.2	362.7	0.3
Р	MPa	-0.096	2.500	-0.100	2.496	-0.100	1.874	0.524	2.500	0.002
4	bar	-0.98	16.0	-1.0	15.98	-1.0	12.0	3.0	16.0	0.02
PI271	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
94	bar	-0.98	10.00	-1.00	9.98	-1.00	7.50	1.50	10.00	0.01
279	psi	-14.2	145.0	-14.5	144.7	-14.5	108.7	21.8	145.0	0.1
Ы	MPa	-0.098	1.000	-0.100	0.998	-0.100	0.750	0.150	1.000	0.001
15	bar	-0.99	6.0	-1.0	5.99	-1.0	4.5	0.5	6.0	0.005
27′	psi	-14.4	87.0	-14.5	86.9	-14.5	65.3	7.3	87.0	0.1
Ы	kPa	-99.0	600.0	-100.0	599.0	-100.0	450.0	50.0	600.0	0.5
95	bar	-0.990	4.000	-1.000	3.990	-1.000	3.000	0.000	4.000	0.005
279	psi	-14.35	58.00	-14.50	57.85	-14.50	43.50	0.00	58.00	0.05
Ы	kPa	-99.0	400.0	-100.0	399.0	-100.0	300.0	0.0	400.0	0.5

 ΔP = step increment

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		SP1	SP2	rP1/	/ rP2	AS	SP	A	EP	
		min	max	min	max	min	max	min	max	ΔΓ
	bar	-0.120	2.500	-0.124	2.496	-0.124	1.880	0.500	2.500	0.002
96	psi	-1.74	36.27	-1.80	36.21	-1.80	27.27	7.26	36.27	0.03
PI279	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
	mbar	-96	1600	-100	1598	-100	1200	300	1600	2
17	psi	-1.4	23.2	-1.44	23.16	-1.46	17.42	4.34	23.2	0.02
PI271	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_2O	-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
	mbar	-48	1000	-50	998	-50	750	200	1000	1
97	psi	-0.70	14.50	-0.73	14.47	-0.73	10.88	2.90	14.50	0.01
1279	kPa	-4.8	100.0	-5.0	99.8	-5.0	75.0	20.0	100.0	0.1
٩	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
~	mbar	-12.0	250.0	-12.4	249.6	-12.4	187.4	50.0	250.0	0.2
798	kPa	-1.20	25.00	-1.24	24.96	-1.24	18.74	5.00	25.0	0.02
PI2	inH_2O	-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
6	mbar	-4.8	100.0	-5.0	99.8	-5.0	75.0	20.0	100.0	0.1
789	kPa	-0.48	10.00	-0.50	9.98	-0.50	7.50	2.00	10.00	0.01
PI2	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 *		UN
rP2	73% VMR *		
COF / tCOF	0.0		
ASP / tASP	0% VMR * Pl2799: -1 bar		
AEP / tAEP	100% VMR*		
Uni	bAr / mbAr		
SELd	Р		
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.

More information at www.ifm.com