



Operating instructions
Flow sensor
SApp20

GB

11458808 / 00 11 / 2020

Contents



1	Preliminary note	4
1.1	Symbols used	4
1.2	Warnings used	4
2	Safety instructions	5
3	Getting started	6
3.1	Device function with factory setting	6
4	Functions and features	7
4.1	Application area	7
5	Function	8
5.1	Output OUT1 selection options	8
5.2	Output OUT2 selection options	8
5.3	Operating modes	8
5.4	Calibration	8
5.5	Switching output	9
5.6	Analogue output	10
5.7	Frequency output	10
5.8	Measured value damping	12
5.9	Display colour setting	12
5.10	IO-Link	12
5.10.1	IO-Link process values	13
6	Installation	14
6.1	Process connection	14
6.2	Interference	14
6.3	Installation position	15
6.3.1	Immersion depth	15
6.3.2	Recommended mounting position	15
6.3.3	Conditionally possible installation position	15
6.3.4	Impermissible installation position	16
6.3.5	Alignment	16
7	Electrical connection	17
8	Operating and display elements	18
9	Menu	19
9.1	Menu overview	19
9.2	Main menu and submenus	19
10	Set-up	22
11	Parameter setting	23
11.1	Parameter setting in general	23
11.2	Presetting	23
11.2.1	Process value for OUT2	23
11.2.2	Operating mode	24
11.2.3	Standard unit of measurement for flow	24
11.2.4	Internal pipe diameter	24
11.2.5	Flow adjustment	24
11.2.6	Remote calibration	25
11.3	Setting the output functions	25
11.3.1	Limit monitoring OUTx / hysteresis function	25
11.3.2	Limit monitoring OUTx / window function	25
11.3.3	Frequency signal OUTx	26
11.3.4	Analogue signal OUT2	26
11.4	User settings (optional)	26
11.4.1	Standard display	26
11.4.2	Display colour setting	26
11.4.3	Output logic	27
11.4.4	Measured value damping	27
11.4.5	Switch-on /switch-off delay	27

- 11.4.6 Error behaviour of the outputs 27
- 11.4.7 Calibration. 27
- 11.4.8 Lock / unlock. 28
- 11.4.9 Factory reset. 28
- 11.5 Diagnostic functions 28
 - 11.5.1 Reading minimum values / maximum values. 28
- 12 Operation 29
 - 12.1 Process value display 29
 - 12.2 Reading the parameter setting 29
- 13 Technical data. 30
- 14 Troubleshooting 31
 - 14.1 Error messages. 31
 - 14.2 Warning messages 31
- 15 Maintenance, repair and disposal 33
- 16 Factory settings. 34

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
- ▶ Instruction
- ▷ 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 creator 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.

3 Getting started

The unit has two configurable outputs for flow and temperature monitoring.

The process values and error messages can be read from the display.

All process values and messages are available via the IO-Link interface irrespective of the output configuration.

3.1 Device function with factory setting

	Factory setting
Operating mode	<ul style="list-style-type: none"> • Relative flow measurement in % of the maximum flow
Output OUT1	<ul style="list-style-type: none"> • Switching signal for flow: <ul style="list-style-type: none"> – hysteresis function normally open, PnP – SP1 = 20 %, rP1 = 15 % of the final value of the measuring range • Measured value damping 0.6 seconds • No switch-on /switch-off delay • In case of a fault the output switches OFF
Output OUT2	<ul style="list-style-type: none"> • Analogue signal for flow (4...20 mA; measuring range unscaled) • In case of a fault the analogue signal goes to 3.5 mA
Display	<ul style="list-style-type: none"> • Red text colour • Update of the measured values every 200 ms • Standard display: flow

More information: Factory setting (→ Factory settings  34).

4 Functions and features

The unit monitors gaseous media.

It detects the process categories flow and medium temperature.

4.1 Application area

- Medium = air



In applications > 6 bar (> 600 kPa), flow range inaccuracies may occur due to the natural convection of the air.



This is a class A product. This product may cause radio interference in domestic areas.

- ▶ If required, take appropriate EMC screening measures.

5 Function

- The unit detects flow based on the calorimetric measuring principle.
- As additional process value the unit detects the medium temperature.
- The unit has an IO-Link interface.
- The unit displays the current process values.
- The unit has many self-diagnostic options.
- The unit generates two output signals according to the parameter setting.

5.1 Output OUT1 selection options

- Switching signal flow
- Frequency signal flow
- IO-Link

5.2 Output OUT2 selection options

- Switching signal flow
- Switching signal temperature
- Analogue signal flow
- Analogue signal temperature
- Frequency signal flow
- Frequency signal temperature
- Input for external teach signal (remote calibration)

5.3 Operating modes

The unit provides 2 selectable operating modes for flow measurement:

Operating mode [ModE]	Display unit
REL	% of the taught range
GAS	m/s, l/min, m ³ /h

The selected operating mode has no effect on the temperature measurement, only absolute values in °C are indicated.



When [ModE] = GAS is selected:

- ▶ Define the internal pipe diameter.
- ▶ If required, calibrate curve of measured values.



When [ModE] = REL is selected:

- ▶ Carry out flow adjustment.

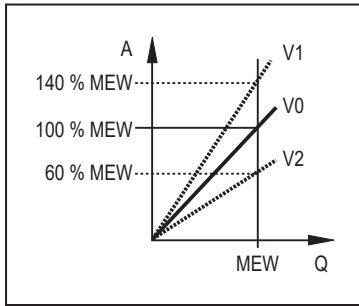


The parameter settings are saved in the respective operating mode, i.e. when the operating mode is changed, the settings are not lost.

5.4 Calibration

Via the calibration factor [CGA] the sensor can be adjusted to a reference flow in the application.

The customer-specific calibration allows changing the gradient of the curve of measured values. It influences the display and the outputs.



- A: Operating value for display and output signals
- Q: Flow
- MEW: Final value of the measuring range
- V: Curve of measured values at factory setting
- V1: Curve of measured values 1 after calibration
- V2: Curve of measured values 2 after calibration

Fig. 1: Calibration

The change in the gradient is indicated in per cent.

Factory setting: CGA = 100 %.

After a change the calibration can be reset to factory setting.



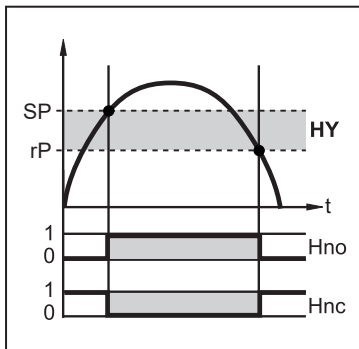
The parameter CGA is not available if [ModE] = REL is set.



Depending on the set CGA factor, it may not be possible to use the complete measuring range.

5.5 Switching output

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

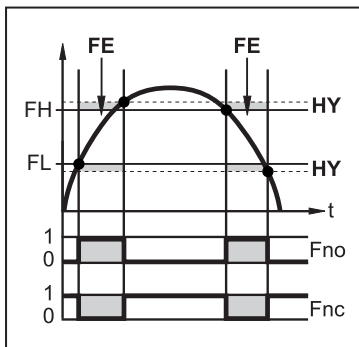


- SP: Set point
- rP: Reset point
- HY: Hysteresis
- Hno: Hysteresis function NO (normally open)
- Hnc: Hysteresis function NC (normally closed)
- t: Time

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.



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

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 keeps the switching status of the output stable if the flow rate varies slightly.


5.6 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.

-  For flow measurement in the operating mode REL, ASP and AEP are not available. In this operating mode, the characteristic curve of the analogue output is defined by the flow adjustment: high flow = 20 mA; low flow = 4 mA.

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 display range or in case of a fault, messages are displayed (UL, OL, Err).

The analogue signal in case of an error is adjustable (→ Error behaviour of the outputs [□ 27](#)):

- [FOU] = On: In case of a fault the analogue signal goes to the upper end stop value (22 mA).
- [FOU] = OFF: In case of a fault the analogue signal goes to the lower end stop value (3.5 mA).
- [FOU] = OU: The analogue signal still corresponds to the measured value.

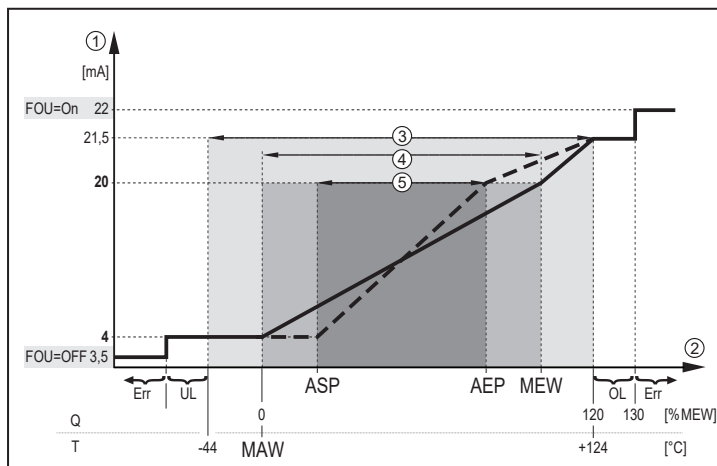


Fig. 4: Characteristics of the analogue output according to the standard IEC 60947-5-7

1:	Analogue signal	MAW:	Initial value of the measuring range
2:	Measured value	MEW:	Final value of the measuring range
3:	Display range	ASP:	Analogue start point
4:	Measuring range	AEP:	Analogue end point
5:	Scaled measuring range	UL:	Below the display range
Q:	Flow	OL:	Above the display range
T:	Temperature	Err:	Error

5.7 Frequency output

The unit provides a frequency signal proportional to the process value.

The frequency signal is scalable:

- [FrPx] defines the frequency signal in Hz that is provided when the upper measured value (MEW or FEPx) is reached.

The measuring range is scalable:

- [FSP2] defines the lower measured value from which a frequency signal is provided.
 - FSP2 is only available for temperature measurement.
- [FEPx] defines the upper measured value at which the output signal has the frequency set under FrPx.
 - FEPx is only available for flow measurement in the operating mode GAS.



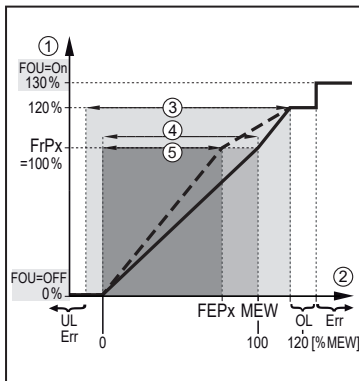
Minimum difference between FSP2 and FEP2 = 20 % of the final value of the measuring range.

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

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

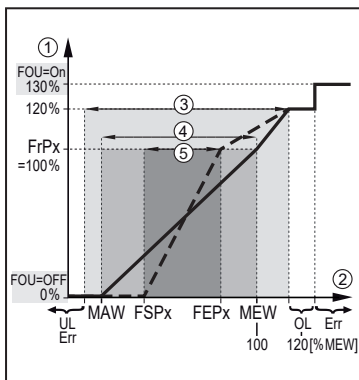
The frequency signal in case of a fault is adjustable (→ Error behaviour of the outputs □ 27):

- [FOU] = On: In case of a fault the frequency signal goes to the upper end stop value (130 % FrPx).
- [FOU] = OFF: In case of a fault the frequency signal goes to the lower end stop value (0 Hz).
- [FOU] = OU: The frequency signal still corresponds to the measured value.



- 1: Frequency signal
- 2: Measured value
- 3: Display range
- 4: Measuring range
- 5: Scaled measuring range
- MEW: Final value of the measuring range
- FEPx: Frequency end point
- FrPx: Frequency signal (Hz) for upper measured value
- OL: Above the display range
- UL: Below the display range
- Err: Error

Fig. 5: Output characteristics frequency output; flow



- 1: Frequency signal
- 2: Measured value
- 3: Display range
- 4: Measuring range
- 5: Scaled measuring range
- MAW: Initial value of the measuring range
- MEW: Final value of the measuring range
- FSPx: Frequency start point
- FEPx: Frequency end point
- FrPx: Frequency signal (Hz) for upper measured value
- OL: Above the display range
- UL: Below the display range
- Err: Error

Fig. 6: Output characteristics frequency output; temperature

5.8 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.



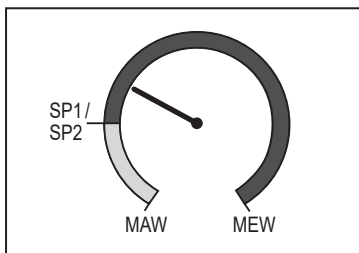
Measured value damping only has an effect on the measured variable flow.

5.9 Display colour setting

The colour of the characters in the display (→ Display colour setting ¶ 26) can be set via the parameter [coLr]. With the set parameters rED (red) and GrEn (green), the display is permanently set to one colour. If the parameters rxou and Gxou are set, the colour of the characters changes depending on the process value:

	OUT1	OUT2	Colour change to...
Parameter setting	r1ou	r2ou	Red
	G1ou	G2ou	Green

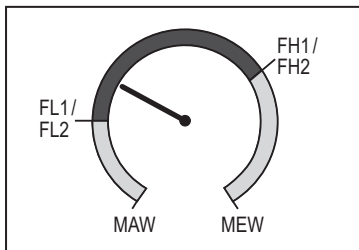
When the hysteresis function is set, the colour changes if the process value is above the set point:



MAW: Initial value of the measuring range
MEW: Final value of the measuring range
SPx: Set point

Fig. 7: Hysteresis function

When the window function is set, the colour changes if the process value is within the window section:



MAW: Initial value of the measuring range
MEW: Final value of the measuring range
FLx: Lower limit of the window section
FHx: Upper limit of the window section

Fig. 8: Window function

5.10 IO-Link

This unit has an IO-Link communication interface which enables direct access to process and diagnostic data. In addition it is possible to set the parameters of the unit while it is in operation. Operation of the unit via the IO-Link interface requires an IO-Link master.

With a PC, suitable IO-Link software and an IO-Link adapter cable, communication is possible while the system is not in operation.

The IO-DDs necessary for the configuration of the unit, detailed information about process data structure, diagnostic information, parameter addresses and the necessary information about the required IO-Link hardware and software can be found at www.ifm.com.

The IO-Link interface provides the following functions using suitable hardware and software:

- Remote parameter setting of the unit.
- Noise-immune signal transmission without measured value losses.
- Transmission of the parameter settings to a replaced unit or to other units of the same type.
- Simultaneous reading of all process values and the binary switching signals.
- Comprehensive display of error and event messages.
- Evaluation of the process values and diagnostic data via IO-Link master.
- Paperless logging of parameter sets, process values and diagnostic information.
- Additional parameters via IO-Link:
 - electronic lock as protection against tampering

5.10.1 IO-Link process values

The process values for flow and temperature are transmitted via IO-Link in the following units of measurement:

Operating mode [ModE]	Flow unit	Temperature unit
REL	%	°C
GAS	m/s	°C



A change of [uni] does not affect the IO-Link process values.

More information → IO Device Description at www.ifm.com.

6 Installation



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.



- ▶ Ensure that the system is free of pressure during installation.
- ▶ Ensure that no media can leak at the mounting location during installation.

6.1 Process connection

Using process adapters the unit can be adapted to different process connections. Adapters have to be ordered separately as accessories.

- Information about the available mounting accessories at www.ifm.com.
- A correct fit of the unit and ingress resistance of the connection are only ensured using ifm adapters.



- ▶ Observe the instructions of the mounting accessories.



- ▶ Use a lubricating paste which is suitable and approved for the application. Grease the threads of the process connection, adapter and sensor. Ensure no grease is applied to the sensor tip.



- ▶ Take the tightening torques of sensor and fixing elements into account: sensor 25 Nm; fixing element → Technical data sheet at www.ifm.com

6.2 Interference

Structures in the pipe, bends, valves, reducing pieces and the like affect the function of the unit.

- ▶ Adhere to the distances between sensor and interference.

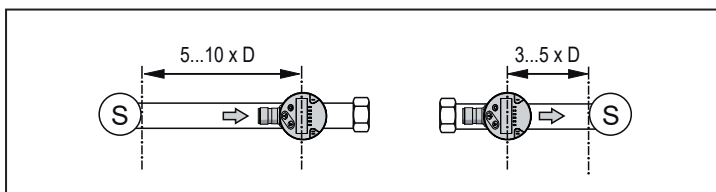


Fig. 9: Inlet and outlet pipe lengths

D: Outside diameter of the pipe
S: Interference

6.3 Installation position

6.3.1 Immersion depth

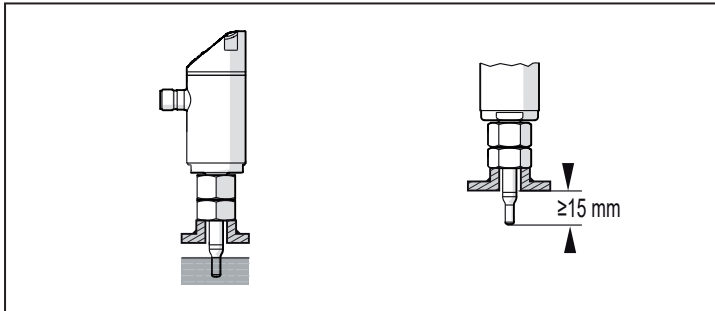


Fig. 10: Immersion depth

The sensor tip must be completely surrounded by the medium.

Recommended immersion depths:

- With an internal pipe diameter (diA) < 120 mm: ~ 15 mm
- With an internal pipe diameter (diA) ≥ 120 mm: ~ 1/8 diA

6.3.2 Recommended mounting position

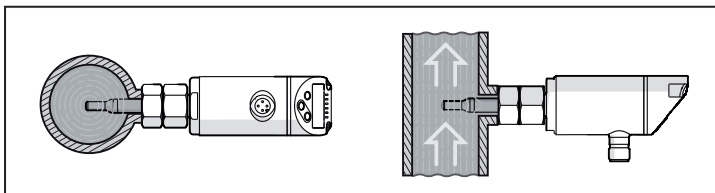


Fig. 11: Recommended mounting position

- For horizontal pipes: mounting from the side.
- For vertical pipes: mounting in the rising pipe.

6.3.3 Conditionally possible installation position

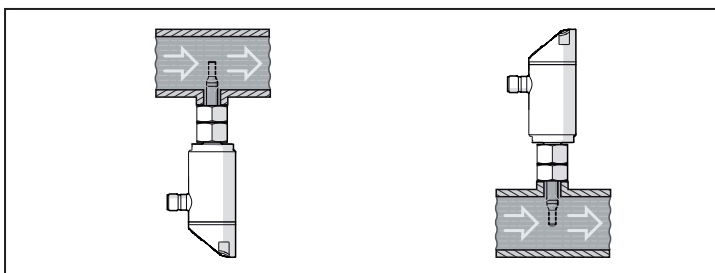


Fig. 12: Conditionally possible installation position

- For horizontal pipes, if the pipe is free from build-up: mounting from below.
- For horizontal pipes, if the pipe is completely filled with medium: mounting from the top.

6.3.4 Impermissible installation position

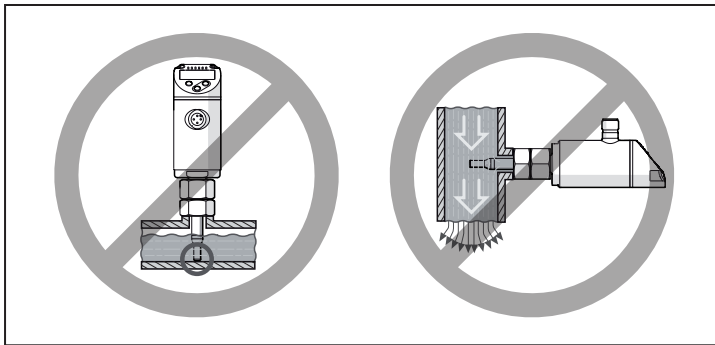


Fig. 13: Impermissible installation position

- The sensor tip must not be in contact with the pipe wall.
- Do not mount in downpipes that are open at the bottom.

6.3.5 Alignment

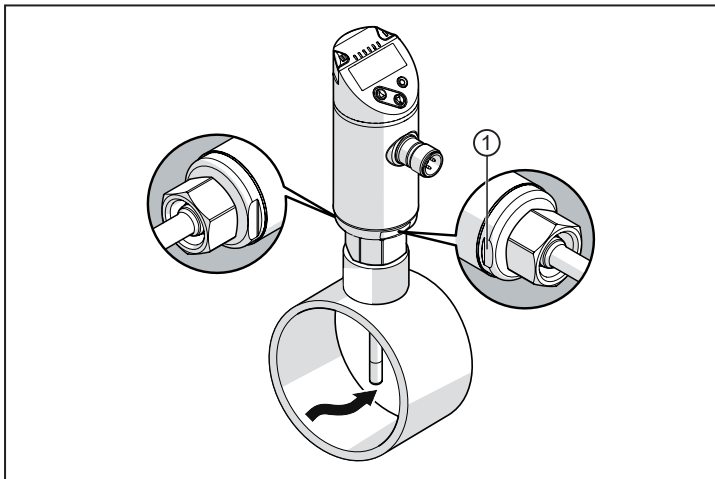


Fig. 14: Flow direction

- ▶ To achieve the optimum measuring accuracy, mount the sensor as shown in the figure: Align the spanner flats parallel to the piping; the smaller spanner flat (1) is facing the front if the flow comes from the left.

For easier readability of the display the sensor housing can be rotated by 345° with regard to the process connection.

! Do not go beyond the end stop.

7 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:

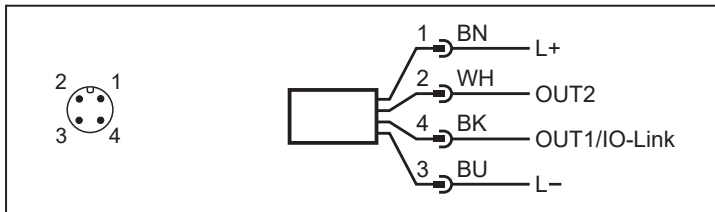


Fig. 15: Wiring diagram (colours to DIN EN 60947-5-2)

BK: black
BU: blue

BN: brown
WH: white

Pin	Connection
1	L+
3	L-
4 (OUT1)	<ul style="list-style-type: none"> • Switching signal flow • Frequency signal flow • IO-Link
2 (OUT2)	<ul style="list-style-type: none"> • Switching signal flow • Switching signal temperature • Analogue signal flow • Analogue signal temperature • Frequency signal flow • Frequency signal temperature • Input for external teach signal (remote calibration)

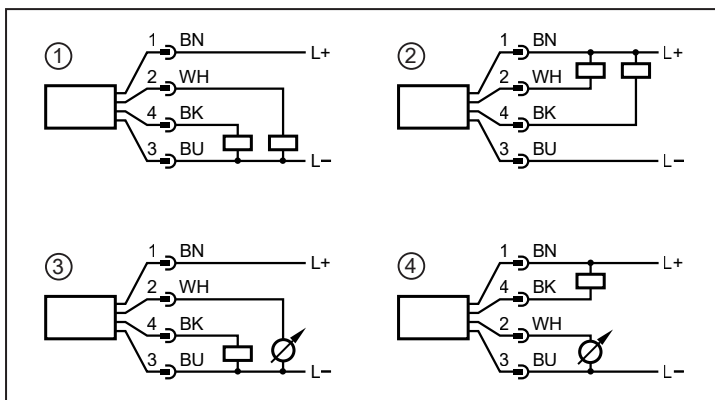
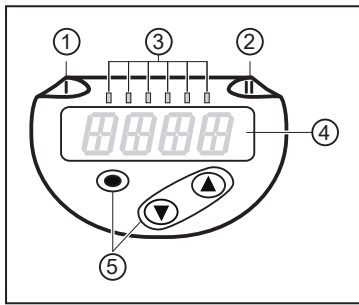


Fig. 16: Circuit examples

- 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

8 Operating and display elements



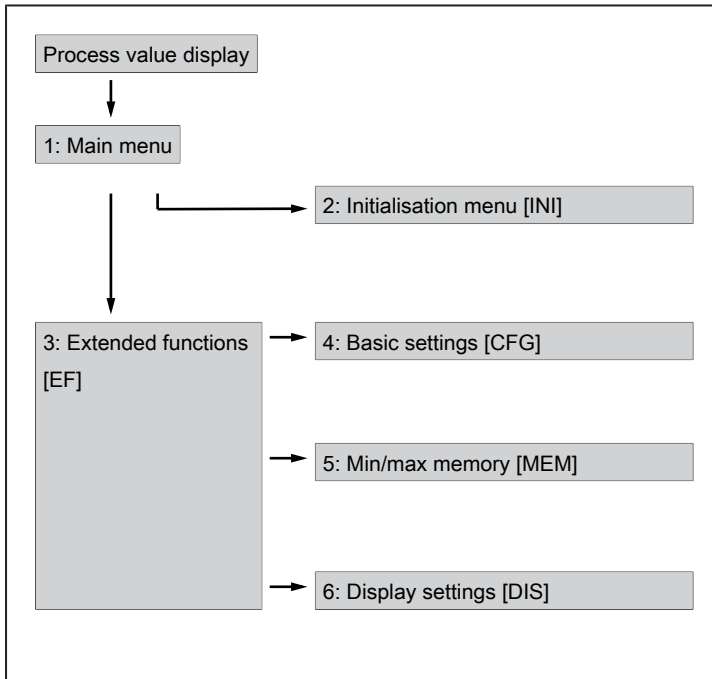
- 1: Switching status LED for OUT1
- 2: Switching status LED for OUT2
- 3: Process value in the indicated unit of measurement (%; m/s; l/min; m³/h; °C; x10³)
- 4: 4-digit alphanumeric display
- 5: Keys for changing views and parameter setting (→ Parameter setting in general □ 23)

Fig. 17: Operating and display elements

9 Menu

9.1 Menu overview

Use the operating keys to navigate from the process value display to the main menu and from there to the submenus. See also Parameter setting in general (→ [23](#)).



- | | | | |
|----|--|----|---|
| 1: | Main menu (→ 20) | 4: | Menu Basic settings CFG (→ 21) |
| 2: | Initialisation menu INI (→ 20) | 5: | Menu Min/max memory MEM (→ 21) |
| 3: | Menu Extended functions EF (→ 20) | 6: | Menu Display settings DIS (→ 21) |

9.2 Main menu and submenus



The following applies to the menu illustrations below:

Parameters with white background are indicated in case of factory setting. If the default settings for the operating mode and output functions are changed, the parameters with a grey background are also visible.

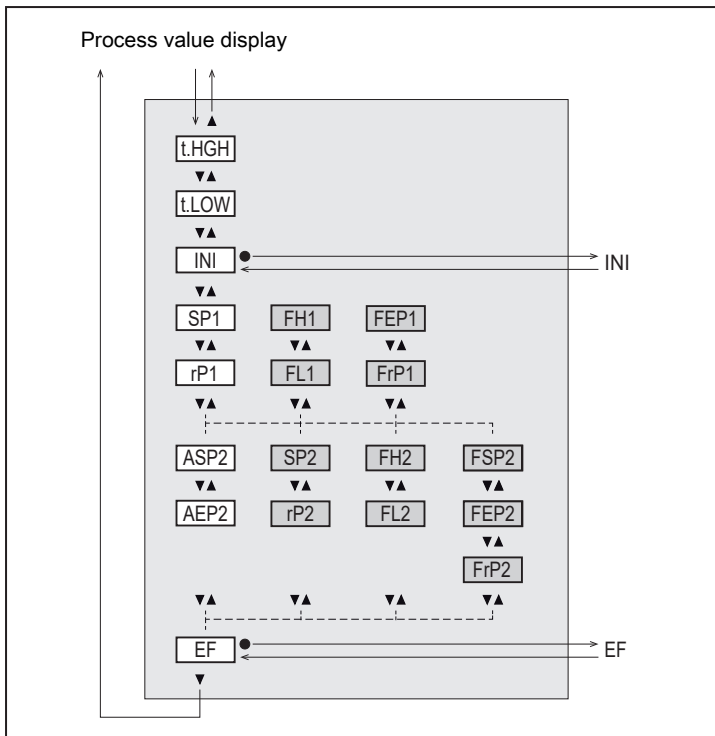


Fig. 18: Main menu

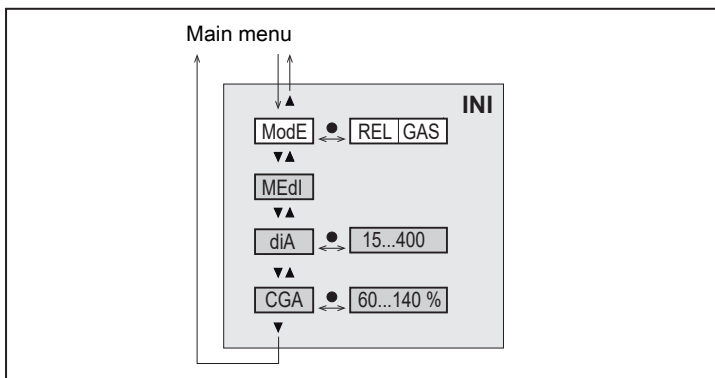


Fig. 19: Initialisation menu INI

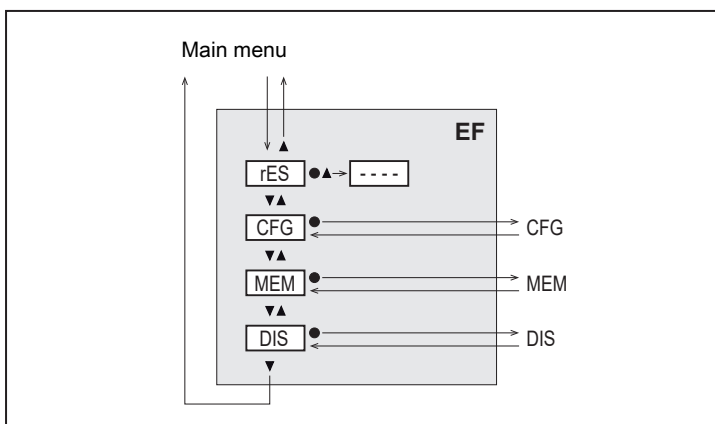


Fig. 20: Menu Extended functions EF

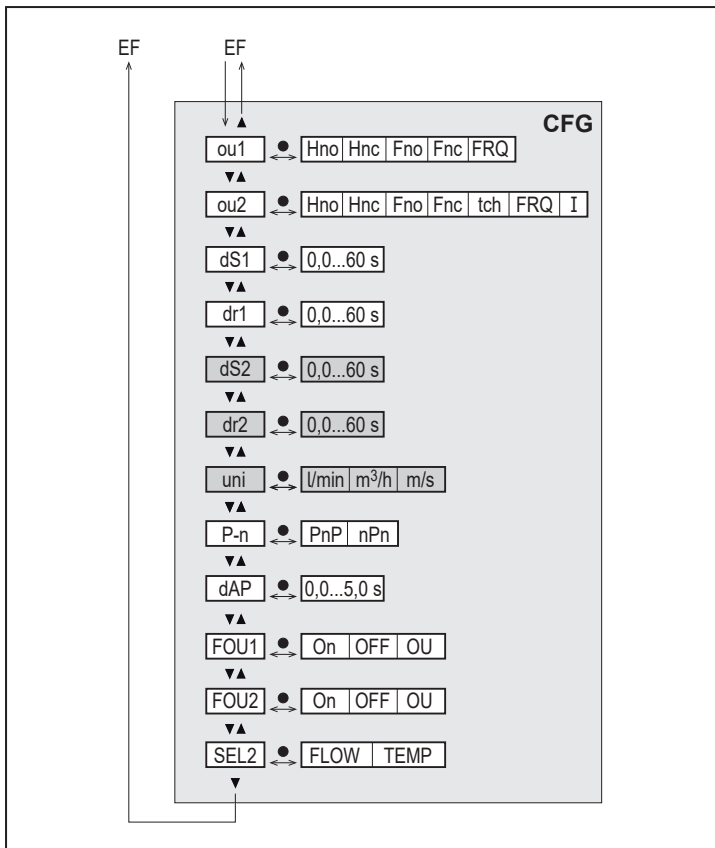


Fig. 21: Menu Basic settings CFG

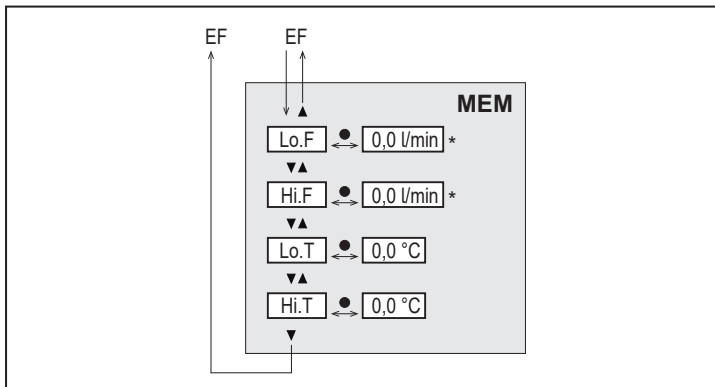


Fig. 22: Menu Min/max memory MEM

* Measured value in the standard unit of measurement (→ Standard unit of measurement for flow □ 24)

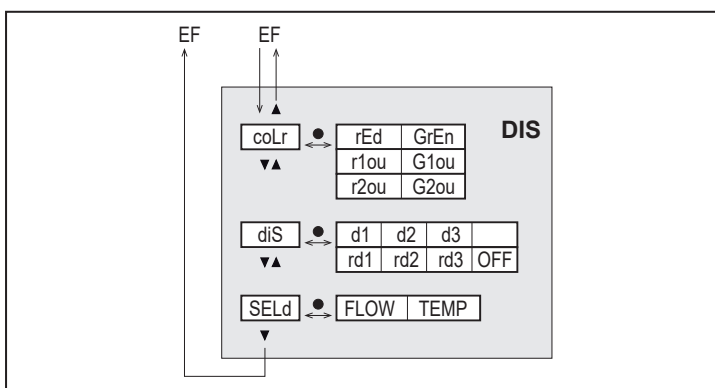


Fig. 23: Menu Display settings DIS

10 Set-up

After power on and expiry of the power-on delay time, 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)
- OFF for frequency output (FRQ)
- 20 mA for current output (I)

11 Parameter setting



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 and set-up of the unit 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.



The parameters can also be set via the IO-Link interface.

11.1 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 submenu (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)

11.2 Presetting



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

- [SEL2]: Process value for OUT2
- [ModE]: Operating mode
- [uni]: Standard unit of measurement for flow

11.2.1 Process value for OUT2

- ▶ Select the CFG menu.
- ▶ Select [SEL2]. Select process value for output 2:
 - TEMP: temperature
 - FLOW: flow

11.2.2 Operating mode

- ▶ Select the INI menu.
- ▶ Select [ModE] and define the operating mode: REL or GAS.



For the operating mode GAS, an internal pipe diameter must be entered.

When the factory setting is changed ([ModE] = REL), the unit displays [≡≡≡≡] to force the entry of the internal pipe diameter:

- ▶ Press [●] to display [diA].
- ▶ Define the internal pipe diameter in mm.



The operating mode REL requires a flow adjustment (→ Flow adjustment □ 24).



A change of the operating mode leads to a restart of the unit. The settings are saved in the respective operating mode, i.e. after a change in the operating mode, the settings are not lost.

11.2.3 Standard unit of measurement for flow

- ▶ Select the CFG menu.
- ▶ Select [uni] and set the unit of measurement: l/min; m³/h; m/s.



uni is only available if the operating mode GAS is selected. For the operating mode REL the flow value is always displayed in % of the measuring range.

11.2.4 Internal pipe diameter

- ▶ Select the INI menu.
- ▶ Select [diA] and define the internal pipe diameter.



diA is only available if the operating mode GAS is selected.

11.2.5 Flow adjustment

High-flow adjustment:

- ▶ Activate the maximum flow in the installation.
- ▶ Select the main menu.
- ▶ Select [t.HGH] and press [●].
 - ▷ [tch] is displayed.
- ▶ Keep [▲] or [▼] pressed.
 - ▷ [----] is displayed.
- ▶ Briefly press [●].
 - ▷ Display [donE]: adjustment successful.
 - ▷ Display [FAIL]: repeat the adjustment.
- ▷ The unit defines the existing flow as maximum flow (final value of the measuring range = 100 %).
- ▶ Briefly press [●].

Low-flow adjustment:

- ▶ Activate the minimum flow in the installation.
- ▶ Select the main menu.
- ▶ Select [t.LOW] and press [●].

- ▷ [tch] is displayed.
- ▶ Keep [▲] or [▼] pressed.
 - ▷ [----] is displayed.
- ▶ Briefly press [●].
 - ▷ Display [donE]: adjustment successful.
 - ▷ Display [FAIL]: repeat the adjustment.
- ▷ The unit defines the existing flow as minimum flow (0 %).
- ▶ Briefly press [●].



t.HGH and t.LOW are only available if the operating mode REL is selected.

11.2.6 Remote calibration

- ▶ Select the CFG menu.
- ▶ Select [ou2] and set tch.

High-flow adjustment:

- ▶ Apply the operating voltage to pin 2 for 5 to 10 s.

Low-flow adjustment:

- ▶ Apply the operating voltage to pin 2 for 10 to 15 s.
- ▷ OUT2 high for 2 s: adjustment successful.
- ▷ OUT2 high for 1 s: adjustment failed. ▶ Repeat the adjustment.

11.3 Setting the output functions



The parameters for flow monitoring and temperature monitoring are set in the same way. The prerequisite is that the process value for OUT2 has first been defined via [SEL2] (→ Process value for OUT2 □ 23).

11.3.1 Limit monitoring OUTx / hysteresis function

- ▶ Select the CFG menu.
- ▶ Select [oux] and set the switching signal:
 - Hno: hysteresis function / normally open
 - Hnc: hysteresis function / normally closed
- ▶ Select the main menu.
- ▶ 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.

11.3.2 Limit monitoring OUTx / window function

- ▶ Select the CFG menu.
- ▶ Select [oux] and set the switching signal:
 - Fno: window function / normally open
 - Fnc: window function / normally closed
- ▶ Select the main menu.

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

11.3.3 Frequency signal OUTx

- ▶ Select the CFG menu.
- ▶ Select [oux] and set FRQ.
- ▶ Select the main menu.
- ▶ Select [FSP2] and set the lower temperature value at which 0 Hz is provided.



FSP2 is only available for temperature measurement at OUT2.

- ▶ Select [FEPx] and set the upper measurement value at which the maximum frequency is provided.



For flow measurement the following applies:
FEP1x is only available if the operating mode GAS is selected.

- ▶ Select [FrPx] and set the maximum frequency: 100 Hz...1000 Hz.

11.3.4 Analogue signal OUT2

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



For flow measurement the following applies:
ASP2 and AEP2 are only available if the operating mode GAS is selected.

11.4 User settings (optional)

11.4.1 Standard display

- ▶ Select the DIS menu.
- ▶ Select [SELd] and set the standard unit of measurement:
 - FLOW: The current flow in the standard unit of measurement is displayed.
 - TEMP: The current medium temperature in °C is displayed.
- ▶ Select [diS] and set the update rate and orientation of the display:
 - d1, d2, d3: update of the measured values every 50, 200, 600 ms.
 - rd1, rd2, rd3: display as with d1, d2, d3; rotated by 180°.
 - OFF: The process value display is deactivated in the RUN mode.



The LEDs remain active even if the display is deactivated. Error messages are displayed even if the display is deactivated.

11.4.2 Display colour setting

- ▶ Select the DIS menu.

- ▶ Select [coLr] and define the colour of the characters in the process value display:
 - rEd: red
 - GrEn: green
 - rxou: colour change from green to red
 - Gxou: colour change from red to green

11.4.3 Output logic

- ▶ Select the CFG menu.
- ▶ Select [P-n] and set PnP or nPn.

11.4.4 Measured value damping

- ▶ Select the CFG menu.
- ▶ Select [dAP] and set the damping constant in seconds (τ value 63 %).

11.4.5 Switch-on /switch-off delay

- ▶ Select the CFG menu.
- ▶ Select [dSx] and set the delay for switching OUTx in seconds.
- ▶ Select [drx] and set the delay for resetting OUTx in seconds.

11.4.6 Error behaviour of the outputs

- ▶ Select the CFG menu.
- ▶ Select [FOUx] and set the error behaviour for OUTx:
 - Switching output
 - On: Output switches ON in case of a fault.
 - OFF: Output switches OFF in case of a fault.
 - OU: Output switches irrespective of the error as defined with the parameters.
 - Analogue output
 - On: The analogue signal goes to 22 mA.
 - OFF: The analogue signal goes to 3.5 mA.
 - OU: The analogue signal still corresponds to the measured value.
 - Frequency output
 - On: The frequency signal goes to 130 % of FrPx.
 - OFF: The frequency signal goes to 0 Hz.
 - OU: The frequency signal still corresponds to the measured value.

11.4.7 Calibration

- ▶ Select the INI menu.
- ▶ Select [CGA] and set a value between 60 and 140 % (100 % = factory setting).



CGA is only available if the operating mode GAS is selected.

11.4.8 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 [Loc] displayed.

Unlocking:

- ▶ Make sure that the unit is in the normal operating mode.
- ▶ Press [▲] and [▼] simultaneously for 10 s until [uLoc] is displayed.

11.4.9 Factory reset

- ▶ Select the EF menu.
- ▶ Select [rES].
- ▶ Briefly press [●].
- ▶ Keep [▼] or [▲] pressed.
 - ▷ [----] is displayed.
- ▶ Briefly press [●].
- ▷ The device carries out a reboot.



We recommend taking down your own settings in the chapter Factory setting (→ Factory settings □ 34) before carrying out a reset.

11.5 Diagnostic functions

11.5.1 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.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.T: minimum value of the temperature measured in the process
 - Hi.T: maximum value of the temperature 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.



In the operating mode REL a new teaching process deletes the memory.

12 Operation

After power on and expiry of the power-on delay time, 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.

12.1 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 device returns to the standard display.

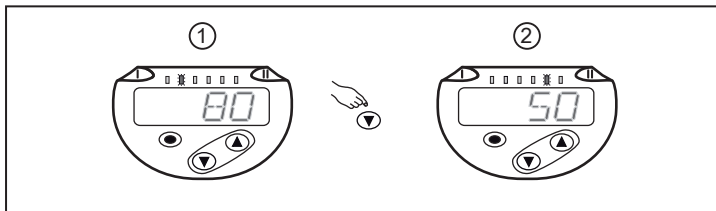


Fig. 24: Process value display

- 1: Standard display as set under [SELd] and [uni].
Example: [SELd] = FLOW and [uni] = m/s
- 2: Further view. The LED indicates in which unit the current process value is displayed.
Example: temperature in °C.

12.2 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.

13 Technical data

Technical data and scale drawing at www.ifm.com.

14 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.



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

14.1 Error messages

Display	Problem/remedy
Err	Unit faulty / malfunction ▶ Replace the unit.
None Display	<ul style="list-style-type: none"> • Supply voltage too low ▶ Check the supply voltage. • Display switched off ▶ Check whether setting diS = OFF and change setting if necessary.
PARA	Parameter setting outside the valid range ▶ Check parameter setting.

14.2 Warning messages

Display	Problem/remedy
Loc	Setting buttons on the unit locked, parameter change rejected. ▶ Unlock unit (→ Lock / unlock \square 28).
C.Loc	Setting buttons on the unit temporarily locked, parameter setting via IO-Link communication active. ▶ Finish parameter setting via IO-Link communication.
S.Loc	Setting buttons locked via parameter setting software, parameter change rejected. ▶ Unlock the unit via IO-Link interface using the parameter setting software.
UL	<ul style="list-style-type: none"> • Value below the minimum value of the temperature display range: temperature value < -44 °C. ▶ Check the temperature range. • Value below the minimum value of the flow measuring range ▶ Adjust flow. ▶ Repeat low-flow adjustment.
OL	<ul style="list-style-type: none"> • Temperature display range exceeded: temperature value < 124 °C. ▶ Check the temperature range. • Flow display range exceeded: flow > 120 % of the final value of the measuring range. ▶ Adjust flow. ▶ Repeat high-flow adjustment.
SC1	Switching status LED for OUT1 flashing: short circuit OUT1. ▶ Check switching output OU1 for short circuit or excessive current.
SC2	Switching status LED for OUT2 flashing: short circuit OUT2. ▶ Check switching output OUT2 for short circuit or excessive current.
SC	Switching status LEDs for OUT1 and OUT2 flashing: short circuit OUT1 and OUT2. ▶ Check switching outputs OUT1 and OUT2 for short-circuit or excessive current.

Display	Problem/remedy
FAIL	Faulty low-flow or high-flow adjustment (e.g. the distance between maximum and minimum flow is too small). ▶ Repeat flow adjustment.

15 Maintenance, repair and disposal

Only the manufacturer is allowed to repair the unit.

- ▶ Ensure that the sensor tip is free from build-up:
 - Check the sensor tip for build-up one month after set-up.
 - Repeat check regularly. Determine check intervals based on the application.
 - In case of soiling clean the sensor tip with a soft cloth. Stubborn build-up, such as lime, can be removed using a common vinegar cleaning agent.
- ▶ After use dispose of the device in an environmentally friendly way in accordance with the applicable national regulations.

16 Factory settings

The factory-set operating mode is REL.

Parameter	Factory setting		User setting
	ModE = REL	ModE = GAS	
SP1 (FLOW)	20 %	6 m/s	
rP1 (FLOW)	15 %	4.6 m/s	
FH1 (FLOW)	20 %	6 m/s	
FL1 (FLOW)	15 %	4.6 m/s	
FEP1 (FLOW)	100 %	30 m/s	
FrP1	100 Hz		
SP2 (FLOW)	40 %	12 m/s	
rP2 (FLOW)	35 %	10.6 m/s	
SP2 (TEMP)	28 °C		
rP2 (TEMP)	26 °C		
FH2 (FLOW)	40 %	12 m/s	
FL2 (FLOW)	35 %	10.6 m/s	
FH2 (TEMP)	28 °C		
FL2 (TEMP)	26 °C		
FSP2 (FLOW)	Not available		
FSP2 (TEMP)	-20 °C		
FEP2 (FLOW)	100 %	30 m/s	
FEP2 (TEMP)	100 °C		
FrP2	100 Hz		
ASP2 (FLOW)	Not available	0 m/s	
AEP2 (FLOW)	Not available	30 m/s	
ASP2 (TEMP)	-20 °C		
AEP2 (TEMP)	100 °C		
uni	Not available	m ³ /h	
CGA	Not available	100 %	
ou1	Hno		
ou2	I		
dS1	0 s		
dr1	0 s		
dS2	0 s		
dr2	0 s		
P-n	PnP		
dAP	0.6 s		
FOU1	OFF		
FOU2	OFF		
SEL2	FLOW		
coLr	rEd		
diS	d2		
SELd	FLOW		

The percentage values refer to the final value of the measuring range (MEW).