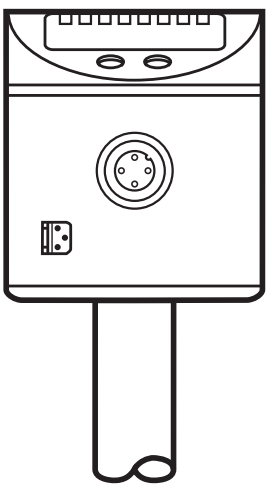
Operating instructions
Electronic level sensor

LK31xx

UK



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Contents

1 Preliminary note

1.1 Symbols used

▶ Instructions

> Reaction, result

[…] Designation of keys, buttons or indications

→ Cross-reference

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

Information
Supplementary note.

2 Safety instructions

- Please read this document prior to set-up of the unit. Ensure that the product is suitable for your application without any restrictions.
- If the operating instructions or the technical data are not adhered to, personal injury and/or damage to property can occur. That is why installation, electrical connection, set-up, operation and maintenance of the unit must only be carried out by qualified personnel authorised by the machine operator.
- In order to guarantee the correct condition of the device for the operating time it is necessary to use the device only for media to which the wetted materials are sufficiently resistant (→ Technical data).
- The responsibility whether the device is suitable for the respective application lies with the operator. The manufacturer assumes no liability for consequences of misuse by the operator.
- Improper installation and use of the unit result in a loss of the warranty claims.
- 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 remedial actions.

3 Functions and features

3.1 Application area

The unit was especially designed to meet the requirements of machine tool building. It is particularly suitable for monitoring coolant emulsions (also dirty) as well as cutting and hydraulic oils.

3.2 Restriction of the application area

- The unit is not suitable for
  - acids and alkalis
  - hygienic and electroplating applications
  - highly conductive and adhesive media (e.g. adhesive, glue, shampoo)
  - granulates, bulk material
  - use in grinders (increased risk of formation of deposits).
- It is possible that foam of good conductivity is detected as level.
  ▶ Check proper functioning in an application test.
- For water and hydrous media with temperatures > 35 °C install the unit in a climatic tube (→ Accessories).
- For automatic medium detection (→ 5.2.1):
  For media which are very inhomogeneous, separate from each other thus forming separation layers (e.g. oil layer on water), the following applies:
  ▶ Check proper functioning in an application test.

4 Getting started

For fast set-up, the example configurations described in the following can be used for most applications. The indicated minimum distances apply exclusively to each separately described case.

4.1 Example configuration 1

Unit:	LK3122 (probe length L= 264 mm)
Medium to be detected:	Mineral oil
Operating mode:	Manual media selection with overflow prevention (factory setting) → 5.2.1
Installation environment:	Metal tank, installation to fig. 4-1

▶ Install unit.

▶ Observe the distances (x), (u) and (c):

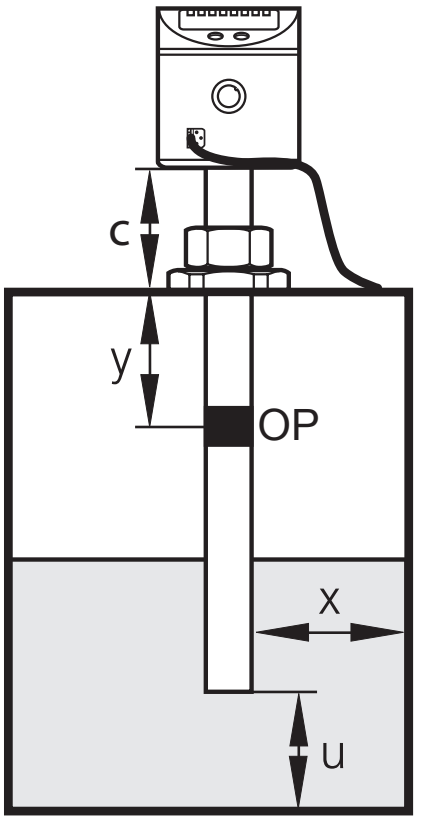
x:	min. 4.0 cm
u:	min. 1.0 cm
c:	max. 14.0 cm

▶ Ground sensor and tank via an electrical connection (→ 7).

▶ Observe the parameter setting sequence:

- [MEdI] = [OIL.2] (→ 10.2.3)
- [OFS] = (u); e.g. (u) = 2.0 cm (→ 5.6)
- [OP] = Set overflow prevention OP at a distance (y) greater than 4.5 cm below the mounting element.

Fig. 4-1



For distances (y) smaller than 4.5 cm there may be malfunctioning and error messages during the adjustment process [cOP].

Step increment and setting range: → 12.2.

Calculation aids for [OP]: → 12.3.

▶ Adjust overflow prevention OP to [cOP] (→ 10.2.5).

> **The unit is ready for operation.**

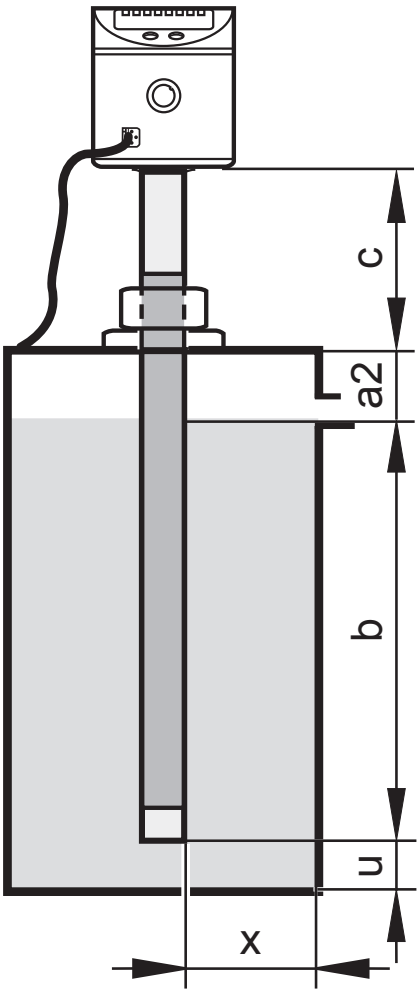
▶ Make further settings if necessary.

▶ Check whether the unit operates correctly.

4.2 Example configuration 2

Unit:	LK3123 (probe length L= 472 mm)
Medium to be detected:	Coolant emulsion
Operating mode:	Automatic medium detection (→ 5.2.1)
Installation environment:	Metal tank, installation to fig. 4-2.

Fig. 4-2



- ▶ Install unit.
- ▶ Observe the distances (x), (u) and (c).

x:	min. 4.0 cm
u:	min. 1.0 cm
c:	max. 23.0 cm

- ▶ Ground sensor and tank via an electrical connection (→ 7).
- ▶ Observe the maximum permitted level (b).

A distance (a2) greater than 5.0 cm must be observed between maximum level (b) and mounting element.

- ▶ Observe the parameter setting sequence:
  - [MEdI] = [Auto] (→ 10.2.3)
  - [OFS] = (u); e.g. (u) = 1.0 cm (→ 5.6)
  - [SP1] = Set the switch point at a distance (a2) greater than 5.0 cm below the mounting element.

Adjustable in step increments of 0.5 cm.

Switch point [SP1] is used as overflow prevention (pump off, close inlet, ...).

- ▶ **Unit must be reinitialised:**
- ▶ Switch the operating voltage off and on again.
- > **The unit is ready for operation.**
- ▶ Make further settings if necessary.
- ▶ Check whether the unit operates correctly.

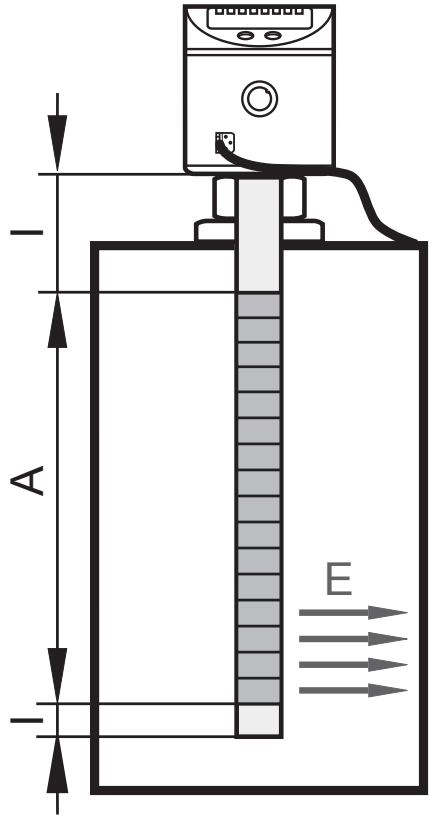
5 Function

5.1 Measuring principle

The sensor determines the level according to the capacitive measuring principle:

- An electrical field [E] is generated and influenced by the medium to be detected. This change to the field causes a measurement signal that is electronically evaluated.
- The dielectric constant of a medium is important for its detection. Media with a high dielectric constant (e.g. water) generate a strong measurement signal, media with a low dielectric constant (e.g. oils) a correspondingly lower signal.
- The active measurement zone of the sensor probe is composed of 16 capacitive measuring segments. They generate measurement signals depending on the degree of coverage.

Fig. 5-1



I: Inactive zone
A: Active zone (16 active segments)
E: Electrical field
Dimensions → Technical data sheet

5.2 Operating principle / features of the unit

The unit can be installed in tanks of different sizes. Mounting elements may also be placed in the active measurement zone. Observe the notes on installation.

2 outputs are available. They can be set separately.

OUT1	Switching signal for level limit value / IO-Link
OUT2	Analogue signal proportional to level (invertible)

To adapt to the present application select the required operating mode.

5.2.1 Operating modes

1. Manual media selection with overflow prevention (factory setting)

Recommended: highest operational reliability!

The medium to be detected is set manually [MEdI]. In addition, an integrated, independently functioning overflow prevention is available.

2. Manual media selection without overflow prevention

Medium operational reliability!

The medium to be detected is set manually as described under 1. However, the overflow prevention is deactivated. For this reason, no adjustment is required.

3. Automatic medium detection

Lowest operational reliability!

Each time the operating voltage is switched on, the unit adjusts itself to the medium and the installation environment.

For automatic media detection, **no** overflow prevention is available

Automatic media detection can only function properly under certain conditions (e.g. compliance with special mounting specifications, restrictions for operation and maintenance).

5.2.2 Notes on the integrated overflow prevention

With the parameter [OP] (OP = overflow prevention), one of the upper measuring segments is defined as integrated overflow prevention OP.

- If the overflow prevention OP is activated, an adjustment to the installation situation has to be made [cOP].
- The overflow prevention OP can be deactivated ([OP] = [OFF]).

Deactivating the overflow prevention can impair the operational reliability. For optimum operation and maximum operational reliability, we therefore recommend to not deactivate the overflow prevention OP.

- The overflow prevention OP is the maximum limit of the measuring range. The switch point [SP1] / [FH1] is always below [OP].
- The overflow prevention OP is **not** assigned to a separate output. It offers additional protection and only switches if as the level rises the switching output has not switched even though the corresponding switch point has been exceeded (e.g. due to application-related malfunctions).
- Typically the overflow prevention OP reacts when the selected measuring segment has been reached (a few mm before the set OP value).
- The overflow prevention OP reacts immediately and without delay. The set delay times (e.g. of a switch point directly below) have no effect on the overflow prevention OP.
- The response of the overflow prevention OP is indicated on the display ("Full" and indication of the current level change every second).

5.3 Display functions

The unit displays the current level, selectable in cm or inch. The display unit is defined by parameter setting. The set unit of measurement and the switching status of the switching output are indicated by LEDs.

5.4 Analogue functions

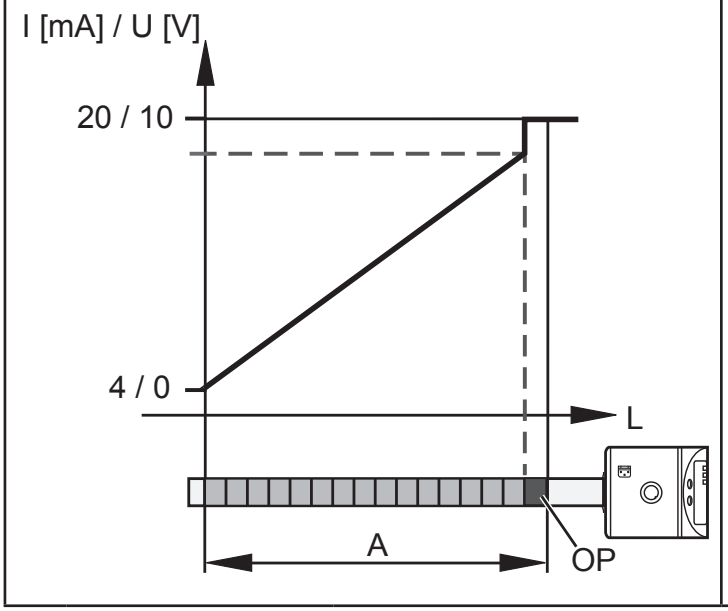
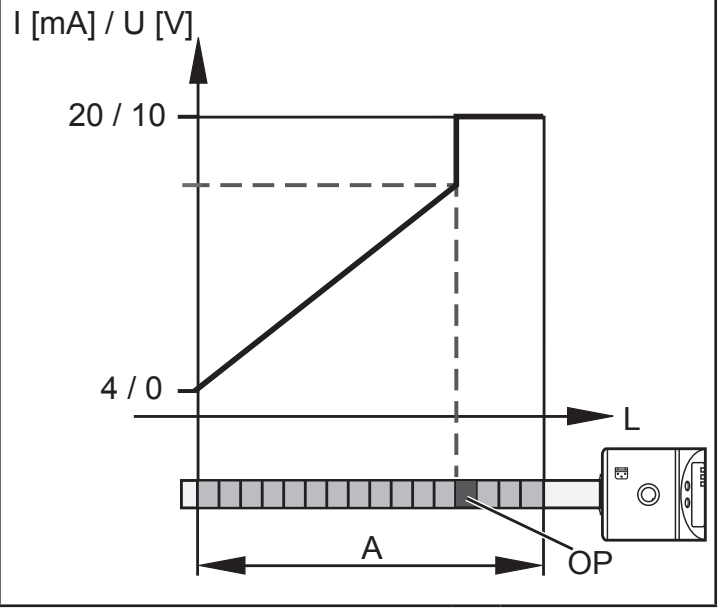
The unit provides an analogue signal proportional to level. The analogue output (OUT2) can be configured:

- [ou2] defines the output function of the analogue output: mA / V (→ 10.3.2).
- In case of an internal fault, the output signal reacts according to the parameters set in [FOU2] (→ 10.3.8).

5.4.1 Curve of the analogue signal with overflow prevention:

[OP] = [value ...] (overflow prevention OP activated)

[ou2] = [I] or [U]

Fig. 5-2	Fig. 5-3
OP positioned in the upper segment.	OP shifted downward.
	

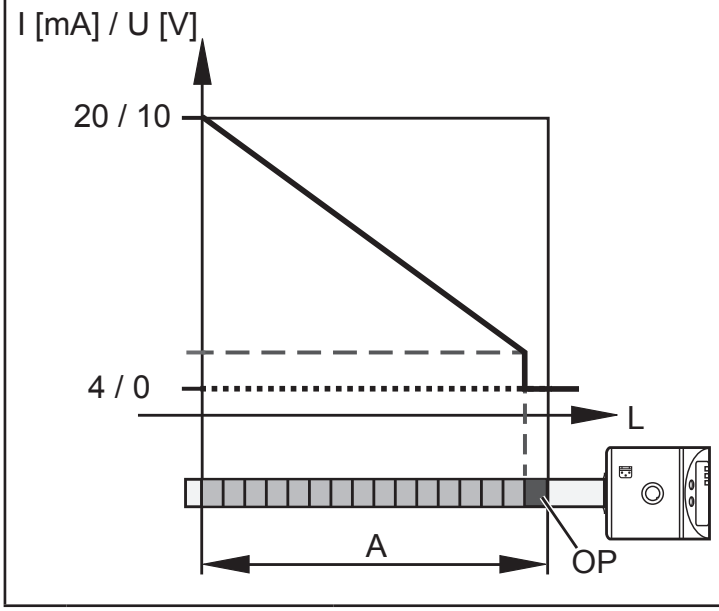
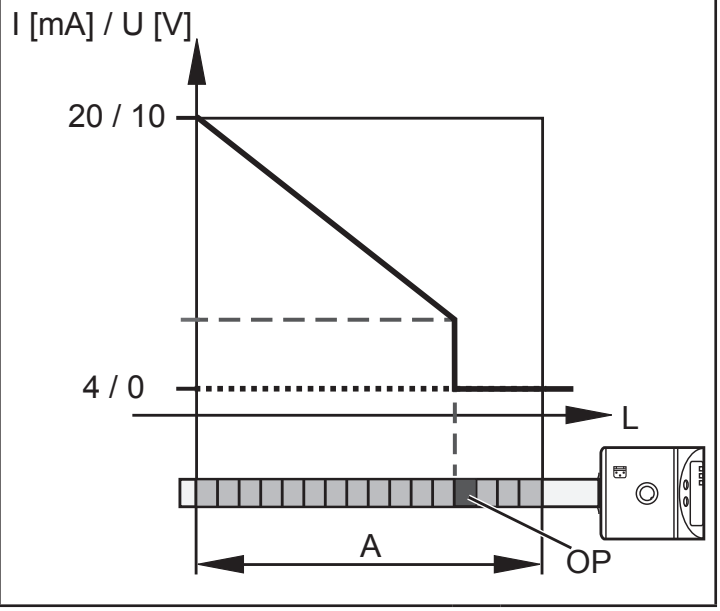
A: Active zone OP: Measuring segment overflow prevention OP L: Level

The measuring range is limited by the active measuring segment OP. If the level reaches the measuring segment OP, the output signal jumps to its maximum value (20 mA / 10 V).

The position of the measuring segment OP does not have any influence on the gradient of the curve.

[OP] = [value ...] (overflow prevention OP activated)

[ou2] = [InEG] or [UnEG]

Fig. 5-4	Fig. 5-5
OP positioned in the upper segment.	OP shifted downward.
	

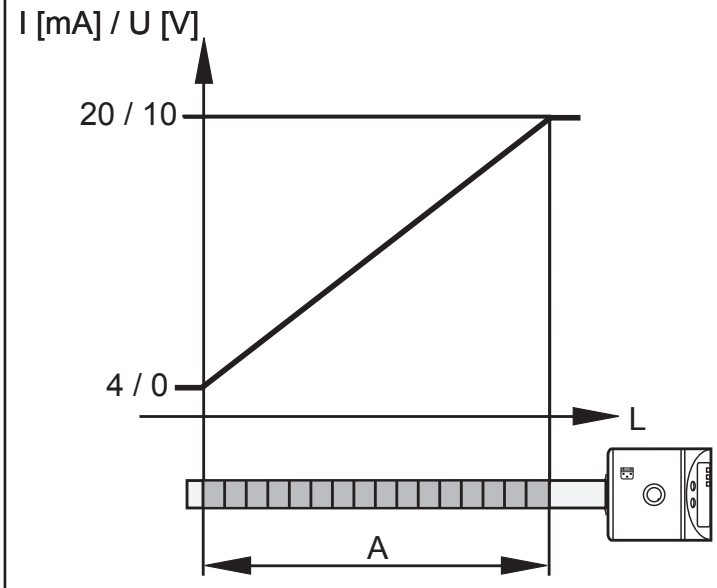
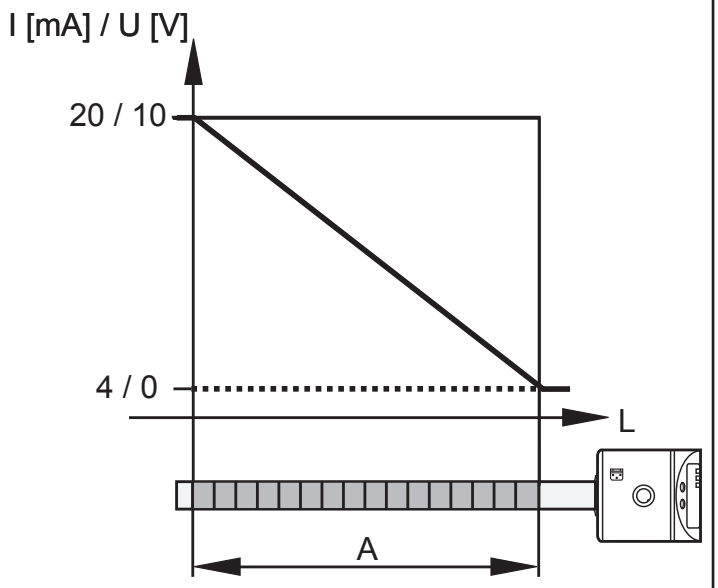
A: Active zone OP: Measuring segment overflow prevention OP L: Level

The measuring range is limited by the active measuring segment OP. If the level reaches the measuring segment OP, the output signal jumps to its minimum value (4 mA / 0 V).

The position of the measuring segment OP does not have any influence on the gradient of the curve.

5.4.2 Curve of the analogue signal without overflow prevention

[MEdI] = [Auto] or [OP] = [OFF] (overflow prevention OP deactivated)

Fig. 5-6	Fig. 5-7
[ou2] = [I] or [U]	[ou2] = [InEG] or [UnEG]
	

A: Active zone L: Level

[MEdI] = [Auto] or [OP] = [OFF]:
Operating mode with the lowest operational reliability (→ 5.2.1).

5.5 Switching functions

The unit signals via the switching output OUT1 that a set limit value has been exceeded or that the level is below the limit value.

Selectable switching functions:

- Hysteresis function / normally open (fig. 5-8): [ou1] = [Hno].
- Hysteresis function / normally closed (fig. 5-8): [ou1] = [Hnc].

First the set point [SP1] is set, then the reset point [rP1] with the required difference.

The hysteresis for the overflow prevention OP is fixed.

- Window function / normally open (fig. 5-9): [ou1] = [Fno].
- Window function / normally closed (fig. 5-9): [ou1] = [Fnc].

The width of the window can be set by means of the difference between [FH1] and [FL1]. [FH1] = upper value, [FL1] = lower value.

Fig. 5-8

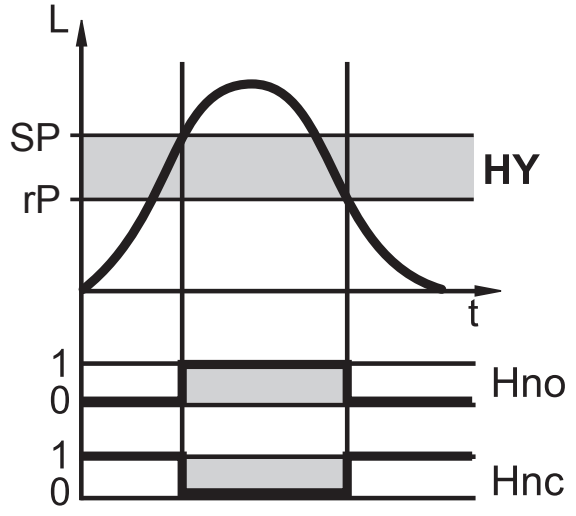
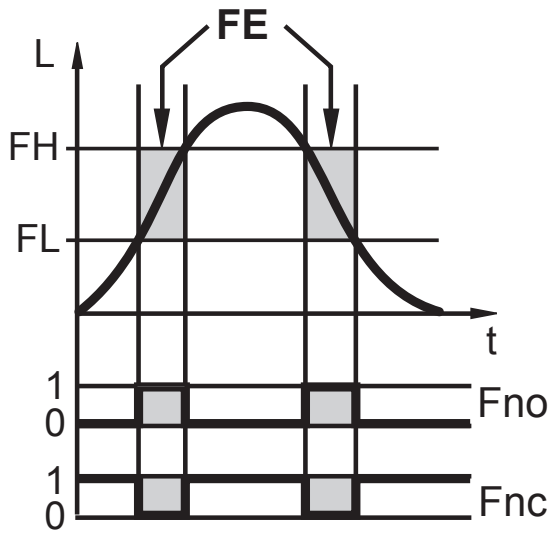


Fig. 5-9



L: Level
HY: Hysteresis
FE: Window

5.6 Offset for indicating the real level in the tank

The distance between tank bottom and lower edge of the measuring probe can be entered as offset value [OFS]. So display and switch points refer to the actual level (point of reference = tank bottom).

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 does not have any effect on the analogue output and the process value transmitted via IO-Link. The OFS parameter, however, is correctly transmitted via IO-Link and can therefore be taken into account.

More information → 5.8.

5.7 Defined state in case of a fault

In case of a fault a 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 a defined state. For this case the response of the outputs can be set via the parameters [FOU1], [FOU2] (→ 10.3.8).

5.8 IO-Link

This unit has an IO-Link communication interface which requires an IO-Link-capable module (IO-Link master) for operation.

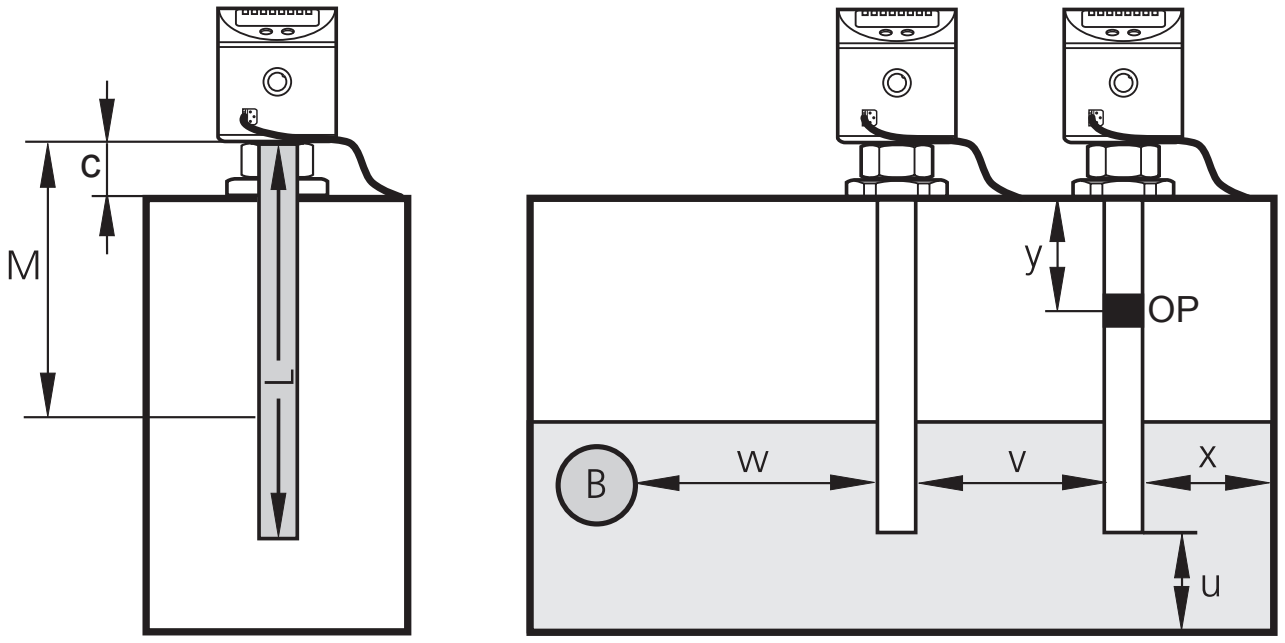
The IO-Link interface enables direct access to the process and diagnostic data and provides the possibility to set the parameters of the unit during operation.

In addition communication is possible via a point-to-point connection with a USB adapter cable.

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.

6 Mounting

Fig. 6-1



L:	Probe length	u ... y:	Minimum distances
M:	Zone for mounting elements	OP:	Overflow prevention
c:	Maximum outside length	B:	Metal object inside the tank

Table 6-1

	LK3122		LK3123		LK3124	
	[cm]	[inch]	[cm]	[inch]	[cm]	[inch]
L (probe length)	26.4	10.4	47.2	18.6	72.8	28.7
M (mounting zone)	14.0	5.5	23.0	9.1	36.0	14.2
c (max. extension length)*						

* Applies to installation as shown (wall thickness of the tank lid was neglected; mounting element does not protrude inside the tank).
Otherwise note mounting zone M.

6.1 Installation instructions for operation with overflow prevention

[MEdI] = [CLW..] or [OIL..]

[OP] = [value ...] (overflow prevention OP activated)

It is permitted to fix the mounting elements within the mounting zone (M) (fig. 6-1).

- ▶ Observe the maximum permitted outside length (c) according to table 6-1.
- ▶ Observe the minimum distances according to fig. 6-1 and table 6-2.
- ▶ Observe the notes on the integrated overflow prevention.

The overflow prevention (OP) must:

1. be below the mounting element
2. be set at a minimum distance (y) to it.
   The minimum distance is measured between the lower edge of the mounting element and the OP value.

Table 6-2

	MEdI = CLW.1		MEdI = CLW.2, OIL.1		MEdI = OIL.2	
	[cm]	[inch]	[cm]	[inch]	[cm]	[inch]
x	2.0	0.8	3.0	1.2	4.0	1.6
u	1.0	0.4	1.0	0.4	1.0	0.4
y (LK3122)	2.5	1.0	3.5	1.4	4.5	1.8
y (LK3123)	4.5	1.8	5.5	2.2	6.5	2.6
y (LK3124)	6.0	2.4	7.0	2.8	8.0	3.2
v	4.5	1.8	4.5	1.8	4.5	1.8
w	4.0	1.6	5.0	2.0	6.0	2.4

Calculation aids for [OP] → 12.3

6.2 Installation instructions for operation without overflow prevention

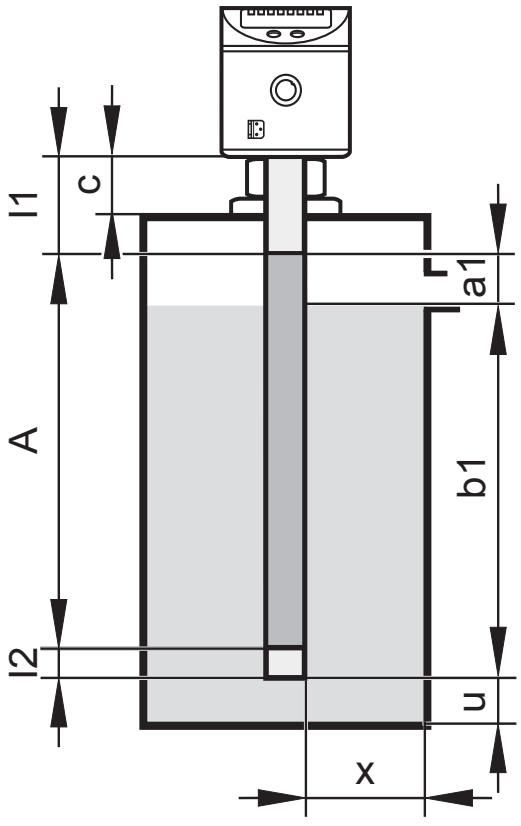
[MEdI] = [Auto] or [OP] = [OFF] (overflow prevention OP deactivated)

6.2.1 Installation in the inactive zone

Between the maximum level (b1) and the inactive zone (I1), the minimum distance (a1) must be adhered to (fig. 6-2 and table 6-3).

- ▶ Fix the unit using mounting elements in the inactive zone (I1). The outside length (c) must not exceed (I1) (table 6-3).
- ▶ Ensure that the maximum level (b1) is not exceeded after completed installation (table 6-3).
- ▶ Observe further minimum distances according to table 6-4.

Fig. 6-2



I1 / I2: Inactive zones

A: Active zone

a1: Minimum distance between the inactive zone (I1) and the maximum level (b1)

b1: Max. level from the lower edge of the sensor (without offset)

c: Max. permitted outside length (observe footnote table 6-1)

Table 6-3

	LK3122		LK3123		LK3124	
	[cm]	[inch]	[cm]	[inch]	[cm]	[inch]
I1	5.3	2.1	6.0	2.4	10.4	4.1
A	19.5	7.7	39.0	15.4	58.5	23.0
a1	1.0	0.4	1.5	0.6	2.5	1
b1	20.0	7.9	39.5	15.6	59.5	23.4

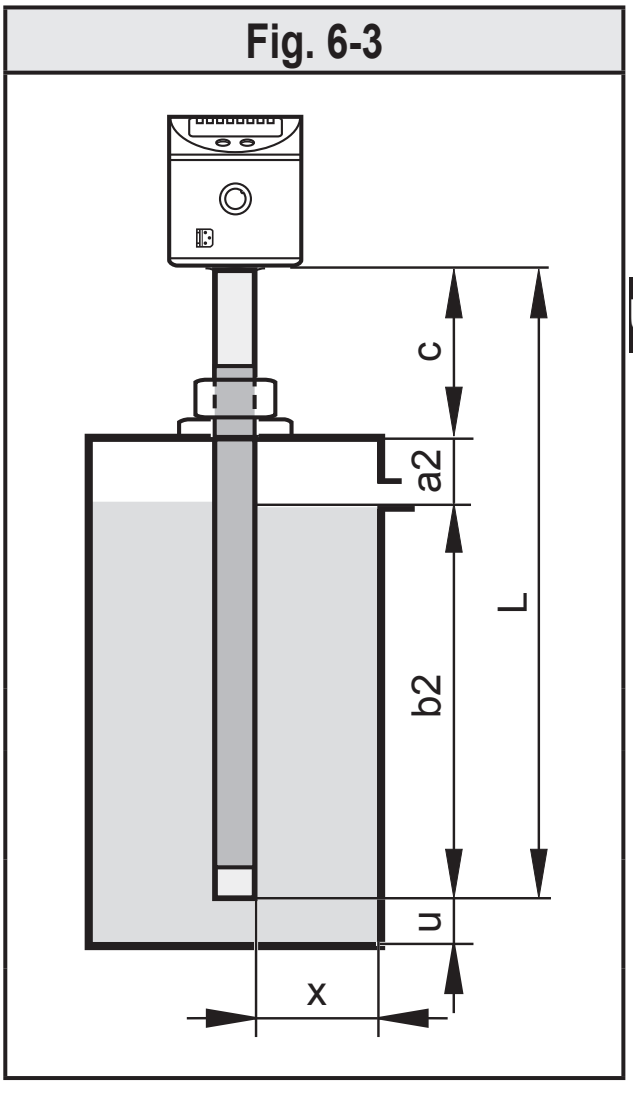
6.2.2 Installation in the active zone

Between the maximum level (b2) and the mounting element the minimum distance (a2) must be adhered to (fig. 6.3 and table 6-4).

- ▶ Fix mounting elements in the mounting zone (M) (fig. 6-1). Adhere to the maximum permitted outside length (c) (table 6-1).
- ▶ Ensure that the maximum level (b2) is not exceeded after completed installation:

  (b2) = (L) - (c) - (a2) (without offset)
- ▶ Observe further minimum distances according to table 6-4.

Fig. 6-3



c: Maximum permitted outside length (observe footnote table 6-1)

a2: Minimum distance between mounting element and maximum level (b2).

b2: Max. level from the lower edge of the sensor

Table 6-4

	MEdI = CLW.1		MEdI = CLW.2, OIL.1		MEdI = OIL.2 / Auto	
	[cm]	[inch]	[cm]	[inch]	[cm]	[inch]
x	2.0	0.8	3.0	1.2	4.0	1.6
u	1.0	0.4	1.0	0.4	1.0	0.4
a2 (LK3122)	2.0	0.8	2.5	1.0	3.0	1.2
a2 (LK3123)	4.0	1.6	4.5	1.8	5.0	2.0
a2 (LK3124)	6.0	2.4	7.0	2.8	8.0	3.2
v *)	4.5	1.8	4.5	1.8	4.5	1.8
w *)	4.0	1.6	5.0	2.0	6.0	2.4

*) → Fig. 6-1.

In case of automatic medium detection [MEdI] = [Auto] or deactivated overflow prevention [OP] = [OFF], the sensor reinitialises itself each time it is switched on and makes adjustments to the medium and the installation environment. The active zone / measuring range must not be completely covered by the medium. The indicated minimum distances ensure this. Too short a distance may lead to maladjustments and malfunctions.

6.3 Other installation notes

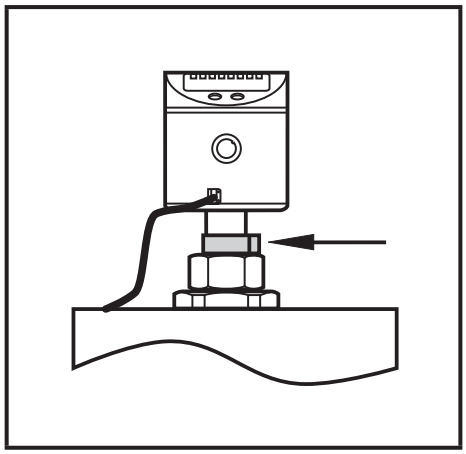
- For mounting in plastic pipes/plastic tanks, the inside diameter must at least be 12 cm (4.8 inches). Install sensor in the centre.
- For mounting in metal pipes the inside pipe diameter (d) must be at least:

Table 6-5

	MEdI = CLW.1		MEdI = CLW.2, OIL.1		MEdI = OIL.2 / Auto	
	[cm]	[inch]	[cm]	[inch]	[cm]	[inch]
d	4.0	1.6	6.0	2.4	10.0	4.0

6.3.1 Marking of the installation height

▶ Fix the set installation height with the supplied stainless steel tube clip.



If the sensor is removed from the fixture for maintenance reasons, the clip serves as a limit stop when remounting the sensor. Thus an inadvertent maladjustment of the sensor is excluded. This is in particular necessary for the correct function of the overflow prevention OP.

▶ Fit the stainless steel tube clip using pliers.

▶ Ensure a safe fit.

▶ To remove the clip it has to be destroyed.

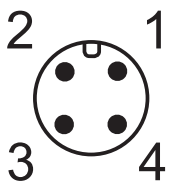
7 Electrical connection

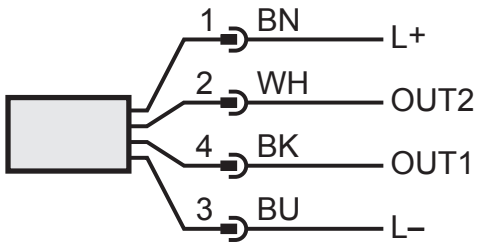
The unit must be connected by a qualified electrician.
The national and international regulations for the installation of electrical equipment must be adhered to.
Voltage supply according to EN 50178, SELV, PELV.

▶ Disconnect power.

▶ Connect the unit as follows:

Core colours	
BK	black
BN	brown
BU	blue
WH	white

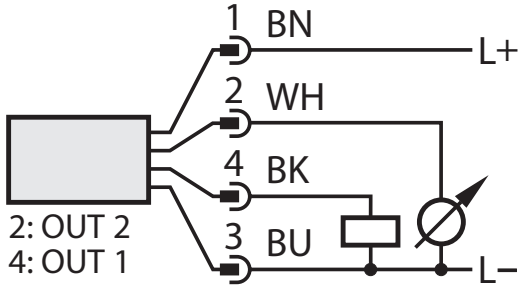




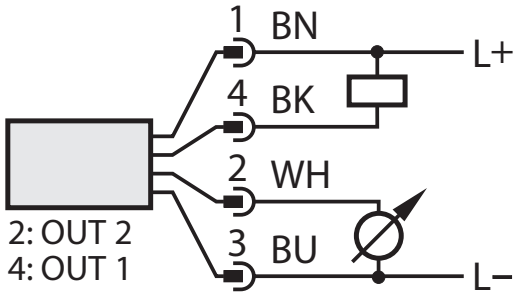
OUT1: switching output / IO-Link
OUT2: analogue output
Colours to DIN EN 60947-5-2

Example circuits

1 x positive switching / 1 x analogue



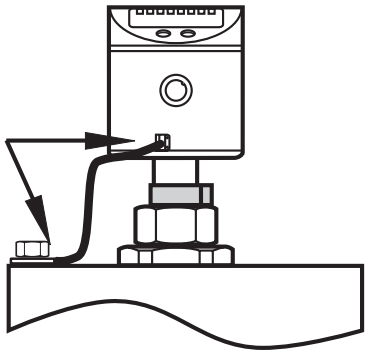
1 x negative switching / 1 x analogue



For a reliable function, the sensor housing must be electrically connected to the counter-electrode (grounding).

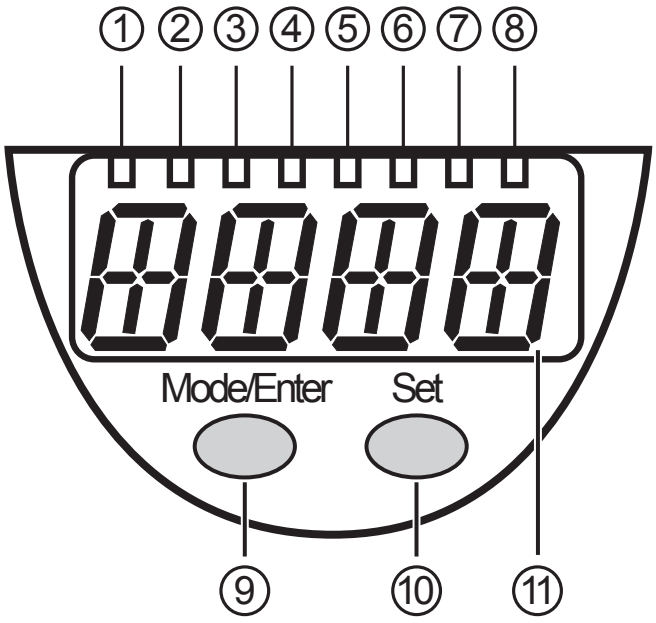
▶ Use the housing connection (see drawing) and a short piece of cable with a wire cross section of min. 1.5 mm².

When using metal tanks, the tank wall serves as the machine earth.
For plastic tanks, a counter-electrode must be provided, e.g. a metal plate inside the tank in parallel with the sensor probe. Adhere to minimum distances to the probe.



UK

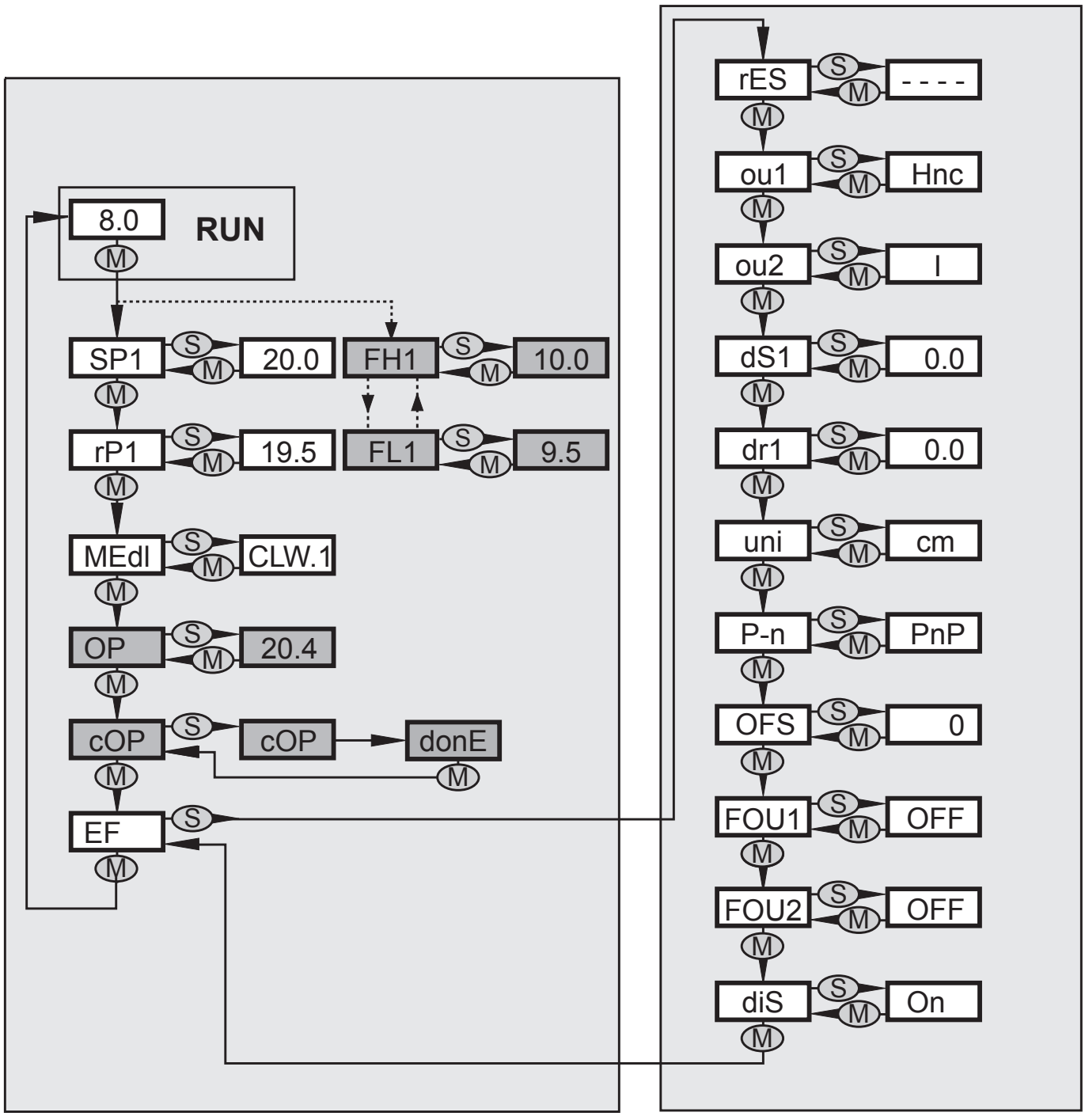
8 Operating and display elements



1 to 8: Indicator LEDs	
LED 1	Indication in cm.
LED 2	Indication in inches.
LEDS 3 - 7	Not used.
LED 8	Switching status OUT1 (lights when output 1 is switched).
9: [Mode/Enter] button	
- Selection of the parameters and acknowledgement of the parameter values.	
10: [Set] button	
- Setting of the parameter values (scrolling by holding pressed; incremental by pressing once).	
11: Alphanumeric display, 4 digits	
- Indication of the current level. - Indication of the parameters and parameter values. - Operation and fault indication.	

9 Menu

9.1 Menu structure

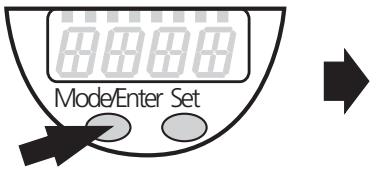
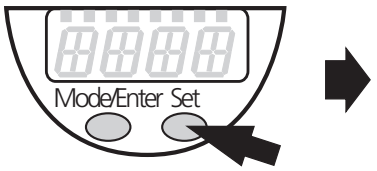
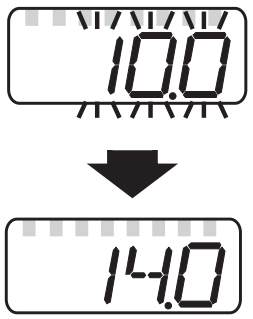
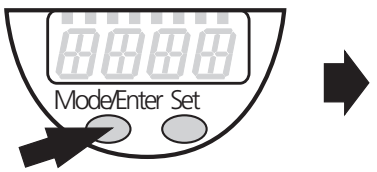


Menu items highlighted in grey,
e.g. [cOP], are only active when assigned parameters have been selected.

UK

10 Parameter setting

10.1 Parameter setting in general

1			▶ Press [Mode/Enter] until the required parameter is displayed. To select parameters in the extended menu (menu level 2): ▶ Select [EF] and briefly press [Set].
2			▶ Press and hold [Set]. > The current parameter value flashes for 5 s. > Value is increased* (step by step by pressing the button once or continuously by keeping the button pressed).
3			▶ Briefly press [Mode/Enter] (= confirmation). > The parameter is displayed again; the new parameter value becomes effective.
4	Change more parameters: ▶ Start again with step 1.		Finish the parameter setting: ▶ Wait for 30 s or press and hold [Mode/Enter]. > The current measured value is displayed. ▶ Release [Mode/Enter], > The parameter setting is finished.

*) Decrease the value: let the display move to the maximum setting value.
Then the cycle starts again at the minimum setting value.

Timeout: If no button is pressed for 30 s during programming, the unit returns to the operating mode with unchanged values (exception: cOP).

Lock / unlock: The unit can be locked electronically to prevent unauthorised setting (factory setting: not locked).

▶ Make sure that the unit is in the normal operating mode.

To lock the unit:

▶ Press both buttons simultaneously for 10 s.

> [Loc] is displayed.

To unlock the unit:

▶ Press both buttons simultaneously for 10 s.

> [uLoc] is displayed.

The unit can be configured before or after installation.
Exception: To adjust the overflow prevention [cOP], the unit must be installed in the tank.

10.2 Basic settings

Setting ranges of all parameters: → 12

Factory settings of all parameters: → 14

10.2.1 Set unit of measurement [uni]

▶ Enter [uni] before entering the values SPx, rPx, OP or OFS.
This avoids unintentional wrong settings.

▶ Select [uni] ▶ Determine unit of measurement: [cm] or [inch]	**uni**

10.2.2 Set offset [OFS]

The distance between tank bottom and lower edge of the measuring probe can be entered as offset value (→ 5.6).

▶ Set [OFS] before the values for SP1, rP1 or OP are entered.
This avoids unintentional wrong settings.

▶ Select [OFS]. ▶ Set the value for the offset. Note the set unit of measurement [uni].	**OFS**

10.2.3 Set medium [MEdI]

▶ Select [MEdI] ▶ Set sensitivity matching the medium to be detected: [CLW.1] = water, hydrous media, coolant emulsions. [CLW.2] = water, hydrous media, coolant emulsions for temperatures > 35 °C (installation in climatic tube). [OIL.1] = oils with an increased dielectric constant (e.g. some synthetic oils). [OIL.2] = oils with a low dielectric constant (e.g. mineral oils). [Auto] = automatic medium detection.	**MEdI**

▶ In case of doubt, select [OIL.2] for oils.

▶ Check proper functioning in an application test.

The settings [CLW.1] and [CLW.2] suppress deposits (e.g. metal swarf). The settings [OIL.1] and [OIL.2] suppress a bottom layer of higher dielectric water or swarf which is a few cm high. If no oil layer is present (or if it is very thin), the bottom layer is detected.

With the setting [MEdI] = [Auto], no overflow prevention is available. In that case, the menu points [OP] and [cOP] are not available.

10.2.4 Set overflow prevention [OP]

▶ Comply with minimum distances and installation instructions. ▶ Select [OP]. ▶ Define the position of the overflow prevention OP. The option [OP] = [OFF] **deactivates** the overflow prevention OP.	**OP**

▶ Set [OP] before [SP1] or [FH1].

> If [OP] is reduced to a value ≤ [SP1] / [FH1] after setting [SP1] / [FH1], [SP1] / [FH1] shifts downwards.

> If [OP] is increased, [SP1] / [FH1] also increases if [OP] and [SP1] / [FH1] are close together (1 x step increment).

If the overflow prevention is deactivated [OP] = [OFF] or [MedI] = [Auto], the reliable function of the sensor must be verified with particular care. Switch-on and switch-off processes and special operating states such as very full tanks, possible maintenance and cleaning operations are to be considered in the verification.

For setting [OP] = [OFF] the menu item [cOP] is not available.

10.2.5 Adjust overflow prevention [cOP]

Only adjust the overflow prevention OP when the unit is installed.

If possible, carry out the adjustment when the tank is empty.
The tank may be partly filled.

▶ Make sure that the overflow prevention OP is not covered by the medium. Observe the minimum distance between the overflow prevention OP and the level (→ table 10-1).

▶ Select [cOP]. ▶ Press [SET] and keep it pressed. > [cOP] flashes for some seconds; then the continuous display indicates that the adjustment is being made. > If the adjustment is successful, [donE] is displayed. ▶ Confirm with [Mode/Enter]. > If the adjustment is not successful, [FAIL] is displayed. ▶ If necessary, lower the level or correct the position of the overflow prevention [OP] and repeat the adjustment operation.	**cOP**

Minimum distance between the overflow prevention OP and the level during adjustment:

Table 10-1

	[cm]	[inch]
LK3122	2.0	0.8
LK3123	3.5	1.4
LK3124	5.0	2.0

The position of the overflow protection OP can be determined by calling up the parameter [OP]. Note the offset if necessary.

The current level is to be determined manually since the unit is not yet ready for operation before the adjustment.

When the overflow prevention is activated ([OP] = [value ...]), an adjustment [cOP] must be carried out each time:

- [MEdI] or [OP] was changed. In this case ≡≡≡≡ appears in the display.
- The installation position (height, orientation) was changed.
- The connection between the sensor and the tank ground (e.g. cable length) was changed.

With deactivated overflow prevention [MEdI] = [Auto] or [OP] = [OFF] it is necessary for the unit for applying the basic settings and adaptation to the medium and installation environment:

1. to be installed in the application
2. to be reinitialised.

▶ Switch the operating voltage off and on again.

10.3 Set output signals

10.3.1 Set output function [ou1] for OUT1 (switching output)

▶ Select [ou1] 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 If the switching output is used as an overflow prevention, the setting [ou1] = [Hnc] (normally closed function) is recommended. The principle of normally closed operation ensures that wire break or cable break is also detected.	**ou1**

10.3.2 Set output function [ou2] for OUT2 (analogue output)

▶ Select [ou2] and set the output function: [I] = current output 4...20 mA [U] = voltage output 0...10 V [InEG] = current output 20...4 mA (inverted) [UnEG] = voltage output 10...0 V (inverted)	**ou2**

10.3.3 Define switching limits [SP1] / [rp1] (hysteresis function)

▶ Make sure that the function [Hno] or [Hnc] is set for [ou1]. ▶ First set [SP1], then [rP1]. ▶ Select [SP1] and set the value at which the output switches.	**SP1**
▶ Select [rP1] and set the value at which the output is reset.	**rP1**

[rP1] is always lower than [SP1]. The unit only accepts values which are lower than [SP1]. If [SP1] is shifted, [rP1] also shifts provided that the lower end of the setting range is not reached.

10.3.4 Define switching limits [FH1] / [FL1] (window function)

▶ Make sure that for [ou1] the function [Fno] or [Fnc] is set. ▶ First set [FH1], then [FL1]. ▶ Select [FH1] and set the upper limit of the acceptable range.	**FH1**
▶ Select [FL1] and set the lower limit of the acceptable range.	**FL1**

[FL1] is always lower than [FH1]. The unit only accepts values which are lower than the value for [FH1]. If [FH1] is shifted, [FL1] also shifts provided that the lower end of the setting range is not reached.

10.3.5 Set switching delay [dS1] for switching output

▶ Select [dS1] and set the value between 0.0 and 60 s. The switching delay reacts according to VDMA.	**dS1**

10.3.6 Set switch-off delay [dr1] for switching output

▶ Select [dr1] and set the value between 0.0 and 60 s. The switching delay reacts according to VDMA.	**dr1**

10.3.7 Define switching logic [P-n] for switching output

▶ Select [P-n] and set [PnP] or [nPn].	**P-n**

10.3.8 Define response of the outputs in case of a fault [FOUx]

▶ Select [FOUx] and set value: [On] = Output switches ON in case of a fault. Analogue output switches on > 21 mA / 10 V in case of a fault. [OFF] = Output switches OFF in case of a fault. Analogue output switches on < 3.6 mA / 0 V in case of a fault. A fault is for example: defective hardware, too low a signal quality. Overflow is not considered to be a fault (→ 11.3).	**FOU1** **FOU2**

10.3.9 Configure display [diS]

▶ Select [diS] and set value: [On] = The display is switched on in the operating mode. Update of the measured values every 500 ms. [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 indicator LEDs remain active even if the display is deactivated.	**diS**

10.3.10 Reset all parameters to factory settings [rES]

▶ Select [rES]. ▶ Press and hold [Set] until [----] is displayed. ▶ Briefly press [Mode/Enter]. > The unit reboots and the factory settings are restored.	**rES**

11 Operation

After power on, the unit is in the operating mode (= normal operating mode).
It carries out its measurement and evaluation functions and generates output signals according to the set parameters.

▶ Check whether the unit operates correctly.

11.1 Operating indicators

Table 11-1	
[----] (continuous)	Initialisation phase after power on.
[numerical value] + LED 1	Current level in cm.
[numerical value] + LED 2	Current level in inch.
LED 8	Switching status OUT1 (lights when output 1 is switched).
[----]	Level below the active zone.
[FULL] + [numerical value] alternately	The overflow prevention OP is reached (overflow warning) or the level is above the active zone.
≡≡≡≡	Adjustment [cOP] of the overflow prevention OP necessary.
[Loc]	Unit locked via buttons; parameter setting is not possible. 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.

11.2 Read set parameters

▶ Briefly press [Mode/Enter] (if required, repeat several times).

> Menu structure is scrolled until the required parameter has been reached.

▶ Briefly press [Set].

> Respective parameter value is displayed for 30 s.

11.3 Error indications

Table 11-2		
	Possible cause	Recommended measures
[Err]	Fault in the electronics.	▶ Replace the unit.
[SEnS]	• Interfering sources (e.g. EMC) • Poor cables • Supply voltage disturbed	▶ Check electrical connection. ▶ Check connection between the sensor and the tank ground.
[FAIL]	Error during adjustment of the overflow prevention OP: • Overflow prevention covered by the medium during adjustment. • Overflow prevention soiled. • Minimum distances too short • Mounting element detected below the overflow prevention. • Measured value not constant.	▶ Lower the level, if possible. ▶ Clean the probe. ▶ Observe the notes on installation. ▶ Correct the position of the overflow prevention OP. ▶ Repeat the adjustment. ▶ Deactivate OP (→ 5.2.1)
[SC1] + LED 8	Flashing: short circuit in switching output OUT1.	▶ Remove the short circuit.
[PArA]	Faulty data set.	▶ Reset to factory settings [rES].

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11.4 Output response in different operating states

Table 11-3		
	OUT1	OUT2*
Initialisation phase	OFF	0 mA
Overflow prevention OP not adjusted	OFF	3.5 mA
Overflow prevention OP adjusted or deactivated, normal operation	according to process value and [ou1] setting	according to process value 4...20 mA
Fault	OFF with [FOU1] = [OFF] ON with [FOU1] = [On]	< 3.6 mA with [FOU2] = [OFF] > 21 mA with [FOU2] = [On]
* If the output function [ou2] = [I] has been selected		

12 Technical data

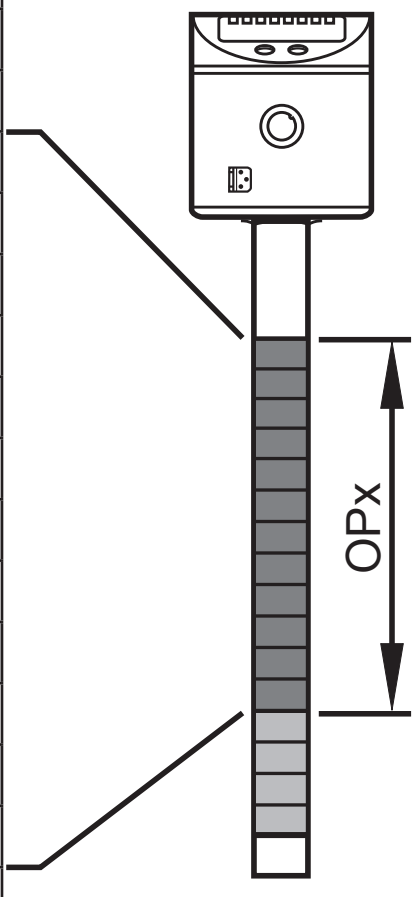
Technical data and scale drawing at www.ifm.com.

12.1 Setting values [OFS]

Table 12-1				
	[cm]		[inch]	
Setting range	0...200.0		0...78.8	
	LK3122 LK3123	LK3124	LK3122 LK3123	LK3124
Step increment	0.5	1	0.2	0.5

12.2 Setting values [OP]

Table 12-2					
LK3122		LK3123		LK3124	
[cm]	[inch]	[cm]	[inch]	[cm]	[inch]
20,4	8,0	40,7	16,0	61	23,9
19,1	7,5	38,3	15,1	57	22,4
17,9	7,1	35,8	14,1	53	21,0
16,7	6,6	33,4	13,1	50	19,5
15,5	6,1	31,0	12,2	46	18,1
14,3	5,6	28,5	11,2	42	16,7
13,0	5,1	26,1	10,3	39	15,2
11,8	4,7	23,6	9,3	35	13,8
10,6	4,2	21,2	8,3	31	12,3
9,4	3,7	18,8	7,4	28	10,9
8,2	3,2	16,3	6,4	24	9,5
6,9	2,7	13,9	5,5	20	8,0



OPx: setting range [OP]

The indicated values for [OP] refer to the distance between OP and the lower edge of the probe.

The values apply if [OFS] = [0].
With [OFS] > [0] the values increase by the set OFS value.

Example LK3122: According to table 12-2 OP is set to segment 20.4 cm.
[OFS] = 7.0 cm
[OP] is set to 20.4 cm + 7.0 cm = 27.4 cm.

12.3 Calculation aids [OP]

For proper functioning of the overflow prevention OP the minimum distance (y) (fig. 12-1) must be observed (→ 6.1).

The following applies (fig. 12-1):

B + c = L + u and **B = z + y**	B: tank height c: outside length (maximum → 6) y: required response level OP from the cover (minimum → 6.1, maximum → 12.2).	L: probe length u: distance between probe and tank bottom z: required response level OP from the bottom (maximum: z < L - c - y or z < B - y).

12.3.1 Definition “from the cover“

Required distance (y) of the overflow prevention OP “from the cover“ is defined.

- Without offset ([OFS] = [0]): [OP] = L - c - y
- With offset ([OFS] = u):

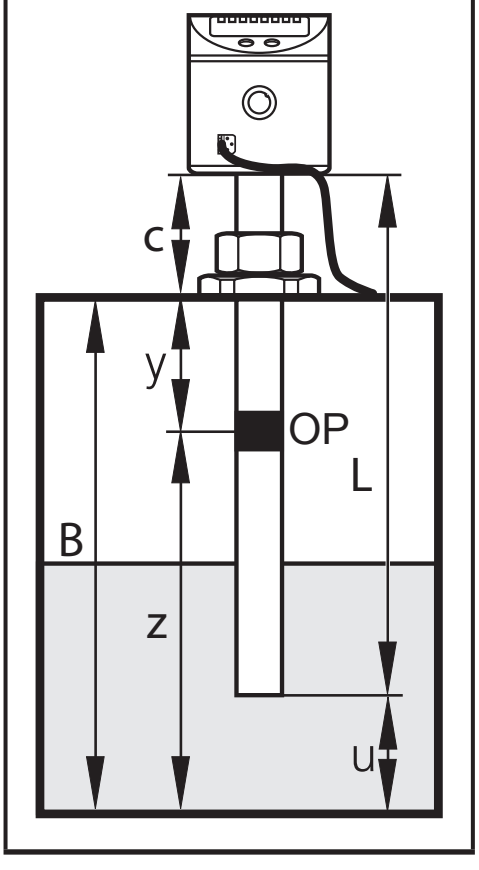
Example LK3122:

c = 3.0 cm, y = 5.0 cm, u = 1.0 cm

Without offset: [OP] = 26.4 cm - 3.0 cm - 5.0 cm
= 18.4 cm

With offset: [OP] = 26.4 cm - 3.0 cm - 5.0 cm - 1.0 cm
= 19.4 cm

Fig. 6-3



12.3.2 Definition “from the bottom“

Response level (z) of the overflow prevention OP from the tank bottom is defined.

- Without offset ([OFS] = [0]): [OP] = z - u
- With offset ([OFS] = u): [OP] = z

Example:
z = 18.0 cm (from the tank bottom), u = 1.0 cm
Without offset: [OP] = 18.0 cm - 1.0 cm = 17.0 cm
With offset: [OP] = 18.0 cm

Round the calculated value to the next lower adjustable value → 12.2.

12.4 Setting ranges switching limits for level

Table 12-3

	LK3122		LK3123		LK3124	
	[cm]	[inch]	[cm]	[inch]	[cm]	[inch]
[SP1] / [FH1]	2.5...20.0	1.0...8.0	3.5...39.0	1.4...15.4	6...59	2.5...23.5
[rP1] / [FL1]	2.0...19.5	0.8...7.8	3.0...38.5	1.2...15.2	5...58	2.0...23.0
Step increment	0.5	0.2	0.5	0.2	1	0.5

The values apply if [OFS] = [0].
If OFS > 0 they increase by the set OFS value.

Example: [SP1] = 20.0 cm
[OFS] = 7.0 cm

Value displayed when the switch point is reached:
display = 20.0 cm + 7.0 cm = 27.0 cm

13 Maintenance / cleaning / change of medium

When removing or installing the unit for maintenance and cleaning:

▶ Make sure that the stainless steel tube clip is fixed to the sensor.

> It must be possible to exactly reproduce the installation height and position.

▶ Remove the sensor and clean it / carry out maintenance.

▶ Install sensor exactly in the same position as before. Otherwise check the parameter [OP] and carry out [cOP] once again.

13.1 Maintenance information for operation without overflow prevention

[MEdI] = [Auto] or [OP] = [OFF] (overflow prevention OP deactivated)

The unit must be reinitialised in the following cases (switch the operating voltage briefly off and on again):

- After all maintenance operations.
- After cleaning operations (e.g. water jet cleaning of the sensor probe).
- If the sensor was removed from the tank and then installed again during operation.
- If the active zone of the sensor was touched with the hand or grounded objects (e.g. a screwdriver, a cleaning lance).
- If the connection between the sensor and the tank wall/counter-electrode was changed.
- After a change of the medium with considerably differing dielectric constants. For manual selection of media, first the [MEdI] setting needs to be adjusted.

14 Factory setting

	Factory setting			User setting
	LK3122	LK3123	LK3124	
SP1	20.0	39.0	59	
rP1	19.5	38.5	58	
OP	20.4	40.7	61	
MEdI	CLW.1			
cOP	----			
rES	----			
ou1	Hnc			
ou2	I			
dS1	0.0			
dr1	0.0			
uni	cm			
P-n	PnP			
OFS	0			
FOU1	OFF			
FOU2	OFF			
diS	On			