GB

Operating instructions
Air gap sensor
SDP110

80300121 / 00 04 / 2021

Contents

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

1.2 Warnings used

CAUTION

Warning of personal injury

▷ Slight reversible injuries may result.

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.
- 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 Intended use

The unit monitors the distance value with the help of compressed air in industrial use.

The unit detects the process values distance, flow velocity, volume flow (flow rate/time) and pressure.

3.1 Application area

All indications apply to standard volume flow to DIN ISO 2533, i.e. volume flow at 1013 mbar (101.3 kPa), 15 °C and 0 % relative air humidity. The unit can be set to different standard conditions.

Electromagnetic compatibility (EMC):
This is a class A product. This product may cause radio interference in domestic areas:

▶ If required, take appropriate EMC screening measures.

Pressure Equipment Directive (PED):
The units comply with the Pressure Equipment Directive and are designed for stable gases of fluid group 2 and manufactured in accordance with the sound engineering practice.
Use of media from group 1 fluids on request.

4 Function

- The unit detects the distance of a workpiece using flow measurement.
- The unit detects flow based on the calorimetric measuring principle.
- As an additional process value the unit also detects the pressure.
- The unit can be operated in SIO mode (standard input-output) or in IO-Link mode.
- The unit displays the current process values.
- The unit has many self-diagnostic options.
- A simulation mode allows simplified set-up of the sensor.
- The unit generates two output signals according to the parameter setting.

4.1 Output OUT1 selection options

- Switching signal distance
- Switching signal flow
- Switching signal pressure
- IO-Link
- OFF (output switched to high impedance)

4.2 Output OUT2 selection options

- Switching signal distance
- Switching signal flow
- Switching signal pressure
- Analogue signal distance
- Analogue signal flow
- Analogue signal pressure
- Input for external distance teach
- OFF (output switched to high impedance)

4.3 Distance measurement

The unit measures the volume flow (flow rate/time) and thus detects the distance: The closer a workpiece is to a measuring nozzle, the lower the quantity of air that flows through the air gap between the workpiece and the measuring nozzle.

- The unit detects the airflow as a flow and converts it into a distance value.
- The unit can output the distance value via an analogue signal.
- The unit can output a switching signal when defined distance values are exceeded or not reached.
  - Distance values can be taught (→ Distance teach 🗋 26).
  - Distance values can be configured (→ Switching output 🗋 8).
- If the surface to be monitored covers several measuring nozzles, the volumetric flow is divided up over the number of measuring nozzles. The unit calculates an average from all distance values. It is therefore possible to monitor several measurement points. The number of measuring nozzles is set via the parameter [NOZ].

A minimum operating pressure of ≥ 500 mbar (50 kPa) is required for a successful distance measurement.

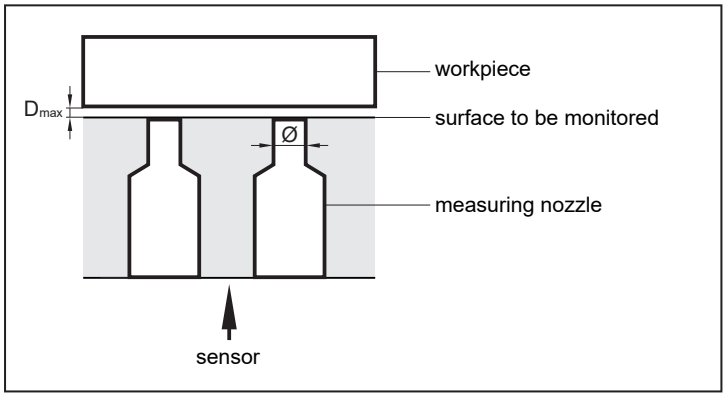


Fig. 1: Example: surface to be monitored with 2 measuring nozzles

The distance between workpiece and surface to be monitored must not exceed a maximum distance D_{max}. D_{max} depends on the diameter of the measuring nozzles and must not exceed the measuring range of the unit.

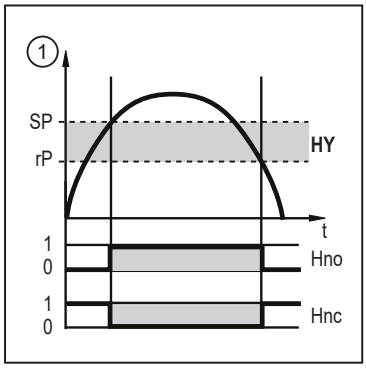
In general, the following applies: D_{max} ≤ ¼ Ø measuring nozzle at the exit.

Ø measuring nozzle in mm	D_{max} in µm	D_{max} none
1.0	250	500
1.1	275	550
1.2	300	600
1.3	325	650
1.4	350	700
1.5	375	750
1.6	400	800
1.7	425	850
1.8	450	900
1.9	475	950
2.0	500	1000

Tab. 1: Maximum distance D_{max} in relation to 1 measuring nozzle

4.4 Switching output

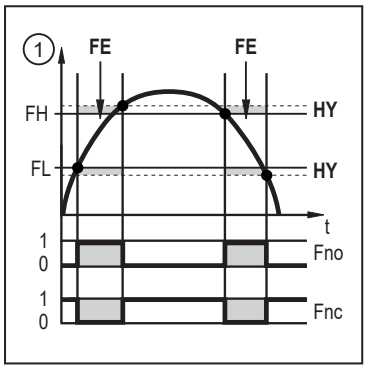
OUTx changes its switching status if it is above or below the set switching limits. Hysteresis or window function can be selected.



1: Process value
t: Time
SP: Set point
rP: Reset point
HY: Hysteresis
Hno: Hysteresis function NO (normally open)
Hnc: Hysteresis function NC (normally closed)

Fig. 2: Hysteresis function

When the hysteresis function is set, the set point [SP] and the reset point [rP] are defined. The rP value must be lower than the SP value. The distance between SP and rP is at least 4 % of the final value of the measuring range (= hysteresis). If only the set point is changed, the reset point is changed automatically; the difference remains constant.



1: Process value
t: Time
FH: Upper limit value
FL: Lower limit value
HY: Hysteresis
FE: Window area
Fno: Window function NO (normally open)
Fnc: Window function NC (normally closed)

Fig. 3: Window function

When set to the window function the upper limit value [FH] and the lower limit value [FL] are defined. The distance between FH and FL is at least 4 % of the final value of the measuring range. FH and FL have a fixed hysteresis of 0.25 % of the final value of the measuring range. This helps keep the switching status of the output stable if the flow rate varies slightly.

The maximum distance (→ Distance measurement 🗋 7) and the final value of the measuring range (→ Technical data) must be observed when setting SP, rP, FL and FH.

The switching signal in case of a fault is adjustable:

- [FOU] = On: The output switches ON in case of a fault.
- [FOU] = OFF: The output switches OFF in case of a fault.
- [FOU] = OU: The output switches ON (pressure measurement) /
  The output switches OFF (distance measurement and flow measurement).

4.5 Analogue output

The unit provides an analogue signal of 4…20 mA proportional to the process value.

The measuring range is scalable:

- [ASP] determines at which measured value the output signal is 4 mA.
- [AEP] determines at which measured value the output signal is 20 mA.

Minimum distance between ASP and AEP = 20 % of the final value of the measuring range.

The maximum distance (→ Distance measurement 🗋 7) and the final value of the measuring range (→ Technical data) must be observed when setting AEP.

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.

For measured values outside the setting range or in case of a fault, messages are displayed (UL, OL, Err, NoData).

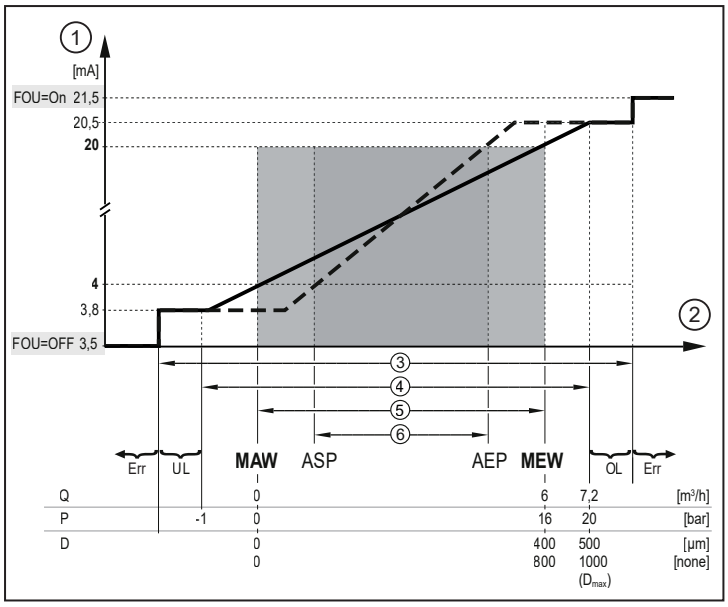


Fig. 4: Characteristics of the analogue output according to the standard IEC 60947-5-7

1:	Analogue signal	MAW:	Initial value of the measuring range (with setting of low flow cut-off for Q: signal output starting at MAW + LFC)
2:	Process value (Q; P; D)	MEW:	Final value of the measuring range
3:	Detection zone	ASP:	Analogue start point
4:	Setting range	AEP:	Analogue end point
5:	Measuring range	UL:	Setting range not reached
6:	Scaled measuring range	OL:	Setting range exceeded
Q:	Flow		
P:	Pressure		
D:	Distance		

Under fault conditions the analogue output is adjustable:

- [FOU] = On: The analogue signal goes to 21.5 mA.
- [FOU] = OFF: The analogue signal goes to 3.5 mA.
- [FOU] = OU: The analogue signal goes to 21.5 mA (pressure measurement) /
  The analogue signal goes to 3.5 mA (distance measurement and flow measurement).

4.6 Measured value damping

Use the damping time [dAP] to set after how many seconds the output signal has reached 63 % of the final value if the measured value changes suddenly. The set damping time stabilises the switching outputs, the analogue outputs, the display and the process value transmission via the IO-Link interface.

The damping time is added to the response time of the sensor (→ Technical data).

The signals UL and OL are defined under consideration of the damping time.

The measured value damping only has an effect on the flow and pressure measurement.

dAP.F = measured value damping for the flow
dAP.P = measured value damping for the pressure

In addition to the damping time of the process value, the unit also features a display refresh rate which, however, only has an influence on the presentation in the display.

4.7 Low flow cut-off

With the function low flow cut-off [LFC] it is possible to suppress small volumetric flow quantities. Volumetric flow below the LFC value is evaluated by the sensor as standstill (Q = 0).

4.8 Simulation

With this function, process values are simulated and their signal path is checked.

When the parameter OL is set, process values that lead to an error message or warning can be simulated.

During the simulation no error message of the current application is available. They are suppressed by the simulation.

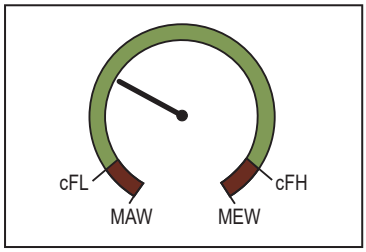
The following values can be simulated:

distance, flow, pressure.

4.9 Display colour setting

The colour of the characters in the display can be set via the parameter [coL.x]:

- Permanent definition of the display colour:
  - bk/wh (black/white)
  - yellow
  - green
  - red
- Colour change from red to green or vice versa:
  - r-cF (red display colour between the limits cFL...cFH)
  - G-cF (green display colour between the limits cFL...cFH)



cFL: Lower limit value
cFH: Upper limit value
MAW: Initial value of the measuring range
MEW: Final value of the measuring range

Fig. 5: Colour change in the window section

The limits can be freely selected within the measuring range and are independent of the output function set for OUT1 and OUT2.

4.10 IO-Link

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

General information about IO-Link can be found at io-link.ifm.

IO Device Description (IODD) with all parameters and process data of the unit can be found at documentation.ifm.com.

In the factory setting the unit is in SIO mode (standard input-output). When connected to an IO-Link master, the unit automatically switches to IO-Link mode.

IO-Link offers the following advantages:

- Noise-immune transmission of all process values.
- Parameter setting during operation or point-to-point at the desk.
- Detection of connected units.

- Freely definable parameters to identify the units in the plant.
- Additional parameter and diagnostic functions (events) compared to the SIO mode.
- Data storage: Automatic transfer of parameters when a unit is replaced.
- Logging of parameter sets, process values and events.

5 Mounting

CAUTION

If the medium temperature is above 50 °C (122 °F), parts of the housing can increase in temperature to over 65 °C (149 °F).

▷ Risk of burns.

▶ Protect the housing against contact with flammable substances and unintentional contact.

▶ Apply the supplied warning label to the sensor cable.

▶ Ensure that the system is free of pressure during installation.

▶ The rules and regulations for the installation and operation of compressed air equipment must be observed.

5.1 Orientation

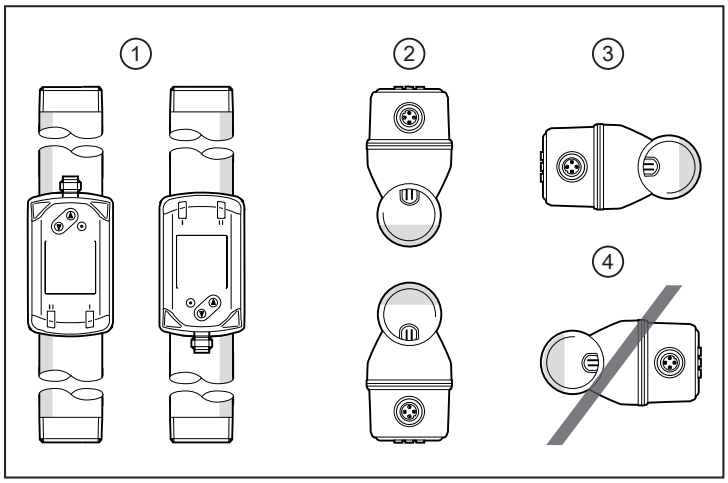


Fig. 6: Orientation of the pipe length and the unit

1: Pipe length vertical, any unit position
2: Pipe length horizontal, unit vertical
3: Pipe length right, unit on side
4: Avoid: pipe length left, unit on side

5.2 Installation location

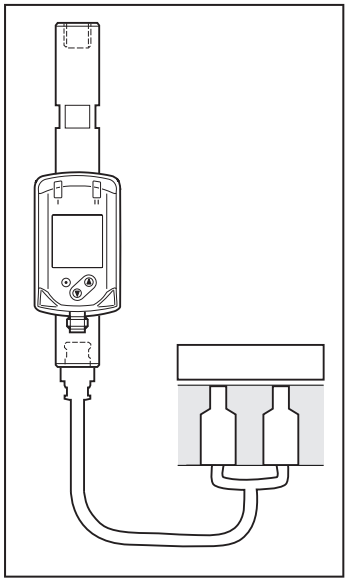
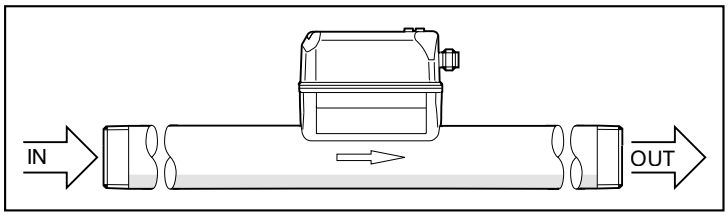


Fig. 7: Installation location

▶ For the continuous elimination of condensation water and particles in the compressed air system, make sure the unit is installed in a position higher than the measuring nozzles.

5.3 Process connection

▶ Fit the unit in the pipe in accordance with the flow direction (arrow on the unit):



Tighten both adapters in opposite direction by applying the defined tightening torque of 50 Nm:

5.4 Pneumatic connection technology

Note when selecting the right push-in fitting:

▶ Avoid cracks or tapering between the sensor and the push-in fitting.

▶ Do not use threads with hexagon socket mounting.
They can have a negative impact on the flow profile of the sensor and lead to an increased inaccuracy of the measured signal.

Recommended push-in fittings: Festo QS-G1/4-6 or QS-G1/4-8 connection

5.5 Rating of the measuring tubes

The response time of the system is mainly determined by the design of the pneumatic system.

Changes in pneumatic pressure are transferred with a time delay since air is compressible.

▶ Minimize the flow restriction of the measuring tubes (surface quality, cross-section changes, connections, etc.).

▶ Make sure that the measurement connection is tight.

Leakage can result in a change of the measurement result.

5.6 Measuring nozzle geometry

In order to achieve an optimal measuring performance of the unit, the measuring nozzles should have the following characteristics:

- The measuring nozzle is 1.5 times longer than its diameter at the outlet.
- The access bore hole of the measuring nozzle has 2.5 x the diameter of the measuring nozzle at the outlet.
- Expanding the access bore hole to an angle of 120°.
- The outlet of the measuring nozzle is sharp-edged.

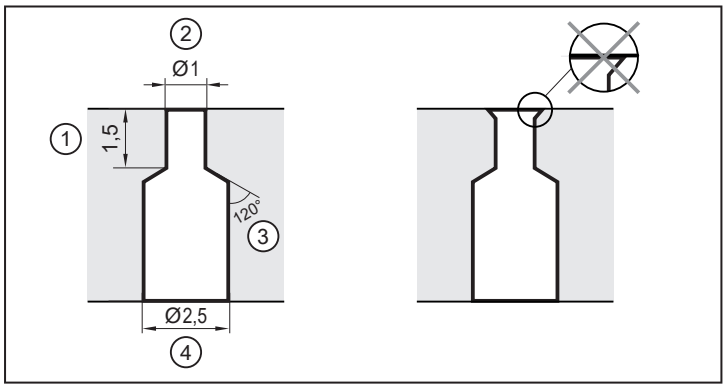


Fig. 8: Example of a measuring nozzle with Ø 1 mm

1: Measuring nozzle length
2: Measuring nozzle outlet
3: Widening of the access bore hole
4: Access bore hole of the measuring nozzle

6 Electrical connection

The device must be connected by a qualified electrician.

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

Voltage supply according to EN 50178, SELV, PELV.

▶ Disconnect power.

▶ Connect the unit as follows:

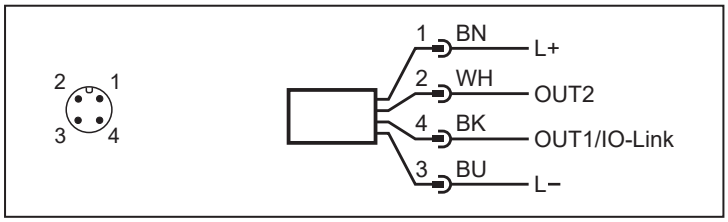


Fig. 9: Wiring diagram (colours to DIN EN 60947-5-2)

BK: black
BN: brown
BU: blue
WH: white

Pin	Connection
1	L+
3	L-
4 (OUT1)	• Switching signal distance • Switching signal flow • Switching signal pressure • IO-Link • OFF (output switched to high impedance)
2 (OUT2)	• Switching signal distance • Switching signal flow • Switching signal pressure • Analogue signal distance • Analogue signal flow • Analogue signal pressure • Input for external distance teach • OFF (output switched to high impedance)

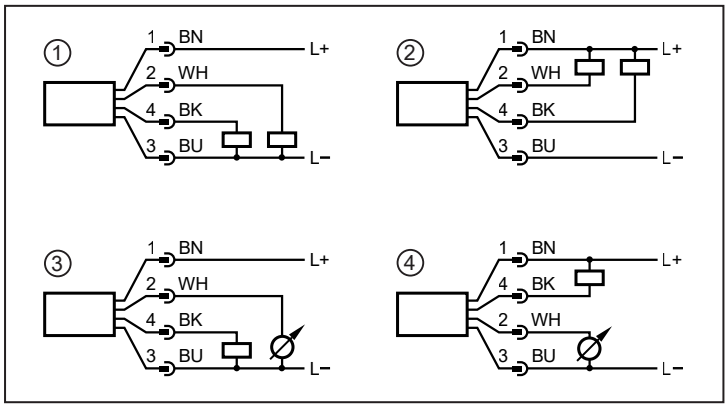
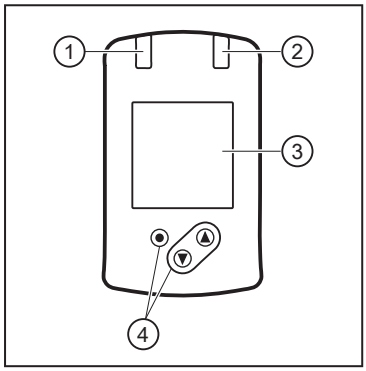


Fig. 10: Circuit examples

1: 2 x positive switching
2: 2 x negative switching
3: 1 x positive switching / 1 x analogue
4: 1 x negative switching / 1 x analogue

7 Operating and display elements



1: Switching status LED for OUT1
2: Switching status LED for OUT2
3: TFT display
4: Keys for changing views and parameter setting

Fig. 11: Operating and display elements

Display illumination:
Unit temperature > 70 °C: brightness automatically reduced.
Unit temperature ≥ 100 °C: display automatically switched off.

8 Menu

The figures in which the menus are displayed show the parameters that can be set on the unit by key input. These parameters and other functions are also available via the IO-Link interface.

8.1 Menu overview

Use the operating keys to navigate from the process value display to the main menu and from there to the submenus.

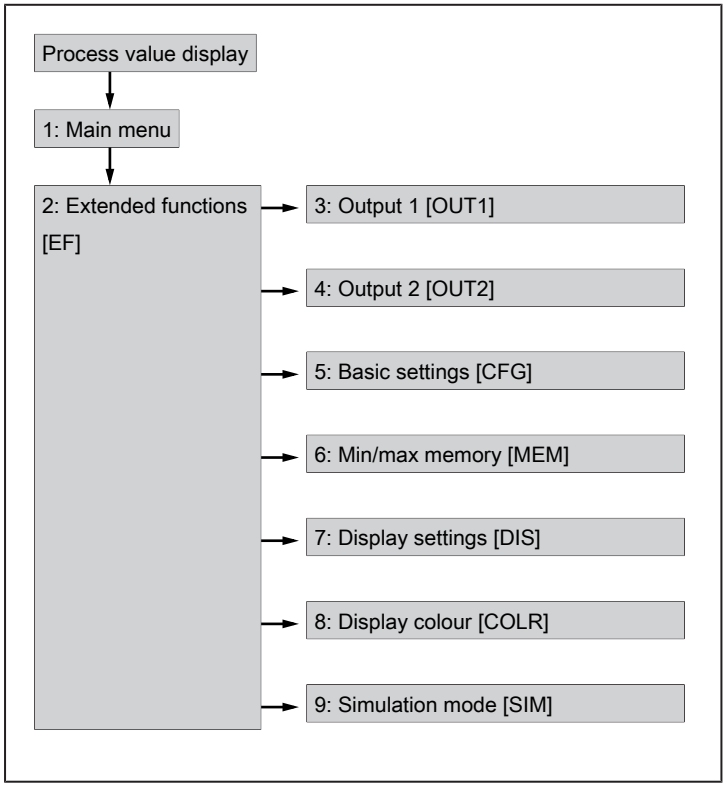


Fig. 12: Menu overview

8.2 Main menu and submenus

The displayed parameters change when the factory setting is changed. The following menu displays show the maximum available parameters.

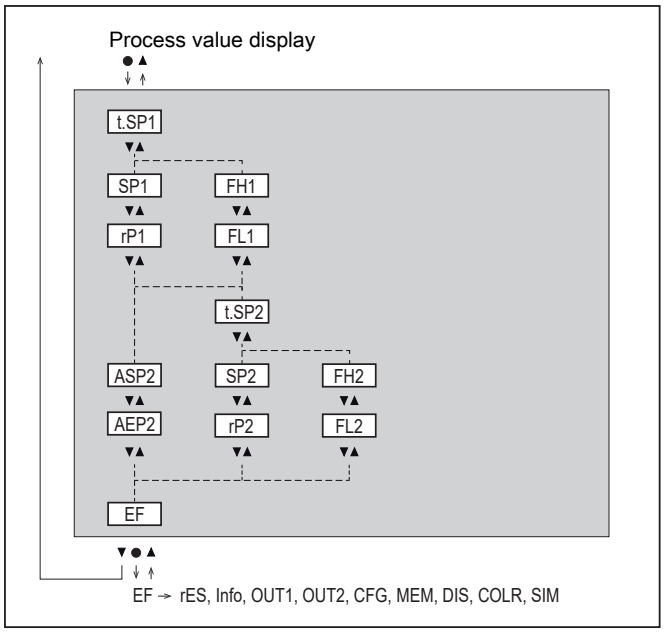


Fig. 13: Main menu

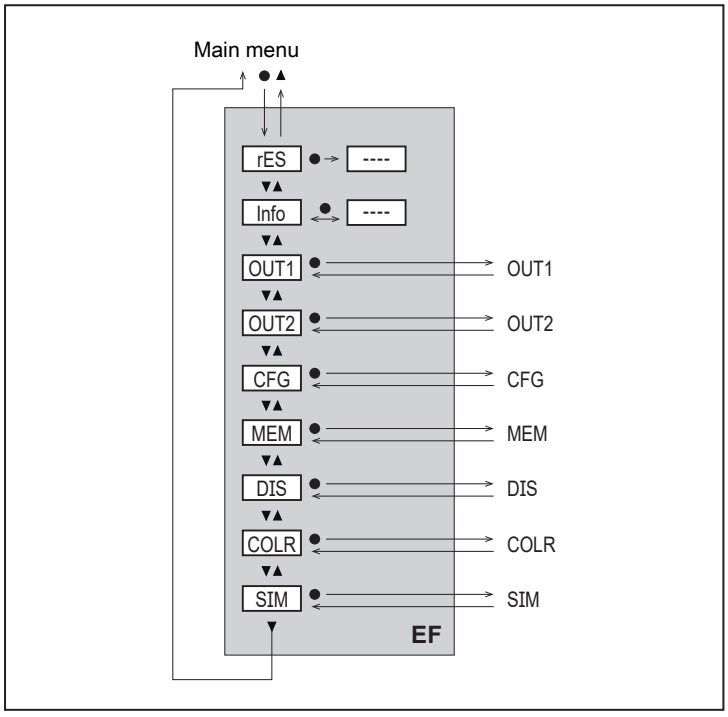


Fig. 14: Extended functions [EF] menu

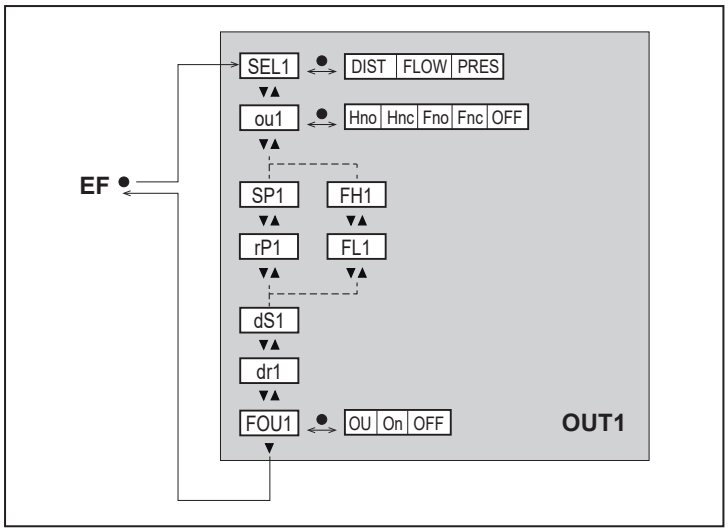


Fig. 15: Output 1 [OUT1] menu

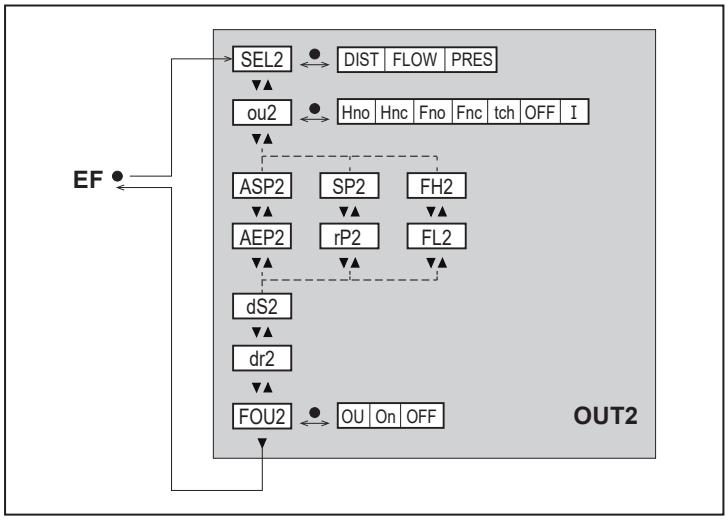


Fig. 16: Output 2 [OUT2] menu

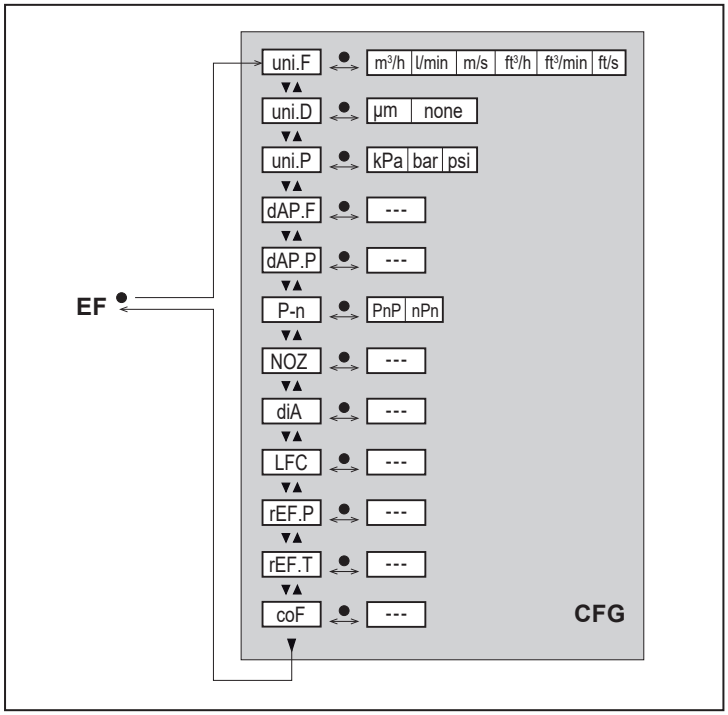


Fig. 17: Basic settings [CFG] menu

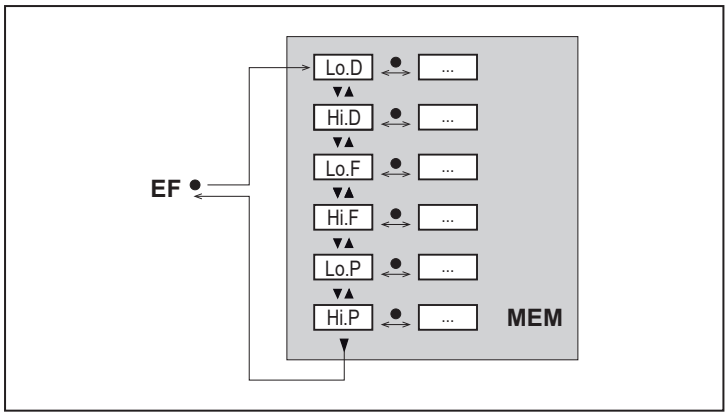


Fig. 18: Min/max memory [MEM] menu

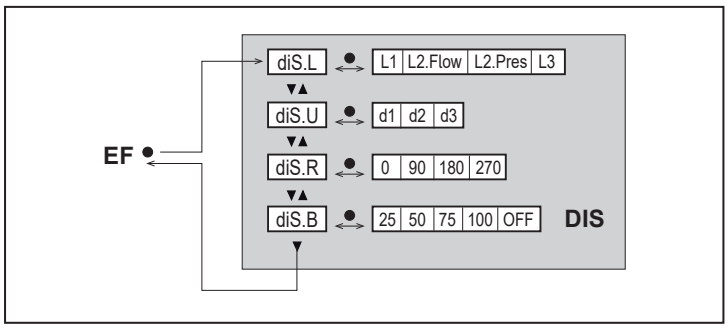


Fig. 19: Display settings [DIS] menu

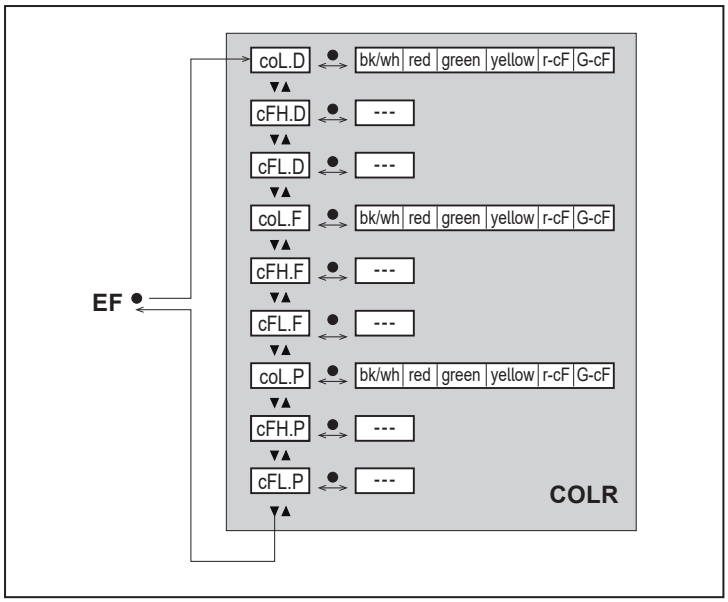


Fig. 20: Display colour [COLR] menu

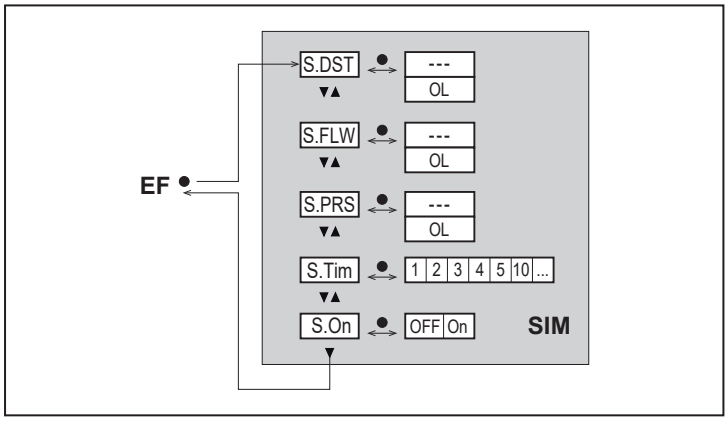


Fig. 21: Simulation Mode [SIM] menu

9 Set-up

After power-on and expiry of the power-on delay time of approx. 1 s, the unit is in the normal operating mode. It carries out its measurement and evaluation functions and generates output signals according to the set parameters.

- During the power-on delay time the outputs are switched as programmed:
  - ON with normally open function (Hno / Fno)
  - OFF with normally closed function (Hnc / Fnc).
- If output 2 is configured as analogue output, the output signal is at 20 mA during the power-on delay time.

When an IO-Link master is connected, the unit automatically switches from SIO mode (standard input-output) to IO-Link mode.

10 Parameter setting

The parameters can be set via the IO-Link interface or via the keys on the unit.

CAUTION

If the medium temperature is above 50 °C (122 °F), parts of the housing can increase in temperature to over 65 °C (149 °F).

▷ Risk of burns

▶ Do not touch the device with your hands.

▶ Use another object (e.g. a ballpoint pen) to carry out settings on the unit.

Parameters can be set before installation or during operation.

If you change parameters during operation, this will influence the function of the plant.

▶ Ensure that there will be no malfunctions in your plant.

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

10.1 Parameter setting via IO-Link

For parameter setting via the IO-Link interface, you need suitable parameter setting software and the IO Device Description (IODD) for the unit.

- IODD, parameter setting software and information on IO-Link at io-link.ifm.
- Notes on parameter setting → Manual of the parameter setting software.
- List of all available parameters in the PDF "IO-Link interface description" at documentation.ifm.com.

Via IO-Link, all parameters can be set that are also accessible via the keys on the unit. In addition, the functions described below are available.

10.1.1 System commands

10.1.1.1 Flashing On / flashing off

The command is used to visually locate the unit in the installation. When activated, the switching status LEDs flash and "IO-L" is displayed.

10.1.1.2 Distance teach

The command is used to teach a switch point SP1 or SP2 for the current object distance. See also Distance teach (→ 🗋 26).

10.1.2 Identification

Information about the unit is provided via the IODD. In addition, customer-specific descriptions for identification can be assigned to the unit via IO-Link.

10.1.2.1 Application Specific Tag

- Customer-specific application description.
- Maximum length 32 characters and freely definable.

10.1.2.2 Function Tag

- Customer-specific functional description.
- Maximum length 32 characters and freely definable.

10.1.2.3 Location Tag

- Customer-specific application description.
- Maximum length 32 characters and freely definable.

10.1.3 Parameters

The unit is configured via the parameters. The parameters described below are only available via the IO-Link interface.

10.1.3.1 Access locks to the units: Local parameter setting

- [Open]: The unit can be adjusted using the keys on the unit.
- [Blocked]: The keys on the unit are locked so that settings on the unit and unlocking can only be made via IO-Link.

10.2 Parameter setting via the unit keys

10.2.1 Parameter setting in general

Intention	Action
Change from the process value display to the main menu	[●]
Change to the submenu	Use [▼] to navigate to the sub-menu (e.g. EF), then [●]
Select the requested parameter	[▲] or [▼]
Change to the setting mode	[●]
Modification of the parameter value	[▲] or [▼] > 1 s
Apply the set parameter	[●]
Exit parameter setting without saving	[▲] and [▼]
Return to the next higher menu level (repeat several times to reach process value display)	[▲] and [▼]
Return to the process value display	> 30 seconds (timeout)

The unit keys can only be locked via the IO-Link interface. Unlocking is then only possible via IO-Link.

10.2.2 Presets

Before setting the parameters, first check the following default settings and change them if necessary:

- [SEL1]: Process value for OUT1
- [SEL2]: Process value for OUT2
- [uni.D]: Standard unit of measurement for distance
- [uni.F]: Standard unit of measurement for flow
- [uni.P]: Standard unit of measurement for pressure

10.2.2.1 Process value for OUTx

▶ Select the OUTx menu.

▶ Select [SELx] and set the process value for output x:

- DIST: Distance
- FLOW: Flow
- PRES: Pressure

10.2.2.2 Standard unit of measurement

▶ Select the CFG menu.

▶ Select [uni.D] and set the unit of measurement for the distance: µm or none (without unit of measurement).

▶ Select [uni.F] and set the unit of measurement for the flow: l/min, m^3/h, m/s, ft^3/min, ft^3/h, ft/s.

▶ Select [uni.P] and set the unit of measurement for the pressure: kPa, bar, psi.

10.2.3 Setting the output functions

The parameters for distance monitoring, flow monitoring and pressure monitoring are set in the same way. The prerequisite is that the process value for OUTx has first been defined via [SELx].

10.2.3.1 Limit monitoring OUTx / hysteresis function

▶ Select the OUTx menu.

▶ Select [oux] and set the switching signal:

- Hno: hysteresis function / normally open
- Hnc: hysteresis function / normally closed

▶ Select [SPx] and set the measured value at which the output switches.

▶ Select [rPx] and set the measured value at which the output switches off.

10.2.3.2 Limit monitoring OUTx / window function

▶ Select the OUTx menu.

▶ Select [oux] and set the switching signal:

- Fno: window function / normally open
- Fnc: window function / normally closed

▶ Select [FHx] and set the upper limit of the window section.

▶ Select [FLx] and set the lower limit of the window section.

10.2.3.3 Analogue signal OUT2

▶ Select the OUT2 menu.

▶ Select [ou2] and set the function:
I: flow-proportional current signal 4…20 mA.

▶ Select [ASP2] and set the measurement value at which the output signal is 4 mA.

▶ Select [AEP2] and set the measurement value at which the output signal is 20 mA.

10.2.4 Distance teach

With distance teach, a switching point SP is set for the current object distance. The reset point rP is changed with a fixed set value (80 % SP). The window function is not available for the distance teach.

▶ For limit value monitoring with window function, set the parameters FH and FL via the menu of the unit (→ Limit monitoring OUTx / window function 🗋 25) or the parameter setting software.

▶ Apply a minimum operating pressure of 500 mbar (50 kPa) to the sensor.

▶ Position the workpiece in front of the surface to be monitored. Do not exceed the maximum distance: Distance measurement (→ 🗋 7).

▶ Perform one of the teach operations described below.

▷ The switch point is set.

10.2.4.1 Teach via keys on the unit

▶ Select the OUTx menu.

▶ Select [SELx] and set DIST.

▶ Select [oux] and set the switching signal:

- Hno: hysteresis function / normally open
- Hnc: hysteresis function / normally closed

▶ Select the main menu.

▶ Select [t.SPx].

▶ Keep [▲] or [▼] pressed.

▷ [---] is displayed.

▶ Briefly press [●].

With a failed teach: [Teach FAIL] is displayed.

▶ Repeat the teach process.

10.2.4.2 Teach via external teach input

▶ Select the OUT1 menu.

▶ Select [SEL1] and set DIST.

▶ Select [ou1] and set the switching signal:

- Hno: hysteresis function / normally open
- Hnc: hysteresis function / normally closed

▶ Select the OUT2 menu.

▶ Select [ou2] and set tch.

▶ Apply HIGH signal to OUT2 for 0.5...5 seconds.

▷ Teach is executed.

▷ The current distance value is adopted as limit value SP1 for output 1.

If the HIGH signal is applied for more than 5 seconds, the unit switches to normal operation. No teach was carried out.

10.2.4.3 Teach via IO-Link interface

▶ Connect the unit to the parameter setting software.

▶ Use the system commands [SP1 teach] or [SP2 teach] to set the parameters for limit values of the unit.

More detailed information can be found in the IODD at www.ifm.com.

10.2.5 User settings (optional)

10.2.5.1 Standard display

▶ Select the DIS menu.

▶ Select [diS.L] and set the process value display:

- L1 = current process value for distance
- L2.Flow = current process value for distance and flow
- L2.Pres = current process value for distance and pressure
- L3 = current process value for distance, flow and pressure

▶ Select [diS.U] and set the refresh rate of the display:

- d1: High
- d2: Medium
- d3: Low

▶ Select[diS.R] and set the orientation of the display:

- 0°, 90°, 180°, 270°

▶ Select [diS.B] and set the brightness of the display:

- 25 %, 50 %, 75 %, 100 %.
- OFF: The process value display is switched off in the operating mode (energy-saving mode).

Error messages are displayed even if the display is deactivated. Display activation by pressing any key.

10.2.5.2 Standard unit of measurement

Set the standard unit of measurement before all other parameter settings (→ Standard unit of measurement 🗋 25).

10.2.5.3 Display colour setting

▶ Select the COLR menu.

▶ Select [coL.x] and set the colour of the characters of the process value display:
bk/wh, yellow, green, red, r-cF, G-cF.

coL.D: Font colour for distance coL.F: Font colour for flow coL.P: Font colour for pressure

▶ Select [cFH.x] and [cFL.x] and set the limits for the colour change:

cFH.D: upper limit for distance cFL.D: lower limit for distance
cFH.F: upper limit for flow cFL.F: lower limit for flow
cFH.P: upper limit for pressure cFL.P: lower limit for pressure

10.2.5.4 Output logic

▶ Select the CFG menu.

▶ Select [P-n] and set PnP or nPn.

10.2.5.5 Measured value damping

▶ Select the CFG menu.

▶ Select [dAP.F] for flow measurement or [dAP.P] for pressure measurement and set damping constant in seconds (τ value 63 %).

10.2.5.6 Measuring nozzle diameter

▶ Select the CFG menu.

▶ Select [diA] and set the inner diameter of the measuring nozzle(s).

10.2.5.7 Number of measuring nozzles

▶ Select the CFG menu.

▶ Select [NOZ] and set the number of measuring nozzles.

Only values of 1…5 can be set.

▶ For an application with more than 5 measuring nozzles: Select the standard unit "none".

10.2.5.8 Low flow cut-off

▶ Select the CFG menu.

▶ Select [LFC] and set the limit below which a flow is evaluated as standstill.

10.2.5.9 Standard conditions

▶ Select the CFG menu.

▶ Select [rEF.P] and set the standard pressure.

▶ Select [rEF.T] and set the standard temperature.

10.2.5.10 Zero-point calibration pressure

▶ Select the CFG menu.

▶ Select [coF] and set value in bar.

▷ The internal measured value 0 is shifted by this value.

10.2.5.11 Switch-on /switch-off delay

▶ Select the OUTx menu.

▶ Select [dSx] and set the delay for switching OUTx in seconds.

▶ Select [drx] and set the delay for resetting OUTx in seconds.

10.2.5.12 Error behaviour of the outputs

▶ Select the OUTx menu.

▶ Select [FOUx] and set the error behaviour for output x: On, OFF, OU.

(More details → chapters Switching output / Analogue output.)

10.2.5.13 Lock / unlock

The unit can be locked electronically to prevent unintentional settings. Factory setting: not locked.

Locking:

▶ Make sure that the unit is in the normal operating mode.

▶ Press [▲] and [▼] simultaneously for 10 s until [Set menu lock] is displayed.

Unlocking:

▶ Make sure that the unit is in the normal operating mode.

▶ Press [▲] and [▼] simultaneously for 10 s until [Reset menu lock] is displayed.

10.2.5.14 Factory reset

▶ Select the EF menu.

▶ Select [rES].

▶ Briefly press [●].

▶ Keep [▼] or [▲] pressed.

▷ [----] is displayed.

▶ Briefly press [●].

▷ The unit carries out a reboot.

We recommend documenting your own settings in the chapter Factory setting before carrying out a reset.

10.2.6 Diagnostic functions

10.2.6.1 Reading minimum values / maximum values

▶ Select the MEM menu.

▶ Select [Lo.x] or [Hi.x] to display the highest or lowest process value measured:

Lo.D: Minimum value of the distance measured in the process Hi.D: Maximum value of the distance measured in the process
Lo.F: Minimum value of the flow value measured in the process (flow volume or flow velocity) Hi.F: Maximum value of the flow value measured in the process (flow volume or flow velocity)
Lo.P: Minimum value of the pressure measured in the process Hi.P: Maximum value of the pressure measured in the process

Delete memory:

▶ Select [Lo.x] or [Hi.x].

▶ Keep [▲] and [▼] pressed.

▷ [----] is displayed.

▶ Briefly press [●].

It makes sense to delete the memories as soon as the unit operates under normal operating conditions for the first time.

10.2.6.2 Simulation

▶ Select the SIM menu.

▶ Select [S.DIS] and set the distance value to be simulated.

▶ Select [S.FLW] and set the flow value to be simulated.

▶ Select [S.PRS] and set the pressure value to be simulated.

▶ Select [S.Tim] and set the time of the simulation in minutes.

▶ Select [S.On] and set the function:

- On: The simulation starts. The values are simulated for the time set under S.Tim. Abort by pressing any key.
- OFF: The simulation is not active.

11 Operation

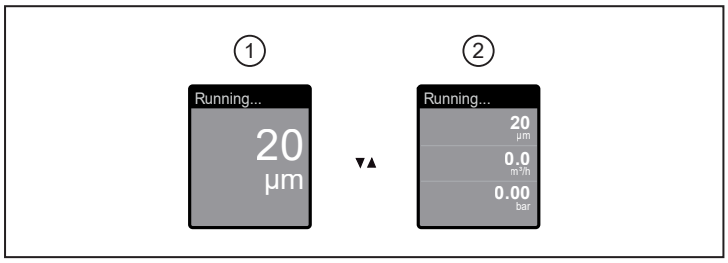
11.1 Process value display

It is possible to switch between different process value indications during operation:

▶ Press [▲] or [▼].

▷ The display changes between the standard indication with set standard unit of measurement and other views.

▷ After 30 s, the unit returns to the standard display.



1: Standard display as set under [dis.L]
2: Overview of all process values

11.2 Reading the parameter setting

▶ Briefly press [●].

▶ Press [▼] to select the parameter.

▶ Briefly press [●].

▷ The currently set value is displayed for 30 s. Then the unit returns to the process value display.

12 Troubleshooting

The unit has many self-diagnostic options. It monitors itself automatically during operation.

Warnings and error states are displayed even if the display is switched off. Error indications are also available via IO-Link.

The status signals are classified according to NAMUR recommendation NE107.

If several diagnostic events occur simultaneously, only the diagnostic message of the event with the highest priority is displayed.

If a process value fails, the other process values are still available. Exception: If the process value for flow fails, no other process values are output.

Additional diagnostic functions are available via IO-Link → IO-Link interface description at documentation.ifm.com.

12.1 Error messages

Display	Problem/remedy
• Title line: ERROR • Process value line: ERROR	Unit faulty / malfunction. ▶ Replace the unit.
No display	• Supply voltage too low. ▶ Check the supply voltage. • Display switched off. ▶ Check whether setting [diS.B] = OFF and change setting if necessary.
• Title line: Running • Process value line: NoData	Process value invalid. ▶ Check process conditions.
• Title line: Parameter Error • Process value line: PARA	Parameter setting outside the valid range. ▶ Check parameter setting.

In the event of an error, the outputs react according to the setting under [FOU].

12.2 Warning messages

Display	Problem/remedy
• Title line: Short circuit OUT1/OUT2 • Process value line: --- • Switching status LEDs for OUT1 and OUT2 flashing	Short circuit in both outputs. ▶ Check OUT1 and OUT2 for short circuit or excessive current.
• Title line: Short circuit OUT1 • Process value line: --- • Switching status LED for OUT1 flashing	Short circuit output 1. ▶ Check OUT1 for short circuit or excessive current.
• Title line: Short circuit OUT2 • Process value line: --- • Switching status LED for OUT2 flashing	Short circuit output 2. ▶ Check OUT2 for short circuit or excessive current.
• Title line: Under limit • Process value line: UL	Setting range not reached. ▶ Check the measuring range.
• Title line: Over limit • Process value line: OL	Setting range exceeded. ▶ Check the measuring range.
• Title line: --- • Process value line: Lock via key	Setting keys on the unit locked, parameter change rejected. ▶ Unlock unit.

Display	Problem/remedy
• Title line: --- • Process value line: Lock via communication	Parameter setting via keys locked, parameter setting is active via IO-Link communication. ▶ Finish parameter setting via IO-Link communication.
• Title line: --- • Process value line: Lock via system	Setting keys locked via parameter setting software, parameter change rejected. ▶ Unlock the unit via IO-Link interface using the parameter setting software.
• Title line: IO-Link flash • Process value line: IO-Link • Switching status LEDs for OUT1 and OUT2 flashing fast	IO-Link function for optical identification of the active unit. ▶ Deactivate IO-Link function.

In the event of a warning, the outputs react according to the setting under [FOU] = OU.
Exception: Short circuit.

13 Maintenance, repair and disposal

13.1 Maintenance

The unit is maintenance-free.

13.2 Repair

Only the manufacturer is allowed to repair the unit.

▶ Flush the unit at regular intervals with higher pressure (maximum 16 bar) to remove any soiling in the measuring channel.

13.3 Disposal

▶ After use dispose of the unit in an environmentally friendly way in accordance with the applicable national regulations.

14 Factory setting

Menu	Parameters	Factory setting	User setting
OUT1	SEL1	DIST	
	ou1	Hno	
	SP1 / FH1	100 µm	
	rP1 / FL1	98 µm	
	dS1	0	
	dr1	0	
	FOU1	On	
OUT2	SEL2	DIST	
	ou2	I	
	ASP2	0 µm	
	AEP2	250 µm	
	FOU2	On	
CFG	uni.F	m^3/h	
	uni.D	µm	
	uni.P	bar	
	dAP.F	0.6 s	
	dAP.P	0.06 s	
	P-n	PnP	
	NOZ	1	
	diA	1 00 mm	
	LFC	0.05 m^3/h	
	rEF.P	1013 mbar	
	rEF.T	15 °C	
	coF	0.00 bar	
DIS	diS.L	L1	
	diS.U	d3	
	diS.R	0	
	diS.B	75	
COLR	coL.D	bk/wh	
	coL.F	bk/wh	
	coL.P	bk/wh	
SIM	S.DST	200 µm	
	S.FLW	3.00 m^3/h	
	S.PRS	8.00 bar	
	S.Tim	3 min	
	S.On	OFF	