

ifm electronic



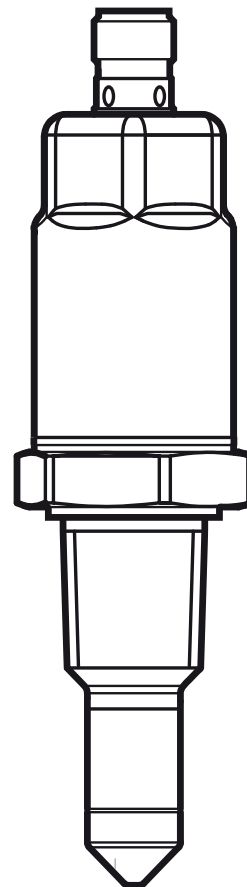
Operating instructions
Binary level sensor

efector160[®]

LMC502

UK

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1 Preliminary note

1.1 Symbols used

▶ Instructions

→ Cross-reference



Important note

Non-compliance can result in malfunction or interference.



Information

Supplementary note.

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2 Safety instructions

- Please read the product description prior to setup 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.
- Improper or non-intended use may lead to malfunctions of the unit or to unwanted effects in your application. That is why installation, electrical connection, set-up, operation and maintenance of the unit must only be carried out by qualified personnel authorised by the machine operator.
- In order to guarantee the correct condition of the device for the operating time the device must only be used in media to which the wetted parts are sufficiently resistant (→ Technical data).
- The responsibility whether the unit 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.

3 Functions and features

The unit monitors the level of liquid, viscous and powdery media in tanks and pipes. It can be used for limit detection and run-dry protection. The separate setting of two switching thresholds enables the detection of two different media (can be used, for example, for phase separation or differentiation of media).

3.1 Applications

- Detection of almost all media, even extremely adhering or non-conductive ones.
- The sensitivity is factory-set to water-based media (e.g. coolant emulsion, cleaning liquid). Easy setup possible without any programming (plug and play). The unit can be set so that it is also suitable for a number of applications (→ 7 Parameter setting / → 11 Factory setting).
- Available process connections: ½" NPT, other connections in preparation.

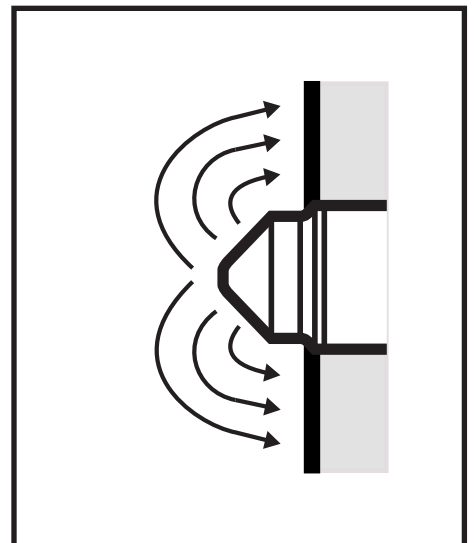
3.2 Restriction of the application area

- Not suitable for abrasive media (e.g. quartz sand) and heavy bulk material (e.g. stones).
- For use in aggressive media (acids and alkali):
 - ▶ Check the compatibility of the product materials beforehand (→ 10 Technical data and scale drawing).
- Media which are inhomogeneous separate from each other thus forming separation layers (e.g. oil layer on water):
 - ▶ Check the function by an application test.
- Air or gas bubbles in liquid media may lead to unwanted switching operations.
 - ▶ Check the function by an application test. If required, adapt the sensitivity or set switching delays (→ 7 Parameter setting).

4 Function

4.1 Measuring principle

The unit operates to the impedance spectroscopy method. It evaluates the electrical behaviour of the media to be monitored in the frequency range between 50 and 200 MHz. An electrical field is generated by the probe tip which is influenced by the level. The various media show characteristic behaviour. Also deposits or foam show significantly different behaviour.





In the factory setting the presence of certain media is detected, deposits or foam are suppressed. In many cases the factory setting is sufficient. For special applications it is also possible to adapt the sensitivity to the respective application (→ 7 Parameter setting).

4.2 Processing of the measured signals

Factory setting

Outputs OUT1 and OUT2 complement each other:

OUT1 = Hno; OUT2 = Hnc

No medium detected	OUT1 = OFF	OUT2 = ON
Medium detected	OUT1 = ON	OUT2 = OFF

The readiness for operation and the switching status are indicated by LEDs (→ 8 Operation).

4.3 Other features of the unit

- Highly resistant materials.
- Indication of the switching status and readiness for operation via LEDs.
- After power on the unit is immediately ready for operation.
- Streamlined sensor geometry, no blockage of the pipe, no pressure loss.
- Orientation-independent installation possible.
- Switching delay and switch-off delay adjustable from 0...10 s.
- IO-Link function (→ 4.4 IO-Link).



Adhere to the technical data sheet.

4.4 IO-Link

4.4.1 General information

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.

You will find more detailed information about IO-Link at www.ifm.com/uk/io-link.

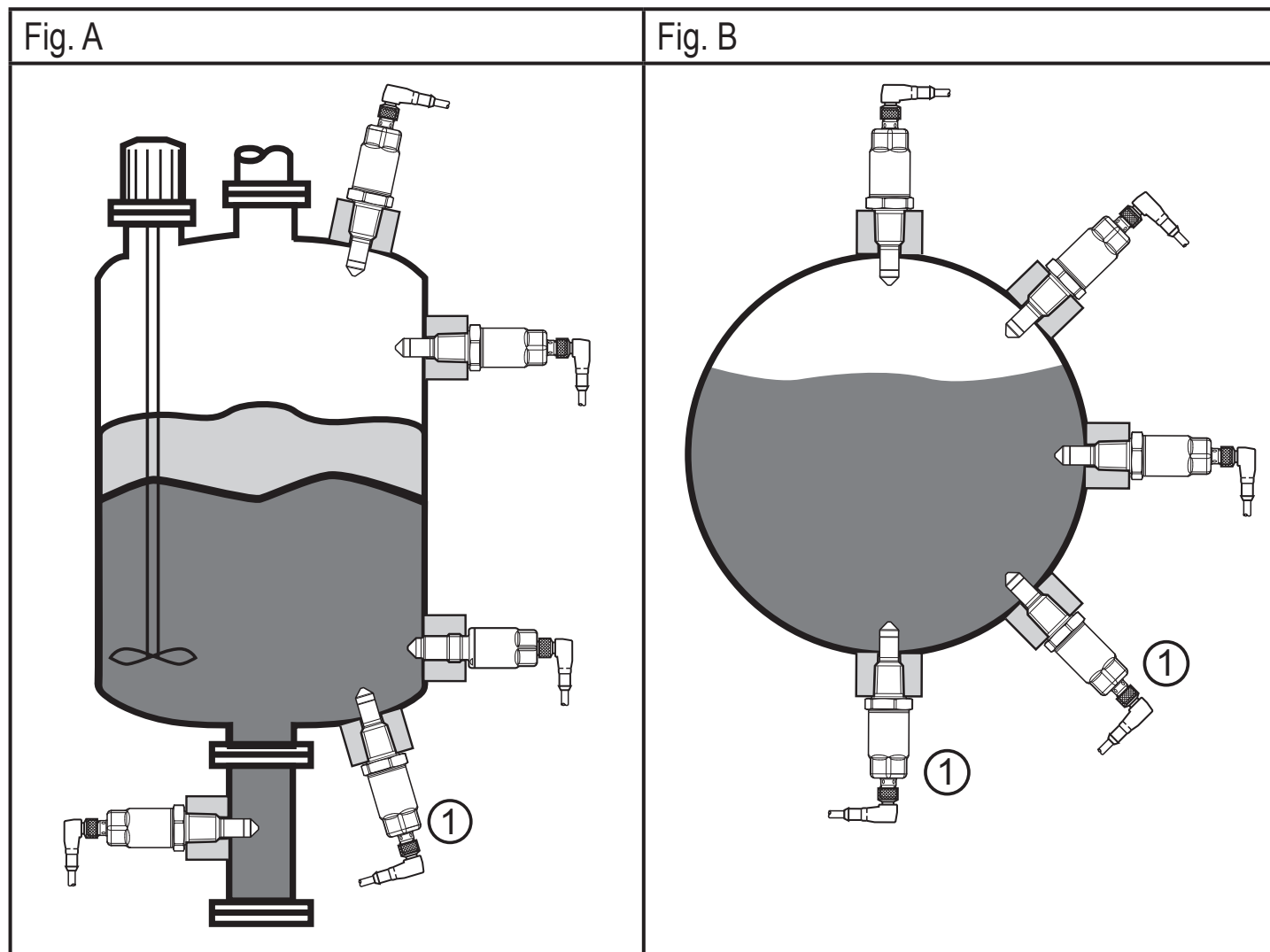
4.4.2 Device-specific information

You will find the IODDs necessary for the configuration of the IO-Link unit and detailed information about process data structure, diagnostic information and parameter addresses at www.ifm.com/uk/io-link.

4.4.3 Parameter setting tools

You will find all necessary information about the required IO-Link hardware and software at www.ifm.com/uk/io-link.

4.5 Application examples



1: Please note the warning!

The sensor can be installed in the following positions:

- Fig. A: Installation positions options in a tank (e.g. for point level detection or as run-dry protection).
- Fig. B: Fill level monitoring in pipes.



In case of strongly adhering and viscous media the installation positions (1) are only suited to some extent. Residues might be detected as level.

5 Installation



Before installing and removing the unit: Make sure that no pressure is applied to the system and there is no medium in the pipe or the tank. Also always note the potential dangers related to extreme machine and medium temperatures.

5.1 Installation location / environment

- Installation preferably in closed, metal tanks.



When installed in plastic tanks, there may be deterioration caused by electromagnetic interference.

- ▶ Check the function by an application test.
- ▶ In case of interference, take suitable measures (shielding, grounding etc.).



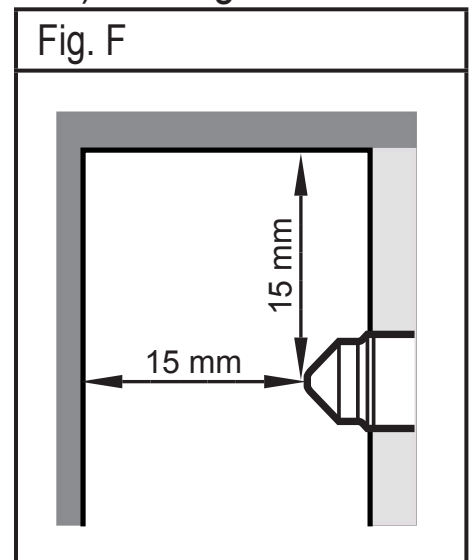
For use of process connections from other manufacturers:

- ▶ Ensure mechanical compatibility.

As a rule, ifm does not assume any responsibility for ingress resistance and function, in particular with non-existing compatibility, incorrect installation and non-observance of the relevant guidelines.

When mounted in restricted spaces (e.g. pipes, tank corners) or in agitators:

- ▶ To avoid malfunction and damage on sensor and plant, adhere to a distance of min. 15 mm to neighbouring objects (e.g. pipe/tank walls, structures, other LMT sensors) (fig. F).
- ▶ Observe the respective installation depth of the probe.



Protect the probe tip against direct sunlight (UV radiation).

5.2 Installation process

The unit has a self-sealing internal 1/2" NPT thread and requires a matching process connection.

If an adapter is used:

- ▶ Observe the installation instructions of the adapter used.
- ▶ Ensure cleanliness of the connections. In case of damages replace the unit or the adapter.
- ▶ Weld or install the adapter.

Installation of the unit

- ▶ Slightly grease the thread using a lubricating paste which is suitable and approved for the application.



Make sure that the sensor is in electrical contact with the metal process connection when additional sealing material (e.g. PTFE tape) is used.

- ▶ Screw the sensor into the adapter and tighten.
Max. tightening torque: 50 Nm.
- ▶ After installation check the tank / pipe for ingress resistance.

6 Electrical connection

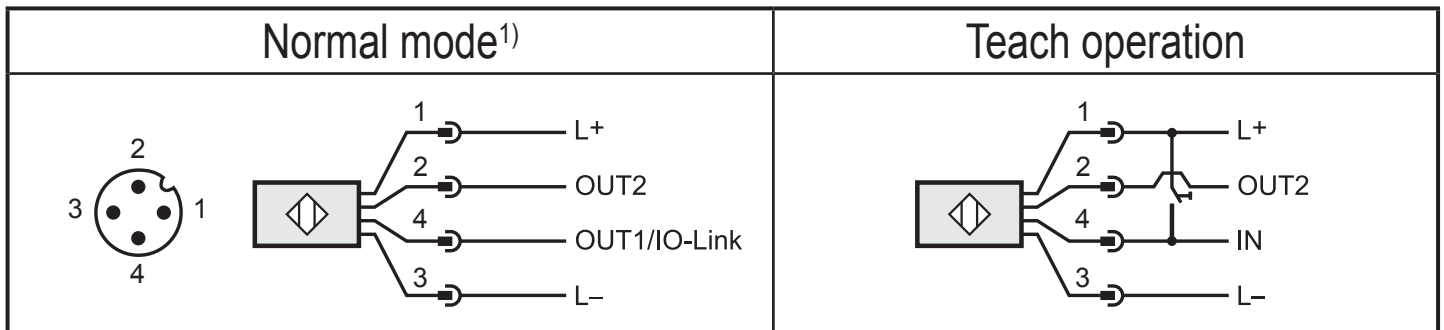


The unit must be connected by a qualified electrician.

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

Voltage supply to EN 50178, SELV, PELV.

- ▶ Disconnect power.
- ▶ Connect the unit as follows:



¹⁾ Factory setting

Pin	Connection	Core colours for ifm sockets
1	Ub+	Brown
3	Ub-	Blue
2 (OUT2)	pnp / npn switching signal	White
4 (OUT1)	<ul style="list-style-type: none"> • pnp / npn switching signal • IO-Link • Input for teach signal 	Black



Factory setting OUT1 and OUT2: pnp switching signal



In the factory setting, the teach operation is deactivated.

For activation: (→ 7.3 Parameter setting via the teach input).

- Only output OUT2 is available in the teach mode.



Information about available sockets/plugs at www.ifm.com → Connection technology → Sockets.

7 Parameter setting



In the factory setting the presence of certain media is detected, deposits or foam are suppressed. In many cases the factory setting is sufficient (→ 3.1 Applications). For special requirements it is possible to adapt the sensitivity and other functions to the application. Splashes, wave movements and air bubbles can be compensated by setting a switching delay, for example.

The parameters can be set prior to installation and setup of the unit or while in operation.



If you change parameters during operation, this will influence the function of the plant.

- ▶ Ensure that there will be no malfunctions in your plant.

The following subchapters describe the three different parameter setting options of the unit.

7.1 Parameter setting via PC


For parameter setting an IO-Link software is necessary (e.g. "LINERECORDER SENSOR" or "ifm Container"). USB interfaces, order no. E30396 or E30390, are available for the connection of the sensor via the USB interface.



The program library of the available DTM objects, the IO Device Description (IODD) and the FDT service program "ifm Container" can be downloaded at www.ifm.com → Service → Download.

The following parameters can be set:

SPx / rPx	Sensitivity of the set points (SPx) and reset points (rPx) for outputs OUT1 and OUT2. The values for SPx / rPx are set in per cent of the maximum process value. The process value is defined as follows: Process value in air = 0 % Process value in tap water = 100 % Minimum hysteresis: 2 % Reference values:	
	Aqueous / water-based media:	SPx = 62 %, rPx = 54 % (factory setting)
	Media with low water content:	SPx = 35 %, rPx = 29 %
	Oils, fats, powdery media:	SPx = 8 %, rPx = 5 %
OUx	Output function for OUTx: - [Hno] = hysteresis function/NO - [Hnc] = hysteresis function/NC - [Fno] = window function/NO - [Fnc] = window function/NC OUT1: - [Tch] = configure pin 4 as input for the teach signal	
TSP1	Teach to medium 1 • Full adjustment to the medium 1 to be detected, automatically sets the switching thresholds SP1 / rP1 for OUT1.	
TSP2	Teach to medium 2 • Full adjustment to the medium 2 to be detected, automatically sets the switching thresholds SP2 / rP2 for OUT2.	
FOUx	Response of the outputs OUTx in case of a fault.	
dFo	Delay time for switching response in case of a fault. Setting range 0...5 s. Step increment 0.2 s	
dsx	Switching delay for OUTx. Setting range 0...10 s. Step increment 0.2 s.	
drx	Switch-off delay for OUTx. Setting range 0...10 s. Step increment 0.2 s.	
P_n	Switching logic for the outputs (pnp or npn)	

The following parameters can be set:	
rES	Restore the factory setting
COd 0	<p>Access code for menu level 1 Menu level 1 contains all parameters listed. After activation of this access code the unit is completely protected against unauthorised changes.</p> <p> In case of loss of the valid code, parameter setting is not possible! Therefore store the code carefully!</p>
COd 1	<p>Access code for menu level 2 Menu level 2 contains the menu items FOU, ds, dr, P_n, dFo, rES and COd. After activation of this access code only these parameters are protected against unauthorised changes.</p>

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7.2 Parameter setting via the memory plug

Parameters can be set quickly and easily via a correctly set memory plug (order no. E30398). To do so, a suitable parameter set must be loaded to the memory plug (e.g. via a PC).



The memory plug can also be used to save the current parameter setting of a unit and to transfer it to other units of the same type.

You can find more information about the memory plug in the technical documentation (available free of charge at www.ifm.com).

7.3 Parameter setting via the teach input



In the teach mode the functionality is restricted, only output OUT2 is available. During teach operation, the LEDs indicate the switching status of output OUT2.

7.3.1 Requirements

The teach input must be activated. To do so, there are two options:

- Via the IO-Link software (→ 7.1 Parameter setting via PC).
- Via the memory plug (→ 7.2 Parameter setting via the memory plug).



Output OUT2 must be configured as hysteresis function (Hnc or Hno). Another configuration causes an error during the teach process (→ 7.3.4 Fault during the setting process).

The teach process itself is carried out by applying Ub+ to pin 4 (→ 6 Electrical connection).



The tool which is available for this process is the teach button (order no. E30405).

7.3.2 Set to the full vessel

With the full adjustment the sensitivity of the unit can be set to the medium to be detected in an optimum manner (this suppresses deposits and foam):

- ▶ Fill the tank until the probe tip is completely covered.
- ▶ Apply Ub+ to pin 4 for > 2 ... < 5 s (T1).
- > LEDs flash with 2 Hz (▬▬▬▬).
- > After the teach process, the LEDs light for 2 s; then the colours change to regular operating mode (table → 7.3.3).

7.3.3 Changing the output function

Output OUT2 can be changed from "NC" (Hnc) to "NO" (Hno) and vice versa. Only the hysteresis functions (Hnc / Hno) are available, the parameters for the window functions can only be set via IO-Link:

- ▶ Apply Ub+ to pin 4 for > 5 ... < 10 s (T1).
- > LEDs flash with 2 Hz first (┌┐┌┐), after 5 s it double flashes at 1 Hz (┌┌┐┌).
- > After the change, the LEDs light for 2 s; then the colours change to regular operating mode (table below).
- > After the change, the LEDs light depending on the level as follows:

No medium detected	LEDs = yellow (with Hnc)	LEDs = green (with Hno)
Medium detected	LEDs = green (with Hnc)	LEDs = yellow (with Hno)

7.3.4 Fault during the setting process

The teach operation is cancelled in case of a fault:

- > LEDs flashes green-yellow at 8 Hz.
- > The unit returns to the operating mode with unchanged settings.

Possible faults:

- Time error (teach time too long / too short).
- Internal sensor signal outside the measuring range.
- Wrong output function: No hysteresis function was selected as output function for OUT2 (→ 7.3.1 Requirements).
- Process value too small (< 9 %, e.g. for powdery media), setting SPx / rPx has to be made manually (→ 7.1 Parameter setting via PC).

8 Operation

When the supply voltage has been applied, the unit is in the operating mode. It carries out its evaluation functions and switches the outputs.



The following table shows the factory settings (i.e. settings on delivery). In this state OUT1 = Hno and OUT2 = Hnc.

Operating mode	LEDs	OUT1	OUT2
Unit ready for operation, no medium detected	Green	OFF	ON
Unit ready for operation, medium detected	Yellow	ON	OFF
No operating voltage	OFF	OFF	OFF
Short circuit output 1	Flashes yellow	-	¹⁾
Short circuit output 2	Flashes yellow	¹⁾	-
Error / failure	-	OFF	OFF
Teach operation	(→ 7.3.2 Set to the full vessel) (→ 7.3.3 Changing the output function)		
Fault during the setting process	LEDs flashes green-yellow at 8 Hz		

¹⁾ According to the level



In the factory setting, the LEDs indicate the switching status of OUT1 (exception: teach operation → 7.3)

9 Maintenance, repair, disposal

- ▶ From time to time check the probe cap for deposits and damage. Clean the unit if badly soiled. In case of damage replace the unit.



When the medium is changed, it may also be necessary to adapt the sensitivity (→ 3.1 Applications).

- ▶ It is not possible to repair the unit.
- ▶ After use dispose of the unit in an environmentally friendly way in accordance with the applicable national regulations.
- ▶ In case of returns ensure that the unit is free from soiling, especially of dangerous and toxic substances. For transport only use appropriate packaging to avoid damage of the unit.

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10 Technical data and scale drawing

Technical data and scale drawing at www.ifm.com → Data sheet search → Enter the article number.

11 Factory setting

	LMC502	User setting
SP1	62 %	
rP1	54 %	
OU1	Hno	
SP2	62 %	
rP2	54 %	
OU2	Hnc	
FOU1	OFF	
FOU2	OFF	
dS1	0.0	
dS2	0.0	
dr1	0.0	
dr2	0.0	
P_n	pnP	
dFo	0.0	

Percentage values refer to the final value of the measuring range
(→ 7 Parameter setting).

More information at www.ifm.com

