ifm electronic

CE

Operating instructions
Volumetric flow sensor

efector300 **UK**

SQ0500

Contents

UK

1 Preliminary note

1.1 Symbols used

▶   Instruction

>   Reaction, result

[…]   Designation of pushbuttons, buttons or indications

→   Cross-reference

⚠   Important note
        Non-compliance can result in malfunctions or interference.

2 Safety instructions

- Please read this document prior to set-up of the unit. Ensure that the product is suitable for your application without any restrictions.

- 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.

- Check the compatibility of the product materials (→ 12 Technical data) with the media to be measured in all applications.

For the scope of validity cULus:
The device shall be supplied from an isolating transformer having a secondary Listed fuse rated as noted in the following table.

Overcurrent protection		
Control-circuit wire size		Maximum protective device rating Ampere
AWG	(mm²)	
26	(0.13)	1
24	(0.20)	2
22	(0.32)	3
20	(0.52)	5
18	(0.82)	7
16	(1.3)	10

3 Functions and features

The unit monitors liquids.

It detects the 3 process categories volumetric flow, consumed quantity, medium temperature.

Application

* Water and hydrous media

The unit is calibrated for water. For use in other hydrous media please check whether a new calibration is needed (→ 4.9 Customer-specific calibration and 9.5.3 Calibration of the curve of measured values).

4 Function

4.1 Processing of the measured signals

* The unit displays the current process values.
* It generates 2 output signals according to the parameter setting.

OUT1: 3 selection options .... Parameter setting
Switching signal for volumetric flow quantity limit value .... (→ 9.2.1)
or pulse sequence for quantity meter .... (→ 9.3.1)
or switching signal for preset counter .... (→ 9.3.2)

OUT2: 4 selection options
Switching signal for volumetric flow quantity limit value .... (→ 9.2.2)
or switching signal for temperature limit value .... (→ 9.4.1)
or analogue signal for volumetric flow quantity .... (→ 9.2.3)
or Analogue signal for temperature .... (→ 9.4.2)

4.2 Volumetric flow monitoring

* 2 switching signals for volumetric flow limit values can be provided (output 1 and output 2). For the switching functions → 4.7.
* An analogue signal which is proportional to the volumetric flow (4...20 mA) can be provided on output 2. For the analogue functions → 4.8.

4.3 Consumed quantity meter (totalizer function)

The unit has an internal quantity meter. It continuously totals the volumetric flow quantity. The sum corresponds to the current consumed quantity since the last reset.

* The current meter reading can be displayed.

- In addition the value before the last reset is stored. This value can also be displayed.

The meter saves the totalled consumed quantity every 10 minutes. After a power failure this value is available as the current meter reading. If a time-controlled reset is set, the elapsed time of the set reset interval is also stored. So the possible data loss can be maximum 10 minutes.

The meter can be reset as follows:
- Manual reset (→ 9.3.3).
- Time-controlled automatic reset (→ 9.3.3).

4.4 Consumed quantity monitoring with pulse output

Output 1 provides a counting pulse if the value set in [ImPS] is reached (→ 9.3.1).

4.5 Consumed quantity monitoring with preset counter

2 types of monitoring are possible:
- Time-dependent quantity monitoring.
  - Settings: [ImPS] = quantity x, [ImPR] = [no], [rTo] = time t.
  - If the quantity x is reached during t, output 1 switches and remains switched until the meter is reset.
  - If the quantity x is not reached during t, the meter is automatically reset and counting starts again; output 1 does not switch.
- Quantity monitoring not time-dependent.
  - Settings: [ImPS] = quantity x, [ImPR] = [no], [rTo] = [OFF].
  - If the quantity x is reached, output 1 switches and remains switched until the meter is reset.

4.6 Temperature monitoring

- A switching signal for temperature limit values can be provided on output 2. For the switching functions → 4.7.
- An analogue signal proportional to the temperature (4...20 mA) can be provided on output 2. For the analogue functions → 4.8.

6

4.7 Volumetric flow or temperature monitoring / switching function

OUTx changes its switching state if it is above or below the set switching limits (SPx, rPx). The following switching functions can be selected:

- Hysteresis function / normally open: [OUx] = [Hno].
- Hysteresis function / normally closed: [OUx] = [Hnc].
  First the set point (SPx) is set, then the reset point (rPx) with the requested difference.
- Window function / normally open: [OUx] = [Fno].
- Window function / normally closed: [OUx] = [Fnc].

The width of the window can be set by means of the difference between SPx and rPx. SPx = upper value, rPx = lower value.
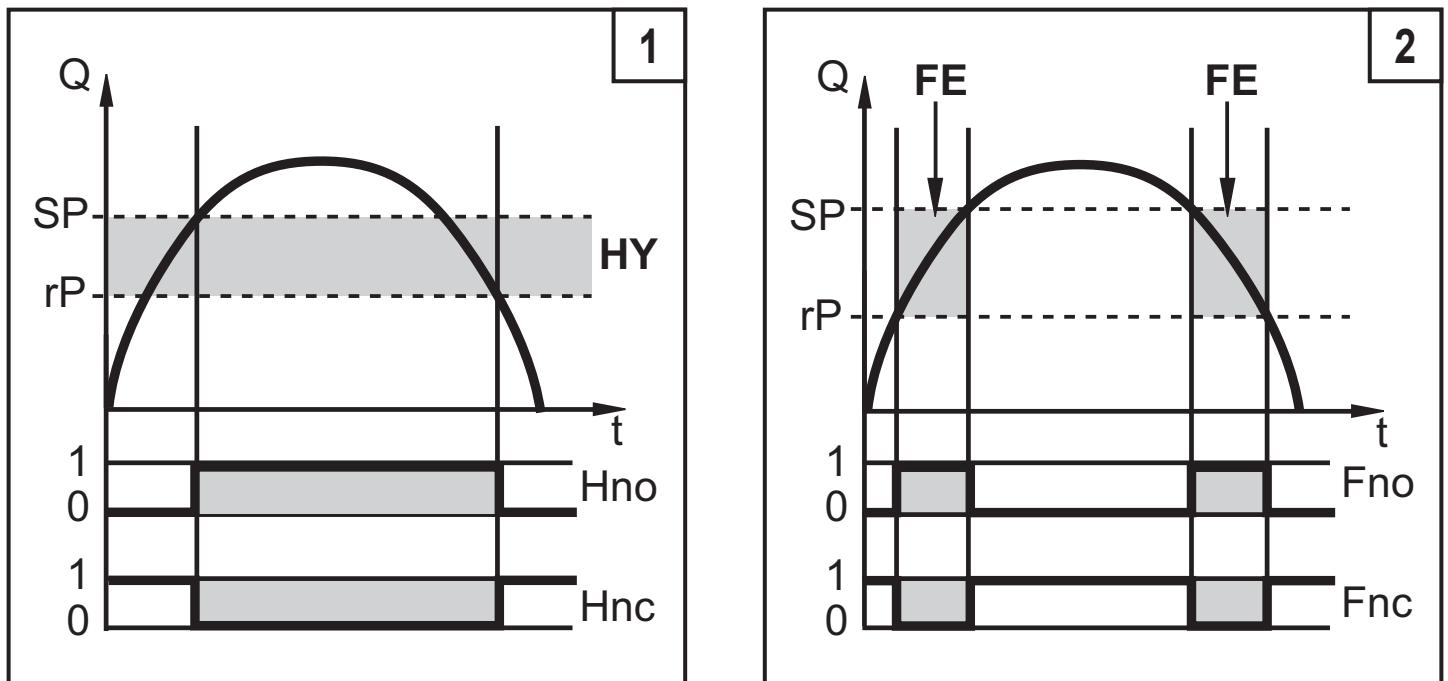
HY = hysteresis; FE = window; examples for volumetric flow monitoring

When set to the window function the set and reset points have a fixed hysteresis of 0.25 % of the final value of the measuring range. This keeps the switching state of the output stable if the volumetric flow varies slightly.

4.8 Volumetric flow or temperature monitoring / analogue function

- Analogue start point [ASP] determines at which measured value the output signal is 4 mA.
- Analogue end point [AEP] determines at which measured value the output signal is 20 mA.
- Minimum distance between [ASP] and [AEP] = 25 % of the final value of the measuring range.

7

Current output 4 ... 20 mA (example volumetric flow monitoring)

| Factory setting	Measuring range scaled
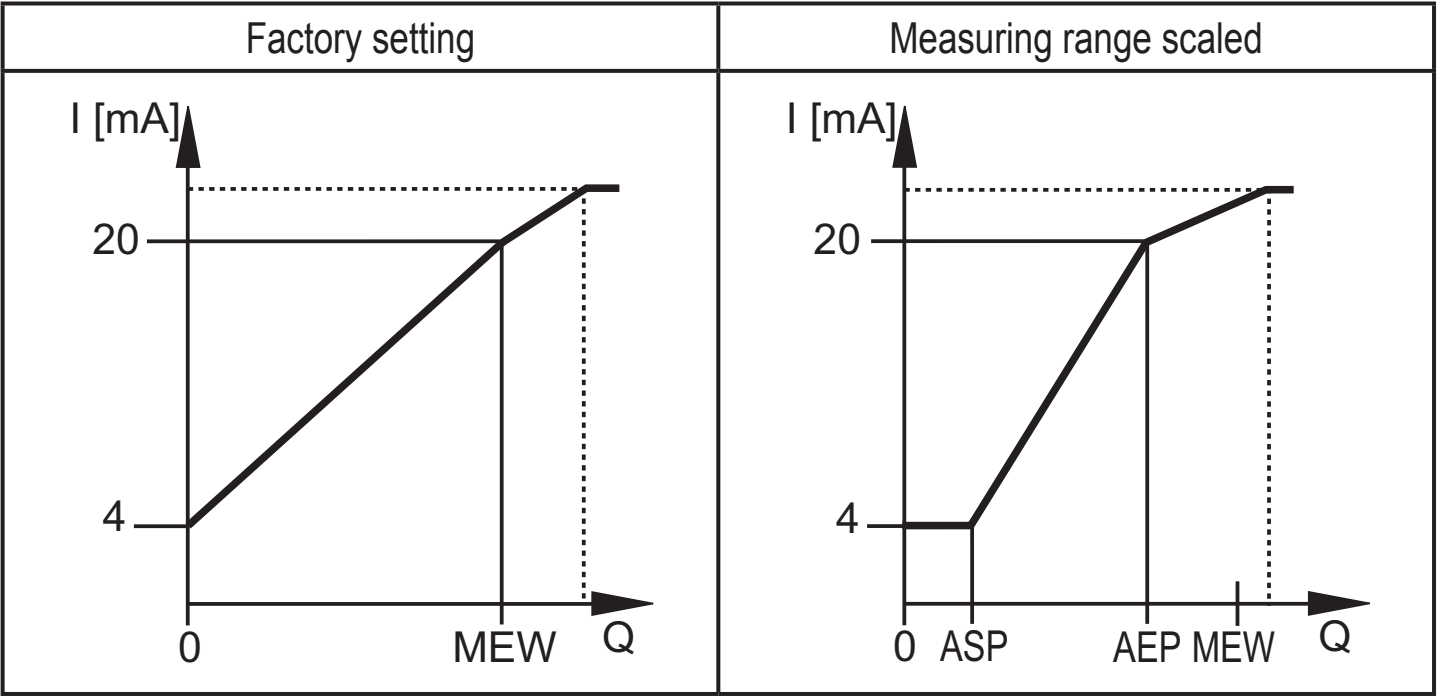
MEW = final value of the measuring range
In the set measuring range the output signal is between 4 and 20 mA.
It is also indicated:
Volumetric flow above the measuring range: output signal > 20 mA.

4.9 Customer-specific calibration (CGA)

The customer-specific calibration allows changing the gradient of the curve of measured values. It influences the display and the outputs.
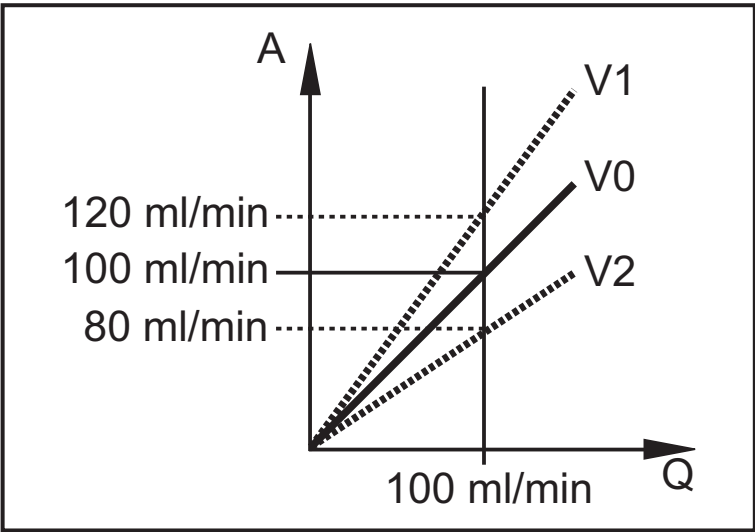
A = operating value
V0 = curve of measured values at factory setting
V1, V2 = curve of measured values after calibration

The change in the increase is indicated in percent. Factory setting = 100%. After a change the calibration can be reset to factory setting (→ Menu item CAr).

5 Installation

▶ Install the unit in a pipe using G⅛ adapters. Max. tightening torque 5 Nm.

- Installation position:vertically in a rising pipe.
  Horizontal installation is not recommended because the specified accuracy cannot be complied with.

- Direction of flow (F) and arrow "flow direction" must point into the same direction.

A: flow conditioner

The flow conditioner can be removed. If the unit is operated without flow conditioner:
- Provide for a calming section (B) of at least 20 cm on the inflow side. Internal pipe diameter preferably 3.5 mm. Disturbances (S) caused by bends, valves, reductions, etc. are compensated for.
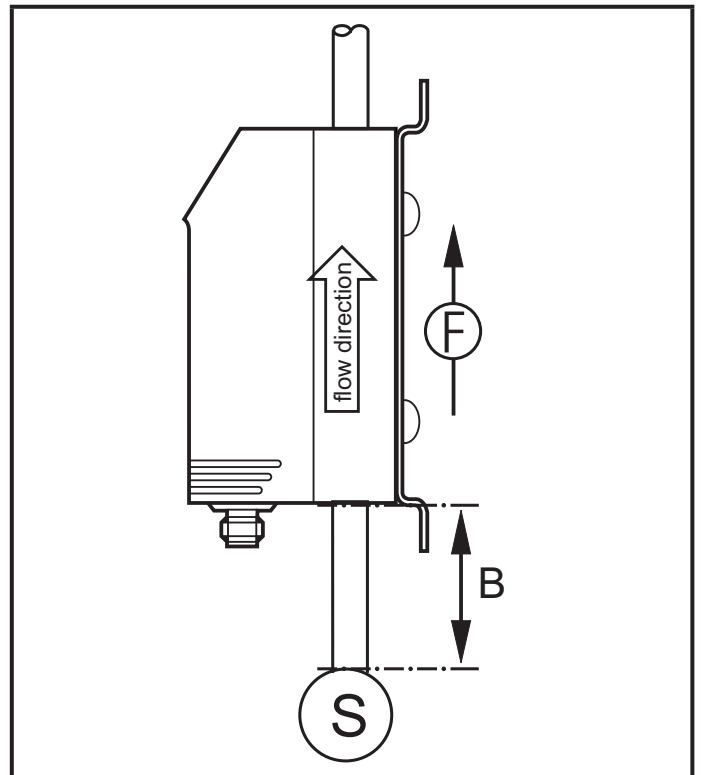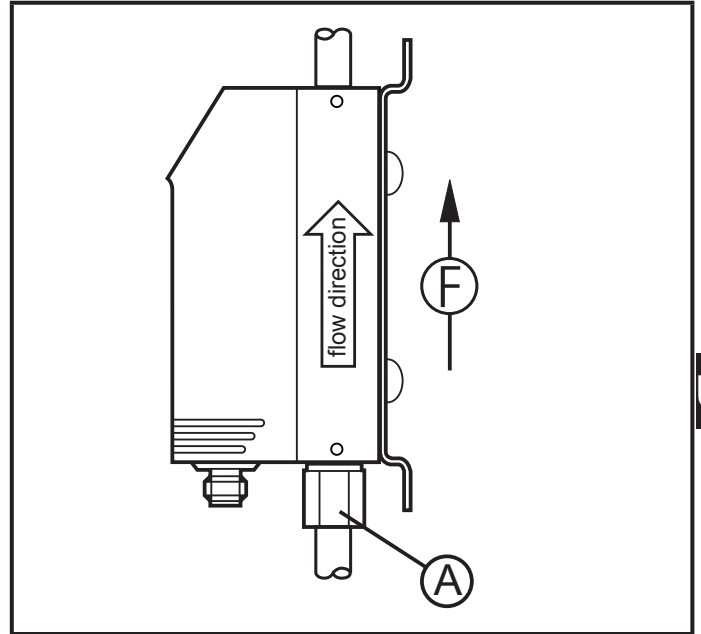
For operation without flow conditioner, the measurement accuracy can deviate from the accuracy specified in the technical data. Remedy:
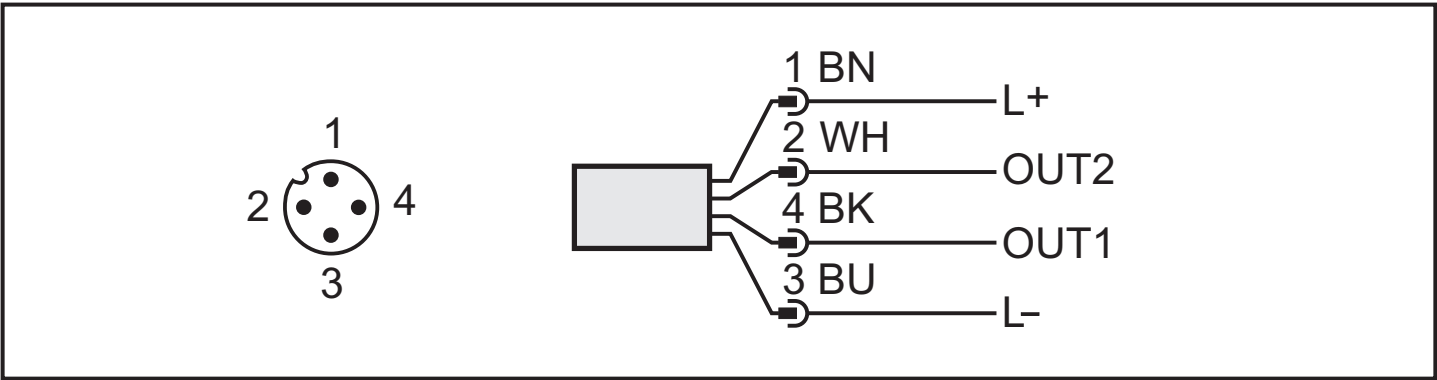▶ Carry out a customer-specific calibration (→ Menu item CGA).

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:

Pin1	Ub+
Pin3	Ub-
Pin4 (OUT1)	Switching signal: limit values for volumetric flow. Switching signal: quantity meter reached preset value. Pulses: 1 pulse every time the defined volumetric flow quantity is reached.
Pin2 (OUT2)	Switching signal: limit values for volumetric flow. Switching signal: limit values for temperature. Analogue signal for volumetric flow. Analogue signal for temperature.

Core colours of ifm sockets:

1 = BN (brown), 2 = WH (white), 3 = BU (blue), 4 = BK (black)

7 Operating and display elements
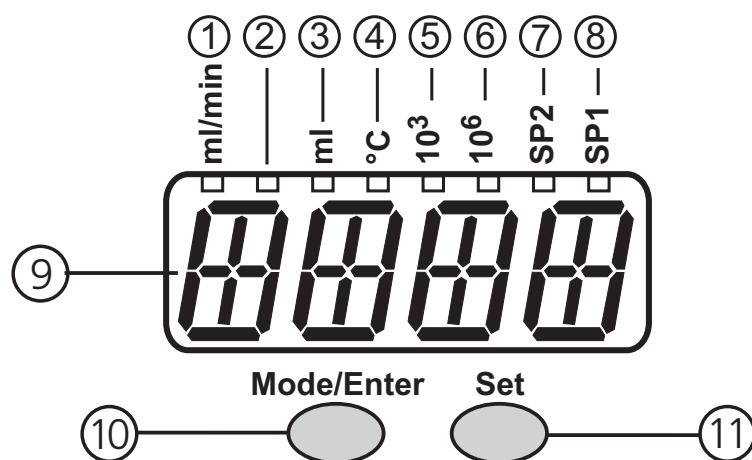
1 to 8: Indicator LEDs

- LED 1 = current volumetric flow in millilitres/minute (ml/min).
- LED 2 = not used.
- LED 3 = current consumed quantity since the last reset in millilitres (ml).
- LED 3 flashing = consumed quantity before the last reset in millilitres (ml).
- LED 4 = current medium temperature in °C.
- LED 5 = the displayed value must be multiplied by factor 10^3.
- LED 6 = the displayed value must be multiplied by factor 10^6.
- LED 7, LED 8 = switching state of the corresponding output.

9: Alphanumeric display, 4 digits

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

10: Mode/Enter button
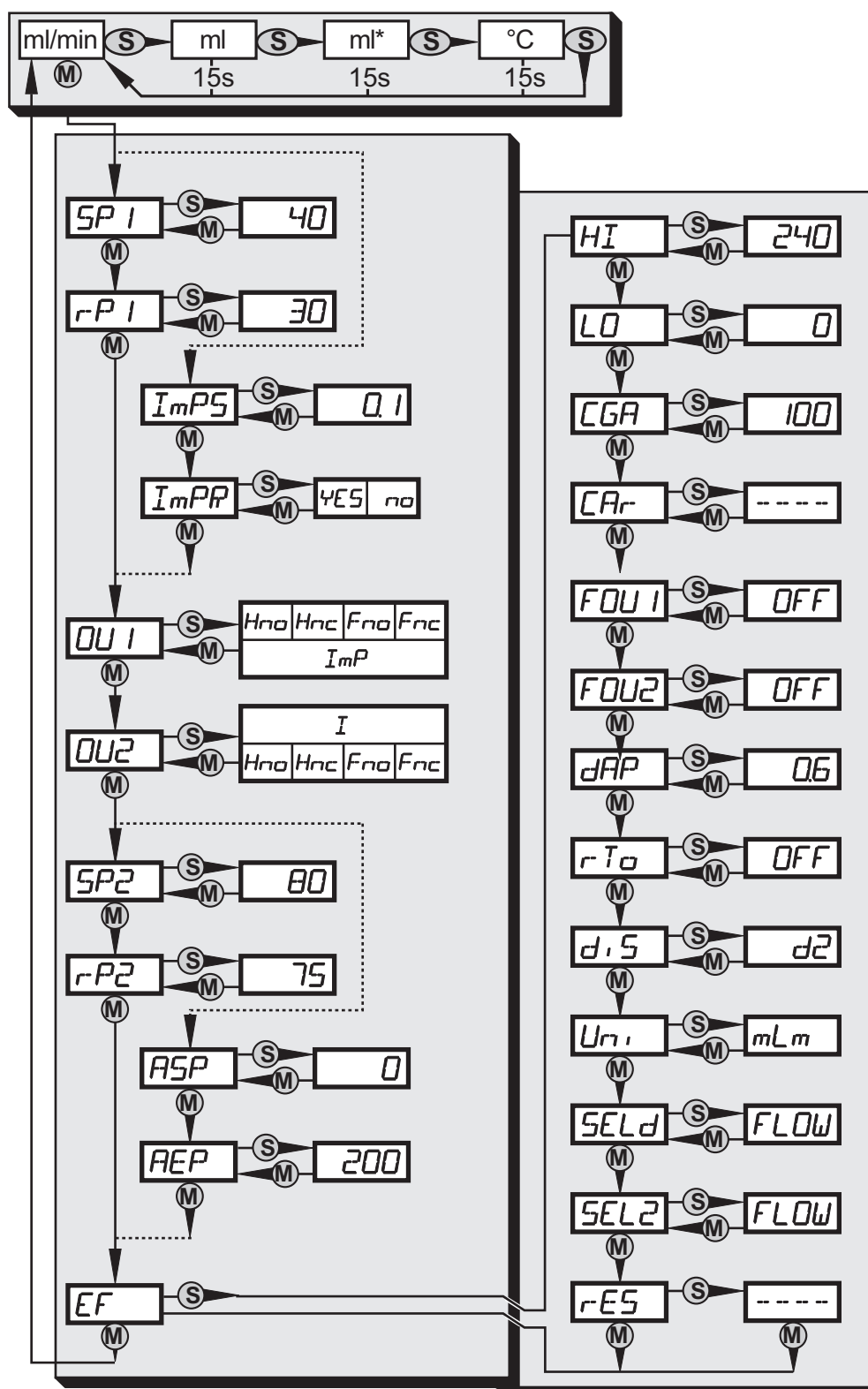
- Selection of the parameters and acknowledgement of the parameter values.

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).

8 Menu

8.1 Menu structure

Ⓜ = [Mode/Enter] / Ⓢ = [Set]
ml = current meter reading in ml
ml* = stored meter reading in ml

8.2 Explanation of the menu

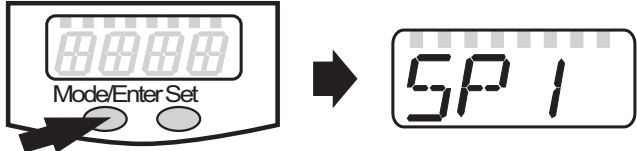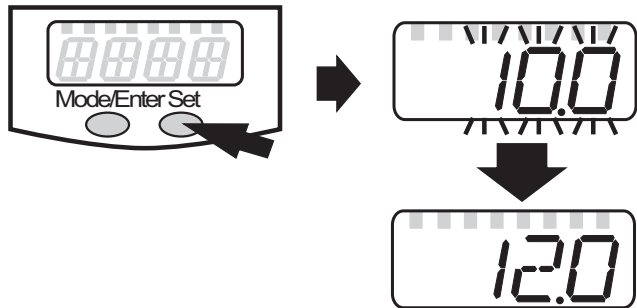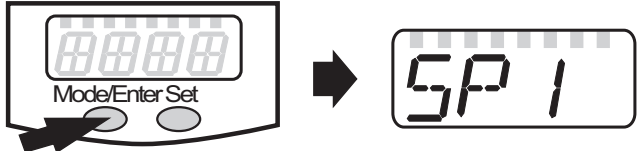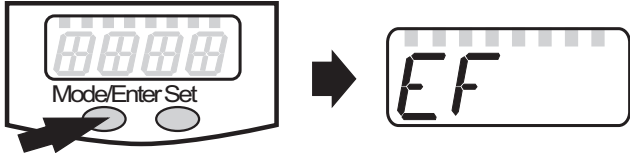|	
SP1/rP1	Upper / lower limit volumetric flow values.
ImPS	Pulse value.
ImPR	Pulse repetition active (= pulse output) or not active (= preset counter function).
OU1	Output function for OUT1 (volumetric flow or consumed quantity): - Switching signal for the limit values: hysteresis function or window function, either normally open or normally closed. - Pulse or switching signal for quantity meter.
OU2	Output function for OUT2 (volumetric flow or temperature): - Switching signal for the limit values: hysteresis function or window function, either normally open or normally closed. - Analogue signal: 4-20 mA [I].
SP2/rP2	Upper / lower limit value for volumetric flow or temperature.
ASP	Analogue start value for volumetric flow or temperature.
AEP	Analogue end value for volumetric flow or temperature.
EF	Extended functions / opening of menu level 2.
HI	Maximum value memory for volumetric flow.
LO	Minimum value memory for volumetric flow.
CGA	Customer-specific calibration of the curve of measured values.
CAr	Calibration reset.
FOU1	Behaviour of output 1 in case of an internal fault.
FOU2	Behaviour of output 2 in case of an internal fault.
dAP	Measured value damping.
rTo	Counter reset: manual reset / time-controlled reset.
diS	Update rate and orientation of the display.
Uni	Standard unit of measurement for volumetric flow: ml/min.
SELd	Standard display unit: volumetric flow value or meter reading.
SEL2	Standard process category for evaluation by OUT2: - limit value signal or analogue signal for volumetric flow - limit value signal or analogue signal for temperature
rES	Restore factory settings.

UK

13

9 Parameter setting

During parameter setting the unit remains in the operating mode. It continues its monitoring function with the existing parameters until the parameter setting has been completed.

9.1 General parameter setting

3 steps must be taken for each parameter setting:

1	**Select parameter** ▶ Press [Mode/Enter] until the requested parameter is displayed.	
2	**Set parameter value** ▶ Press [Set] and keep it pressed. > 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.	
	Numerical values are incremented continuously. To reduce the value: let the display move to the maximum setting value. Then the cycle starts again at the minimum setting value.	
3	**Acknowledge parameter value** ▶ Press [Mode/Enter] briefly. > The parameter is displayed again. The new setting value is stored.	

Setting of other parameters:
▶ Start again with step 1.

Finishing the parameter setting:
▶ Press [Mode/Enter] several times until the current measured value is displayed or wait for 15 s.
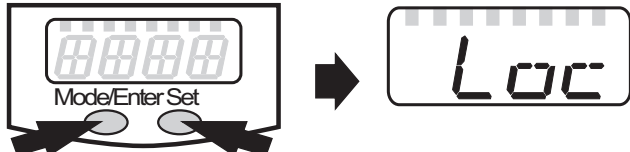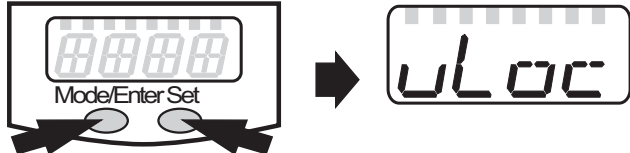> The unit returns to the operating mode.

• Change from menu level 1 to menu level 2:

| ▶ Press [Mode/Enter] until [EF] is displayed. | Mode/Enter Set ➡ EF |
| ▶ Press [Set] briefly.
> The first parameter of the submenu is displayed (here: [HI]). | Mode/Enter Set ➡ HI |

• Locking / unlocking
  The unit can be locked electronically to prevent unintentional settings.

▶ Make sure that the unit is in the normal operating mode. ▶ Press [Mode/Enter] + [Set] for 10 s. > [Loc] is displayed.	Mode/Enter Set ➡ Loc
During operation: [LOC] is briefly displayed if you try to change parameter values.	
For unlocking: ▶ Press [Mode/Enter] + [Set] for 10 s. > [uLoc] is displayed.	Mode/Enter Set ➡ uLoc

On delivery: unlocked.

• Timeout:

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

9.2 Settings for volumetric flow monitoring

9.2.1 Settings for limit value monitoring with OUT1

▶ Select [OU1] and set the switching function:
  - [Hno] = hysteresis function/NO.
  - [Hnc] = hysteresis function/NC.
  - [Fno] = window function/NO.
  - [Fnc] = window function/NC.
▶ Select [SP1] and set the value at which the output switches.
▶ Select [rP1] and set the value at which the output switches off.
	OU1
	SP1
	rP1

9.2.2 Settings for limit value monitoring with OUT2

▶ Select [SEL2] and set [FLOW].
▶ Select [OU2] and set the switching function:
  - [Hno] = hysteresis function/NO.
  - [Hnc] = hysteresis function/NC.
  - [Fno] = window function/NO.
  - [Fnc] = window function/NC.
▶ Select [SP2] and set the value at which the output switches.
▶ Select [rP2] and set the value at which the output switches off.
	SEL2
	OU2
	SP2
	rP2

9.2.3 Setting the analogue value for volumetric flow

▶ Select [SEL2] and set [FLOW]. ▶ Select [OU2] and set the function: - [I] = current signal proportional to the volumetric flow (4…20 mA). ▶ Select [ASP] and set the value at which the minimum value is provided. ▶ Select [AEP] and set the value at which the maximum value is provided.	SEL2 OU2 ASP AEP

9.3 Settings for consumed quantity monitoring

9.3.1 Settings for quantity monitoring via pulse output

▶ Select [OU1] and set [ImP]. ▶ Select [ImPS] and set the volumetric flow quantity at which 1 pulse is provided (→ 9.7). ▶ Select [ImPR] and set [YES]. > Pulse repetition is active. Output 1 provides a counting pulse every time the value set in [ImPS] is reached.	OU1 ImPS ImPR

9.3.2 Settings for quantity monitoring via the preset counter

▶ Select [OU1] and set [ImP]. ▶ Select [ImPS] and set the volumetric flow quantity at which output 1 switches (→ 9.7). ▶ Select [ImPR] and set [no]. > Pulse repetition is not active. The output switches ON if the value set in [ImPS] is reached. It remains switched until the meter is reset.	*OU 1* *ImPS* *ImPR*

9.3.3 Settings for program-controlled counter reset

▶ Select [rTO] and continue with a) or b). a) Reset the meter manually: ▶ Press [SET] until [rES.T] is displayed, then briefly press [Mode/Enter]. b) Enter the value for time-controlled reset: ▶ Press [Set] until the requested value is displayed (intervals from 1 hour to 8 weeks), then briefly press [Mode/Enter].	*r To*

9.3.4 Deactivation of the counter reset

▶ Select [rTo] and set [OFF]. The meter is only reset after overflow (= factory setting).	*r To*

9.4 Settings for temperature monitoring

9.4.1 Settings for limit value monitoring with OUT2

▶ Select [SEL2] and set [TEMP].
▶ Select [OU2] and set the switching function:
  - [Hno] = hysteresis function/NO,
  - [Hnc] = hysteresis function/NC,
  - [Fno] = window function/NO,
  - [Fnc] = window function/NC.
▶ Select [SP2] and set the value at which the output switches.
▶ Select [rP2] and set the value at which the output switches off.
	SEL2
	OU2
	SP2
	rP2

9.4.2 Setting the analogue value for temperature

▶ Select [SEL2] and set [TEMP]. ▶ Select [OU2] and set the function: - [I] = temperature-proportional current signal (4…20 mA). ▶ Select [ASP] and set the value at which the minimum value is provided. ▶ Select [AEP] and set the value at which the maximum value is provided.	*SEL2* *OU2* *ASP* *AEP*

9.5 User settings (optional)

9.5.1 Setting of the standard unit of measurement for volumetric flow

Currently only the unit of measurement ml/min [mLm] is available. The setting only has an effect on the volumetric flow value. The counter values (consumed quantity) are automatically displayed in ml.	*Uni*

9.5.2 Configuration of the standard display

▶ Select [SELd] and determine the standard measuring unit:
   - [FLOW] = the current volumetric flow value in the standard unit of measurement is displayed.
   - [TOTL] = the current meter reading in ml, 10^3 ml or 10^6 ml is displayed (millilitres, litres, cubic metres).
   - [TEMP] = the current medium temperature in °C is displayed.
▶ Select [diS] and set the update rate and orientation of the display:
   - [d1] = update of the measured values every 50 ms.
   - [d2] = update of the measured values every 200 ms.
   - [d3] = update of the measured values every 600 ms.
   - [rd1], [rd2], [rd3] = display as for d1, d2, d3; rotated by 180°.
   - [OFF] = the display is switched off in the operating mode.
	SELd
	diS

9.5.3 Calibration of the curve of measured values

▶ Select [CGA] and set a percentage between 60 and 140 (100 = factory preset).	*CGA*

9.5.4 Calibration reset

▶ Select [CAr]. ▶ Press [Set] and keep it pressed until [----] is displayed. ▶ Press [Mode/Enter] briefly. > The values are reset to the factory setting (CGA = 100).	*CAr-*

9.5.5 Setting of measured value damping

▶ Select [dAP] and the damping constant in seconds (t value 63 %).	*dAP*

9.5.6 Setting the error behaviour of the outputs

▶ Select [FOU1] and set the value: - [On] = output 1 switches ON in case of a fault. - [OFF] = output 1 switches OFF in case of a fault. - [OU] = output 1 switches irrespective of the fault as defined with the parameters. ▶ Select [FOU2] and set the value: - [On] = output 2 switches ON in case of a fault, the analogue signal goes to the upper end stop value. - [OFF] = output 2 switches OFF in case of a fault, the analogue signal goes to the lower end stop value. - [OU] = output 2 switches irrespective of the fault as defined with the parameters. The analogue signal corresponds to the measured value.	*FOU1* *FOU2*

9.6 Service functions

9.6.1 Reading of the min/max values for volumetric flow

▶ Select [HI] or [Lo], briefly press [Set]. [HI] = maximum value, [LO] = minimum value. Delete memory: ▶ Select [HI] or [LO]. ▶ Press [Set] and keep it pressed until [----] is displayed. ▶ Press [Mode/Enter] briefly. It makes sense to delete the memories as soon as the unit operates under normal operating conditions for the first time.	*HI* *LO*

9.6.2 Reset of all parameters to factory setting

▶ Select [rES]. ▶ Press [Set] and keep it pressed until [----] is displayed. ▶ Press [Mode/Enter] briefly. For the factory settings please refer to the end of these instructions (→ 13 Factory setting). We recommend taking down your own settings in that table before carrying out a reset.	*r-ES*

9.7 Setting of the preset counter / pulse value (ImPS)

The unit has 8 setting ranges:

	LED	Display		in steps of	Value
1	3	`0` `0` `0.` `1`	... `9` `9` `9.` `9`	0.1 ml	0.1...999.9 ml
2	3	`1` `0` `0` `0`	... `9` `9` `9` `9`	1 ml	1000...9999 ml
3	3 + 5	`1` `0.` `0` `0`	... `9` `9.` `9` `9`	0.01 l	10.00...99.99 l
4	3 + 5	`1` `0` `0.` `0`	... `9` `9` `9.` `9`	0.1 l	100.0...999.9 l
5	3 + 5	`1` `0` `0` `0`	... `9` `9` `9` `9`	1 l	1000 ...9999 l
6	3 + 6	`1` `0.` `0` `0`	... `9` `9.` `9` `9`	10 l	10 000 ...99 990 l
7	3 + 6	`1` `0` `0.` `0`	... `9` `9` `9.` `9`	100 l	100 000 ...999 900 l
8	3 + 6	`1` `0` `0` `0`	... `2` `0` `0` `0`	1000 l	1 000 000 ...2 000 000 l

Setting operation:

▶ Set [OU1] to [ImP] (→ 9.3.2).

▶ Press [Mode/Enter] until [ImPS] is displayed.

▶ Press [Set] and keep it pressed.

> The current numerical value flashes for 5 s, then one of the 4 digits becomes active (digit flashes, can be changed).

▶ Set the requested value as shown in the following table.
    ▶ First select the requested setting range (1, 2, 3,...).
    ▶ Then set the number from left (first digit) to right (fourth digit).

▶ Press [Mode/Enter] briefly when all 4 digits have been set.

As soon as the first digit flashes there are 3 options:

▶ Briefly press [SET] 1 x.	The flashing digit is increased. 9 is followed by 0 - 1 - 2, etc.
	`8` `1.` `2` `3`
	1 x [Set] pressed `9` `1.` `2` `3`
	1 x [Set] pressed `0` `1.` `2` `3`
	1 x [Set] pressed `1` `1.` `2` `3`

▶ Press [Set] and keep it pressed.	The flashing digit is increased, 9 is followed by 0 and the digit following on the left becomes active. `8 1. 8 3` [Set] permanently pressed `8 1. 9 3` [Set] kept pressed `8 1. 0 3`
	If digit 1 is increased this way, the display changes to the next higher setting range (9 is followed by 10, the decimal point is moved one place to the right or the LED display changes). `8 1. 2 3` [Set] permanently pressed `9 1. 2 3` [Set] kept pressed `1 0 1. 2`
▶ Wait 3 s (do not press any button).	The digit following on the right flashes (= becomes active). `8 1 2. 3` no pushbutton pressed; after 3 s `8 1 2. 3` after 3 s `8 1 2. 3` after 3 s `8 1 2. 3`
	If the fourth digit flashes unchanged for 3 s, digit 1 becomes active again (if the value of digit 1 is > 0). after 3 s `8 1 2. 3` If digit 1 has the value "0", the display changes to the next lower setting range (the decimal point is moved one place to the left or the LED display changes). `0 1 2. 3` after 3 s `1 2. 3 0` Next: Change digit 4 or wait 3 s and set digit 1. after 3 s `1 2. 3 0`

UK

Highlighted grey (`1`) = flashing digit.

Note: if [Set] is pressed continuously, the display moves through all ranges; after the end value it jumps back to the start value. Then release [Set] briefly and start the setting again.

10 Operation

After power on and expiry of the power-on delay time (approx. 5 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 for NO function (Hno, Fno), OFF for NC function (Hnc, Fnc).
- If output 2 is configured as analogue output, the output signal is at the maximum value during the power-on delay time.

The unit reaches the specified accuracy after a warm-up of 30 minutes.

Operating indication → Chapter 7 Operating and display elements.

10.1 Reading of the set parameters

▶ Press [Mode/Enter] until the requested parameter is displayed.

▶ Press [Set] briefly.

> The unit displays the corresponding parameter value for approx. 15 s. After another 15 s the parameter is displayed again, then the unit returns to the Run mode.

10.2 Changing the display unit in the Run mode

▶ Press [Set] briefly in the Run mode. Press the button to move to the next display unit.

> The unit displays the current measured value in the selected display unit for approx. 15 s, the corresponding LED lights.

10.3 Fault indication

[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 > 120 % of the final value of the measuring range.
[UL]	Below the detection zone of volumetric flow or temperature; measured value below initial value of the measuring range.
[Err]	Unit faulty / malfunction.
[Loc]	Setting buttons locked, parameter change rejected.

10.4 General operating conditions

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

▶ From time to time check the pipe wall visually for deposits; in case of soiling clean at regular intervals.

Use a suitable cleaning liquid (e.g. alcoholic solution).

11 Scale drawing
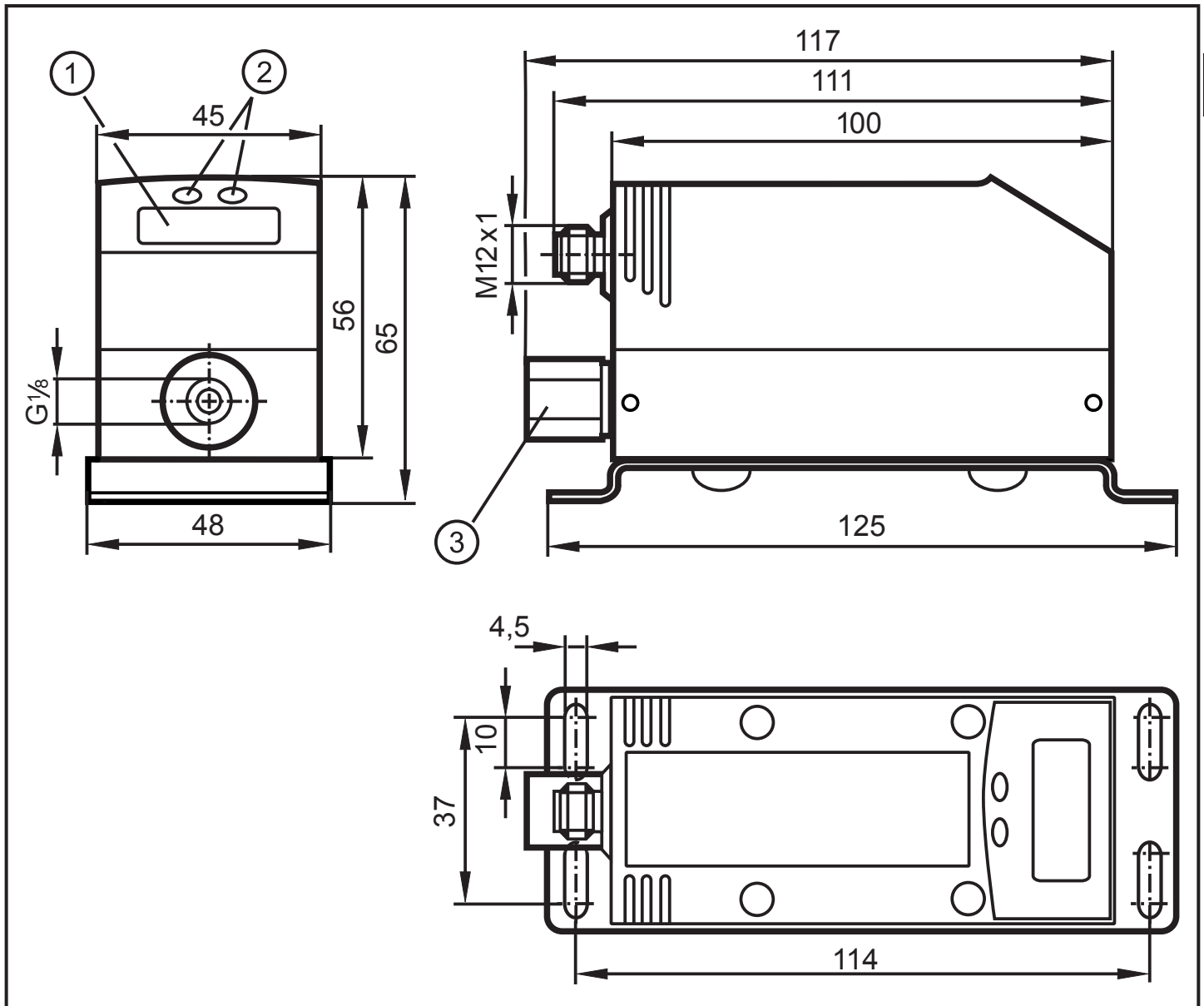
Dimensions in mm
1: Alphanumeric display
2: Setting buttons
3: Flow conditioner

23

12 Technical data

Operating voltage [V]	19...30 DC
Current rating [mA]	2 x 250
short-circuit proof; rev. polarity, overload protection	
Voltage drop [V]	< 2
Current consumption typ. [mA]	110
Analogue output	4 ... 20 mA; measuring range scalable
Max. load [Ω]	500
Pulse value [ml]	0.1...2 000 000 000
Pulse length [s]	min. 0.0125 / max. 2
Power-on delay time [s]	5

Flow monitoring	
Measuring range [ml/min]	1...200
Display range [ml/min]	0...240
Response time [s]	< 0.3 (dAP = 0)
Damping (dAP) [s]	0 - 0.2 - 0.4 - 0.6 - 0.8 - 1 ...5
Accuracy	± (15 % MW + 2 % MEW)[1]
	[1] The values apply with the following conditions:
	- application: water
	- medium temperature: 20 °C;
	- ambient temperature: 22...28 °C
	- Unit with mounted flow conditioner
Repeatability [% MW]	± 3
Pressure drop without flow conditioner [mbar]	max. 5
Pressure drop with flow conditionerr [mbar]	max. 23

Temperature monitoring	
Measuring range [°C]	0.0...60.0
	Valid values only at Q > 20 ml/min

```
Medium temperature [°C] ................................................................. 0...60
Ambient temperature [°C] ............................................................... 0...60
Storage temperature [°C] ............................................................ -25...85
Materials (wetted parts) ............................ high-grade stainless steel (316L/1.4404); NBR
Housing materials ........................... high-grade stainless steel (316L/1.4404); PC; POM;
                                                                       FKM; PBT-GF 20; Viton
Protection ........................................................................ IP 65 / III
Pressure resistance [bar] ........................................................................10
Insulation resistance [MΩ] ......................................................... > 100 (500 V DC)
Shock resistance [g] ..................................................... 30 (DIN IEC 68-2-27, 11 ms)
Vibration resistance [g] ............................................ 5 (DIN IEC 68-2-6, 55 - 2000 Hz)
EMC
IEC 1000/4/2 ESD: ...................................................................... 4 / 8 KV
IEC 1000/4/3 HF radiated: ............................................................... 10 V/m
IEC 1000/4/4 Burst: ......................................................................2 KV
IEC 1000/4/6 HF conducted: ............................................................... 10 V
```

MW = measured value; MEW = final value of the measuring range

12.1 Setting ranges

FLOW	SP1 / SP2		rP1 / rP2		ASP		AEP		ΔQ
	min	max	min	max	min	max	min	max	
ml/min	6	200	1	195	0	150	50	200	1

TEMP	SP2		rP2		ASP		AEP		ΔT
	min	max	min	max	min	max	min	max	
°C	1.8	60.0	0.3	58.5	0.0	45.0	15.0	60.0	0.1

ImPS	min	max
	0.1 ml	2 000 000 000 ml

(ΔQ, ΔT = step increment)

13 Factory setting

	Factory setting	User setting
SP1	40	
rP1	35	
ImPS	0.1	
ImPR	YES	
OU1	Hno	
OU2	I	
SP2	80	
rP2	75	
ASP	0	
AEP	200	
CGA	100	
FOU1	OFF	
FOU2	OFF	
dAP	0.6	
rTo	OFF	
diS	d2	
Uni	mLm	
SELd	FLOW	
SEL2	FLOW	

Further information at www.ifm.com