

**Manual****Level sensor – Microwave meter****PNP-output****Parallel Probe****FM910323: L = 300mm****FM910324: L = 500mm****FM910325: L = 800mm**

**Contents**

- 1. Important notes..... Page 3**
- 2. Operational description ..... Page 3**
- 3. Installation conditions..... Page 3**
- 4. Electrical connection..... Page 4**
- 5. Connection to earth..... Page 4**
- 6. Screen display and menu operation ..... Page 5**
  - 6.1 Menu structure..... Page 6
  - 6.2 Sub menus ..... Page 7
- 7. Maintenance..... Page 11**
- 8. Dimensions ..... Page 12**
- 9. Technical Data ..... Page 12**

## 1. Important Notes

- Read this operating manual carefully before connecting and commissioning the device.
- The device may only be installed and connected by a specialist authorized by the plant-manufacturer, observing the relevant safety and accident prevention regulations.
- Improper installation or use can damage the device or lead to errors in the application.
- Repairs or modifications to the device may only be carried out by the manufacturer.
- The sensor with parallel probe detects liquid media with a dielectric constant of  $\epsilon_r \geq 2.3$ .

Non suitable medias are:

- Media with large solid particles
  - Media in areas with an explosion hazard media in the foodstuffs and galvanizing industry.
  - Media with  $\epsilon_r < 2,3$
- The length „L“ of the sensor is part of the article-number.
  - Never use these devices in applications where the safety of a person depends on their functionality!

## 2. Operational description

The sensor works with the principle of the guided microwave. It measures the traveling time that a microwave takes from the sensor to the surface of the media and back. The media level is calculated from this time.

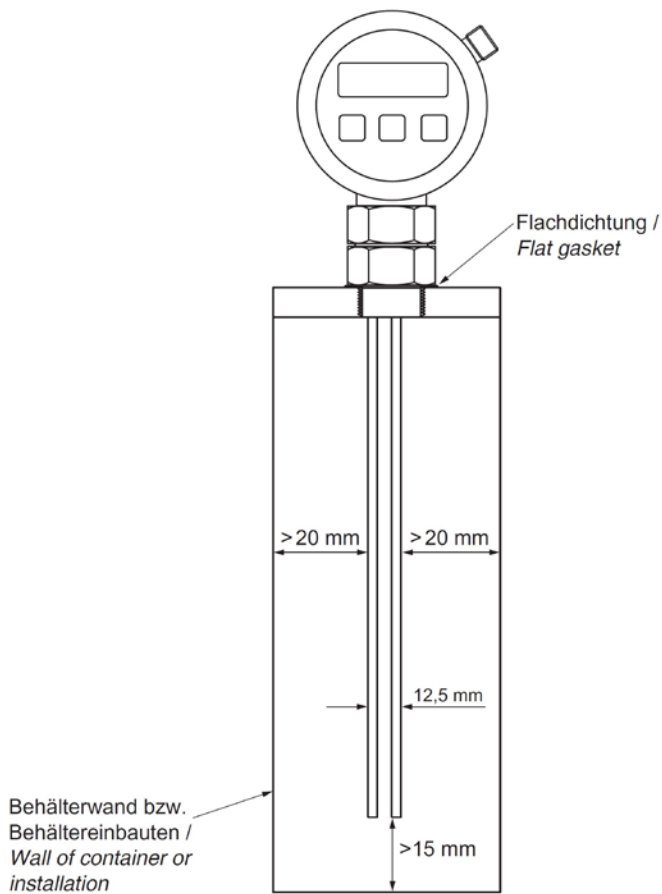
This measured fill level appears on the display. The zero point for the level measurement is the lower end of the probe. The measuring range is the distance L line in the drawing (see dimensions on page 12). Both switching outputs are activated according to the settings.

## 3. Installation conditions

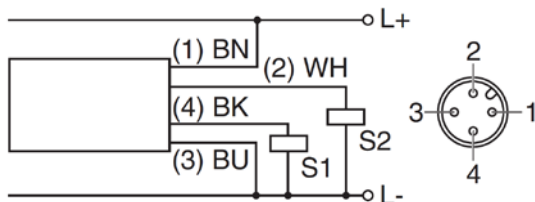
The sensor is installed perpendicularly from above in a container using the screw thread. A flat gasket has to be used for the installation. The container must have the minimum dimensions shown in the drawing. Installations in the container must have a minimum distance of 20 mm from the probe. The sensor does not require a metal flange plate.

To adjust the alignment of the display it can be rotated carefully through 360°.

Details are shown in the drawing on the following page:



#### 4. Electrical connection



The electrical connection is made according to the circuit diagram above, observing the relevant standards. The switching outputs are PNP-type and can tolerate a maximum switching current of 200mA. The display lights after applying the operating voltage. The device is ready, when the first measurement values appear.

#### 5. Connection to earth

In order to comply with the EMC standards, the device has to be earthed via the process connection. If the device is installed in a metal container, the container must be connected to earth. If, instead, a plastic container is to be used, the earth connection must be made, for example, by means of a metal flange plate.

## 6. Screen display and menu operation

During measuring mode, the fill level and unit are shown large in the display. If an offset is set, then the display shows fill level + offset. The state of the switching outputs are visible on the right side with S1 and S2. In the following figure switching output S1 is active (filled square) and switching output S2 is not active (empty square).

The actual function of the three buttons, F1, F2 and OK, are indicated directly above the respective button. In the operating manual the button's function is specified with brackets. At start, the [MENU] function is displayed in the measuring data display above the right button. The left and centre buttons have no functionality in the measuring data display.



### User menu

The user menu is accessed via the [MENU] button. It's first menu item is called „OUPUTS“.

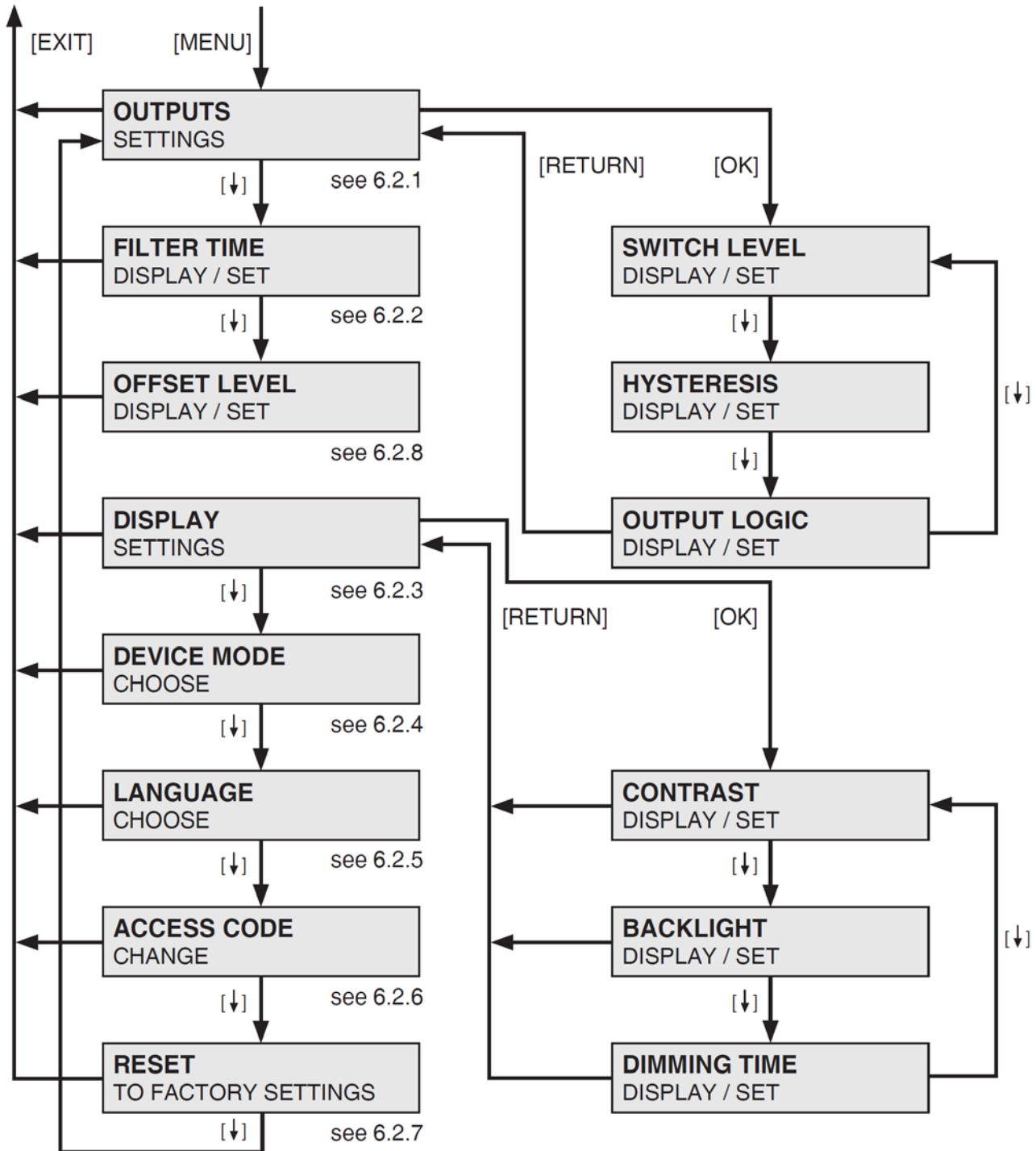


Exit the settings menu with the [EXIT] function and return to the measuring data display. By selecting the [RETURN] function, the actual submenu or setting procedure is exited.

A submenu or menu item is accessed via the [OK] function.

Navigate through menu entries via the [↓] function. The menu structure is illustrated in the following diagram:

6.1 Menu structure



## 6.2 Sub menus

If a menu item is accessed, e.g. „Outputs“, „Switch level“, the current value(s) is / are displayed the next graphic shows:



If the value should be changed, then [**EDIT**] accesses the function. First, the access code (factory setting: 0000) has to be entered.



The last code digit displayed is increased by one with [**+**] and accepted with [**\***]. The current position can be deleted with [**←**] and returned to the previous. After entering the last position, [**OK**] ends code entry.

If the menu is not exited after entering the correct access code, then the code does not have to be re-entered to change other codes.

### 6.2.1 Outputs

Switching outputs are configured here:

- SWITCH LEVEL is the fill level at which a switching output changes its state. The fill level is measured from the lower probe end. This limit moves with an offset  $\neq 0$  (see 6.2.8).
- HYSTERESIS is the fill level range below the switching level where the switching output is not switched back.
- OUTPUT LOGIC determines whether a switching output is operated as normally open (NO) or as normally closed (NC).

Since adjustment is similar in all three points, it is illustrated here with an example for the switching level. The other two take place in a similar manner.



The positions of the switching points on the probe are shown in the top section of the display. The half-marked triangle indicates the switching point, the right line being the hysteresis. In the lower section of the display the associated values for the switching points are visible. The hysteresis values are not illustrated here since they have their own menus.

If a value has to be changed, then the [EDIT] button must be pressed and the access code entered (see 6.2). Subsequently the following display appears:



The actual selected switching point is displayed with its blinking triangle marking. The point to be set next can be selected with the centre button in the order [S1], [S2], [BOTH] and is indicated above that button (and not the actual selected, which is shown blinking). The [BOTH] function allows to select the S1 und S2 points simultaneously.

To start the adjustment of the actual limit(s) (blinking), press the [EDIT] button. The associated display shows the following graphic:



The blinking value(s) and associated triangular marking(s) show which value can be changed. The [←] button increases the value and the [→] button decreases it. The value is accepted with the [OK] button.



## level sensor FM91032x with parallel probe

- smallest offset: -99,9 cm
- largest offset: 199,9 cm – probe length.

The offset value also affects the switching outputs as described in the following. Therefore, settings for the switching outputs (6.2.1) should be immediately checked after setting the offset value.

### Switching output settings with offset values ≠ 0:

The display shows the actual fill level (measured from the end of the probe) plus the set offset. The set switching level always refers to this value on the display. If the offset is changed, then the values for the switching level are automatically adjusted. Therefore the switching output is not changed for the same fill level (however, the value on the display will change).

The following table and graphic (on page 14) illustrate setting examples:

- Line 1 and figure 1: Basic setting. Offset = 0 and fill level below S1. Switching output inactive.
- Line 2 and figure 2: The fill level has been increased, S1 is now active.
- Line 3 and figure 3: Only the offset value has been changed from 0 to 10cm. This value is also added to the display value, so that the display changes from 40cm to 50cm. The S1 switching level is automatically adjusted to the same amount simultaneously. Therefore, nothing changes on the switching output.
- Line 4 and figure 4: The switching level is reset to the previous value while the offset is constant. The switching position is now lower in relation to the measuring probe.
- Line 5: A negative offset was set and the switching level is subsequently corrected. The display shows a reduced value accordingly.

	Set value S1	Set offset	Fill level example	Display view	Switching output aktiv	Figure No.
1.	<b>35cm</b>	<b>0cm</b>	30cm	30cm	no	1
2.	35cm	0cm	40cm	40cm	yes	2
3.	45cm*	<b>10cm</b>	40cm	50cm	yes	3
4.	<b>35cm**</b>	10cm	40cm	50cm	yes	4
5.	<b>35cm**</b>	<b>-10cm</b>	40cm	40cm	no	

**bold:** manually set values, different to previous lines.

\* The set switching level has changed due to adjusted offset values.

\*\* After setting the offset value, the switching level is then set to specified values.

Fig. 1: Basic setting

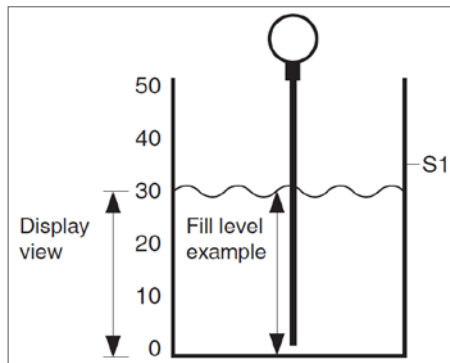


Fig. 2: Fill level amount

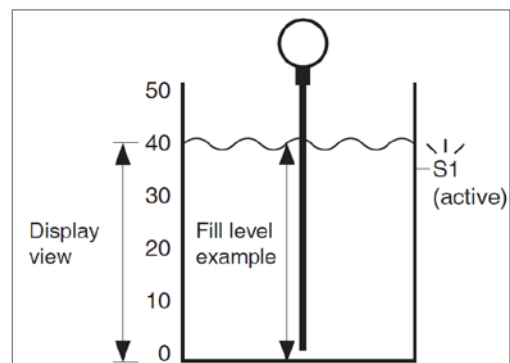


Fig. 3: Offset is set

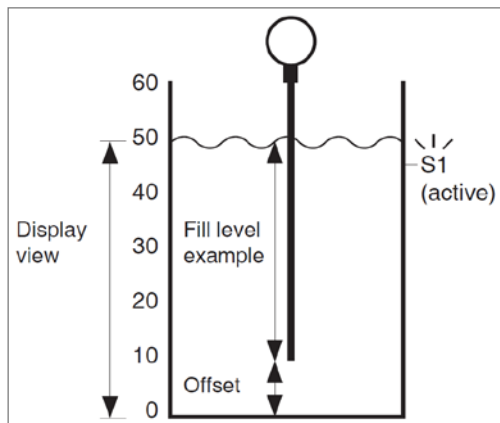
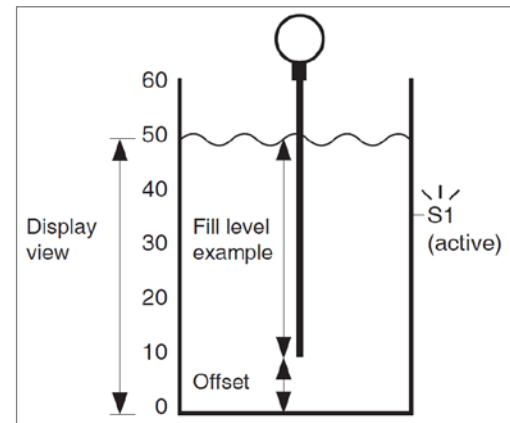


Fig. 4: Adjusting the switching level



*Effect on the display*

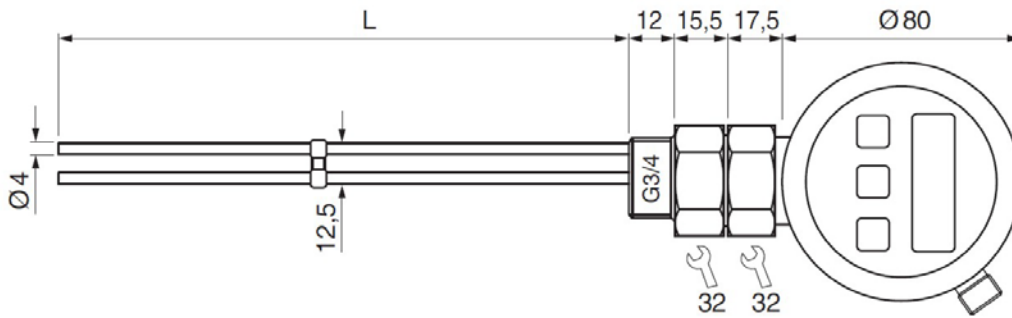
The triangle markings (see 6.2.1) refer to the positions of the respective switching level relative to the probe. This means that offset value have changed during adjustment.

Example: The position of the triangle for the switching level = 20 cm, offset = 10 cm is the same as for switching level = 10 cm, offset = 0 cm.

**7. Maintenance**

The only maintenance necessary for the sensor is the regular inspection for soiling and then cleaning, as necessary.

8. Dimensions



9. Technical Data

container connection	G3/4 thread
supply voltage	20 ... 27V DC
current consumption (without load)	< 45mA
switching outputs	2 x PNP, NO/NC programmable
switching current	≤ 200mA
dielectric constant of the medium	$\epsilon_r \geq 2.3$
precision	better than illustrated in the diagram
compressive strength (25°C)	10bar
ambient temperature	0 ... +70°C
medium temperature	0 ... +80°C
system of protection (EN 60529)	IP 67
housing material	aluminum
materials	AISI 316Ti / PTFE / POM
sealing material	NBR / AFM 34
connection	M12-Connector 4-pin
connection accessories	e.g. <b>VK200325</b>
access code factory default	0000

Measuring precision (standard conditions)

