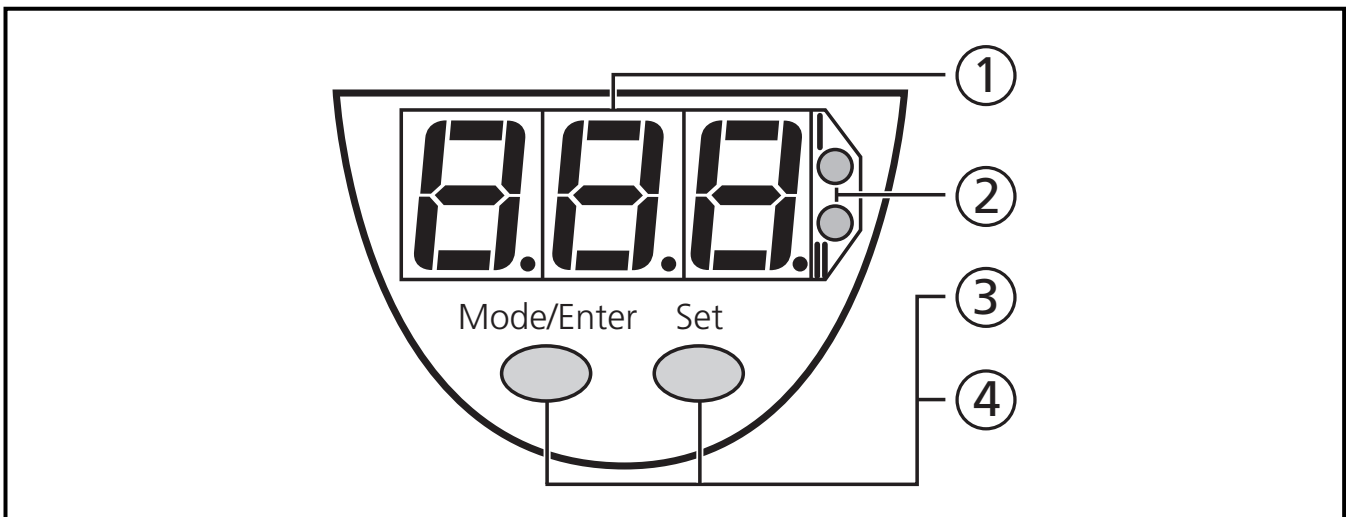


DEUTSCH

Controls and indicating elements



①	LED display	Indication of the level, indication of the parameters and parameter values.
②	2 x LED red	Switching status indication; lights if output I / II is switched I = operating switching output II = overflow switching output.
③	Mode / Enter pushbutton	Selection of the parameters and menu points, acknowledgement of the parameter values.
④	Set pushbutton	Setting of the parameter values (scrolling by holding pressed; incremental by pressing briefly).

Function and features

Applications

The level sensor LK12 was specially designed to meet the requirements of machine tool building. It is specially suitable for monitoring coolant emulsions (also dirty) as well as cutting and hydraulic oils.

Description of the function

- The sensor has 2 switching outputs.
 - a) The **operating output** (OUT1) with adjustable switch point (**SP1**) and reset point (**rP1**) can be used to control a pump, valve, etc. Four output functions are selectable:

- **Hno** = hysteresis / NO
- **Hnc** = hysteresis / NC
- **Fno** = window function / NO
- **Fnc** = window function / NC

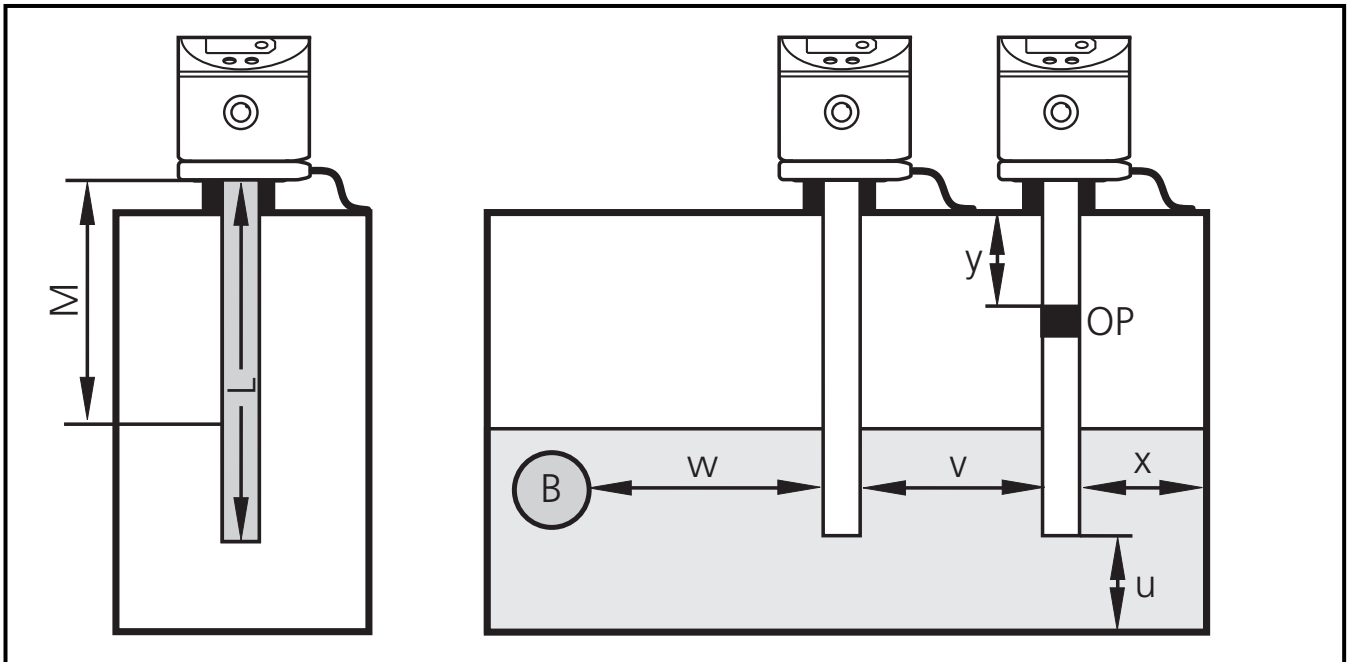
For specially long pump cycles a switch-off delay (**dr1**) of up to 5 s can be additionally set (only for hysteresis function).

- b) The **overflow output** OUT-OP works as an **independent overflow protection**. For safety reasons it is fixed to NC (normally closed principle). It is continuously monitored for its function. A measuring segment of the sensor probe is selected as overflow protection point OP (→ page 56) and assigned to the output OUT-OP. As soon as OP responds the overflow output opens and the operating output is switched according to its configuration in the same way as for the "full" state.
- The zone between tank bottom and lower edge of the measuring probe can be entered as **offset value (OFS)**. Thus display and switch points refer to the real level.
- The sensor can be adjusted to the medium used (→ page 55).
- Wave movements of the medium are smoothed.
- **Display** of the current level, unit cm (cm) or inch (in).

Restriction of the application area

- The sensor is not suitable for extremely conductive and adhering media, granulates and bulk materials, acids and alkalis. It is not suitable for food and electroplating applications.
- The sensor is not suitable for use in grinders.
- It is possible that foam of good conductivity is detected as level. Check the effects in your application.
- For water and hydrous media with temperatures > 35°C the unit must be mounted into a climatic tube (order no. E43100, E43101, E43102).

Mounting



	LK1222		LK1223		LK1224	
	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	5.5	23	9.1	36	14.2

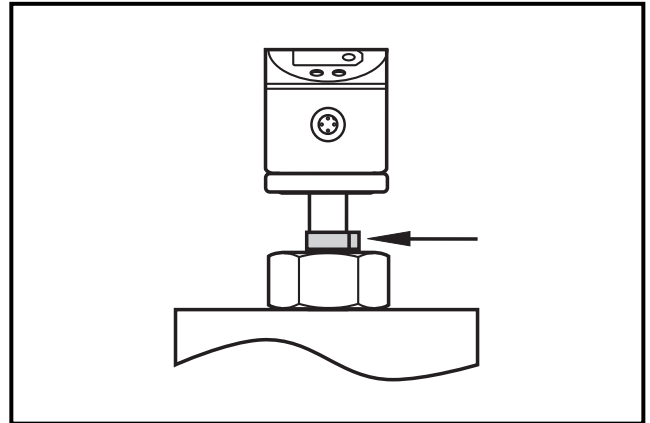
- Fasten mounting elements within zone M.
- Mounting elements must be fixed above the overflow switch point **OP** and at a minimum distance (y) to **OP**.
- The probe must comply with **minimum distances** to the tank wall, metallic objects in the tank (B), tank bottom and further level sensors. The distances x, y and w depend on the medium set (**med**).

	med = 1c		med = 2c, 1o		med = 2o	
	cm	inch	cm	inch	cm	inch
x	2.0	0.8	3.0	1.2	4.0	1.6
y (LK1222)	2.5	1.0	3.5	1.4	4.5	1.8
y (LK1223)	3.5	1.4	4.5	1.8	5.5	2.2
y (LK1224)	5.0	2.0	6.0	2.4	7.0	2.8
u	1.0	0.4	1.0	0.4	1.0	0.4
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

- For mounting in plastic pipes / plastic tanks the inside (pipe) diameter must be min. 120mm.

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 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 protection**.

The clip is fitted using common nipper pliers. Ensure a correct fit. To remove the clip, it must be destroyed.

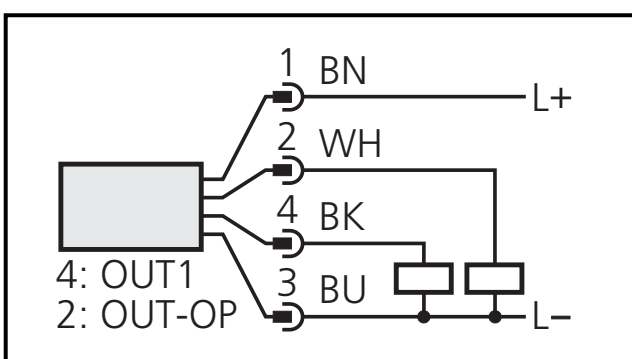
Electrical connection



The unit must be connected by a suitably qualified electrician. The national and international regulations for the installation of electrical equipment must be observed.

Voltage supply according to EN50178, SELV, PELV.

Disconnect power before connecting the unit as follows:



Core colours of ifm sockets:

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

OUT1 = operating output

OUT-OP = overflow output



For safe function the earthing ring must be connected to the vessel wall. Use short cables with a wire cross-section of min. 1.5mm².

When using metal tanks the electrical ground of the tank serves as the machine earth. When using plastic tanks an electrode has to be installed that is connected to the machine earth (e.g. sheet metal in the tank in parallel with the probe; min. distance to the probe: → page 50, distance x).

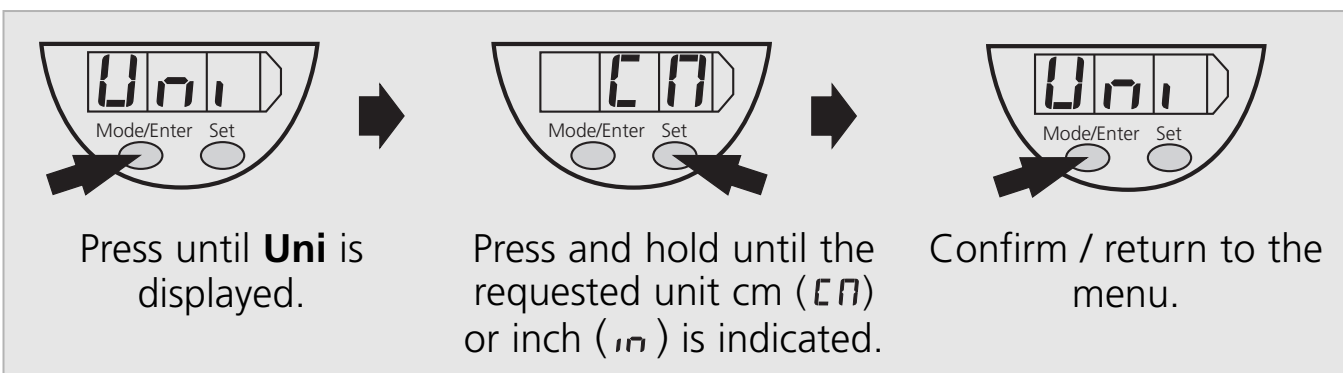
Programming

The sensor can be programmed before or after mounting.

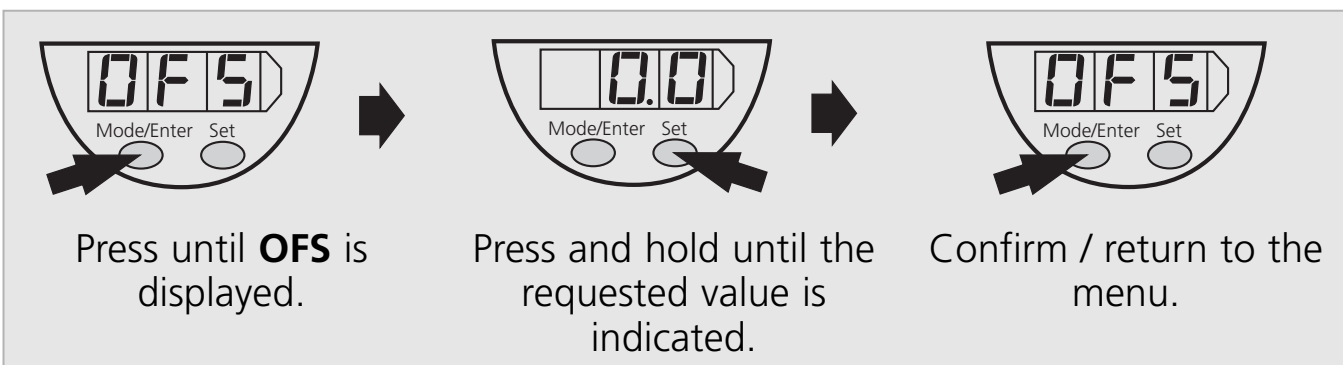
Exception: Empty adjustment must always be made when the sensor is mounted!

For programming carry out the following steps in the indicated order:

1. Selection of the display unit



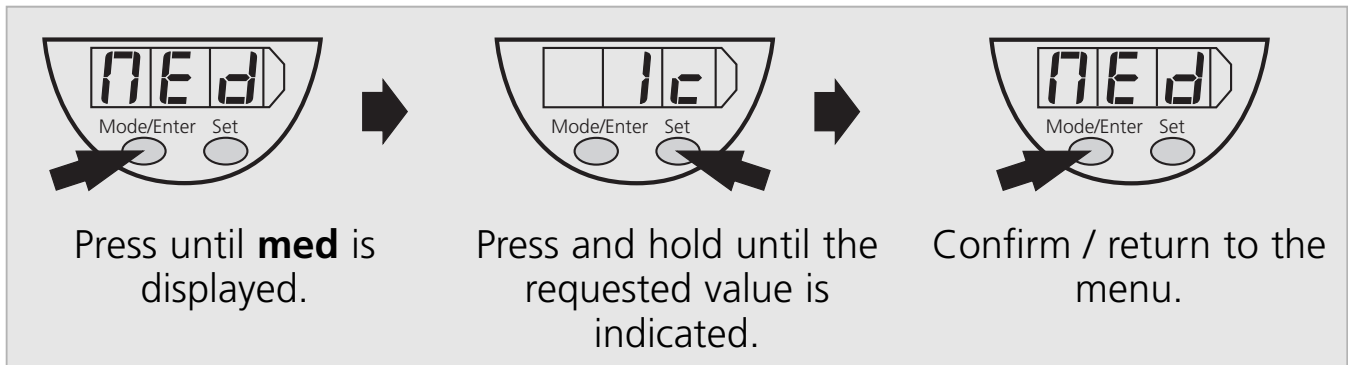
2. Input of the offset value



	LK1222		LK1223		LK1224	
	cm	inch	cm	inch	cm	inch
Setting range	0...78	0...30.6	0...57	0...22.4	0...186	0...73
in steps of	0.5	0.2	0.5	0.2	1	0.5

3. Setting to the medium

The sensitivity of the sensor (1 = low, 2 = high) and the mode (c = coolant, o = oil) can be set in 4 steps.



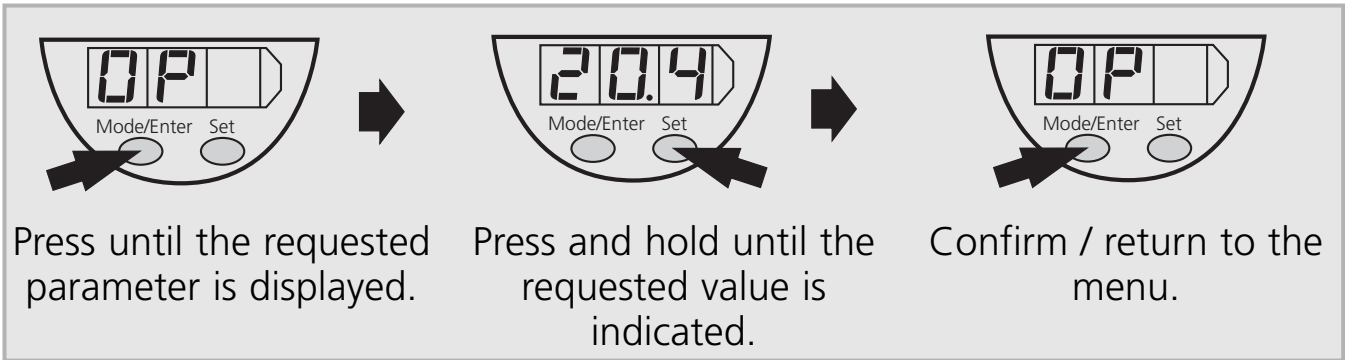
For these media ...	select the following option
Water, coolant emulsions, hydrous media	1c
Hydrous media with temperatures > 35°C / sensor mounted in the climatic tube (= ifm accessory)	2c
Special media, e.g. synthetic oils or media whose dielectric constant is between the dielectric constant value of oil and that of water*	1o
Mineral oils	2o

*Also select this setting if the medium is detected with 2o but on the whole the sensor sensitivity is too high.

In case of doubt ensure the correct function by performing **a test in your application.**

- If it is set to water and coolant emulsion (mode c), build-up (e.g. metal swarf) is suppressed.
- If it is set to oil (mode o), a bottom layer of higher dielectric water or swarf which is a few cm high is suppressed. If no oil layer is present (or if it is very thin), the bottom layer is detected.

4. Setting of the switching parameters



Set the parameters in the following order:

OP	Overflow switch point: position of the measuring segment used as overflow protection. Please observe the installation instructions and the indicated minimum distances, especially the distance between OP and the medium (→ page 52, 57).
SP1	Switch point: upper limit value at which the operating output changes its switching status.
rP1	Reset point: lower limit value at which the operating output changes its switching status.
OU1	Switching function for the operating output: 4 settings can be selected: hysteresis (H..) or window function (F..), as normally open (.no) or normally closed (.nc).
dr1	Switch-off delay for the operating output (only for hysteresis function), setting range: 0 ... 5s in steps of 0.2 s.

Setting values for OP

LK1222		LK1223		LK1224	
cm	inch	cm	inch	cm	inch
6.9	2.7	13.9	5.5	20	8.0
8.2	3.2	16.3	6.4	24	9.5
9.4	3.7	18.8	7.4	28	10.9
10.6	4.2	21.2	8.3	31	12.3
11.8	4.7	23.6	9.3	35	13.8
13.0	5.1	26.1	10.3	39	15.2
14.3	5.6	28.5	11.2	42	16.7
15.5	6.1	31.0	12.2	46	18.1
16.7	6.6	33.4	13.1	50	19.5
17.9	7.1	35.8	14.1	53	21.0
19.1	7.5	38.3	15.1	57	22.4
20.4	8.0	40.7	16.0	61	23.9

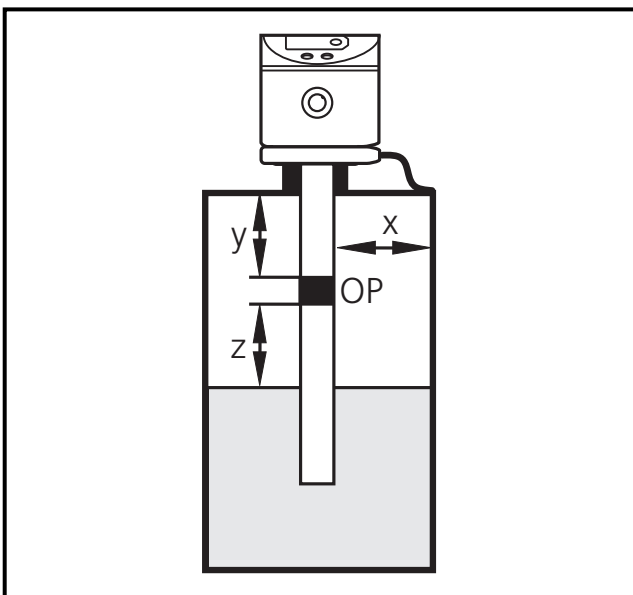
Setting range for SP1, rP1

	LK1222		LK1223		LK1224	
	cm	inch	cm	inch	cm	inch
SP1	2.5...19.0	1.0...7.6	4.0...39.0	1.4...15.2	6...58	2.5...22.5
rP1	2.0...18.5	0.8...7.4	3.5...38.5	1.2...15.0	5...57	2.0...22.0
ΔL^*	0.5	0.2	0.5	0.2	1	0.5

* ΔL = increments

- rP1 is always smaller than SP1, SP1 is always smaller than OP.
If the value for OP is reduced to a value \leq SP1, the position of SP1 is shifted. Reducing the value for SP1 to a value \leq rP1 also shifts the position of rP1.
- If the difference between rP1 and SP1 is small (approx. 3 x increment), increasing rP1 also increases SP1.
- If the difference between rP1 and SP1 is great, rP1 remains at the set value even if SP1 is increased.

5. Empty adjustment



Empty adjustment to adapt OP must be carried out when the sensor is mounted.

It is allowed that the tank is partly filled. Minimum distance (z) between OP and medium:

LK1222		LK1223		LK1224	
cm	inch	cm	inch	cm	inch
3.0	1.2	6.0	2.4	9.0	3.5


Ensure that the minimum distances x and y are adhered to (→ page 52).


Press until **cOP** is displayed.


Press and hold until the display no longer flashes.

If adjustment is successful, **rdy** is indicated. Return to the menu by pressing a pushbutton.

During adjustment the sensor checks the mounting situation. If for example the mounting situation is below the minimum distance, an error message is displayed (→ page 59, operating and error messages).

 The sensor can start its operation only after empty adjustment. If it is not carried out, the unit remains in the initialisation mode, `≡≡≡` is displayed.

 Furthermore, empty adjustment must be carried out each time when changing a sensitive parameter (setting to the medium, position of the overflow switch point). If the sensor detects relevant changes, `≡≡≡` is displayed.

 If the mounting situation (height, position) or grounding (e.g. length of the earthing cable) is changed, it is also absolutely necessary to make a new empty adjustment to ensure a correct function of the overflow protection. Caution: In this case empty adjustment is not required by the sensor by displaying `≡≡≡ !`

Timeout

If no pushbutton is pressed for 15s during the setting procedure, the unit returns to the Run mode with unchanged values (exception: **cOP**).

Locking / Unlocking

The unit can be electronically locked to prevent unwanted adjustment of the set parameters: In the Run mode press both programming buttons for 10s. As soon as the indication goes out the unit is locked or unlocked.

Units are delivered from the factory in the unlocked state.

With the unit in the locked state **Loc** is indicated briefly when you try to change parameter values.

Installation and set-up / Operation

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

Operating and error messages:

≡ ≡ ≡	Briefly after power on: initialisation. Continuously: empty adjustment required.
XX.X	Level indication, (maximum value when the overflow alarm responds).
- - -	Level below the active zone.
SC1 / SC2	Flashing: short circuit in the switching output 1 / 2.
Er0, Er2, Er7, Er8,	Fault in the electronics (the unit must be replaced).
Er1	OP segment dirty (clean the probe and carry out a reset) or faulty (the unit must be replaced).
Er3	Operational reliability not ensured (sources of interference, faulty wiring). Check the electrical connection, the connection sensor-vessel wall (→ page 53), and the mounting conditions.
Er4	Adjustment fault: distance between OP segment and the mounting elements or the medium too small. Please observe the installation instructions and the indicated minimum distances, especially the distance between OP and the medium (→ page 52, 57).
Er5	Adjustment fault: mounting element below OP segment detected. Please observe the installation instructions and the indicated minimum distances, especially the distance between OP and the medium (→ page 52, 57).
Er6	Adjustment fault: measured value not constant.

Resetting the error messages: carry out the empty adjustment again or power off and on again.

Response action of the overflow protection, output action in case of a fault

- The OP value refers to a complete measuring segment (set value = middle of the measuring segment). Typically the overflow output already switches when the OP segment is reached.
- The response of the overflow protection is indicated in the display as follows: **FULL** and the current level (= lower field limit of the OP segment) are indicated alternately in the display every 2 seconds.
- As soon as the overflow switch point OP is reached
 - the **overflow output** (OUT-OP) opens.
 - As SP1 is always below OP, SP1 is exceeded at this time. Therefore the **operating output** (OUT1) is switched according to its configuration in the same way as in the "full" state:
ON for output function **Hno** or **Fnc**,
OFF for output function **Hnc** or **Fno**.
- The overflow switch point OP has a fixed hysteresis of a few millimetres.
The **response time** when **switching on** the overflow alarm: typ. 450ms, max. 720ms.
The values apply to **med = 2o**. For the other settings much faster response times are partly achieved.
- State of the outputs in the initialisation mode or in case of a fault ("too full" is not considered to be a fault): OUT1 = OFF (not switched), OUT-OP = OFF (not switched).

Technical data

Operating voltage [V]	12 ... 30 DC
Current rating [mA]	200
Short-circuit protection; reverse polarity protection / overload protection	
Voltage drop [V]	< 2.5
Current consumption [mA]	< 60
Accuracy of switch point [% of the final value of the measuring range]	± 5
Repeatability [% of the final value of the measuring range]	± 2
Maximum speed of the change of level [mm/s]	
- LK1222	100
- LK1223	200
- LK1224	300
Dielectric constant medium	> 2
Maximum tank pressure [bar]	0.5
(when mounted with ifm mounting accessories)	
Housing material	EPDM/X (Santoprene); FPM (Viton); white bronze coated brass; NBR (Buna N); PBTP (Pocan); PC (Macrolon); PP (polypropylene); PA (polyamide)
Materials (wetted parts)	PP (polypropylene)
Protection	IP 67, III
Operating temperature [°C]	0 ... +60
Medium temperature [°C]	
- Oil	0...+65
- Coolant emulsions, water and hydrous media*	
- LK1222	0 ... +65
- LK1223	0 ... +60
- LK1224	0 ... +55
Storage temperature [°C]	-25 ... +80
Shock resistance [g]	12
Vibration resistance [g]	2.5
EMC	
EN 61000/4/2 ESD:	4/8 kV
EN 61000/4/3 HF radiated:	10 V/m
EN 61000/4/4 Burst:	2 kV
EN 61000/4/5 Surge:	500 V / 1 kV
EN 61000/4/6 HF conducted:	10

*For water and hydrous media with temperatures > 35°C install the unit into a climatic tube (order no. E43100, E43101, E43102).