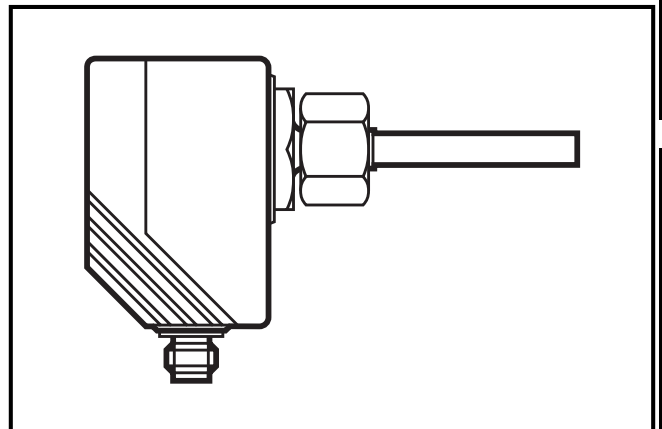


**Bedienungsanleitung
Operating instructions
Notice utilisateurs**

efector 3000[®]

**Strömungswächter
Flow monitor
Contrôleur de débit**

SI-FKOW



DEUTSCH

ENGLISH

FRANÇAIS

Brief adjustment instructions

- **Installation**

Mounting → page 24, electrical connection → page 26.

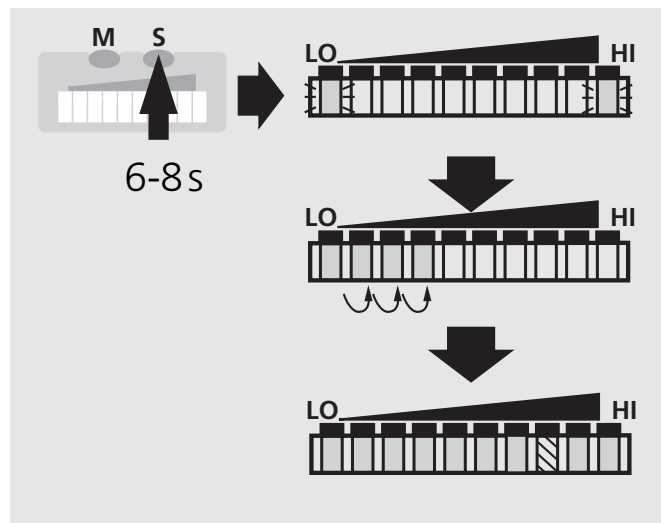
- **HI-Teach**

Apply the operating voltage.

After approx. **15s** the unit is ready.

Allow the medium to flow through the system at the required **maximum flow rate (HI)**.

Press the **Learn/Set** button and keep it pressed.
The green LEDs on the right and on the left flash,
after 5s the LED bar (green) fills from left to right
(release the button as soon as the first LEDs light).
The indication goes off briefly.
The unit stores the current flow as maximum flow.

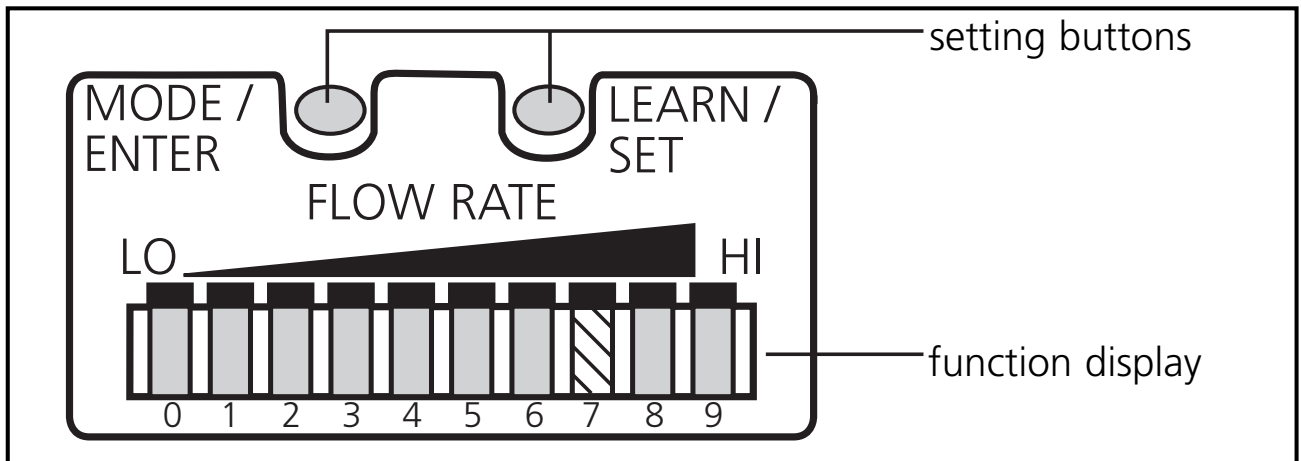


- **The unit is ready for normal operation.**

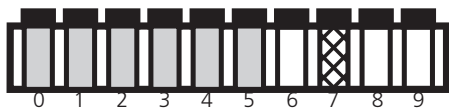
Further setting options (→ page 27)

- The HI-Teach is sufficient for the majority of waterbased applications. Optional: adjustment to minimum flow (**LO-Teach**).
- Setting of the **switch point** (for changing the reaction time and excess gain).
- Manual adjustment to maximum flow.
- Manual adjustment to maximum flow / monitoring and optical indication of excess flow.
- Manual adjustment to minimum flow / flow standstill.
- Changing of the function of the output relay.

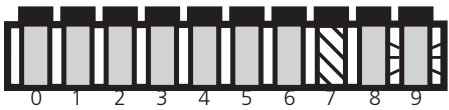
Controls and visual indication



Function display (Run mode)



current flow within the display range
(LED bar green)



excess flow (LED 9 flashes)



underflow (LED 0 flashes)

Indication of the switch point (SP):
LED orange: flow \geq SP; LED red: flow $<$ SP

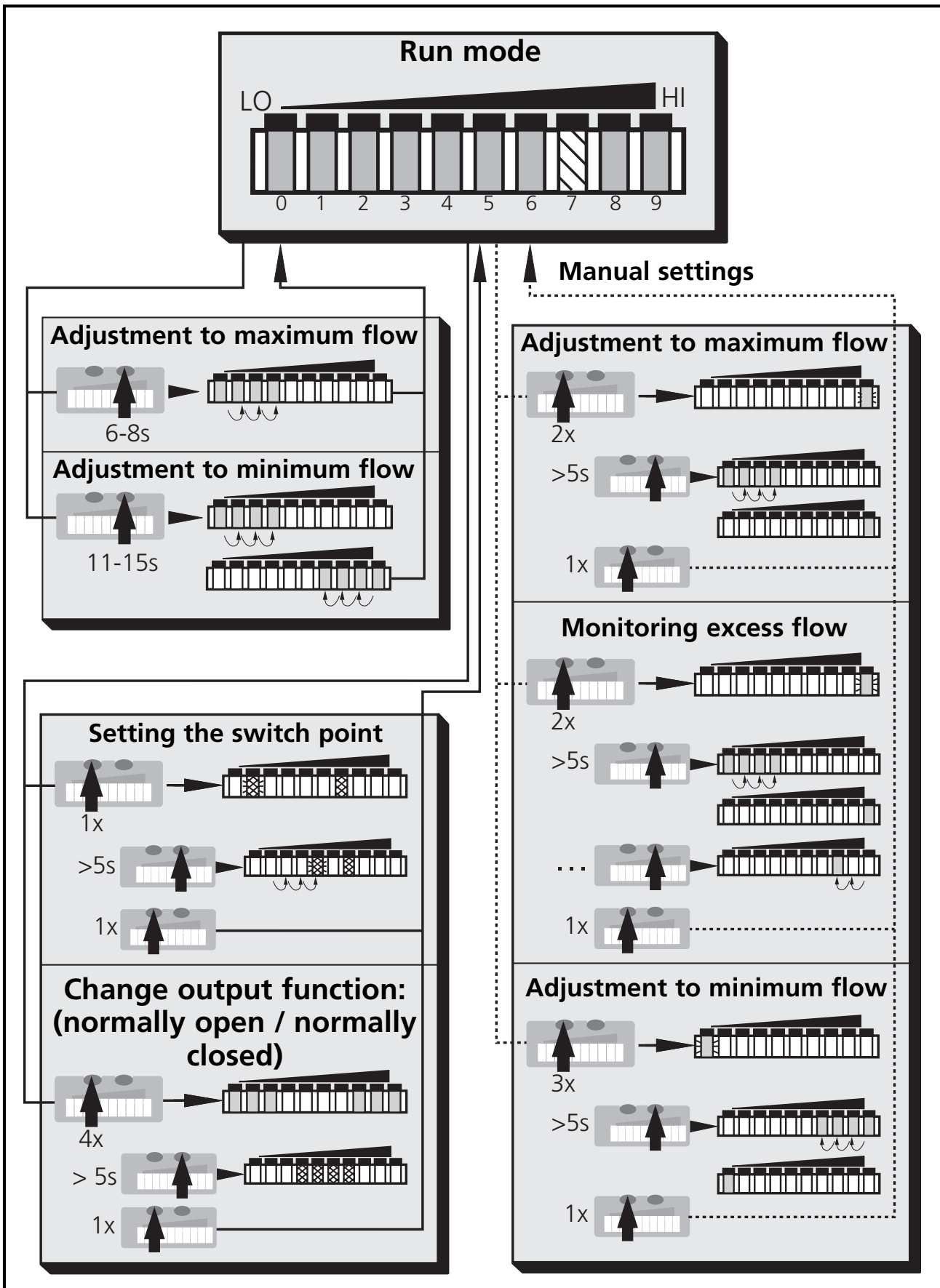
Setting buttons

Mode / Enter:
selection of the menu items and acknowledgement

Learn/Set:
adjustment to maximum / minimum flow; setting of values (scrolling by holding pressed; incremental by pressing briefly)



Menu structure



LED = green
 LED = orange
 LED = red

Contents

Function and features	page 23
Installation	page 24
Electrical connection	page 26
Programming	page 27
Installation and set-up / Operation / Maintenance	page 29
Technical data	page 29
Programming diagrams / Technical information	page 30

Function and features

The flow monitor

- detects the **flow velocity** in liquid and gaseous media
- switches the **output relay** according to the programming,

normally open	relay energised when the switch point has been reached
normally closed	relay de-energised when the switch point has been reached

(for programming → page 26)

- and indicates the relative flow value within the adjustable detection range by means of **LEDs**:
 - LED 0 = lower limit of the detection range (maximum value / **LO**)
 - LED 9 = upper limit of the detection range (minimum value / **HI**)
- It is also possible to indicate:
 - Switching status (LED red: flow below the switch point, LED orange: flow has reached the switch point).
 - Excess flow: LED 9 flashes if the flow is considerably higher (2 LEDs) than the display range.
 - Underflow / flow standstill: LED 0 flashes if the flow is lower than the display range.

Installation

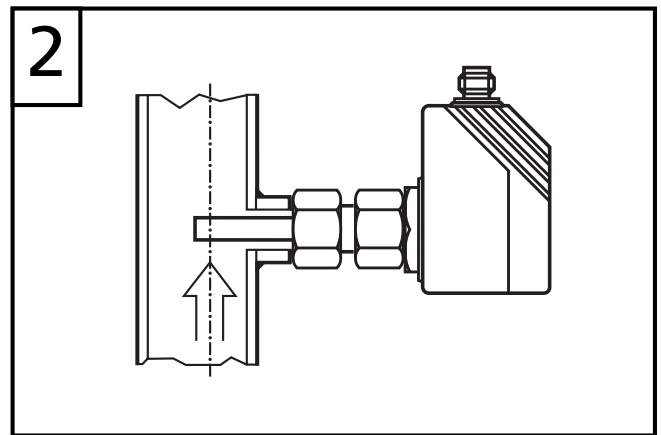
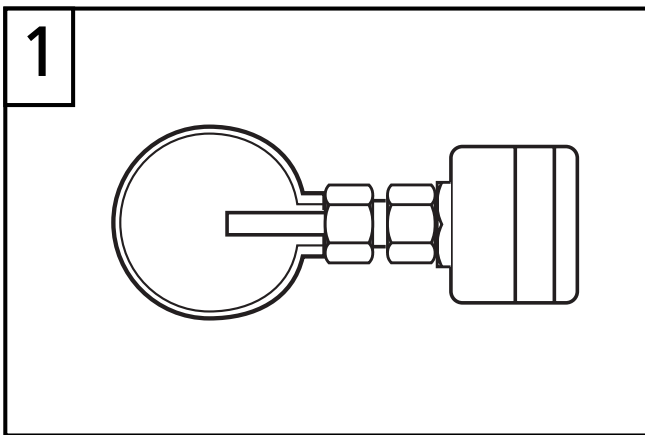
The unit is adaptable for various process fittings (adapters to be ordered separately as accessories).

- In the case of horizontal pipes mount the unit from the side, if possible (fig. 1).

When the unit is to be mounted at the bottom of the pipe, it should be free from deposits.

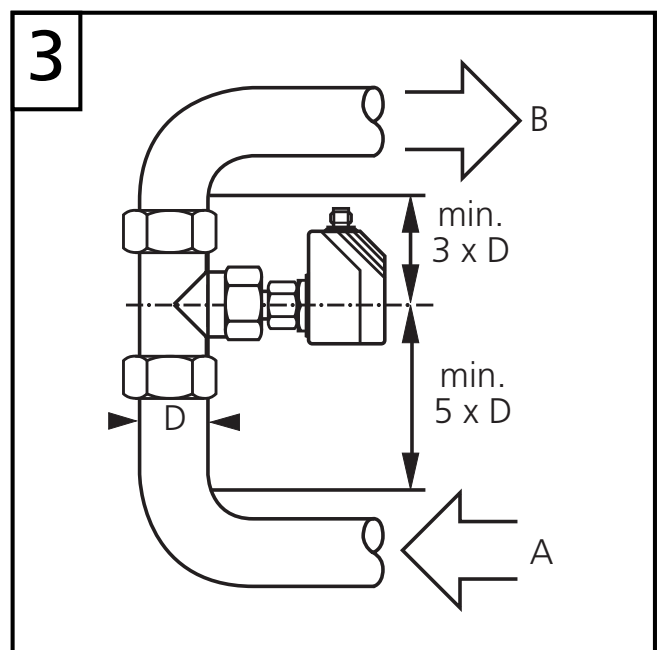
When the unit is to be mounted at the top of the pipe, it should be completely filled with the medium to be monitored.

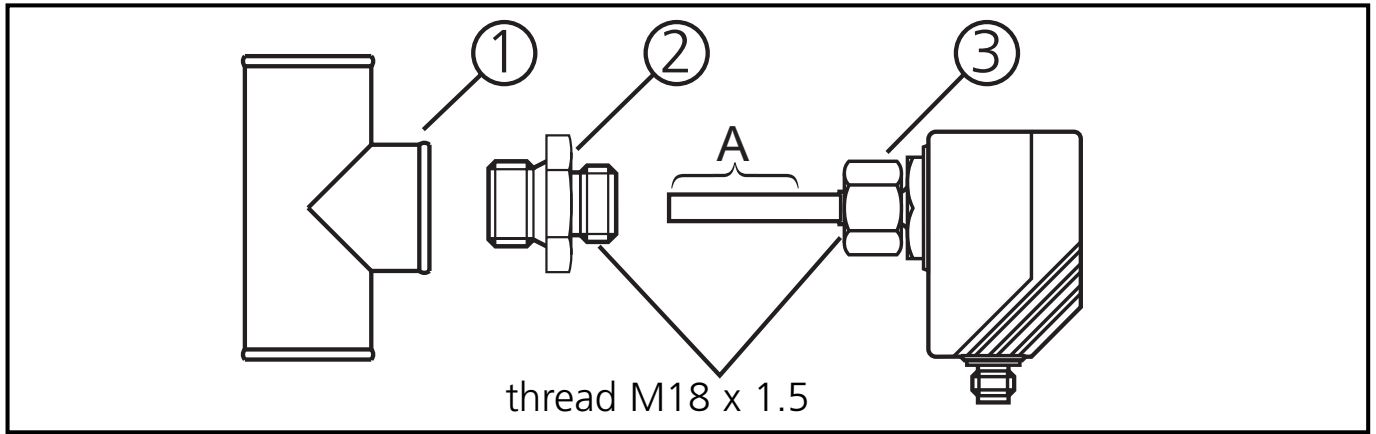
- In the case of vertical pipes mount the unit in a place where the medium flows upwards (fig. 2).



To avoid malfunction a minimum distance between the flow monitor and bends, valves, changes in cross-section or such like must be observed:

- Min. 5 x pipe diameter upstream (A),
- min. 3 x pipe diameter downstream (B).





1. Lubricate the nut (3) and all threads with grease to ensure the nut can be loosened and tightened several times.
Note: No grease must be applied to the sensor tip (A).
2. Screw the suitable adapter (2) onto the process fitting (1).
3. Insert the flow monitor into the adapter. While keeping the unit aligned tighten the nut (3); (max. tightening torque 50Nm).

Insertion depth of the sensor: min. 12 mm in the pipe. When the adapters are used which are available as accessories, the correct depth is ensured.

Note: The sensor tip must not touch the pipe wall.

mounting dimension with M12 adapter	mounting dimension with G $\frac{1}{4}$ adapter	mounting dimension with G $\frac{1}{2}$ adapter

Electrical connection



The unit must only be connected by an electrician.

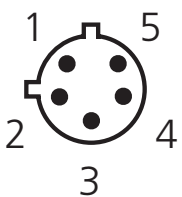
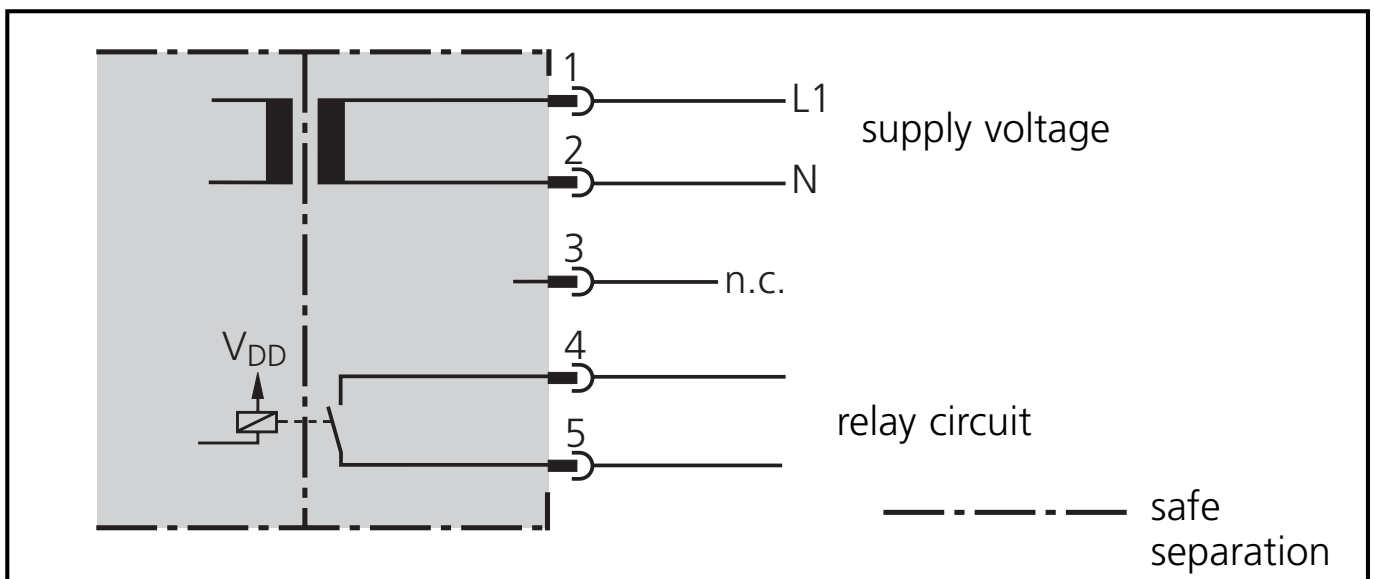
The national and international regulations for the installation of electrical equipment must be observed.

Caution: For the output circuit the same protective measures as for the supply circuit must be taken.

The permissible potential difference between supply and output circuit is max. 300V.

Disconnect power before connecting the unit.

Wiring:



connector view (sensor)

ifm-sockets are available as accessories:

Order no. E11248, E11249, E11250, E11251.

When the supply voltage is applied, all LEDs light and go off one after the other.* The unit is then ready for operation.

*During this time the output relay is energised.

Programming

■ **Setting of the detection range** (→ page 30)

- Allow the medium to flow through the system at the required maximum flow rate.
- Press the **Learn/Set** button for 6-8s (= adjustment to maximum flow / upper limit of the detection range).
This setting is sufficient for the majority of waterbased applications.
Optional: adjustment to minimum flow.
- Allow the medium to flow through the system at the required minimum flow rate or bring flow to a standstill.
- Press the **Learn/Set** button for 11-15s (= adjustment to minimum flow or flow standstill / lower limit of the detection range).

■ **Setting of the switch point** (→ page 32)

- Press the **Mode/Enter** button briefly.
- Press the **Learn/Set** button for 5s,
- keep the Learn/Set button pressed or press the button several times until the requested switch point is set.
- Press the **Mode/Enter** button briefly.

■ **Manual adjustment to maximum flow (HI-Teach)** (→ page 33)

- Allow the medium to flow through the system at the required maximum flow rate.
- Press the **Mode/Enter** button twice.
- Press the **Learn/Set** button for 5s, release the button when LED bar fills from left to right.
- Press the **Mode/Enter** button briefly, when LED 9 is lit.

■ **Manual adjustment to maximum flow (HI-Teach) / monitoring excess flow** (→ page 34)

- Allow the medium to flow through the system at the required maximum flow rate.
- Press the **Mode/Enter** button twice.
- Press the **Learn/Set** button for 5s, release the button when LED bar fills from left to right.
- When LED 9 (= LED for the maximum display value) is lit: Press the **Learn/Set** button several times to shift the LED.
- Press the **Mode/Enter** button briefly.

■ **Manual adjustment to minimum flow (LO-Teach)** (→ page 35)

- Allow the medium to flow through the system at the required minimum flow rate or bring flow to a standstill.
- Press the **Mode/Enter** button three times.
- Press the **Learn/Set** button for 5 s, release the button when LED bar fills from right to left.
- Press the **Mode/Enter** button briefly, when LED 0 is lit.

■ **Change output function: (normally open / normally closed)**

(→ page 36)

- Press the **Mode/Enter** button four times.
- Press the **Learn/Set** button for 5 s,
- keep the Learn/Set button pressed or press the button several times until the requested function is set (OUT = **normally open** when **3 LEDs on the right and 3 LEDs left are lit green**. OUT = **normally closed**, when the 4 LEDs in the middle are lit in red).
- Press the **Mode/Enter** button briefly.

■ **The following applies to all setting procedures:**

- If no button is pressed for 20s during the setting procedure, the unit returns to the operating mode with the parameter values unchanged.
- If adjustment has not been possible, all the red LEDs flash. The unit returns to the operating mode with the parameter values unchanged.

■ **Locking / Unlocking**

The unit can be electronically locked to prevent unwanted adjustment of the set parameters: Press both setting buttons for 10s (the unit must be in Run mode). Indication goes out briefly (acknowledgement of locking / unlocking).

Units are delivered from the factory in the unlocked state.

If the unit is locked, it is possible to indicate

- the current switch point (press the Mode/Enter button once) and
- the programming of the output relay (press the Mode/Enter button 2 times).

Installation and set-up / Operation / Maintenance

After mounting, wiring and setting check whether the unit operates correctly.

When the supply voltage is applied, all LEDs light and go off one after the other.* The unit is then ready for operation.

*During this time the output is switched according to the programming: relay energised with the NO function and de-energised with the NC function.

Recommended maintenance

Check the sensor tip for build-up from time to time. Clean it with a soft cloth. If necessary, build-up which adheres firmly (e.g. lime) can be removed with a common vinegar cleansing agent.

Technical data

Nominal voltage [V]	90 ... 240 AC (45...65 Hz)
Voltage tolerance [%]	-5 / +10
Operating voltage [V]	85 ... 265 AC
Power consumption [VA]	3.5
Switching power of relay	3A (250V AC / 30V DC)
Number of switching cycles:	20 million mechanically
Switching cycles with 3 A load:	100.000 electrically
Relay type:	contact closed at work

Liquids

Medium temperature [°C]	-25 ... +80
Setting range [cm/s]	3 ... 300
Greatest sensitivity [cm/s]	3 ... 60
Max. temperature gradient of medium [K/min]	300

Gases

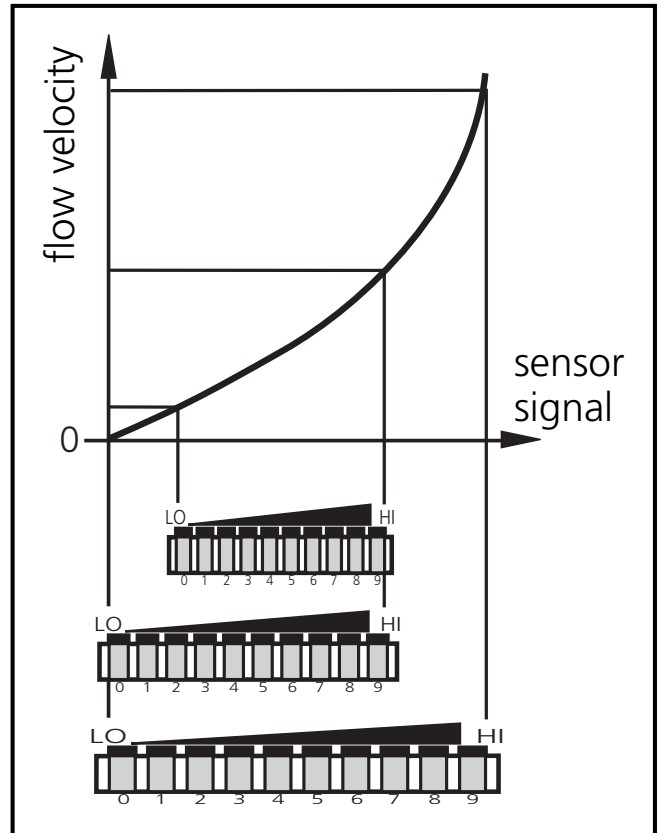
Medium temperature [°C]	-25 ... +80
Setting range [cm/s]	200 ... 3000
Greatest sensitivity [cm/s]	200 ... 800
Response time [s]	1 ... 10
Power-on delay time [s]	15, optically indicated
Pressure rating [bar]	300
Operating temperature [°C]	-25 ... +80
Protection	IP 67 / II
Housing material	PBT-GF-20
Material sensor surface (SI1006)	stainless steel (316S12); O-ring: FPM 8x1.5 gr 80° Shore A
Material sensor surface (SI1106)	titanium; O-ring: FFPM (Kalrez) 8x1.5

Programming diagrams / Technical information

■ Setting of the detection range

The **detection range** (window) is determined by:

- Adjustment to the required maximum flow (HI-Teach) = upper limit of the window. This setting is sufficient for the majority of waterbased applications.
- Adjustment to the required minimum flow / flow standstill (LO-Teach) = lower limit of the window.



• Adjustment to maximum flow (HI-Teach)

The unit detects the current flow and sets this value as the maximum value for the LED display (LED 9).

1	<p>Apply the operating voltage. After approx. 15s the unit is ready. Allow the medium to flow through the system at the required maximum flow rate.</p>
2	<div style="display: flex; align-items: flex-start;"> <div style="flex: 1;"> </div> <div style="flex: 2; padding-left: 10px;"> <p>Press the Learn/Set button and keep it pressed. The green LEDs on the right and on the left flash, after 5s the LED bar (green) fills from left to right, (release the button as soon as the first LEDs light).</p> <p>The indication goes off briefly. The unit stores the current flow as maximum flow and passes into the operating mode.</p> </div> </div>

- **Adjustment to minimum flow / flow standstill (LO-Teach), optional**

The unit detects the current flow and sets this value as the minimum display value for the LED display. In normal operation the first green LED (LED 0) flashes when the flow falls below this value (or when it comes to a standstill).

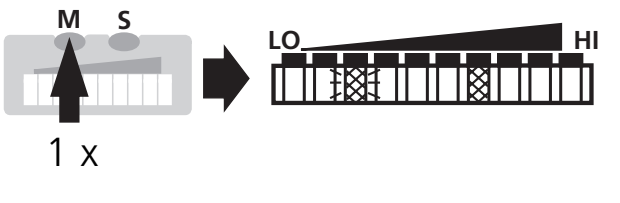
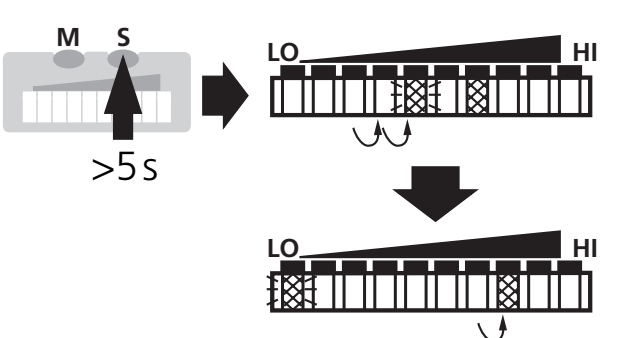
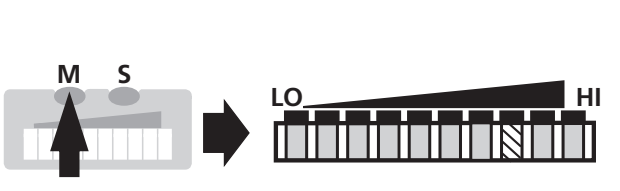
NOTE: The LO-Teach operation may only be carried out after the HI-Teach operation.

1	<p>Allow the medium to flow through the system at the required minimum flow rate or bring to a standstill.</p>
2	<div style="display: flex; align-items: flex-start;"> <div style="flex: 1;"> </div> <div style="flex: 2; padding-left: 20px;"> <p>Press the Learn/Set button and keep it pressed. The green LEDs on the right and on the left flash, after 5s the LED bar (green) fills from left to right</p> <p>after a further 5s the LED bar (gren) fills from right to left (release the button as soon as the first LEDs on the left light).</p> <p>The indication goes off briefly. The unit stores the current flow as minimum flow and passes into the operating mode.</p> </div> </div>

■ Setting of the switch point

The switch point is preset at the factory (LED 7). The setting influences the reaction time of the unit.

- High switch point = fast reaction in the case of flow decrease.
- Low switch point = fast reaction in the case of flow increase.

1		<p>Press the Mode/Enter button briefly. The current switch point is indicated: LED lit: coarse setting, LED flashes: fine setting.</p>
2		<p>Press the Learn/Set button and keep it pressed. After 5s the switch point is increased* (incremental by pressing briefly or scrolling by holding pressed). Indication: The flashing LED moves from left to right. After LED 9 has been reached the cycle starts again at LED 0. The LED which is constantly lit moves on by one position.**</p>
3		<p>Press the Mode/Enter button briefly (acknowledgement). The indication goes off briefly. The set switch point becomes effective; the unit passes into the operating mode.</p>

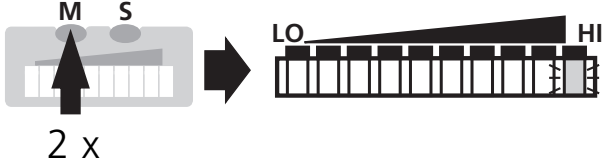
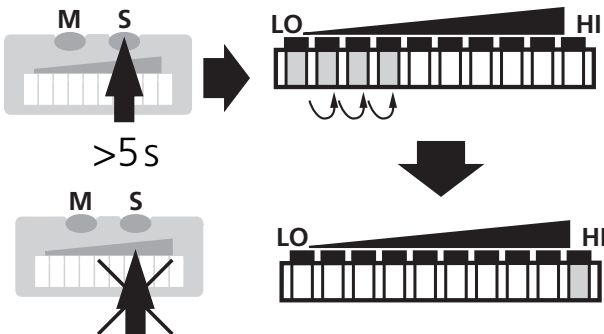

*Decrease the switch point: Let the flashing and lit LEDs move to the maximum setting value. Then the cycle starts again at the minimum setting value.

**Overflow: If the flashing LED and the lit LED exceed the maximum setting value, the cycle starts again at the minimum setting value.

■ Manual adjustment to maximum flow (HI-Teach)

The unit detects the current flow and sets this value as the maximum value for the LED display (LED 9).

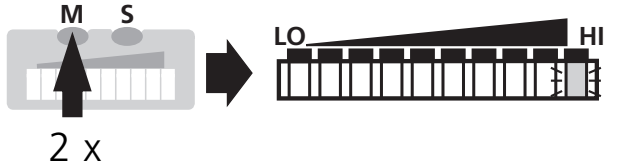
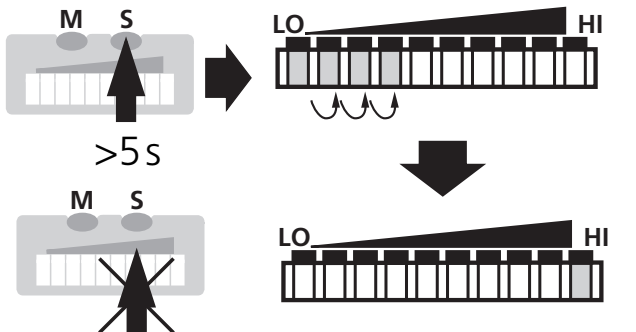
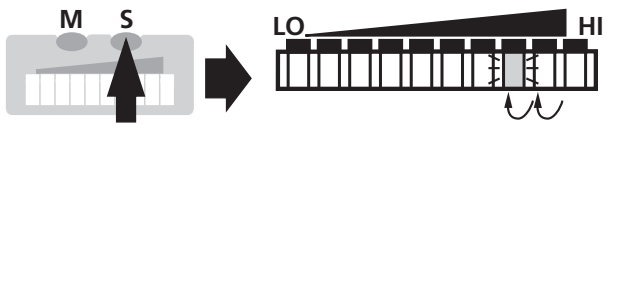

In normal operation all LEDs are lit in green when the max. flow is reached. They go out step by step as the flow decreases.

1	<p>Apply the operating voltage. After approx. 15s the unit is ready. Allow the medium to flow through the system at the required maximum flow rate.</p>
2	 <p>Press the Mode/Enter button twice. LED 9 flashes.</p>
3	 <p>Press the Learn/Set button and keep it pressed. after 5s the LED bar (green) fills from left to right; (release the button as soon as the first LEDs light), after this LED 9 is lit.</p>
4	 <p>Press the Mode/Enter button briefly (acknowledgement). The indication goes off briefly. The unit stores the current flow as maximum flow and passes into the operating mode.</p>

■ Manual adjustment to maximum flow (HI-Teach) / monitoring excess flow

The unit detects the current flow and sets this value as the maximum value for the LED display (LED 9).

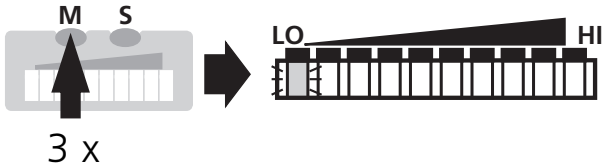
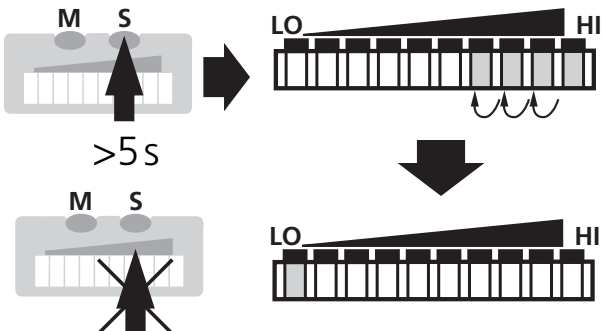

In addition the **position of the display window** within the detection range can be defined: Shift the LED for the maximum display value to position 8, 7, 6 or 5. In the case of maximum flow all LEDs from 0 up to this LED are lit. The LEDs above the range signal excess flow. If the switch point is above this range, the unit switches in the case of excess flow.

1	<p>Apply the operating voltage. After approx. 15s the unit is ready. Allow the medium to flow through the system at the required maximum flow rate.</p>	
2		<p>Press the Mode/Enter button twice. LED 9 flashes.</p>
3		<p>Press the Learn/Set button and keep it pressed, after 5s the LED bar (green) fills from left to right; (release the button as soon as the first LEDs light), after this LED 9 is lit.</p>
4		<p>Press the Learn/Set button several times until the requested LED lights (LED 8, 7, 6 or 5). Each time the button is pressed the LED moves back by one position. When it is lower than LED 5 the cycle starts again at LED 9.</p>
5		<p>Press the Mode/Enter button briefly (acknowledgement). The indication goes off briefly. The unit stores the current flow as maximum flow and passes into the operating mode.</p>

■ Manual adjustment to minimum flow (LO-Teach)



The unit detects the current flow and sets this value as the minimum display value for the LED display. In normal operation the first green LED (LED 0) flashes when the flow falls below this value (or when it comes to a standstill).

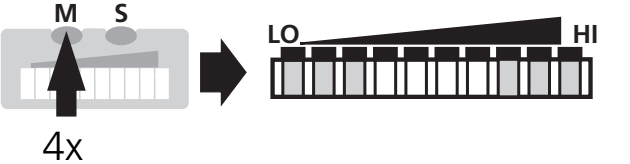
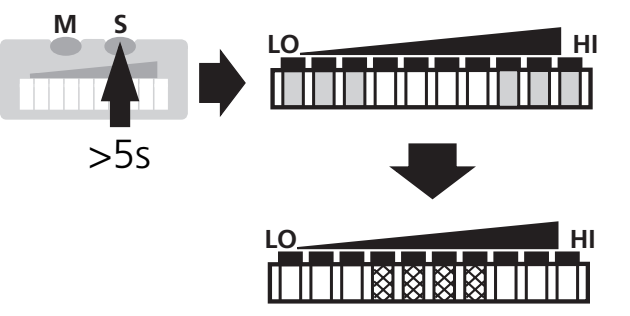

NOTE: The LO-Teach operation may only be carried out after the HI-Teach operation.

1	<p>Allow the medium to flow through the system at the required minimum flow rate or bring to a standstill.</p>
2	 <p>Press the Mode/Enter button three times. LED 0 flashes.</p>
3	 <p>Press the Learn/Set button and keep it pressed. after 5s the LED bar (green) fills from left to right; (release the button as soon as the first LEDs on the left light), after this LED 9 is lit.</p>
4	 <p>Press the Mode/Enter button briefly (acknowledgement). The indication goes off briefly. The unit stores the current flow as minimum flow and passes into the operating mode.</p>

■ Change output function: (normally open / normally closed)

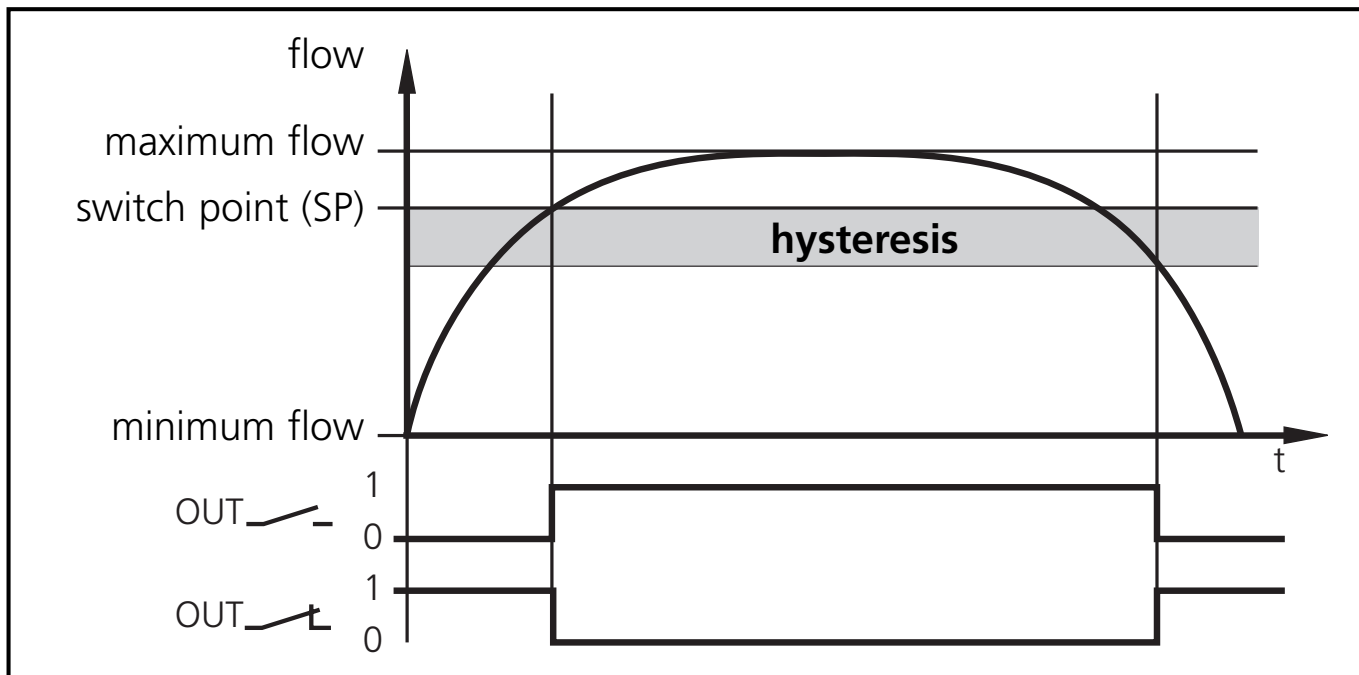
The set function is displayed as below:

Normally open		The 3 LEDs on the right and left are lit in green.
Normally closed		The 4 LEDs in the middle are lit in red.

1		Press the Mode/Enter button four times. The current setting is indicated (here normally open).
2		Press the Learn/Set button and keep it pressed, after 5s the function changes (here: normally closed) Each time the Learn/Set button is pressed the function changes again.
3		Press the Mode/Enter button briefly (= acknowledgement). The unit then passes into the operating mode.

Unit supplied: normally open.

Hysteresis function



When the flow rises, the output switches when the switch point (SP) has been reached.

When the flow falls again, the output switches back when the value "SP minus hysteresis" has been reached.

The hysteresis is considerably influenced by the choice of the operating range on the sensitivity curve of the sensor:

- In the case of adjustment to HI-Flow values in the range 0 ... 60cm/s the hysteresis is 2 - 4cm/s (values apply to water).
- In the case of adjustment to HI-Flow values above 100cm/s the hysteresis increases as the flow rises.

The typical **response time** of the unit is 3 ... 8s. It can be influenced by setting the LO-Teach and the switch point:

- The lower the LO-Teach or the switch point is set, the faster the unit switches **on**.
- The higher the LO-Teach or switch point is set, the faster the unit switches **off**.