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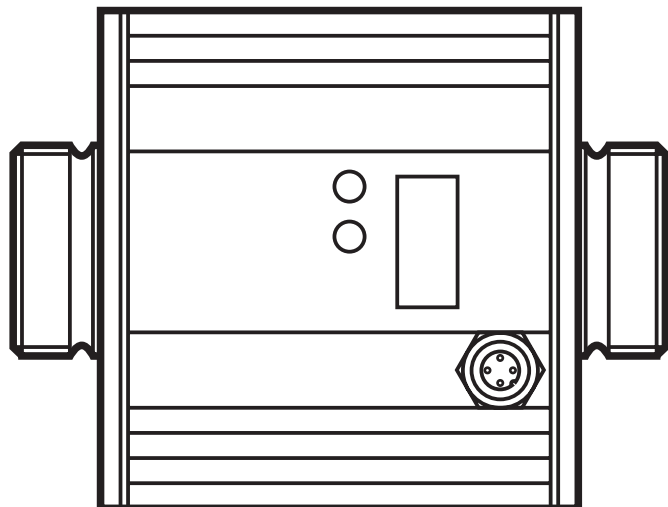
Operating instructions
Ultrasonic flow rate sensor

efector300[®]

SU9004

UK

80222195 / 00 11 / 2014



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1 Preliminary note

1.1 Symbols used

- ▶ Instructions
- > Reaction, result
- [...] Designation of keys, buttons or indications
- Cross-reference



Important note

Non-compliance may result in malfunction or interference.

1.1 Warning signs used

CAUTION

Warning of personal injury.

Slight reversible injuries may result.

2 Safety instructions

- Read this document prior to set-up of the unit. Ensure that the product is suitable for your application without any restrictions.
- If the operating instructions or the technical data are not adhered to, personal injury and/or damage to property can occur.
- Improper or non-intended use may lead to malfunctions of the unit or to unwanted effects in your application. That is why installation, electrical connection, set-up, operation and maintenance of the unit must only be carried out by qualified personnel authorised by the machine operator.
- In order to guarantee the correct condition of the device for the operating time it is necessary to use the device only for media to which the wetted materials are sufficiently resistant (→ Technical data).
- The responsibility whether the measurement devices are suitable for the respective application lies with the operator. The manufacturer assumes no liability for consequences of misuse by the operator. Improper installation and use of the devices result in a loss of the warranty claims.
- For medium temperatures above 50 °C (122 °F) some parts of the housing can heat up to over 65 °C (149 °F). Moreover, during installation or in case of a fault (e.g. housing damage) media under high pressure or hot media can leak from the system. To avoid personal injury, take the following measures:
 - ▶ Install the unit according to the applicable rules and regulations.
 - ▶ Ensure that the system is free of pressure during installation.
 - ▶ Protect the housing against contact with flammable substances and unintentional contact. To do so, equip the unit with suitable protection (e.g. protective cover).
 - ▶ Do not press the pushbuttons manually; instead use another object (e.g. ballpoint pen).

3 Functions and features

Pressure Equipment Directive (PED): The units comply with section 3, article 3 of the Directive 97/23/EC and must be designed and manufactured for non-superheated liquids of group 2 fluids in accordance with the sound engineering practice.

The unit monitors liquid media.

It detects the two process categories volumetric flow and medium temperature.

Application area

- Water
- Glycol solutions
- Low viscosity oils (viscosity: 7...40 mm²/s at 40 °C / 7...40 cSt at 104 °F)
- High viscosity oils (viscosity: 30...68 mm²/s at 40 °C / 30...68 cSt at 104 °F)

Selection of the medium to be monitored → 10.4.8.

4 Function

4.1 Process measured signals

The unit displays the current process values.

It generates 2 output signals according to the parameter setting.

- OUT1: Analogue signal for temperature limit value (→ 10.2)
- OUT2: Analogue signal for volumetric flow limit value (→ 10.3)

4.2 Volumetric flow monitoring

The volumetric flow is monitored by an ultrasonic measuring system, the measured signals are evaluated by the electronics.

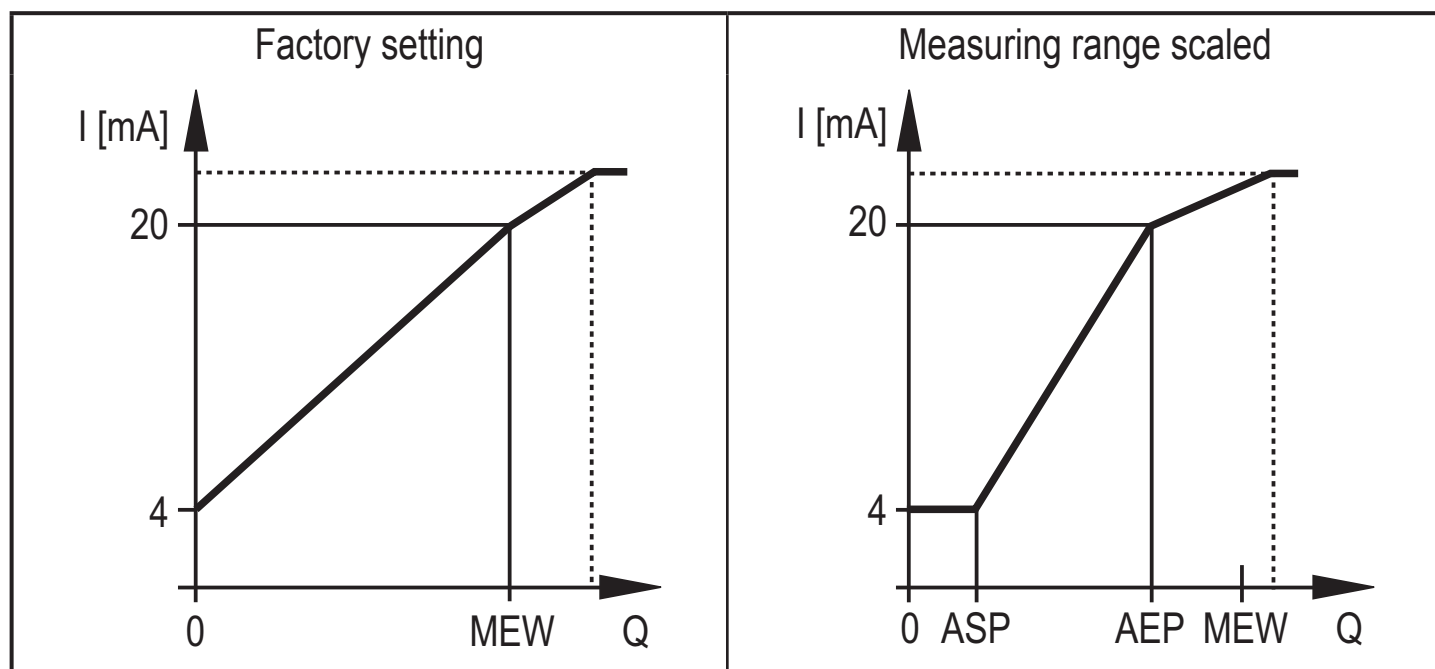
An analogue signal which is proportional to the volumetric flow (4...20 mA) is provided on output 2 → 4.4.

4.3 Temperature monitoring

An analogue signal which is proportional to the temperature (4...20 mA) is provided on output 1 → 4.4.

4.4 Analogue function

Example of volumetric flow monitoring



MEW = Final value of the measuring range

ASP = Analogue start point: determines at which measured value the output signal is 4 mA.

AEP = Analogue end point: determines at which measured value the output signal is 20 mA



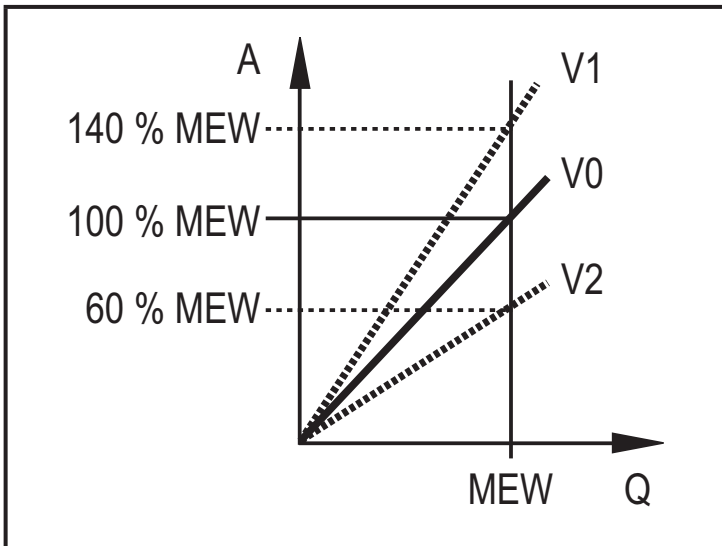
Minimum distance between ASP and AEP = 20 % of the measuring range.

In the set measuring range the output signal is between 4 and 20 mA.

For an output signal > 20 mA the volumetric flow quantity is above the final value of the measuring range.

4.5 Customer-specific calibration (CGA)

The customer-specific calibration allows changing the gradient of the curve of measured values (→ 10.4.5). It influences the display and the outputs.



A = operating value for display and output signals

Q = flow

MEW = final value of the measuring range

V0 = curve of measured values with factory setting

V1, V2 = curve of measured values after calibration

The change in the gradient is indicated in per cent. Factory setting = 100 %. After a change the calibration can be reset to factory setting (→ 10.5.3).

5 Installation

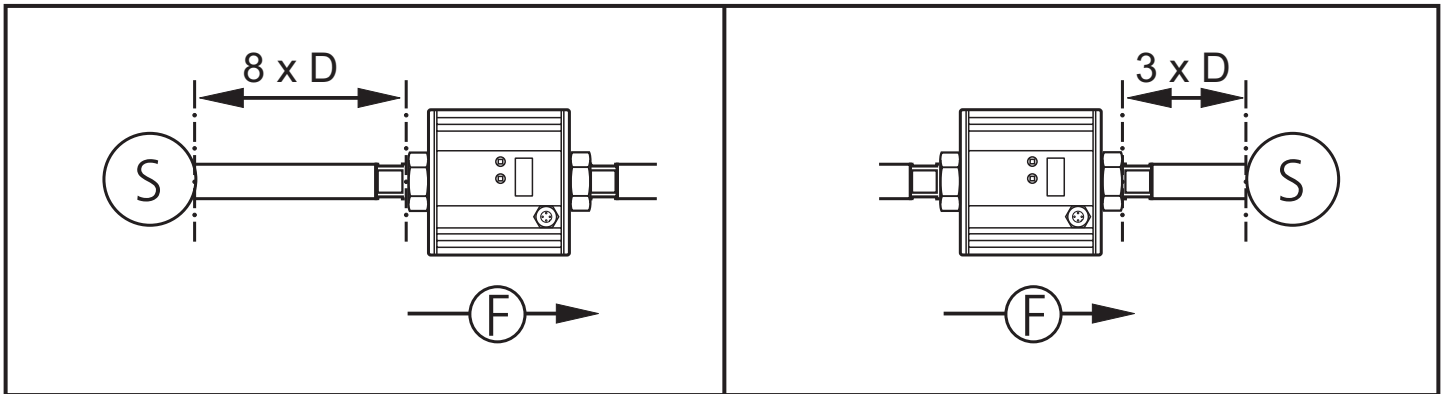


- ▶ Avoid deposits, accumulated gas and air in the pipe system.

5.1 Recommended mounting position

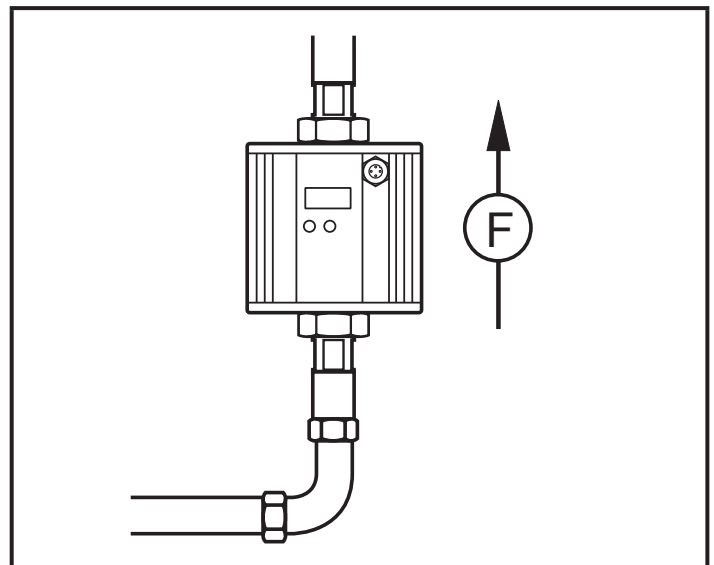
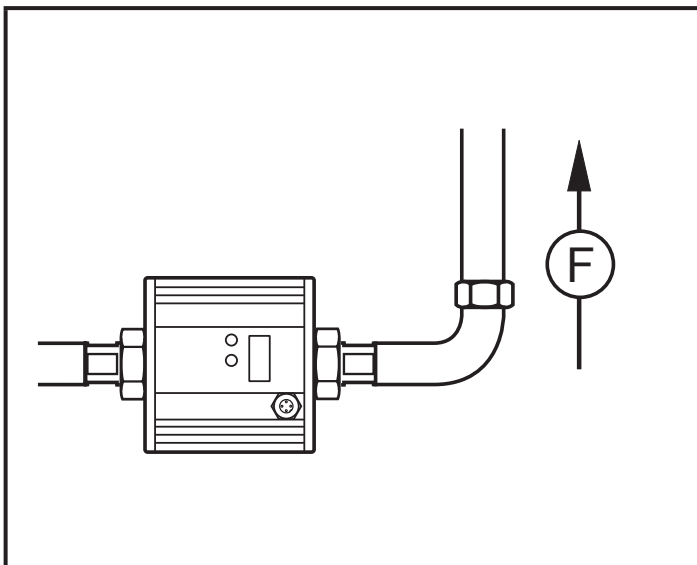
- ▶ Install the unit in that section of the plant where the medium flows under pressure. This avoids disturbance by air bubbles.
- ▶ Install the unit so that the measuring pipe is completely filled.
- ▶ Arrange for inlet and outlet pipe lengths. Disturbances caused by bends, valves, reductions, etc. are compensated for. It applies in particular: No shut-off and control devices are allowed directly in front of the unit.

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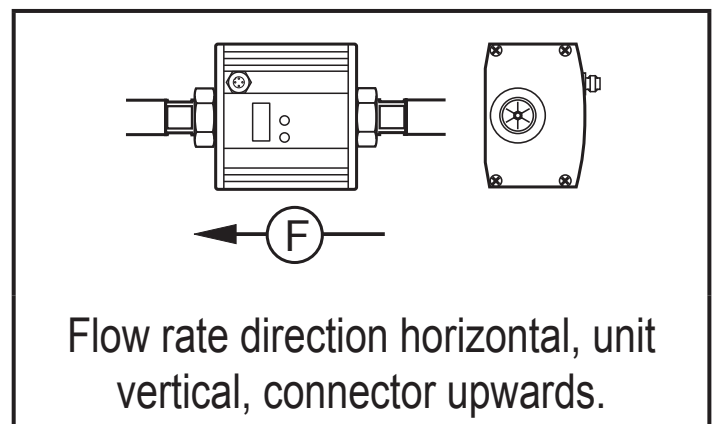
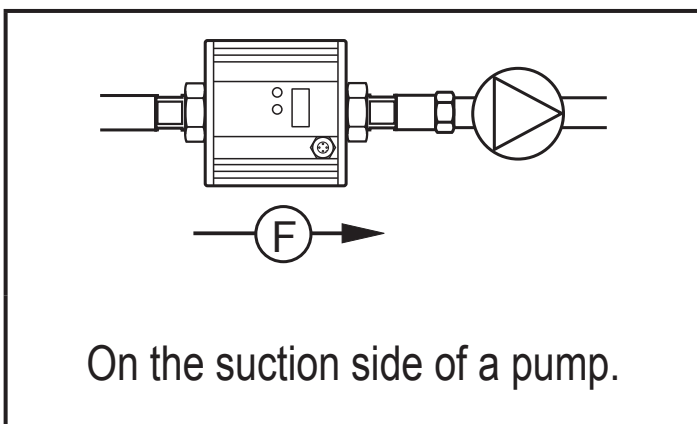
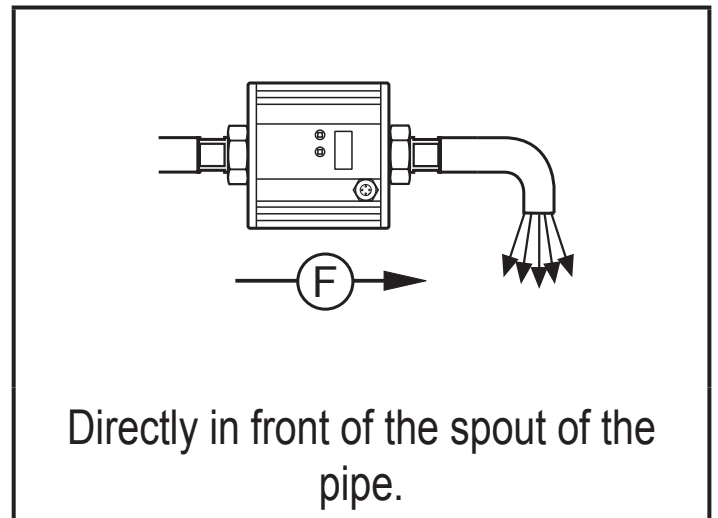
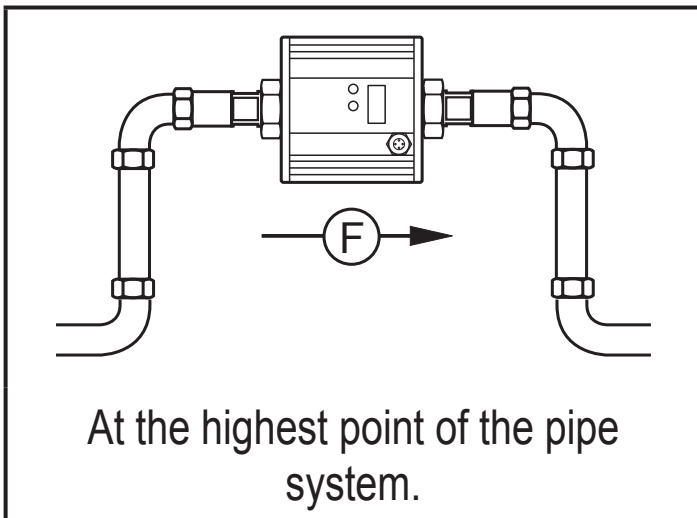
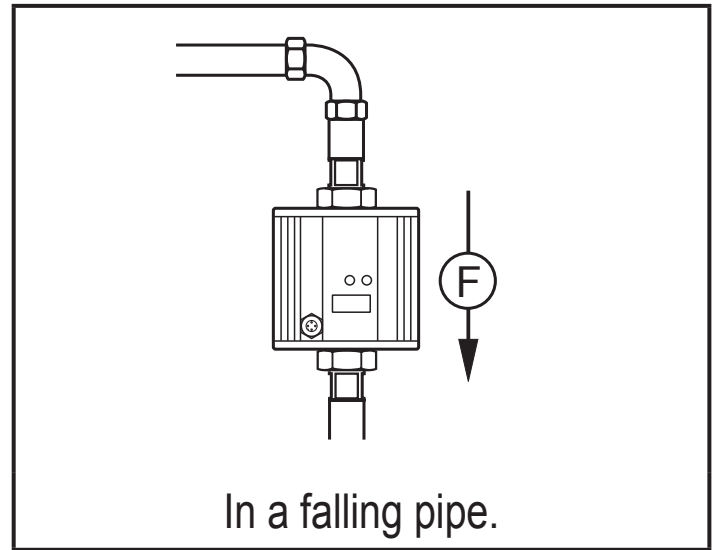
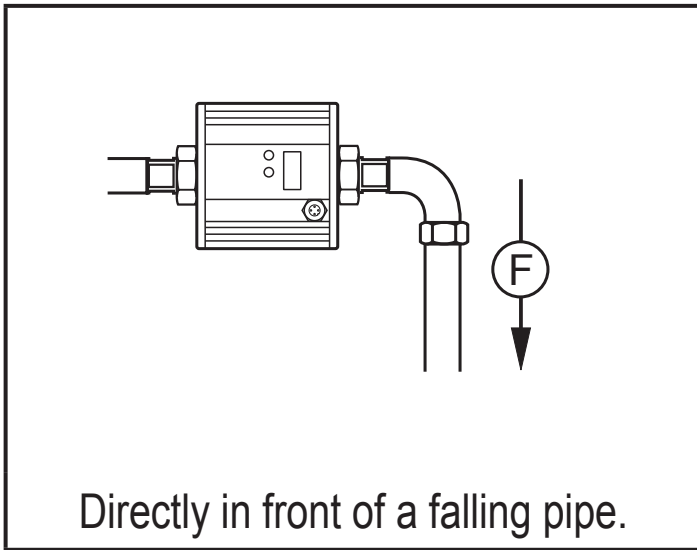
S = disturbance
D = pipe diameter
F = flow direction

- ▶ Install in front of or in a rising pipe.



5.2 Non recommended installation position

► Avoid the following installation positions:



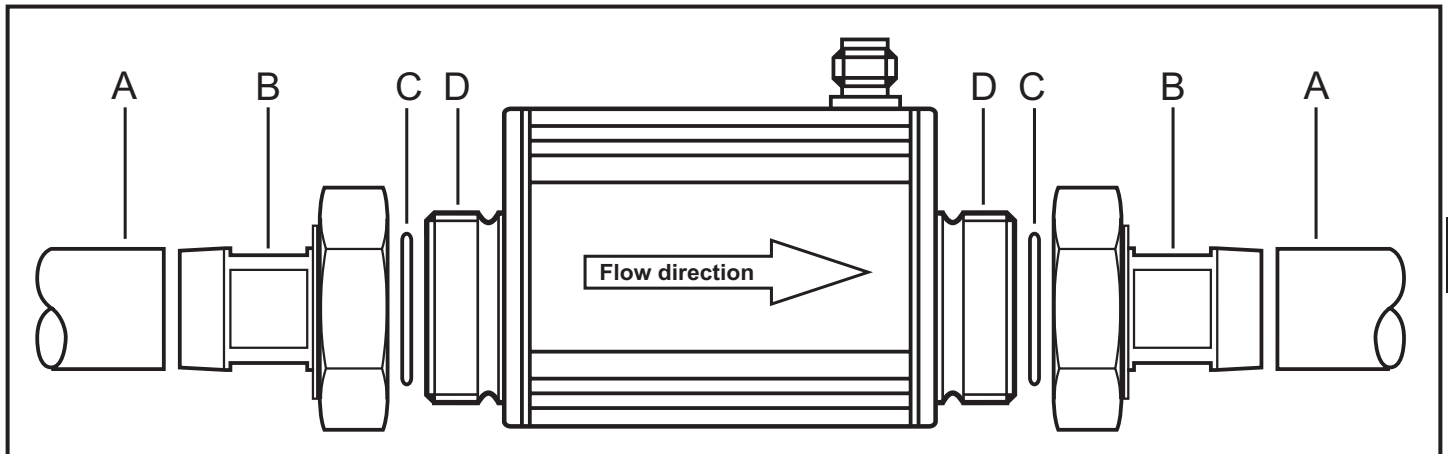
F = flow direction

5.3 Installation in pipes

The unit can be installed in pipes using adapters.



Information about the available adapters at www.ifm.com.



1. Screw the adapter (B) into the pipe (A).
2. Place the seals (C) and install the unit according to the marked flow direction.



► To mount the adapters on the process connection of the sensor use suitable lubricants.

3. Screw the adapter (B) with the threads (D) until it is hand-tight.
4. Tighten the two adapters in opposite direction (tightening torque: 30 Nm).

After installation air bubbles in the system can affect the measurement.

Corrective measures:

- Rinse the system after installation for ventilation (rinsing quantity > 5 gpm; < 20 l/min).

6 Electrical connection

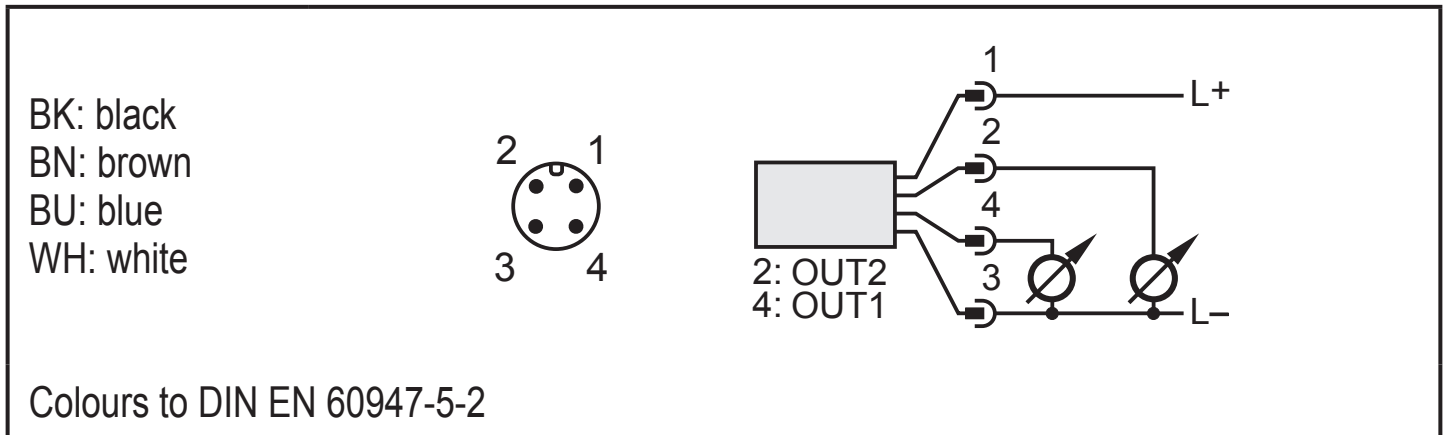


The unit must be connected by a qualified electrician.

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

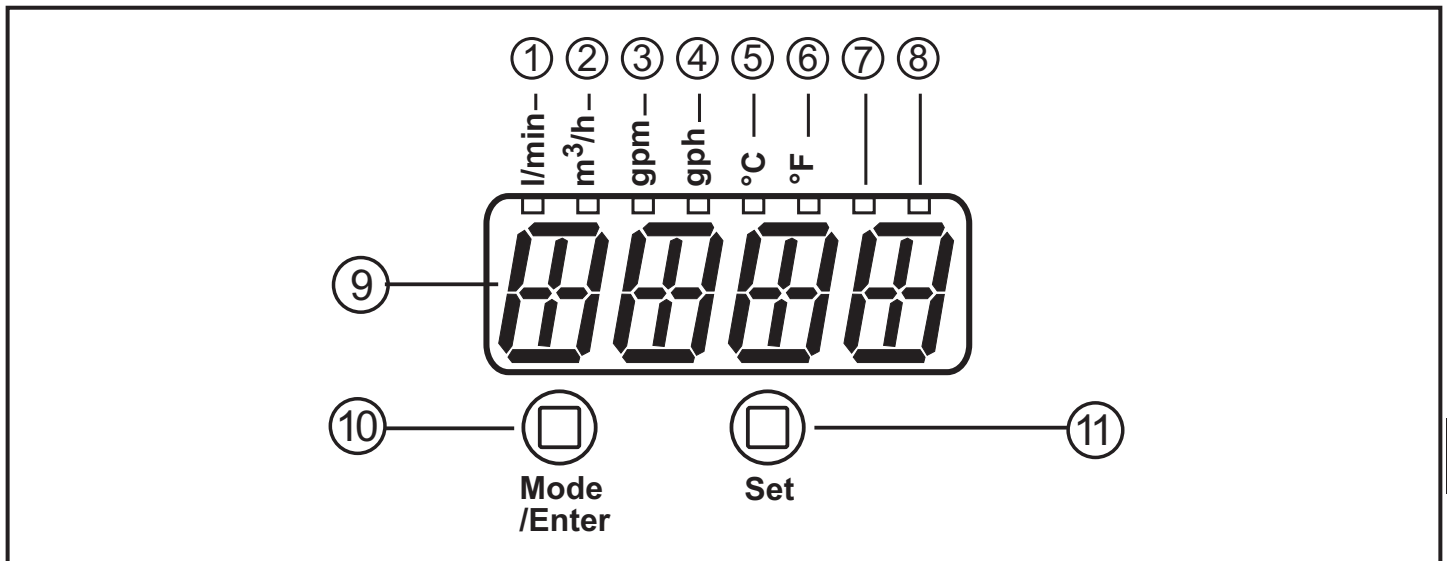
Voltage supply according to EN 50178, SELV, PELV.

- ▶ Disconnect power.
- ▶ Connect the unit as follows:



Pin 1	L+
Pin 3	L-
Pin 4 (OUT1)	Analogue signal for temperature
Pin 2 (OUT2)	Analogue signal for volumetric flow

7 Operating and display elements



1 to 8: Indicator LEDs

- LED 1 = current volumetric flow in litres / minute.
- LED 2 = current volumetric flow in cubic metres / hour.
- LED 3 = current volumetric flow in gallons / minute (gpm).
- LED 4 = current volumetric flow in gallons / hour (gph).
- LED 5 = current medium temperature in °C.
- LED 6 = current medium temperature in °F.
- LED 7, LED 8 = not used.

9: Alphanumeric display, 4 digits

- Indication of the current volumetric flow (if [SELd] = [FLOW] is set).
- Indication of the current medium temperature (if [SELd] = [TEMP] is set).
- Indication of the parameters and parameter values.

10: Mode/Enter button

- Selection of the parameters and acknowledgement of the parameter values.

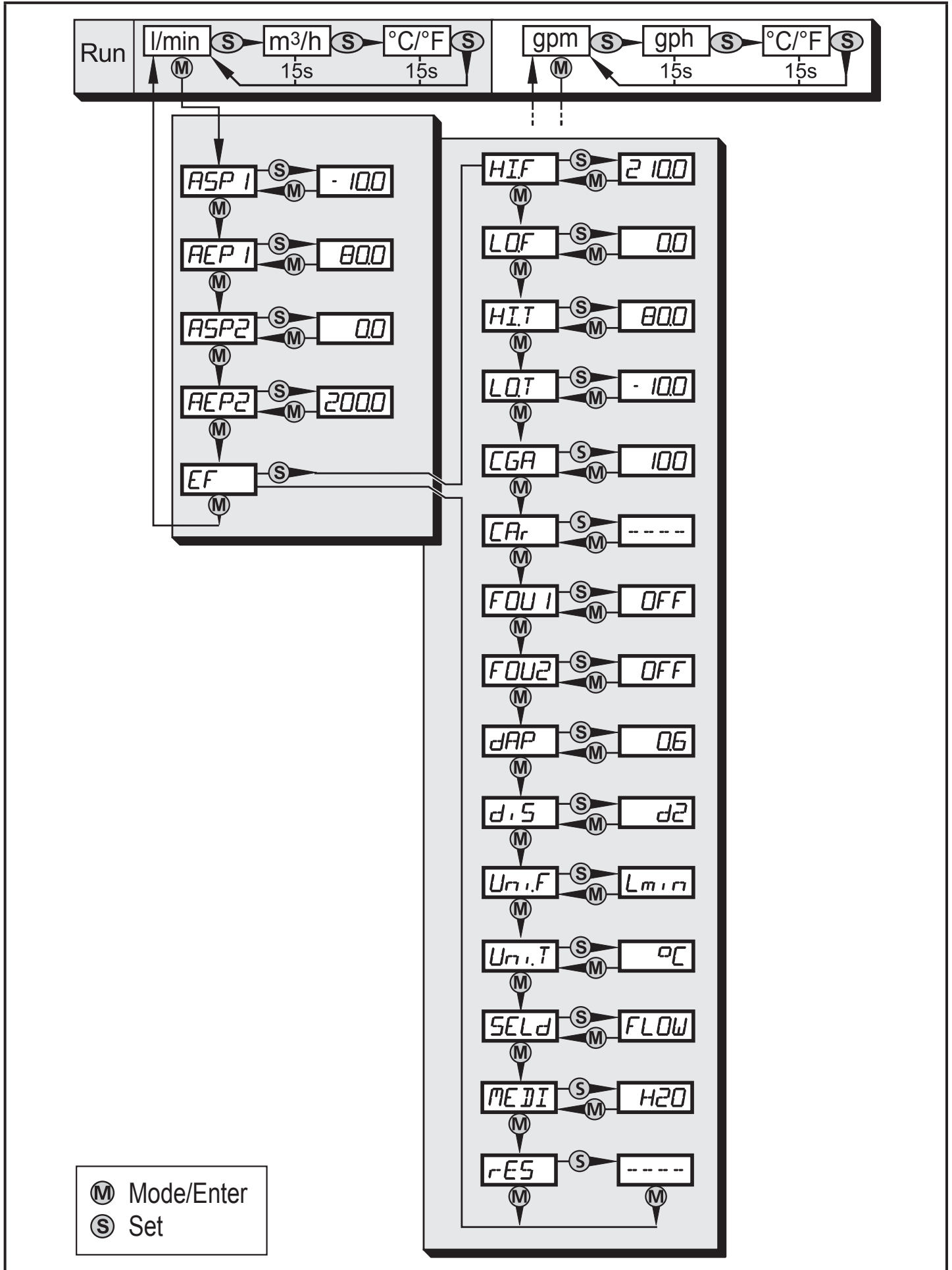
11: Set button

- Setting of the parameter values (scrolling by holding pressed; incrementally by pressing once).
- Change of the display unit in the normal operating mode (Run mode).

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8 Menu

8.1 Menu structure



8.2 Explanation of the menu

ASP1	Analogue start value for temperature.
AEP1	Analogue end value for temperature.
ASP2	Analogue start value for volumetric flow.
AEP2	Analogue end value for volumetric flow.
EF	Extended functions / opening of menu level 2.
HI.F	Maximum value memory for volumetric flow.
LO.F	Minimum value memory for volumetric flow.
HI.T	Maximum value memory for temperature.
LO.T	Minimum value memory for temperature.
CGA	Customer-specific calibration of the curve of measured values for volumetric flow.
CAr	Reset calibration data.
FOU1	Status of output 1 in case of a device fault.
FOU2	Status of output 2 in case of a device fault.
dAP	Measured value damping / damping constant for volumetric flow in seconds.
diS	Update rate and orientation of the display.
Uni.F	Standard unit of measurement for volumetric flow: litres/minute (lmin), cubic metres/hour (m ³ h), gallons per minute (gpm) or gallons per hour (gph).
Uni.T	Standard unit of measurement for temperature: °C or °F.
SELd	Standard measuring unit of the display: Volumetric flow value or medium temperature.
MEDI	Selection of the medium to be monitored.
rES	Restore factory setting.

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9 Set-up

After power on and expiry of the power-on delay time of approx. 10 s the unit 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.

- 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).

10 Parameter setting

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 (Run mode). It continues to monitor with the existing parameter until the parameter setting has been completed.

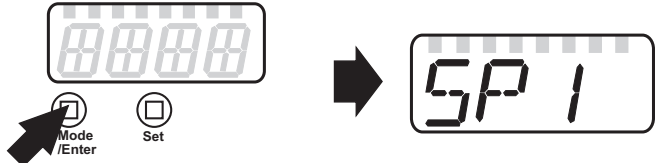
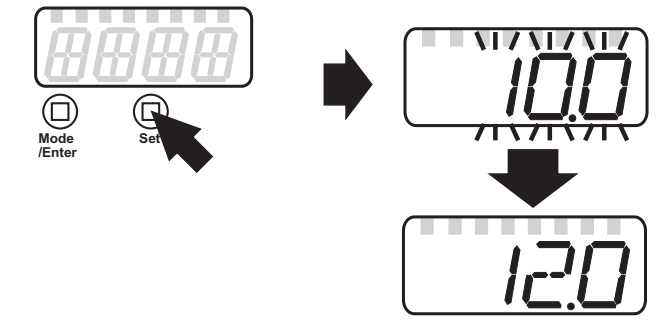

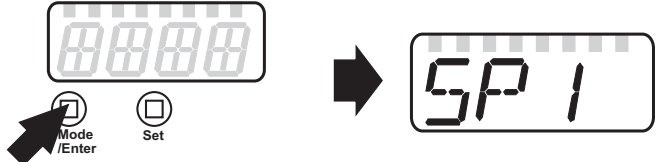
CAUTION

For medium temperatures above 50 °C (122 °F) some parts of the housing can heat up to over 65 °C (149 °F).

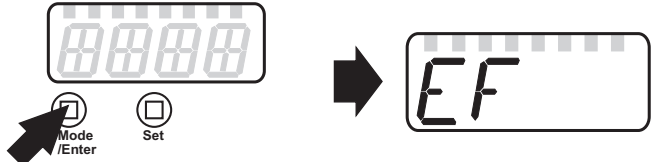
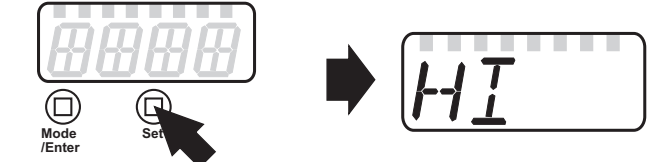
- ▶ Do not press the pushbuttons manually; instead use another object (e.g. ballpoint pen).

10.1 Parameter setting in general

3 steps must be taken for each parameter setting:

<p>1 Select parameter</p> <ul style="list-style-type: none"> ▶ Press [Mode/Enter] until the requested parameter is displayed. 	
<p>2 Set parameter value</p> <ul style="list-style-type: none"> ▶ Press and hold [Set]. > Current setting value of the parameter flashes for 5 s. > After 5 s: setting value is changed: incrementally by pressing the button once or continuously by keeping the button pressed. 	
<p> Numerical values are incremented continuously. For reducing the value:</p> <ul style="list-style-type: none"> ▶ Let the display move to the maximum setting value. > Then the cycle starts again at the minimum setting value. 	
<p>3 Acknowledge parameter value</p> <ul style="list-style-type: none"> ▶ Briefly press [Mode/Enter]. > The parameter is displayed again. The new setting value is saved. 	
<p>Set other parameters</p> <ul style="list-style-type: none"> ▶ Start again with step 1. 	
<p>Finish parameter setting and change to the process value display:</p> <ul style="list-style-type: none"> ▶ wait for 15 s or ▶ press [Mode/Enter] several times until the current measured value is displayed. > The unit returns to the operating mode. 	

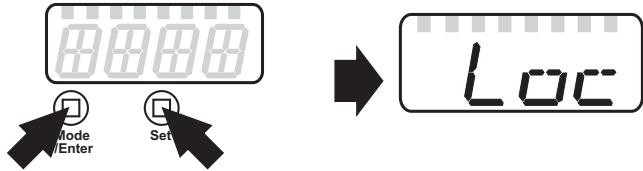

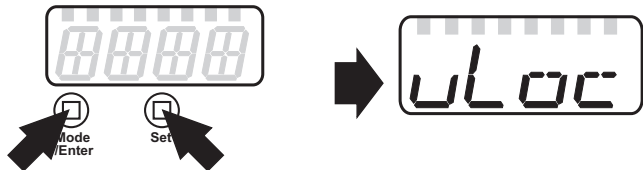
10.1.1 Change from menu level 1 to menu level 2

<ul style="list-style-type: none"> ▶ Press [Mode/Enter] until [EF] is displayed. 	
<ul style="list-style-type: none"> ▶ Briefly press [Set]. > The first parameter of the submenu is displayed (here: [HI]). 	

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10.1.2 Locking / unlocking

The unit can be locked electronically to prevent unintentional settings.

<p>Locking:</p> <ul style="list-style-type: none"> ▶ Make sure that the unit is in the normal operating mode. ▶ Press [Mode/Enter] + [Set] for 10 s. > [Loc] is displayed. 	
<p> During operation: [LOC] is briefly displayed if you try to change parameter values.</p>	
<p>Unlocking:</p> <ul style="list-style-type: none"> ▶ Press [Mode/Enter] + [Set] for 10 s. > [uLoc] is displayed. 	

On delivery: not locked.

10.1.3 Timeout

If no button is pressed for 15 s during parameter setting, the unit returns to the operating mode with unchanged parameter.

10.2 Scaling of the analogue value for temperature

<ul style="list-style-type: none"> ▶ Select [ASP1] and set the value at which 4 mA is provided. ▶ Select [AEP1] and set the value at which 20 mA is provided. 	<p>ASP1 AEP1</p>
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10.3 Scaling of the analogue value for volumetric flow

<ul style="list-style-type: none"> ▶ Select [ASP2] and set the value at which 4 mA is provided. ▶ Select [AEP2] and set the value at which 20 mA is provided. 	<p>ASP2 AEP2</p>
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10.4 User settings (optional)

10.4.1 Set standard unit of measurement for volumetric flow

<ul style="list-style-type: none"> ▶ Select [Uni.F] and set the unit of measurement: [Lmin], [m3h], [GPm] or [GPh]. 	<p>Uni.F</p>
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10.4.2 Set the standard unit of measurement for temperature

▶ Select [Uni.T] and set the unit of measurement: [°C] or [°F].	Uni.T
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10.4.3 Configuration of the standard display

<ul style="list-style-type: none">▶ Select [SELD] and determine the standard measuring unit:<ul style="list-style-type: none">- [FLOW] = the current volumetric flow value in the standard unit of measurement is displayed.- [TEMP] = the current medium temperature is displayed in the standard unit of measurement.▶ Select [diS] and set the update rate and orientation of the display:<ul style="list-style-type: none">- [d1] = update of the measured values every 500 ms.- [d2] = update of the measured values every 1000 ms.- [d3] = update of the measured values every 2000 ms.- [rd1], [rd2], [rd3] = display as for d1, d2, d3; rotated by 180°.- [OFF] = the display is switched off in the operating mode.	SELD diS
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10.4.4 Calibrate the curve of measured values for volumetric flow

▶ Select [CGA] and set a percentage between 60 and 140 (100 = factory setting).	CGA
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10.4.5 Reset calibration data

<ul style="list-style-type: none">▶ Select [CAr].▶ Press and hold [Set] until [----] is displayed.▶ Briefly press [Mode/Enter].> The values are reset to the factory setting (CGA = 100).	CAr-
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10.4.6 Set the measured value damping for volumetric flow

▶ Select [dAP] and set the damping constant in seconds (t value 63 %).	dAP
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10.4.7 Set output status in fault condition

<ul style="list-style-type: none">▶ Select [FOU1] and set the value:<ul style="list-style-type: none">- [On] = The analogue signal goes to the upper end stop value.- [OFF] = The analogue signal goes to the lower end stop value.▶ Select [FOU2] and set the value:<ul style="list-style-type: none">- [On] = The analogue signal goes to the upper end stop value.- [OFF] = The analogue signal goes to the lower end stop value.	FOU1 FOU2
---	--------------

10.4.8 Select the medium to be monitored

<ul style="list-style-type: none">▶ Select [MEDI] and set the requested medium:<ul style="list-style-type: none">- [H2O] = water.- [GLYC] = glycol solutions.- [OIL.1] = high viscosity oil (30...68 mm²/s at 40°C; 30...68 cSt at 104°F)- [OIL.2] = low viscosity oil (7...40 mm²/s at 40°C; 7...40 cSt at 104°F)	MEDI
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10.5 Service functions

10.5.1 Read min/max values for volumetric flow

<ul style="list-style-type: none">▶ Select [HI.F] or [LO.F], briefly press [Set]. [HI.F] = max. value, [LO.F] = min. value. Delete memory: <ul style="list-style-type: none">▶ Select [HI.F] or [LO.F].▶ Press and hold [Set] until [----] is displayed.▶ Briefly press [Mode/Enter]. <p>It makes sense to delete the memories as soon as the unit operates under normal operating conditions for the first time.</p>	HI.F LO.F
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10.5.2 Read the min/max values for the temperature

<ul style="list-style-type: none">▶ Select [HI.T] or [LO.T], briefly press [Set]. [HI.T] = max. value, [LO.T] = min. value. Delete memory: <ul style="list-style-type: none">▶ Select [HI.T] or [LO.T].▶ Press and hold [Set] until [----] is displayed.▶ Briefly press [Mode/Enter]. <p>It makes sense to delete the memories as soon as the unit operates under normal operating conditions for the first time.</p>	HI.T LO.T
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10.5.3 Reset all parameters to factory setting

<ul style="list-style-type: none">▶ Select [rES].▶ Press and hold [Set] until [----] is displayed.▶ Briefly press [Mode/Enter]. <p>For the factory settings please refer to the end of these instructions (→ 13 Factory setting).</p> <p>We recommend taking down your own settings in that table before carrying out a reset.</p>	r-ES
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11 Operation

11.1 Read the process value

The LEDs 1-6 signal which process value is currently displayed.

The process value to be displayed as standard (temperature or volumetric flow) can be preset → 10.4.3 Configuration of the standard display).

A standard unit of measurement can be defined for the flow velocity and the temperature (→ 10.4.1 and → 10.4.2).

11.2 Change the display unit in the Run mode

- ▶ Briefly press [Set] in the Run mode. Press the button to move to the next display unit. The display changes according to the preset:

l/min – m ³ /h – °C/°F	or	gpm – gph – °C/°F
-----------------------------------	----	-------------------

- > The unit displays the current process value in the selected display unit for approx. 15 s, the corresponding LED is lit.

11.3 Read the set parameters

- ▶ Briefly press [Mode/Enter] to scroll the parameters.
- ▶ Briefly press [Set] when the requested parameter is displayed.
- > The unit displays the corresponding parameter value. After about 15 s it again displays the parameter, then it returns to the Run mode.

11.4 Fault indications

[SC1]	Short circuit in OUT1.
[SC2]	Short circuit in OUT2.
[SC]	Short circuit in both outputs.
[OL]	Detection zone of volumetric flow or temperature exceeded. Measured value between 120 % and 130 % of the final value of the measuring range.
[UL]	Below the temperature detection zone: measured value below -10°C (14 °F).
[Err]	<ul style="list-style-type: none">• Unit faulty / malfunction.• Measured value greater than 130 % of the final value of the measuring range.
[SEnS]	Sensor indicates incorrect measurement. Possible cause: accumulated gas and air in the medium or unit. For more detailed diagnostics / fault assessment: <ul style="list-style-type: none">▶ Briefly press [Set].> The latest measured values are displayed.
[IOE]	Flow sensor faulty
[Loc]	Setting pushbuttons locked, parameter change rejected.

12 Technical data

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

13 Factory setting

	Factory setting	User setting
ASP1	-10.0	
AEP1	80.0	
ASP2	0.0	
AEP2	200.0	
CGA	100	
FOU1	OFF	
FOU2	OFF	
dAP	0.6	
diS	d2	
Uni.F	Lmin	
Uni.T	°C	
SELd	FLOW	
MEDI	H2O	

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More information at www.ifm.com