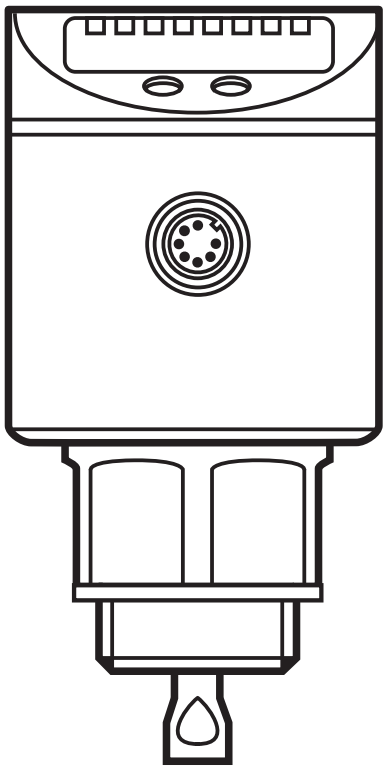
Operating instructions
Electronic level sensor

LR8010

UK



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Contents

1 Preliminary note

1.1 Symbols used

▶ Instruction

> Reaction, result

[…] Designation of keys, buttons or indications

→ Cross-reference

Important note
Non-compliance may result in malfunction or interference.

Information
Supplementary note.

CAUTION

Warning of personal injury.

> Slight reversible injuries may result.

2 Safety instructions

- The device described is a subcomponent for integration into a system.
  - The system architect is responsible for the safety of the system.
  - The system architect undertakes to perform a risk assessment and to create documentation in accordance with legal and normative requirements to be provided to the operator and user of the system. This documentation must contain all necessary information and safety instructions for the operator, the user and, if applicable, for any service personnel authorised by the architect of the system.
- Read this document before setting up the product and keep it during the entire service life.
- The product must be suitable for the corresponding applications and environmental conditions without any restrictions.
- Only use the product for its intended purpose (→ Functions and features).
- Only use the product for permissible media (→ Technical data).
- If the operating instructions or the technical data are not adhered to, personal injury and/or damage to property may occur.

- The manufacturer assumes no liability or warranty for any consequences caused by tampering with the product or incorrect use by the operator.
- Installation, electrical connection, set-up, operation and maintenance of the product must be carried out by qualified personnel authorised by the machine operator.
- Protect units and cables against damage.
- The unit complies with the standard EN 61000-6-4. The unit may cause radio interference in domestic areas. If interference occurs, the user must take appropriate actions.
- The surface of the unit may get hot if the switching outputs are overloaded. There is a risk of burns. However, only overload will cause hot surfaces.

3 Items supplied

- Level sensor LR8010 with integrated overflow prevention according to WHG*
- Operating instructions

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

- 1 probe
- 1 coaxial pipe
- 1 socket

* Building authority approval according to the German Federal Water Act (WHG).

Only use probes and coaxial pipes from ifm electronic gmbh! The optimum function is not ensured when using components from other manufacturers.

Available accessories: www.ifm.com

4 Functions and features

The unit continuously detects the level of liquids in tanks and generates output signals according to the parameter settings.4 switching outputs are available:

- 3 freely programmable switching outputs (NC / NO)
- 1 switching output for overflow prevention according to WHG* (NC)

* Building authority approval according to the German Federal Water Act (WHG).

If the unit is used as overflow prevention with building authority approval according to the German Federal Water Act (WHG), please observe the corresponding chapter (= Technical description) of the documentation!

4.1 Operation with coaxial probe

Only operate the device with coaxial probe! Operation with single probe is not supported by this unit version.

The coaxial probe is made up of an inner probe and an outer probe pipe (coaxial pipe). The probe is centred in the coaxial pipe by one or several spacers.

When using a coaxial probe, media with a low dielectric constant (e.g. oil and oil-based media) are detected in addition to aqueous media. Furthermore, no lateral minimum distances to tank walls and objects in the tank are required (→ 6 Installation).

4.2 Applications

- Water, water-based media
- Oils, oil-based media
- Medium temperature 0…80 °C
- Tank pressures: -0.5...4 bar

Application examples:

- Detection of power steering oil
- Monitoring of brake fluid
- Detection of water-glycol mixtures
- Monitoring of hydraulic oil in a hydraulic power unit

4.2.1 Restriction of the application area

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 performing an application test.

▶ Installation in a steady area (→ 6.1).

> In case of signal loss, the unit displays [E.033] and switches the outputs to a defined state (→ 5.2.6 Safe state).

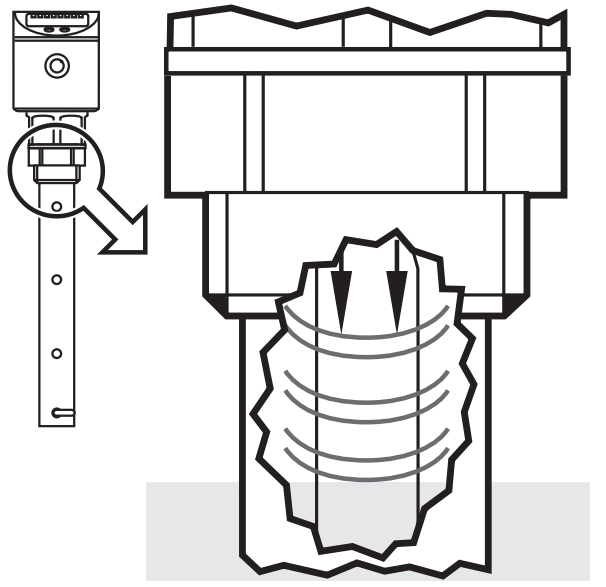
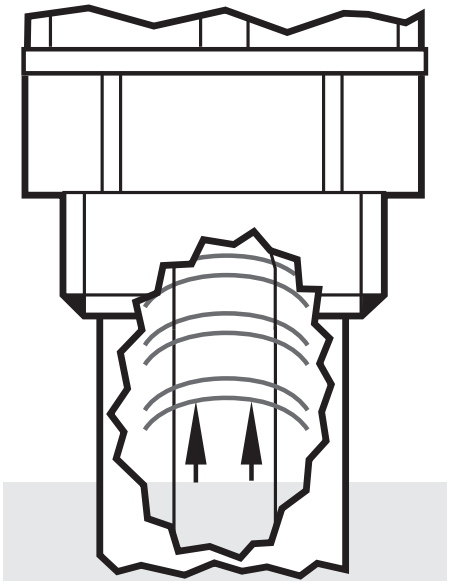
- Only operate the device with coaxial probe! Operation with single probe is not supported by this unit version.
- Use for fluids only! Make sure that the coaxial probe will not be blocked or clogged (e.g. with solid particles or media that tend to deposit).

Maximum viscosity: 500 mPa · s

- If the unit is to be used in acids or alkalis (e.g. in hygienic areas or in electroplating applications): first check the compatibility of the product materials with the media to be monitored (→ Technical data sheet).

5 Function

5.1 Measuring principle

Fig. 5-1	Fig. 5-2
	

The unit operates on 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. 5-1). When they hit the medium to be detected they are reflected and guided back to the sensor (Fig. 5-2). 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.

By using a coaxial probe, the guided wave runs only along the inside of the coaxial pipe. This allows installation where space is very restricted (→ 6 Installation).

5.2 Features of the unit

5.2.1 Easy set-up

- When operating voltage is applied to the unit for the first time, the probe length and the medium to be detected must be entered. Then the unit is ready for operation (→ 10.2).
- If necessary, parameters for the output signals and optimisation of the monitoring functions can be set (→ 10.2.3 to → 10.3).
- All settings can also be carried out before installation of the unit.
- Reset to the factory settings is possible.

- The unit can be locked electronically (electronic lock) to prevent unintentional settings (→ 10.1). In addition, the sensor can be protected by a password as an option(→ 5.3).

5.2.2 Display functions

The unit displays the current level, either in cm, inch or in percent of the final value of the measuring range. Factory setting: cm. The display unit is defined by programming (→ 10.2.3 Configuration of the display).In the Run mode, it can be temporarily switched between length indication (cm / inch) and percentage:

▶ Briefly press [Set].

> The selected unit is displayed for 30 s, the corresponding LED is lit. With each push of the button the display type is changed.

The set unit of measurement and the switching status of the outputs are indicated by LEDs.

5.2.3 Switching functions

The unit signals via 4 switching outputs OUT1...OUT3 and OUT-OP that a set limit level has been reached or that the level is below the limit value.

The output OUT-OP (OP = overflow prevention) functions as integrated overflow prevention. For safety reasons it is fixed to NC (normally closed principle). According to the German building authority approval (WHG), its function is constantly monitored.

Output OUT-OP has a fixed hysteresis of 10 mm.

For outputs OUT1...OUT3, the following switching functions can be selected:

- Hysteresis function / normally open (Fig. 5-3): [OUx] = [Hno].
- Hysteresis function / normally closed (Fig. 5-3): [OUx] = [Hnc].

First the set point (SPx) is set, then the reset point (rPx) with the requested difference.

- Window function / normally open (Fig. 5-4): [OUx] = [Fno].
- Window function / normally closed (Fig. 5-4): [OUx] = [Fnc].

The width of the window can be set by means of the difference between FHx and FLx. FHx = upper value, FLx = lower value.

Fig. 5-3

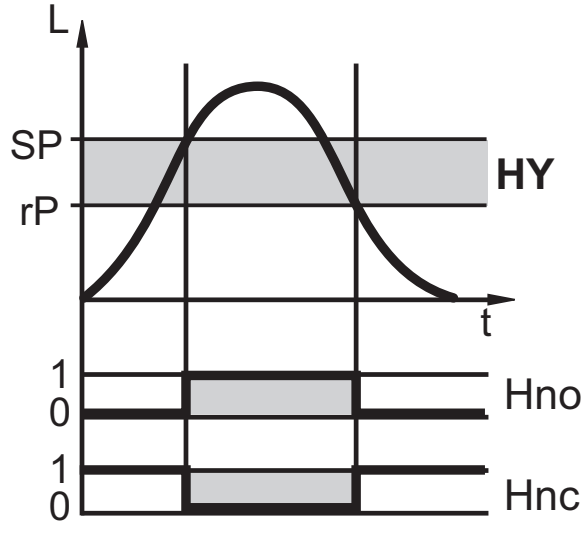
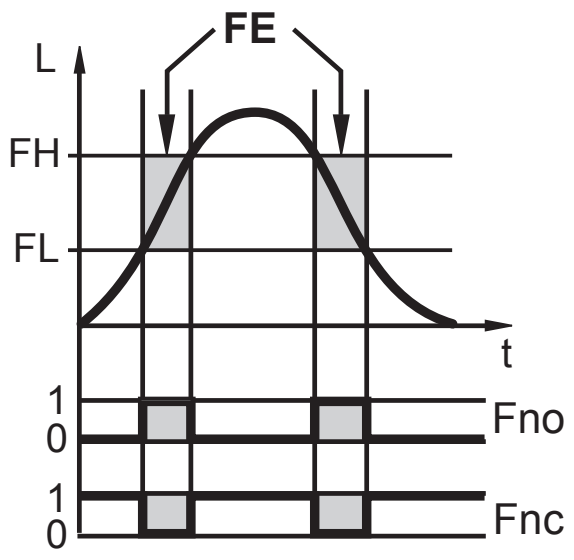


Fig. 5-4



L = level; HY = hysteresis; FE = window

For the switching outputs OUT1...OUT3, a switch-off delay of max. 60 s can be set (e.g. for especially long pump cycles).

5.2.4 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 points refer to the actual level.

For [OFS] = [0]: The reference point is the lower edge of the measuring probe.

The set offset only refers to the display on the unit. It has no effect on the process value transmitted via IO-Link. The OFS parameter, however, is correctly transmitted via IO-Link and can therefore be taken into account (→ 5.2.7).

5.2.5 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 10 cm, the maximum probe length is 160 cm.

- Probe and housing can be rotated without restriction. This enables easy installation and orientation of the head of the unit after installation.

5.2.6 Safe state

- 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 OUT1...OUT3 can be set via the parameters [FOU1]...[FOU3] (→ 10.5.5 Response of the outputs in case of a fault).

The response of the output OUT-OP (overflow prevention) is fixed: it **opens** in case of a fault.

- Temporary loss of signal (caused e.g. by turbulence or foam formation) can be suppressed for OUT1...OUT3 by using a delay time (→ 10.5.6 Setting of the delay time after signal loss). 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 the measured signal is not received again in sufficient strength within the delay time, the outputs pass into the safe state.

Also the timing of the OUT-OP output is fixed:in case of a fault, it opens **without delay**.

5.2.7 IO-Link function

This unit has an IO-Link communication interface which enables direct access to process and diagnostic data.

In addition it is possible to set the parameters of the unit while it is in operation. Operation of the unit via an IO-Link interface requires an IO-Link capable module (IO-Link master).

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

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

5.3 Password protection against inadvertent manipulation

As an option, the sensor can be protected by a password against inadvertent manipulation and unauthorised changes.

Password on delivery: **Not activated!**

For activation/deactivation (→ 10.5.7)

6 Installation

6.1 Installation location / environment

The unit must be installed from above!

CAUTION

The surface of the unit may get hot if the switching outputs are overloaded. However, only overload will cause hot surfaces.

> Risk of burns

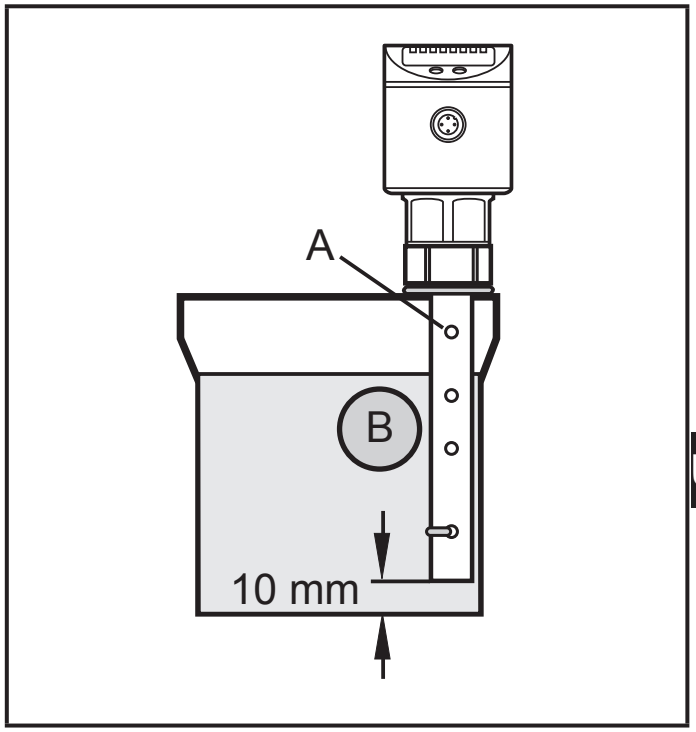
▶ Cover housing to prevent unintentional contact.

6.1.1 Coaxial probe

- No minimum distances to the tank wall and structures in the tank (B) are required.

Minimum distance to the bottom of the tank: 10 mm.

- The vent hole (A) must not be covered by mounting elements or similar.
- Do not install the unit in the immediate vicinity of a fill opening. No water jets must enter into the holes of the coaxial pipe.



UK

6.2 Probe installation

Probe and coaxial pipe are not included in the scope of delivery. They must be ordered separately.

Available accessories: www.ifm.com

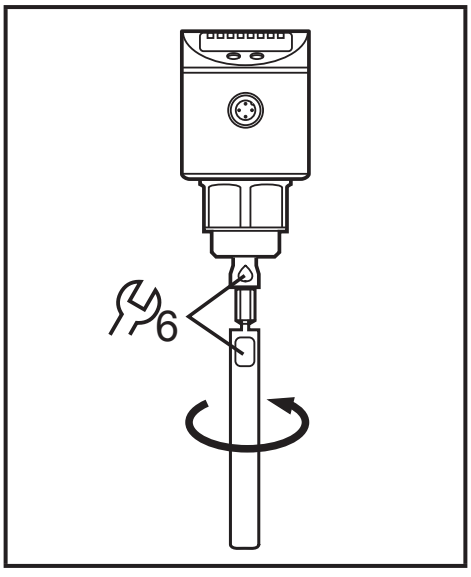
6.2.1 Attaching the probe

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.



In case of high mechanical stress (e.g. strong vibration), it may be necessary to secure the screw connection. For this purpose, the manufacturer recommends Loctite 270.

Substances such as glue or screw retaining compounds might migrate into the medium. Therefore, make sure that they are harmless!

When using mechanical means of securing, protruding edges must be avoided. They may cause interference reflection.

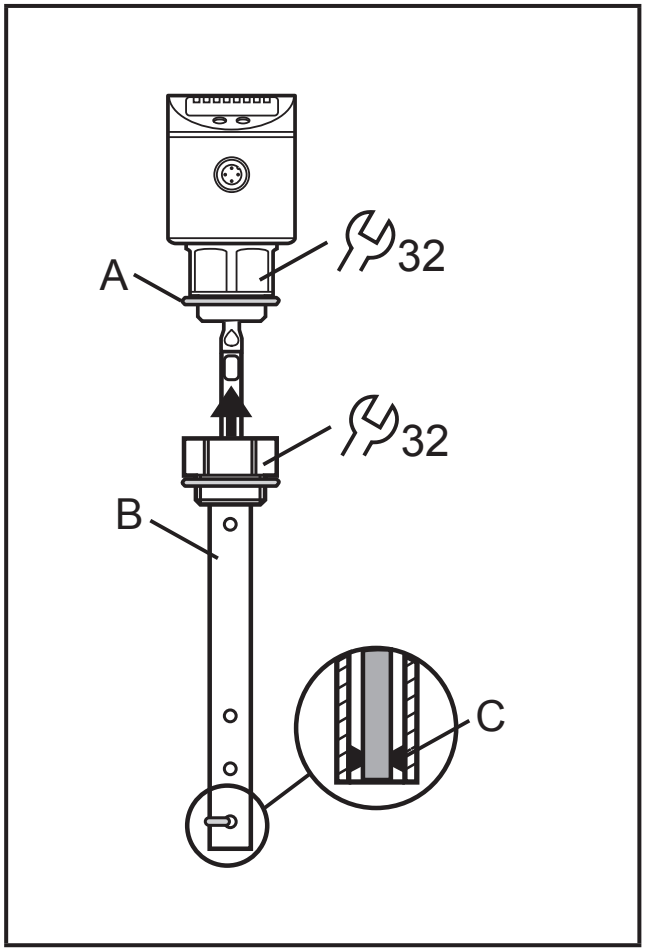
6.2.2 Installation of the coaxial pipe

The coaxial pipe and the probe must be of the same length. The coaxial pipe can be shortened (→ 6.3.2 Shortening of the coaxial pipe).

- ▶ Screw the probe to the unit and tighten it.

  Recommended tightening torque: 4 Nm.

- ▶ Slide the sensor seal (A) onto the thread.
- ▶ Slide the coaxial pipe (B) onto the probe. Carefully centre it and carefully move the probe through the centring piece (C) – for lengths > 140 cm through both centring pieces – of the coaxial pipe. Do not damage the centring pieces.
- ▶ Screw onto the sensor thread and tighten.



Secure the screw connection between the coaxial pipe and the sensor! For this purpose, the manufacturer recommends Loctite 270.

Substances such as glue or screw retaining compounds might migrate into the medium. Therefore, make sure that they are harmless!

6.3 Shortening of the probe

The probe can be shortened to adapt to different tank heights. In that case, not only the probe but also the coaxial pipe needs to be shortened.

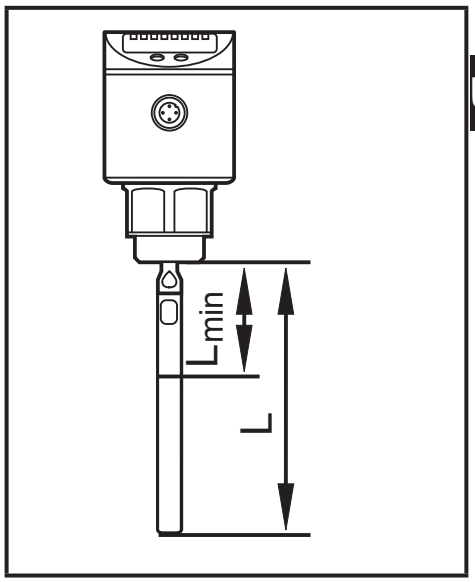
6.3.1 How to shorten the probe and to determine its length

Ensure that the probe length is never below the minimum permissible probe length of 10 cm (L_{min})! The unit does not support probe lengths below 10 cm. If shorter probes are used, measurement errors can occur.

- ▶ 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 at the mark.
- ▶ Remove all burrs and sharp edges.
- ▶ Screw the probe to the unit again and tighten it.

  Recommended tightening torque: 4 Nm.

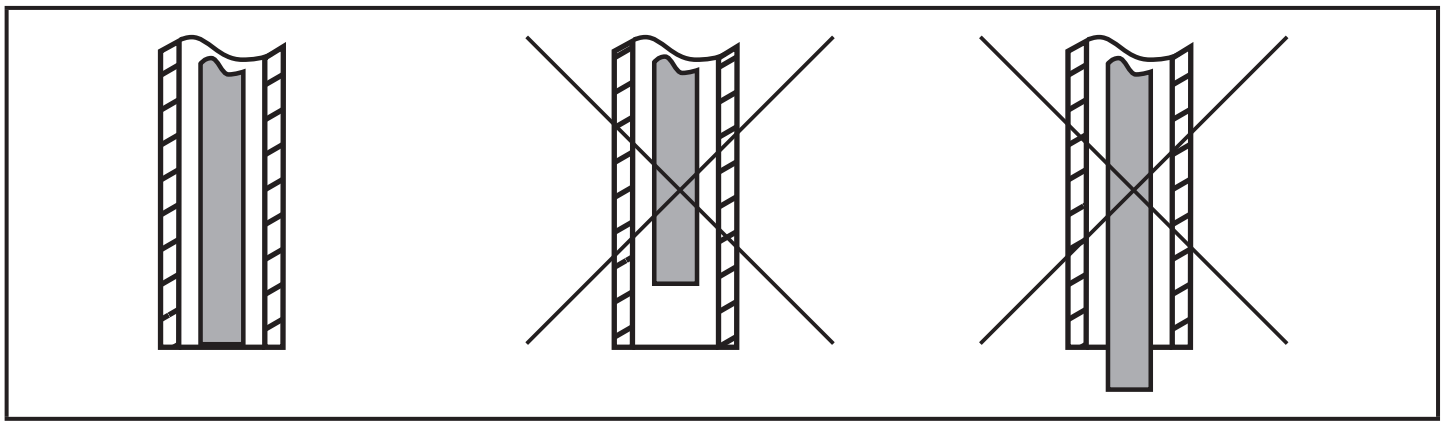
- ▶ Precisely measure the probe length L, note the value. It must be entered during parameter setting of the unit (→ 10.2).



L_{min}= 10 cm

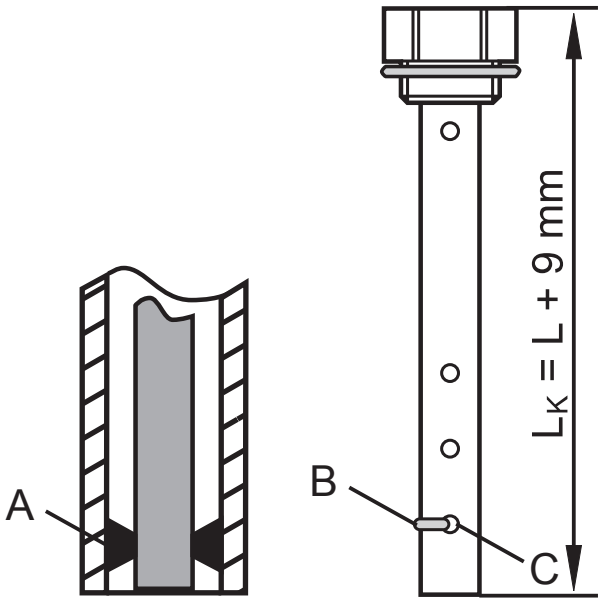
6.3.2 Shortening of the coaxial pipe

The coaxial pipe and the probe must be of the same length:



- ▶ Remove fastening bracket and centring piece (A, B).
- ▶ Shorten the coaxial pipe to the requested length: $L_K = L + 9$ mm.
- ▶ After shortening, at least one hole (C) for insertion of the fixing bracket has to be left.
- ▶ Remove all burrs and sharp edges.
- ▶ Insert centring piece (A) at the lower end of the pipe and attach it using the fixing bracket (B) at the lower hole (C).

Fig. 6-1



L_K = length of the coaxial pipe
L = length of the probe from the lower edge of the process connection (→ 6.3.1)

6.3.3 Determination of the probe length L if the coaxial probe is mounted

Only relevant if the probe length L (→ 6.3.1) is unknown:

- ▶ Measure the exact total length L_K of the coaxial pipe (→ Fig. 6-1, on the right).
- ▶ Deduct 9 mm from the total length of the coaxial pipe: $L_K - 9$ mm = L.
- ▶ Note down L. It must be entered during parameter setting of the unit (→ 10.2).

6.4 Installation of the unit with coaxial probe in the tank

There must be a fitting process connection (G¾) in the tank.

- ▶ Seal the process connection: slide the supplied seal onto the thread of the coaxial pipe.
- ▶ Screw the unit with the coaxial pipe into the tank and tighten it.

Secure the screw connection between the coaxial pipe and the tank! For this purpose, the manufacturer recommends Loctite 270.

Substances such as glue or screw retaining compounds might migrate into the medium. Therefore, make sure that they are harmless!

6.5 Alignment of the sensor housing

After installation, the sensor housing can be aligned:

The sensor housing can be rotated without restriction. Even if rotated several times there is no risk of damage to the unit.

7 Electrical connection

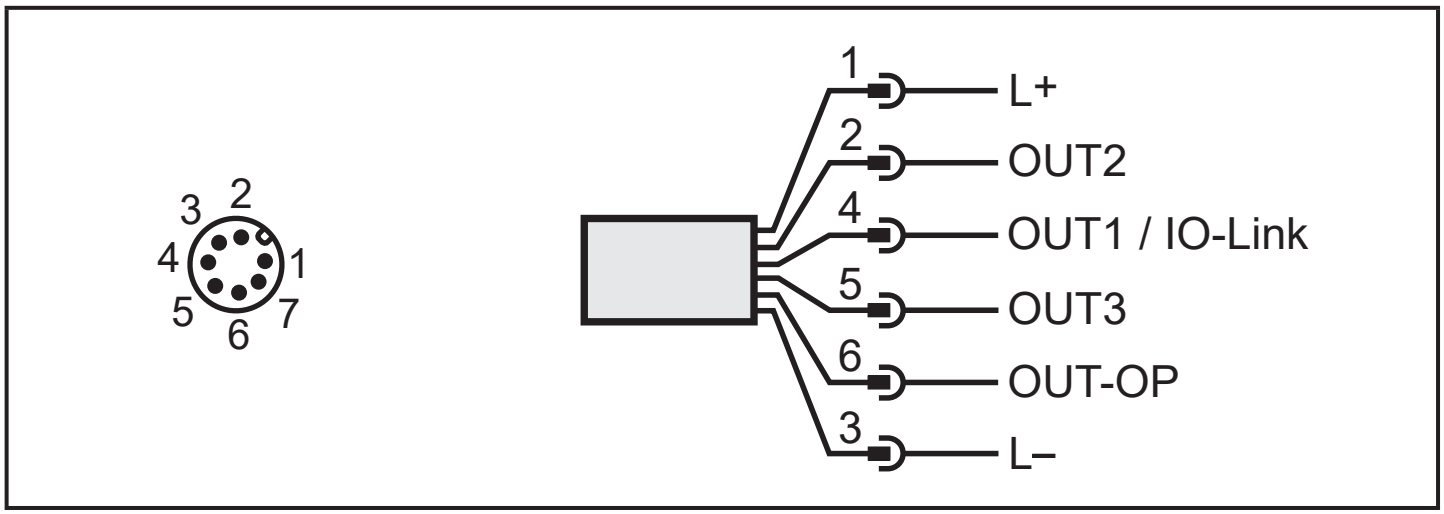
The unit must be connected by a qualified electrician.

Observe the national and international regulations for the installation of electrical equipment!

Voltage supply according to EN 50178, SELV, PELV.

▶ Disconnect power.

▶ Connect the unit as follows:



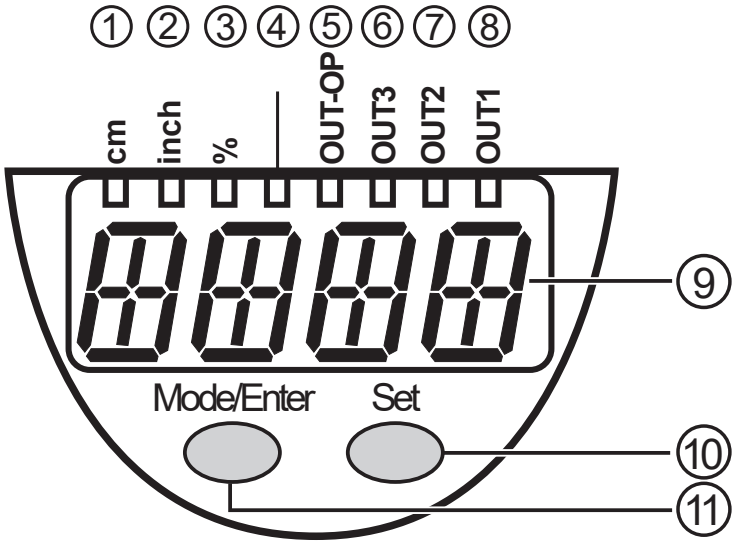
Pin / connection		Core colours	
		for ifm sockets	for sockets according to DIN 47100
1	L+	brown	white
2	OUT2 (switching output 2)	white	brown
3	L-	blue	green
4	OUT1 / IO-Link (switching output 1)	black	yellow
5	OUT3 (switching output 3)	grey	grey
6	OUT-OP (switching output for overflow prevention)	pink	pink
7	not used	violet	blue

Sockets and 8-pole connectors to 4-pole connectors are available as accessories:

Available accessories: www.ifm.com

When operating voltage is applied to the unit for the first time, the probe length and the medium to be detected must be entered. Only then is the unit ready for operation (→ 10.2).

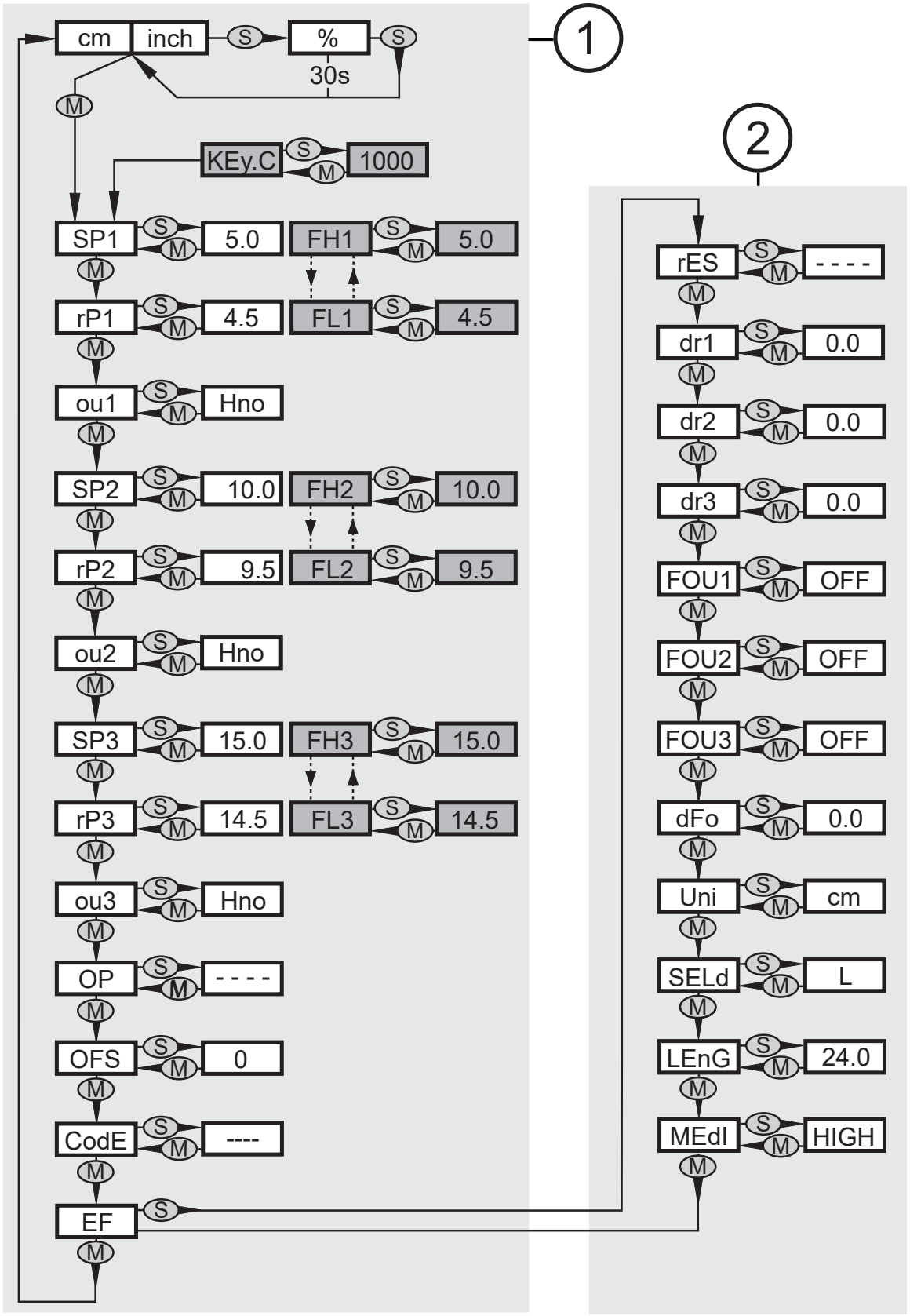
8 Operating and display elements



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	green	Indication of the level in % of the final value of the measuring range.
LED 4		not used
LED 5	yellow	Switching status of the overflow prevention (OUT-OP): • LED on: no overflow • LED off: tank is full
LED 6	yellow	Output 3 is switched.
LED 7	yellow	Output 2 is switched.
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 (scrolling by holding pressed; incrementally by pressing once).		
Change between cm/inch indication and percent indication in the normal operating mode (Run mode).		
11: Mode/Enter button		
Selection of the parameters and acknowledgement of the parameter values.		

9 Menu

9.1 Menu structure



1: Menu level 1
2: Menu level 2

Menu items highlighted in grey, e.g. [FH1], are only active when assigned parameters have been selected.

9.2 Password protection

If the password protection is activated, the parameter [KEy.C] is displayed upon opening of the menu. Under this parameter, the password can be entered.

When the password has been entered, there is full write and read access to all parameters. If no button is pressed for 2 minutes, the password protection becomes active again.

If no password or a wrong password is entered, there is only read access to the parameters. Attempts to change parameters are acknowledged by the message [CodE]. Changing the password: (→ 10.6), enter password: (→ 10.7).

10 Parameter setting

CAUTION

The surface of the unit may get hot if the switching outputs are overloaded. However, only overload will cause hot surfaces.

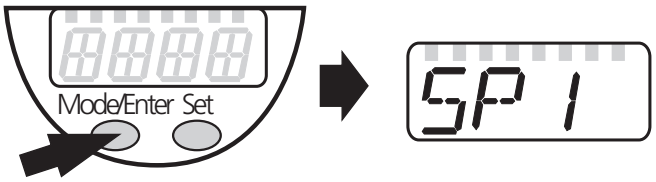
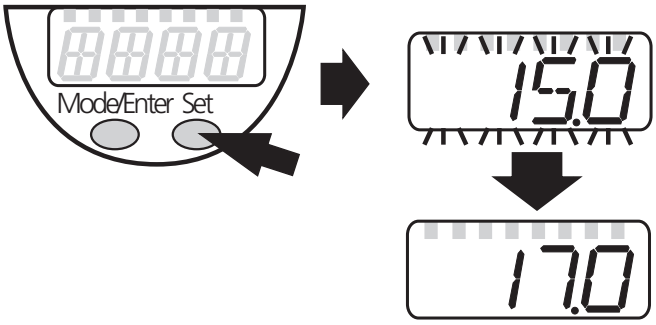
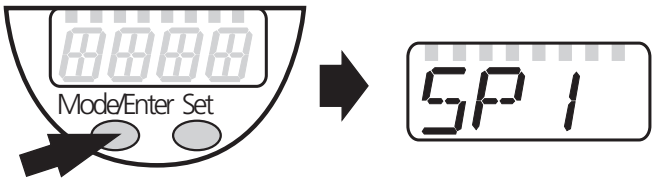
> Risk of burns

- ▶ Do not touch the device with your hands.
- ▶ Use another object (e.g. a ballpoint pen) to carry out settings on the unit.

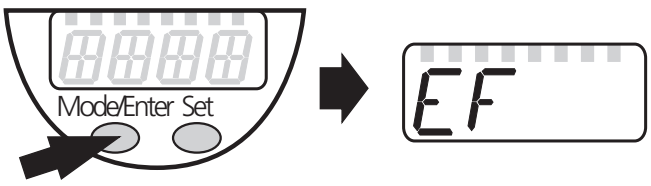
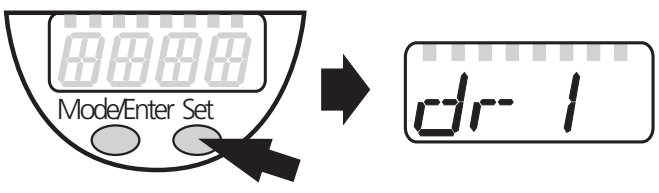
During parameter setting the unit remains in the operating mode internally.It continues its monitoring functions with the existing parameters until the parameter setting has been completed.

10.1 Parameter setting in general

3 steps must be taken for each parameter setting:

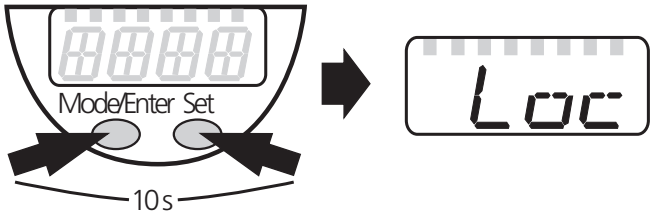
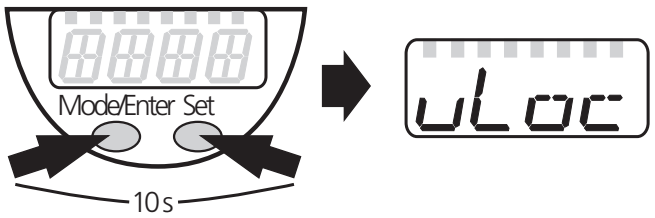
1	**Select parameter** ▶ Press [Mode/Enter] until the requested parameter is displayed.	
2	**Set parameter value** ▶ Press [SET] and keep it pressed. > Current setting value of the parameter flashes for 5 s. > After 5 s: Setting value is changed (incrementally by pressing the button once or continuously by keeping the button pressed).	
	Numerical values are incremented continuously. For reducing 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** ▶ Briefly press [Mode/Enter]. > The parameter is displayed again. The new setting value is saved.	
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 30 s. > The unit returns to the operating mode.		

- Change from menu level 1 to menu level 2:

▶ Press [Mode/Enter] until [EF] is displayed.	
▶ Briefly press [Set]. > The first parameter of the submenu 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: not locked.

Timeout:

If no button is pressed for 30 s during parameter setting, the unit returns to the operating mode with unchanged values.

10.2 Basic settings (unit on delivery)

On delivery of the unit, you must first enter the basic settings (probe length, medium). The complete parameter setting menu cannot be accessed before this.

Malfunctions may occur if wrong basic settings are entered.

10.2.1 Enter probe length

▶ Apply operating voltage. > The initial display ≡≡≡≡ is shown. ▶ Select [LEnG], press [SET] for 5 s. > [nonE] is displayed. ▶ Enter the probe length in cm. Remarks on the determination of the probe length: ▶ Note the remarks → 6.3.1 and → 6.3.2. ▶ Briefly press [Mode/Enter].	**LEnG**

10.2.2 Setting to the medium

In case of doubt, carry out an application test to ensure the setting (HIGH or LOW) which is best for the medium to be measured.

▶ Select [MEdI], press [SET] for 5 s. > [nonE] is displayed. ▶ Set the requested value: - [HIGH] for water and water-based media. - [LOW] for oils and oil-based media.	**MEdI**

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

10.2.3 Configuration of the display

▶ Select [Uni] and set the unit of measurement: [cm], [inch]. Factory setting: cm. ▶ Select [SELd] and set type of indication: - [L] = The level is indicated in cm or inch. - [L%] = The level is indicated in percent of the final value of the measuring range. - [OFF] = The display is switched off in the operating mode. When one of the buttons is pressed, the current measured value is displayed for 30 s. The LEDs remain active even if the display is deactivated.	**Uni** **SELd**

10.3 Offset setting

Set offset before setting the switching limits (SPx/FHx, rPx/FLx, OP). Otherwise, the switching limits shift by the value of the set offset.

▶ 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.	**OFS**

10.4 Define overflow switch point (OP)

Output OUT-OP is fixed to NC and has a fixed hysteresis of 10 mm.

▶ Select [OP] and a value at which output OUT-OP switches.	**OP**

10.5 Set the output signals of the outputs OUT1...OUT3

10.5.1 Setting of the output function

Output OUT-OP (overflow prevention) is fixed to NC [Hnc] for safety reasons. The principle of normally closed operation ensures that wire break or cable break is also detected.

▶ Select [OU1] ... [OU3] and set the switching function: [Hno] = hysteresis function/normally open [Hnc] = hysteresis function/normally closed [Fno] = window function/normally open [Fnc] = window function/normally closed	**OU1** **...** **OU3**

10.5.2 Set the switching limits (hysteresis function)

▶ Make sure that the function [Hno] or [Hnc] is set for [OUx]. ▶ Select [SP1] ... [SP3] and set the value at which the output switches.	**SP1** **...** **SP3**
▶ Select [rP1] ... [rP3] and set the value at which the output switches off. rPx is always smaller than SPx. The unit only accepts values which are lower than the value for SPx.	**rP1** **...** **rP3**

10.5.3 Set the switching limits (window function)

▶ Make sure that the function [Fno] or [Fnc] is set for [OUx]. ▶ Select [FH1] ... [FH3] and set the upper limit of the acceptable range.	**FH1** **...** **FH3**
▶ Select [FL1] ... [FL3] and set the lower limit of the acceptable range. FLx is always lower than FHx. The unit only accepts values which are lower than the value for FHx.	**FL1** **...** **FL3**

10.5.4 Setting of the switch-off delay

For output OUT-OP (overflow prevention) no switch-off delay can be set for safety reasons.

▶ Select [dr1] ... [dr3] and set a value between 0.2 and 60 s.At 0.0 (= factory setting) the delay time is not active. The switch-off delay is only active if "hysteresis" has been set as switching function (OUx = Hno or Hnc).	**dr1** **...** **dr3**

10.5.5 Response of the outputs in case of a fault

The response of the output OUT-OP (overflow prevention) is fixed: OUT-OP **opens** in case of a fault!

▶ Select [FOU1] ... [FOU3] and set the value: [on] = output switches ON in case of a fault. [OFF] = output switches OFF in case of a fault. Factory setting: [FOU1] ... [FOU3] = [OFF]. Faults: faulty hardware, too low a signal quality, untypical level curve. Overflow is not considered to be a fault.	**FOU1** **...** **FOU3**

10.5.6 Setting of the delay time after signal loss

The timing of output OUT-OP (overflow prevention) is fixed for safety reasons:In case of a fault, OUT-OP opens **without delay**!

▶ Select [dFo] and set a value between 0.2 and 5.0 s. At 0.0 (= 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 (→ 5.2.6 Safe state).	**dFo**

10.5.7 Reset all parameters to factory setting

After resetting all parameters to factory setting, the unit is not operational. First, the basic settings must be entered (→ 10.2).

▶ Select [rES], then press [Set] and keep it pressed until [----] is displayed. ▶ Briefly press [Mode/Enter]. > The unit reboots and the factory settings are restored.	**rES**

10.5.8 Enter probe length

After entering the probe length: Check values for OFS and for switching limits / enter new ones!

After resetting all parameters to factory setting (→ 10.5.7) and after changing the probe length, it is necessary to set the probe length.

▶ Measure the total length L_K of the coaxial probe to a precision of ± 2 mm (± 0.1 inch) (→ 6.3.1 and → 6.3.2). ▶ Deduct 9 mm from the measured value. L = L_K - 9 mm. ▶ Round up the determined value (step increment 0.5 cm / 0.2 inch). ▶ Select [LEnG] and set the determined value L (setting range: 10.0 ... 160.0 cm / 4.0 ... 63.0 inch).	**LEnG**

10.5.9 Adjustment to the medium to be detected

In case of doubt, carry out an application test to make sure that the setting which is best for the medium to be measured is used!

▶ Select [MEdI] and set the value: - [HIGH] for water and water-based media. - [LOW] for oils and oil-based media.	**MEdI**

10.6 Changing the password

The password protects all parameters from unauthorised change. If the password protection is activated, the parameters can still be read, only the write access is blocked.

Password on delivery: **Not activated!**

If the password is lost, changing the parameters is no longer possible. In this case, the unit needs to be sent back to the manufacturer!

▶ Select [CodE] and enter a new password (4-digit number between 1000 and 9999). ▶ Keep the password in a safe place! ▶ To deactivate the password protection select the value [nonE]; to do so, a full cycle of all values is necessary.	**CodE**

10.7 Enter password [KEy.C]

Only visible if the password protection is activated.The parameter is displayed immediately after opening the user menu. ▶ Select [KEy.C] and enter the correct password. > When the correct password is entered, there is full write and read access to all operating parameters of the unit. > When a wrong password is entered, [FAIL] is displayed and there is only read access.	**KEy.C**

11 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.

11.1 Operating indicators

[----] continuous	Initialisation phase after power on
Numerical value + LED 1	Current level in cm.
Numerical value + LED 2	Current level in inches.
Numerical value + LED 3	Current level in % of the final value of the measuring range.
LED 5	Switching status of the overflow prevention (OUT-OP): • LED on: No overflow (overflow prevention point OP not reached). • LED off: Tank is full (overflow prevention point OP is reached)!
LED 6 ... LED 8	Switching status of the corresponding output.
[----]	Level below the active zone.
[FULL] + numerical value alternately	Level has reached or exceeded the maximum measuring range.
≡≡≡≡	On delivery the unit is not operational. Basic settings required (→ 10.2).
[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.
[C.Loc]	The unit is temporarily locked. Parameter setting via IO-Link is active (temporary locking).
[S.Loc]	Unit is permanently locked via software. This locking can only be removed with a parameter setting software.
[CodE]	Unit is locked via code.Before the unit can be configured, the correct code must be entered. Use parameter [KEy.C] to enter the password (→ 10.7).

11.2 Read set parameters

▶ Briefly press [Mode/Enter] to scroll the parameters.

▶ Briefly press [Set] to indicate the corresponding parameter value for about 30 s. After another 30 s the unit returns to the Run mode

11.3 Changing the display unit in the Run mode

(= switching between length indication (cm / inch) and percentage).

▶ Briefly press [Set] in the Run mode.

> The selected unit is displayed for 30 s, the corresponding LED is lit. With each push of the button the display type is changed.

11.4 Error indications

	Possible cause	Recommended measures
[E.000]	Fault in the electronics.	Replace the unit.
[E.031]	Probe detached from the unit; possibly incorrect setting of the probe length.	• Check if the probe - especially the inner probe - is correctly screwed to the unit. • Check the parameter [LEnG].
[E.033]	Measurement disturbed by heavy foam build-up or turbulence.	• If possible, install the unit in a different position. • If possible, prevent or exclude foam formation or turbulences by taking appropriate measures (e.g. add antifoaming agents or reduce the pump output a little).
	Measurement disturbed by separation layers (e.g. oil layer on water).	Remove the oil layer by suction, stir the medium, check the composition.
	Probe or process connection soiled.	Clean probe (space between inner probe and coaxial pipe) and process connection; then carry out a reset.*
	Installation conditions were not adhered to.	Observe the notes in "Installation" (→ 6).
	Probe length or sensitivity (setting to the medium) incorrect.	Correct basic settings (→ 10.2), then carry out a reset.*
[SCx]	Flashing: Short circuit in switching output OUTx.	Remove the short circuit.
[SC.OP]	Flashing: Short circuit in switching output OUT-OP (overflow prevention).	Remove the short circuit.
[SC]	Flashing: Short circuit in at least two switching outputs.	Remove the short circuit.
[PArA]	Faulty data set	Reset to factory settings [rES].

* Carry out a reset (power off and on again) (→ 10.5.7) after rectifying the fault to reset the error message.

11.5 Output response in different operating states

	OUT1... OUT3	OUT-OP (overflow prevention)
Initialisation	OFF	OFF
Normal operation	According to the level and the setting of the output function OU1...OU3	ON
Fault (E.0xx)	• OFF for FOUx = OFF • ON for FOUx = on	OFF
Overflow prevention point reached	According to the level and the setting of the output function OU1...OU3	OFF

12 Technical data and scale drawing

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

13 Setting ranges

[LEnG]	cm	inch
Setting range	10...160	4.0...63
Step increment	0.5	0.2

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

The values in the following table apply to [OFS] = 0. The values in brackets apply to the setting [MEdI] = [LOW]. This is the setting for detection of oils and oil-based media.

The setting ranges for the switching limits (SPx, rPx, FHx, FLx, OP) depend on the probe length (L):

	cm		inch	
	min	max	min	max
SPx / FHx	1.5 (3.5)	L - 3	0.6 (1.4)	L - 1.2
rPx / FLx	1.0 (3.0)	L - 3.5	0.4 (1.2)	L - 1.4
Step increment	0.5		0.2	

	cm		inch	
	min	max	min	max
[OP]	7.0	L - 3	2.8	L - 1.2
Hysteresis (fixed)	1.0	1.0	0.4	0.4
Step increment	0.5		0.2	

Moreover, the following applies:

- rPx (FLx) is always smaller than SPx (FHx). If the value for SPx (FHx) is reduced to a value ≤ rPx (FLx), the position of rPx (FLx) also shifts.
- If rPx (FLx) and SPx (FHx) are close together (approx. 3 x step increment), rPX (FLx) is changed automatically when SPx (FHx) is increased.
- If there is a greater distance between rPx (FLx) and SPx (FHx), rPx (FLx) maintains the set value even if SPx (FHx) is increased.

14 Maintenance

Always observe the admissible application area to avoid damage and to reduce maintenance (→ 4.2)!

▶ Keep the ventilation hole and the interior of the coaxial pipe free from deposits and foreign bodies. Observe application area (→ 4.2)!

▶ In case of soiling: Clean probe at regular intervals.If soiling occurs: It is absolutely necessary to take measures to prevent soiling. Observe application area (→ 4.2)!

In case of longer operation separation layers can form in the medium (e.g. oil on water). It is possible that a separation layer may form inside the coaxial tube!

▶ Remove separation layers at regular intervals (e.g. remove oil by suction).

15 Factory setting

	Factory setting	User setting
SP1 / FH1	25 % SP/FHmax	
rP1 / FL1	25 % rP/FLmax	
OU1	Hno	
SP2 / FH2	50 % SP/FHmax	
rP2 / FL2	50 % rP/FLmax	
OU2	Hno	
SP3 / FH3	75 % SP/FHmax	
rP3 / FL3	75 % rP/FLmax	
OU3	Hno	
OFS	0.0	
dr1	0.0	
dr2	0.0	
dr3	0.0	
FOU1	OFF	
FOU2	OFF	
FOU3	OFF	
dFo	0	
Uni	cm	
SELd	L	
OP	100 % SPmax	
LEnG	nonE	
MEdI	nonE	
CodE	none	

SP/FH_{max} = LEnG value minus 3.
rP/FL_{max} = LEnG value minus 3.5.
When the LEnG value is entered, the program calculates the basic setting.

More information at www.ifm.com

Building authority approval

If the unit is used as overflow prevention with building authority approval according to the German Federal Water Act (WHG), please observe the corresponding chapter (= Technical description) of the documentation!