Level | Pressure | Flow | Temperature | Liquid Analysis | Registration | Systems Components | Services | Solutions

Description of Device Functions

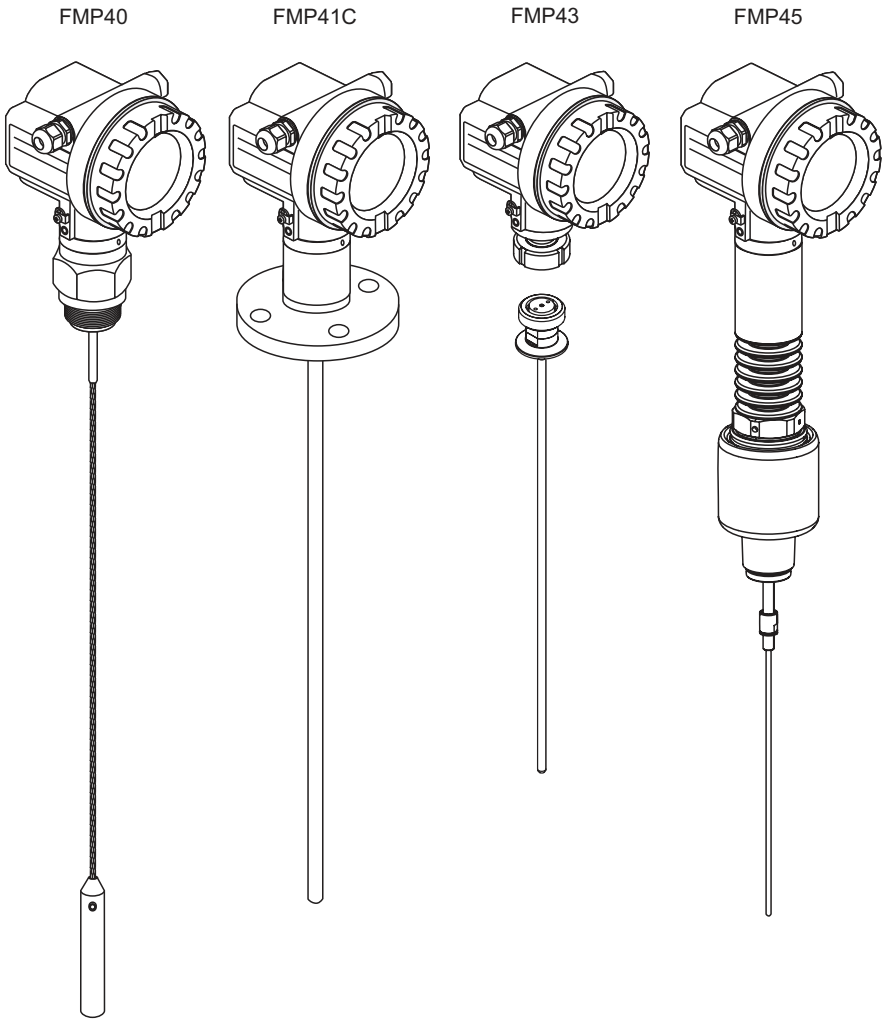
Levelflex M FMP40, FMP41C, FMP43, FMP45

Guided Level-Radar
with HART, PROFIBUS PA and FOUNDATION Fieldbus

HART® FIELD COMMUNICATION PROTOCOL

PROFIBUS® PROCESS FIELD BUS

Fieldbus™ Foundation



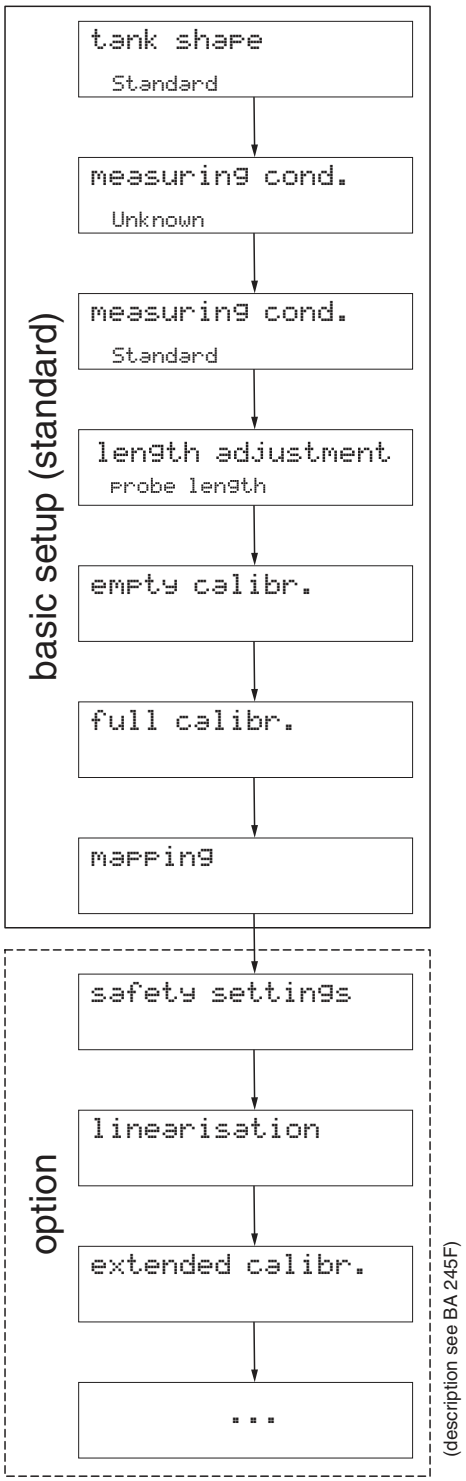
BA245F/00/en/07.07
No. 71040940

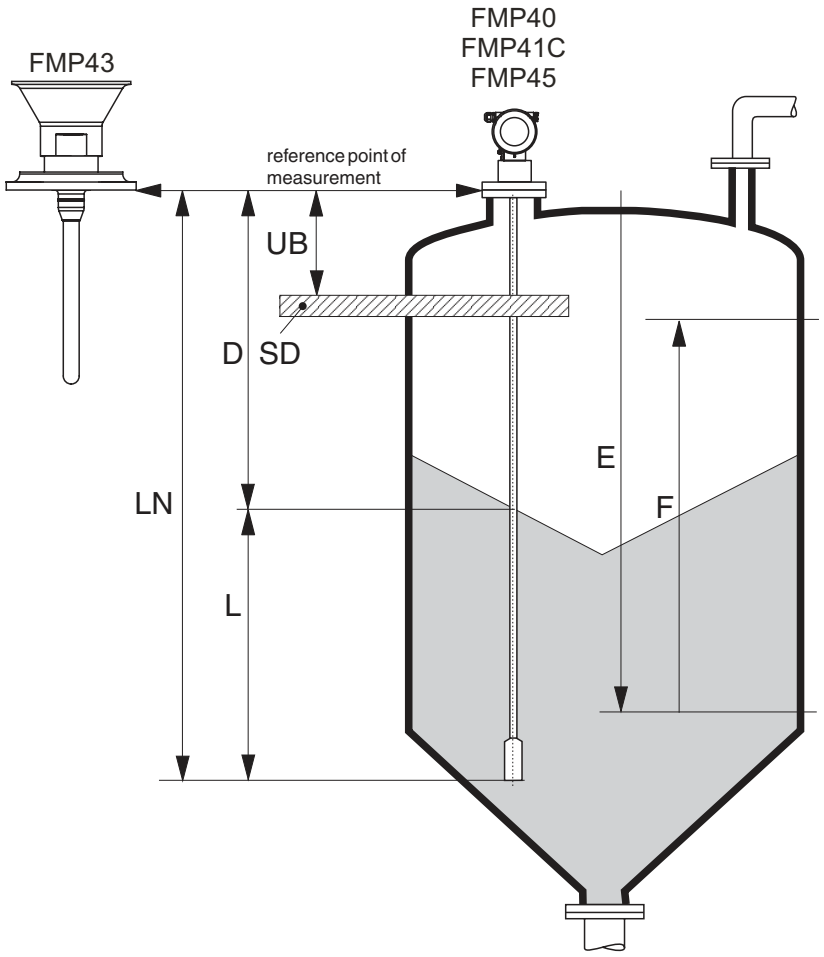
Valid as of software version:
V 01.04.02

Endress+Hauser

People for Process Automation

Basic Setup





E = empty calibr. (= zero)
setting in 005

F = full calibr. (= span)
setting in 006

D = distance (distance flange / product)
display in 0A5

L = level
display in 0A6

LN = probe length
setting in 033

UB = upper blocking distance
setting in 059

SD = safety distance
setting in 015

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1 Notes on use

You have various options for accessing the descriptions of instrument functions or how to enter parameters.

1.1 Using the table of contents to locate a function description

All the functions are listed in the table of contents sorted by function group (e.g. basic setup, safety settings, etc.). You can access a more detailed description of a function by using a page reference / link.
The table of contents is on → 4.

1.2 Using the graphic of the function menu to locate a function description

This guides you step by step from the highest level, the function groups, to the exact function description you require.

All the available function groups and instrument functions are listed in the table (→ 12). Select your required function group or function. You can access an exact description of the function group or function by using a page reference / link.

1.3 Using the index of the function menu to locate a function description

To simply navigation within the function menu, each function has a position which is shown in the display. You can access each function via a page reference/link in the function menu index (→ 83) which lists all the function names alphabetically and numerically.

1.4 General structure of the operating menu

The operating menu is made up of two levels:

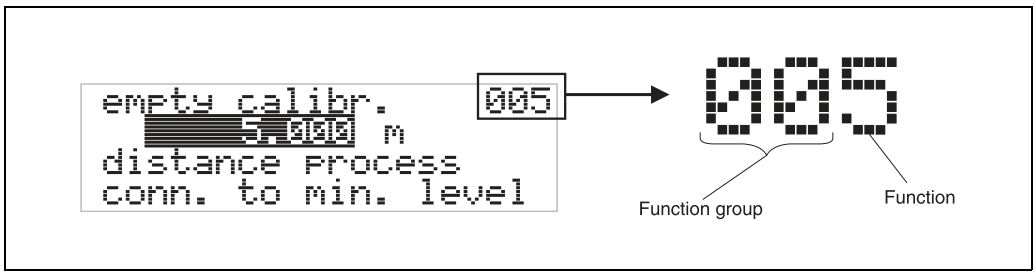
- **Function groups (00, 01, … , 0C, 0D):**
  The individual operating Selection of the instrument are split up roughly into different function groups. The function groups that are available include, e.g.: "**basic setup**", "**safety settings**", "**output**", "**display**", etc.
- **Functions (001, 002, 003, …, 0D8, 0D9):**
  Each function group consists of one or more functions. The functions perform the actual operation or parameterisation of the instrument. 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 instrument is to be changed, carry out the following procedure:

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

1.4.1 Identifying the functions

For simple orientation within the function menus (→ 12), for each function a position is shown on the display.



The first two digits identify the function group:

- **basic setup** **00**
- **safety settings** **01**
- **lenght adjustment** **02**

…

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

- **basic setup** **00** →
  - **tank properties** **002**
  - **medium property** **003**
  - **process cond.** **004**

  …

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

1.5 Display and operating elements

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

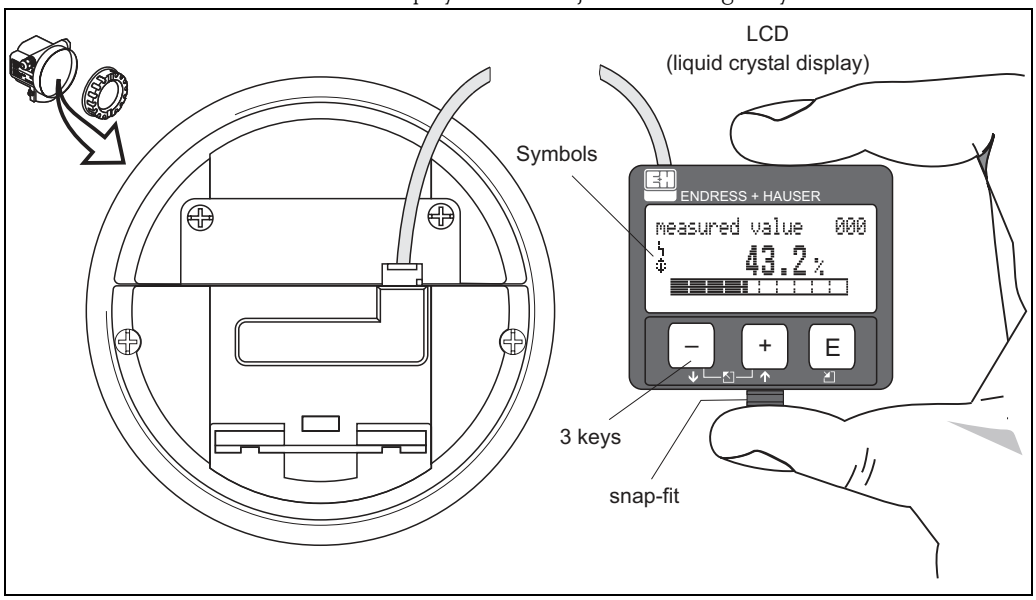


Abb. 1: Layout of the display and operating elements

The VU331 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 cable.

1.5.1 Display

Liquid crystal display (LCD):
Four lines with 20 characters each. Display contrast adjustable through key combination.

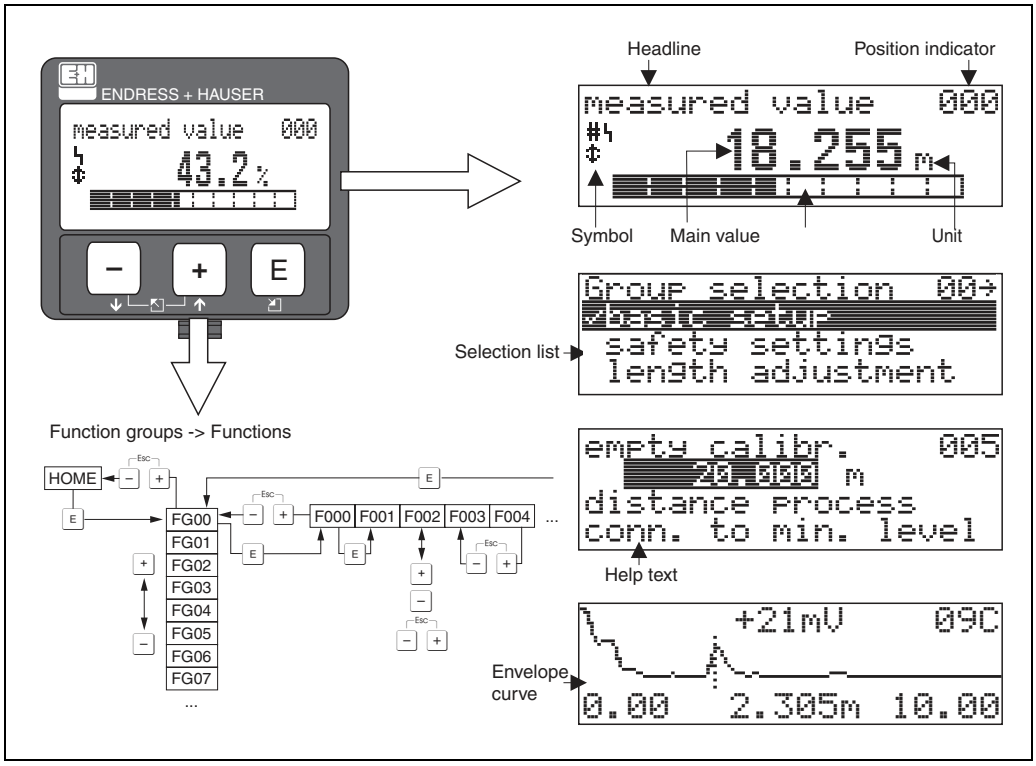


Abb. 2: Display

1.5.2 Display symbols

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

Symbols	Meaning
	**ALARM_SYMBOL** This alarm symbol appears when the instrument is in an alarm state. If the symbol flashes, this indicates a warning.
	**LOCK_SYMBOL** This lock symbol appears when the instrument is locked,i.e. if no input is possible.
	**COM_SYMBOL** This communication symbol appears when a data transmission via e.g. HART, PFOFIBUS-PA or FOUNDATION Fieldbus is in progress.
	**SIMULATION_SWITCH_ENABLE** This communication symbol appears when simulation in FOUNDATION Fieldbus is enabled via the DIP switch.

Tab. 1-1 Meaning of Symbols

1.5.3 Key assignment

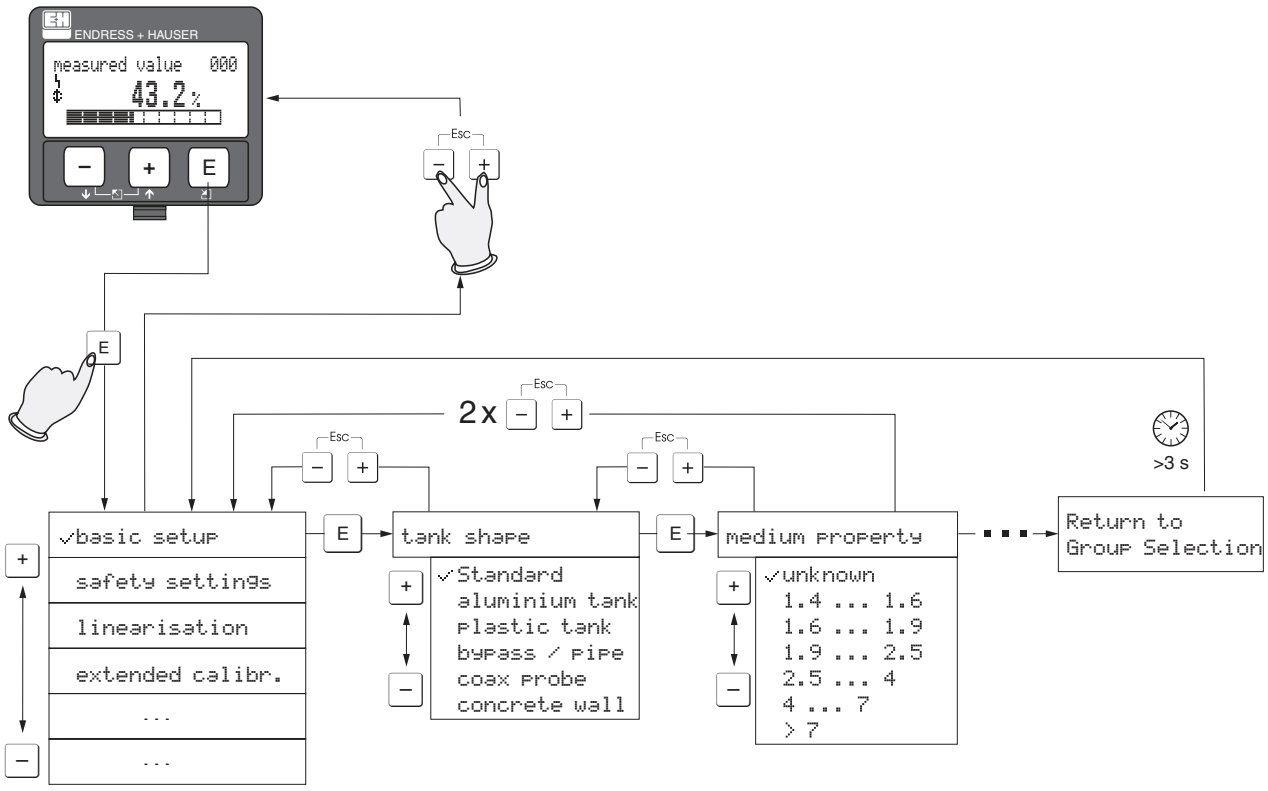
The operating elements are located inside the housing and are accessible for operation by opening the lid of the housing.

Function of the keys

Key(s)	Meaning
+ or ↑	Navigate upwards in the selection list Edit numeric value within a function
− or ↓	Navigate downwards in the selection list Edit numeric value within a function
Esc − + or ←	Navigate to the left within a function group
E or E	Navigate to the right within a function group, confirmation.
+ and E or − and E	Contrast settings of the LCD
+ and − and E	Hardware lock / unlock After a hardware lock, an operation of the instrument 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.

Tab. 1-2 Function of the keys

1.5.4 Operation with the VU331



Selection and configuration in Operation menu:

1.) Change from Measured Value Display to **Group Selection** by pressing E

2.) Press − or + to select the required **Function Group** (e.g.. "basic setup (00)") and confirm by pressing E ➜ First f**unction** (e.g. "tank shape (002)") is selected.

Note!
The active selection is marked by a ✔ in front of the menu text.

3.) Activate Edit mode with + or −.

Selection menus:

a) Select the required **Parameter** in selected **function** (e.g. "tank shape (002)") with − or +.
b) E confirms selection ➜ ✔ appears in front of the selected parameter
c) E confirms the edited value ➜ system quits Edit mode
d) + / − (= Esc) interrupts selection ➜ system quits Edit mode

Typing in numerals and text:

a) Press + or − to edit the first character of the **numeral / text** (e.g. "empty calibr. (005)")
b) E positions the cursor at the next character ➜ continue with (a) until you have completed your input
c) if a ↵ symbol appears at the cursor, press E to accept the value entered ➜ system quits Edit mode
d) + / − (= Esc) interrupts the input, system quits Edit mode

4) Press E to select the next **function** (e.g. "medium property (003)")

5) Press + / − (= Esc) once ➜ return to previous **function** (e.g. "tank shape (002)")
Press + / − (= Esc) twice ➜ return to **Group selection**

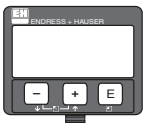
6) Press + / − (= Esc) to return to **Measured value display**

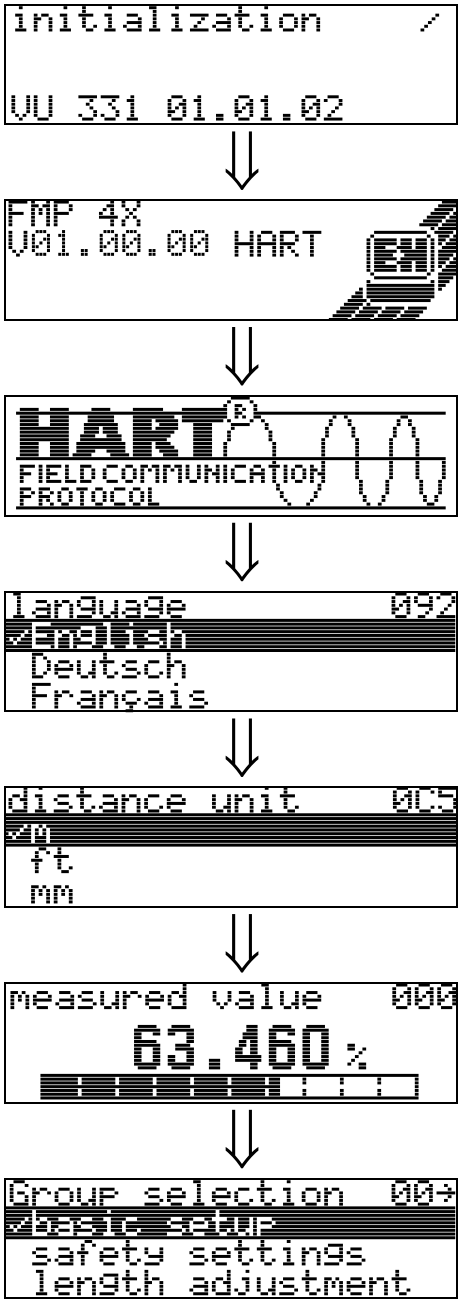
Abb. 3: Selection and configuration in operation menu

1.6 Commissioning

1.6.1 Switching on the measuring device

When the instrument is switched on for the first time, the following messages appear on the display:





After 5 s, the following message appears

Nach 5 s erscheint (z.B. bei HART Geräten)

After 5 s or after you have pressed E the following message appears

Select the language
(this message appears the first time the instrument is switched on)

Select the basic unit
(this message appears the first time the instrument is switched on)

The current measured value is displayed

After E is pressed, you reach the group selection.

This selection enables you to perform the basic setup

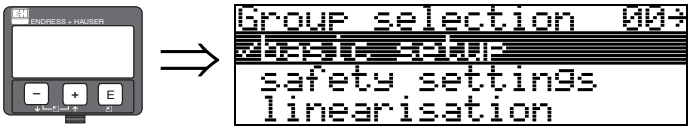
2 Function menu Levelflex M

Function group			Function			Description
basic setup	**00**	⇒	measured value	000	→	Page 15
(siehe Seite 15)			tank properties	002	→	Page 15
⇓			medium property	003	→	Page 16
			process cond.	004	→	Page 18
			end of probe	030	→	Page 18
			probe length	031	→	Page 19
			probe	032	→	Page 19
			probe length	033	→	Page 19
			determine length	034	→	Page 19
			empty calibr.	005	→	Page 20
			full calibr.	006	→	Page 21
			check distance	051	→	Page 22
			range of mapping	052	→	Page 23
			start mapping	053	→	Page 23
safety settings	**01**	⇒	output on alarm	010	→	Page 25
(siehe Seite 25)			output on alarm (HART only)	011	→	Page 27
⇓			outp. echo loss	012	→	Page 27
			ramp %span/min	013	→	Page 28
			delay time	014	→	Page 29
			safety distance	015	→	Page 29
			in safety dist.	016	→	Page 29
			ackn. alarm	017	→	Page 31
			overspill prot.	018	→	Page 31
			brocken probe det	019		Page 31
length adjustment	**03**	⇒	end of probe	030	→	Page 32
(siehe Seite 32)			probe length	031	→	Page 32
⇓			probe	032	→	Page 33
			probe length	033	→	Page 33
			determine length	034	→	Page 33
Linearisation	**04**	⇒	level/ullage	040	→	Page 34
(siehe Seite 34)			linearisation	041	→	Page 35
⇓			customer unit	042	→	Page 38
			table no.	043	→	Page 39
			input level	044	→	Page 39
			input volume	045	→	Page 40
			max. scale	046	→	Page 40
			diameter vessel	047	→	Page 40

Function group		Function			Description
extended calibr.	**05**	selection	050	→	Page 41
(siehe Seite 41)		check distance	051	→	Page 41
⇓		range of mapping	052	→	Page 42
		start mapping	053	→	Page 42
		pres. map dist.	054	→	Page 43
		delete map.	055	→	Page 43
		echo quality	056	→	Page 44
		offset	057	→	Page 44
		output damping	058	→	Page 44
		upper block.dist	059	→	Page 45
output	**06**	commun. address (HART only)	060	→	Page 48
PROFIBUS param.	**06**	instrument addr. (PROFIBUS PA only)	060	→	Page 48
PROFIBUS PA only		no. of preambels (HART only)	061	→	Page 49
(siehe Seite 48)		ident number (PROFIBUS PA only)	061	→	Page 49
⇓		low output limit (HART only)	062	→	Page 50
		set unit to bus (PROFIBUS PA only)	062	→	Page 50
		curr. output mode	063		Page 51
		out value (PROFIBUS PA only)	063	→	Page 51
		fixed cur. value (HART only)	064	→	Page 52
		out status (PROFIBUS PA only)	064	→	Page 52
		simulation	065	→	Page 53
		simulation value	066	→	Page 54
		output current (HART only)	067	→	Page 54
		2nd cyclic value (PROFIBUS PA only)	067	→	Page 54
		4mA value (HART only)	068		Page 54
		select v0h0 (PROFIBUS PA only)	068	→	Page 55
		20mA value (HART only)	069	→	Page 55
		display value (PROFIBUS PA only)	069	→	Page 55
envelope curve	**0E**	plot settings	0E1	→	Page 56
(siehe Seite 56)		recording curve	0E2	→	Page 56
⇓		envelope curve	0E3	→	Page 57
display	**09**	language	092	→	Page 59
(siehe Seite 59)		back to home	093	→	Page 59
⇓		format display	094	→	Page 60
		no.of decimals	095	→	Page 60
		sep. character	096	→	Page 60
		display test	097	→	Page 61
diagnostics	**0A**	present error	0A0	→	Page 63
(siehe Seite 62)		previous error	0A1	→	Page 63
⇓		clear last error	0A2	→	Page 63
		reset	0A3	→	Page 64
		unlock parameter	0A4	→	Page 65
		measured dist.	0A5	→	Page 66
		measured level	0A6	→	Page 67
		detection window	0A7		Page 67
		application par.	0A8	→	Page 68

Function group			Function			Description
system parameters (siehe Seite 69)	**0C**	⇒	tag no.	0C0	→	Page 69
			device tag (FOUNDATION Fieldbus only)	0C0	→	Page 69
			Profile Version (PROFIBUS PA only)	0C1	→	Page 69
			protocol+sw-no.	0C2	→	Page 69
			serial no.	0C4	→	Page 70
			device id (FOUNDATION Fieldbus only)	0C4	→	Page 70
			distance unit	0C5	→	Page 70
			download mode	0C8	→	Page 71
service	**D00**	⇒	service level	D00		Page 72

3 Function group "basic setup" (00)

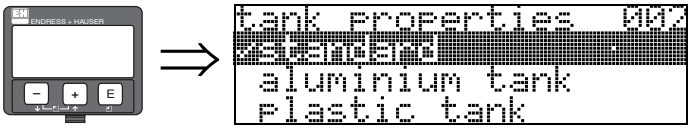


3.1 Function "measured value" (000)



This function displays the current measured value in the selected unit (see "**customer unit**" **(042)** function). The number of places after decimal point can be selected in the "**no.of decimals**" **(095)** function.

3.2 Function "tank properties" (002)



This function is used to select the tank properties.

Selection:
- **standard**
- aluminium tank
- plastic tank
- bypass / pipe
- coax probe
- concrete wall

standard
The "**standard**" option is recommended for normal containers for rod and rope probes.

aluminium tank
The "**aluminium tank**" option is designed especially for high aluminium silos that cause an increased level of noise when empty. This option is only useful for probes longer than (< 4 m). For short probes (< 4 m) select the "**standard**" option.

✎ Note!
If "**aluminium tank**" is selected, the device calibrates of its own accord when first filled, depending on the medium's properties. Slope errors can, therefore, occur when beginning the first filling procedure.

plastic tank
Select the "**plastic tank**" option when installing probes in wood or plastic containers **without** metallic surfaces at the process connection (see installation in plastic containers). When using a metallic surface at the process connection, the "**standard**" option is sufficient.

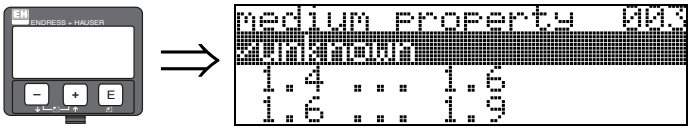
✎ Note!
In principle the employment of a metallic surface area should be preferred at the process connection!

bypass / pipe
The "**bypass / pipe**" option is designed especially for the installation of probes in a bypass or a stilling well. If this option is selected, the upper blocking distance is preset to 100 mm.

coax probe (not relevant for FMP43)
Select the "**coax probe**" option when using a coaxial probe. When this setting is made, the evaluation is adapted to the high sensitivity of the coax probe. This option should, therefore, **not** be selected when using rope or rod probes.

concrete wall
The **"concrete wall"** option takes into account the signal-damping property of concrete walls when mounting with < 1 m distance to the wall.

3.3 Function "medium property" (003)



This function is used to select the dielectric constant.

Selection:
- **unknown**
- 1.4 ... 1.6
  FMP40: for coaxial and Rod probe with installation in metallic pipes ≤ DN 150
  FMP41C, FMP45: 1,4 for installation in metallic pipes)
- 1.6 ... 1.9
- 1.9 ... 2.5
- 2.5 ... 4.0
- 4.0 ... 7.0
- > 7.0

FMP40:

Media group	DC (εr)	Typical bulk solids	Typical liquids	Measuring range	
				bare metallic probes	PA-coated rope probes
1	1.4...1.6		Condensed gases, e.g. N_2, CO_2	4 m / 157", only coax probe	—
2	1.6...1.9	Plastic granulate White lime, special cement Sugar	Liquefied gas, e.g. Propane Solvent Frigen / Freon Palm oil	25...30 m / 984...1181"	12,5...15 m / 492...590"
3	1.9...2.5	Portland cement, plaster	Mineral oils, fuels	30...35 m / 1181...1378"	—
		Flour	—	—	15...25 m / 590...984"
4	2.5...4	Grain, seeds	—	—	25...30 m / 984...1181"
		Ground stones Sand	Benzene, styrene, toluene Furan Naphthalene	35 m / 1378"	25...30 m / 984...1181"
5	4...7	Naturally moist (ground) stones, ores Salt	Chlorobenzene, chloroform Cellulose spray Isocyanate, aniline	35 m / 1378"	35 m / 1378"
6	> 7	Metallic powder Carbon black Coal	Aqueous solutions Alcohols Ammonia	35 m / 1378"	35 m / 1378"

FMP43:

Media group	DC (εr)	Typical liquids	Typ. measuring range
1	1.4 to 1.6	Condensed gases, e.g. N_2, CO_2	—
2	1.6 to 1.9	Liquefied gas, e.g. propane Solvent Frigen / Freon Palm oil	4 m (354")
3	1.9 to 2.5	Mineral oils, fuels	
4	2.5 to 4	Benzene, styrene, toluene Furan Naphthalene	
5	4 to 7	Chlorobenzene, chloroform Cellulose spray Isocyanate, aniline	
6	> 7	Aqueous solutions Alcohols Acids, alkalis	

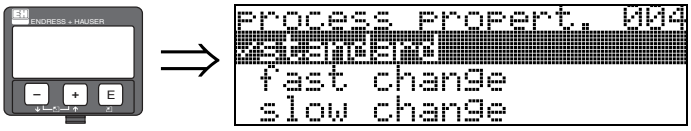
FMP41C, FMP45:

Media group	DC (εr)	Typical liquids	Typ. measuring range
1	1.4...1.6	Condensed gases, e.g. N_2, CO_2	4 m (157"), when installed in metallic pipes
2	1.6...1.9	Liquefied gas, e.g. Propane Solvent Frigen / Freon Palm oil	9 m (354")
3	1.9...2.5	Mineral oils, fuels	12 m (472")
4	2.5...4	Benzene, styrene, toluene Furan Naphthalene	16 m (629")
5	4...7	Chlorobenzene, chloroform Cellulose spray Isocyanate, aniline	25 m (984")
6	> 7	Aqueous solutions Alcohols Acids, alkalis	30 m (1181")

The lower group applies to very loose or loosened bulk solids.
Reduction of the max. possible measuring range by means of:
- extremely loose surfaces of bulk solids, e.g. bulk solids with low piled density when filled pneumatically.
- Build-up, primarily of moist products.

✎ Note!
Due to the high diffusion rate of ammonia it is recommended to use the FMP45 with gas-tight bushing for measurements in this medium.

3.4 Function "process propert." (004)

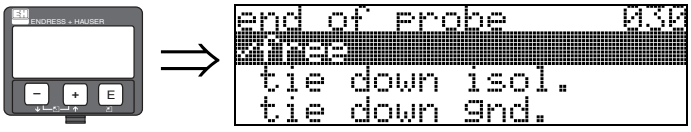


Use this function to adapt the device reaction to the filling speed in the tank. The setting impacts on an intelligent filter.

Selection:
- **standard**
- fast change
- slow change
- test:no filter

Selection:	standard	fast change	slow change	test:no filter
Application:	For all normal applications, bulk solids and fluids at low to medium filling speed and sufficiently large tanks.	Small tanks, primarily with fluids, at high filling speeds.	Applications with strong surface movement, e.g. caused by stirrer, primarily large tanks with slow to medium filling speed.	Shortest reaction time: ■ For test purposes ■ Measurement in small tanks at high filling speeds, if "rapid change" setting is too slow.
2-wire electronics:	Dead time: 4 s Slewrate: 18 s	Dead time: 2 s Slewrate: 5 s	Dead time: 6 s Slewrate: 40 s	Dead time: 1 s Slewrate: 0 s
4-wire electronics:	Dead time: 2 s Slewrate: 11 s	Dead time: 1 s Slewrate: 3 s	Dead time: 3 s Slewrate: 25 s	Dead time: 0,7 s Slewrate: 0 s

3.5 Function "end of probe" (030)

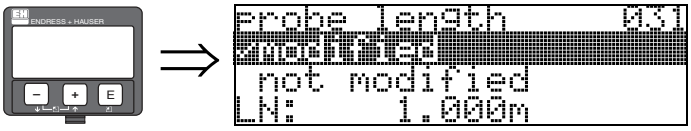


Use this function to select the polarity of the probe end signal. If the probe end is uncovered or in an insulated attachment, there is a negative probe end signal.
The signal from the probe end is positive if the attachment is grounded.
Only the setting "**free** " is permitted for the FMP41C/FMP43.

Selection:
- **free**
- tie down isol.[1]
- tie down gnd.[1]

1.FMP41C/FMP43: These settings lead to a false output signal for empty tanks.

3.6 Function "probe length" (031)

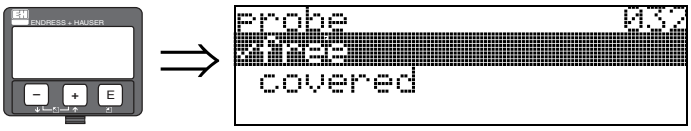


Use this function to select whether the probe length was changed after factory calibration. Only then is it necessary to enter or correct the probe length.

Selection:
- **not modified**
- modified

Note!
If "modified" was selected in the "**probe length**" **(031)** function, the probe length is defined in the next step.

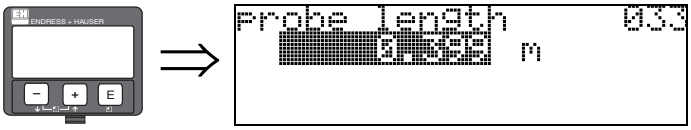
3.7 Function "probe" (032)



Use this function to select whether the probe is uncovered or covered.
If the probe is uncovered, the Levelflex can determine the probe length automatically "**determine length**" (**034**). function. If the probe is covered, a correct entry is required in the "**probe length**" **(033)** function

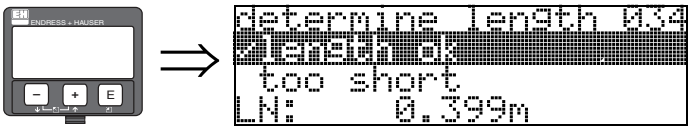
Selection:
- **free**
- covered

3.8 Function "probe length" (033)



With this function, the probe length can be entered manually.

3.9 Function "determine length" (034)

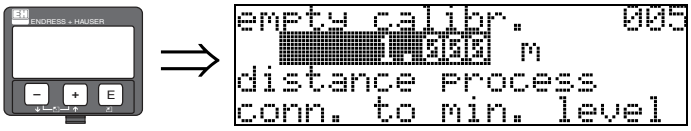


Use this function to determine the probe length automatically.
Due to the mounting conditions, the automatically determined probe length may be larger than the actual probe (typically 20 .. 30 mm longer). This has no influence on the measuring accuracy. When entering the empty value for a linerisation, please use the "empty calibration" instead of the automatically determined probe length.

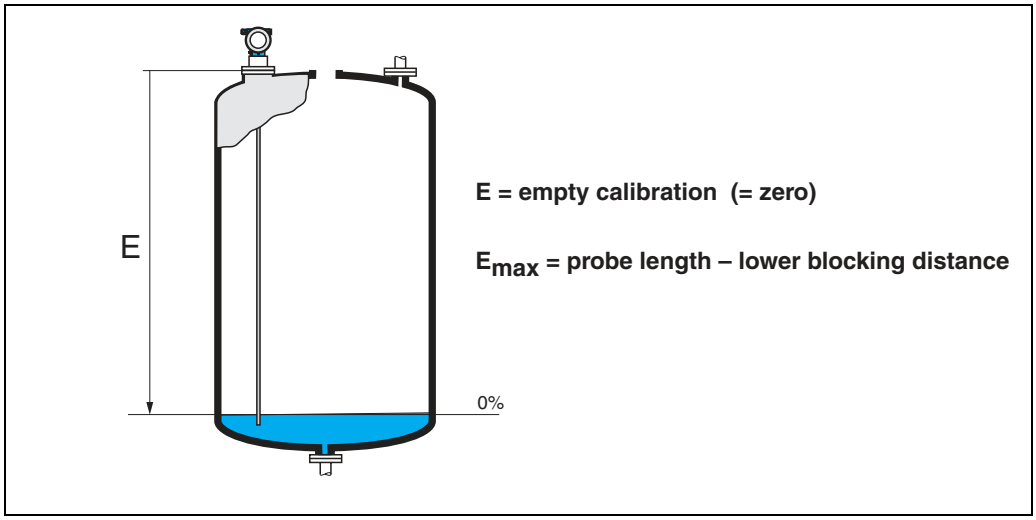
Selection:
- **length ok**
- too short
- too long

After selection "length too short" or "length too long", the calculation of the new value need approx. 10 s.

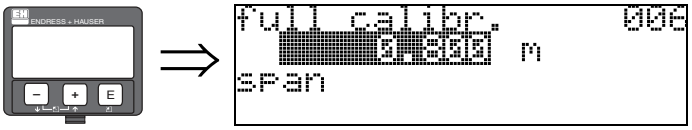
3.10 Function "empty calibr." (005)



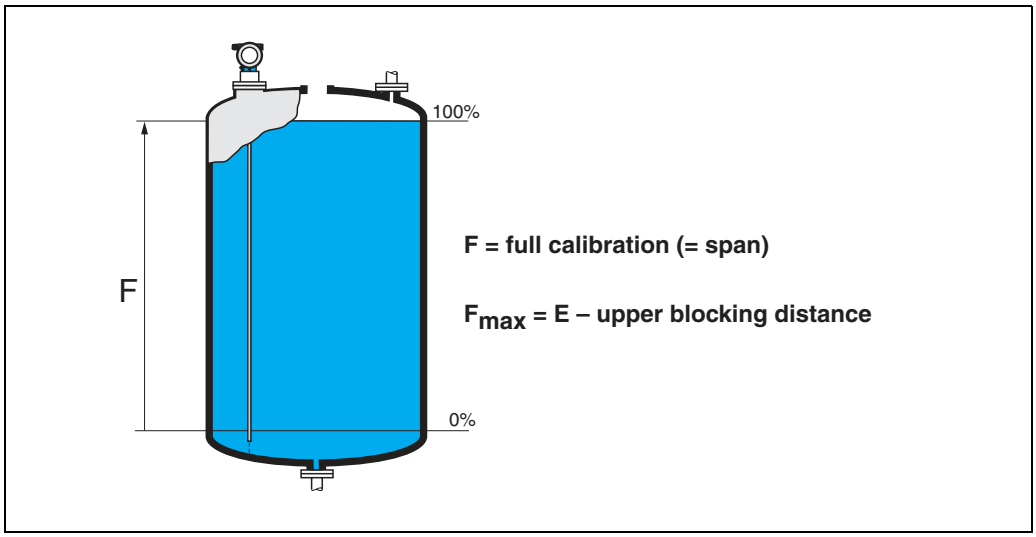
This function is used to enter the distance from the flange (reference point of the measurement) to the minimum level (=zero).



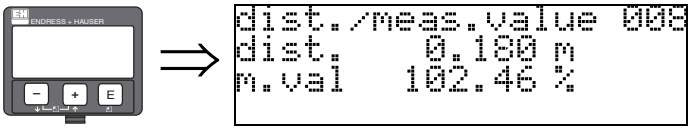
3.11 Function "full calibr." (006)



This function is used to enter the distance from the minimum level to the maximum level (=span).



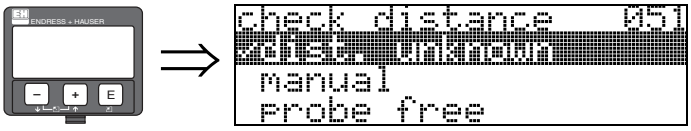
3.12 Display (008)



The **distance** measured from the reference point to the product surface and the **meas. value** calculated with the aid of the empty adjustment are displayed. Check whether the values correspond to the actual meas. value 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)**

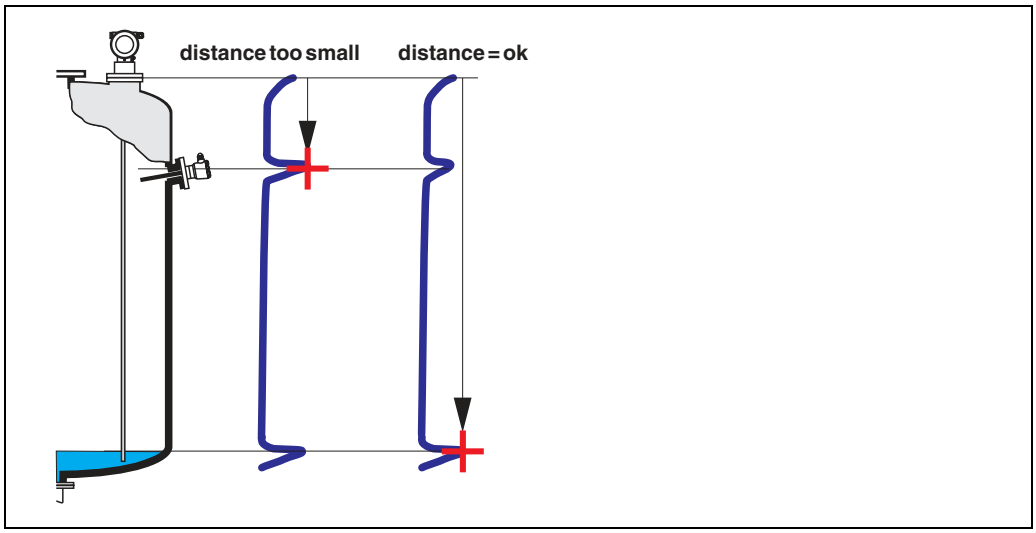
3.13 Function "check distance" (051)



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. The following options are available for selection:

Selection:

- distance = ok
- dist. too small
- dist. too big
- dist. unknown
- **manual**
- probe free



distance = ok

Use this function at part-covered probe. Choosing function "**manual**" or "**probe free**" at free probe.

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

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

Note!
At free probe, the mapping should be confirmed with the choice "**probe free**".

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.

Caution!
The range of mapping must end 0.3 m (20") before the echo of the actual level. In case of empty vessel it is possible to make a map over the whole probe length.

probe free
If the probe is uncovered, mapping is carried out along the whole probe length.

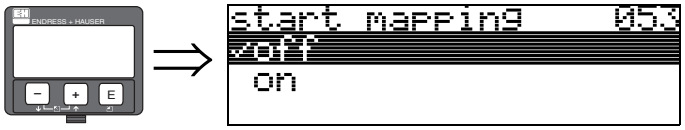
Caution!
Only begin mapping in this function if the probe is safely uncovered. Otherwise, the device will not make correct measurements.

3.14 Function "range of mapping" (052)



This function displays the suggested range of mapping. The reference point is always the reference point of the measurement (→ 1). This value can be edited by the operator.
For manual mapping, the default value is 0,3 m.

3.15 Function "start mapping" (053)

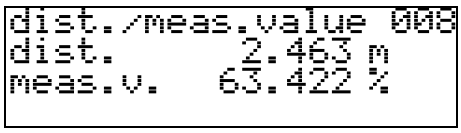


This function is used to start the interference echo mapping up to the distance given in "**range of mapping" (052)**.

Selection:
- off: no mapping is carried out
- on: mapping is started

3.16 Display (008)

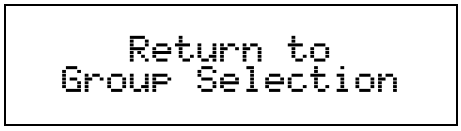




The distance measured from the reference point to the product surface and the meas. value calculated with the aid of the empty alignment are displayed again. Check whether the values correspond to the actual meas. value or the actual distance. The following cases can occur:

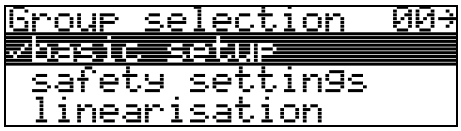
- Distance correct – meas. value correct -> basic setup completed
- Distance incorrect – meas. value incorrect -> a further interference echo mapping must be carried out "**check distance**" (**051)**.
- Distance correct – meas. value incorrect -> check "**empty calibr.**" **(005)**







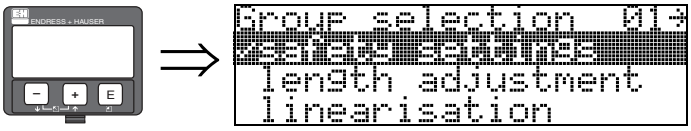
After 3 s, the following message appears





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

4 Function group "safety settings" (01)



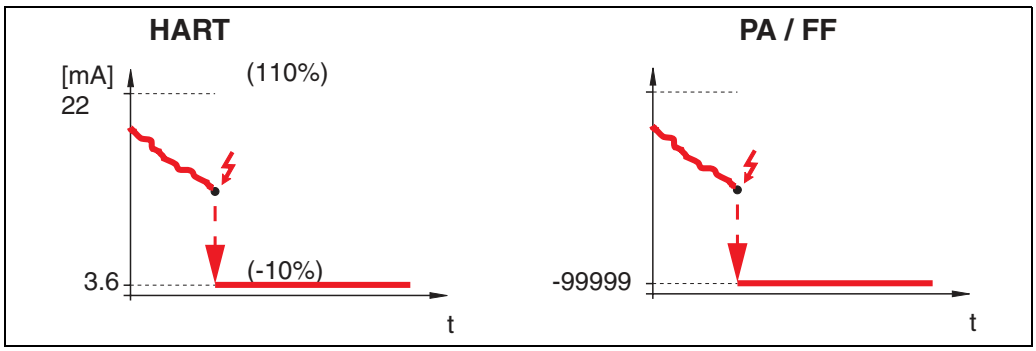
4.1 Function "output on alarm" (010)



This function is used to select the reaction of output on an alarm.

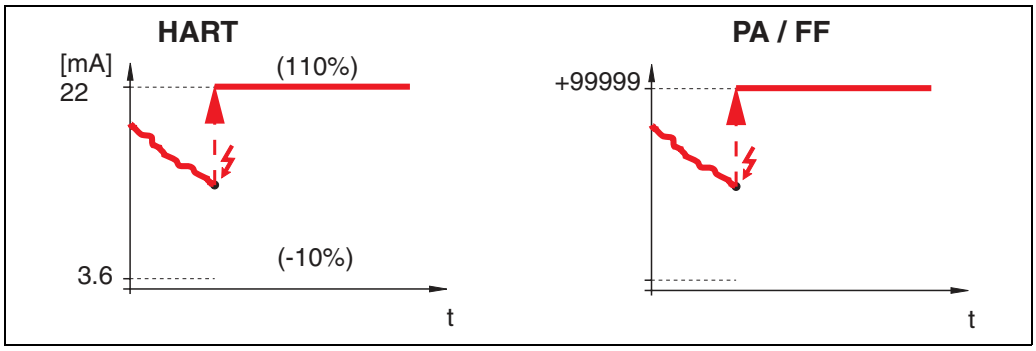
Selection:
- MIN (<= 3.6mA)
- **MAX (22mA)**
- hold
- user specific

MIN (<= 3.6mA)



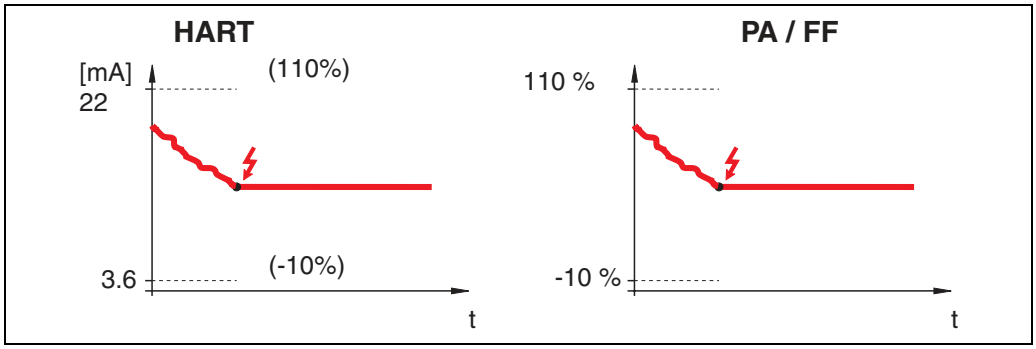
If the instrument is in alarm state, the output changes as follows:
- HART: MIN-Alarm 3.6 mA
- PROFIBUS PA: MIN-Alarm -99999
- FOUNDATION Fieldbus: MIN-Alarm -99999

MAX 110% 22mA



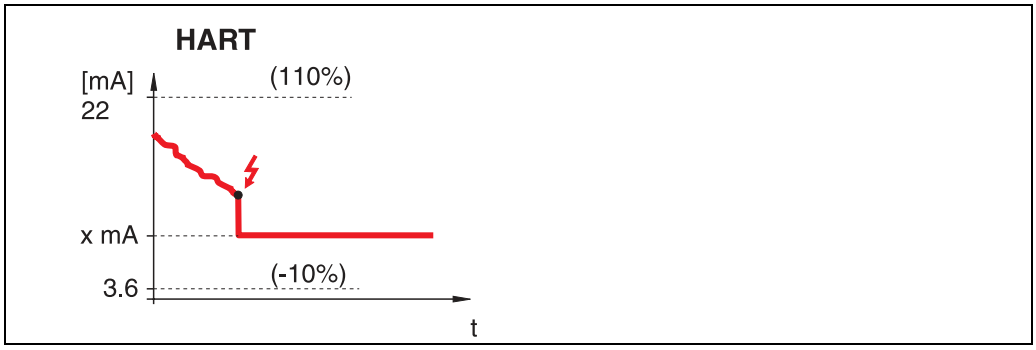
If the instrument is in alarm state, the output changes as follows:
- HART: MAX-Alarm 22 mA
- PROFIBUS PA: MAX-Alarm +99999
- FOUNDATION Fieldbus: MAX-Alarm +99999

hold



If the instrument is in alarm state, the last measured value is held.

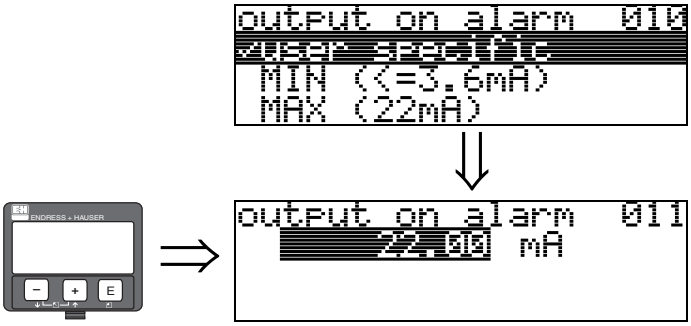
user specific



If the instrument is in alarm state, the output is set to the value configured in "**output on alarm**" **(011)** (x mA).

Caution!
This selection is available for HART devices only!

4.2 Function "output on alarm" (011), HART only



On alarm, the output current is in mA. This function is active when you selected "**user specific**" in the "**output on alarm**" **(010)** function.

Caution!
This function is available for HART devices only!

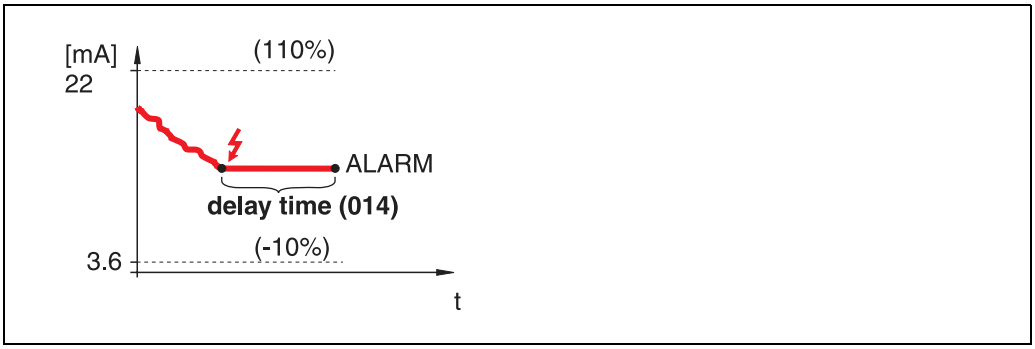
4.3 Function "outp. echo loss" (012)



Use this function to set the output response on echo loss.

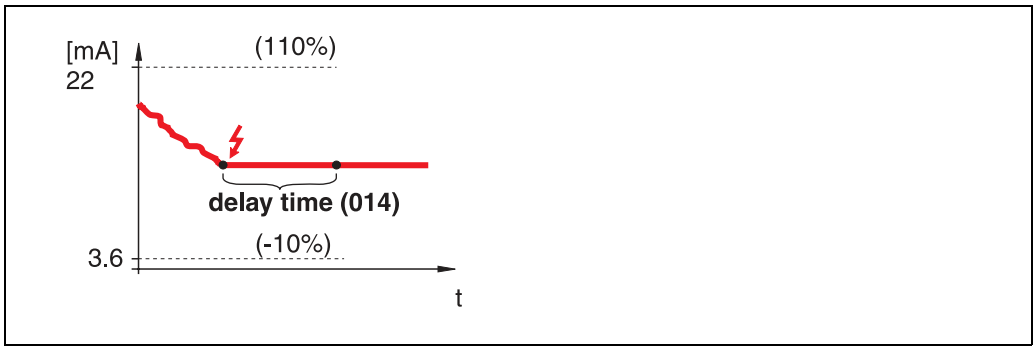
Selection:
- alarm
- **hold**
- ramp %/min

alarm



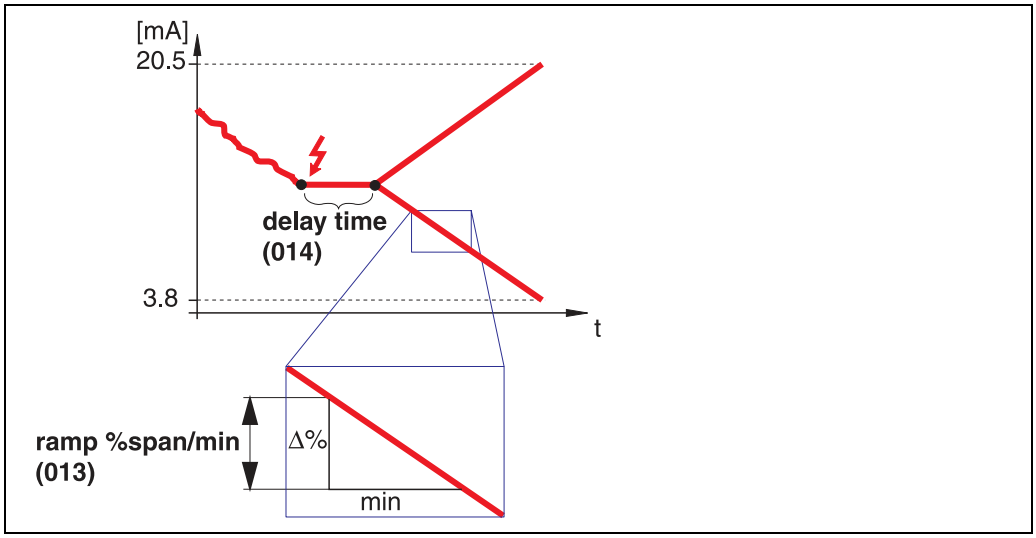
On echo loss, the instrument switches to alarm state after an adjustable "**delay time**" **(014)**. The output response depends on the configuration set in "**output on alarm**" **(010)**.

hold



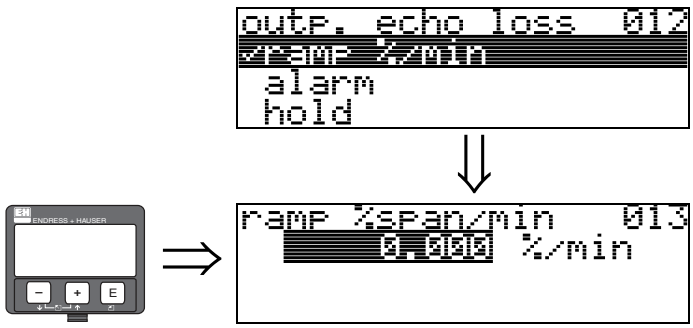
On echo loss, a warning is generated after a definable "**delay time**" **(014)**. Output is held.

ramp %/min



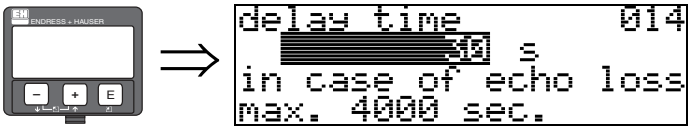
On echo loss, a warning is generated after a definable "**delay time**" **(014)**. The output is changed towards 0% or 100% depending on the slope defined in "**ramp %span/min**" **(013)**.

4.4 Function "ramp %span/min" (013)



Ramp slope which defines the output value on echo loss. This value is used if "**ramp %span/min**" is selected in "**outp. echo loss**" **(012)**. The slope is given in % of the measuring range per minute.

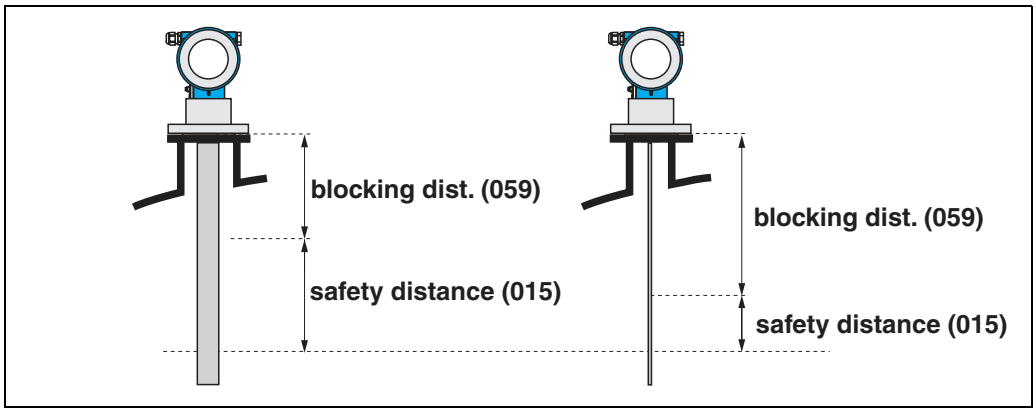
4.5 Function "delay time" (014)

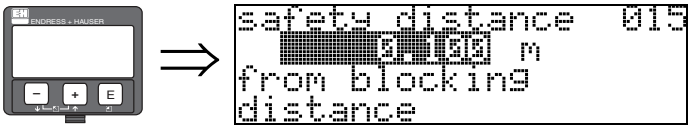


Use this function to enter the delay time (Default = 30 s) after which a warning is generated on echo loss, or after which the instrument switches to alarm state.

4.6 Function "safety distance" (015)

A configurable safety distance is placed before the "**blocking dist.**" **(059)** (→ 45). This distance warns you that any further level increase would make the measurement invalid.





Enter the size of the safety distance here. The default value is: 0.1 m.

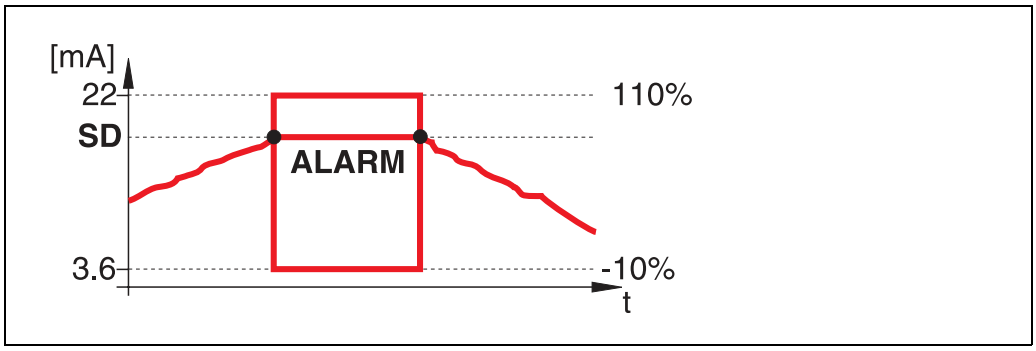
4.7 Function "in safety dist." (016)



This function defines the response when the level enters the safety distance .

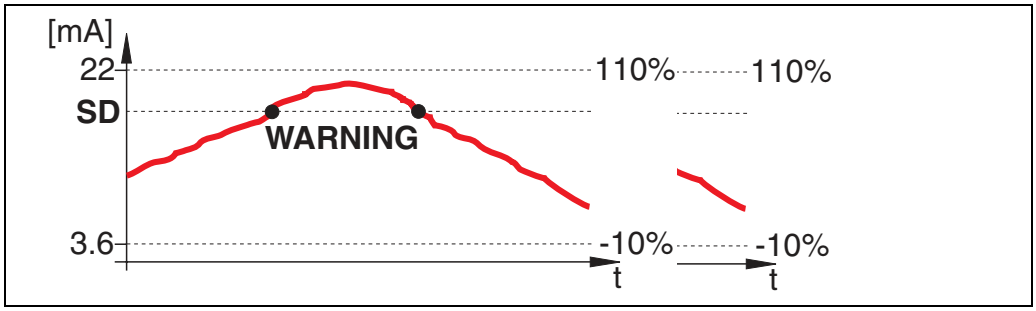
Selection:
- alarm
- **warning**
- self holding

alarm



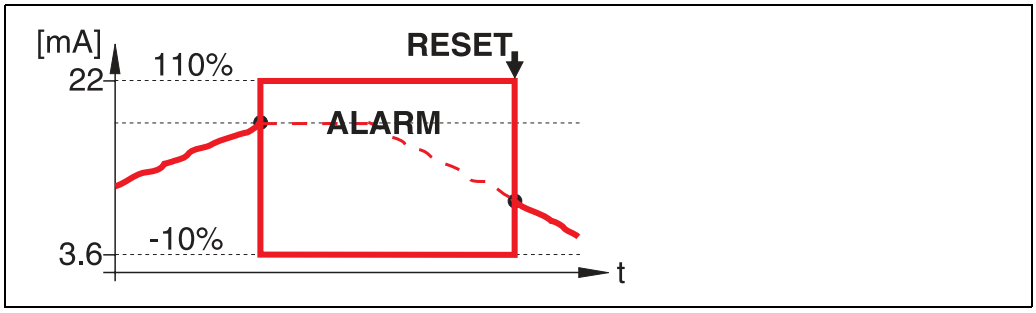
Instrument enters the defined alarm state ("**output on alarm**" **(011)**). The alarm message **E651** - "**level in safety distance - risk of overspill**" is displayed.
If the level drops out of the safety distance, the alarm warning disappears and the instrument starts to measure again.

warning



Instrument displays a warning **E651** - "**level in safety distance - risk of overspill**", but continues to measure. If the level leaves the safety distance, the warning disappears.

self holding



Instrument switches to defined alarm state ("**output on alarm**" **(011)**). The alarm message **E651** - "**level in safety distance - risk of overspill**" is displayed.
If the level leaves the safety distance, the measurement continues only after a reset of the self holding (function: "**ackn. alarm**" **(017)**).

4.8 Function "ackn. alarm" (017)



This function acknowledges an alarm in case of "**self holding**".

Selection:
- **no**
- yes

no
The alarm is not acknowledged.

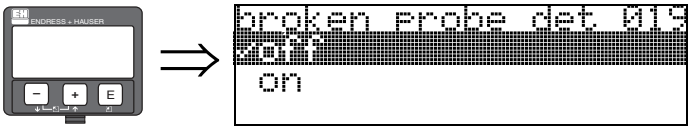
yes
Acknowledgement takes place.

4.9 Function "overspill prot." (018)



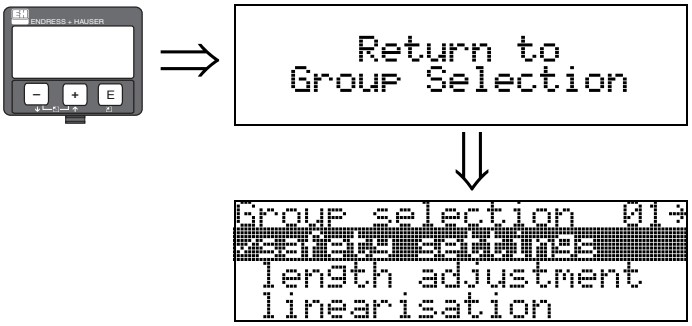
When "**german WHG**" is selected, various parameters relating to WHG overflow protection are defaulted and the instrument is locked against further operation. Select "**Standard**" to unlock, the WHG parameter settings are retained.

4.10 Function "broken probe det" (019)



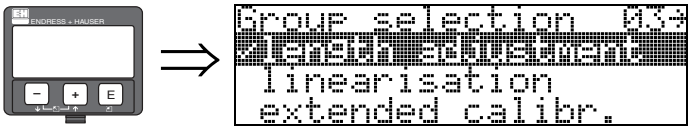
This function activates the automatic recognition of broken probes.
Before updating the broken probe detection a mapping must be performed (function "**range of mapping**" **(052)** and "**start mapping**" **(053)**).

Selection:
- **off**
- on

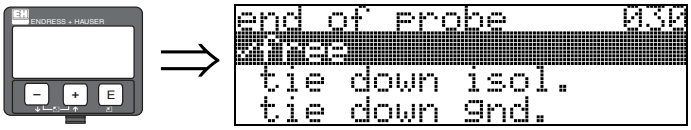


After 3 s, the following message appears

5 Function group "length adjustment" (03)



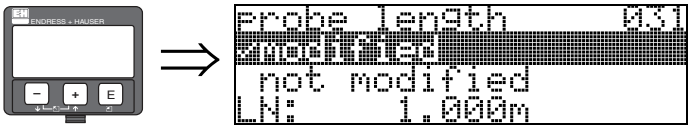
5.1 Function "end of probe" (030)



Use this function to select the polarity of the probe end signal. If the probe end is uncovered or in an insulated attachment, there is a negative probe end signal.
The signal from the probe end is positive if the attachment is grounded.
Only the setting "**free** " is permitted for the FMP41C.

Selection:
- **free**
- tie down isol.[1]
- tie doen gnd.[1]

5.2 Function "probe length" (031)



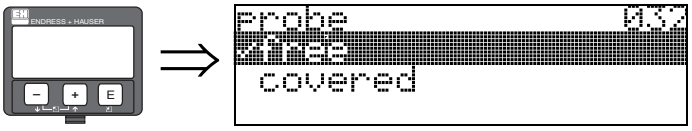
Use this function to select whether the probe length was changed after factory calibration. Only then is it necessary to enter or correct the probe length.

Selection:
- **modified**
- not modified

✎ Note!
If "**modified**" was selected in the "**probe length**" **(031)** function, the probe length is defined in the next step.

1.FMP41C: These settings lead to a false output signal for empty tanks.

5.3 Function "probe" (032)

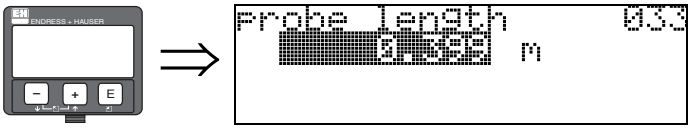


Use this function to select whether the probe is at the time of the commisioning uncovered or covered. If the probe is uncovered, the Levelflex can determine the probe length automatically "**determine length**" (**034**). function. If the probe is covered, a correct entry is required in the "**probe length**" **(033)** function

Selection:

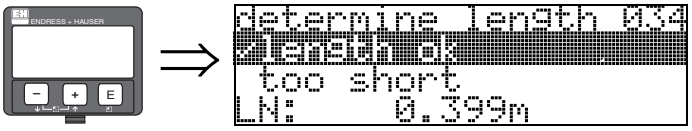
- **free**
- covered

5.4 Function "probe length" (033)



Use this function to enter the probe length.

5.5 Function "determine length" (034)



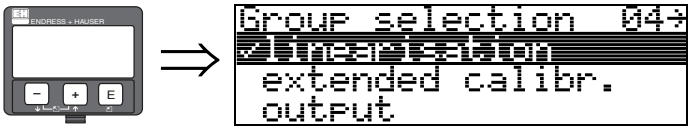
Use this function to determine the probe length automatically.
Due to the mounting conditions, the automatically determined probe length may be larger than the actual probe (typically 20 .. 30 mm longer). This has no influence on the measuring accuracy. When entering the empty value for a linerisation, please use the "empty calibration" instead of the automatically determined probe length.

Selection:

- **length ok**
- too short
- too long

After selecting "length too short" or "length too long" the calculation of the new probe length takes up to approx. 10 s.

6 Function group "linearisation" (04)



6.1 Function "level/ullage" (040)



Selection:
- **level CU**
- level DU
- ullage CU
- ullage DU

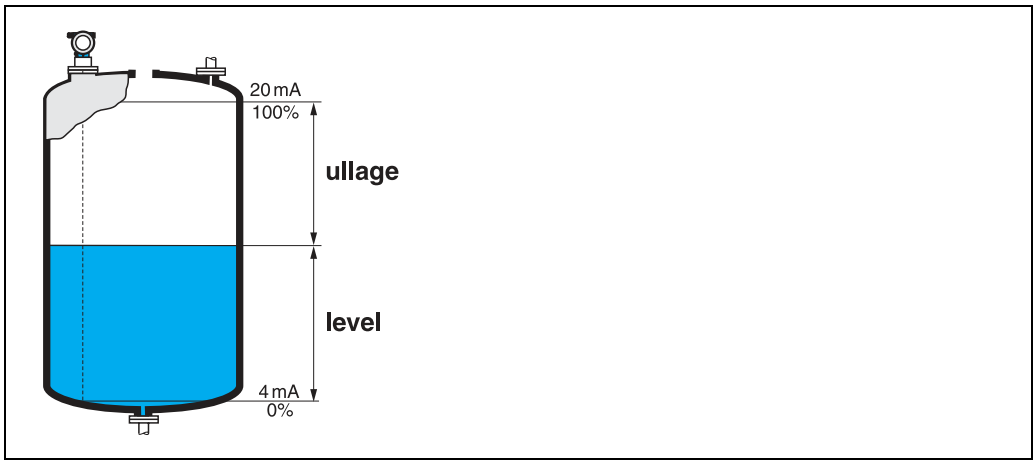
level CU
Level in customer units. The measured value can be linearised.
The "**linearisation**" **(041)** default value is set to a linear 0...100%.

level DU
Level in the selected "**distance unit**" **(0C5)**.

ullage CU
Ullage in customer units. The value can be linearised.
The "**linearisation**" **(041)** default value is set to a linear 0...100%.

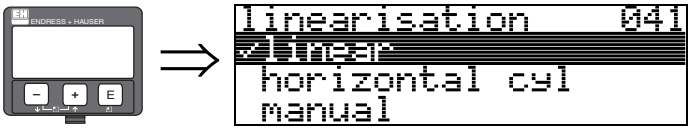
ullage DU
Ullage in the selected "**distance unit**" **(0C5)**.

✎ Note!
Reference point for the ullage is "**full calibr.**" **(006)** (=span).



6.2 Function "linearisation" (041)

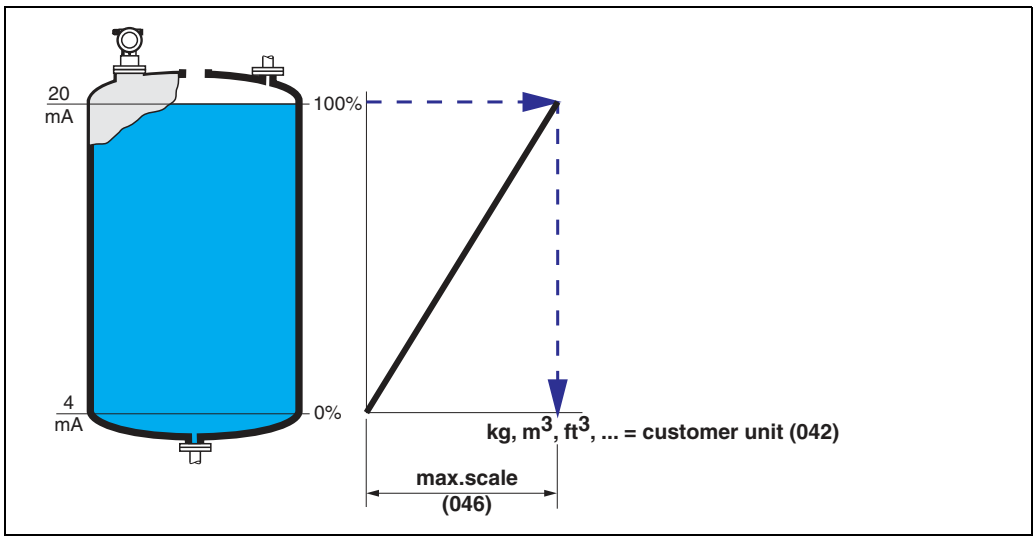
Linearisation defines the ratio of level to container volume or product weight and allows a measurement in customer units, e.g. metres, hectolitres etc. The measured value in (000) is then displayed in the selected unit.



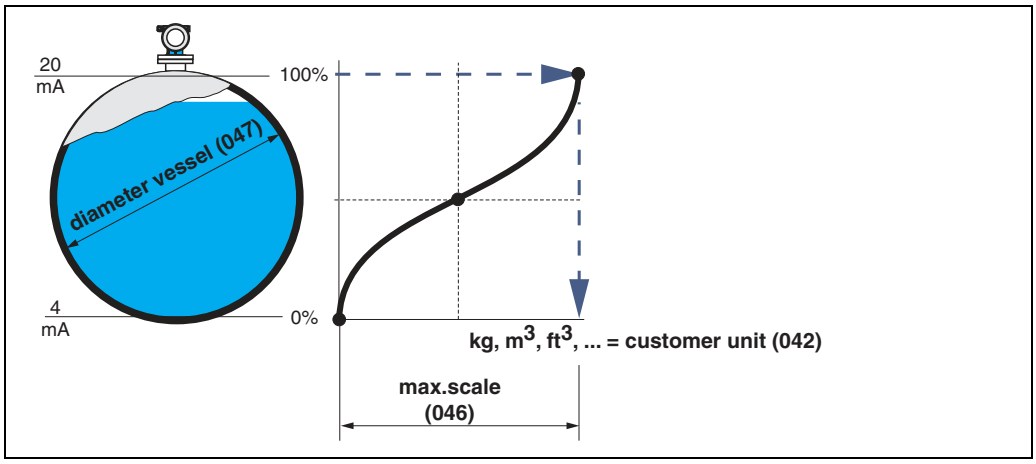
This function is used to select the linearisation modes.

Selection:
- **linear**
- horizontal cyl
- manual
- semi-automatic
- table on
- clear table

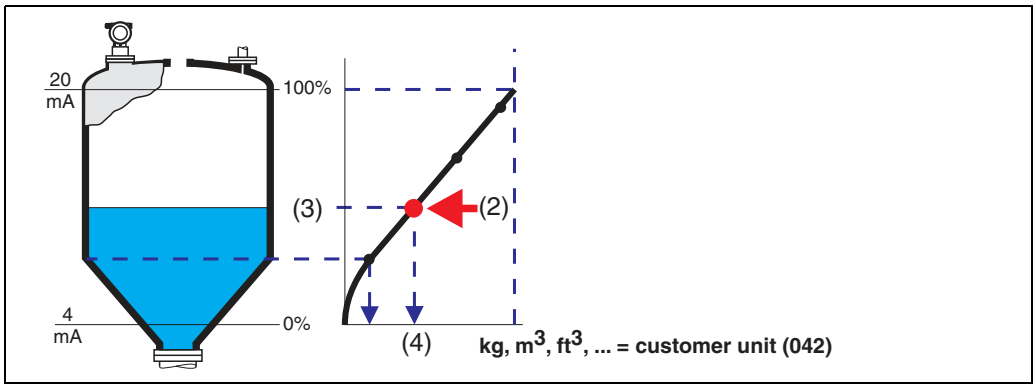
linear
The tank is linear e.g. a cylindrical vertical tank. You can measure in customer units by entering a maximum volume/weight.
You can select the "**customer unit**" **(042)**. Define the volume value corresponding to the calibration in "**max. scale**" **(046)**. This value corresponds to an output of 100% (= 20 mA for HART).



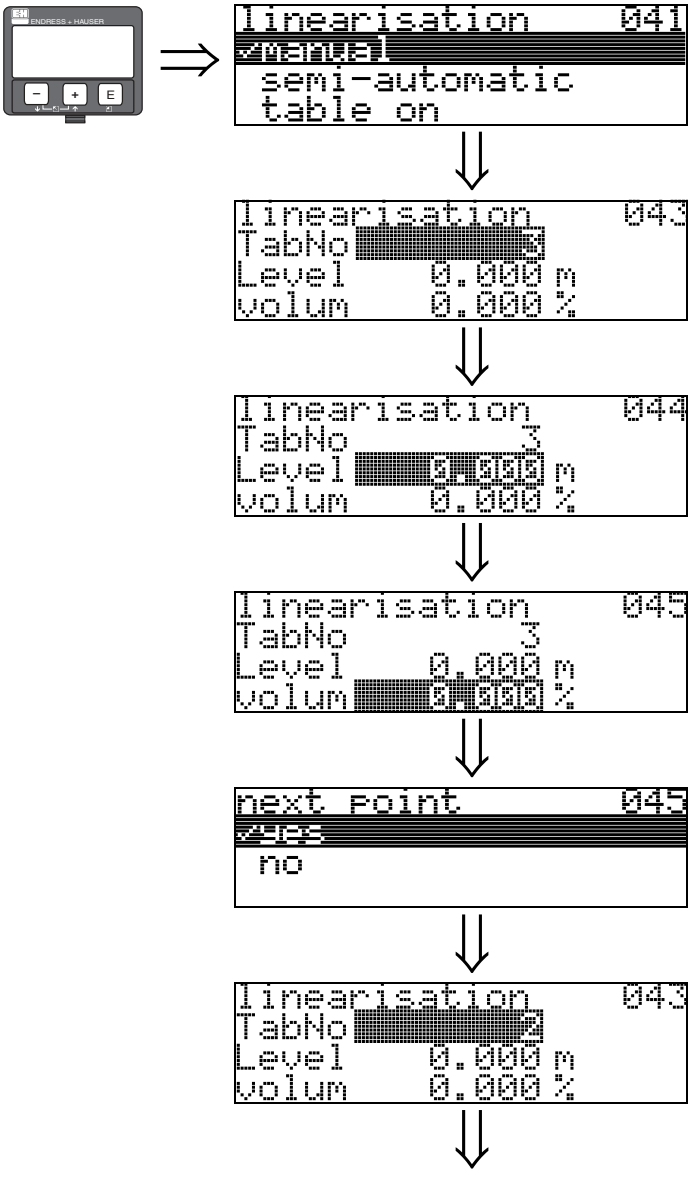
horizontal cyl
The volume, mass etc. are calculated automatically in cylindrical horizontal tanks by entering the "**diameter vessel**" **(047)**, the "**customer unit**" **(042)** and the "**max. scale**" **(046)**. The "**max. scale**" **(046)** corresponds to an output of 100% (= 20 mA for HART).



manual
If the level is not proportional to the volume or weight within the set measuring range, you can enter a linearisation table in order to measure in customer units. The requirements are as follows:
- The 32 (max.) value pairs for the linearisation curve points are known.
- The level values must be given in ascending order. The curve is monotonously increasing.
- The level heights for the first and last points on the linearisation curve correspond to empty and full calibration respectively.
- The linearisation takes place in the basic setup unit ("**distance unit**" **(0C5)**).



Each point (2) in the table is described by a value pair: level (3) and, for example, volume (4). The last value pair defines the 100% output (= 20 mA for HART).



Select the table point (Point 3).

Enter the level belonging to Point 3.

Enter the corresponding volume.

Enter a further table point?

Next table point.

...

Continue until "**next point**" **(045)** is answered with **no**.

✎ Note!
After making entries into the table, activate it with "**table on**".
The 100% value (=20 mA for HART) is defined by the last point in the table.

✎ Note!
Before confirming 0.00 m as the level or 0.00% as the volume, activate the Edit mode with + or −.

Entries can be made into the linearisation table in ToF Tool using the table editor.
You can also display the contents graphically.
In addition, linearisation curves can be calculated for any tank shape.

semi-automatic
The tank is filled in stages when the linearisation curve is entered semi-automatically. The Levelflex automatically detects the level and the corresponding volume/weight has to be entered.
The procedure is similar to manual table entry, where the level value for each table point is given automatically by the instrument.

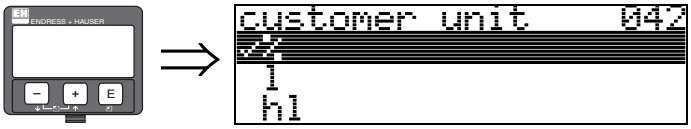
✎ Note!
If the tank is emptied, pay attention to the following points:
- The number of points must be known in advance.
- The first table number = (32 – number of points).
- Entries in "**Tab. no.**" **(043)** are made in reverse order (last entry = 1).

table on
An entered linearisation table only becomes effective when activated.

clear table
Before making entries into the linearisation table, any existing tables must be deleted. The linearisation mode automatically switches to linear.

✎ Note!
A linearisation table can be deactivated by selecting "**linear**" or "**horizontal cyl**" (or the "**level/ullage**" **(040)** function = "**level DU**", "**ullage DU**"). It is not deleted and can be reactivated at any time by selecting "**table on**".

6.3 Function "customer unit" (042)

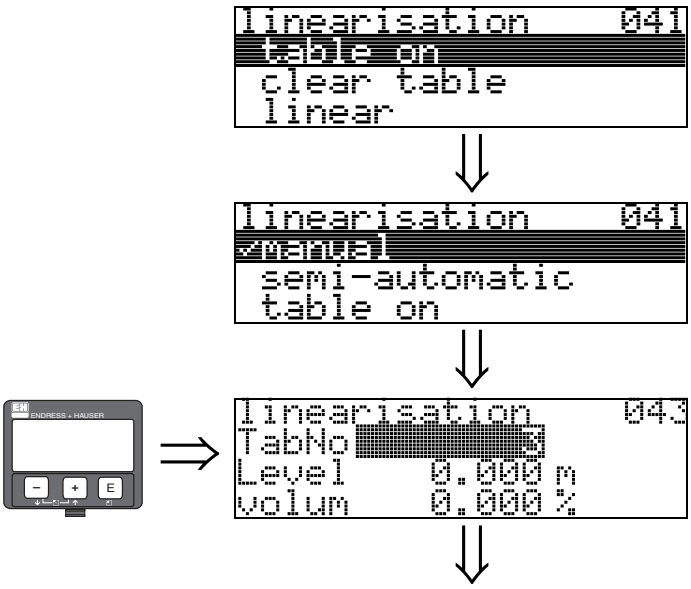


You can select the customer unit with this function.

Selection:
- **%**
- l
- hl
- m3
- dm3
- cm3
- ft3
- us_gal
- i_gal
- kg
- t
- lb
- ton
- m
- ft
- mm
- inch

Dependence
The units of the following parameters are changed:
- measured value (000)
- input volume (045)
- max. scale (046)
- simulation value (066)

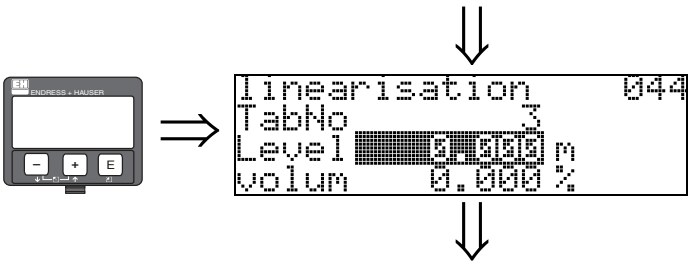
6.4 Function "table no." (043)



Position of the value pair in the linearisation table.

Dependence
Updates "**input level**" **(044)** , "**input volume**" **(045)**.

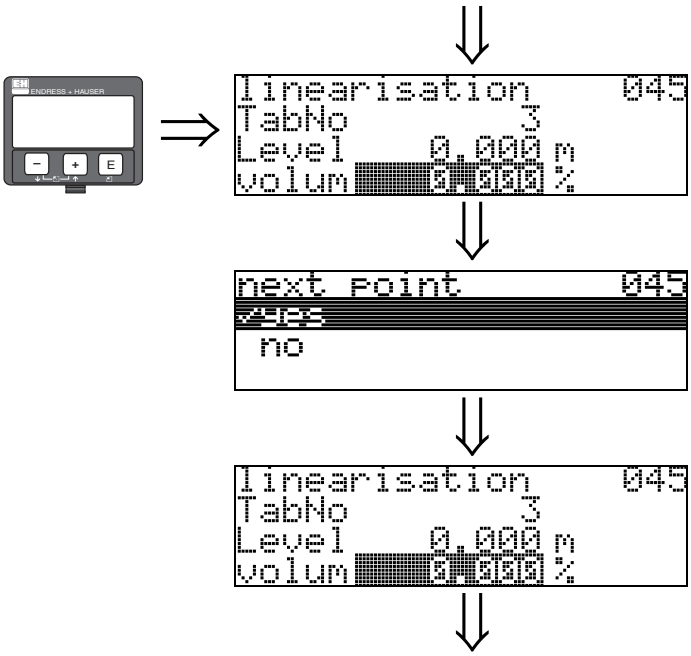
6.5 Function "input level" (044)



You can enter the level for each point of the linearisation curve with this function. When the linearisation curve is entered semi-automatically, Levelflex detects the level automatically.

User input:
Level in "**distance unit**" **(0C5)**.

6.6 Function "input volume" (045)



Specify the volume for each point of the linearisation curve with this function.

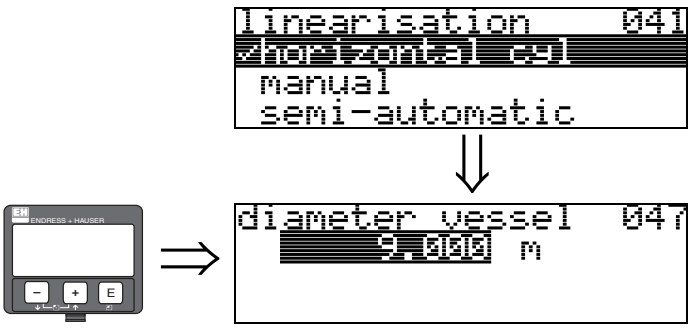
User input:
Volume in "**customer unit**" **(042)**.

6.7 Function "max. scale" (046)



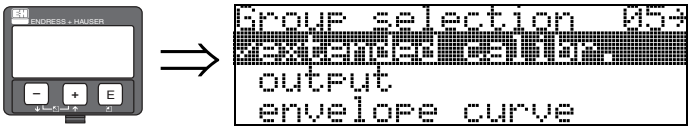
You can enter the end value of the measuring range with this function. This input is necessary if you selected "**linear**" or "**horizontal cyl**" in the "**linearisation**" **(041)** function.

6.8 Function "diameter vessel" (047)

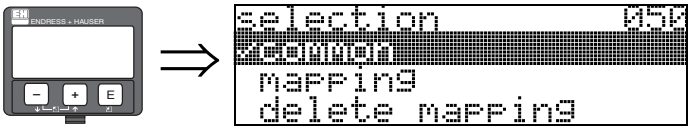


Enter the tank diameter with this function. This entry is necessary if you selected "**horizontal cyl**" in the "**linearisation**" **(041)** function.

7 Function group "extended calibr." (05)



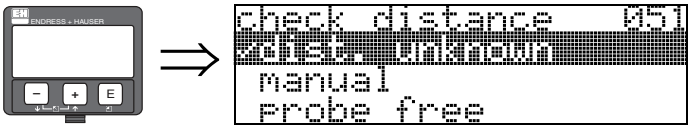
7.1 Function "selection" (050)



Select the function of the extended calibration.

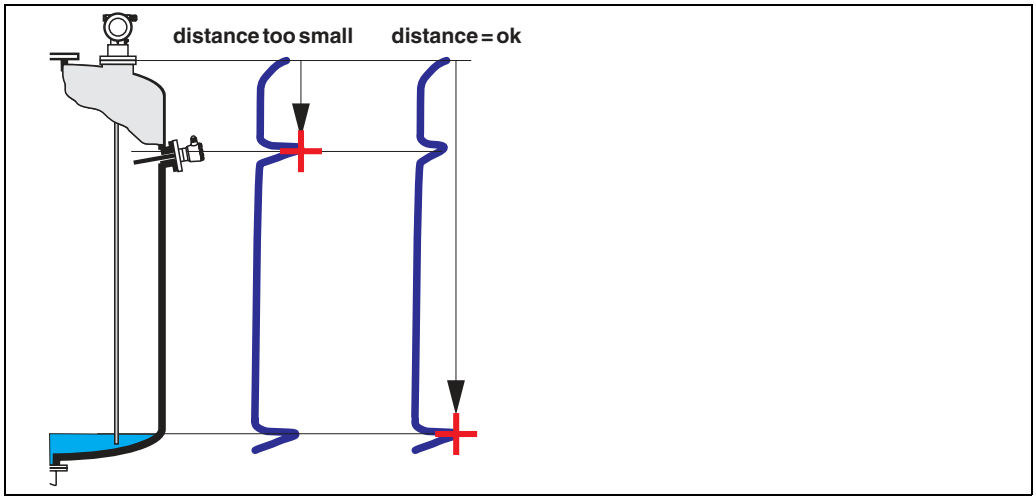
Selection:
- **common** (e.g. "Level correction", "Output damping", etc.)
- mapping
- delete mapping

7.2 Function "check distance" (051)



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. The following options are available for selection:

Selection:
- distance = ok
- dist. too small
- dist. too big
- dist. unknown
- **manual**
- probe free



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

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

Note!
At free probe, the mapping should be confirmed with the choice "**probe free**".

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

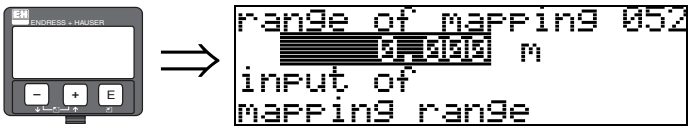
dist. too big
- This error cannot be remedied by interference echo mapping
- Check the application parameters **(002), (003), (004)** and "**probe length**" **(033)**

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.

Caution!
The range of mapping must end 0.3 m (12") before the echo of the actual level.

7.3 Function "range of mapping" (052)



This function displays the suggested range of mapping. The reference point is always the reference point of the measurement (→ 1). This value can be edited by the operator.
For manual mapping, the default value is 0.3 m.

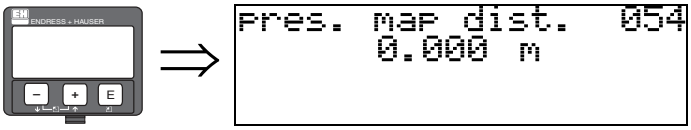
7.4 Function "start mapping" (053)



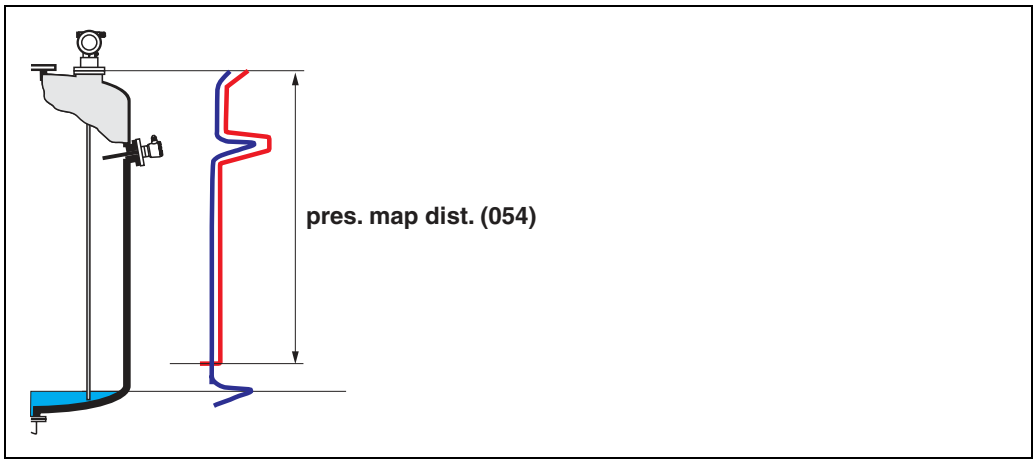
This function is used to start the interference echo mapping up to the distance given in "**range of mapping**" **(052)**.

Selection:
- off: no mapping is carried out
- on: mapping is started

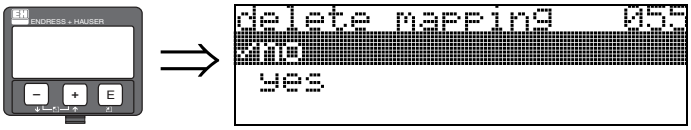
7.5 Function "pres. map dist." (054)



Displays the distance up to which a mapping has been recorded.
A value of 0 indicates that no mapping was recorded so far.



7.6 Function "delete mapping" (055)



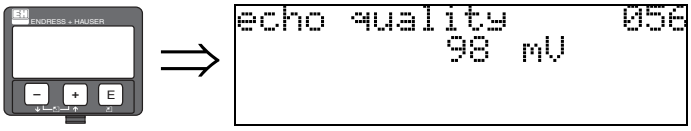
This function allows cancellation of the available mapping.

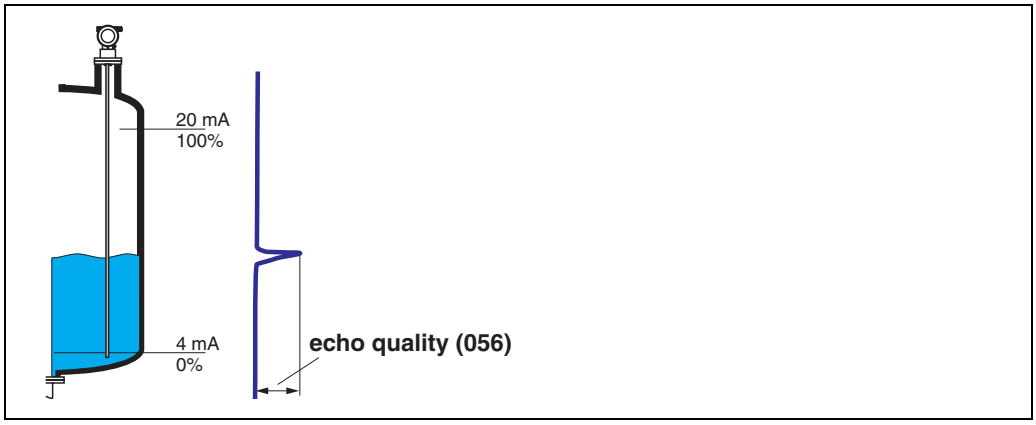
Selection:
- no
- yes

no
The available mapping is not cancelled and remains active.

yes
After mapping is cancelled, the device skips to the "**dist./meas.value**" **(008)** display.

7.7 Function "echo quality" (056)





The echo quality is the benchmark for measurement reliability. It describes the amount of reflected energy and depends primarily on the following conditions:
- Dielectric constant of the medium
- probe type
- Distance between sensor and product

Low values increase the probability that the echo is lost through a change in measurement conditions, e.g. angel s of repose or large measuring distance.

7.8 Function "offset" (057)



This function corrects the measured level by a constant value. The entered value is added to the measured level.

7.9 Function "output damping" (058)



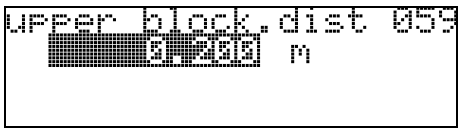
Influences the time an output requires to react to a sudden level jump (63% of steady state). A high value attenuates, for example, the influences of rapid changes on the measured variable.

User input:
0...255 s

The default value depends on the selected application parameter "**process cond.**" **(004)**.

7.10 Function "upper block. dist" (059)





For rod probes and for rope probes with lengths of up to 8 m, the upper blocking distance is preset to 0.2 m on delivery.
For rope probes with lengths of more than 8 m, the upper blocking distance is preset to 2.5% of the probe length.
For media with DC > 7, the upper blocking distance for rod and rope probes can be reduced to 0.1 m, if the probe is mounted flush with the wall or in a nozzle of maximum 50 mm (exception: FMP43).

Blocking distance and measuring range

At the lower end of the probe there is no blocking distance but a transition region with reduced accuracy, see section "Maximum measured error" on → 46.

FMP40	LN [m]		UB [m]
	min	max	min
Rope probe	1	35 a)	0,2 b)
6 mm rod probe	0,3		0,2 b)
16 mm rod probe	0,3	4	0,2 b)
Coax probe	0,3	4	0

a. Larger measuring range available on request.
b. The indicated blocking distances are preset. At media with DC > 7, the upper blocking distance UB can be reduced to 0.1 mm for rod and rope probes. The upper blocking distance UB can be entered manually.

FMP43	LN [m]		UB [m]
	min	max	min
Rod probe	0.3	4	0.2 a)

a. The indicated blocking distances are preset. The blocking distance can be reduced if the probe is mounted flush with the wall or in a nozzle, max. 50 mm in height. When using a spray ball the blocking distance may not be smaller than 50 mm.

FMP41C	LN [m]		UB [m]
	min	max	min
Rod probe	0,3	4	0,2 a)
Rope probe	1	30	0,2 a)

a. The indicated blocking distances are preset. At media with DC > 7, the upper blocking distance UB can be reduced to 0.1 mm for rod and rope probes. The upper blocking distance UB can be entered manually.

FMP45	LN [m]		UB [m]
	min	max	min
Rod probe	0,3	4	0,2 a)
Rope probe	1	35	0,2 a)
Coax probe	0,3	4	0

a. The indicated blocking distances are preset. At media with DC > 7, the upper blocking distance UB can be reduced to 0.1 mm for rod and rope probes. The upper blocking distance UB can be entered manually.

✎ Note!
Within the upper and lower blocking distance, a reliable measurement can not be guaranteed.

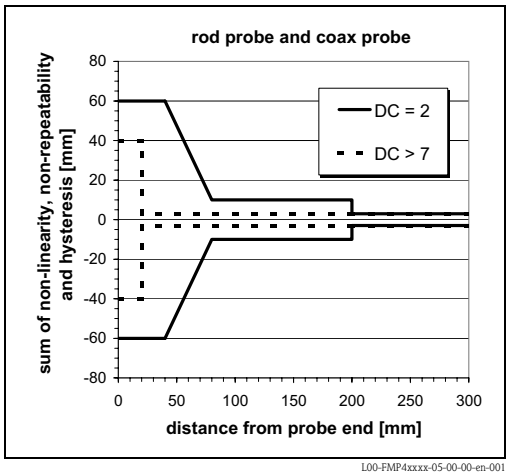
For stilling well applications
The upper blocking distance (UB) is preset to 100 mm when the "bypass/pipe" parameter has been selected in the "**tank properties**" **(002)** function.

Maximum measured error
Typical statements for reference conditions:
DIN EN 61298-2, percentage of the span.

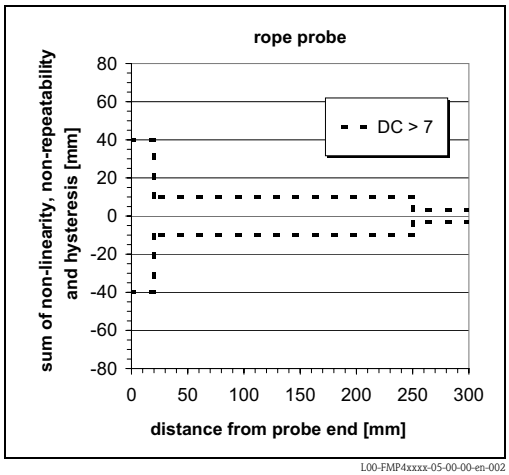
Output:	**digital**	**analogue**
sum of non-linearity, non-repeatability and hysteresis	**measurig range FMP40, FMP45:** – up to 10 m: ±3 mm – > 10 m: ± 0.03 % **measurig range FMP41C:** – up to 10 m: ±5 mm – > 10 m: ± 0.05 % **measurig range FMP43:** – up to 4 m: ±3 mm **for PA coated rope measuring range:** – up to 5 m: ±5 mm – > 5 m: ± 0.1 %	± 0.06 %
Offset / Zero	±4 mm	± 0.03 %

If the reference conditions are not met, the offset/zero arising from the mounting situation may be up to ±12 mm. This additional offset/zero can be compensated for by entering a correction (function "**offset**" **(057)**) during commissioning.

Differing from this , the following measuring error is present in the vicinity of the probe end:

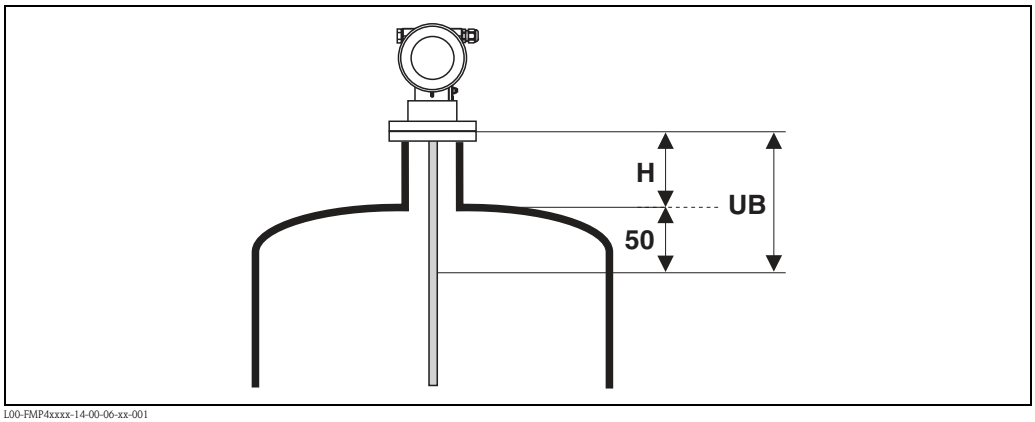


L00-FMP4xxxx-05-00-00-en-001

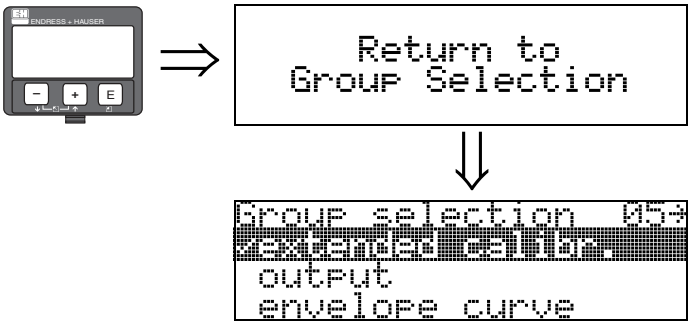


L00-FMP4xxxx-05-00-00-en-002

✎ Note!
Please reenter the blocking distance in the function group "**extended calibr.**" **(05)** function "**upper block.dist**" **(059)** when installing the device in a high nozzle: upper blocking distance (UB) = nozzle height (H) + 50 mm.

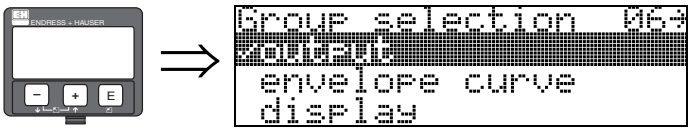


L00-FMP4xxxx-14-00-06-xx-001

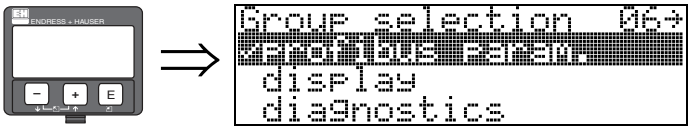


After 3 s, the following message appears

8 Function group "output" (06), - "PROFIBUS param." (06), PROFIBUS PA only



Display at HART and FOUNDATION Fieldbus instrument



Display at PROFIBUS PA instrument

8.1 Function "commun. address" (060), HART only

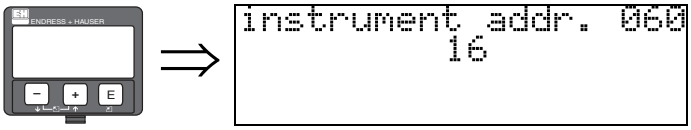


Enter the communication address for the instrument with this function.
- Standard: 0
- Multidrop: 1-15

In multidrop mode, the standard output current is 4 mA. This can be changed in the "**fixed cur. value**" **(064)** function.

Caution!
This function is available for HART devices only!

8.2 Function "instrument addr." (060), PROFIBUS PA only



The PA bus address is displayed in this field. The address is set either directly on the instrument using DIP switches (see instrument operating instructions) or using a special SetSlaveAddress command via the bus, e.g. by the ToF Tool.

Caution!
This function is available for PROFIBUS PA devices only!

8.3 Function "no. of preambels" (061), HART only



Enter the number of preambles for the HART protocol with this function.
An increase in the value is advisable for "bad" lines with communications problems.

Caution!
This user input is available for HART devices only!

8.4 Function "ident number" (061), PROFIBUS PA only



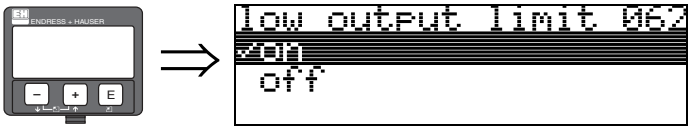
- manufacturer
- profile

manufacturer
Set to1522 hex according to manufacturer (PNO registered).

profile
Setting defined as in PA Profile 3.0: 9700 hex - instrument with one AI block.

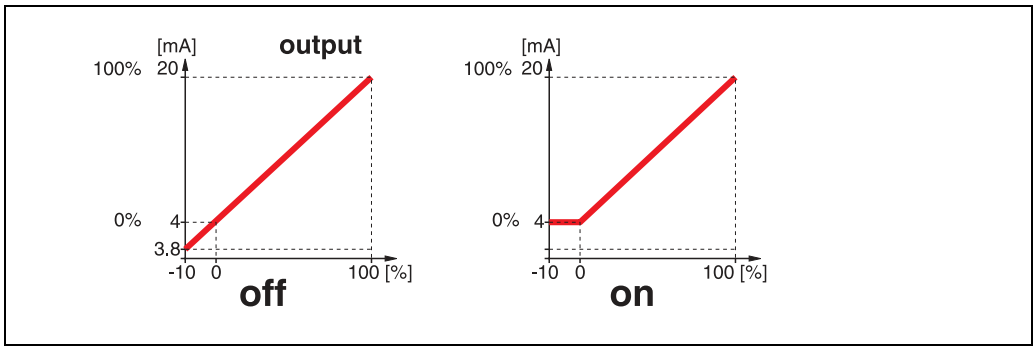
Caution!
This function is available for PROFIBUS PA devices only!

8.5 Function "low output limit" (062), HART only



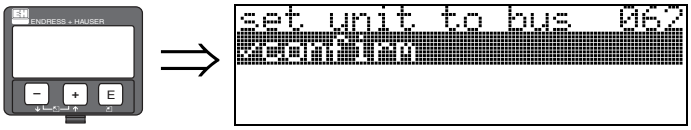
The output of negative level values can be suppressed with this function.

Selection:
- off minimum output -10% (3.8 mA for HART)
- on minimum output 0% (4 mA for HART)



Caution!
This user input is available for HART devices only!

8.6 Function "set unit to bus" (062), PROFIBUS PA only

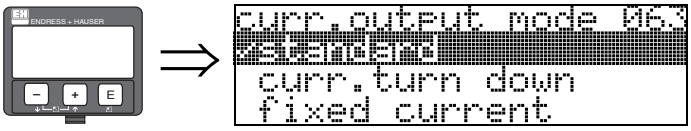


- confirm

After confirming this function, the unit of the measured variable is taken over in the AI block (PV scale -> Out scale).
This function must always be executed after changing the unit.

Caution!
This function is available for PROFIBUS PA devices only!

8.7 Function "curr. output mode" (063), HART only



Use this function to specify the current output mode for HART devices.

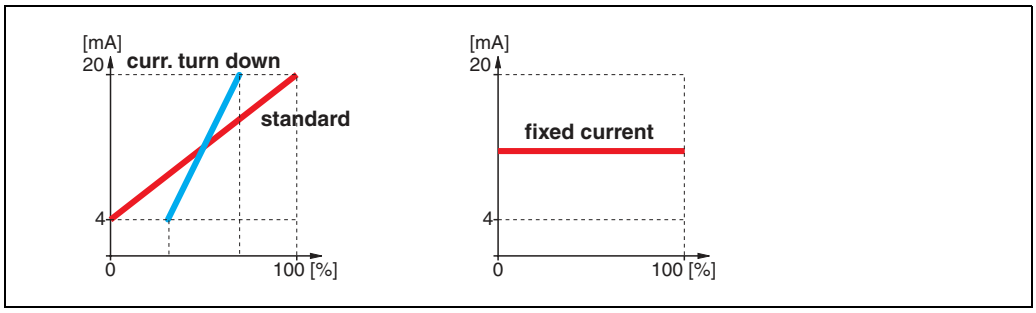
Selection:
- **standard**
- curr. turn down
- fixed current

standard
This selection displays the complete measuring range (0...100%) across the full current interval (4...20 mA).

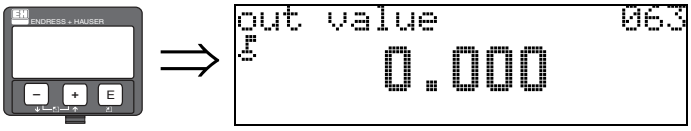
curr. turn down
This selection only displays a part of the measuring range across the full current interval (4...20 mA). This range is specified using the "**4mA value**" **(068)** and "**20mA Value**" **(069)** functions.

fixed current
Selecting this outputs a fixed current. The measured value is only transmitted using the HART signal. The current output value is set using the "**fixed cur. value**" **(064)** function.

Caution!
This selection is available for HART devices only!



8.8 Function "out value" (063), PROFIBUS PA only



This displays the AI block output.

Caution!
This function is available for PROFIBUS PA devices only!

8.9 Function "fixed cur. value" (064), HART only

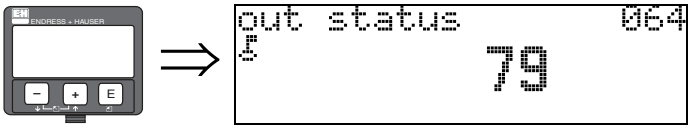


Set the fixed current value with this function. This data is necessary if you have selected the "**fixed current**" option in the "**curr. output mode**" **(063)** function.

User input:
3,8...20,5 mA

Caution!
This user input is available for HART devices only!

8.10 Function "out status" (064), PROFIBUS PA only



Displays the current output status (for value, see operating instructions of relevant instrument).

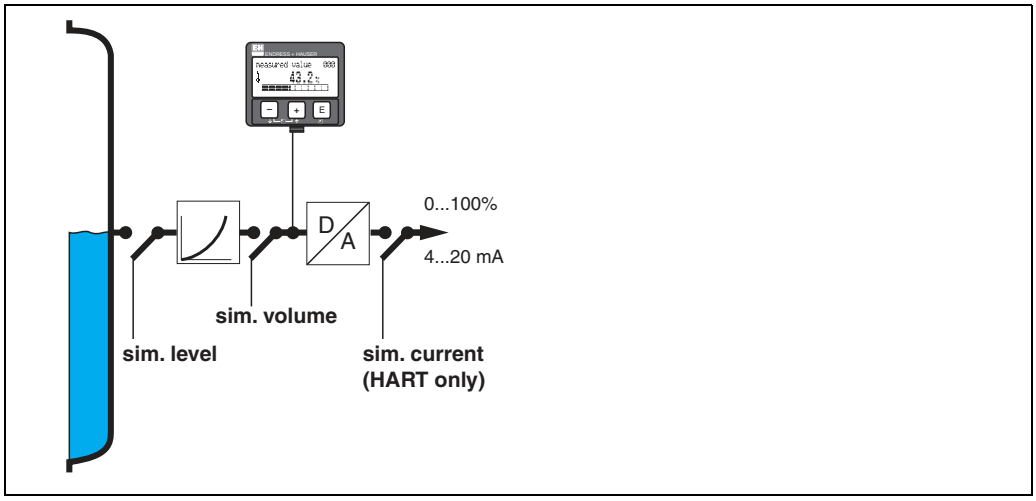
Caution!
This function is available for PROFIBUS PA devices only!

8.11 Function "simulation" (065)



If necessary, linearisation, the output signal and the current output can be tested with the simulation function. You have the following simulation options:

Selection:
- **sim. off**
- sim. level
- sim. volume
- sim. current (HART only)



sim. off
Simulation is switched off.

sim. level
Enter the level value in "**simulation value**" **(066)**.
The functions
- measured value (000)
- measured level (0A6)
- output current" (067) - only with HART instruments!

follow the entered values.

sim. volume
Enter the volume value in "**simulation value**" **(066)**.
The functions
- measured value (000)
- output current" (067) - only with HART instruments!

follow the entered values.

sim. current (HART only)
Enter the current value in "**simulation value**" **(066)**.
The function
- output current" (067) - only with HART instruments!

follows the entered values.

8.12 Function "simulation value" (066)



After selecting the "**sim. level**" option in the "**simulation**" **(065)** function, the following message appears in the display: you can enter the level.

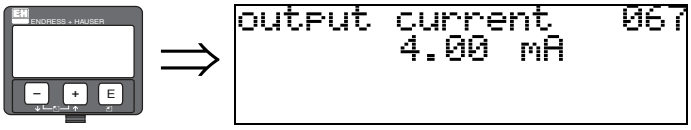


After selecting the "**sim. volume**" option in the "**simulation" (065)** function, the following message appears in the display: you can enter the volume.



After selecting the "**sim. current**" option in the "**simulation" (065)** function, the following message appears in the display: Enter the output current (only for HART instruments).

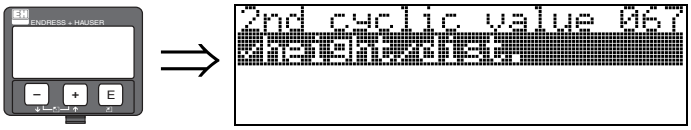
8.13 Function "output current" (067), HART only



Displays the output current in mA.

Caution!
This function is available for HART devices only!

8.14 Function "2nd cyclic value" (067), PROFIBUS PA only



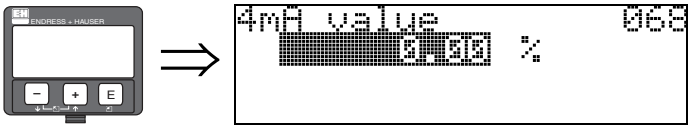
Selects the second cyclical value.

- height/dist.

Levelflex always transmits the distance as the second cyclical value.

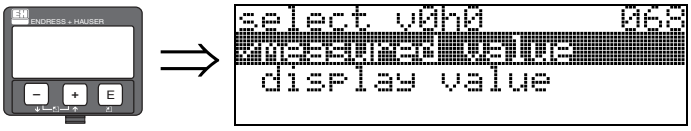
Caution!
This function is available for PROFIBUS PA devices only!

8.15 Function "4mA value" (068), HART only



In this function, enter the level (or volume, weight) at which the output current should be 4 mA. This entry is only required if you selected the **"current turn down"** option in the **"curr. output mode" (063)** function.

8.16 Function "select v0h0" (068), PROFIBUS PA only



Selects the value displayed in "**measured value**" **(000)**.

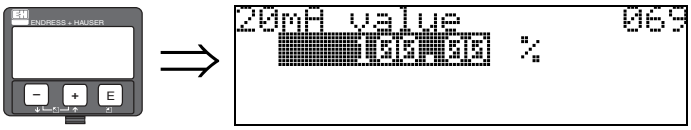
Selection:
- measured value
- display value

measured value
The configured measured value is displayed in the "**measured value**" **(000)** function.

display value
The value in "**display value**" **(069)** is displayed in the "**measured value**" **(000)** function.

Caution!
This function is available for PROFIBUS PA devices only!

8.17 Function "20mA value" (069), HART only



In this function, enter the level (or volume, weight) at which the output current should be 20 mA. This entry is only required if you have selected the **"current turn down"** option in the **"curr. output mode" (063)** function.

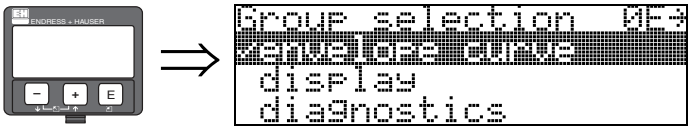
8.18 Function "display value" (069), PROFIBUS PA only



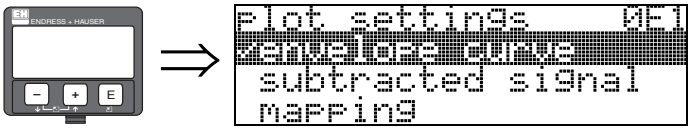
This field can be set externally, e.g. from a PLC. The value is then displayed as the main measured variable in the display by selecting the "**select v0h0**" **(068)** = "**display value**" function.

Caution!
This function is available for PROFIBUS PA devices only!

9 Function group "envelope curve" (0E)



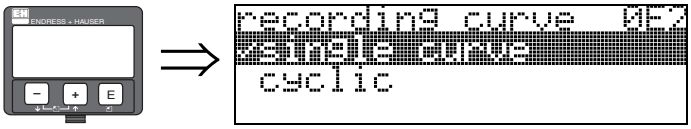
9.1 Function "plot settings" (0E1)



Here select which information is displayed in the LCD:
- **envelope curve**
- substracted signal
- mapping

9.2 Function "recording curve" (0E2)

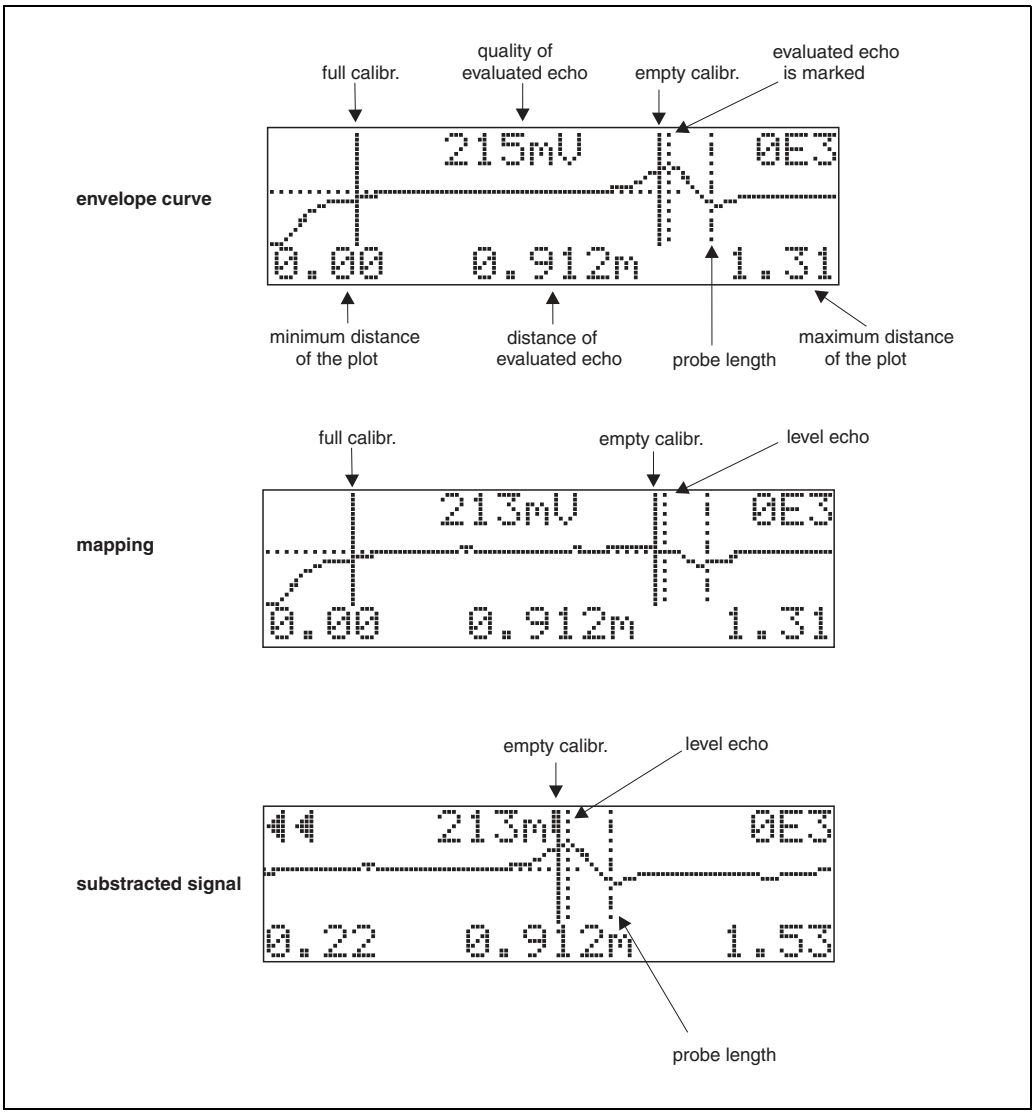
This function defines whether the envelope curve is read as a
- **single curve**
  or
- cyclic.



Note!
If the cyclical envelope curve is active in the display, the measured variable is refreshed in a slower cycle time. It is therefore recommended to exit the envelope curve display after optimising the measuring point.

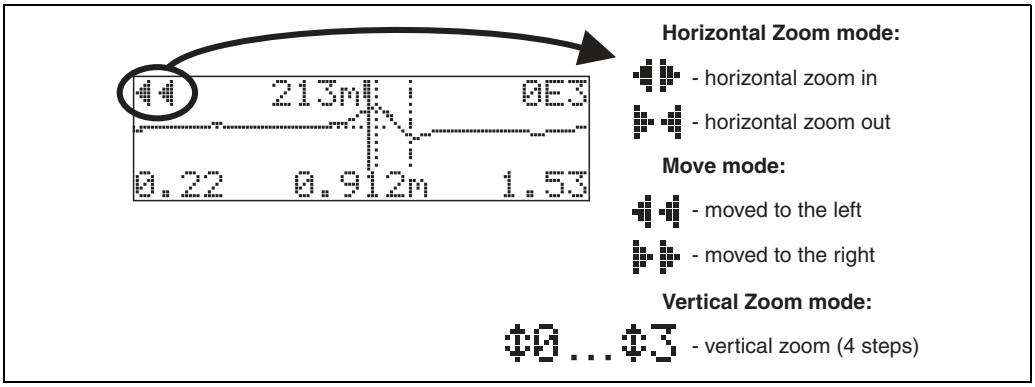
9.3 Function "envelope curve display" (0E3)

You can obtain the following information from the envelope curve display in this function:

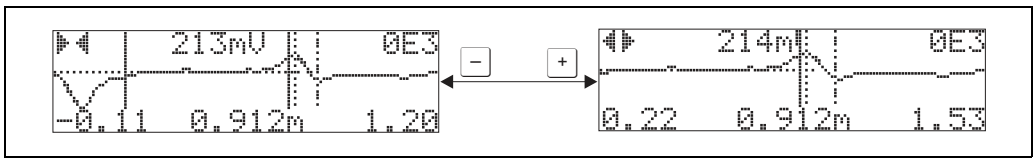


Navigation in the envelope curve display

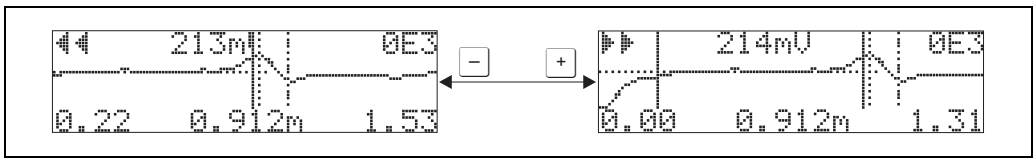
Using navigation, the envelope curve can be scaled horizontally and vertically and shifted to the left or the right. The active navigation mode is indicated by a symbol in the top left hand corner of the display.



Horizontal-Zoom-Modus
Press [+] or [−], to switch to the envelope curve navigation. You are then in Horizontal Zoom mode. Either ◀▶ or ▶◀ is displayed.
You now have the following options:
- [+] increases the horizontal scale.
- [−] decreases the horizontal scale.

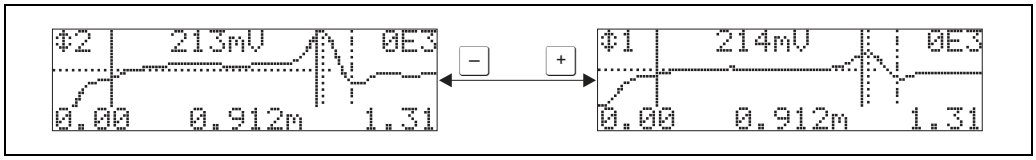


Move-Modus
Then press [E], to switch to Move mode. Either ▶▶ or ◀◀ is displayed.
You now have the following options:
- [+] shifts the curve to the right.
- [−] shifts the curve to the left.



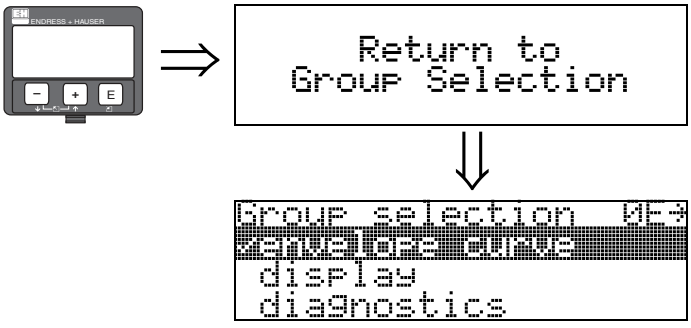
Vertical-Zoom-Modus
Press [E], once more to switch to Vertical Zoom mode ↕1 is displayed.
You now have the following options:
- [+] increases the vertical scale.
- [−] decreases the vertical scale.

The display icon shows the current zoom factor (↕0 to ↕3).



Exiting the navigation
- Press [E] again to run through the different modes of the envelope curve navigation.

Press [+] and [−] to exit the navigation. The set increases and shifts are retained. Only when you reactivate the **"recording curve" (0E2)** function does the Levelflex use the standard display again.



After 3 s, the following message appears

10 Function group "display" (09)



10.1 Function "language" (092)



Selects the display language.

Selection:
- **English**
- Deutsch
- Français
- Español
- Italiano
- Nederlands
- Katakana (japanese)

Dependence
All texts are changed.

Caution!
This function is not visualised in Commuwin II!

10.2 Function "back to home" (093)



If no entry is made using the display during the specified time period, the display returns to the measured value display.
9999 s means that there is no return.

User input:
3...9999 s

Caution!
This function is not visualised in Commuwin II!

10.3 Function "format display" (094)



Selects the display format.

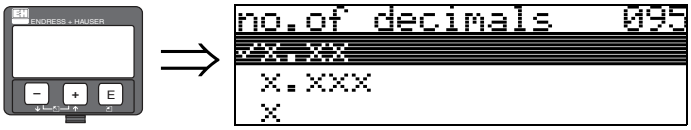
Selection:
- **decimal**
- ft-in-1/16"

decimal
The measured value is given in decimal form in the display (e.g. 10.70%).

ft-in-1/16"
The measured value is given in the display in this format (e.g 5'05-14/16").
This option is only possible for "**distance unit**" **(0C5)** - "**ft**" and "**in**"!

Caution!
This function is not visualised in Commuwin II!

10.4 Function "no.of decimals" (095)



Selection:
- x
- x.x
- **x.xx**
- x.xxx

10.5 Function "sep. character" (096)



Selection:
- .
- ,

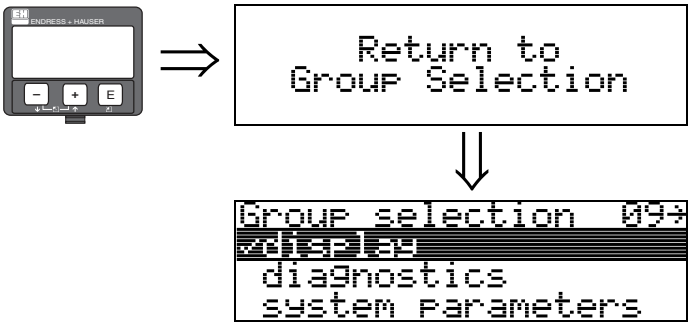
.
The decimal place is separated by a point.

,
The decimal place is separated by a comma.

10.6 Function "display test" (097)



All display pixels are switched on. If the whole LCD is dark, it is working correctly.



After 3 s, the following message appears

11 Function group "diagnostics" (0A)



In the "**diagnostics**" function group, you can display and confirm error messages.

Type of error
Errors that occur during commissioning or measuring are displayed immediately on the local display. If two or more system or process errors occur, the error with the highest priority is the one shown on the display.
The measuring system distinguishes between two types of error:
- **A (Alarm):**
  Instrument goes into a defined state (e.g. MAX)
  Indicated by a constant ϟ symbol.
  (For a description of the codes, see Table 15.2 → 76)
- **W (Warning):**
  Instrument continue measuring, error message is displayed.
  Indicated by a flashing ϟ symbol.
  (For a description of the codes, see Table 15.2 → 76)
- **E (Alarm / Warning):**
  Configurable (e.g. loss of echo, level within the safety distance)
  Indicated by a constant/flashing ϟ symbol.
  (For a description of the codes, see Table 15.2 → 76)

Error messages
Error messages appear as four lines of plain text on the display. In addition, a unique error code is also output. A description of the error codes is given on → 76.
- The "**diagnostics (0A)**" function group can display current errors as well as the last errors that occurred.
- If several current errors occur, use [+] or [−] to page through the error messages.
- The last occurring error can be deleted in the "**diagnostics (0A)**" function group with the function"**clear last error**" **(0A2)**.

11.1 Function "present error" (0A0)



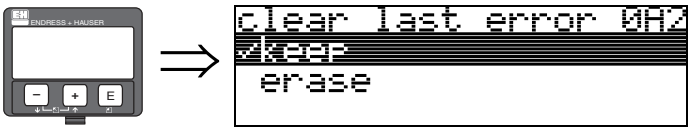
The present error is shown using this function.

11.2 Function "previous error" (0A1)



The last error presented is shown with this function.

11.3 Function "clear last error" (0A2)



Selection:
- **keep**
- erase

11.4 Function "reset" (0A3)

Caution!
A reset sets the instrument back to the factory settings. This can lead to an impairment of the measurement. Generally, you should perform a basic setup again following a reset.

A reset is only necessary:
- if the instrument no longer functions
- if the instrument must be moved from one measuring point to another
- if the instrument is being de-installed /put into storage/installed



Entry ("reset" (0A3)):
- 333 = customer parameters (HART)
- 33333 = customer parameters (PROFIBUS PA and FOUNDATION Fieldbus)

333 = reset customer parameters for HART
33333 = reset customer parameters for PROFIBUS PA and FOUNDATION Fieldbus
This reset is recommended whenever an instrument with an unknown 'history' is to be used in an application:
- The Levelflex is reset to the default values.
- **The customer specific tank map is not deleted.**
- A linearisation is switched to "**linear**" although the table values are retained. The table can be reactivated in the "**linearisation**" **(04)** function group.

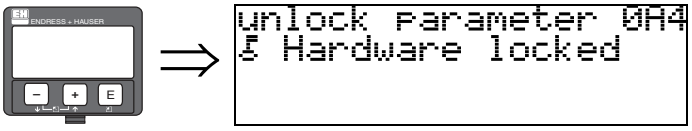
List of functions that are affected by a reset:

- tank properties (002)
- medium cond. (003)
- process proper. (004)
- empty calibr. (005)
- full calibr. (006)
- output on alarm (010)
- output on alarm (011)
- outp. echo loss (012)
- ramp %span/min (013)
- delay time (014)
- safety distance (015)
- in safety dist. (016)
- overspill protection (018)
- end of probe (030)
- level/ullage (040)
- linearisation (041)
- customer unit (042)
- max. scale (046)
- diameter vessel (047)
- check distance (051)
- range of mapping (052)
- start mapping (053)
- offset (057)
- output damping (058)
- low output limit (062)
- curr. output mode (063)
- fixed cur. value (064)
- 4mA value (068)
- language (092)
- back to home (093)
- format display (094)
- no of decimals (095)
- sep. character (096)
- unlock parameter (0A4)

The mapping can also be deleted in the "**cust. tank map**" **(055)** function of the "**extended calibr.**" **(05)** function group.

A complete "**basic setup**" **(00)** must be activated.

11.5 Function "unlock parameter" (0A4)



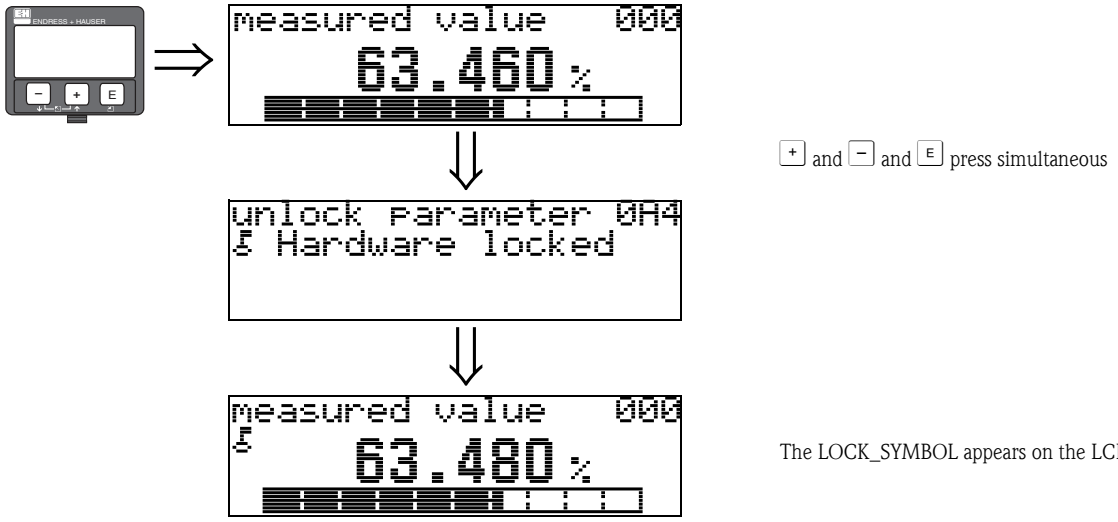
Set-up can be locked and unlocked with this function.

11.5.1 Locking of the configuration mode

The Levelflex can be protected in two ways against unauthorised changing of instrument data, numerical values or factory settings:

"**unlock parameter**" **(0A4):**
A value **<> 100 for HART** (e.g. 99) or **<> 2457 for PROFIBUS PA and FOUNDATION Fieldbus** (e.g. 2456) must be entered in "**unlock parameter**" **(0A4)** in the "**diagnostics**" **(0A)** function group. The lock is shown on the display by the symbol and can be released again either via the display or by communication.

Hardware lock:
The instrument is locked by pressing the + and − and E keys at the same time.
The lock is shown on the display by the symbol and can **only** be unlocked again via the display by pressing the + and − and E keys at the same time again. It is **not** possible to unlock the hardware by communication.
All parameters can de displayed even if the instrument is locked.



11.5.2 Unlocking of configuration mode

If an attempt is made to change parameters when the instrument is locked, the user is automatically requested to unlock the instrument:

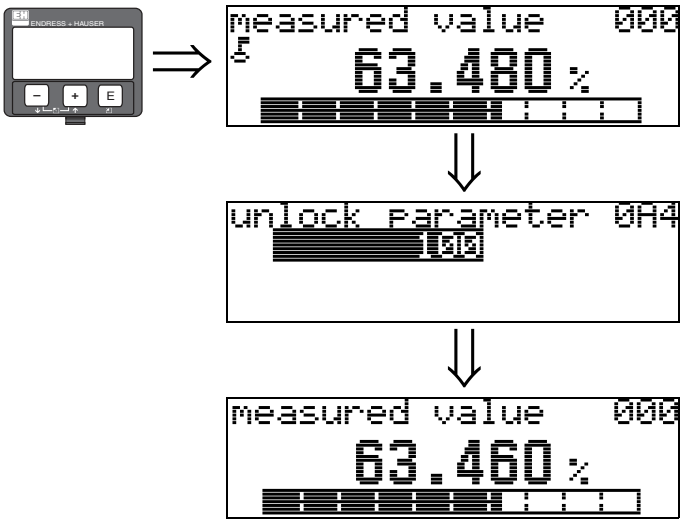
"**unlock parameter**" **(0A4):**
By entering the unlock parameter (on the display or via communication)

100 = for HART devices
2457 = for PROFIBUS PA and FOUNDATION Fieldbus devices

the Levelflex is released for operation.

Hardware-lock:
After pressing the [+] and [−] and [E] keys at the same time, the user is asked to enter the unlock parameter

100 = for HART devices
2457 = for PROFIBUS PA and FOUNDATION Fieldbus devices.

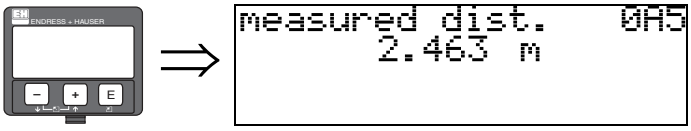


[+] and [−] and [E] press simultaneous

Please enter unlock code and confirm with [E].

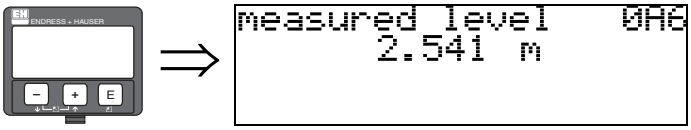
Caution!
Changing certain parameters such as all sensor characteristics, for example, influences numerous functions of the entire measuring system, particularly measuring accuracy. There is no need to change these parameters under normal circumstances and consequently, they are protected by a special code known only to the E+H service organization. Please contact Endress+Hauser if you have any questions.

11.6 Function "measured dist." (0A5)

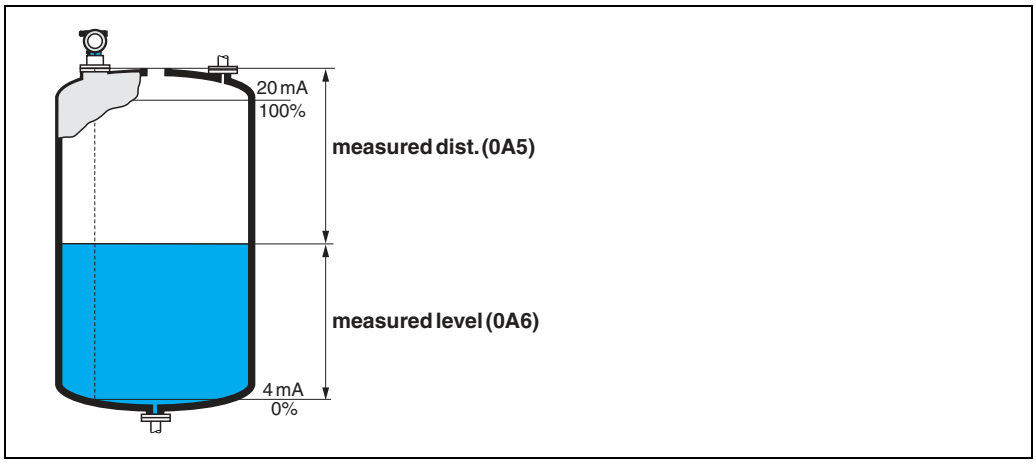


Display of measured distance in the selected "**distance unit**" **(0C5)**.

11.7 Function "measured level" (0A6)



Display of measured level in the selected "**distance unit**" **(0C5)**.



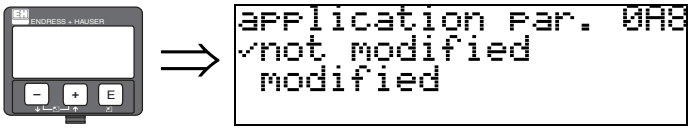
11.8 Function "detection window" (0A7) (from Software 01.04.00)



Is used to switch the detection window on and off and to reset an existing detection window.
If this function is switched on, a window is defined surrounding the current level echo (typical width: 1 to 2.5 m; depending on the application parameters).
The window always moves togehter with a rising a falling echo.
Echos beyond the limits of the window are ignored for a certain time.

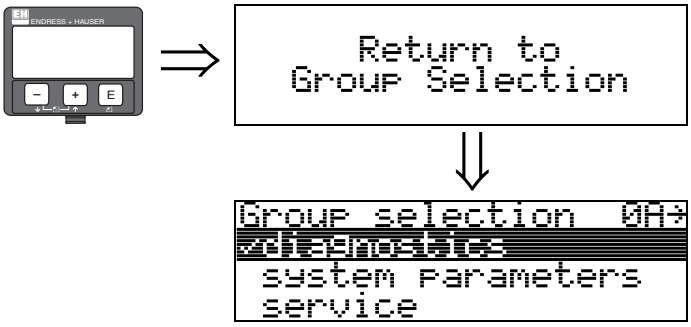
Selection:
- **off**
- on
- reset
  After selection of this option, the current window is reset, the level echo is looked for in the complete measuring range and a new window is defined surrounding the current level echo.

11.9 Function "application par." (0A8)



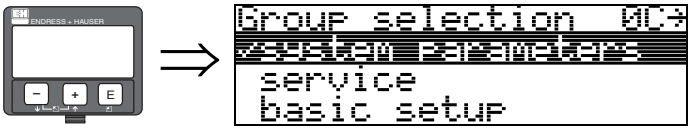
Displays whether or not one of the settings dependent on the "**tank shape**" **(002)**, "**medium property**" **(003)** and "**process cond.**" **(004)** application parameters has been changed or not.
If, for example, the "**output damping**" **(058)** is changed, the "**application par.**" shows "**modified**".

Selection:
- **not modified**
- modified



After 3 s, the following message appears

12 Function group "system parameters" (0C)



12.1 Function "tag no." (0C0)



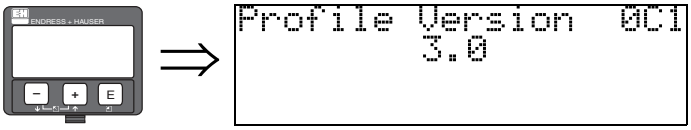
You can define the tag number with this function.

User input:
- 16 alphanumeric characters for HART instruments (8 using the HART universal command)
- 32 alphanumeric characteristics for PROFIBUS PA instruments

12.2 Function "device tag" (0C0), FOUNDATION Fieldbus only

This function displays the tag number.

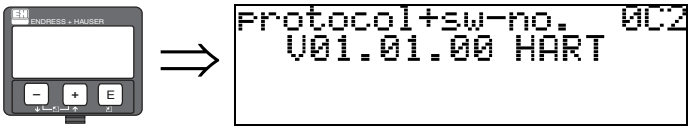
12.3 Function "Profile Version" (0C1), PROFIBUS PA only



The PA Profile version is shown using this function (Profile 3.0).

Caution!
This function is available for PROFIBUS PA devices only!

12.4 Function "protocol+sw-no." (0C2)



This function shows the protocol and the hardware and software version: Vxx.yy.zz.prot.

Display:
xx: hw-version
yy: sw-version
zz: sw-revision
prot: protocoll type (e.g. HART)

12.5 Function "serial no." (0C4)



This function displays the instrument serial number.

12.6 Function "device id" (0C4), FOUNDATION Fieldbus only

This function displays the instrument serial number.

12.7 Function "distance unit" (0C5)



You can select the basic distance unit with this function.

Selection:
- m
- ft
- mm
- inch

Dependence
m, mm: "**format display**" **(094)** can only be "**decimal**".

The units are changed for the following parameters:
- empty calibr. (005)
- full calibr. (006)
- safety distance (015)
- input level (044)
- diameter vessel (047)
- range of mapping (052)
- cust. tank map (055)
- offset (057)
- simulation value (066)
- measured dist. (0A5)
- measured level(0A6)

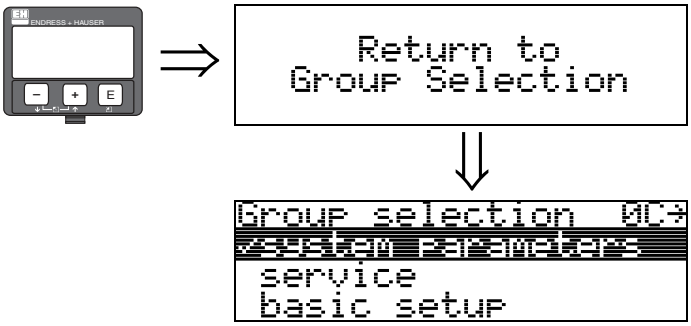
12.8 Function "download mode" (0C8)



This parameter defines which values are written to the instrument during a ToF Tool or Commuwinn II configuration download.

Selection:
- parameter only
- param+cust.map
- mapping only

Note!
This parameter must not be described explicitly in ToF Tool. The various possibilities can be selected from the download dialog.



After 3 s, the following message appears

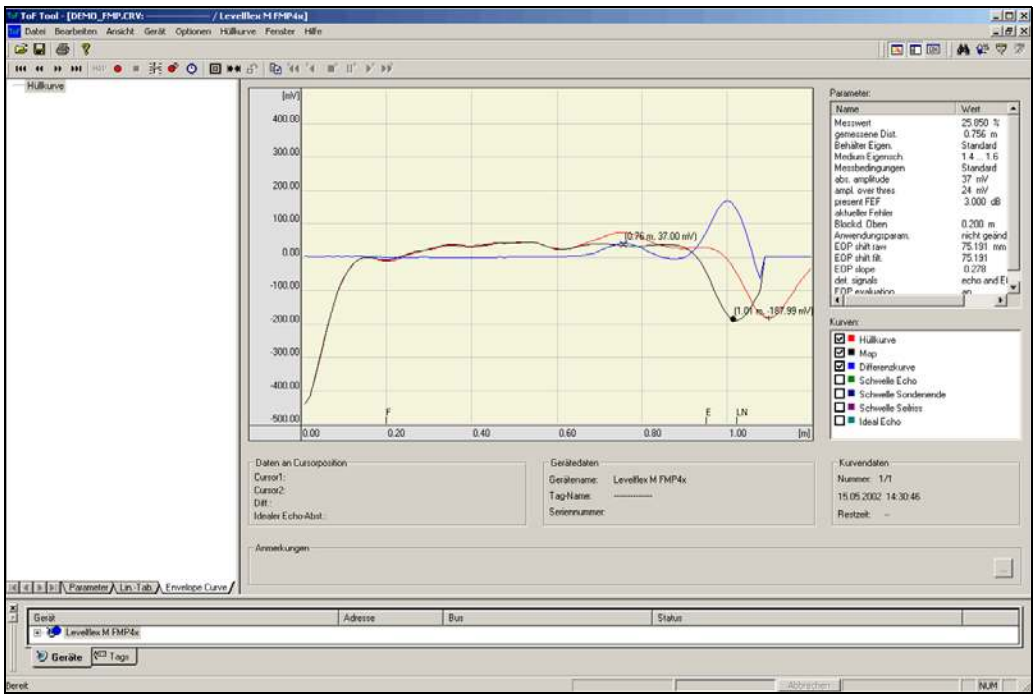
13 Function group "service" (0D)

You can find a detailed description of the "Service" function group as well as a detailed overview of the function menu in the Service Manual for Levelflex M.

14 Envelope curve

14.1 The envelope curve window in the ToF Tool

Signal analysis via envelope curve

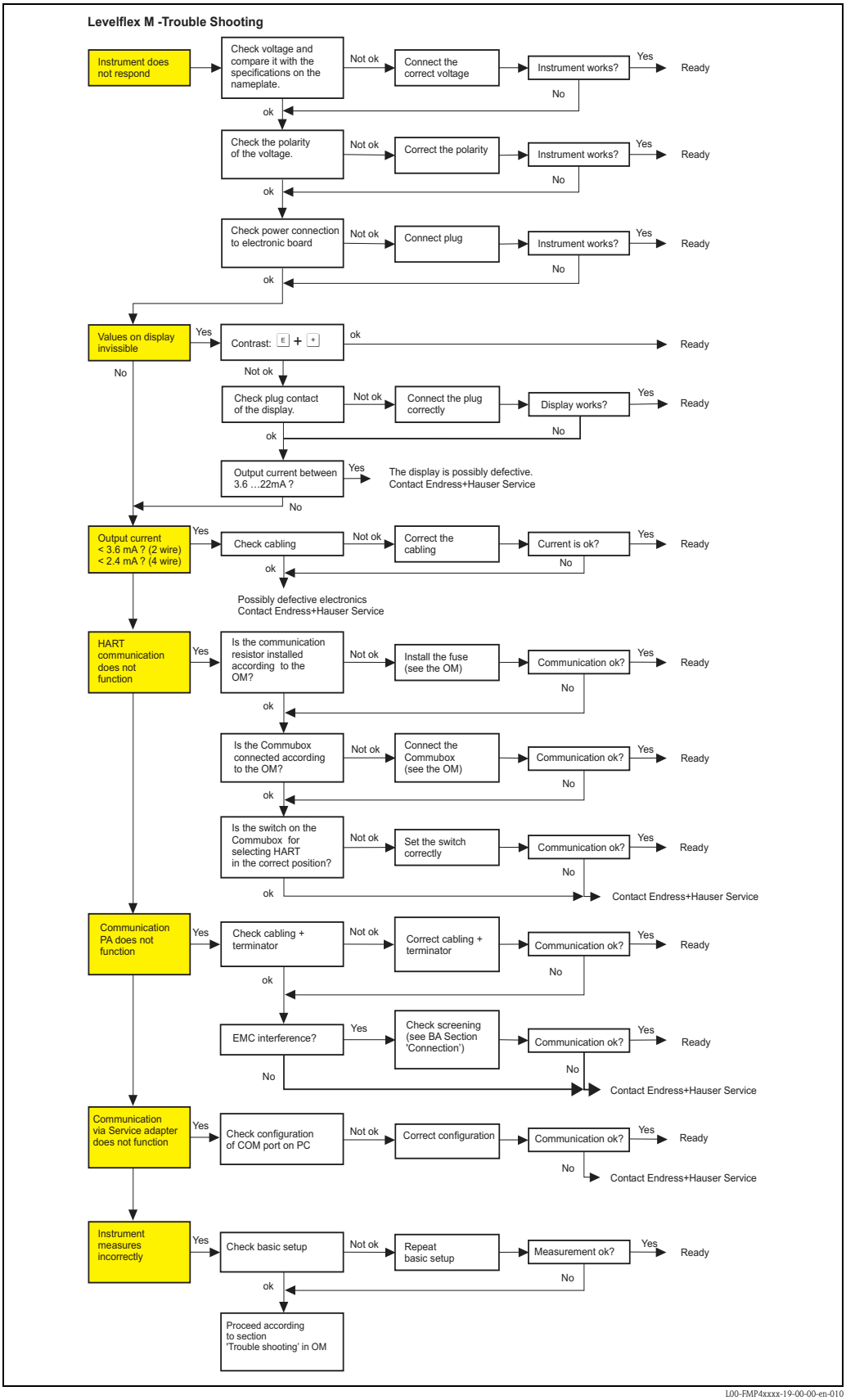


To the envelope representation on the local display see → 📄 56.

15 Trouble-shooting

If you have followed the instructions in this operating manual, the Levelflex should work correctly. If this is not the case, Levelflex has facilities for analysing and correcting errors.
You can find a structured approach for locating errors on → 75 ff. or in the appropriate instrument operating manual.

15.1 Troubleshooting instructions



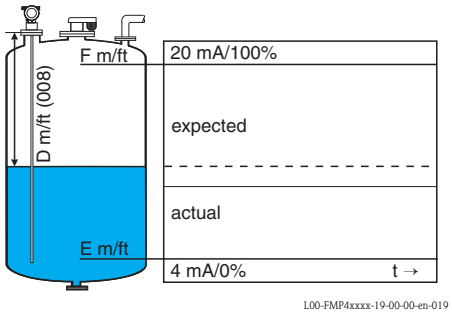
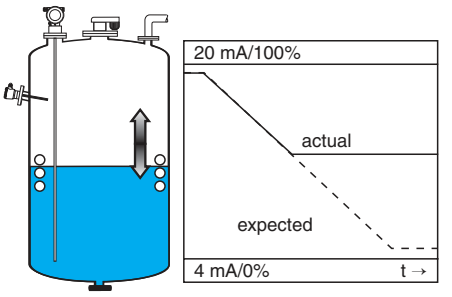
L00-FMP4xxxx-19-00-00-en-010

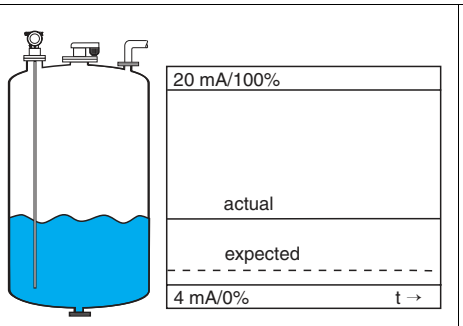
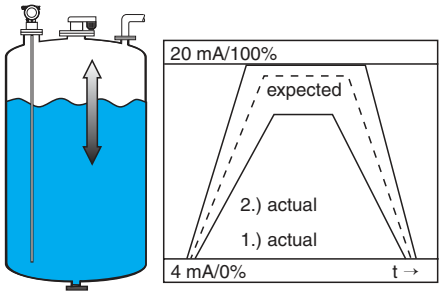
15.2 System error messages

Code	Description	Possible cause	Remedy
A102	checksum error total reset & new calibr. required.	device was switched off before data were stored; EMC problem; E^2PROM defective	reset avoid EMC problems; if alarm prevails after reset, exchange electronics
W103	initializing - please wait	E^2PROM storage not yet finished	wait a few seconds; if warning prevails, exchange electronics
A106	downloading - please wait	downloading data	wait, message disappears after downloading operation
A110	checksum error total reset & new calibr. required.	device was switched off before data were stored; EMC problem; E^2PROM defective	reset avoid EMC problems; if alarm prevails after reset, exchange electronics
A111	electronics defective	RAM defective	reset if alarm prevails after reset, exchange electronics
A113	electronics defective	ROM defective	reset if alarm prevails after reset, exchange electronics
A114	electronics defective	E^2PROM defective	reset if alarm prevails after reset, exchange electronics
A115	electronics defective	general hardware problem	reset if alarm prevails after reset, exchange electronics
A116	download error repeat download	checksum of stored data not correct	restart download of data
A121	electronics defective	no factory calibration available; E^2PROM cleared	contact service
W153	initializing - please wait	initialization of electronics	wait a few seconds; if warning prevails, switch power off and on again
A160	checksum error total reset & new calibr. required.	device was switched off before data were stored; EMC problem; E^2PROM defective	reset avoid EMC problems; if alarm prevails after reset, exchange electronics
A164	electronics defective	hardware problem	reset if alarm prevails after reset, exchange electronics
A171	electronics defective	hardware problem	reset if alarm prevails after reset, exchange electronics
A221	probe pulse deviates from normal values	HF module or cable between HF module and electronics defective	check contacts on HF module if fault cannot be eliminated: replace HF module
A241	Broken probe	rod probe broken, rope probe broken/torn or value entered for probe length is too short	check the probe length in 033, check the probe mechanically, if the probe is broken, change the probe or change to a non contact system
		probe break monitoring enabled without mapping beforehand	disable probe break monitoring, perform mapping and then reactivate probe break monitoring
A251	feedthrough	lost contact in the process feedthrough	replace process feedthrough

Code	Description	Possible cause	Remedy
A261	HF cable defective	HF cable defective or HF connector loose	check HF connector, replace cable if defective
W275	offset too high	temperature at the electronics too high or HF module defective	check temperature, replace HF module if defective
W512	recording of mapping - please wait	recording active	wait a few seconds until alarm disappears
W601	linearization ch1 curve not monotone	linearization not monotonously increasing	correct linearization table
W611	less than 2 linearization points for channel 1	number of entered linearization points < 2	correct linearization table
W621	simulation ch. 1 on	simulation mode is active	switch off simulation mode
E641	no usable echo channel 1 check calibr.	echo lost due to application conditions or buildup on probe	check basic setup; clean probe (see Operating Instructions, Troubleshooting)
W650	signal/noise ratio too low or no echo	noise amplitude too high	eliminate electromagnetic interference
E651	level in safety distance - risk of overfill	level in safety distance	alarm will disappear as soon as level leaves safety distance perform reset where necessary
A671	linearization ch1 not complete, not usable	linearization table is in edit mode	activate linearization table
W681	current ch1 out of range	current out of range (3.8 mA to 21.5 mA)	check basic setup and linearization

15.3 Application errors

Error	Output	Possible cause		Remedy
A warning or alarm has occurred.	Depending on the configuration	See table of error messages (→ 76)		1. See table of error messages (→ 76)
Measured value (00) is incorrect		Measured distance (008) OK?	yes →	1. Check empty calibr. (005) and full calibr. (006) 2. Check linearization: → Level/ullage (040) → Max. scale (046) →Diameter vessel (047) → Check table
		no ↓		
		An interference echo may have been evaluated.	yes →	1. Carry out tank mapping → Basic setup
No change of measured value on filling/emptying		Interference echo from tank internals, nozzle or buildup on the probe		1. Carry out tank mapping → Basic setup 2. If necessary, clean probe 3. If necessary, select better mounting position
E 641 (loss of echo) after switching on the power supply	**If the device is configured to HOLD in the event of echo loss the output is set to any value/current.**	Noise level during the initialization phase too high.		Repeat empty calibr. (005) once more. Caution! Before confirmation change with + or − to the edit mode.

Device displays a level when the tank is empty.	 L00-FMP4xxxx-19-00-00-en-020	Incorrect probe length		1. Carry out automatic probe length detection when the tank is empty. 2. Carry out mapping over entire probe when the tank is empty (probe free!).
Measured value incorrect (slope error in the entire measuring range)	 L00-FMP4xxxx-19-00-00-en-021	Tank properties incorrect. Medium properties incorrect.		LN < 4 m and "Aluminum tank" tank properties selected → Calibration not possible. → Selection → Select standard → Thresholds too high Select lower medium properties.

15.4 Software history

Levelflex M FMP40

Date	Software version	Software modifications	Documentation			
			HART	**PA**	**FF**	**HART, PA, FF**
04.2002	V 01.02.00	Original software. Operated via: – ToF Tool – Commuwin II (as of Version 2.05.03) – HART-Communicator DXR375 with Rev. 1, DD 1.	BA242F/00/en/03.02 52011929 BA242F/00/en/06.02 52011929 BA242F/00/en/01.03 52011929 BA242F/00/en/02.03 52011929 BA242F/00/en/02.04 52011929	 BA243F/00/en/04.02 52011931 BA243F/00/en/06.02 52011931 BA243F/00/en/02.03 52011931 BA243F/00/en/02.04 52011931	 BA244F/00/en/06.02 52011933 BA244F/00/en/02.03 52011933 BA244F/00/en/02.04 52011933	BA245F/00/en/03.02 52011935 BA245F/00/en/06.02 52011935 BA245F/00/en/02.03 52011935 BA245F/00/en/02.04 52011935
08.2003	V 01.02.02	■ Function group: envelope curve display: Katakana (japanese) ■ current turn down (HART only) ■ the customer tank map can be edited Operated via: – ToF Tool – Commuwin II (as of Version 2.08-1 Update C) – HART-Communicator DXR375 with Rev. 1, DD 1.	—	—	—	—
07.2004	V 01.02.04	■ "mapping" function improved ■ Specification of the measuring accuracy at the end of probe	BA242F/00/en/06.04 52011929 BA242F/00/en/01.06 52011929	BA243F/00/en/06.04 52011931 BA243F/00/en/04.05 52011931 BA243F/00/en/01.06 52011931	BA244F/00/en/06.04 52011933 BA244F/00/en/04.05 52011933 BA244F/00/en/01.06 52011933	BA245F/00/en/06.04 BA245F/00/en/01.06
01.2005	V 01.02.06	Function "echo lost" improved	—	—	—	—
03.2006	V 01.04.00	■ function "detection window" ■ Description of Instrument Functions ■ Operating menu extended	BA242F/00/en/05.06 52011929 BA242F/00/en/11.06 52011929	BA243F/00/en/05.06 52011931 BA243F/00/en/11.06 52011931	BA244F/00/en/05.06 52011933 BA244F/00/en/11.06 52011933	 BA245F/00/en/06.06

Levelflex M FMP41C

Date	Software version	Software modifications	Documentation			
			HART	PA	FF	HART, PA, FF
04.2002	V 01.02.00	Original software. Operated via: – ToF Tool – Commuwin II (as of Version 2.05.03) – HART-Communicator DXR375 with Rev. 1, DD 1.	BA276F/00/en/11.03 52021032	BA277F/00/en/11.03 52021034	BA278F/00/en/11.03 52021036	BA245F/00/en/02.04 52011935
08.2003	V 01.02.02	■ Funktionsgruppe: Hüllkurvendarstellung ■ Katakana (Japanisch) ■ Stromlupe (nur HART) ■ editierbare Störechoausblendung Operated via: – ToF Tool – Commuwin II (as of Version 2.08-1 Update C) – HART-Communicator DXR375 with Rev. 1, DD 1.	BA276F/00/en/02.04 52021032	BA277F/00/en/02.04 52021034	BA278F/00/en/02.04 52021036	—
07.2004	V 01.02.04	■ "mapping" function improved ■ Specification of the measuring accuracy at the end of probe	BA276F/00/en/06.04 52021032 BA276F/00/en/01.06 52021032	BA277F/00/en/06.04 52021034 BA277F/00/en/04.05 52021034 BA277F/00/en/01.06 52021034	BA278F/00/en/06.04 52021036 BA278F/00/en/04.05 52021036 BA278F/00/en/01.06 52021036	BA245F/00/en/06.04 BA245F/00/en/01.06
01.2005	V 01.02.06	Function "echo lost" improved	—	—	—	—
03.2006	V 01.04.00	■ function "detection window" ■ Description of Instrument Functions ■ Operating menu extended	BA276F/00/en/05.06 52021032 BA276F/00/en/11.06 52021032	BA277F/00/en/05.06 52021034 BA277F/00/en/11.06 52021034	BA278F/00/en/05.06 52021036 BA278F/00/en/11.06 52021036	BA245F/00/en/06.06

Levelflex M FMP43

Date	Software version	Software modifications	Documentation			
			HART	PA	FF	HART, PA, FF
07.2007	V 01.04.02	Original software.	BA357F/00/en/07.07 71040912	BA358F/00/en/07.07 71041163	BA359F/00/en/07.07 71041165	BA245F/00/en/07.07 52011935

Levelflex M FMP45

Date	Software version	Software modifications	Documentation			
			HART	**PA**	**FF**	**HART, PA, FF**
08.2003	V 01.02.02	Original software. Operated via: – ToF Tool – Commuwin II (as of Version 2.08-1 Update C) – HART-Communicator DXR375 with Rev. 1, DD 1.	BA279F/00/en/04.04 52021038	BA280F/00/en/04.04 52021040	BA281F/00/en/04.04 52021042	—
07.2004	V 01.02.04	■ "mapping" function improved ■ Specification of the measuring accuracy at the end of probe	BA279F/00/en/06.04 52021038 BA279F/00/en/01.06 52021038	BA280F/00/en/06.04 52021040 BA280F/00/en/04.05 52021040 BA280F/00/en/01.06 52021040	BA281F/00/en/06.04 52021042 BA281F/00/en/04.05 52021042 BA281F/00/en/01.06 52021042	BA245F/00/en/06.04 BA245F/00/en/01.06
01.2005	V 01.02.06	Function "echo lost" improved	—	—	—	—
03.2006	V 01.04.00	■ function "detection window" ■ Description of Instrument Functions ■ Operating menu extended	BA279F/00/en/05.06 52021038 BA279F/00/en/11.06 52021038 BA279F/00/en/12.06 52021038	BA280F/00/en/05.06 52021040 BA280F/00/en/11.06 52021040 BA280F/00/en/12.06 52021040	BA281F/00/en/05.06 52021042 BA281F/00/en/11.06 52021042 BA281F/00/en/12.06 52021042	 BA245F/00/en/06.06

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