



Operating instructions
Electronic pressure sensor

GB

**PM16
PM17**

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1 Preliminary note

You will find instructions, technical data, approvals and further information using the QR code on the unit / packaging or at www.ifm.com.

1.1 Symbols used

- ✓ Requirement
- Instructions
- ▷ Reaction, result
- [...] Designation of keys, buttons or indications
- Cross-reference
-  Important note
Non-compliance may result in malfunction or interference.
-  Information
Supplementary note

2 Safety instructions

- The unit described is a subcomponent for integration into a system.
 - The system architect is responsible for the safety of the system.
 - The system architect undertakes to perform a risk assessment and to create 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 architect 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 (→ Intended use).
- Only use the product for permissible media (→ Technical data).
- If the operating instructions or the technical data are not adhered to, personal injury and/or damage to property may occur.
- The manufacturer assumes no liability or warranty for any consequences caused by tampering with the product or incorrect use by the operator.
- Installation, electrical connection, set-up, operation and maintenance of the product must be carried out by qualified personnel authorised by the machine operator.
- Protect units and cables against damage.
- The units are only permitted in gas applications with pressures >25 bar if no elastomer sealing material is used for the adaptation of the device or if a metal seal is used.

3 Intended use

The unit measures and monitors the system pressure of machines and installations.

Two outputs are available:

OUT1: Measured pressure value via IO-Link.

OUT2: Analogue signal proportional to pressure 4...20 mA.

3.1 Application area

Type of pressure: relative pressure



Information on pressure rating and bursting pressure → Data sheet



Avoid static and dynamic overpressure exceeding the indicated pressure rating 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 systems that have to meet the criteria of E9.2 / 63-04 of the 3-A standard.



The units are only permitted in gas applications with pressures >25 bar if no elastomer sealing material is used for the adaptation of the device or if a metal seal is used.



The units are vacuum resistant. Adhere to the specifications in the data sheet!

4 Function

Measuring cell:

- The system pressure is measured by a ceramic capacitive measuring system.
- The sealing of the ceramic measuring cell is free of elastomers and thus maintenance-free.

Signal transmission:

- The unit can be operated in analogue mode and in IO-Link mode. When connected to an IO-Link master, the unit automatically switches to IO-Link mode. An additional manual switching is not required.

Analogue mode:

- Analogue signal measured pressure value 4-20 mA (pin 2).

IO-Link mode (pin 4):

- Measured pressure value
- Exceeding or falling below the limits of the measuring range
- Device status
- Parameter setting
- Device diagnostics (events)

4.1 IO-Link

IO-Link is an internationally standardised IO technology (IEC 61131-9) for communicating with sensors and actuators.



Further information about IO-Link at: www.io-link.com

IO-Link offers the following advantages:

- Noise-immune transmission of several process values.
- Parameter setting during operation as well as point-to-point at the desk.
- Device diagnostics (events)
- Data storage: Automatic new parameter setting in case of replacement.
- Detection of connected units.
- Freely definable parameters to identify the units in the plant.



Information and documentation on the IO-Link interface at: www.io-link.ifm

4.2 IO-Link properties of the sensor

4.2.1 Description IO-Link interface

A description of the IO-Link interface can be found at www.io-link.ifm

The sensor provides the internal unit temperature as a readable parameter for diagnostic purposes.

4.2.2 Additional functions via IO-Link

- Device temperature: the internal temperature of the sensor can be read via the A-cyclic IO-Link channel.

- Application Specific Tag: freely definable text assigned to the unit.
- Function Tag: freely definable text describing the device function in the plant.
- Location Tag: freely definable text describing the installation location in the plant.

For more detailed information refer to the device-specific IO Device Description PDF at www.ifm.com.

4.3 Defined state in case of a fault

If a fault is detected, the analogue output passes into a defined state (= 21.5 mA).



In case of a fault indication (= 21.5 mA)

- Read parameters via IO-Link or contact the manufacturer.

4.4 Operating modes

The operating mode is defined by the wiring (→ Electrical connection) and automatically recognised by the unit.

4.4.1 2-wire operation

OUT2 (pin 2)	Analogue signal proportional to pressure 4...20 mA
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4.4.2 3-wire operation

OUT1 (pin 4)	Communication via IO-Link
OUT2 (pin 2)	Analogue signal proportional to pressure 4...20 mA

4.5 Analogue output

The device provides an analogue signal proportional to the pressure. Within the measuring range the analogue signal is between 4...20 mA. The measuring range is scalable:

- [ASP2] defines at which measured value the output signal is 4 mA.
- [AEP2] defines at which measured value the output signal is 20 mA.



Minimum distance between [ASP2] and [AEP2] = 20 % of the final value of the measuring range.

If the measured value is outside the measuring range or in the event of an internal error, the current signal indicated in the following figure is provided.

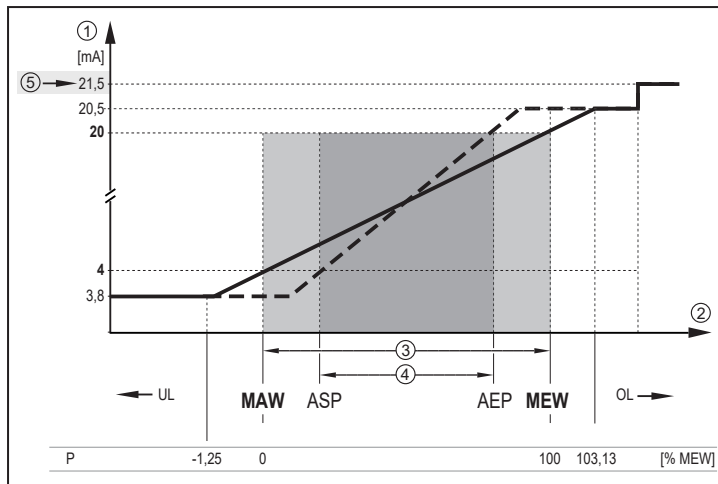


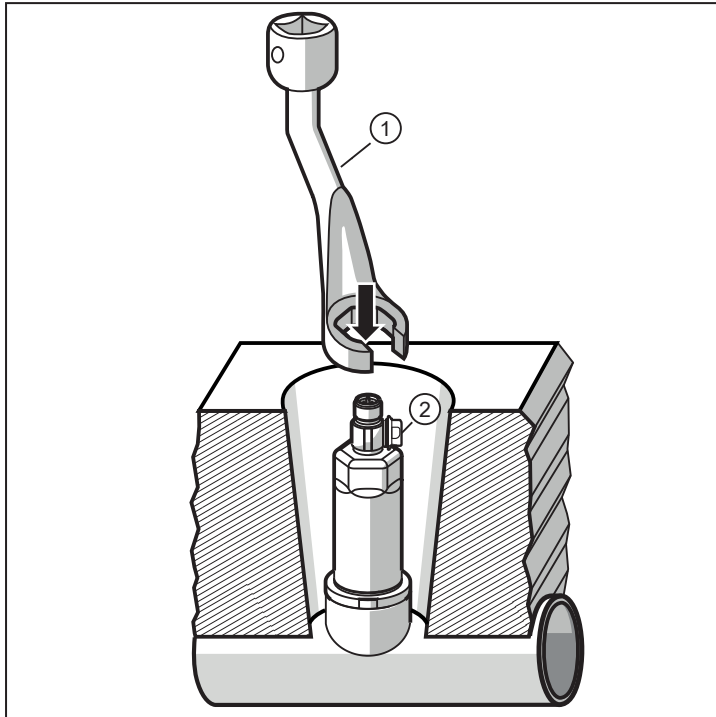
Fig. 1: Output characteristics of the analogue output to Namur

- 1: Analogue signal
- 2: Measured value
- 3: Measuring range
- 4: Scaled measuring range
- 5: Signalling fault 21.5 mA
- P: Pressure
- MAW: Initial value of the measuring range with non-scaled measuring range.
- MEW: Final value of the measuring range with non-scaled measuring range
- ASP: Analogue start point with scaled measuring range
- AEP: Analogue end point with scaled measuring range
- UL: Below the display range
- OL: Above the display range

5 Installation

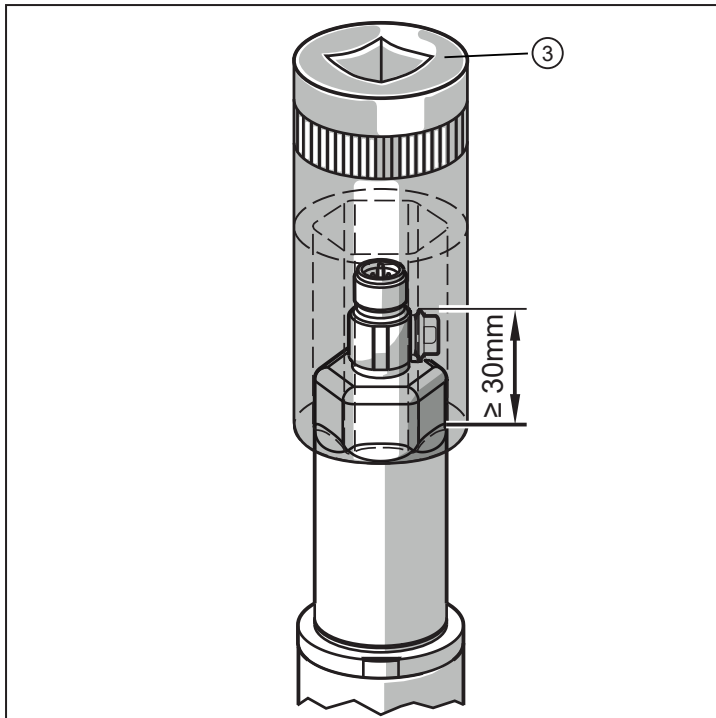
The device can be adapted to clamp connections 1" – 1.5".

-  Before installing and removing the unit: Make sure that no pressure is applied to the system and there is no medium in the pipe.
-  In case of a recessed sensor installation, please use an open ring spanner or a hexagon socket with the corresponding inside contour.
-  During sensor installation, do not exert any axial leverage with the tool (1) on the rotatable filter cover (2).



- 1: Tool
2: Filter cover

-  In case of installation by means of a hexagon socket (3), make sure that the tool's spanner flat has an inner height of at least 30 mm. Align the rotatable filter cover so that it is flush with one of the spanner flats.



3: Hexagon socket

- Insert the unit in a process connection.
- Tighten firmly. Recommended tightening torque:

Process connection	Tightening torque in Nm
G1A Aseptoflex Vario	35
G1A sealing cone	20
Depends on the sealing type, the pressure load and the lubrication!	

5.1 G1A Aseptoflex Vario adaptation PM17



Information about available adapters at: www.ifm.com

- Observe the instructions of the adapter.
- Insert the sensor with the process adapter into the process connection.

The process adapter can be adapted to different process connections.

Options are as follows:

1: Installation through process adapter with sealing ring (hygiene-compliant according to 3A and EHEDG)

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 through welding adapter with sealing ring (hygiene-compliant according to 3A and EHEDG)

- ▶ 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. (→ Operating instructions 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 hygienic metal-to-metal seal

Order no. E337xx / E338xx



A long-term stable, maintenance-free fitting without bug traps in the metal-to-metal sealing is only valid for once-only mounting.

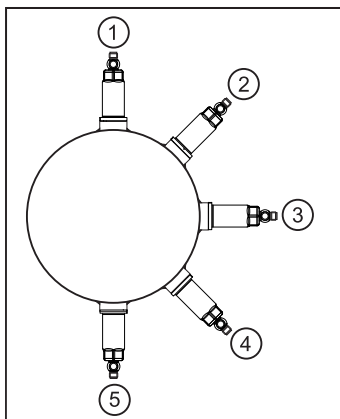
- ▶ If the sealing has to be installed several times, use a new adapter.

4: Installation to G 1 flange / G 1 adapter

The sensor is sealed with the sealing ring at the back of the process connection.

- ▶ The sealing area on the flange/adapter must be flush with the tapped hole and have a surface characteristic of min. Rz = 6.3 (observe DIN EN ISO 1179-1).

5.2 Use in hygienic areas according to 3-A



The following applies to units with 3-A certification:

- ▶ Only use adapters with A-3 certification for the process connection.
- ▶ Do not install the unit at the lowest point of the pipe or tank (position 5) in order that the medium can run off the area of the measuring element.

5.3 Use in hygienic areas to EHEDG



In case welded adapters are used, the food contact surface must be smooth (surface roughness $R_a < 0.8 \mu\text{m}$) and the welding has to be done according to EHEDG Guideline 9 and 35.



The device is suited for CIP (cleaning in process) when installed correctly.

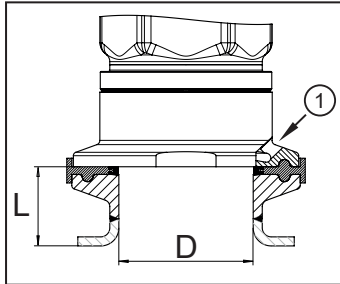
- ▶ Observe the application limits (temperature and material resistance) according to the data sheet.
- ▶ Ensure that the installation of the device in the system complies with EHEDG guidelines.
- ▶ Use self-draining installation.

- 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.

- When mounted in a tank, the installation must be flush mount. If not possible then direct water jet cleaning and cleaning of dead spaces must be possible.
- Leakage ports must be clearly visible and must be installed facing downwards for vertical pipes.



- To avoid dead space adhere to the dimensions:
 $L < D$

1: Leakage port

5.4 G1A sealing cone adaptation PM16



Information about available adapters at: www.ifm.com

- Observe the instructions of the adapter.



A guarantee for a long-term stable and maintenance-free fitting, with no bug traps in the sealing of the metal seal is only valid for once-only mounting.

The unit can be fixed to different process connections.

Options are as follows:

1: Installation using a clamp adapter

Order no. E3360x.



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.
- Recommended tightening torque: 35Nm.

The adapter E33602 is supplied with an EPDM-O-ring (order no. E30438) and an FKM O-ring (order no. E30437).

2: Installation using a welding adapter

Order no. E30013 sealing: metal to metal

Order no. E30072 sealing: with sealing ring



Information about available adapters at www.ifm.com.

- Observe the instructions of the adapter.
- Make sure that the process adapter does not warp during welding.
- Use a lubricating paste which is suitable and approved for the application.

The adapter E30072 is supplied with an EPDM-O-ring (order no. E30438) and an FKM O-ring (order no. E30437).

3: Installation using an adapter G1 to G1/2

Order no. E30116



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.
- ▶ Recommended tightening torque: 20Nm.

5.5 Ventilation diaphragm with protective cap (not PM1602)

5.5.1 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 ventilation diaphragm please take the following into account:

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



If the sensor is in a cooling stage:

- ▶ Avoid contact of the ventilation diaphragm with liquids to avoid negative pressure in the measuring system (resulting in a slightly falsified measured value) and additional strain on the diaphragm.

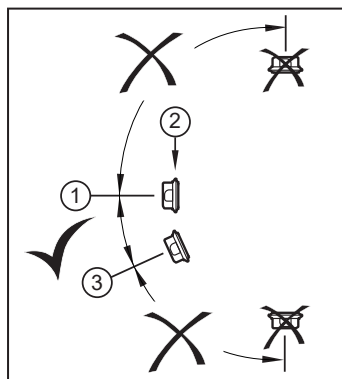
5.6 Ventilation diaphragm

5.6.1 Orientation filter cover

The filter cover is freely rotatable around the sensor's axis and thus adaptable to the environmental conditions.

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

When the sensor is mounted in a horizontal position or similar, the filter protection cap must be rotated towards one of the two lateral faces to bring the ventilation diaphragm into a vertical position. This guarantees the optimum drainage for liquids.



- ▶ Ideal orientation (1):
The filter cover is in a horizontal position.
- ▶ The ventilation diaphragm (2) in the filter cover is in a vertical position.
- ▶ Maximum inclination of the filter cover: 30° (3)

5.6.2 Replace filter cover

(1) Accessory E30483 (with drip edge) or E30142 (without drip edge)

Filter cover with integrated ventilation diaphragm.

In difficult environmental conditions or an installation situation that does not correspond to the ideal alignment (1), the following accessories can be used to protect the ventilation diaphragm:

(2) Accessory E30148

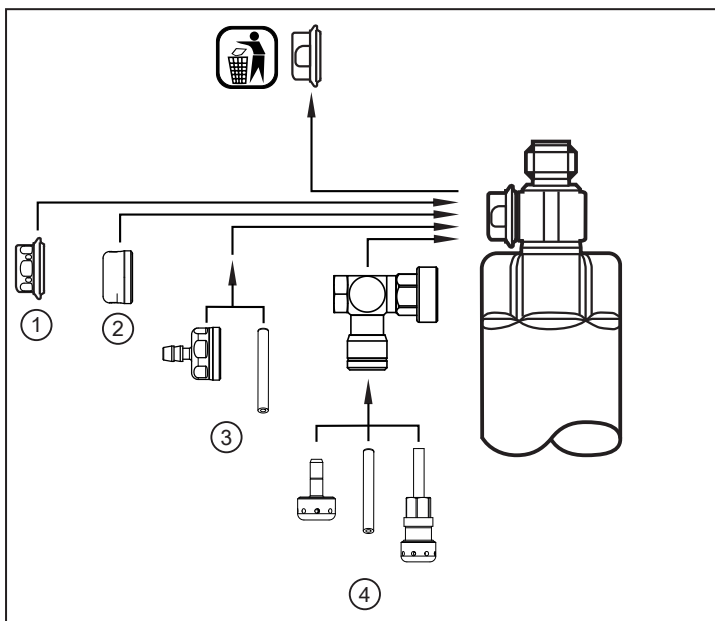
Closed version of the filter cover: → Observe the operating instructions of the sensor!

(3) Set of accessories E30139

Filter cover with integrated ventilation diaphragm and tube fitting with a vent tube.

(4) Set of accessories E30467

Ventilation for demanding applications:
Consisting of an adapter with integrated ventilation diaphragm, a tube fitting that is directly inserted into a right-angle fitting, or with a vent tube placed in between.



- ▶ Avoid soiling and moisture during the exchange
- ▶ Clean the thread carefully and without residues.
- ▶ Do not damage the adhesive surface for the diaphragm on the sensor.
- ▶ Observe the orientation of the filter cover (→ Installation instructions E30139 / E30467).



When using the closed filter cover, there is no pressure compensation of the measuring cell any more. Therefore measurement deviations due to:
Fluctuations of the atmospheric pressure.
Pressure fluctuations inside the device in case of temperature changes ($\Delta 10\text{ K} \leq 30\text{ mbar}$).

6 Electrical connection



The unit must be connected by a qualified electrician.

Observe the national and international regulations for the installation of electrical equipment.

Voltage supply according to SELV, PELV.

► Disconnect power.

► Connect the unit as follows:

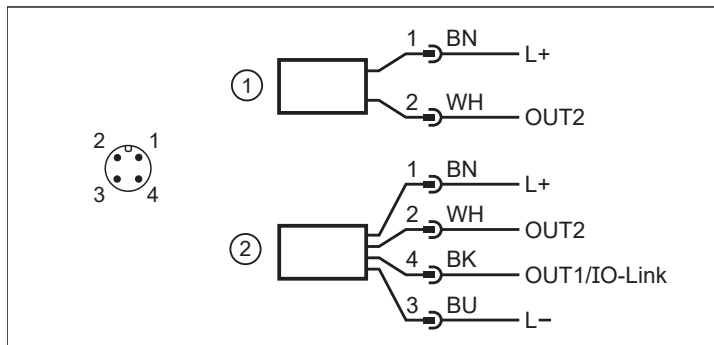
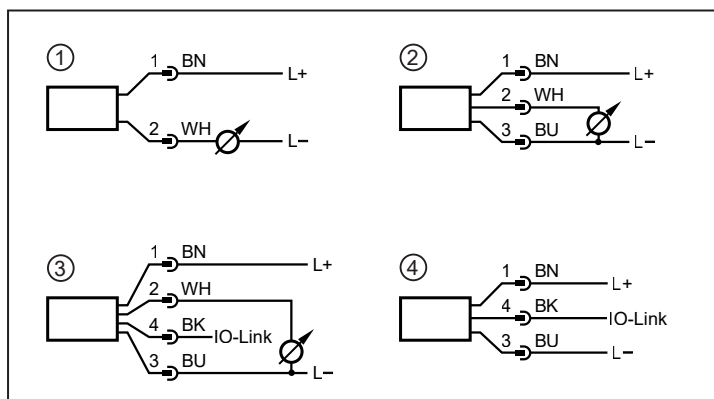


Fig. 2: Wiring diagram (colours to DIN EN 60947-5-2)

BK:	Black	BN:	Brown
BU:	Blue	WH:	White
1:	2-wire operation (2w)		
2:	3-wire operation (3w)		

Pin	Connection
1	L+
3	L-
4 (OUT1)	• IO-Link
2 (OUT2)	• Analogue output

Circuit examples:



- 1: (2w) 1 x analogue
- 2: (3w) 1 x analogue
- 3: (3w) 1 x analogue / 1 x IO-Link
- 4: (3w) 1 x IO-Link



EMC test to EN 61000-4-5 Surge: 0.5 kV

7 Parameter setting



The unit can be configured via the IO-Link function.

- ▶ Use the unit description file (IODD) for this purpose: www.ifm.com
- ▶ Prepare IO-Link hardware and software for parameter setting.
- ▶ Connect the unit with e.g. an IO-Link interface or programmed memory plug.
- ▶ Set the parameters.
- ▶ Put the unit into operation.
- ▶ The parameters can be set before installation or during operation.



Changing parameters during operation can influence the function of the plant.

- ▶ Make sure that there will be no malfunctions or dangerous operation in your plant.

7.1 Parameter setting via PC

For parameter setting, an IO-Link parameter setting software, an IO-Link master and a suitable device description file (IODD) are required. www.ifm.com.

- ▶ Prepare computer, parameter setting software and IO-Link master.
- ▶ Connect the device with the IO-Link master.
- ▶ Follow the menu of the IO-Link parameter setting software.
- ▶ Set the parameters.
- ▶ Put the device into operation.

7.2 Parameter setting via the memory plug

A parameter set can be written to the device / can be recorded by the device via a memory plug (ifm storage module): www.ifm.com.



In order to allow for data to be written from the memory plug to the sensor, the sensor must have the factory setting.



If the sensor has been configured, the memory plug records the parameter set which can then be transferred to other sensors of the same type.

- ▶ Load a suitable parameter set (e.g. from a PC or from a sensor of the same type) to the memory plug.
- ▶ Connect the memory plug between sensor and socket.
- ▷ Sensor with factory setting:
When voltage is supplied, the parameter set is transferred from the memory plug to the sensor.
- ▷ Sensor with changed settings:
When voltage is supplied, the memory plug records the sensor's parameter set.
- ▶ Remove the memory plug.
- ▶ Put the unit into operation.

More information on the memory plug: → Documentation www.ifm.com.

7.3 Teach offset with button

An external teach button (E30425) allows for a zero-point calibration (calibration offset). The current measured value is taken as internal zero point if this measured value lies within a range of $\pm 3\%$ of the measuring span.

► Connection: → Data sheet E30425



If a teach button is connected, no IO-Link communication is possible.

- Integrate the teach button between the installed sensor and the supply cable.
- Maintain the plant pressure constantly at zero (configurable range = $\pm 3\%$ of the measuring span).
- Press the button for $> 2 \dots < 10$ s.
- ▷ When voltage is supplied, the LED in the button flashes at 2 Hz and configures the zero point (calibration offset).
- ▷ In case of a fault, the LED flashes at 8 Hz.

7.4 Scale analogue value

► Select [ASP2] and set the pressure value at which 4 mA is provided.	[ASP2]
► Select [AEP2] and set the pressure value at which 20 mA is provided.	[AEP2]
Minimum distance between ASP2 and AEP2 = 20 % of the measuring span (scaling factor 5).	

7.5 Setting of the standard unit of measurement

► Select [uni.P] and set the unit of measurement: [bAr] / [mbar] / [MPa] / [kPa] / [PSI] / [mWS] / [inH2O]	[uni]
---	-------



The selectable units of measurement depend on the respective device.

7.6 User settings (optional)

7.6.1 Set damping for the analogue output

► Select [dAA] and set the damping constant (rise time 10...90 %) in seconds: Setting range: 0.000...4.000 s	[dAA]
---	-------



Damping [dAA] only influences the analogue output / analogue signal path.

7.6.2 Set damping for the measured signal

► Select [dAP] and set the damping constant in seconds (τ value 63 %). Setting range: 0.000...4.000 s.	[dAP]
---	-------



Damping [dAP] influences the process data flow (IO-Link communication).

7.6.3 Zero-point calibration

► Select [coF] and set the zero point between -3%...+3%. The internal measured value "0" is shifted by this value.	[coF]
--	-------

 The command "Teach COF" is used to readjust to zero.
The command "Reset COF" resets [coF].

7.6.4 List of the parameters

Parameter	Function
ASP2	Analogue start point: Measured value at which 4 mA is provided.
AEP2	Analogue end point: Measured value at which 20 mA is provided. Minimum distance between ASP and AEP = 20% of the measuring span.
uni	Standard unit of measurement for system pressure (display): [bar] / [mbar] / [MPa] / [kPa] / [PSI] / [mWS] / [inH2O]  The selectable units of measurement depend on the respective device.
coF	Zero-point calibration (calibration offset). Compared to the real measured value, the internal measured value (operating value of the sensor) is shifted. Setting range: -3%...+3% of the measuring span.
dAA	Damping for the analogue output. Pressure peaks of short duration or high frequency can be filtered out using this function.
dAP	Damping of the process value (only applies to IO-Link evaluation).
Lo	Minimum value memory for system pressure (irrespective of the set damping).
Hi	Maximum value memory for system pressure (irrespective of the set damping).

7.7 Diagnostic functions

7.7.1 Read min/max values for the system pressure

► Select [Hi] or [Lo] to display the highest or lowest measured process value: [Hi] = maximum system pressure [Lo] = minimum system pressure	[Hi] [Lo]
--	--------------

 The memory can be reset.

8 Operation

After switching on the supply voltage and expiry of the power-on delay time (2-wire: approx. 1 s / 3-wire: approx. 0.5 s), the device is in the RUN mode (= normal operating mode). It carries out its measurement and evaluation functions and generates output signals according to the set parameters.

9 Troubleshooting

The device has many self-diagnostic options.

It monitors itself automatically during operation. Warnings and faults are signalled via IO-Link. If a process value fails, the other process values are still available.



Additional diagnostic functions are available via IO-Link.
IODD interface description at: www.ifm.com.



The IO-Link error codes are contained in the IODD.

Type	Description	Output behaviour	Troubleshooting
Error	Device faulty / malfunction	21.5 mA	Replace device.
Error	Supply voltage too low.	Off	Check the supply voltage.
Error	Parameter setting outside the valid range.	21.5 mA	Repeat parameter setting.
Error	Error in pressure measurement	21.5 mA	Check pressure measurement. Replace device.
Warning	Pressure range exceeded ($\geq 105\%$ MEW*).	20.5 mA	Check pressure range.
Warning	Pressure range not reached ($\leq -5\%$ MAW**).	3.8 mA	Check pressure range.

*MEW = final value of the measuring range

**MAW = initial value of the measuring range

10 Disposal, repair and return

- ▶ In case of return shipment, ensure that the unit is free from soiling, especially from dangerous and toxic substances.
- ▶ It is not possible to repair the unit.
- ▶ After use dispose of the product or components in an environmentally friendly way in accordance with the applicable national regulations.

11 Factory setting

	Factory setting	User settings
ASP2	0% VMR*	
AEP2	100% VMR	
uni	bar / mbar	
cof	0.0	
dAA	0.1	
dAP	0.06	

VMR = final value of the measuring range

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