ifm electronic

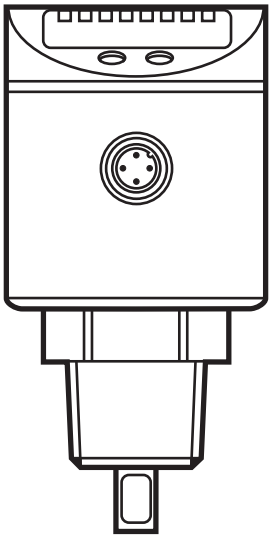
CE

Operating instructions
Electronic level sensor

efector160®

LR3300

UK



704805 / 00 05 / 2010

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Preliminary note

- Operating elements are indicated in these instructions as follows:
  [Mode/Enter] = "Mode/Enter" button
- Displays are indicated as follows:
  [OU1] =parameter "OU1", [Hno] = parameter value "Hno"
- An instruction is indicated by "▶":
  Example: ▶Check whether the unit operates correctly.
- A reaction to the action is indicated by ">":
  Example: > LED 8 lights.

1 Safety instructions

- The unit must be connected by a qualified electrician.
- The national and international regulations for the installation of electrical equipment must be adhered to.
- The unit complies with the standard EN 61000-6-4 and is a class A product. The radiated energy of the microwaves is, for example, much below that of mobile phones. According to the current state of science the operation of the unit can be classified to be harmless to human health.
- The unit may cause radio interference in domestic areas. If interference occurs, the user must take appropriate remedial actions.
- 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.

2 Items supplied

- Level sensor LR3300.

In addition, for installation and operation the following is necessary:

- Probe
- Mounting material

The following components are available as accessories:

Probe L = 24 cm / 9.5 inch..... order no. E43203
Probe L = 45 cm / 17.7 inch..... order no. E43204
Probe L = 70 cm / 27.6 inch..... order no. E43205
Probe L = 100 cm / 39.4 inch..... order no. E43207
Probe L = 120 cm / 47.2 inch..... order no. E43208
Probe L = 140 cm / 55.1 inch..... order no. E43209
Probe L = 160 cm / 63.0 inch..... order no. E43210
Flange plate 73 - 90 / ¾" NPT..... order no. E43206

Only use ifm probes. If other probes are used, optimum function is not ensured.

For correct function the unit needs a large enough metal transfer plate. It is necessary for transferring the microwave pulse to the tank with optimum transmission power.

For installation in closed metal tanks, the tank lid serves as a transfer plate. For installation in open tanks a large enough fixing plate or similar must be used (→chapter 5, Installation).

3 Functions and features

The unit continuously detects the level in tanks and generates output signals according to the parameter settings.

2 outputs are available: one analogue output and one switching output. They can be set separately.

3.1 Application area

- Hydrous media
- Medium temperature 0...80 °C
- Tank pressures: -1...4 bar

Application examples:

- Detection of coolant emulsion in a machine tool.
- Detection of cleaning liquid in a parts cleaning system.

3.2 Restriction of the application area

- The unit can only be used in metal tanks.
- The unit is not suitable for media with a dielectric constant < 20 (e.g. oils, fats, plastic granulates, bulk material).
- If the unit is to be used in acids or alkalis, in hygienic areas or in electroplating applications: First check the compatibility of the product materials (--> chapter 12, Technical data) with the media to be monitored.
- Incorrect measurements or signal loss may be caused by the following media:
  - highly absorbing surfaces (e.g. foam)
  - intensely bubbling surfaces.
  - media which are very inhomogeneous, separate from each other thus forming separation layers (e.g. oil layer on water).

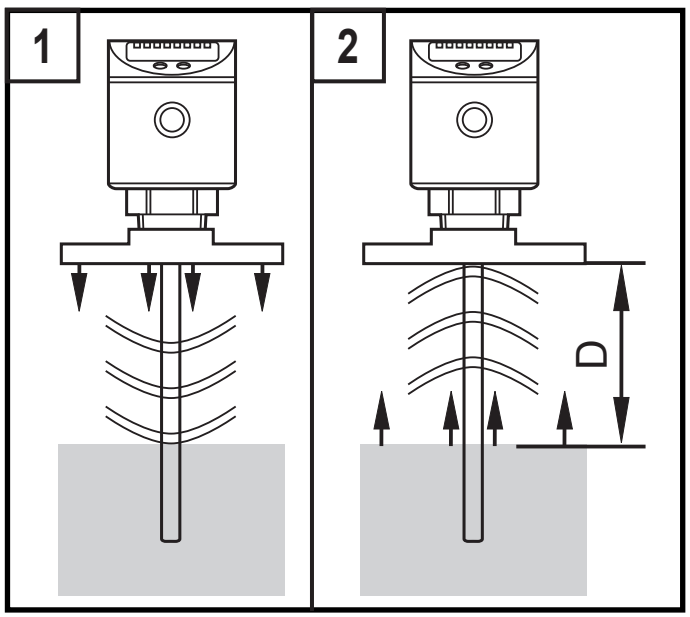
  Check the function by an application test.
  In case of signal loss, the unit displays [Err1] and switches the outputs to a defined state (→ 9.4.5).
- The unit is not suitable for applications where the probe is subjected to permanent and high mechanical stress (e.g. strongly moving viscous media or strongly flowing media).

4 Function

4.1 Measuring principle

The unit operates to the principle of guided wave radar. It measures the level using electromagnetic pulses in the nanosecond range.

The pulses are transmitted by the sensor head and guided along the probe (fig. 1). When they hit the medium to be detected they are reflected and guided back to the sensor (fig. 2). The time between transmitting and receiving the pulse directly relates



to the travelled distance (D) and the current level.
The reference for distance measurement is the lower edge of the process connection.

4.2 Features of the unit

Easy set-up

- When operating voltage is applied to the unit for the first time, the probe length must be entered. Afterwards the unit is in principle operational.
  (→ 9.2 Entering of the probe length - unit on delivery).
- If necessary, parameters for the output signals and optimisation of the monitoring functions can be set (→9.4).
- All settings can also be carried out before installation of the unit.
- Reset to the factory settings is possible.
- Electronic lock can be set to prevent unintentional operations.

Display functions

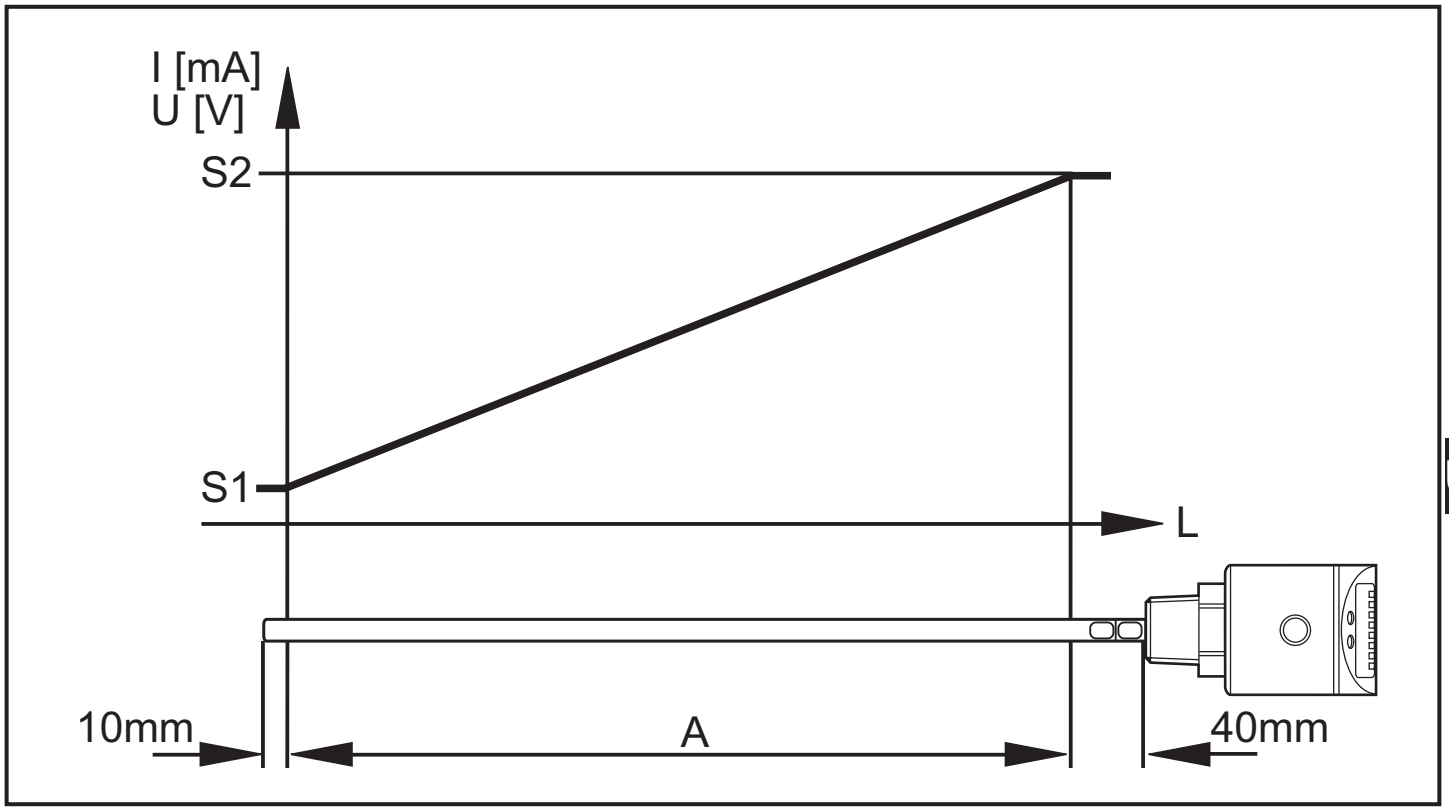
- The unit displays the current level, selectable in cm or inch.
  Factory setting for = inch.
- The set unit of measurement and the switching status for OUT1 are indicated by LEDs.

Analogue function

The unit provides an analogue signal proportional to level. The analogue output (OUT2) can be set as current or voltage output:

- Current output analogue 4...20 mA: [OU2] = [I].
- Voltage output analogue 0...10 V: [OU2] = [U].

Curve of the analogue signal:



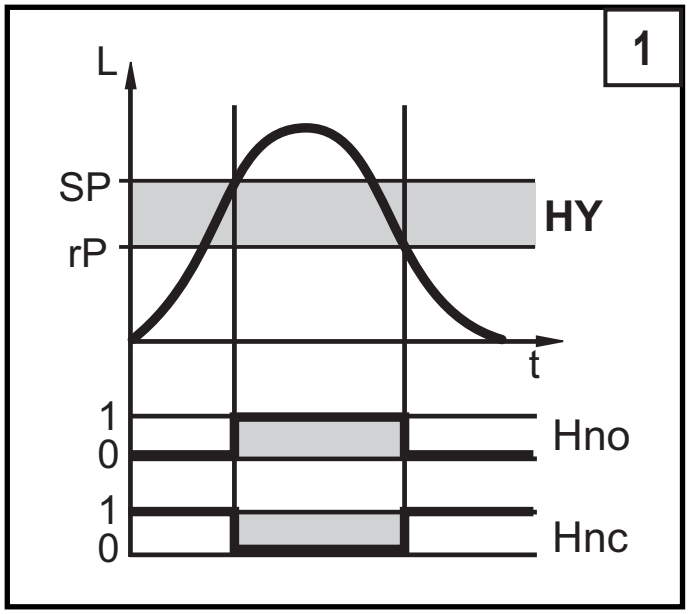
L = level
A = active zone (→ 11 Scale drawing)
S1 = zero signal (4 mA / 0 V)
S2 = full signal (20 mA / 10 V)

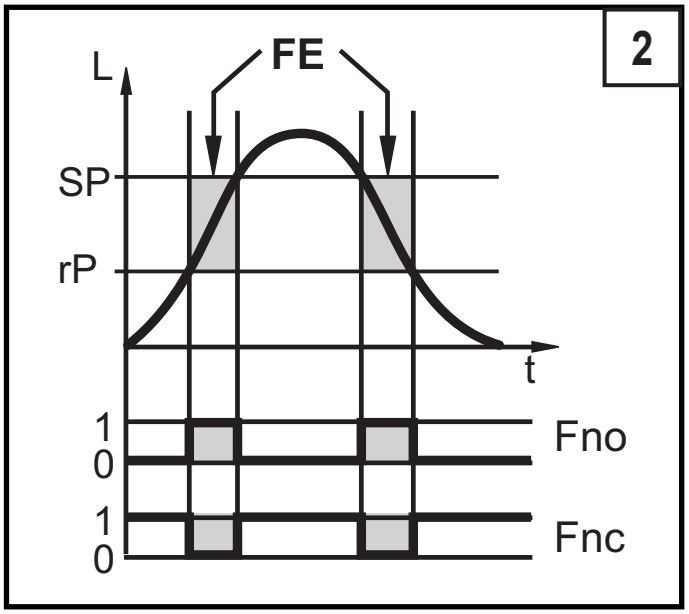
Note the tolerances and accuracy limits during the evaluation of the analogue signal (→ 12 Technical data / data sheet).

Switching functions

The unit signals via the switching output (OUT1) that a set limit value has been reached or that the level is below the limit value (SP1, rP1).
The following switching functions can be selected:

- Hysteresis function / normally open: [OU1] = [Hno].
- Hysteresis function / normally closed: [OU1] = [Hnc].
  First the set point (SP1) is set, then the reset point (rP1) at the requested level.
- Window function / normally open: [OU1] = [Fno].
- Window function / normally closed: [OU1] = [Fnc].
  The width of the window can be set by means of the difference between SP1 and rP1. SP1 = upper value, rP1 = lower value.





L = level; HY = hysteresis; FE = window

- For the switching output a switch-off delay of max. 5 s can be set (e.g. for especially long pump cycles).

Offset for indicating the real level in the tank

The zone between tank bottom and lower edge of the probe can be entered as offset value [OFS]. So display and switch point refer to the actual level.

Probes for different tank heights

- The unit can be installed in tanks of different sizes. Probes in different lengths are available. To adapt to the tank height, each probe can be shortened. The minimum probe length is 15 cm, the maximum probe length 160 cm.
- Probe and housing can be rotated without restriction. This enables easy installation and orientation of the head of the unit after installation.

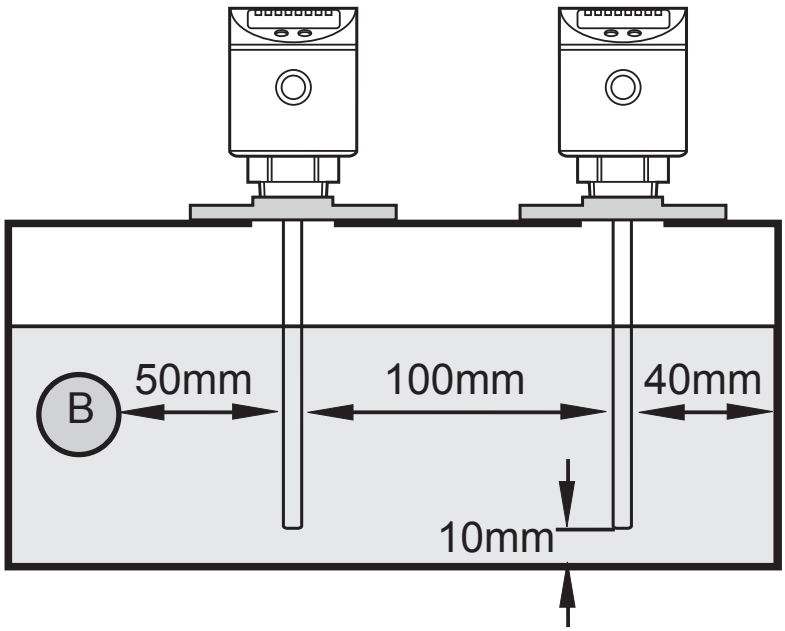
Safe state

- In case of a fault a safe state can be defined for each output.
- If a fault is detected or if the signal quality is below a minimum value, the outputs pass into the "safe state". For this case the response of the outputs can be set via the parameters [FOU1], [FOU2].
- Temporary loss of signal caused e.g. by turbulence or foam formation can be suppressed by a delay time (→ 9.4.6 [dFo]). During the delay time the last measured value is frozen. If the measured signal is received again in sufficient strength within the delay time, the unit continues to work in normal operation. If, however, it is not received again in sufficient strength within the delay time, the outputs pass into the safe state.

5 Installation

5.1 Installation location / environment

- Vertical installation from the top is preferred.
- For optimum operation the sensor should be installed as near as possible to the tank wall. Distance between the probe and the tank wall: minimum 40 mm, maximum 300 mm.
- The following minimum distances between the probe and tank walls, objects in the tank (B), tank bottom and other level sensors must be adhered to:

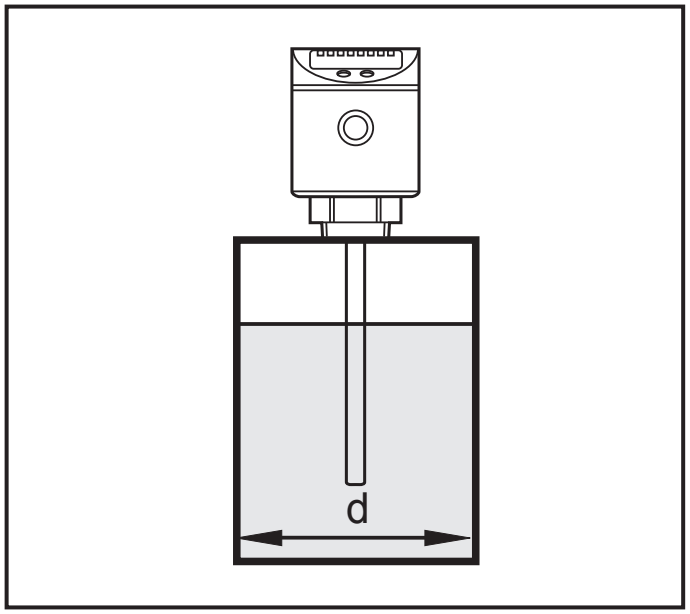


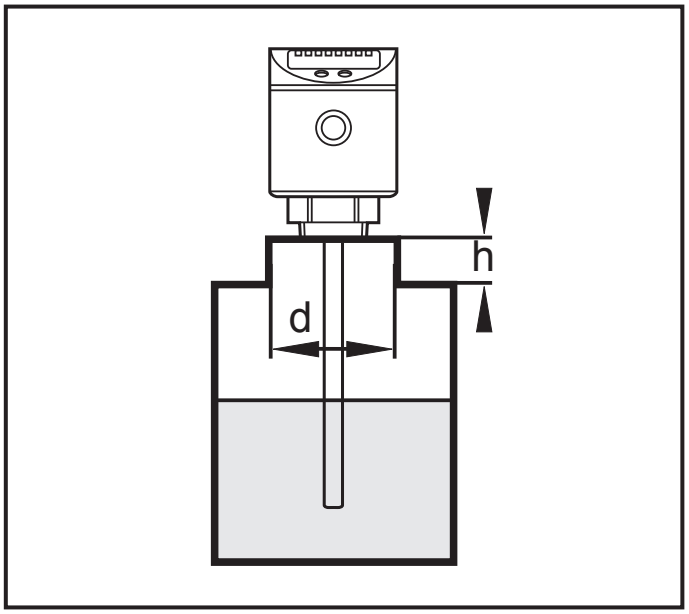
- For tank walls which are not straight, steps, supports or other structures in the tank a distance of 50 mm to the tank wall must be adhered to.
- For probe lengths > 70 cm the probe can be considerably deflected by movement of the medium. To avoid contacting the tank wall or other structures in the tank in such cases, the minimum distances should be increased. Reference values:

Probe length	Distance to the tank wall or structures in the tank
70...100 cm	100 mm
100...160 cm	180 mm

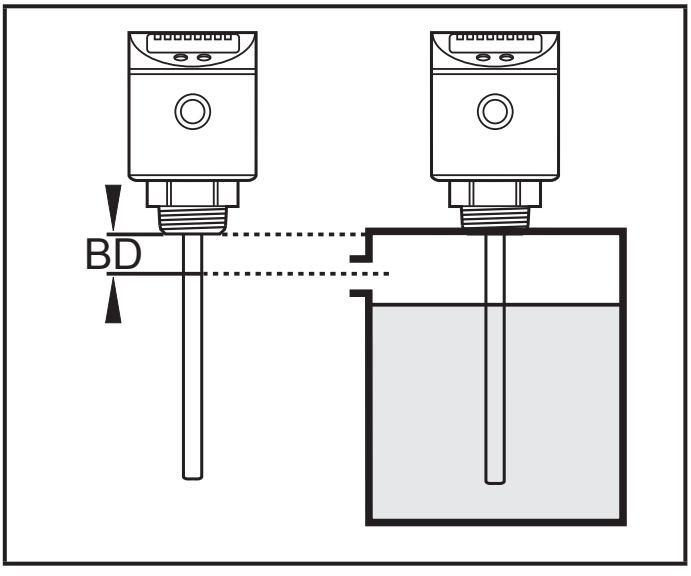
- If the medium is strongly polluted, there is the risk that a bridge forms between the probe and the tank wall or structures in the tank. To avoid incorrect measurements: adhere to increased minimum distances depending on type and intensity of the pollution.

- For installation in pipes:
  - The inside pipe diameter (d) must be at least 100 mm.
  - Only install the unit in metal pipes.
- For installation in connection pieces:
  - The diameter of the connection piece (d) must be at least 50 mm.
  - The height of the connection piece (h) must not exceed 40 mm.

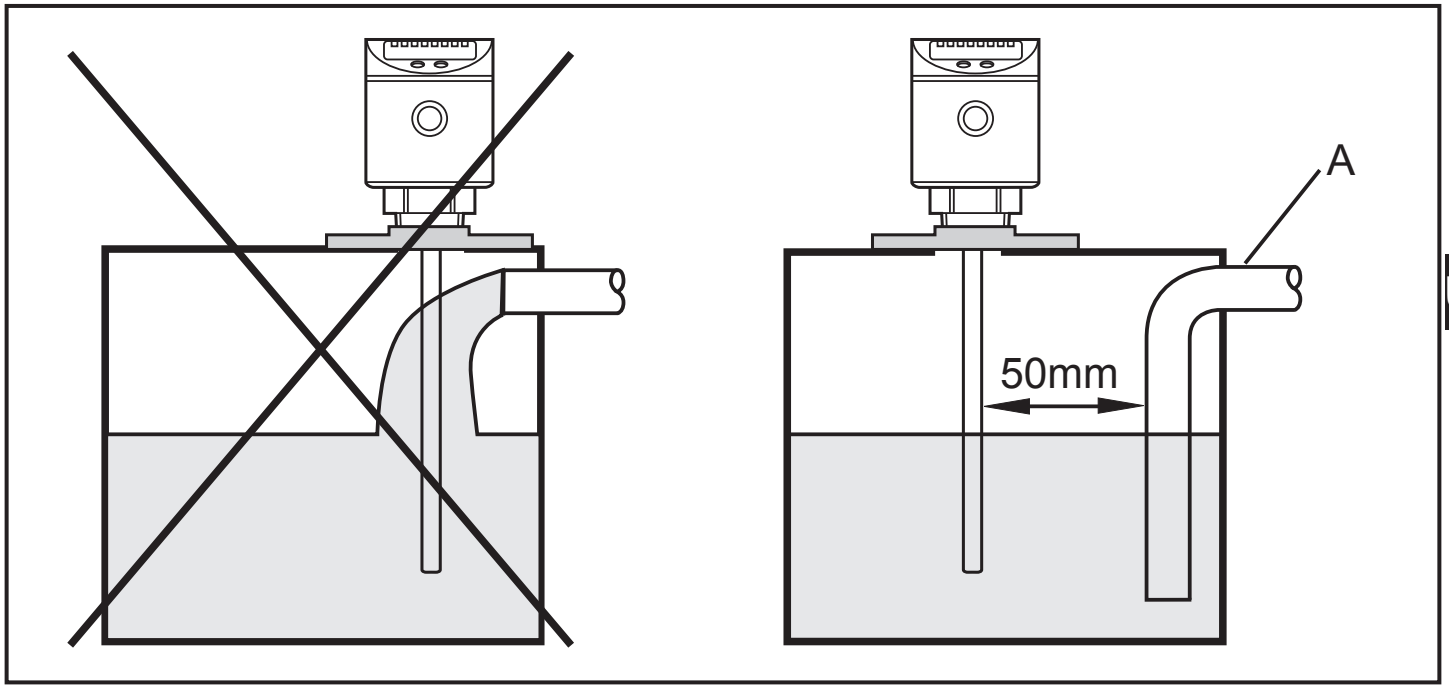




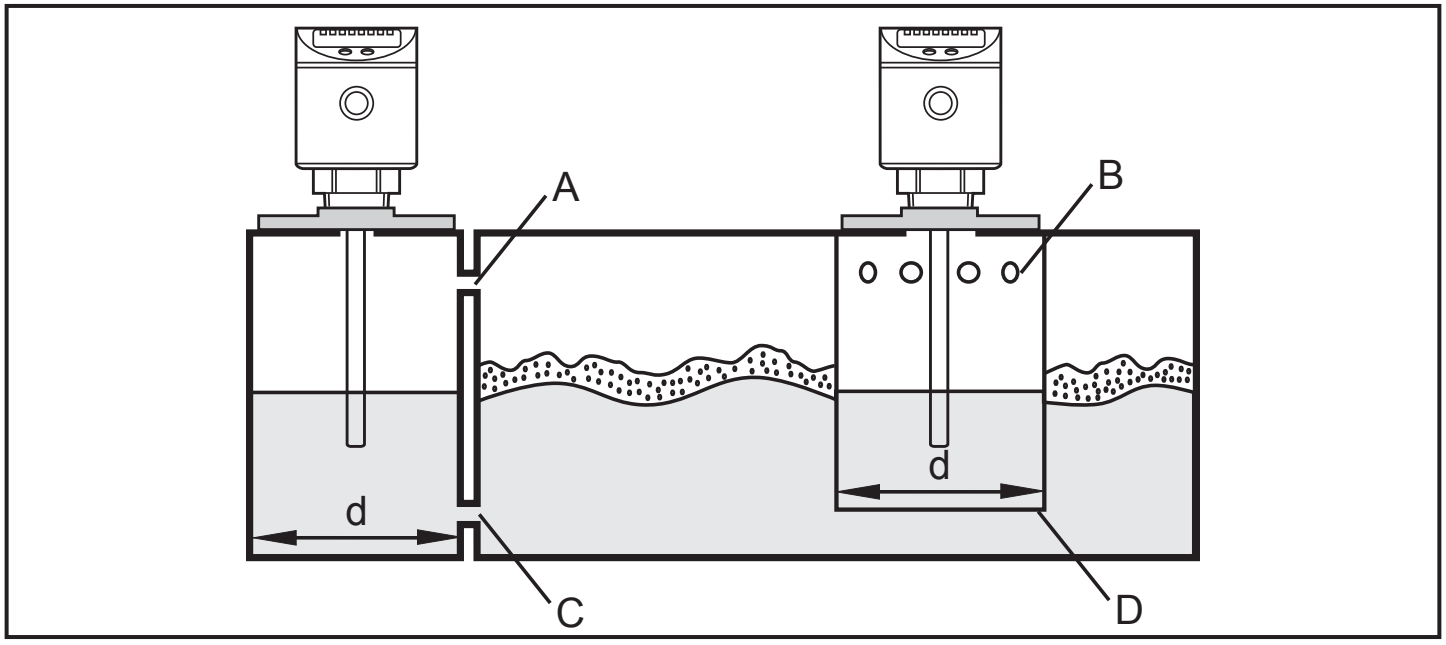
- The maximum level must not exceed the limit of the block distance (BD = 40 mm). If it is exceeded by more than 10 mm, malfunctions can occur.
  Remedies: Arrange for a spout; install the unit in a connection piece.



- Do not install the unit in the immediate vicinity of a fill opening. If possible, install a fill pipe (A) in the tank.
  Minimum distance between the fill pipe and the probe = 50 mm; higher for probe lengths > 70 cm and in case of strong pollution (see above).



- Strong foam formation and strongly moving surfaces can lead to malfunctions. Recommended remedies: installation of a still pipe or a bypass. Note: minimum diameter d = 100 mm. The upper access to the bypass (A) and the fill openings of the still pipe (B) must be above the maximum level. The lower edges of the bypass (C) and the still pipe (D) must be below the minimum level. This ensures that neither foam nor waves impact the sensor zone.



5.2 Installation of the probe

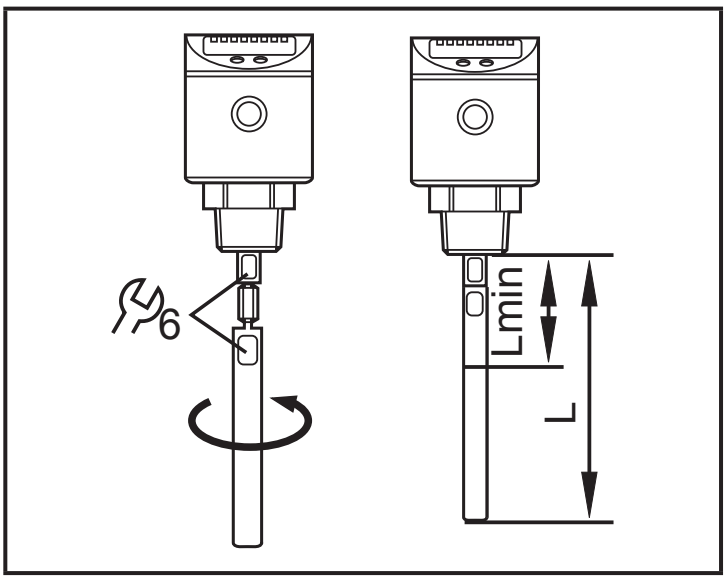
The probe is not included in the scope of supply. It must be ordered separately. The following probes are available as accessories:

Probe L = 24 cm / 9.5 inch..... order no. E43203
Probe L = 45 cm / 17.7 inch..... order no. E43204
Probe L = 70 cm / 27.6 inch..... order no. E43205
Probe L = 100 cm / 39.4 inch..... order no. E43207
Probe L = 120 cm / 47.2 inch..... order no. E43208
Probe L = 140 cm / 55.1 inch..... order no. E43209
Probe L = 160 cm / 63.0 inch..... order no. E43210

Fixing of the probe:

- ▶ Screw the probe to the unit and tighten.
  Recommended tightening torque: 4 Nm.

For ease of installation and removal the probe connection can be rotated without restriction. Even if rotated several times there is no risk of damage to the unit.



Lmin = 15 cm / 6.0 inch

In case of high mechanical stress (strong vibration, moving viscous media) it may be necessary to secure the screw connection, e.g. by a screw retaining compound. Note: Such substances may migrate into the medium. Make sure that they are harmless.

When using mechanical means of securing (e.g. tooth lock washer), protruding edges must be avoided. They may cause interference reflection.

5.3 Shortening of the probe

The probe can be shortened to adapt to different tank heights. NOTE: Ensure that the probe length is not below the minimum permissible length of 15 cm / 6.0 inch (Lmin).

Proceed as follows:

- ▶ Screw the probe to the unit.
- ▶ Mark the desired length (L) on the probe. The reference point is the lower edge of the process connection.
- ▶ Remove the probe from the unit.

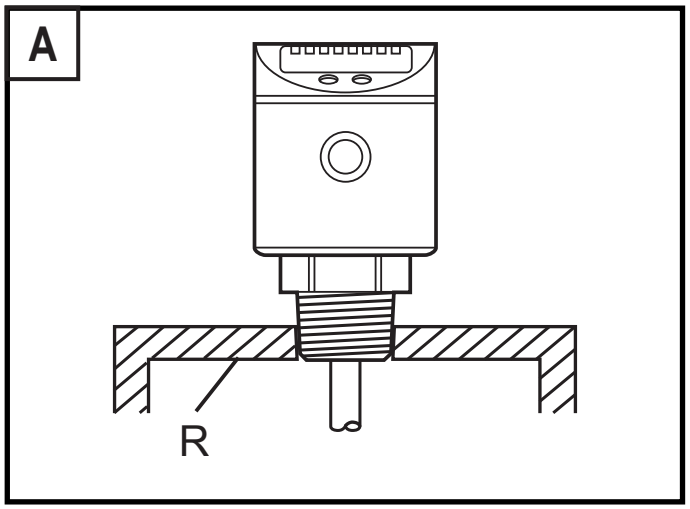
- ▶ Shorten the probe.
- ▶ Remove all burrs and sharp edges.
- ▶ Screw the probe again to the unit and tighten. Recommended tightening torque: 4 Nm.
- ▶ Measure exactly the probe length L, note the value. It must be entered during parameter setting of the unit (→ 9.2 Entering of the probe length - unit on delivery).

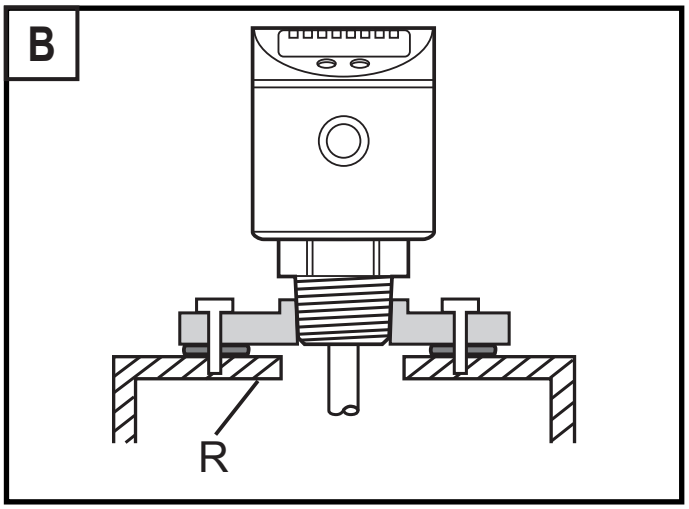
5.4 Installation of the unit in a tank

NOTE: In all cases the unit needs a metal surface to transfer the measured signals (transfer plate).

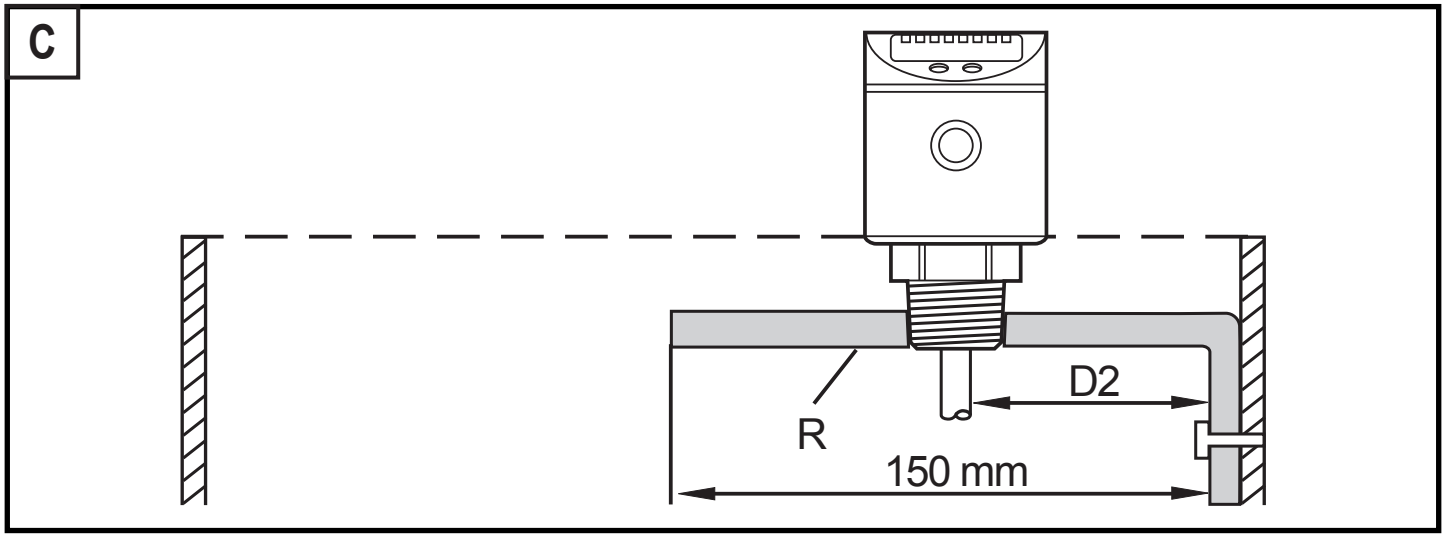
For installation in closed metal tanks, the metal lid serves as a transfer plate (R).
2 ways of installation are possible:

- Screwing in a process connection G¾" NPT in the tank lid (fig. A).
- Installation in the tank lid using a flange plate e.g. for tanks with thin walls (fig. B).

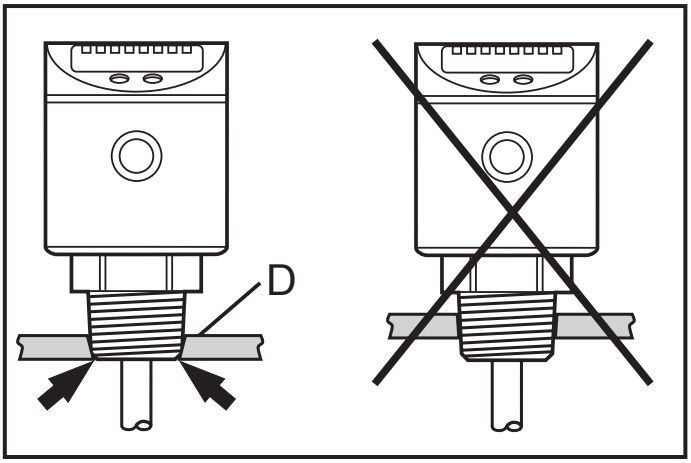




For installation in open tanks, the unit must be installed using a metal fixture. It serves as a transfer plate (R). Minimum size: 150 x 150 mm for a square fixture, 150 mm diameter for a circular fixture. If possible, mount the unit in the middle of the fixture. The distance D2 must not be below 40 mm. (fig. C); higher for probe lengths > 70 cm and in case of strong pollution (→ 5.1).



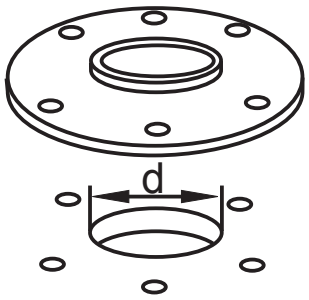
The lower edge of the process connection should be flush with the installation environment. Use seals or washers (D) to reach the required height. The height can be slightly corrected by means of appropriate sealing material such as Teflon tape.

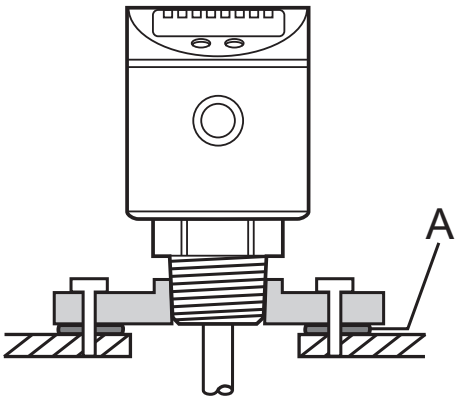


When using the ifm flange plates flush installation is ensured.

5.5 Installation of the unit using a flange plate

The following flange plate is available as accessories:
Flange plate 73 - 90 / ¾" NPT ..... order no. E43206





▶ Arrange for a bore hole in the tank lid. It must have a minimum diameter (d) to enable sufficient transfer of the measured signal to the probe. The diameter depends on the wall thickness of the tank lid:

Wall thickness [mm]	1...5	5...8	8...11
Bore hole diameter [mm]	35	45	55

▶ Install the flange plate with the flat surface showing to the tank and fix it with appropriate screws.
A seal (A) can be placed between the flange plate and the tank.
▶ Ensure cleanness and evenness of the sealing areas, especially if the tank is under pressure. Tighten the fixing screws sufficiently.
▶ If necessary, appropriate sealing material (e.g. Teflon tape) can be applied to the thread of the sensor.
▶ Screw the unit in the flange plate and tighten firmly.

• After installation, the sensor housing can be aligned. It can be rotated without restriction. Even if rotated several times there is no risk of damage to the unit.

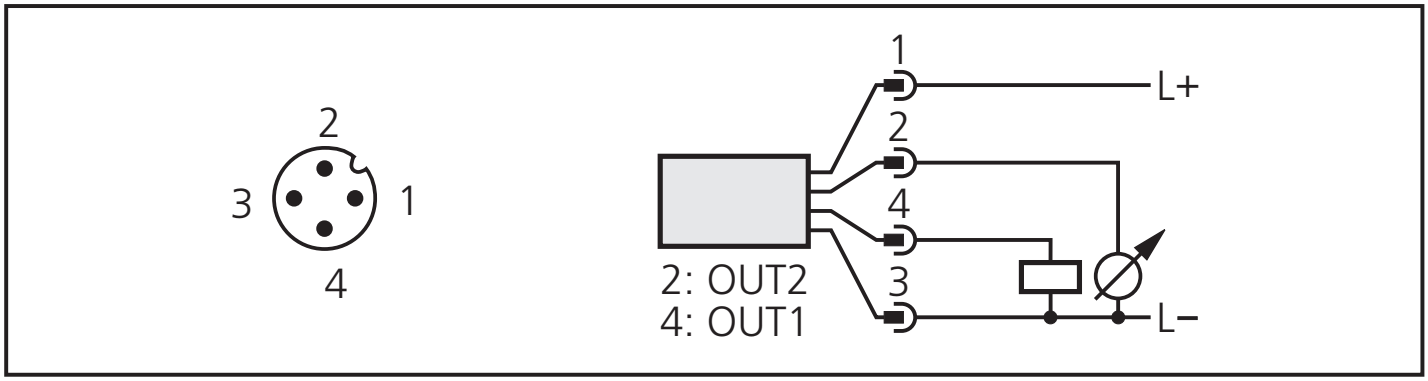
6 Electrical connection

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 to EN 50178, SELV, PELV.

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	(mm^2)	
26	(0.13)	1
24	(0.20)	2
22	(0.32)	3
20	(0.52)	5
18	(0.82)	7
16	(1.3)	10

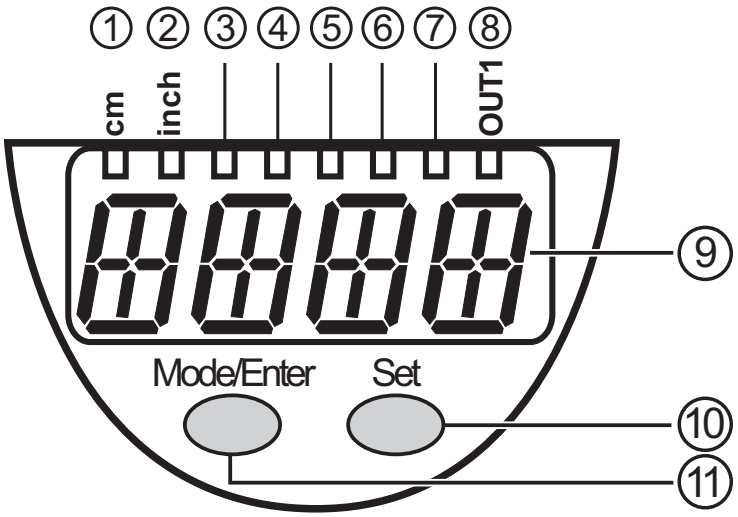
▶ Disconnect power.
▶ Connect the unit as follows:



Pin / connection	Core colours for ifm sockets:
1 L+	brown
2 OUT2 (analogue output)	white
3 L-	blue
4 OUT1 (switching output)	black

Note: When operating voltage is applied to the unit for the first time, the probe length must be entered. Afterwards the unit is in principle operational (→ 9.2 Entering of the probe length - unit on delivery).

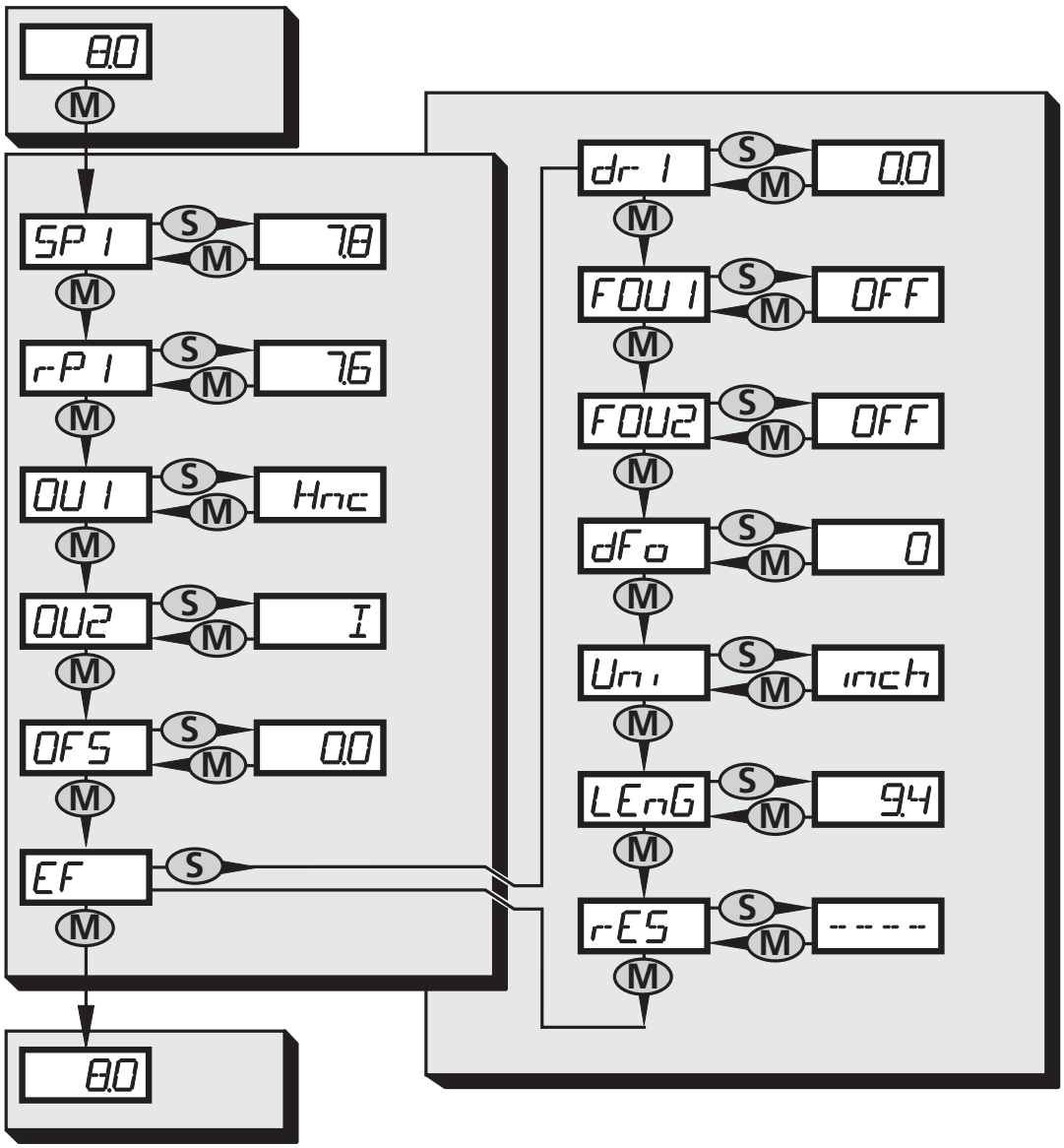
7 Operating and display elements



1 to 8: Indicator LEDs
- LED 1: green = indication of the level in cm. - LED 2: green = indication of the level in inch. - LED 3 - LED 7: not used. - LED 8: yellow = output 1 is switched.
9: alphanumeric display, 4 digits
- Indication of the current level. - Operation and fault indication. - Indication of the parameters and parameter values.
10: Set button
- Setting of the parameter values (continuously by keeping the button pressed; incrementally by pressing the button once).
11: Mode/Enter button
- Selection of the parameters and acknowledgement of the parameter values.

8 Menu

8.1 Menu structure



8.2 Explanation of the menu

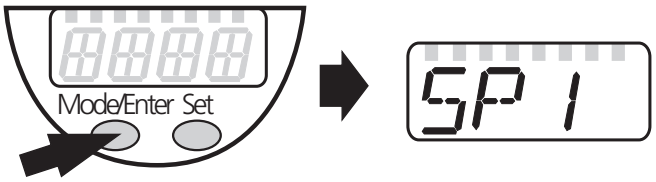
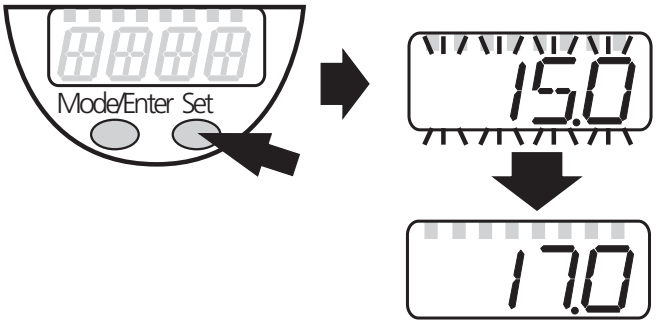
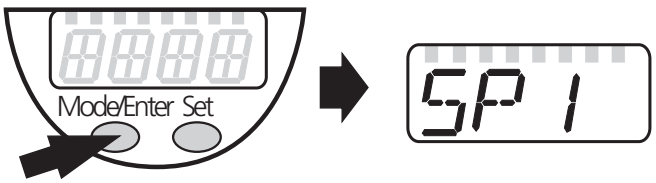
SP1/rP1	Upper / lower limit level values.
OU1	Output function for switching output (OUT1): hysteresis function or window function, normally closed or normally open.
OU2	Output function for analogue output (OUT2): current or voltage output: I = 4...20 mA / U = 0...10 V.
OFS	Offset value for level measurement.
EF	Extended functions / opening of menu level 2.
dr1	Switch-off delay for OUT1.
FOUx	Response of OUTx in case of a fault.
dFo	Delay time for the outputs to pass into the safe state.
Uni	Unit of measurement (cm or inch).
LEnG	Length of the probe.
rES	Restore factory setting.

9 Parameter setting

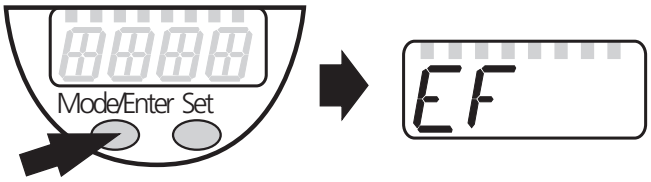
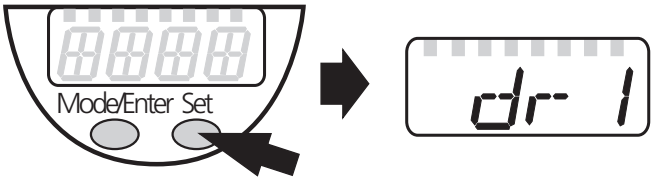
During parameter setting the unit remains in the operating mode. It continues its monitoring function with the existing parameters until the parameter setting has been completed.

9.1 General parameter setting

3 steps must be taken for each parameter setting:

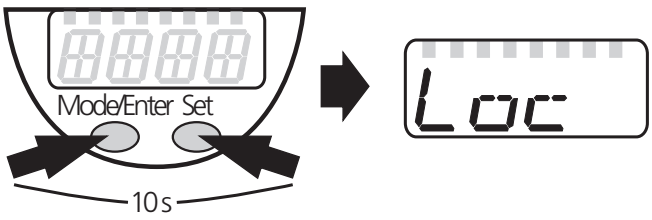
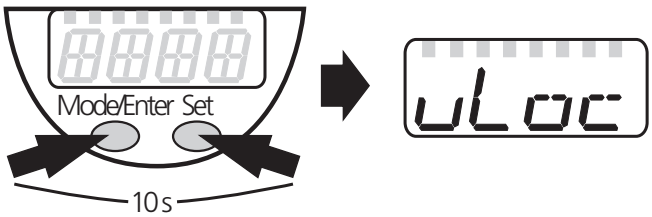
<table>
<tr><td>1</td><td>Selection of the parameter
▶ Press [Mode/Enter] until the requested parameter is displayed.</td><td>
</td></tr>
<tr><td rowspan="2">2</td><td>Setting of the parameter value
▶ Press [Set] and keep it pressed.
> Current setting value of the parameter flashes for 5 s.
> After 5 s: Setting value is changed: incrementally by pressing the button once or continuously by keeping the button pressed.</td><td>
</td></tr>
<tr><td colspan="2">Numerical values are incremented continuously. For reducing the value: let the display move to the maximum setting value. Then the cycle starts again at the minimum setting value.</td></tr>
<tr><td>3</td><td>Acknowledgement of the parameter value
▶ Press [Mode/Enter] briefly.
> The parameter is displayed again. The new setting value is stored.</td><td>
</td></tr>
<tr><td colspan="3">Setting of other parameters:
▶ Start again with step 1.</td></tr>
<tr><td colspan="3">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 if no button is pressed for 15 s after acknowledgement of the new parameter value.</td></tr>
</table>

- Change from menu level 1 to menu level 2:

▶ Press [Mode/Enter] until [EF] is displayed.	
▶ Press [Set] briefly. > The first parameter of the sub-menu is displayed (here: [dr1]).	

- 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.	
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.	

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.

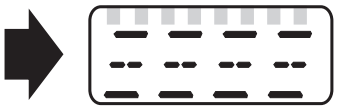
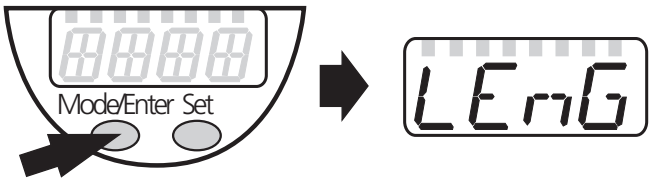
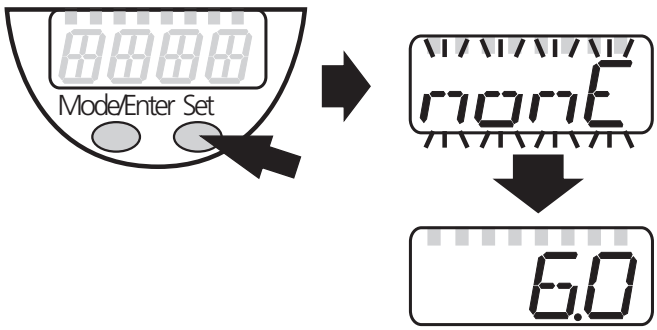
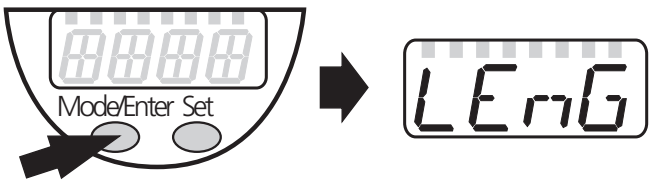
9.2 Entering of the probe length (unit on delivery)

On delivery of the unit you must first enter the probe length. The complete parameter setting menu cannot be accessed before this.

▶ Ensure that the correct probe length is entered. In particular it has to be considered:

- Is the measurement of the probe length correct (lower edge of the process connection to the probe end; → chapter 5.3)?
- Does the unit of the measurement (cm / inch) correspond to the unit of measurement set in the sensor (→ 9.3.1)?

UK

1	▶ Apply operating voltage. > Initial display is shown.	
2	▶ Press [Mode/Enter] briefly. > [LEnG] is displayed.	
3	▶ Press [SET] and keep it pressed. > [nonE] flashes for 5 s. > After 5 s: The initial value is displayed and changed: incrementally by pressing the button once or continuously by keeping the button pressed.	
	The value is incremented continuously. For reducing the value: let the display move to the maximum setting value. Then the cycle starts again at the minimum setting value. Note: on delivery the values are displayed in inch.	
4	▶ Press [Mode/Enter] briefly. > [LEnG] is displayed again. The new setting value is stored.	

Then the unit changes to the operating mode. For further parameter setting the menu can be opened (→ 9.3).

You can open [LEnG] directly like any other parameter. It is therefore possible to change the value for the probe length at any time.

9.3 Basic settings

9.3.1 Selection of the display unit	
▶ Select [Uni] and set the unit of measurement: [cm], [inch]. Factory setting: inch.	Uni
9.3.2 Offset setting	
▶ Select [OFS] and enter the distance between bottom of the tank and lower edge of the probe. Afterwards, display and switch points refer to the real level. Factory setting: [OFS] = 0. Note: Set [OFS] before setting the switching limits (SP1, rP1). Otherwise, the switching limits shift by the value of the set offset.	OFS

9.4 Setting of output signals

9.4.1 Setting of the switching limits for OUT1	
▶ Select [SP1] and set the measured value at which the output switches. ▶ Select [rP1] and set the measured value at which the output switches back. rP1 is always smaller than SP1. The unit only accepts values which are lower than SP1.	SP1 rP1
9.4.2 Setting of the output function for OUT1 (switching output)	
▶ Select [OU1] and set the switching function: [Hno] = hysteresis function/NO [Hnc] = hysteresis function/NC [Fno] = window function/NO [Fnc] = window function/NC Note: If the switch point is used as an overflow protection, the setting OU1 = Hnc (NC function) is recommended. The principle of normally closed operation ensures that wire break is also detected.	OU1
9.4.3 Setting of the output function for OUT2 (analogue output)	
▶ Select [OU2] and set the output function: [I] = current output 4...20 mA [U] = voltage output 0...10 V	OU2

9.4.4 Setting of the switch-off delay for OUT1

▶ Select [dr1] and set the value between 0.2 and 5.0 s. At 0.0 (= factory setting) the delay is not active.

The switch-off delay is only active if hysteresis has been set as switching function (OU1 = Hno or Hnc).



9.4.5 Response of the outputs in case of a fault

▶ Select [FOU1] / [FOU2] and set the value:
[on] = output switches ON in case of a fault.
Analogue output goes to 20 mA / 10 V in case of a fault.
[OFF] = switching output switches OFF in case of a fault.
Analogue output goes to 4 mA / 0 V in case of a fault.

Factory setting: [FOU1] and [FOU2] = [OFF].

Faults: faulty hardware, too low a signal quality, untypical level curve.

Overflow is not considered to be a fault.



9.4.6 Setting of the delay time after signal loss

▶ Select [dFo] and set the value between 1 and 5 s.

At 0 (= factory setting) the delay time is not active.

Mind the dynamics of your application. In case of fast level changes it is recommended to adapt the value step by step.



9.5.2 Reset of all parameters to factory setting

▶ Select [rES], then press [Set] and keep it pressed until [----] is displayed.
▶ Press [Mode/Enter] briefly.
> During the storage operation [WAIT] is displayed for several seconds. Then the unit restarts and the factory settings are restored.

Note: On delivery the unit is not operational. You first must enter the value for the probe length (→ 9.2).



9.6 Entering of the probe length (after changing the probe length)

Required after a factory reset [rES] or in case of subsequent changes of the probe length.

▶ Measure the probe length L to a precision of ± 2 mm (± 0.1 inch). L = lower edge of the process connection to the probe end.
▶ Round up the measured value (step increment 0.5 cm / 0.2 inch).
▶ Select [LEnG] and set the value between 15.0 and 160.0 cm (6.0 und 63.0 inch).

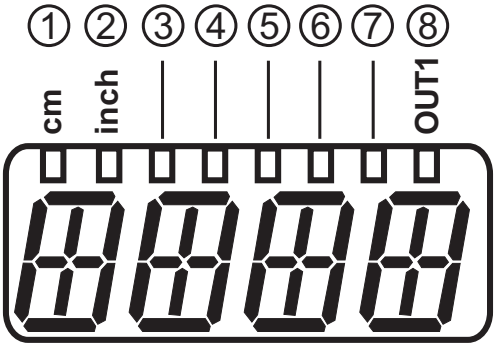
Note: After changing the probe length, the values for OFS and the switching limits must also be re-entered.



10 Operation

After power on, 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.

10.1 Operation indication



Numerical value + LED 1	Current level in cm.
Numerical value + LED 2	Current level in inch.
LED 8	Switching status for output 1.
[----]	Level below the active zone.
[FULL] + numerical value alternately	Level has reached or exceeded the maximum measuring range (= warning overflow).
[CAL]	Initialisation phase after power on.
≡≡≡≡	On delivery the unit is not operational. Entering of the probe length is required (→ 9.2).
[Loc]	Unit electronically locked; parameter setting impossible. For unlocking press the two setting buttons for 10 s.
[uLoc]	Unit is unlocked / parameter setting is possible again.
[WAIT]	Factory reset takes place.

LED 3 - LED 7: not used

10.2 Reading of the set parameters

- ▶ Press [Mode/Enter] briefly to scroll the parameters.
- ▶ Press [Set] briefly to indicate the corresponding parameter value for about 15 s. After another 15 s the unit returns to the Run mode.

10.3 Error indication

	Possible cause	Recommended measures
[Err0]	Fault in the electronics.	Replace the unit.
[Err1]	Measurement disturbed by foam formation or strong turbulence.	Install the unit in a still pipe or bypass. Set or increment [dFo] (→ 9.4.6).
	Measurement disturbed by separation layers e.g. oil layer on water.	Remove the oil layer by suction, stir the medium, verify the composition.
	Probe or process connection soiled.	Clean the probe and the process connection, carry out a reset.**
	Installation conditions were not adhered to.	Follow the instructions in chapter 5 Installation.
	Block distance exceeded by more than 10 mm.	Lower the level; follow the instructions in chapter 5 (installation).
	Atypical, abrupt level changes.*	Carry out a reset.**
[SCx]	Flashing: short circuit in switching output x.	Remove the short circuit.
[SC]	Flashing: short circuit in all switching outputs.	Remove the short circuit.

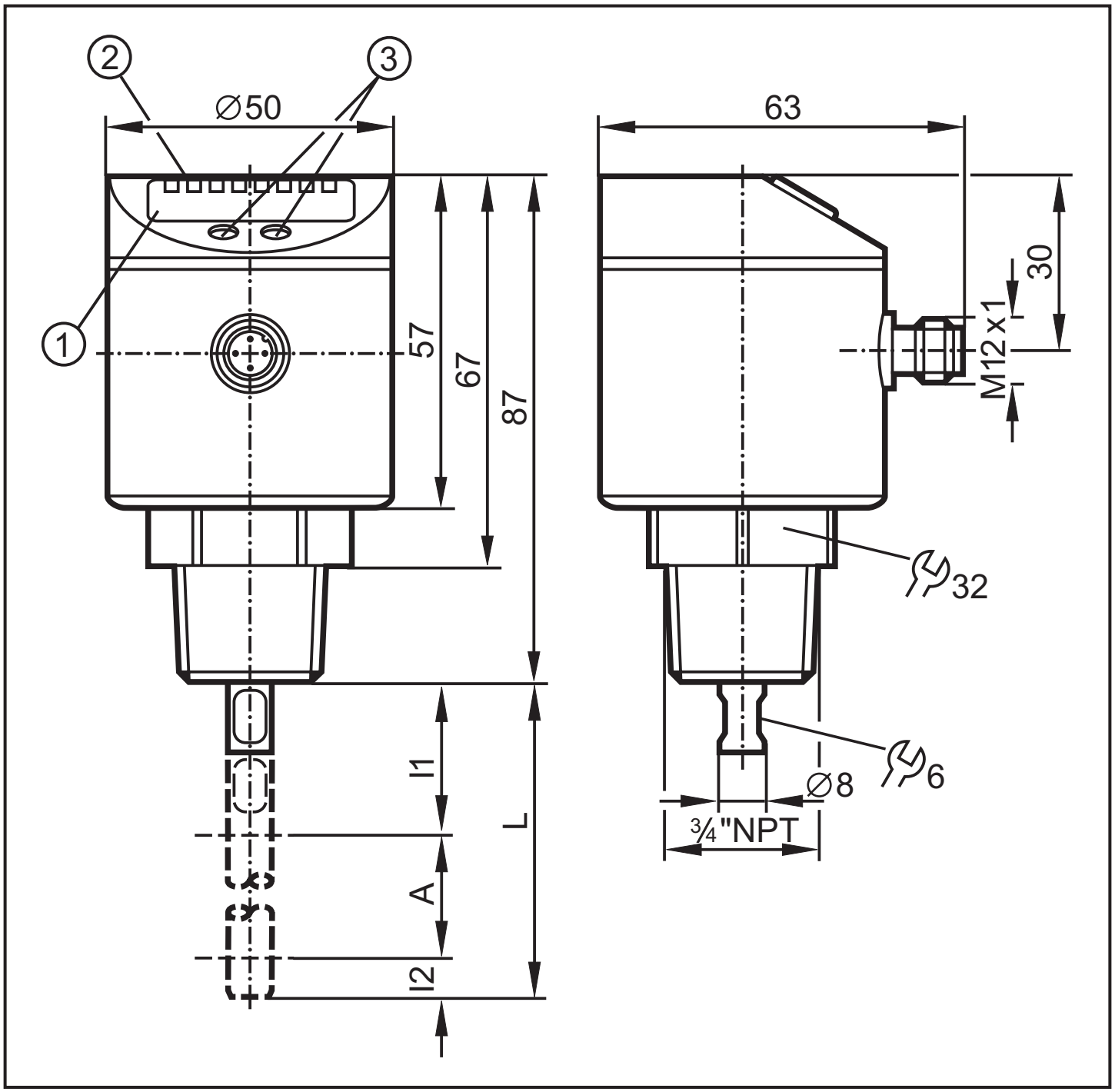
* The unit carries out plausibility checks to increase the operational reliability. Atypical level changes can be caused e.g. by contact with the probe. They can also be caused by strong soiling or turbulence. With the parameter dFo the response of the unit can be delayed (→ 9.4.6).

** Carry out a reset (power off and on again) after rectifying the fault and to reset the error message.

10.4 Output response in different operating states

	OUT1	OUT2
Initialisation	OFF	OFF
Normal operation	according to the level and OU1 setting	according to the level and OU2 setting
Error (Err0, Err1)	OFF for FOU1 = OFF; ON for FOU1 = on	4 mA / 0 V for FOU2 = OFF 20 mA / 10 V for FOU2 = on

11 Scale drawing



1: display; 2: status LEDs; 3: programming buttons

	cm		inch	
	min	max	min	max
L (probe length)	15	160	6.0	63.0
A (active zone)	10	L - 5	3.9	L - 2.0
I1 (inactive zone 1)	4		1.6	
I2 (inactive zone 2)	1		0.4	

12 Technical data

Operating voltage [V]	18 ... 30 DC
Current rating [mA]	200
Short-circuit protection, pulsed; reverse polarity / overload protection	
Voltage drop [V]	< 2.5
Current consumption [mA]	< 80
Analogue output [1]	4 ... 20 mA (max. 500 Ω) / 0 ... 10 V (min. 2000 Ω)
Zero signal [mA / V]	3.6 ... 4.0 / 0.0 ... 0.2
Full signal [mA / V]	20.0 ... 20.8 / 10.0 ... 10.3
Resolution [mm]	0,5 [1] / 0,2% A [2]
Measuring sensitivity [mA/V per mm]	16 mA ÷ A *) / 10 V ÷ A *)
Offset error [cm]	± 1.0
Characteristics deviation [cm]	± 1.0
Switch point accuracy [cm]	± (1.5 + 0.5% A)*
Repeatability [cm]	± 0.5
Max. speed of the level change [mm/s]	100
Dielectric constant medium	> 20
Max. tank pressure [bar]	-1...4
Housing materials	stainless steel (304S15); FKM; NBR; PBT; PC; PEI; TPE / V; PTFE
Materials (wetted parts)	stainless steel (303S22); PTFE; NBR
Protection	IP 67, III
Operating temperature [°C]	0...60
Medium temperature [°C]	0...80
Storage temperature [°C]	-25...80
Shock resistance [g]	12 (DIN EN 60068-2-29, 11 ms)
Vibration resistance [g]	2.5 (RMS, 1...1000 Hz)
EMC:	IEC60947-1

* A = active zone (→ Scale drawing)

[1] active zone (A) up to 250 mm

[2] active zone (A) 250...1550 mm

12.1 Setting ranges

[LEnG]	cm	inch
Setting range	15...160	6...63
Step increment	0.5	0.2

[OFS]	cm	inch
Setting range	0...100	0...39.4
Step increment	0.5	0.2

The setting ranges for the set point (SP1) and reset point (rP1) depend on the probe length (L).
In general the following applies:

	cm		inch	
	min	max	min	max
SP1	1.5	L - 4	0.6	L - 1.6
rP1	1.0	L - 4.5	0.4	L - 1.8
Step increment	0.5		0.2	

The values apply if [OFS] = 0.
- rP1 is always smaller than SP1. If the value for SP1 is reduced to a value ≤ rP1, the position of rP1 also shifts.
- If rP1 and SP1 are close together (about 3 x step increment), rP1 is changed automatically when increasing SP1.
- If there is a greater difference between rP1 and SP1, rP1 maintains the set value even if SP1 is increased.

13 Maintenance

▶ Keep the process connection free of deposits and foreign bodies.

▶ In case of strong pollution: clean the process connection and the probe at regular intervals.

In case of longer operation separation layers can form in the medium (e.g. oil on water). This applies especially to still pipes or bypasses.

▶ Remove separation layers at regular intervals.

14 Factory setting

	Factory setting	User setting
SP1	100 % SPmax	
rP1	100 % rPmax	
OU1	Hnc	
OU2	I	
OFS	0.0	
dr1	0.0	
FOU1	OFF	
FOU2	OFF	
dFo	0	
Uni	inch	
LEnG	nonE	

SPmax = LEnG value in inch minus 1.6.
rPmax = LEnG value in inch minus 1.8.
When the LEnG value is entered, the program calculates the basic setting.

Further information at www.ifm.com