# Brief Operating Instructions Micropilot S FMR532

Level-Radar





These Instructions are Brief Operating Instructions; they do not replace the Operating Instructions included in the scope of supply.

For detailed information, refer to the Operating Instructions and other documentation on the CD-ROM provided or visit "www.endress.com/deviceviewer".



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# 1 Safety instructions

## 1.1 Designated use

The Micropilot S is a compact radar level transmitter for the continuous, contactless measurement of liquids. The device can also be freely mounted outside closed metal vessels because of its operating frequency of about 6 GHz and a maximum radiated pulsed energy of 1 mW (average power output  $1 \mu$ W). Operation is completely harmless to humans and animals.

## 1.2 Installation, commissioning and operation

The Micropilot S has been designed to operate safely in accordance with current technical, safety and EU standards. If installed incorrectly or used for applications for which it is not intended, however, it is possible that application-related dangers may arise, e.g. product overflow due to incorrect installation or calibration. For this reason, the device must be installed, connected, operated and maintained according to the instructions in this manual: personnel must be authorised and suitably qualified. The manual must have been read and understood, and the instructions followed. Modifications and repairs to the device are permissible only when they are expressly approved in the manual.

# 1.3 Operational safety and process safety

Alternative monitoring measures must be taken to ensure operational safety and process safety during configuration, testing and maintenance work on the device.

#### 1.3.1 Hazardous areas

Measuring systems for use in hazardous environments are accompanied by separate "Ex documentation", which is an integral part of this Operating Manual. Strict compliance with the installation instructions and ratings as stated in this supplementary documentation is mandatory.

- Ensure that all personnel are suitably qualified.
- Observe the specifications in the certificate as well as national and local regulations.

## 1.3.2 FCC approval

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions:

- 1. This device may not cause harmful interference, and
- 2. this device must accept any interference received, including interference that may cause undesired operation.

### **A**CAUTION

Changes or modifications not expressly approved by the part responsible for compliance could void the user's authority to operate the equipment.

## 1.4 Return

Follow the instructions on returning the device as outlined in the Operating Instructions (BA00208F/00/EN) on the CD-ROM provided.

## 1.5 Notes on safety conventions and symbols

In order to highlight safety-relevant or alternative operating procedures in the manual, the following conventions have been used, each indicated by a corresponding symbol in the margin.

#### 1.5.1 Safety symbols

Symbol	Meaning
	<b>DANGER!</b> This symbol alerts you to a dangerous situation. Failure to avoid this situation will result in serious or fatal injury.
A0011190-EN	WARNING! This symbol alerts you to a dangerous situation. Failure to avoid this situation can result in serious or fatal injury.
	<b>CAUTION!</b> This symbol alerts you to a dangerous situation. Failure to avoid this situation can result in minor or medium injury.
NOTICE A0011192-EN	<b>NOTICE!</b> This symbol contains information on procedures and other facts which do not result in personal injury.

#### 1.5.2 Electrical symbols

Symbol	Meaning
	<b>Protective ground connection</b> A terminal which must be connected to ground prior to establishing any other connections.
A0018339	

## 1.5.3 Tool symbols

Symbol	Meaning
A0011221	Allen key

## 1.5.4 Symbols for certain types of information

Symbol	Meaning			
A0011182	Allowed Indicates procedures, processes or actions that are allowed.			
A0011184	Forbidden Indicates procedures, processes or actions that are forbidden.			
A0011193	Tip Indicates additional information.			
A0015484	Reference to page Refers to the corresponding page number.			
1. , 2. , 3. ,	Series of steps			

#### **1.5.5** Symbols in graphics

Symbol	Meaning
1, 2, 3, 4,	Item numbers
1. , 2. , 3. ,	Series of steps
A, B, C, D,	Views

## 1.5.6 Symbols at the device

Symbol	Meaning
▲ → 🗐	Safety instructions Observe the safety instructions contained in the associated Operating Instructions.
A0019221	Temperature resistance of the connection cables Specifies the minimum value of the temperature resistance of the connection cables.

# 2 Mounting

# 2.1 Quick installation guide

## 2.1.1 Installation only in stilling well



The performance of the planar antenna is not dependent on the alignment or geometry of standard stilling wells. No special alignment is required. However, make sure that the planar antenna is installed vertically relative to the stilling well axis.

## 2.2 Incoming acceptance, transport, storage

#### 2.2.1 Incoming acceptance

Check the packing and contents for any signs of damage. Check the shipment, make sure nothing is missing and that the scope of supply matches your order.

## 2.2.2 Transport

#### **A** CAUTION

Follow the safety instructions and transport conditions for devices of more than 18 kg (39.69 lbs).

#### 2.2.3 Storage

Pack the measuring device so that is protected against impacts for storage and transport. The original packing material provides the optimum protection for this. The permissible storage temperature is -40 to +80  $^{\circ}$ C (-40 to +176  $^{\circ}$ F).

## 2.3 Installation

#### 2.3.1 Mounting kit

For the mounting, you will require the following tool:

- The tool for flange mounting
- 4 mm (0.1") Allen wrench for turning the housing

#### 2.3.2 Installation in tank (stilling well)

#### **Optimum mounting position**



- 1 Marker at instrument flange
- A DN 150, ANSI 6"
- B DN 200 to 250, ANSI 8 to 10"

#### Standard installation

- After mounting, the housing can be turned 350° in order to simplify access to the display and the terminal compartment.
- Planar axis vertical to flange.
- Measurements can be performed through an open ball valve without any problems.

#### 2.3.3 Recommendations for the stilling well

- Metal (no enamel coating, plastic on request).
- Constant diameter.
- When using a FMR532, an increase of the pipe diameter from DN 150 to DN 200 / DN 200 to DN 250 / DN 250 to DN 300 is acceptable. A larger step-width for the increase of the pipe diameter (e.g. DN 150 to DN 300) is possible if the upper part of the pipe has a suitable length. The length of the stilling well enlargement must be kept. In this case, the upper end of the pipe must have a minimum length of 0.5 m (1.6 ft) before the diameter increases (refer to table on BA00208F/00/EN in Chapter "Examples for the construction of stilling wells"). If the length is less than "L", please contact Endress+Hauser in order to determine a suitable antenna adapter (separable antenna horn). Ideally, a sample hatch is used.
- Any rectangular increase of the pipe diameter has to be avoided.
- Weld seam as smooth as possible and on the same axis as the slots.
- For best radar propagation behavior holes it is recommended to have holes instead of slots. If slots can not be avoided, they should be as thin and short as possible.
- The diameter of the holes (deburred) can be up to 1/7 of the pipe diameter but should not exceed 30 mm (1.18 in).
- Length and number of the holes do not affect the measurement.
- Maximum gap allowed between the antenna/horn and the inside of the stilling well is 5 mm (0.2 in).
- At any transition (e.g. when using a ball valve or mending pipe segments), no gap may be created exceeding 1 mm (0.04 in).
- The stilling well must be smooth on the inside. Use extruded or parallel welded steel pipe. An extension of the pipe is possible with welded flanges or pipe sleeves. Flange and pipe have to be properly aligned at the inside.
- Do not weld through the pipe wall. The inside of the stilling well must remain smooth. In case
  of unintentional welding through the pipe, the weld seam and any unevenness on the inside
  need to be carefully removed and smoothed. Otherwise, strong interference echoes will be
  generated and material build-up will be promoted.

## NOTICE

#### Selection of antenna size

- Select antenna extension as big as possible. For intermediate sizes (e.g. 180 mm (7.09 in)) select next larger antenna extension and adapt it mechanically. Maximum gap allowed between the antenna/horn and the inside of the stilling well is 5 mm (0.2 in).
- The antenna extension of the FMR532 is mounted with defined pressure. It is strongly recommended not to dismantle this antenna.
- Dimensions of a nozzle for manual gauging must be adapted to the dimensions of the horn antenna used (see BA00208F/00/EN, Chapter "Mounting with Sample hatch on stilling well").

## 2.3.4 Measuring conditions

- The measuring range begins where the beam hits the tank bottom. Particularly with dish bottoms or conical outlets the level cannot be detected below this point.
- For **overfill prevention**, it is possible to define a safety distance **(SD)** additionally to the blocking distance **(BD)**.
- Depending on its consistence, foam can either absorb microwaves or reflect them off the foam surface. Measurement is possible under certain conditions.
- The smallest possible measuring range **B** depends on the antenna version (see Fig.).
- The zero should be positioned at the end of the tube, as the electromagnetic waves do not propagate completely outside the tube. It must be taken into account that the accuracy may be reduced in the area C. In order to guarantee the required accuracy in these cases, it is recommended to position the zero-point at a distanc **C** above the tank bottom (see Fig.).
- In applications with **planar** antennas, especially for media with low dielectric constants (see BA00208F/00/EN, Chapter "Measuring range"), the end of the measuring range should not be closer than 1 m (3.3 ft) to the flange (cf. **A** in following figure).
- The safety distance (SD) is set to 0.5 m (1.6 ft) by default, generating an alarm in case the product level rises inside the safety distance.



1 Max. level

Reference: flar	nge / BD (cf. picture)	Reference: antenna tip (cf. picture)		
Blocking distance Safety distance		Recommended additional settings		
BD [m (ft)] SD [m (ft)]		A [mm (in)]	B [m (ft)]	C [mm (in)]
1 (3.3) 0,5 (1.6)		1000 (39.4)	0,5 (1.6)	150 to 300 (5.91 to 11.8)

#### Behaviour if measuring range is exceeded

The behaviour in case of the measuring range being exceeded can be freely set: The default setting is a current of 22 mA and the generation of a digital warning (E681).

#### 2.3.5 Turn housing

After mounting, the housing can be turned 350° in order to simplify access to the display and the terminal compartment. Proceed as follows to turn the housing to the required position:

- 1. Undo the allen screw
- 2. Turn the housing in the required direction
- 3. Tighten up the allen screw strongly by hand



# 2.4 Post-installation check

After the measuring device has been installed, perform the following checks:

- Is the measuring device damaged (visual check)?
- Does the measuring device correspond to the measuring point specifications such as process temperature/pressure, ambient temperature, measuring range, etc.?
- Is the flange marking correctly aligned ( $\rightarrow \ge 7$ )?
- Have the flange screws been tightened up with the respective tightening torque?
- Are the measuring point number and labeling correct (visual check)?
- Is the measuring device adequately protected against rain and direct sunlight (see Chapter "Accessories" in the Operating Instruction on CD-ROM)?

# 3 Wiring

# 3.1 Quick wiring guide

When grounding conductive screens, the corresponding directives EN 60079-14 and EN 1127-1 must be observed. Recommendation for safe grounding of conductive screens:

## **A** CAUTION

#### Before connection please note the following:

- The power supply must be identical to the data on the nameplate.
- Switch off power supply before connecting the device.
- Connect equipotential bonding to transmitter ground terminal before connecting the device.
- Tighten the locking screw: It forms the connection between the antenna and the housing ground potential.
- When you use the measuring system in hazardous areas, make sure you comply with national standards and the specifications in the safety instructions (XA's)

### 3.1.1 Verdrahtung

#### **A** CAUTION

#### Before connection please note the following:

- The power supply to be delivered by a transmitter supply unit.
- Befor removing housing cover at seperate connection compartment turn off the power supply!
- 1. Insert cable through gland . Use screened, twisted 2-wire or 4-wire cable.

## **A** CAUTION

# Only ground screening of the line on sensor side.

- 2. Make connection (see pin assignment).
- 3. Tighten cable gland.
- 4. Replace and tighten off housing cover.
- 5. Switch on power supply.

#### A Micropilot S situated in a hazardous area is connected as a **single device** to a **power supply unit and transmitter**

situated outside of the hazardous area. In this case, it is recommended that the screen be connected directly to the Micropilot at the housing's earth, whereby the Micropilot S and the power supply unit are connected to the same potential equalization line.



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- A Power 24 VDC; from a transmitter supply unit
   B Signal 24 VDC; from a transmitter supply unit
- 1 Housing cover
- 2 Cable 3 Cable
- 3 Cable gland 4 Alternative
  - Alternative connection
- 5 Commubox FXA195, Field Communicator
- 6 Shielding cable
- 7 Test socket; Output current
- 8 PML (potential matching line)

#### 3.1.2 Wiring with Tank Side Monitor NRF590

#### **A** CAUTION

#### Before connection please note the following:

- Make sure you use the specified cable gland.
- Befor removing housing cover at seperate connection compartment turn off the power supply!
- 1. Insert cable through gland . Use screened, twisted 2-wire or 4-wire cable.

#### **A** CAUTION

#### Only ground screening of the line on sensor side.

- 2. Make connection (see pin assignment).
- 3. Tighten cable gland.
- 4. Replace and tighten off housing cover.
- 5. Switch on power supply.

The Micropilot S is - possibly in combination with other devices connected to a Tank Side Monitor in a hazardous area. In this case, it is recommended that you ground the cable screen centrally at the NRF590 and connect all devices to the same potential equalization line (PML). If, for functional reasons, a capacitive coupling is required between local earth and screen (multiple grounding), ceramic condensers with a dielectric strength of min. 1500 Veff must be used, whereby the total capacitance of 10 nF must not be exceeded. Notes on grounding

interconnected intrinsically safe devices are provided by the FISCO model. If there is no way to set a ground cable between NRF590 and Micropilot S it is possible to ground Α single side (grounding on side NRF590). R In this case it's imperative to ground the 1 shield (on Micropilot S side) via a ceramic 2 3 capacitor with a maximum capacitance of 10 nF and a minimum insulating voltage of 5 6 1500 V. 7



- Tank Side Monitor NRF590 Micropilot S Housing cover Cabel Cable gland
- Intrinsically safe terminal board
- Only for Micropilot S
- HART Sensor
- Grounding single sided on Tank Side Monitor NRF590
- Shielding cable

8

9 PML (potential equalization line)

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# 3.2 Connecting the measuring unit

### 3.2.1 Load HART

Minimum load for HART communication: 250  $\Omega$ 

### 3.2.2 Cable entry

Description	Feature	Option model
Cable gland M20	060	2
Thread for cable gland G ½"	060	3
Thread for cable gland NPT 1/2"	060	4

## 3.2.3 Supply voltage

DC voltage: per table below

Communication		Terminal voltage minimum		maximum	
Power supply	Standard	U (20 mA) =	16 V	36 V	
Power suppry	Ex	U (20 mA) =	16 V	30 V	
Cignal	Ex	U (4 mA) =	11.5 V	30 V	
Signal		U (20 mA) =	11.5 V	30 V	

#### 3.2.4 Power consumption

- Max. 330 mW at 16 V
- Max. 500 mW at 24 V
- Max. 600 mW at 30 V
- Max. 700 mW at 36 V

#### 3.2.5 Current consumption

Max. 21 mA (50 mA inrush current).

- The level transmitter Micropilot S is equipped with an internal overvoltage protector (600 Vrms surge arrester) according to EN/IEC 60079-14 or EN/IEC 60060-1 (impulse current test 8/20  $\mu$ s,  $\hat{I} = 10$  kA, 10 pulses). Additionally, the device is protected by a galvanic insulation of 500 Vrms between the power supply and the (HART) current ouput. Connect the metallic housing of the Micropilot S to the tank wall or screen directly with an electrically conductive lead to ensure reliable potential matching.
- Installation with additional overvoltage protector HAW560Z/HAW562Z (see XA00081F "Safety instructions for electrical apparatus certified for use in explosion-hazardous areas").
  - Connect the external overvoltage protector and the Micropilot S transmitter to the local potential matching system.
  - Potentials shall be equalised both inside and outside the explosion hazardous area.
  - The cable connecting the overvoltage protector and the Micropilot S transmitter shall not exceed 1 m (3.3 ft) in length.
  - The cable shall be protected e.g. routed in an armoured hose.

#### 3.2.7 Power supply

- For stand alone operation via two Endress+Hauser RN221N.
- Integrated in tank gauging system via Endress+Hauser Tank Side Monitor NRF590 (recommended operation mode).

#### 3.2.8 Highly accurate measurement

For highly accurate measurements the measured variable must be transmitted using HART protocol to ensure the necessary resolution.

## 3.3 Equipotential bonding

Connect the Equipotential bonding to the external ground terminal of the transmitter.

## 3.4 Degree of protection

- Housing: IP65/68; NEMA 4X/6P
- Antenna: IP65/68; NEMA 4X/6P

## 3.5 Post-connection check

After wiring the measuring device, perform the following checks:

- Is the terminal allocation correct ( $\rightarrow \square 13$ )?
- Is the cable gland tight?
- Is the housing cover screwed tight?
- If auxiliary power is available: Is the device ready for operation and does the liquid crystal display show any value?
- Is grounding (tank potential) correct?

# 4 Operation

# 4.1 General structure of the operating menu

The operating menu is made up of two levels:

- Function groups (00, 01, 03, ..., 0C, 0D): The individual operating options of the device are split up roughly into different function groups. The function groups that are available include, e.g.: "basic setup", "safety settings", "output", "display", etc.
- Functions (001, 002, 003, ..., 0D8, 0D9): Each function group consists of one or more functions. The functions perform the actual operation or parameterisation of the device. Numerical values can be entered here and parameters can be selected and saved. The available functions of the "basic setup" (00) function group include, e.g.: "tank shape" (002), "medium property" (003), "process cond." (004), "empty calibr" (005), etc.

If, for example, the application of the device is to be changed, carry out the following procedure:

- 1. Select the **"basic setup" (00)** function group.
- 2. Select the "tank shape" (002) function (where the existing tank shape is selected).

## 4.1.1 Identifying the functions

For simple orientation within the function menus (see chapter "Apendix" in BA00208F/00/EN), for each function a position is shown on the display.



1 Function group

2 Function

The first two digits identify the function group:

- basic setup 00
- safety settings
   01
- linearisation 04

•••

The third digit numbers the individual functions within the function group:

<ul> <li>basic setup</li> </ul>	00	$\rightarrow$	tank shape	002
			medium property	003
			process cond.	004

Here after the position is always given in brackets (e.g. **"tank shape" (002)**) after the described function.

## 4.2 Display and operating elements



#### NOTICE

To access the display the cover of the electronic compartment may be removed even in hazardous area. The LCD-display can be removed to ease operation by simply pressing the snap-fit (see graphic above). It is connected to the device by means of a 500 mm (19.7 in) cable.

## 4.2.1 Display

## Liquid crystal display (LCD)

Four lines with 20 characters each. Display contrast adjustable through key combination.



- Operating keys
- 1 2 3 Bargraph
- Symbols
- 4 Function name
- 4 Parameter Identification number

#### 4.2.2 Display symbols

The following table describes the symbols that appear on the liquid crystal display:

Symbols	Meaning
L	ALARM_SYMBOL This alarm symbol appears when the device is in an alarm state. If the symbol flashes, this indicates a warning.
ļ.	<b>LOCK_SYMBOL</b> This lock symbol appears when the device is locked, i.e. if no input is possible.
\$	<b>COM_SYMBOL</b> This communication symbol appears when a data transmission via e.g. HART is in progress.
#	Calibration to regulatory standards disturbed If the device is not locked or it cannot guarantee the calibration to regulatory standards, the situation will be indicated on the display via the symbol.

## 4.2.3 Light emitting diods (LEDs)

There is a green and a red LED besides the liquid crystal display.

LED (LED)	Meaning
red LED continuously on	Alarm
red LED flashes	Warning
red LED off	No alarm
green LED continuously on	Operation
Green LED flashes	Communication with external device

#### 4.2.4 Function of the keys

Key(s)	Meaning
+ or 1	<ul><li>Navigate upwards in the selection list.</li><li>Edit numeric value within a function.</li></ul>
- or +	<ul><li>Navigate downwards in the selection list.</li><li>Edit numeric value within a function.</li></ul>
	Navigate to the left within a function group.
E	<ul><li>Navigate to the right within a function group.</li><li>Confirm entry.</li></ul>
+ and E or and E	Contrast settings of the LCD.
+ and - and E	Hardware lock / unlock After a hardware lock, an operation of the device via display or communication is not possible! The hardware can only be unlocked via the display. An unlock parameter must be entered to do so.

#### 4.2.5 Custody locking switch

Access to the electronics can be prevented by means of a custody locking switch that locks the device settings. The custody locking switch can be sealed for custody transfer applications.

# 5 Commissioning

## 5.1 Function check

Make sure that all final checks have been completed before you start up your measuring point:

- Checklist "Post installation check",  $\rightarrow$  12.
- Checklist "Post connection check",  $\rightarrow$  17.

## 5.2 Switching on the measuring device

When the device is switched on for the first time, the following messages appear in a sequence of 5 s on the display: software version, communication protocol and language selection.

On-site display		Meaning
Language	092	Select the language
✔ English		on)
Deutsch		
Français		
distance unit	0C5	Select the basic unit
✔ m		on)
ft		
mm		
measured value	000	The current measured value is displayed
63.455 %		
		After $E$ is pressed, you reach the group selection
Group selection	00→	This selection enables you to perform the basic setup
✓ basic setup		
safety settings		
linearisation		

## 5.3 Overview Basic Setup



## **A** CAUTION

To successfully commission a precise measurement to the nearest mm, it is important you carry out a history reset on first installation after mechanical installation and after the basic setup of the device . Only after a history reset the mounting calibration is carried out. Enter the measurement offset as the first point in the dip table for the mounting calibration. When a value is dipped at a later date, make a second entry into the dip table, using the semi-automatic mode. This way, you can easily carry out a linear correction of the measurement. When configuring the function in "basic setup" (00) please take into account the following notes

- Select the functions as described in BA00208F/00/EN.
- Some functions can only be used depending on the parameterisation of the device. For example, the pipe diameter of a stilling well can only be entered if "stilling well" was selected beforehand in the "tank shape" (002) function.
- ► Certain functions (e.g. starting an interference echo mapping (053)) prompt you to confirm your data entries. Press + or to select "YES" and press = to confirm. The function is now started.
- If you do not press a key during a configurable time period (» function group "display" (09)), an automatic return is made to the home position (measured value display).

## NOTICE

After finishing the basic setup pairs of values "measuring value Micropilot S - hand dipping value" should be collected and if necessary a further correction should be performed through entering characteristic pairs of values into the dip table. Information on the usage of the dip table, see chapter "Dip table" in BA00208F/00/EN.

#### NOTICE

## Data handling during setup

- The device continues to measure while data entry is in progress, i.e. the current measured values are output via the signal outputs in the normal way.
- If the envelope curve mode is active on the display, the measured values are updated in a slower cycle time. Thus, it is advisable to leave the envelope curve mode after the measuring point has been optimised.
- If the power supply fails, all preset and parameterised values remain safely stored in the EEPROM.
- All functions are described in detail, as is the overview of the operating menu itself, in the manual "BA00217F Description of Instrument Functions", which can be found on the enclosed CD-ROM.
- The default values of the parameters are typed in **boldface**.

# 5.4 Basic Setup with device display VU331

### 5.4.1 Function "measured value" (000)



## 5.4.2 Function group "basic setup" (00)

On	-site display	
Gro	oup selection	00→
r	basic setup	
	safety settings	
	linearisation	

#### Meaning

This function displays the current measured value in the selected unit (see "customer unit" (042)) function). The number of digits after decimal point can be selected in the "no.of decimals" (095) function. The length of the bargraph corresponds to the percental value of the present measured value with regard to the span.

## Function "tank shape" (002)

0n	-site display	
tan	k shape	002
r	stilling well	
	sphere.	
	dome ceiling	

#### Meaning

This function is used to select the tank shape.

For the application of the FMR532 the selection "**stilling well**" has to be choosen in the function "**tank shape**" (002).

Further options:

- Dome ceiling
- Horizontal cyl
- Bypass
- Stilling well (factory setting for FMR532)
- Flat ceiling (Typical ceiling of storage tanks: a slight slope of only a few degrees can be neglected)
- Sphere



## Function "medium property." (003)

## On-site display

medium property	
✔ unknown	
DC: < 1.9.	
DC: 1.94	

## Further options:

- unknown
- DC: < 1.9
- DC: 1.9 to 4
- DC: 4 to 10
- DC: > 10

Media group	DC ( <b>E</b> r)	Examples	
А	1.4 to 1.9	Non-conducting liquids, e.g. liquefied gas (LPG). For more information please conta your Endress+Hauser representative.	
В	1.9 to 4	Non-conducting liquids, e.g. benzene, oil, toluene, white products, black products, crudes, bitumen/asphalts,	
С	4 to 10	E.g. concentrated acids, organic solvents, esters, aniline, alcohol, acetone,	
D	>10	Conducting liquids, e.g. aqueous solutions, dilute acids and alkalis	

#### Meaning

This function is used to select the dielectric constant.

#### Function "process cond." (004)

0n	-site display	
pro	ocess cond.	004
r	standard	
	calm surfaces.	
	turb. surface	

Further options:

- Standard
- Calm surface
- Turb. surface
- Agitator
- Fast change
- Heavy conditions
- Test: no filter

Standard	Calm surface	
For all applications that do not fit into any of the following groups.	Storage tanks with immersion tube or bottom filling	
A0020531	A0020533	
The filter and output damping are set to average values.	The averaging filters and output damping are set to high values. → Steady meas. value → Precise measurement → Slower reaction time	

#### NOTICE

When FMR532 is ordered as a Custody Transfer Specification, phase evaluation is enabled. The phase evaluation of the Micropilot S is only activated if you select the measuring conditions "standard", "calm surface" or "heavy conditions". If, however, "heavy conditions" is selected, no index values are stored. We strongly recommend that, in the case of rough product surfaces or rapid filling, you activate the appropriate application parameters.

#### Meaning

This function is used to select the process conditions.

#### Function "empty calibr." (005)

On-site display				
empty calibr.			005	
	5.000	m		
distance process				
conn. to min. level				

#### Meaning

This function is used to enter the distance from the flange (reference point of the measurement) to the minimum level (= zero).

#### **A** CAUTION

For dish bottoms or conical outlets, the zero point should be no lower than the point at which the radar beam hits the bottom of the tank.

#### Function "full calibr." (006)

On-site display			
full calibr.			006
	5.000	m	
span			

#### Meaning

This function is used to enter the distance from the minimum level to the maximum level (= span). In principle, it is possible to measure up to the tip of the antenna. However, due to considerations regarding corrosion and build-up, the end of the measuring range should not be chosen any closer than 50 mm (1.97 in) to the tip of the antenna.

## NOTICE

If bypass or stilling well was selected in the "tank shape" (002) function, the pipe diameter is requested in the following step.

## Function "pipe diameter" (007)

On-site display			
pipe diameter			007
	204.425	n	n
inner diameter of			
bypass/stilling well			

#### Meaning

This function is used to enter the pipe diameter of the stilling well or bypass pipe.

Microwaves propagate slower in pipes than in free space. This effect depends on the inside diameter of the pipe and is automatically taken into account by the Micropilot. It is only necessary to enter the pipe diameter for applications in a bypass or stilling well. If mounting the FMR532 on stilling wells with a widening of the pipe, the **inner** diameter of the lower part of the pipe must be entered. This is the part of the stilling well, where the measurement is actually performed.

#### Function "dist./ meas. value" (008)

On-site display			
dist./meas.value			008
dist.	2.463	m	
m.value.	63.414	%	

#### Meaning

The **distance** measured from the reference point to the product surface and the **level** calculated with the aid of th empty adjustment are displayed. Check whether the values correspond to the actual level or the actual distance. The following cases can occur:

- Distance correct meas. value correct: Continue with the next function "check distance" (051)
- Distance correct meas. value incorrect: Check "empty calibr." (005)
- Distance incorrect meas. value incorrect: Continue with the next function "check distance" (051)

#### Function "check distance" (051)

## On-site display check disttance 051 ✓ dist, unknown

manual

distance = ok

#### Meaning

This function triggers the mapping of interference echoes. To do so, the measured distance must be compared with the actual distance to the product surface.

Further options:

- distance = ok
- dist. too small
- dist. too big
- dist. unknown
- manual



- A Distance to small
- B Distance ok

#### distance = ok

- mapping is carried out up to the currently measured echo
- The range to be suppressed is suggested in the "range of mapping." (052) function

## NOTICE

Anyway, it is wise to carry out a mapping even in this case.

#### dist. too small

- At the moment, an interference is being evaluated
- Therefore, a mapping is carried out including the presently measured echoes
- The range to be suppressed is suggested in the "range of mapping." (052) function

#### dist. too big

- This error cannot be remedied by interference echo mapping
- Check the application parameters (002), (003), (004) and "empty calibr." (005)

#### dist. unknown

If the actual distance is not known, no mapping can be carried out.

#### manual

A mapping is also possible by manual entry of the range to be suppressed. This entry is made in the **"range of mapping." (052)** function.

#### **A** CAUTION

The range of mapping must end 0.5 m (1.6 ft) before the echo of the actual level. For an empty tank, do not enter E, but E - 0.5 m (1.6 ft). If a mapping already exists, it is overwriten up to the distance specified in "range of mapping" (052). Beyond this value the existing mapping remains unchanged.

Function "range of mapping" (052)

range of mapping	052
0.000 m	
input of	
mapping range	

#### Meaning

This function displays the suggested range of mapping. The reference point is always the reference point of the measurement ( $\rightarrow \exists 23$ ). This value can be edited by the operator. For manual mapping, the default value is: 0 m.

#### Function "start mapping" (053)

On-site display		
sta	rt mapping	053
r	off	
	on	

#### Meaning

This function is used to start the interference echo mapping up to the distance given in **"range of mapping" (052)**.

Selection:

off

No mapping is carried out

• on

Mapping is started

During the mapping process the message "record mapping"" is displayed.

#### **A** CAUTION

#### A mapping will be recorded only, if the device is not in alarm-state.

#### Function "dist./meas.value" (008)

On-site display			
dist./meas.value			008
dist.	2.463	m	
m.value.	63.414	%	

#### Meaning

The **distance** measured from the reference point to the product surface and the **level** calculated with the aid of th empty adjustment are displayed. Check whether the values correspond to the actual level or the actual distance. The following cases can occur:

- Distance correct meas. value correct: Continue with the next function "check distance" (051)
- Distance correct meas. value incorrect: Check "empty calibr." (005)
- Distance incorrect meas. value incorrect: Continue with the next function "check distance" (051)

## Function "history reset" (009)

On-site display	
history reset	009
🖌 no	
yes	

#### Meaning

By this function a history reset of the device is performed, i.e. the correspondance table between level an index values is deleted. A new correspondance table will be filled and stored after the history reset.

#### **A** CAUTION

#### A history reset must be performed after:

- ► first installation or
- ► change of basic setup or
- change of the installation situation.

In this case alse effect a reset of the dip table in function **"dip table mode"** (033).

On-site display		Meaning
Return to Group Selection		
		After 3 s, the following message appear
Group selection	$00 \rightarrow$	
✓ basic setup		
safety settings		
linearisation		

### NOTICE

After the basic setup, an evaluation of the measurement with the aid of the envelope curve ("envelope curve" (0E) function group) is recommended.

## 5.5 Envelope curve with device display VU331

After the basic setup, an evaluation of the measurement with the aid of the envelope curve ("display" (09) function group) is recommended.

#### 5.5.1 Function "plot settings" (09A)

On-site display		
plo	t settings	09A
~	envelope curve	
	env. curve+FAC	
	env. curve+cust.map	

Here you can select which information is shown on the display:

- Envelope curve
- Env. curve+FAC (for FAC see BA00217F/00/EN)
- Env. curve+cust.map (i.e. the tank map is also displayed)



- 1 Tank map / FAC
- 2 Echo quality (S/N)
- 3 Marking of evaluated echo
- 4 End value of representation
- 5 Distance of current echo
- 6 Envelope curve 7 Begin value of r
- 7 Begin value of representation

#### 5.5.2 Function "recording curve" (09B)

This function determines whether the envelope curve is read as:

- single curve or
- cyclic

On-site display		
rec	cording curve	09B
r	single curve	
	cyclic	

## NOTICE

If the envelope curve mode is active on the display, the measured values are updated in a slower cycle time. Thus, it is advisable to leave the envelope curve mode after the measuring point has been optimised.

## 5.5.3 Function "envelope curve display"" (09C)

The envelope curve is displayed in this function. You can use it to obtain the following information:



- Α Envelope curve only
- В Envelope curve and interference echo suppression (map)
- 1 Full calibr.
- Quality of evaluated echo
- 2 3 Evaluated echo is marked
- 4 Empty calibr.
- 5 Maximum distance of the plot
- 6 Distance of the evaluated echo
- 7 Minimum distance of the plot
- 8 Мар
- 9 Interference echo
- 10 Level echo



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