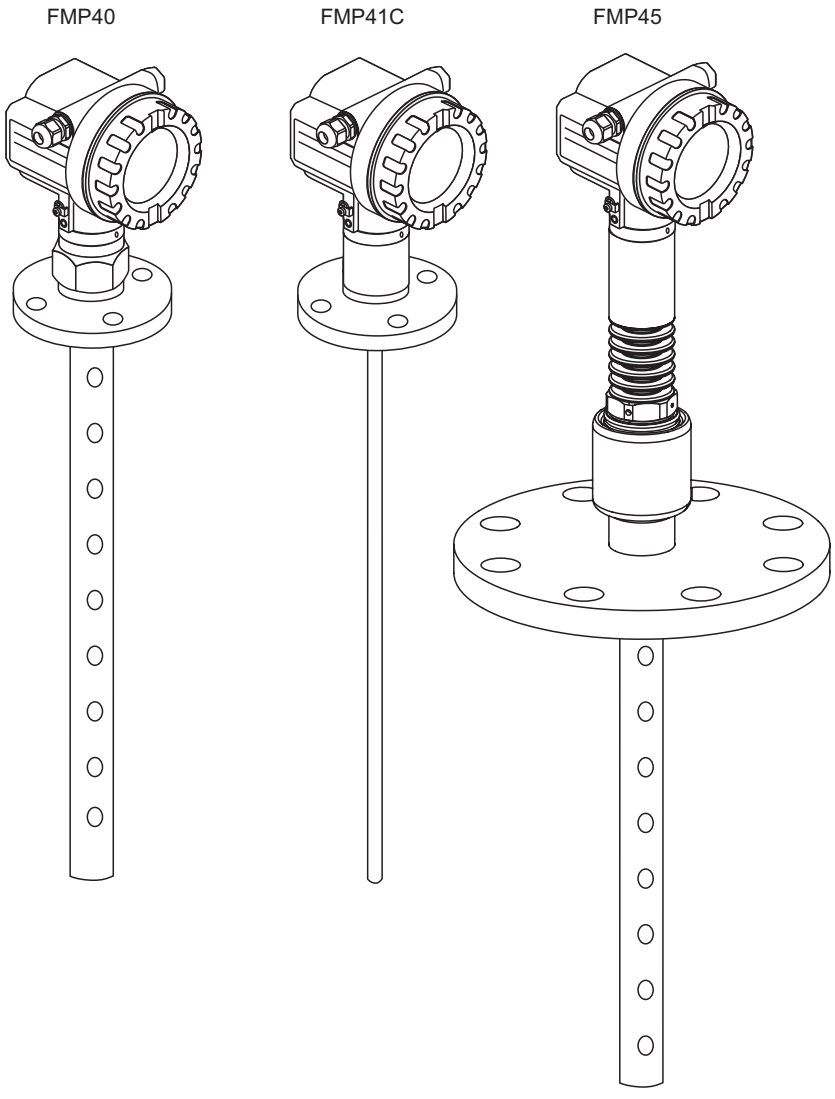
Level Pressure Flow Temperature Liquid Analysis Registration Systems Components Services Solutions

Description of Device Functions

Levelflex M FMP40, FMP41C, FMP45

Guided Level Radar for Interface Measurement with HART

HART® FIELD COMMUNICATION PROTOCOL



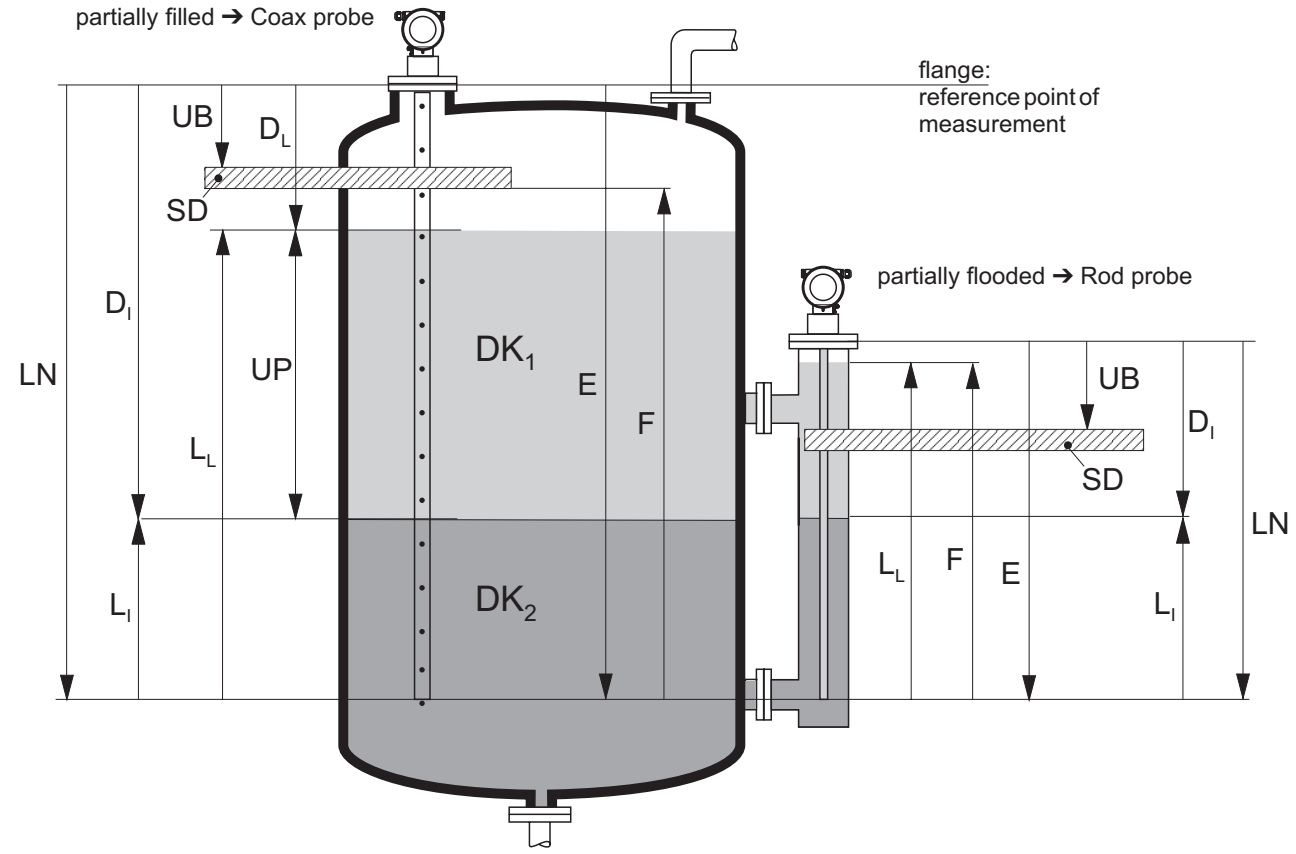
BA366F/00/en/01.08
No. 71060890

Valid as of software version:
01.08.zz

Endress+Hauser

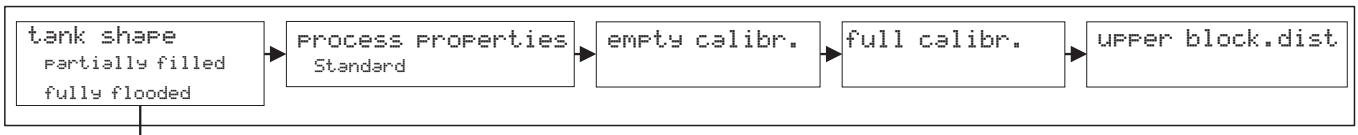
People for Process Automation

Basic Setup



E = empty calibr. (= zero) - setting in 005
F = full calibr. (= span) - setting in 006
D_I = distance interface (distance flange / DK_2) - display in 0A6
L_I = level interface (distance probe end / DK_1) - display in 0A5
D_L = distance complete level - display in 0A5
L_L = level complete - display in 0A6
LN = probe length - setting in 033
UB = upper blocking distance - setting in 059
UP = thickness upper medium
SD = safety distance - setting in 015

basic setup (standard)



option (description see BA366F)

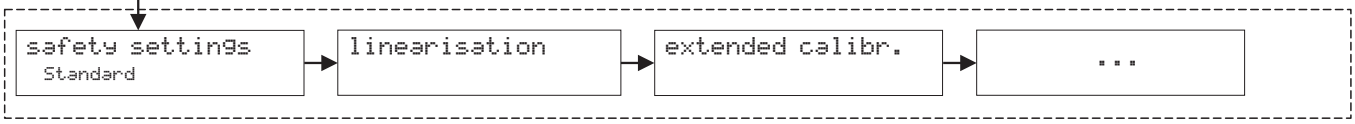


Table of contents

1 Notes on using this manual

There are various ways of getting to the device function you require or the parameters to be entered.

1.1 Using the table of contents to locate a function description

All the functions are listed by function group (e.g. "Basic Setup", "Security Settings", etc.) in the table of contents. The page reference/link shows you exactly where to find the detailed descriptions of the functions in question.
The table of contents can be found on → 4.

1.2 Using the graphic display of the function menus to locate a function description

This step-by-step, top-down approach starts with the function groups, the highest level, and works down through the matrix to the description of the function you need.

All the available function groups and functions of the device are listed in the table (→ 12). Select the function group or a function needed for your particular application. The page reference/link shows you exactly where to find the detailed description of the function group or function in question.

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

To ease orientation within the function menu, a position is shown on the display for each function. The function menu index (→ 71) which lists the codes for all the functions in alphabetical or numerical order takes you to the function in question via a page reference or link.

1.4 General structure of the operating menu

The operating menu is made up of two levels:

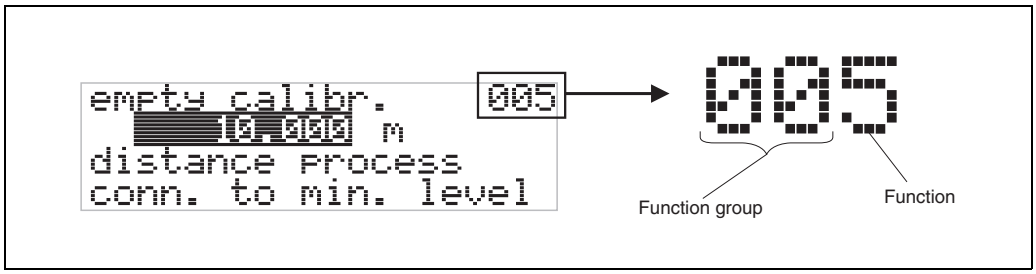
- **Function groups (00, 01, … , 0C, 0D):**
  The individual operating options of the device are split up roughly into different function groups. The function groups that are available include: "**Basic Setup**", "**Safety Settings**", "**Output**", "**Display**", etc.
- **Functions (001, 002, 003, …, 0D8, 0D9):**
  Each function group consists of one or more functions. The functions perform the actual operation or configuration of the device. Numerical values can be entered here and parameters can be selected and saved. The functions available for the "**Basic Setup**" **(00)** function group include: "**Tank Properties**" **(002)**, "**Process Propert.**" **(004)**, "**Empty Calibration**" **(005)**, etc.

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

1. Select the "**Basic Setup**" **(00)** function group
2. Select the "**Tank Properties**" **(002)** function (where the tank level is selected).

1.4.1 Identifying the functions

To ease orientation within the function menus (See → 12), a position is shown on the display for each function.



The first two digits identify the function group:

- **Basic Setup** **00**
- **Safety Settings** **01**
- **Length Adjustment** **02**

…

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

- **Basic Setup** **00** → - **Tank Properties** **002**
  - **Process Properties** **004**
  …

In the following section, the position is always indicated in brackets (e.g."**Tank Properties**" **(002)**) after the function described.

1.5 Display and operating elements

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

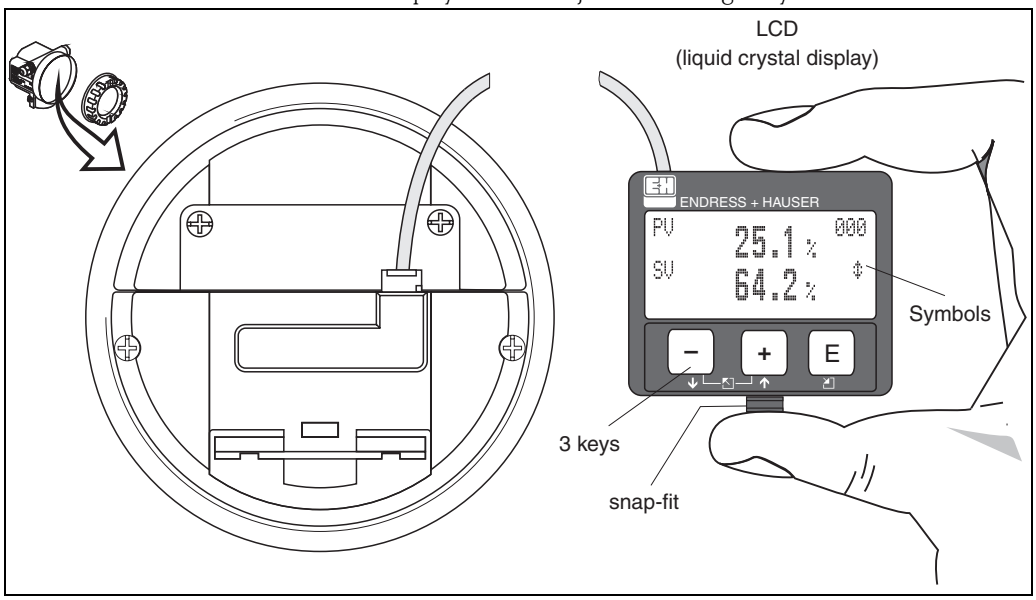


Fig. 1: Layout of the display and operating elements

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.

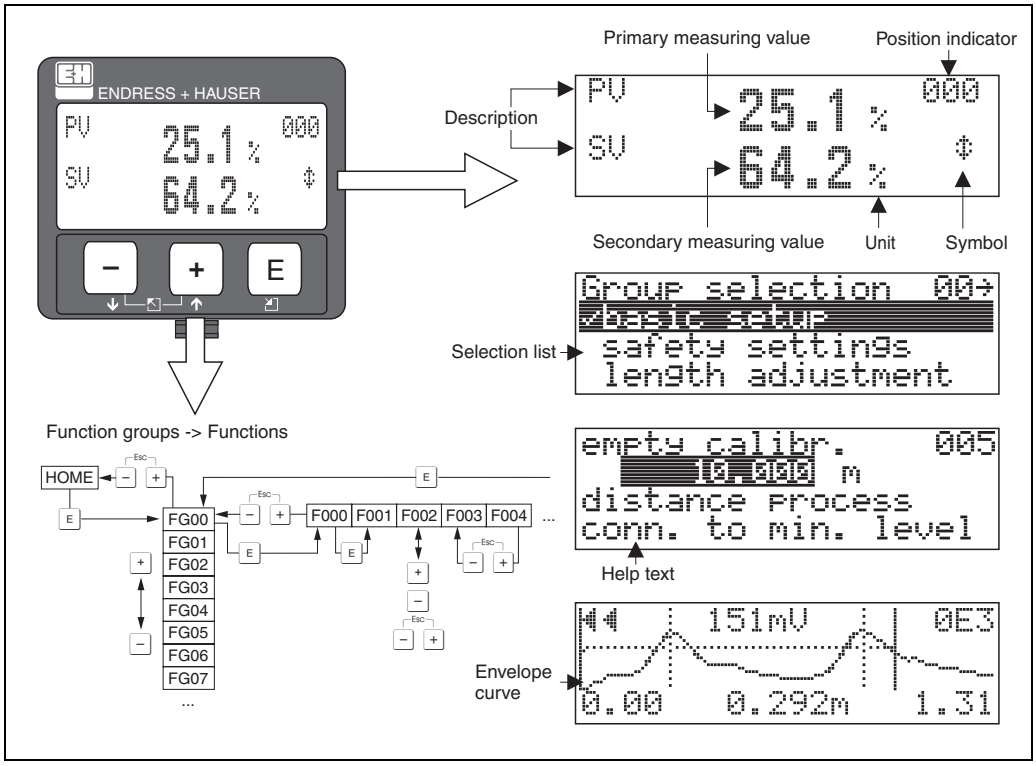


Fig. 2: Display

1.5.2 Display symbols

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

Symbol	Meaning
	**ALARM_SYMBOL** This alarm symbol appears when the device is in an alarm condition. If the symbol flashes, this indicates a warning.
	**LOCK_SYMBOL** This lock symbol appears when the device is locked,i.e. if no input is possible.
	**COM_SYMBOL** This communication symbol appears when data transmission via HART is in progress.

Tab. 1-1 Meaning of the symbols

1.5.3 Key assignment

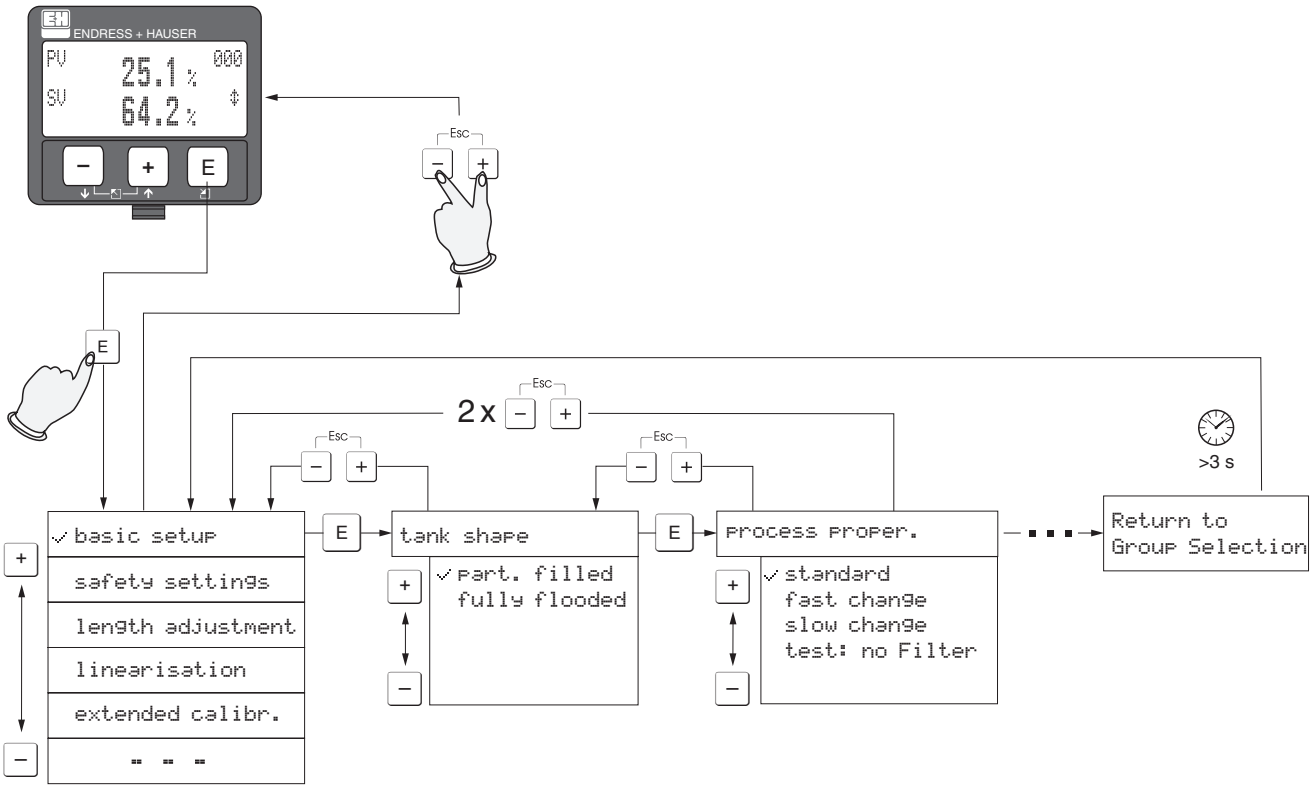
The operating elements are located inside the housing and are accessible for operation by opening the lid of the housing.

Function of the keys

Key(s)	Meaning
+ or ↑	Navigate upwards in the picklist Edit numeric value within a function
− or ↓	Navigate downwards in the picklist Edit numeric value within a function
Esc (− and +) or ←	Navigate to the left within a function group
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, operation of the device via display or communication is not possible! The hardware can only be unlocked via the display. A release code must be entered to do so.

Tab. 1-2 Function of the keys

1.5.4 Operation with 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**

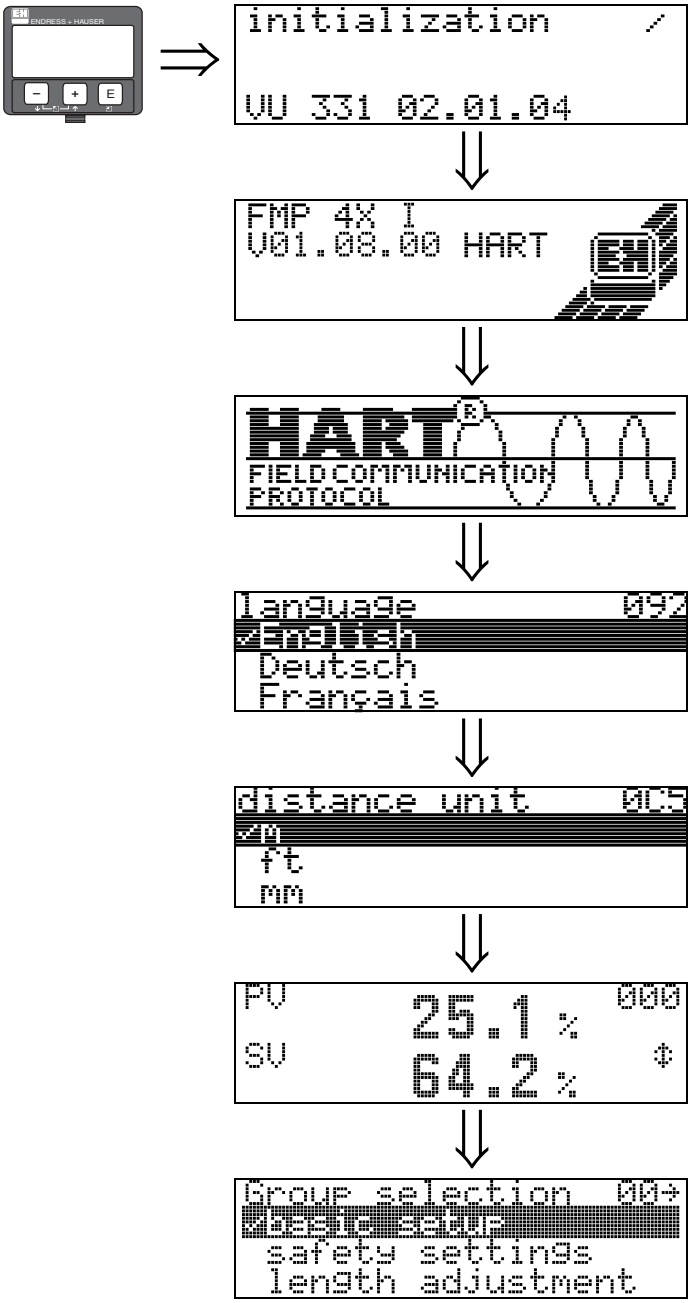
6) Press + / − (= Esc) to return to **Measured value display**

Fig. 3: Selecting functions and configuring parameters (basic menu)

1.6 Commissioning

1.6.1 Switching on the measuring device

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



After 5 s, the following message appears

After 5 s, the following message appears

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

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

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

The current measured values PV (interface layer) and SV (level) are displayed in the standard settings.

After [E] is pressed, you reach the group selection.

This selection enables you to perform the basic setup

2 Levelflex M function menu

Function group		Function			Description
Basic Setup	**00**	Measured Value	000	→	See → 14
(See → 14)		Tank Properties	002	→	See → 14
⇓		Process Properties	004	→	See → 15
		Empty Calibration	005	→	See → 15
		Full Calibration	006	→	See → 16
		Upper Block. Distance	059	→	See → 16
		Medium Property	003	→	See → 18
Safety Settings	**01**	Outp. on Alarm	010	→	See → 20
(See → 20)		Outp. on Alarm	011	→	See → 21
⇓		Outp. Echo Loss	012	→	See → 22
		Delay Time	014	→	See → 22
		Safety Distance	015	→	See → 23
		In Safety Dist.	016	→	See → 23
		Ackn. Alarm	017	→	See → 25
Length Adjustment	**03**	Probe	032	→	See → 26
(See → 26)		Probe Length	033	→	See → 26
⇓		Determine Length	034	→	See → 26
Linearization	**04**	Level/Ullage	040	→	See → 27
(See → 27)		Linearization	041	→	See → 28
⇓		Customer Unit	042	→	See → 31
		TabNo	043	→	See → 32
		Level	044	→	See → 32
		Volume	045	→	See → 33
		Max. Scale	046	→	See → 33
		Diameter Vessel	047	→	See → 33
Extended Calibration	**05**	Selection	050	→	See → 34
(See → 34)		Installation instructions	007	→	See → 34
⇓		Medium Property2	018	→	See → 35
		Range of Mapping	052	→	See → 36
		Start Mapping	053	→	See → 36
		Distance/Measured Value	008	→	See → 19
		Pres. Map. Dist.	054	→	See → 36
		Delete Map.	051	→	See → 37
		Echo Qual. Level	055	→	See → 37
		Echo Qual. Interface	056	→	See → 38
		Offset	057	→	See → 38
		Output Damping	058	→	See → 38

Function group		Function			Description
Output (See → 39)	**06**	Assignment PV	035	→	See → 39
		Assignment SV	036	→	See → 39
		Assignment TV	037	→	See → 39
		PV and SV	038	→	See → 40
		TV and QV	039	→	See → 40
		Commun. Address	060	→	See → 40
		No. of Preambles	061	→	See → 41
		Low Output Limit	062	→	See → 41
		Current Output Mode	063	→	See → 42
		Fixed Current	064	→	See → 43
		Simulation	065	→	See → 43
		Simulation Value	066	→	See → 45
		Output Current	067	→	See → 45
		4mA Value	068	→	See → 45
		20mA Value	069	→	See → 45
Envelope Curve (See → 46)	**0E**	Plot Settings	0E1	→	See → 46
		Recording Curve	0E2	→	See → 46
		Envelope Curve Display	0E3	→	See → 46
Display (See → 50)	**09**	Language	092	→	See → 50
		Back to Home	093	→	See → 50
		Format Display	094	→	See → 51
		No. of Decimals	095	→	See → 51
		Sep. Character	096	→	See → 51
		Display Layout	098	→	See → 52
		Display Test	097	→	See → 52
Diagnostics (See → 53)	**0A**	Present Error	0A0	→	See → 54
		Previous Error	0A1	→	See → 54
		Clear Last Error	0A2	→	See → 54
		Reset	0A3	→	See → 55
		Unlock Parameter	0A4	→	See → 56
		Dist. Level	0A5	→	See → 58
		Dist. Interface	0A6	→	See → 58
		Application Param.	0A8	→	See → 59

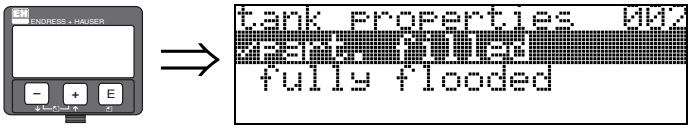
Function group		Function			Description
System Parameter (See → 60)	**0C**	Tag No.	0C0	→	See → 60
		Protocol+SW No.	0C2	→	See → 60
		Serial No.	0C4	→	See → 60
		Distance Unit	0C5	→	See → 61
		Download Mode	0C8	→	See → 62
Service	**D00**	Service level	D00	→	See → 63

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 digits after the decimal point can be selected in the "**No. of Decimals**" **(095)** function.
The standard settings for PV and SV assignment are as follows:
PV corresponds to the interface layer; SV = total level

3.2 Function "Tank Properties" (002)



This function is used to select the tank properties.
Depending on the settings, the system searches for one (flooded) echo or 2 (partially filled) echoes.

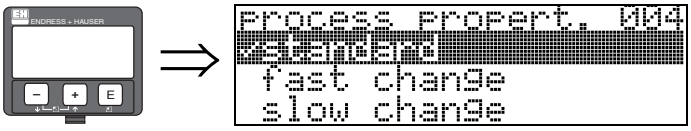
Options:
- **Partially Filled**
- Flooded

Partially Filled
The system searches for 2 signals in the measuring range. The upper signal is assigned to the total level and the lower signal to the level of the interface layer. The difference between the two levels corresponds to the thickness of the upper phase.

Flooded
The biggest signal in the measuring range is evaluated. If the signal for the total level is within the upper blocking distance, the signal detected corresponds to the level of the interface layer. If an echo is not found, echo loss is detected.

✎ Note!
- If "Flooded" is selected, it is absolutely essential that the upper signal for the total level is within the upper blocking distance so that it is not evaluated incorrectly. The setting for the upper blocking distance is an integral part of the basic setup if "Flooded" is selected.
- A change in the total level when "Flooded" is selected impacts the accuracy.

3.3 Function "Process Propert." (004)



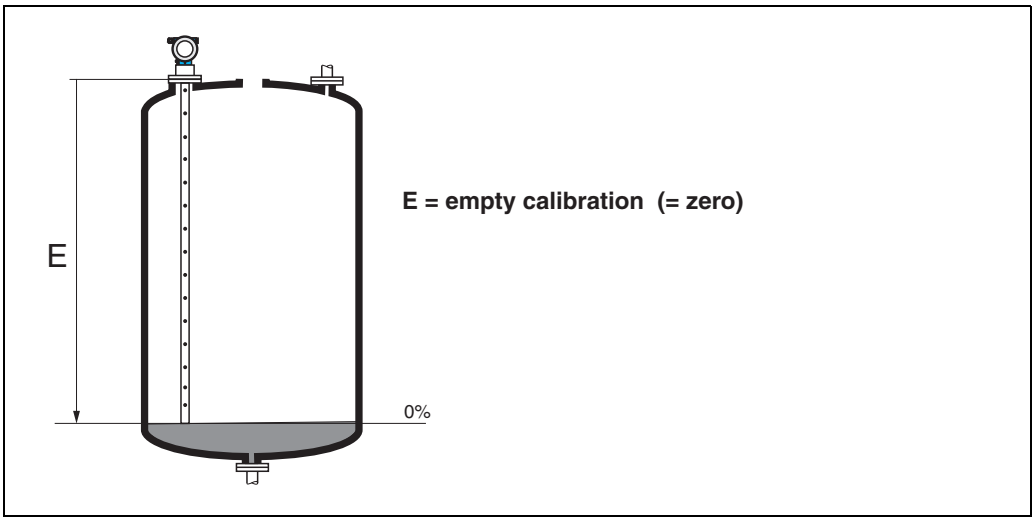
Use this function to adapt the device reaction to the filling speed in the tank. The setting influences an intelligent filter and affects the total level and interface layer level in the same way.

Options:
- **Standard**
- Fast Change
- Slow Change
- Test: No Filter

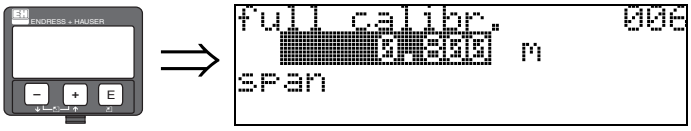
Options:	Standard	Fast Change	Slow Change	Test: No Filter
Application:	For all normal applications, bulk solids and liquids with low to medium filling speeds and sufficiently large tanks.	Small tanks, primarily with liquids, at high filling speeds.	Applications with severe surface movement, e.g. caused by agitator, primarily large tanks with low to medium filling speeds.	Shortest reaction time: ■ For test purposes ■ Measurement in small tanks at high filling speeds, if "Fast Change" setting is too slow.
2-wire electronics:	Dead time: 4 s Rise time: 18 s	Dead time: 2 s Rise time: 5 s	Dead time: 6 s Rise time: 40 s	Dead time: 1 s Rise time: 0 s

3.4 Function "Empty Calibr." (005)

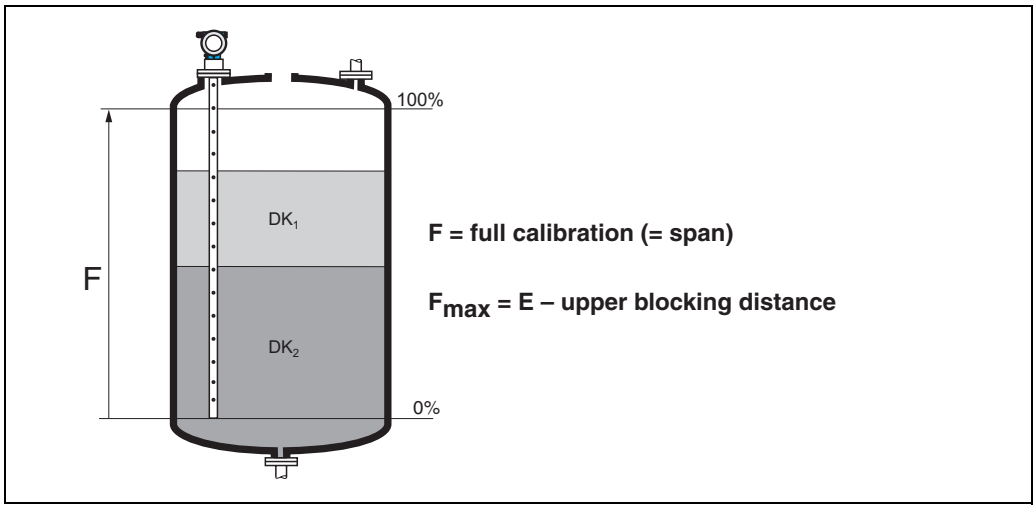
This function is used to enter the distance from the flange (reference point of the measurement) to the minimum level (=zero).



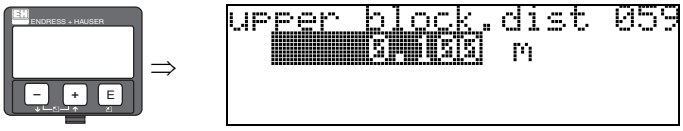
3.5 Function "Full Calibr." (006)



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



3.6 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 0.1 m on delivery.

Blocking distances and measuring range depending on probe type

At the lower end of the probe, accurate measuring is not possible, see section "Maximum measured error" on → 17.

FMP40	LN [m]		UB [m]
	min	max	min
Coax probes	0.3	4	0
16 mm rod probe in the bypass	0.3	4	0.1 a)
6 mm rod probe in the bypass	0.3	2	0.1 a)
Rope probe in free field b)	1	10 c)	0.1 a)

a. The indicated blocking distances are preset. The upper blocking distance UB can be entered manually.
b. Measurements in free field available on request
c. Larger measuring range available on request.

FMP41C/FMP45	LN [m]		UB [m]
	min	max	min
Rod probe in bypass	0.3	4	0.1 [a]
Rope probe [b] in free field (not FMP41C)	1	35 [c]	0.1 [a]
Coax probe (not FMP41C)	0.3	4	0

a. The indicated blocking distances are preset.
b. Measurements in free field available on request.
c. Larger measuring range available on request.

Note!
When installing in flooded bypasses, the blocking distance is used to map the total level echo. It may have to be adjusted to suit local conditions.

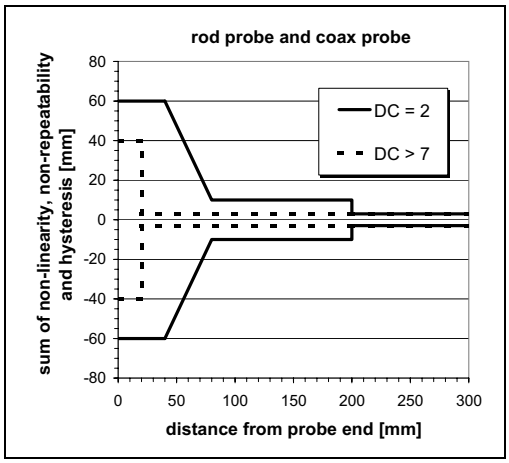
Maximum measured error

Typical data under reference conditions:
DIN EN 61298-2, percentage values in relation to the span.

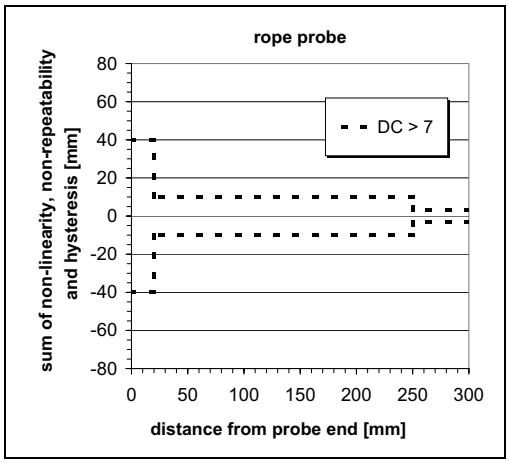
Output:	**Digital**	**Analog**
Sum of non-linearity, non-repeatability and hysteresis	**Level (electronic version level and interface measurement):** FMP40, FMP45 – Measuring range up to 10 m: ±3 mm – Measuring range > 10 m: ± 0.03 % FMP45 with coax probe: – Measuring range ±5 mm FMP41C: – Measuring range up to 10 m: ±5 mm – Measuring range > 10 m: ± 0.05 % For PA-coated rope probes: – Measuring range up to 5 m: ±5 mm – Measuring range > 5 m: ±0.1 %	± 0.06 %
	Interface (only for electronic version "K" interface measurement): Measuring range up to 10 m: ±10 mm If the thickness of the interface is <60 mm, the interface can no longer be differentiated from the overall level such that both output signals are identical.	
Offset / Zero	±4 mm	± 0.03 %

If the reference conditions are not met, the offset/zero point arising from the mounting situation may be up to ±12 mm for rope and rod probes. This additional offset/zero point 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 level (electronic version level and interface measurement):



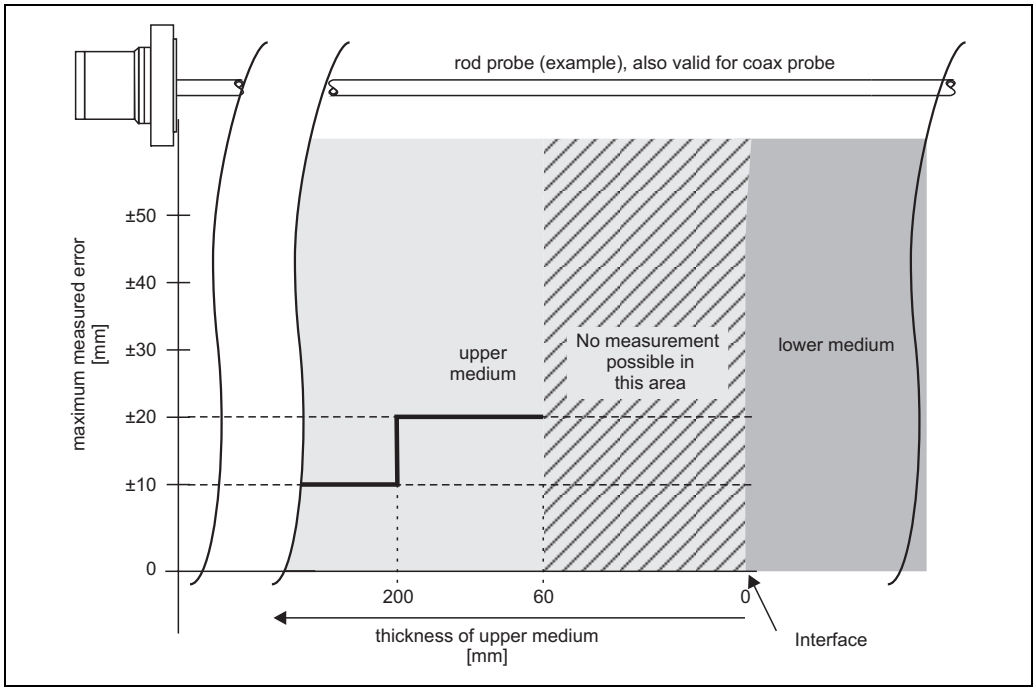
L00-FMP4xxxx-05-00-00-en-001



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

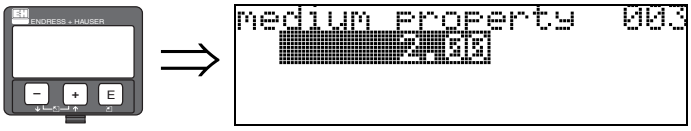
If for rope probes the DC value is less than 7, then measurement is not possible in the area of the straining weight (0 to 250 mm from end of probe; lower blocking distance).

Differing from this, the following measuring error is present for the thin interface (only for electronic version "K" interface measurement):



L00-FMP4xlxx-05-00-00-en-001

3.7 Function "Medium Property" (003)



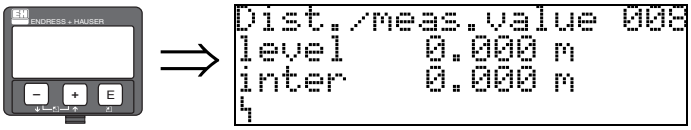
Use this function to enter the dielectric constant of the upper medium (upper phase).

Options:
- **2.00**

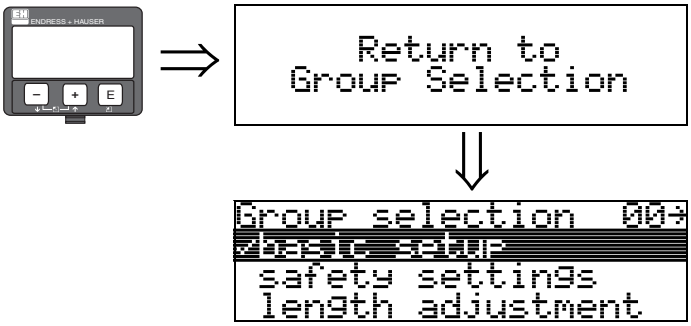
The tables below divide the DK values by product group. However, it is not sufficient to assume a typical value. For accurate interface measurement, it is necessary to determine the DK of the upper medium (upper phase) as accurately as possible and enter the value in this function.
The DK of the upper medium must be known and constant. The DK can be determined via the DK manual SD106F. If there is an interface of known thickness, the DK can also be calculated automatically by FieldCare.

DC (εr)	Typical liquids
1.4 to 1.6	– Condensed gases, e.g. N_2, CO_2
1.6 to 1.9	– Liquefied gas, e.g. propane – Solvent – Freon – Palm oil
1.9 to 2.5	– Mineral oils, fuels
2.5 to 4	– Benzene, styrene, toluene – Furan – Naphthalene
4 to 7	– Chlorobenzene, chloroform – Cellulose spray – Isocyanate, aniline
> 7	– Aqueous solutions – Alcohols – Ammonia

3.8 Display (008)

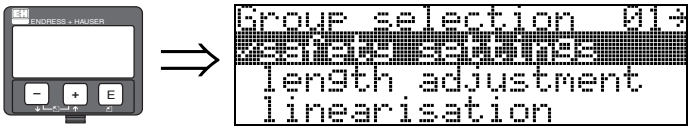


The measured distances from the reference point to the product level and the interface are shown. Check whether the values correspond to the actual distances. The following cases can occur:
- Distances correct -> continue with group selection
- Distance to level incorrect -> empty tank/bypass and perform mapping over the entire probe length.
- Distance to interface incorrect -> check entry for "Medium Prop." (003).



After 3 s, the following message appears

4 Function group "Safety Settings" (01)

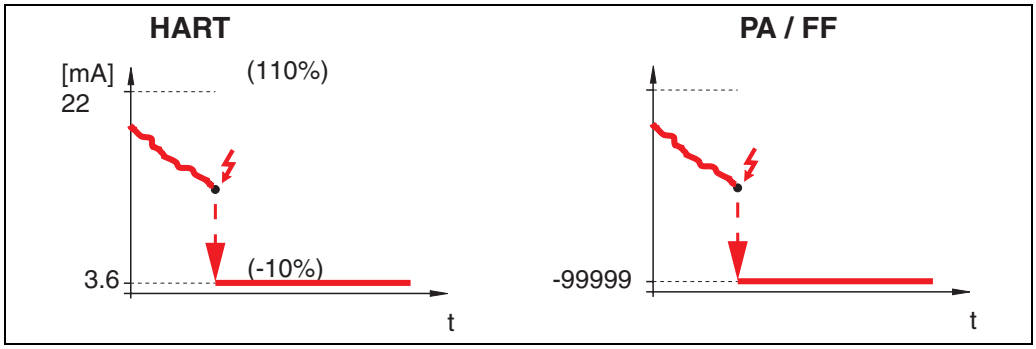


4.1 Function "Outp. on Alarm" (010)

Use this function to select the reaction of the device to an alarm condition.

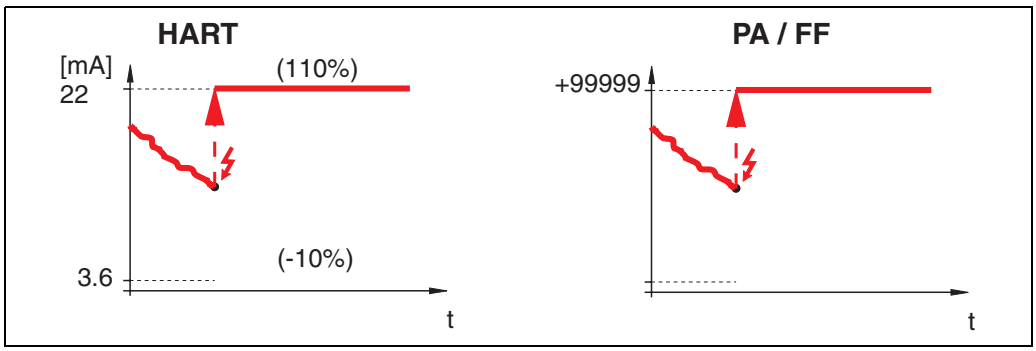
Options:
- MIN (<= 3.6mA
- **MAX (22mA)**
- Hold
- User-specific

MIN (<= 3.6mA)



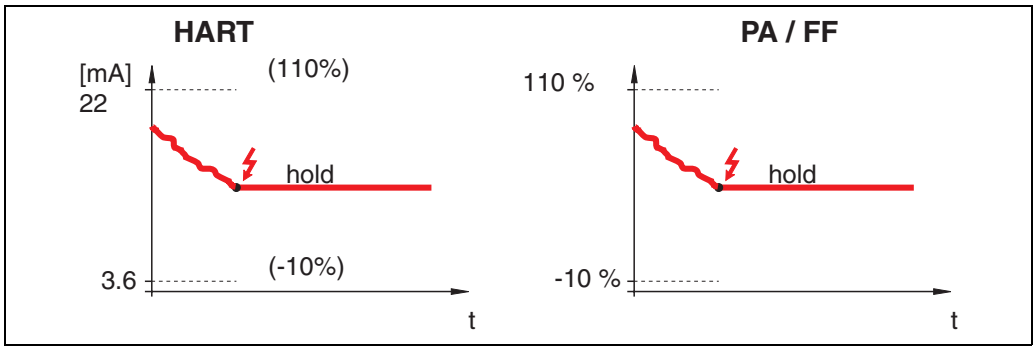
If the device is in an alarm condition, the output is changed as follows:
- HART: MIN alarm 3.6 mA

MAX 110% 22mA



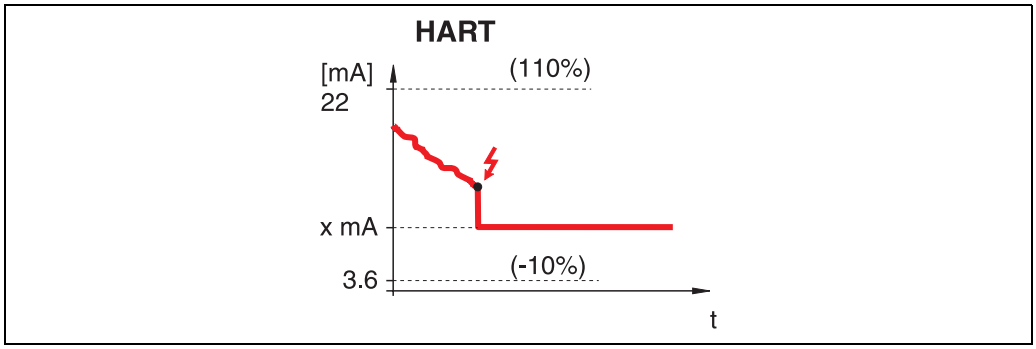
If the device is in an alarm condition, the output is changed as follows:
- HART: MAX alarm 22 mA

Hold



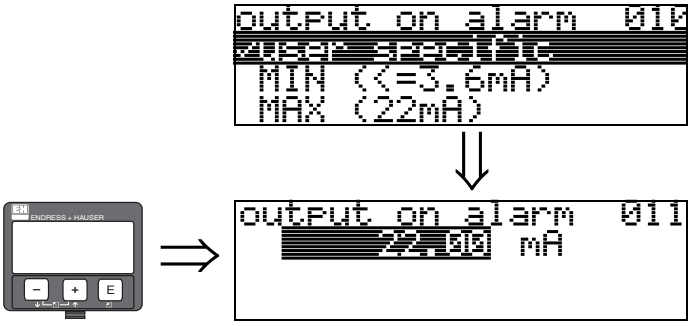
If the device is in an alarm condition, the last measured value is held.

User-specific



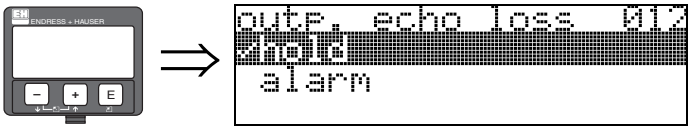
If the device is in an alarm condition, the output is set to the value (x mA) configured in the "**Outp. on Alarm**" **(011)** function.

4.2 Function "Outp. on Alarm" (011)



Output current in mA in event of alarm. This function is active if you selected **"User-specific"**" in the "**Outp. on Alarm**" **(010)** function.

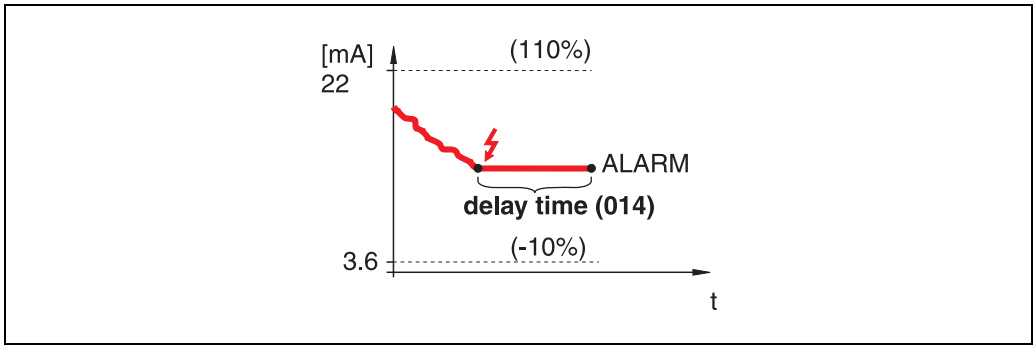
4.3 Function "Outp. Echo Loss" (012)



Use this function to set the behavior of the output in the event of an echo loss. An echo loss takes place if neither a total level echo nor an interface echo is detected!

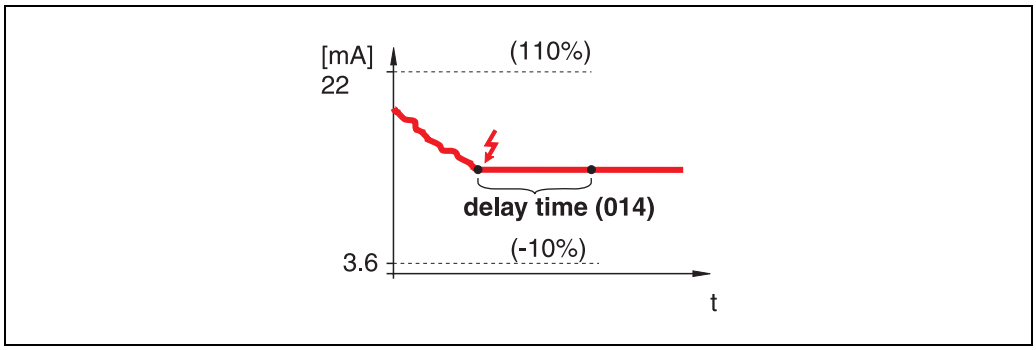
Options:
- Alarm
- **Hold**

Alarm



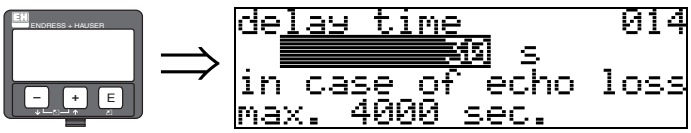
In the event of an echo loss, the device is set to the alarm condition after a time which can be configured in "**Delay Time**" **(014)**. The reaction of the output depends on the configuration in "**Outp. on Alarm**" **(010)**.

Hold



In the event of an echo loss, a warning is generated after a configurable "**Delay Time**" **(014)**. The output is held.

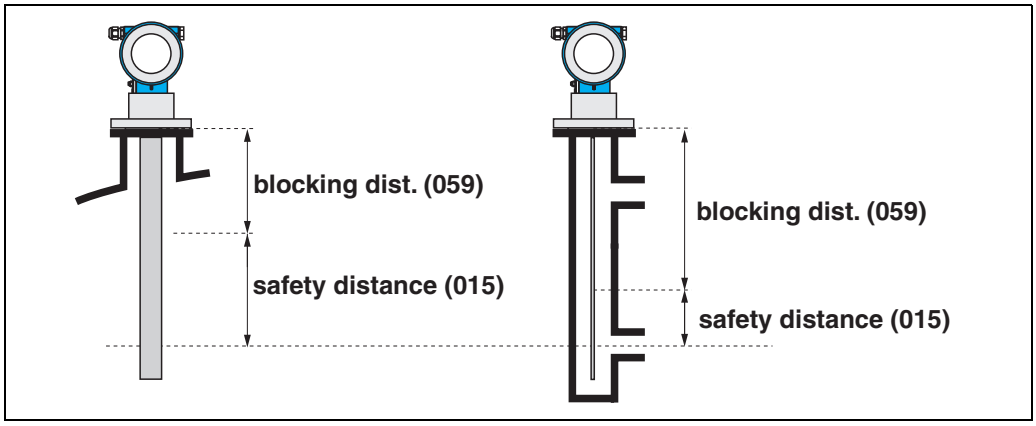
4.4 Function "Delay Time" (014)

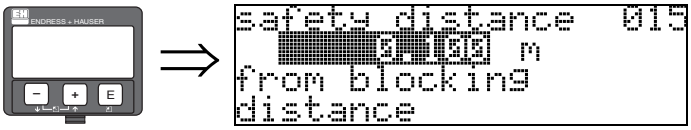


Use this function to specify the delay time (default = 60 s) after which a warning is generated or the device goes to the alarm condition in the event of an echo loss.

4.5 Function "Safety Distance" (015)

A configurable safety zone is set before the "**Blocking Distance**" **(059)** (See → 16). This zone is used as a warning to indicate that the measurement value will soon be invalid if the level continues to rise.





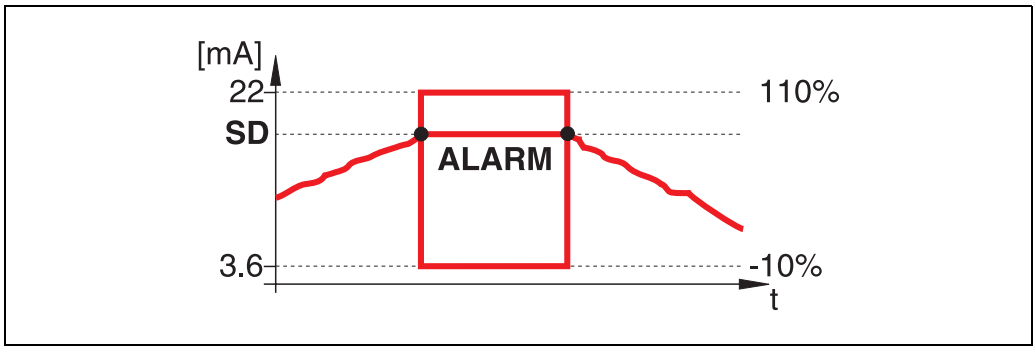
The size of the safety distance can be entered here. Default value: 0.1 m.
Negative values can also be entered to prevent a safety warning!

4.6 Function "In Safety Distance" (016)

This function can be used to specify a reaction to the level entering the safety distance.

Options:
- Alarm
- **Warning**
- Self Holding

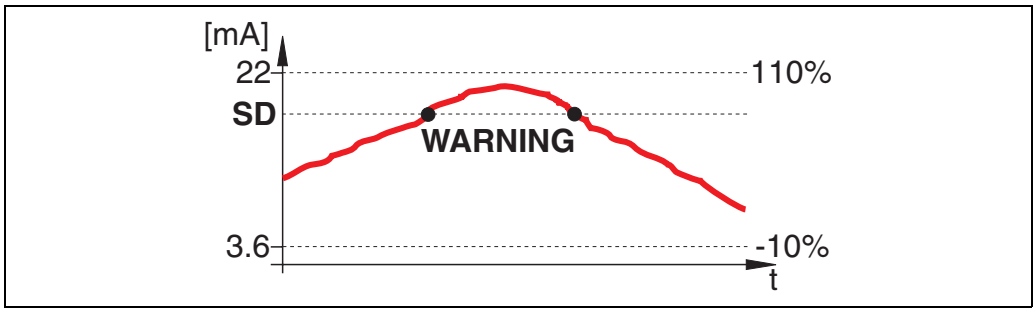
Alarm



Device goes to the defined alarm condition "**Outp. on Alarm**" **(011)**). Alarm message **E651** - "**Level in Safety Distance - Risk of Overspill**" is output.

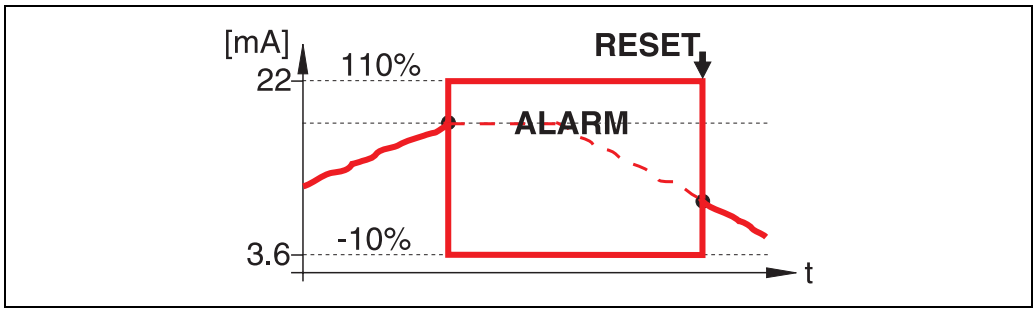
If the level leaves the safety distance again, the alarm message is deleted and the device continues measuring.

Warning



The device outputs a warning **E651** – "**Level in Safety Distance - Risk of Overspill**" but continues measuring. The warning disappears as soon as the level leaves the safety distance.

Self Holding



Device goes to the defined alarm condition ("**Outp. on Alarm**" **(011)**). Alarm message **E651** – "**Level in Safety Distance - Risk of Overspill**" is output.
If the level leaves the safety distance, measuring does not continue until a reset self hold has been performed (function: "**Ackn. Alarm**" **(017)**).

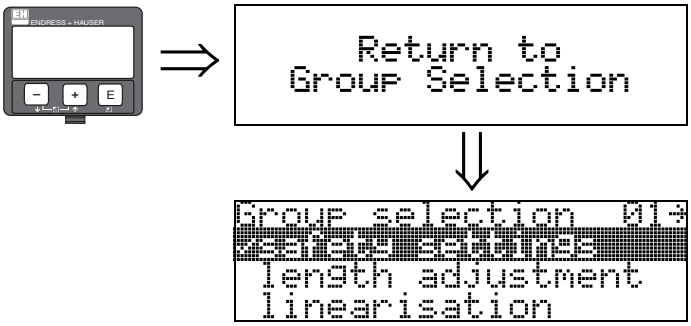
4.7 Function "Ackn. Alarm" (017)

With this function, the alarm is acknowledged in the event of a "**Self Hold**".

Options:
- **No**
- Yes

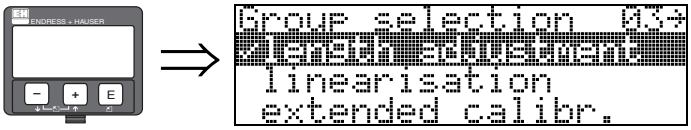
No
The alarm is not acknowledged.

Yes
The alarm is acknowledged.

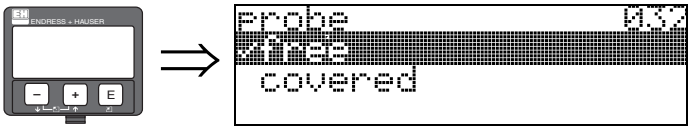


After 3 s, the following message appears

5 Function group "Length Adjustment" (03)



5.1 Function "Probe" (032)

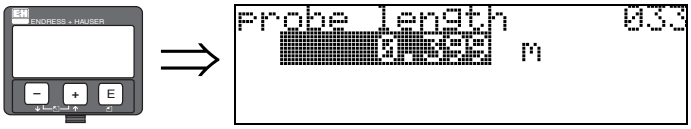


Use this function to select whether the probe is uncovered or covered at the time the probe length is adjusted. If the probe is uncovered, the Levelflex can determine the probe length automatically ("**Determine Length**" function **(034)**. If the probe is covered, a correct entry is required in the "**Probe Length**" **(031)** function.

Options:

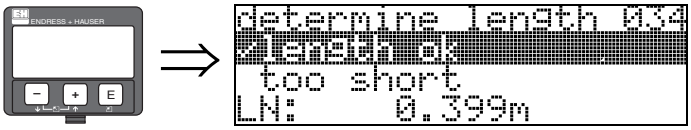
- **Free**
- Covered

5.2 Function "Probe Length" (033)



The probe length can be entered manually using this function.

5.3 Function "Determine Length" (034)



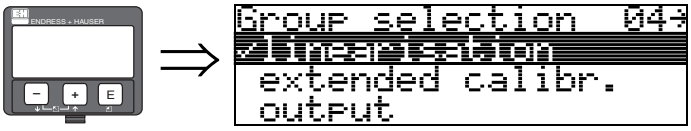
The probe length can be determined automatically using this function.
Depending on the installation conditions, the probe length determined automatically may be larger than the actual probe (typically 20 to 30 mm longer). This does not affect measuring accuracy.
When entering a linearization, please use the "Empty Calibration" value for the empty value and not the probe length determined automatically.
After determining the probe length automatically, mapping is recommended over the entire probe length.

Options:

- **Length OK**
- Too Short
- Too Long

After selecting "Too Short" or "Too Long", the system needs up to 10 seconds approximately to calculate the new probe length.

6 Function group "Linearization" (04)



6.1 Function "Level/Ullage" (040)

The "Level/Ullage" function applies equally to the measured interface layer and the total level.

Options:

- **Level CU**
- Level m/ft/in
- Ullage CU
- Ullage m/ft/in

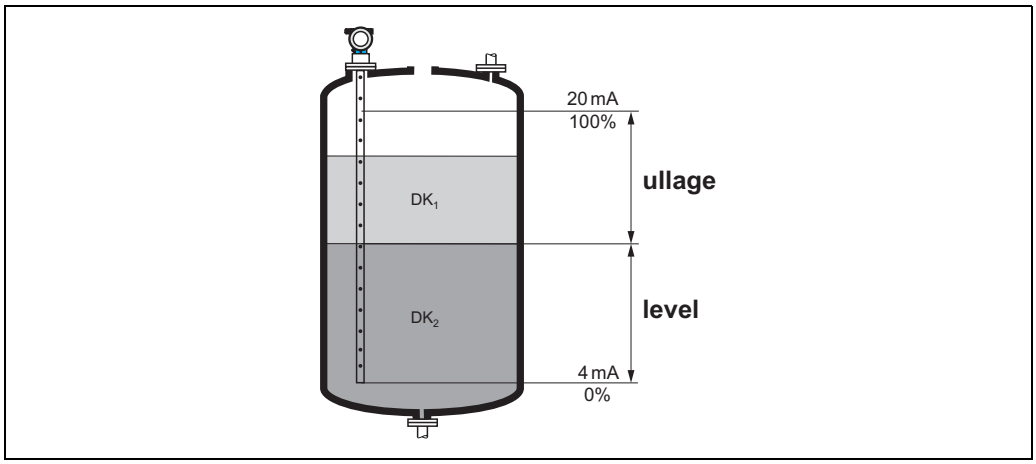
Level CU
Level in technical units. A linearization of the measured value is possible.
Linear 0 to 100% is set as the default value for "**Linearization**" **(041)**.

Level m/ft/in
Level in the selected "**Distance Unit**" **(0C5)**.

Ullage CU
Ullage in technical units. A linearization of the value is possible.
Linear 0 to 100% is set as the default value for "**Linearization**" **(041)**.

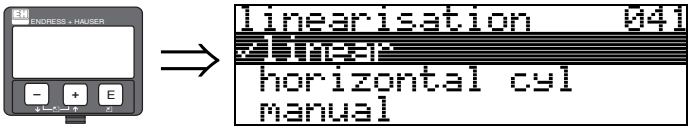
Ullage m/ft/in
Ullage in the selected "**Distance Unit**" **(0C5)**.

✎ Note!
The "**Full Calibration**" **(006)** (=span) is the reference point for the ullage.



6.2 Function "Linearization" (041)

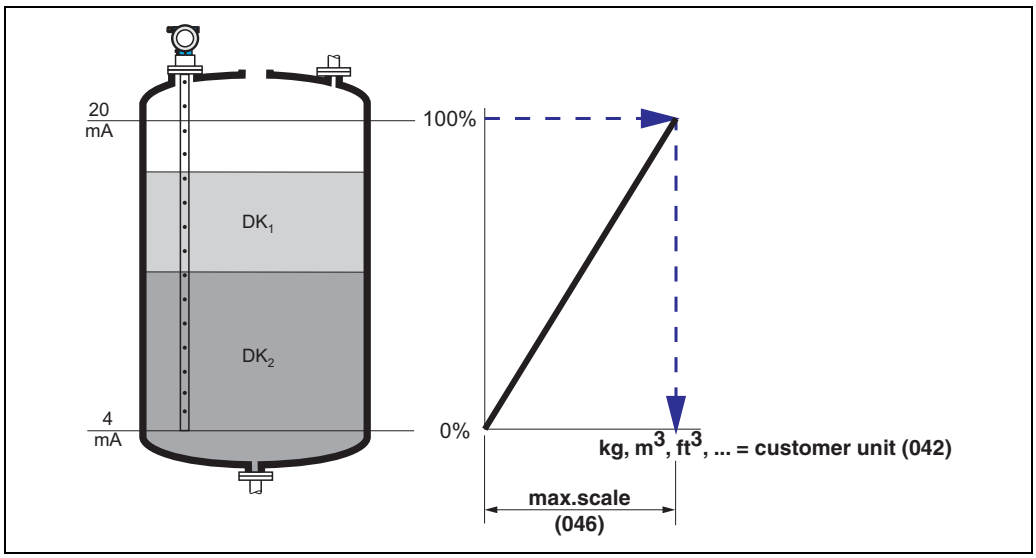
A linearization specifies the ratio of the level to the tank volume or product weight and allows measurement in technical units, such as meters, hectoliters, etc. The measured value in (000) is then displayed in the selected unit.



Selecting the linearization mode.

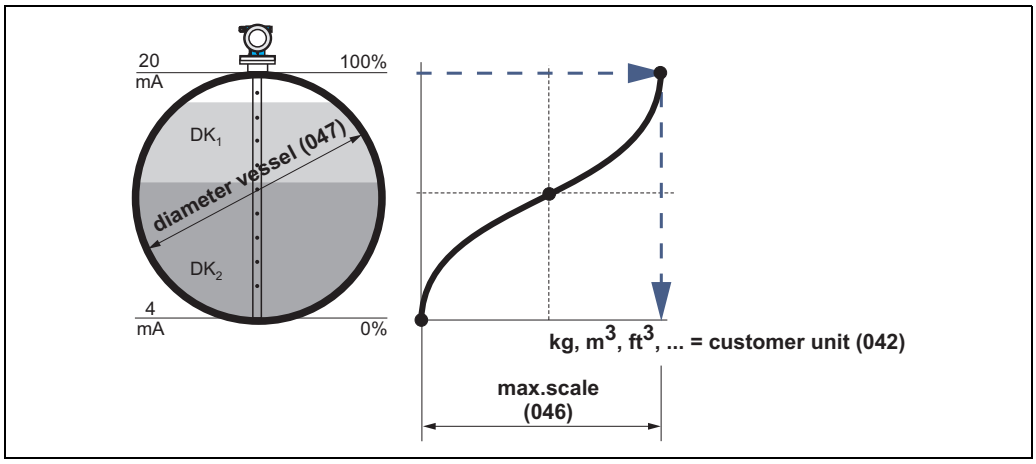
Options:
- **Linear**
- Horizontal Cyl
- Manual
- Table On
- Clear Table

Linear
The tank is linear, e.g. cylindrical vertical tank. The system can measure in technical units by entering a Max. Volume/Weight.
The "**Customer Unit**" **(042)** can be selected. The volume value corresponding to the full calibration is defined in "**Max. Scale**" **(046)**. This value corresponds to an output of 100% (= 20 mA for HART).



Horizontal Cyl

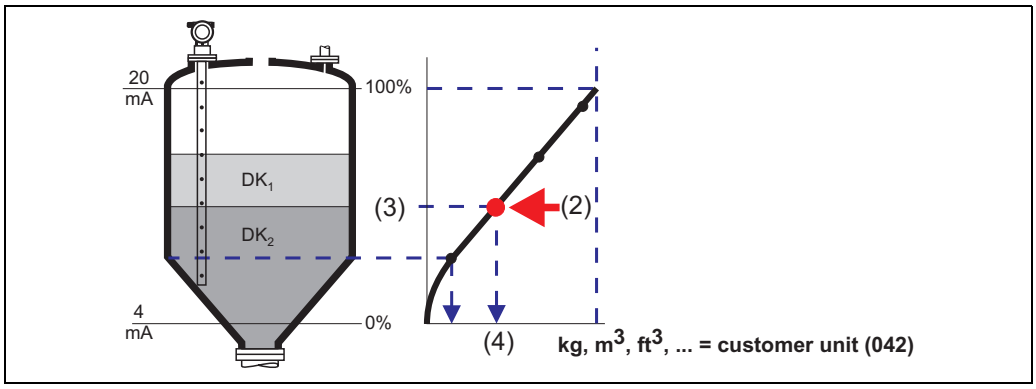
In the case of horizontal cylindrical tanks, the volume and mass are calculated automatically by specifying the "**Diameter Vessel**" **(047)**, the "**Customer Unit**" **(042)** and the "**Max. Scale**" **(046)**. The "**Max. Scale**" **(046)** then corresponds to an output of 100% (= 20 mA for HART).



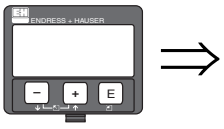
Manual

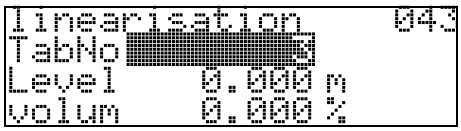
If the level is not in proportion to the volume or weight within the set measuring range, you can enter a linearization table to measure in technical units. The prerequisites are as follows:

- The max. 32 value pairs for the points in the linearization curve are known.
- The level values have to be entered in increasing order. The curve is monotone increasing.
- The level for the first and last point in the linearization curve should correspond to the empty calibration and full calibration.
- Linearization takes place in the unit of the basic setup ("**Distance Unit**" **(0C5)**).

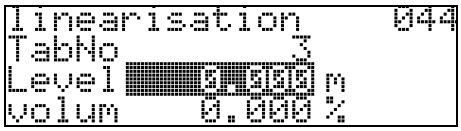


Every point (2) in the table is described by a value pair: level (3) and volume, for example, (4). The last value pair determines the output of 100% (= 20 mA for HART).



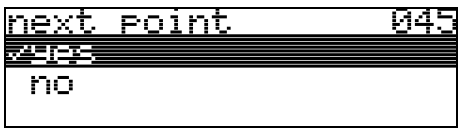


Select the table point (point 3).

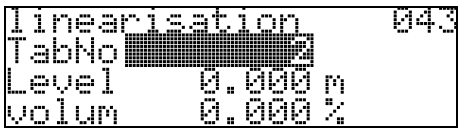


Enter the level that belongs to Point 3.

Enter the related volume.



Should another point be entered?



Next point.

...
Continue until "**Next Point**" **(045**) is answered with **No**.

✎ Note!
After entering the table, the table must be activated with "**Table On**".
The 100% value (=20 mA for HART) is determined by the last point in the table.

✎ Note!
Prior to confirming 0.00 m as the level or 0.00% as the volume, the editing mode must be enabled with + or −.

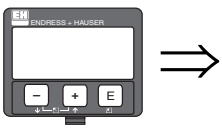
In the Endress+Hauser operating program, the linearization table can also be entered or graphically visualized with the aid of a table editor.
In addition, linearization curves can be calculated for any tank shape.

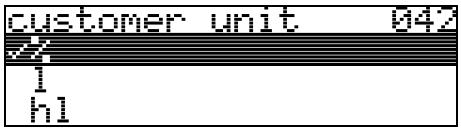
Table On
A linearization table entered does not take effect until it has been activated.

Clear Table
An existing table must always be deleted before entering a new linearization table. The linearization mode goes automatically to linear here.

✎ Note!
A linearization table can be disabled by selecting "**Linear**" or "**Horizontal Cyl.**" (or function "**Level/Ullage**" **(040)** = "**Level m/ft/in**", "**Ullage m/ft/in**"). It is not cleared in the process and can be reactivated at any time by selecting "**Table On**".

6.3 Function "Customer Unit" (042)



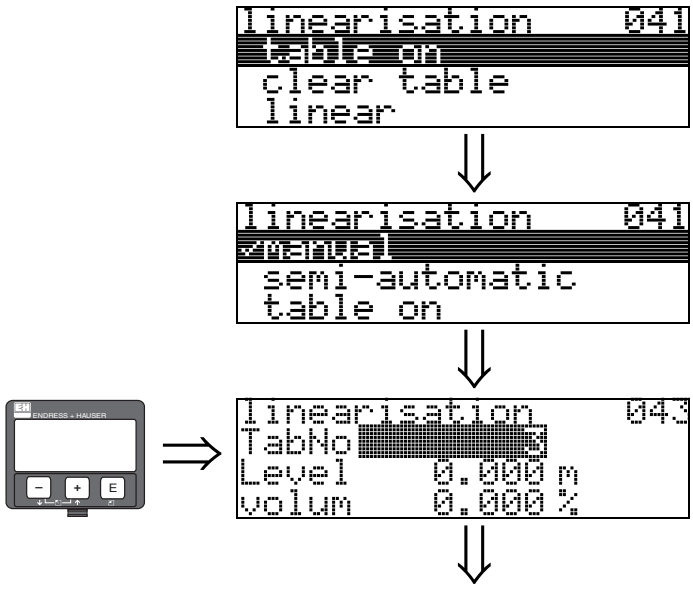


You can use this function to select the customer unit.

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

Interdependency
The units are changed in the following parameters:
- Measured Value (000)
- Input Volume (045)
- Max. Scale (046)
- Simulation Value (066)

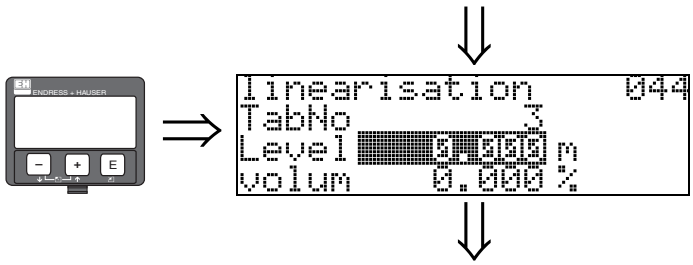
6.4 Function "Tab No" (043)



Position of the value pair in the linearization table.

Interdependency
Updates "**Input Level**" **(044)**, "**Input Volume**" **(045)**.

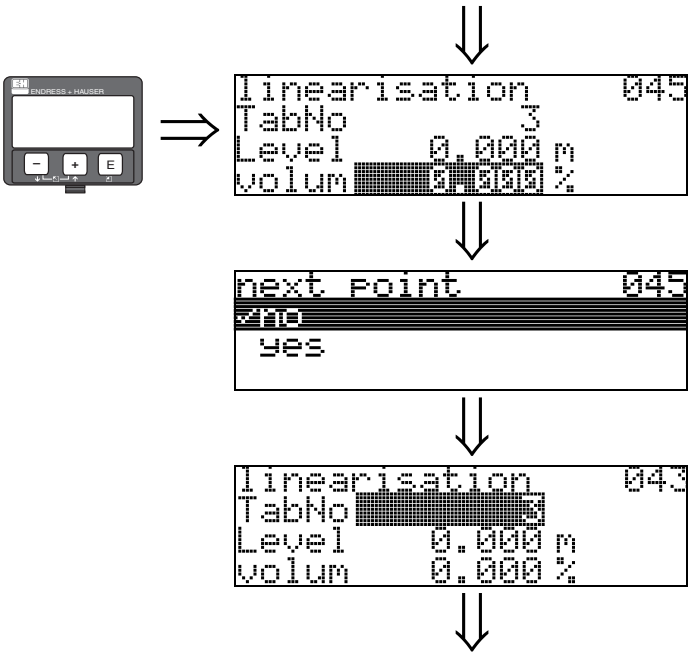
6.5 Function "Level" (044)



Use this function to specify the level for every point in the linearization curve.

User input:
Level in "**Distance Unit**" **(0C5)**.

6.6 Function "Volume" (045)



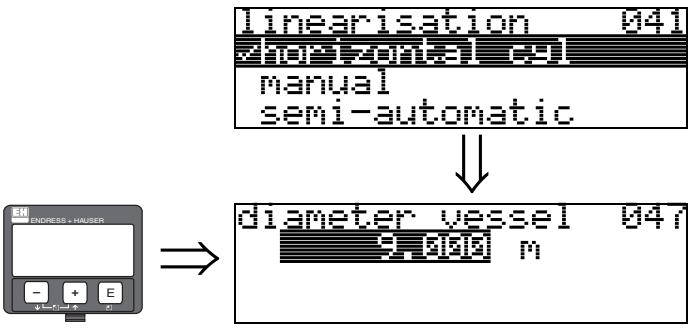
Use this function to specify the volume for every point in the linearization curve.

User input:
Volume in "**Customer Unit**" **(042)**.

6.7 Function "Max. Scale" (046)

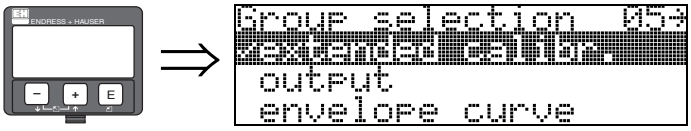
Use this function to specify the end value of the measuring range. This information is needed if you selected "**Linear**" or "**Horizontal Cyl.**" in the Linearization" **(041)** function.

6.8 Function "Diameter Vessel" (047)



Use this function to specify the tank diameter. This information is needed if you selected "**Horizontal Cyl.**" in the **Linearization**" **(041)** function.

7 Function group "Extended Calibration" (05)

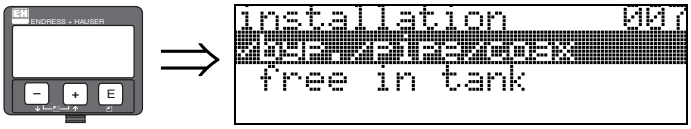


7.1 Function "Selection" (050)

Selecting the functions for extended calibration.

Options:
- **General** (e.g. "Offset", "Output Damping", ...)
- Mapping
- Delete Map.

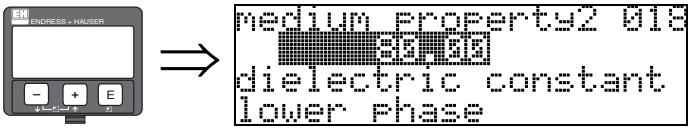
7.2 Function "Installation" (007)



You can use this function to adapt the echo thresholds to the installation conditions. By standard a rod probe in bypass/stilling well or a coax probe is recommended. The "Free in Tank" setting is not recommended and is reserved for special applications.

Options:
- **Byp./Pipe/Coax**
- Free in Tank

7.3 Function "Medium Property2" (018)



Use this function to select the dielectric constant of the lower medium (lower phase).

Options:
- **80**

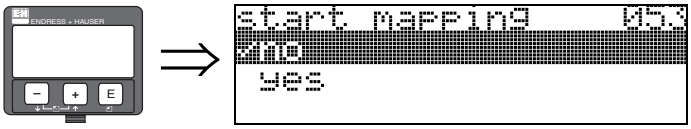
If the interface layer is not detected, enter the DK of the lower medium (lower phase). The tables below divide the DK values by product group. .

DC (εr)	Typical liquids
1.4 to 1.6	– Condensed gases, e.g. N_2, CO_2
1.6 to 1.9	– Liquefied gas, e.g. propane – Solvent – Freon – Palm oil
1.9 to 2.5	– Mineral oils, fuels
2.5 to 4	– Benzene, styrene, toluene – Furan – Naphthalene
4 to 7	– Chlorobenzene, chloroform – Cellulose spray – Isocyanate, aniline
> 7	– Aqueous solutions (DC ca. 80) – Alcohols – Ammonia

7.4 Function "Range of Mapping" (052)

This function is used to suppress interference signals within the measuring range.
In the case of coax probes, mapping is performed at the factory. Nothing must be done by the user.
In a partially filled state, it is recommended to map the distance 10 cm before the actual total level at least (range of mapping = actual distance from total level - 10 cm). In the case of empty tanks, it is recommended to enter values > LN.

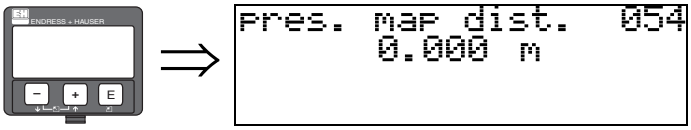
7.5 Function "Start Mapping" (053)



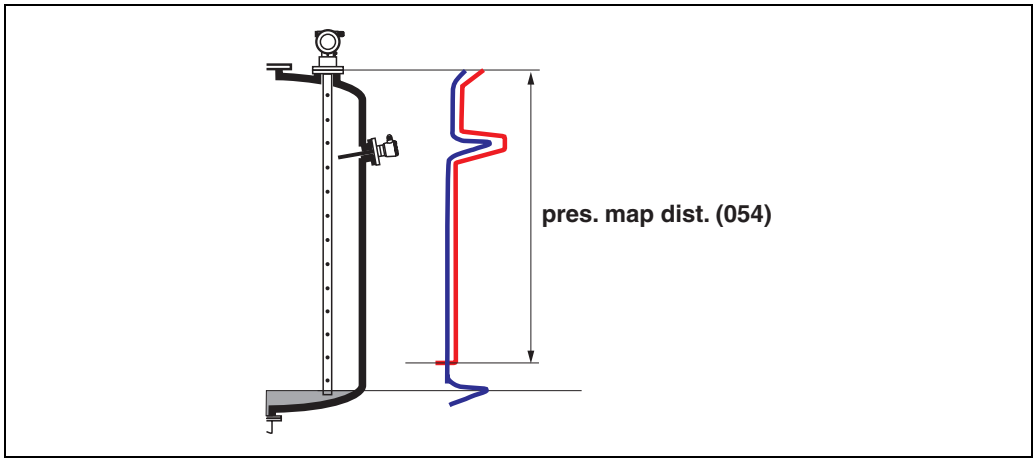
This function is used to perform interference echo suppression up to the distance given in "**Range of Mapping" (052)**.

Options:
- **No**: no mapping is carried out
- Yes: mapping is started

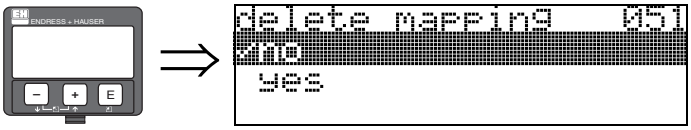
7.6 Function "Pres. Map. Dist." (054)



Displays the distance up to which interference echo suppression was performed.
A value of 0 indicates that no interference echo suppression was performed up until now.



7.7 Function "Delete Map." (051)



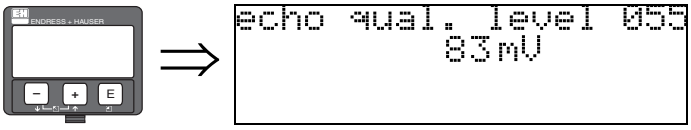
This function makes it possible to delete an existing mapping.

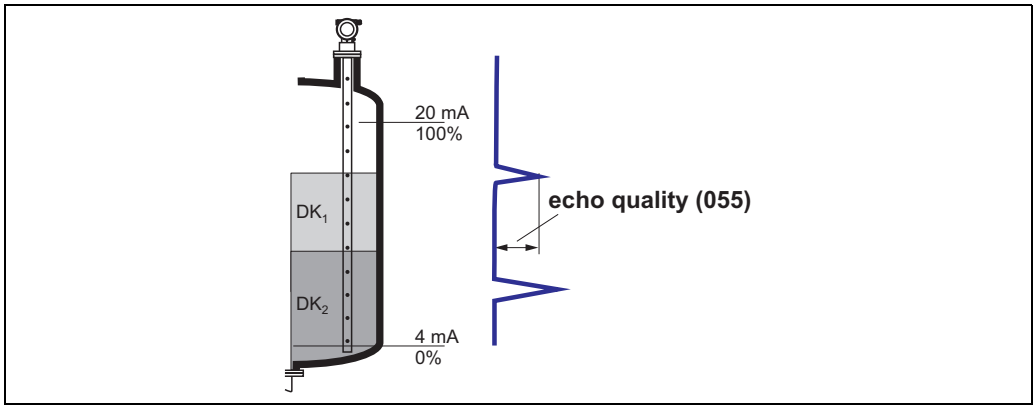
Options:
- No
- Yes

No
The existing mapping is not deleted and remains active.

Yes
After deleting the mapping, the device jumps to the "**Distance/Measured Value**" **(008)** display.

7.8 Function "Echo Qual. Level" (055)

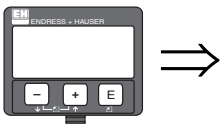


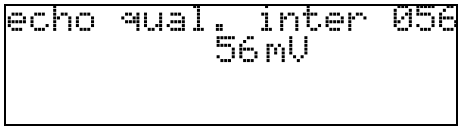


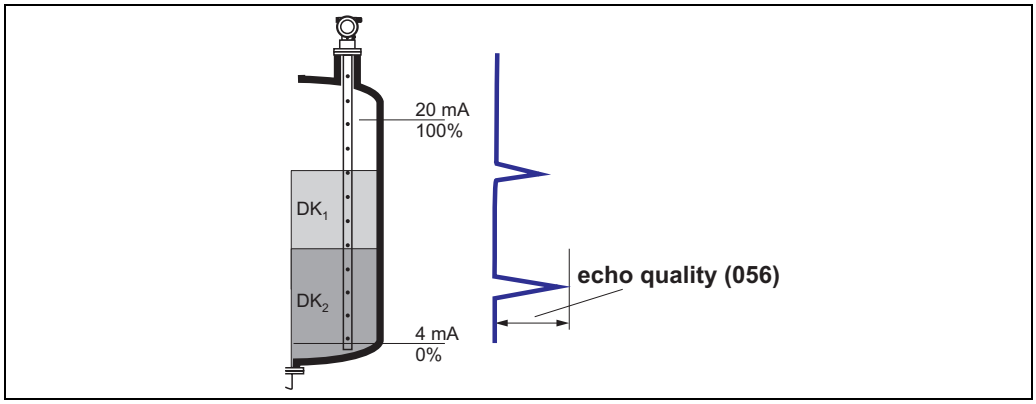
The echo quality is a measure for the reliability of the measurement. It describes the quantity of reflected energy and depends, in particular, on the following:
- DK of the medium
- Probe type
- Distance from the sensor to the product

If the values are low, there is an increased chance that the echo will be lost due to a change in measuring conditions.

7.9 Function "Echo Qual. Inter." (056)



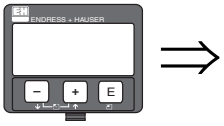




The echo quality is a measure for the reliability of the measurement. It describes the quantity of reflected energy and depends, in particular, on the following:
- DK of the medium
- Probe type
- Distance from the sensor to the product

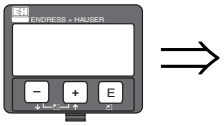
If the values are low, there is an increased chance that the echo will be lost due to a change in measuring conditions.

7.10 Function "Offset" (057)



With this function, the measured level can be corrected by a constant value. The value entered is added to the measured level.

7.11 Function "Output Damping" (058)

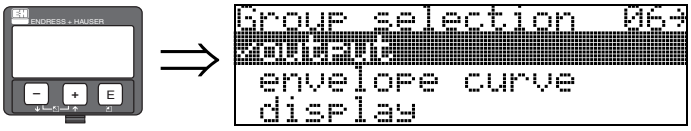


Affects the time the output needs to react to a sudden jump in the level (63% of the steady state). A high value dampens the effects of rapid changes on the measured value.

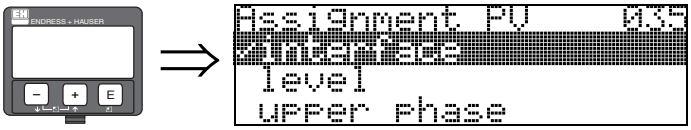
User input:
0 to 255 s

The default value depends on the "**Process Propert.**" **(004)** application parameter.

8 Function group "Output" (06)



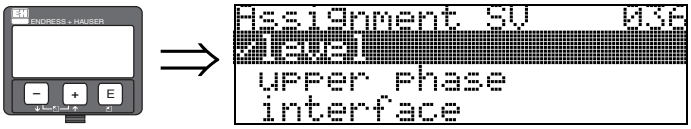
8.1 Function "Assignment PV" (035)



Using this function, the parameters in the picklist can be assigned to the primary process measured value (PV). The PV is also permanently linked to the current output.

Options:
- **Interface**
- Level
- Upper Phase

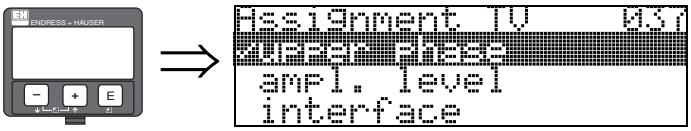
8.2 Function "Assignment SV" (036)



Using this function, the parameters in the picklist can be assigned to the secondary process measured value (SV).

Options:
- **Level**
- Upper Phase
- Interface

8.3 "Assignment TV" function (037)



Using this function, the parameters in the picklist can be assigned to the tertiary process measured value (TV).

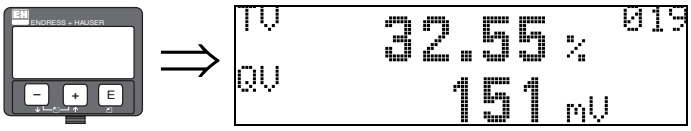
Options:
- **Upper Phase**
- Ampl. Level
- Interface
- Level

Note!
The quaternary process value (QV) is permanently assigned to the "Amplitude of Interface" parameter (Echo Qual. Level).

8.4 Display "PV and SV" (038)

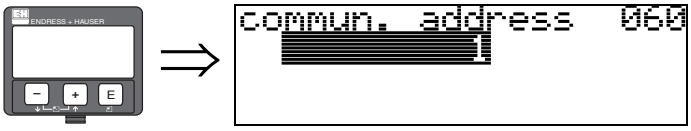
Displays the current measured values, in accordance with the "PV" and "SV" assignment.

8.5 Display "TV and QV" (039)



Displays the current measured values "TV" and "QV" ("TV" depending on assignment; QV = Ampl. Interface).

8.6 Function "Commun. Address" (060)



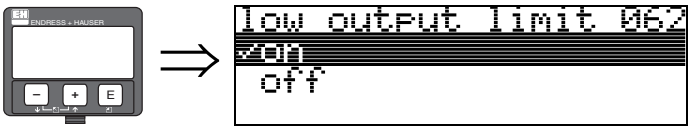
Use this function to specify a communication address for the device.
- Standard: 0
- Multidrop: 1-15

In the Multidrop mode, the output current is 4 mA as standard but can be changed in the "Fixed Cur. Value" **(064)** function.

8.7 Function "No. of Preambles" (061)

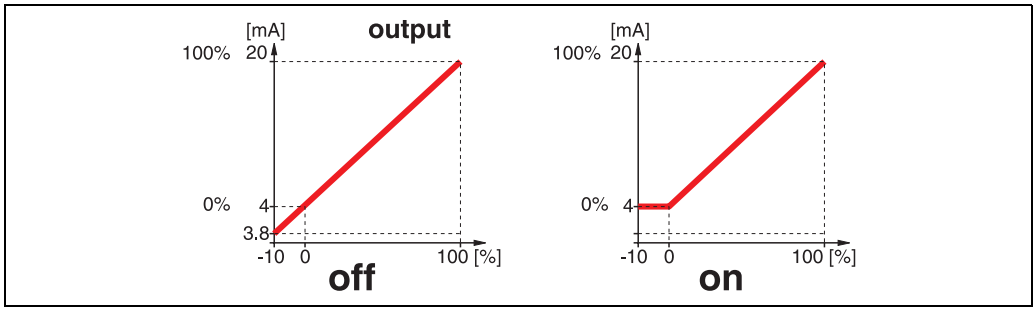
Use this function to specify the number of preambles for the HART protocol.
It might be helpful to increase the value for "bad" lines with communication problems.

8.8 Function "Low Output Limit" (062)

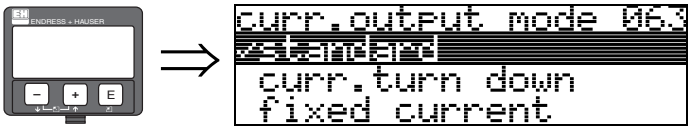


This function can be used to suppress the output of negative level values.

Options:
- Off: minimum output -10% (3.8 mA for HART)
- **On**: minimum output 0% (4 mA for HART)



8.9 Function "Current Output Mode" (063)



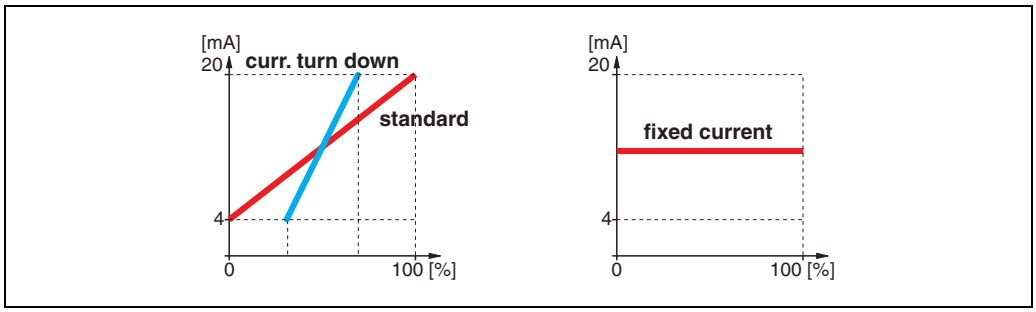
Use this function to specify the mode of the current output for HART devices.

Options:
- **Standard**
- Curr. Turn Down
- Fixed Current

Standard
With this option, the entire measuring range (0 to 100%) is mapped to entire current interval (4 to 20 mA).

Curr. Turn Down
With this option, only a part of the measuring range is mapped to entire current interval (4 to 20 mA). This range is specified by the "**4mA Value" (068)** and "**20mA Value" (069)** function.

Fixed Current
A fixed current is output with this option. The measured value is only transmitted via the HART signal. The value of the output current is specified by the "**Fixed Curr. Value**" **(064)** function.



8.10 Function "Fixed Curr. Value" (064)

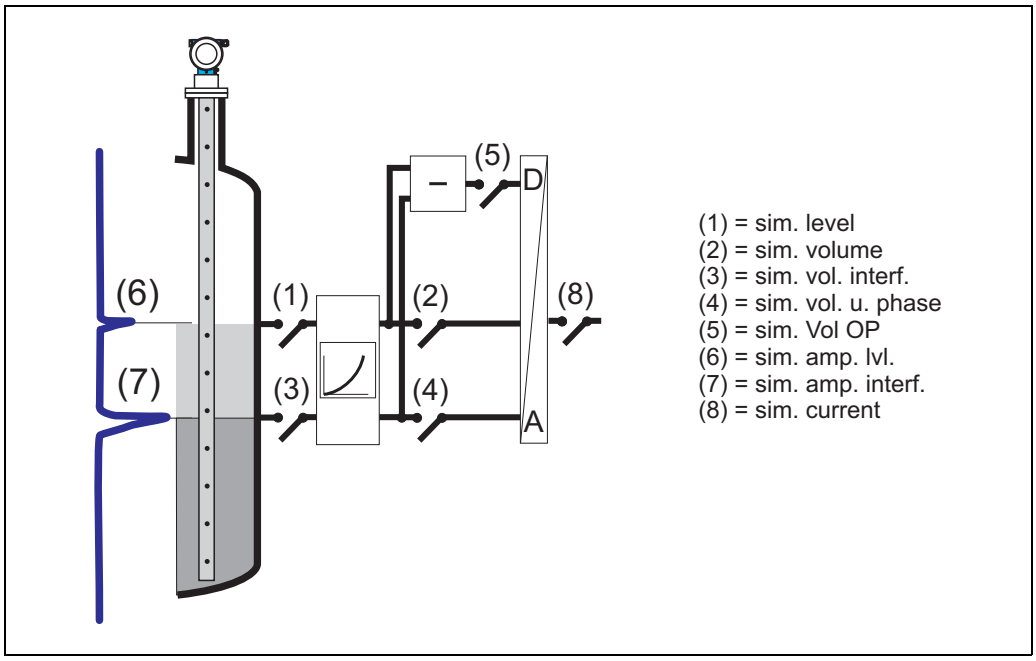
Use this function to specify the value for the fixed current. This information is needed if you selected "**Fixed Current**" in the "**Current Output Mode**" **(063)** function.

User input:
3.8 to 20.5 mA

8.11 Function "Simulation" (065)

The linearization, output signal and the current output can be tested with the simulation function. The following simulation options are available:

Options:
- **Sim. Off**
- Sim. Level
- Sim. Volume
- Sim Lvl. Interf.
- Sim Vol. Interf.
- Sim. Vol U. Phase
- Sim. Ampl. Lvl.
- Sim Ampl. Interf.
- Sim. Current



Sim. Off
Simulation is switched off.

Sim. Level
The value for the total level can be specified in "Simulation Value" (066).
The functions
- "Measured Value" (000)
- "Measured Level" (0A6)
- "Output Current" (067)

follow the values entered.

Sim. Volume
The value for the volume of the total level can be specified in "Simulation Value" (066).
The functions
- "Measured Value" (000)
- "Output Current" (067)

follow the values entered.

Sim Lvl. Interf.:
The "Simulation Value" (066) of the interface level can be specified.
Depending on the assignment (035, 036, 037), the functions
- "Output Value PV SV" (018)
- "Output Value TV QV" (019)
- "Output Current" (067)

follow the values entered.

Sim Vol. Interf.:
The "**Simulation Value**" **(066)** of the interface volume can be specified.
Depending on the assignment (035, 036, 037), the functions
- "Output Value PV SV" (018)
- "Output Value TV QV" (019)
- "Output Current" (067)

follow the values entered.

Sim. Vol U. Phase:
The "Simulation Value" (066) of the volume of the upper phase can be specified.
Depending on the assignment (035, 036, 037), the functions
- Output Value PV SV (018)
- Output Value TV QV (019)
- Output Current (067)

follow the values entered.

Sim. Ampl. Lvl.:
The "Simulation Value" (066) of the level amplitude can be specified.
Depending on the assignment (035, 036, 037), the functions
- "Output Value PV SV" (018)
- "Output Value TV QV" (019)
- "Output Current" (067)

follow the values entered.

Sim Ampl. Interf.:
The "Simulation Value" (066) of the amplitude of the interface level can be specified.
The function
- "Output Value QV" (019)

follows the values entered.

Sim. Current
The value for the current can be specified in "Simulation Value" (066).
The function
- "Output Current" (067)

follows the values entered.

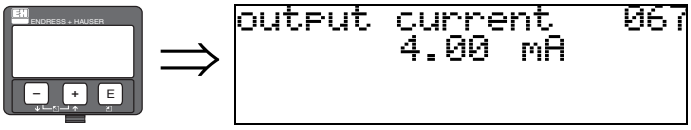
8.12 Function "Simulation Value" (066)

After selecting the "**Sim. Level**" option in the "**Simulation" (065)** function, the following appears on the display:
the level can be entered.

After selecting the "**Sim. Volume**" option in the "**Simulation" (065)** function, the following appears on the display:
the volume can be entered.

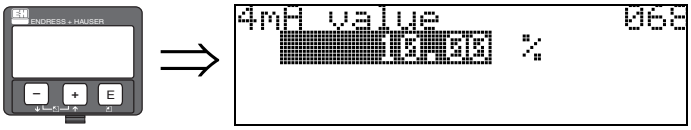
After selecting the "**Sim. Current**" option in the "**Simulation" (065)** function, the following appears on the display:
the output current can be entered.

8.13 Function "Output Current" (067)



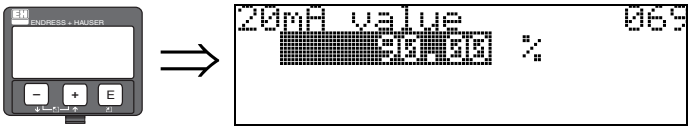
The current output current appears on the display in mA. This value is always linked to the primary value "PV".

8.14 Function "4mA Value" (068)



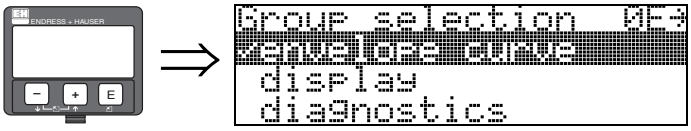
In this function, specify the level (or volume or weight) at which the output current should be 4 mA. This information only has to be input if you selected the **"Curr. Turn Down"** option in the **"Current Output Mode" (063**) function.

8.15 Function "20mA Value" (069)

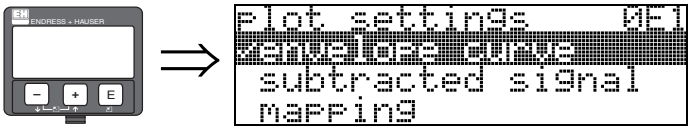


In this function, specify the level (or volume, weight or flow) at which the output current should be 20 mA. This information only has to be input if you selected the **"Curr. Turn Down"** option in the **"Current Output Mode" (063)** function.

9 Function group "Envelope Curve" (0E)



9.1 Function "Plot Settings" (0E1)



Here you can select which information is shown on the display:
- **Envelope Curve**
- Substracted Signal
- Mapping

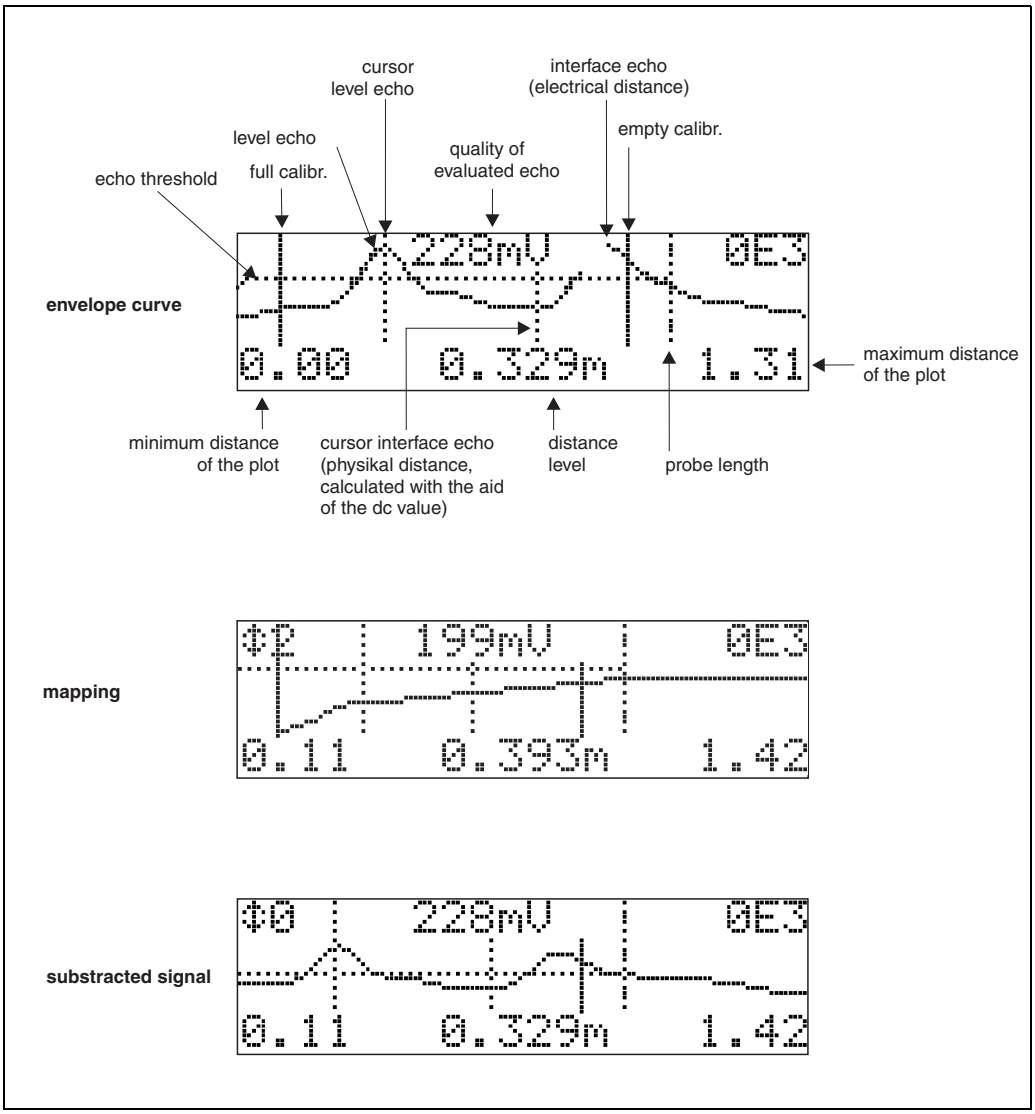
9.2 Function "Recording Curve" (0E2)

This function determines whether the envelope curve is read as
- **Single Curve**
  or
- Cyclic

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

9.3 Function "envelope curve display" (0E3)

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



9.3.1 Envelope curve

The Levelflex emits individual pulses in quick succession and scans their reflection with a slightly variable delay. The energy values received are ordered by their time-of-flight. The graphic representation of this sequence is known as an "envelope curve".

9.3.2 Mapping (empty curve) and difference curve

To suppress interference signals, the envelope curve is not directly evaluated in the Levelflex. The mapping (empty curve) is first subtracted from the envelope curve.
The system looks for level echoes in the resulting difference curve.
Difference curve = envelope curve – mapping (empty curve)

The mapping (empty curve) should be a good representation of the probe and the empty tank or silo. Ideally, only the signals from the medium being measured remain in the difference curve.

9.3.3 Mapping

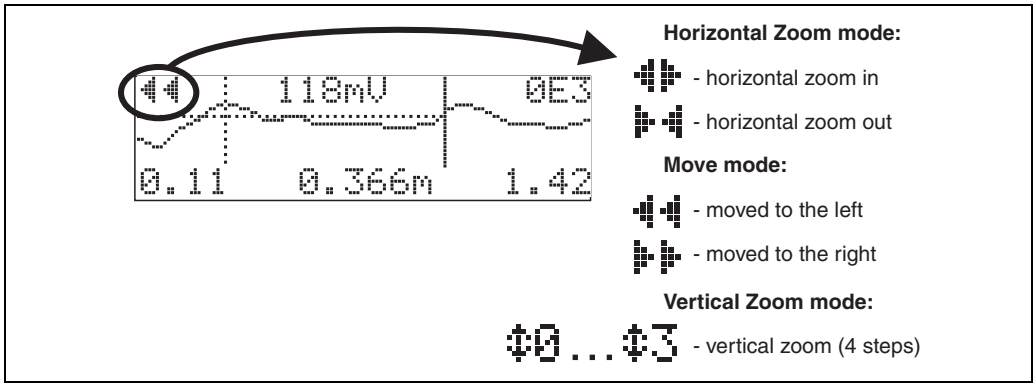
- Factory mapping
  Mapping (empty curve) is already available in the device when the device is delivered.
- Customer mapping
  In a partially filled state, it is recommended to map the distance 10 cm before the actual total level at least (range of mapping = actual distance from total level – 10 cm). In the case of empty tanks, it is recommended to enter values > LN.
- Dynamic mapping
  Is not static like factory and customer-specific interference echo suppression. Instead, it follows directly from static mapping and constantly adapts to the changing features of the probe environment during ongoing operation. Thus, dynamic mapping does not have to be recorded explicitly.

9.3.4 Echo threshold

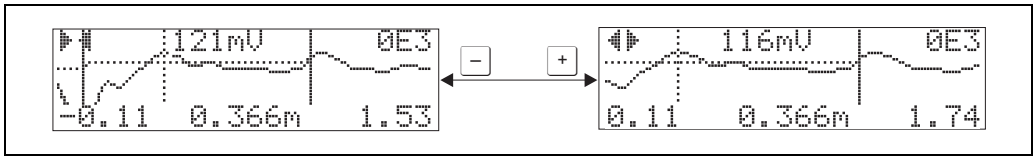
Maximum points in the difference curve are only accepted as reflection signals if they are above a specified threshold.
This threshold depends on the location and is automatically calculated from the ideal echo curve of the probe used.
The calculation of the threshold in question depends on the "Installation" customer parameter in the extended calibration function.

9.3.5 Navigation in the envelope curve display

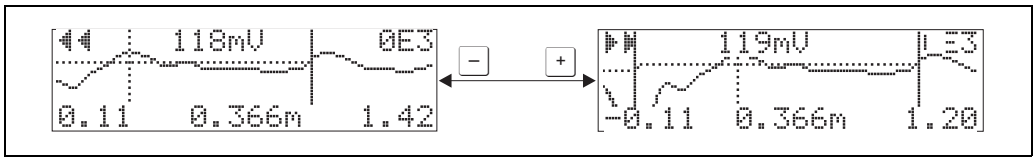
Using navigation, the envelope curve can be scaled horizontally and vertically and shifted to the left or the right. The active navigation mode is indicated by a symbol in the top left hand corner of the display.



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.

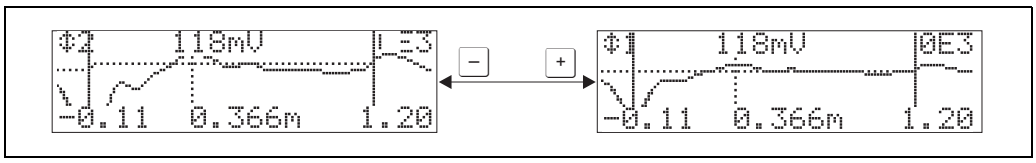


Move-Modus
Then press [E], to switch to Move mode. Either ⇹ or ⇹ is displayed.
You now have the following options:
- [+] shifts the curve to the right.
- [−] shifts the curve to the left.



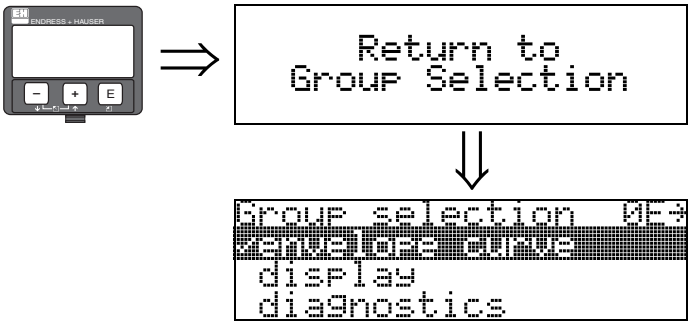
Vertical-Zoom-Modus
Press [E], once more to switch to Vertical Zoom mode ⇳ is displayed.
You now have the following options:
- [+] increases the vertical scale.
- [−] decreases the vertical scale.

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.

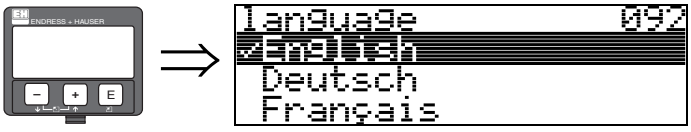
Press [+] and [−] to exit the navigation. The set increases and shifts are retained. Only when you reactivate the **"recording curve" (0E2)** function does the Levelflex use the standard display again.



After 3 s, the following message appears

10 Function group "Display" (09)

10.1 Function "Language" (092)



Selecting the language on the display.

Options:
- **English**
- Deutsch
- Français
- Español
- Italiano
- Nederlands
- Katakana (Japanese)

Interdependency
All texts are changed.

10.2 Function "Back to Home" (093)

If you do not enter information via the display during the specified time, the system returns to the measured value display.
9999 s means that no return takes place.

User input:
3 to 9999 s

10.3 Function "Format Display" (094)

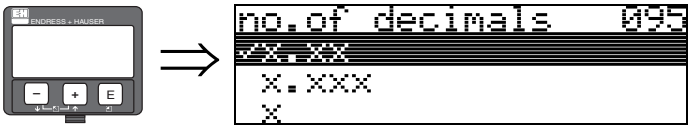
Selecting the display format on the display.

Options:
- **Decimal**
- ft-in-1/16"

Decimal
The measured value is shown in decimal notation (e.g. 10.70%) on the display.

ft-in-1/16"
The measured value is shown in feet and inches (e.g. 5'05-14/16") on the display.
This option is only possible for "**Distance Unit" (0C5)** - "**ft**" and "**in**"!

10.4 Function "No. of Decimals" (095)



Options:
- x
- x.x
- **x.xx**
- x.xxx

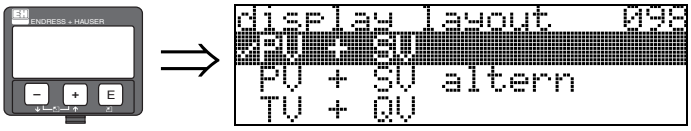
10.5 Function "Sep. Character" (096)

Options:
- **.**
- **,**

.
A point is used as the decimal delimiter.

,
A comma is used as the decimal delimiter.

10.6 Function "Display Layout " (098)



This function can be used to change what is displayed for the "**Measured Value**" **(000)**.

Option:
- PV only
- **PV + SV**
- PV + SV altern
- TV + QV

PV only
Only PV with bargraph

PV + SV
PV + SV one below the other

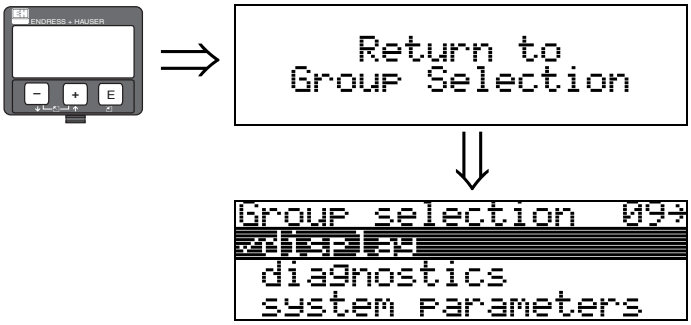
PV + SV altern
PV + SV alternating. The interval time is 3 seconds in "PV" and "SV" alternately.

TV+ QV
TV + QV one below the other

The interval time is 3 seconds in "PV" and "SV" alternately.

10.7 Function "Display Test" (097)

All the pixels on the display are activated. If the entire display is dark, it is OK.



After 3 s, the following message appears

11 Function group "Diagnostics" (0A)

You can view and confirm error messages in the "**Diagnostics**" function group.

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 the following types of error:

- **A (Alarm):**
  Device goes to a defined state (e.g. MAX)
  Indicated by a constant symbol ϟ.
  (For a description of the codes see see Table 14.2 on → 66)
- **W (Warning):**
  Device continues measuring, error message is displayed.
  Indicated by a flashing ϟ symbol.
  (For a description of the codes see see Table 14.2 on → 66)
- **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 see Table 14.2 on → 66)

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 See → 66.

- The "**Diagnostics**" **(0A)** function group can display the current error as well as the last error that occurred.
- If several errors are pending, use ⊞ or ⊟ to scroll through the error messages.
- The last error to occur can be deleted in the "**Diagnostics**" **(0A)** function group with the "**Clear Last Error**" **(0A2)** function.

11.1 Function "Present Error" (0A0)

The current error is displayed with this function.

11.2 Function "Previous Error" (0A1)

The last error to occur is displayed with this function.

11.3 Function "Clear Last Error" (0A2)

Options:
- **Keep**
- Erase

11.4 Function "Reset" (0A3)

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

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

User input ("reset" (0A3)):
- 333 = customer parameters

333 = Reset Customer Parameter
This reset is recommended whenever a device with an unknown history is to be used in an application:
- The Levelflex is reset to the default values.
- **Customer-specific interference echo suppression is not deleted.**
- A linearization is switched to "**Linear**" although the table values are retained. The table can be reactivated in the "**Linearization**" **(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)
- Installation (007)
- Outp. on Alarm (010)
- Outp. on Alarm (011)
- Outp. Echo Loss (012)
- Delay Time (014)
- Safety Distance. (015)
- In Safety Dist. (016)
- Probe (032)
- PV Assignment (035)
- SV Assignment (036)
- TV Assignment (037)
- Level/Ullage (040)
- Linearization (041)
- Customer Unit (042)
- Max. Scale (046)
- Diameter Vessel (047)
- Range of Mapping (052)
- Start Mapping (053)
- Offset (057)
- Output Damping (058)
- Low Output Limit (062)
- Current Output Mode (063)
- Fixed Curr. Value (064)
- 4mA Value (068)
- Language (092)
- Back to Home (093)
- Format Display (094)
- No of Decimals (095)
- Sep. Character (096)
- Display Layout (098)
- Unlock Parameter (0A4)
- Application Param. (0A8)
- Medium Property2 (018)

The mapping can be deleted in the "**Cust. Tank Map**" **(055)** function of the "**Extended Calibr.**" **(05)** function group.

A complete "**Basic Setup**" **(00)** must be performed.

11.5 Function "Unlock Parameter" (0A4)

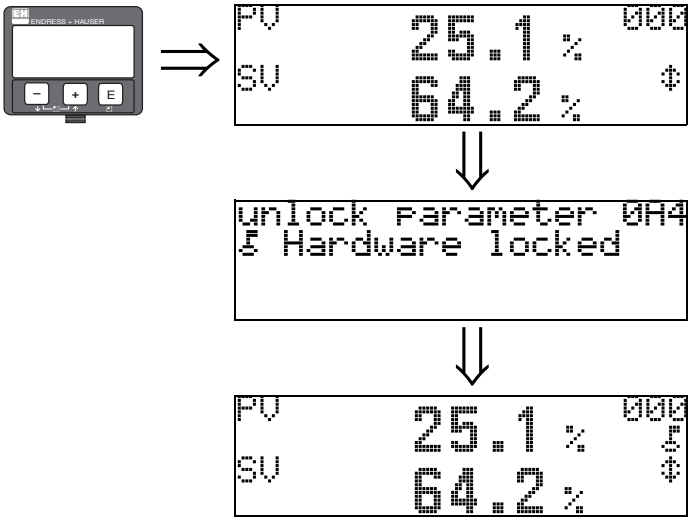
The configuration can be blocked or enabled with this function.

11.5.1 Locking of the configuration mode

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

"**Unlock Parameter**" **(0A4):**
In the "**Diagnostics**" **(0A)** function group, a value **< > 100** (e.g. 99) must be entered in "Unlock Parameter" (**0A4)**. The lock is shown on the display by the symbol and can be released again either via the display or by communication.

Hardware Locking:
The device 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 here.
All parameters can be displayed even if the device is locked.



Press [+] and [−] and [E] simultaneously

The LOCK_SYMBOL appears on the LCD.

11.5.2 Unlocking the configuration mode

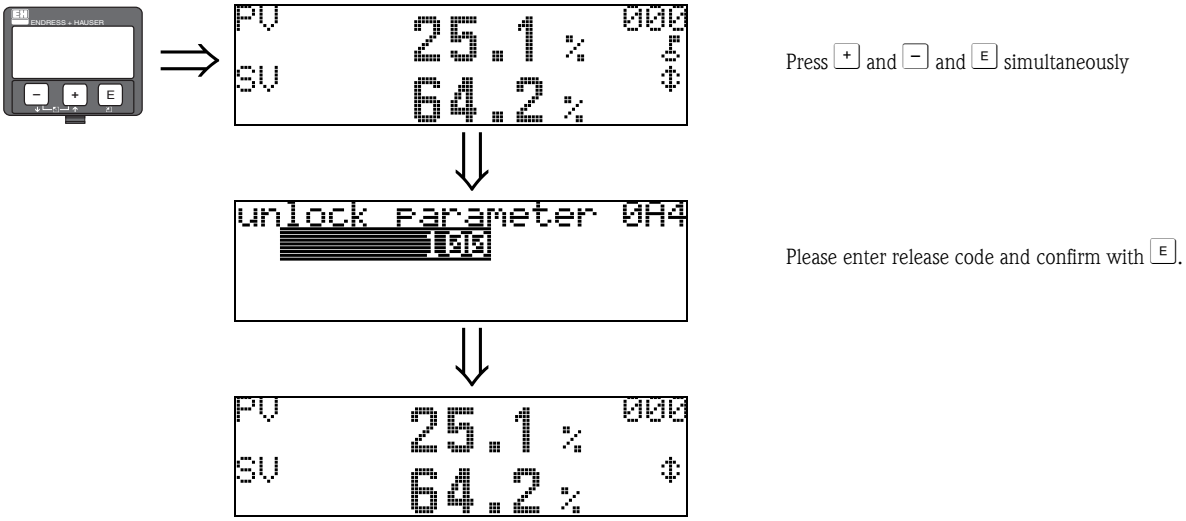
If an attempt is made to change parameters when the device is locked, the user is automatically requested to unlock the device:

"**Unlock Parameter**" **(0A4):**
The Levelflex is released for operation by entering the release code (at the display or via communication)

100

Hardware Locking:
After pressing the [+] and [−] and [E] keys at the same time, the user is asked to enter the release code

100.

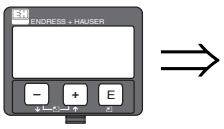


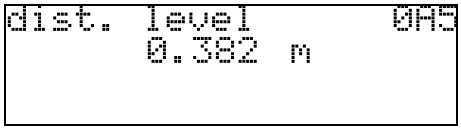
Press [+] and [−] and [E] simultaneously

Please enter release 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 Endress+Hauser service organization. Please contact Endress+Hauser if you have any questions.

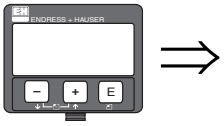
11.6 Function "Dist. Level" (0A5)

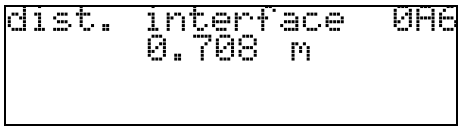




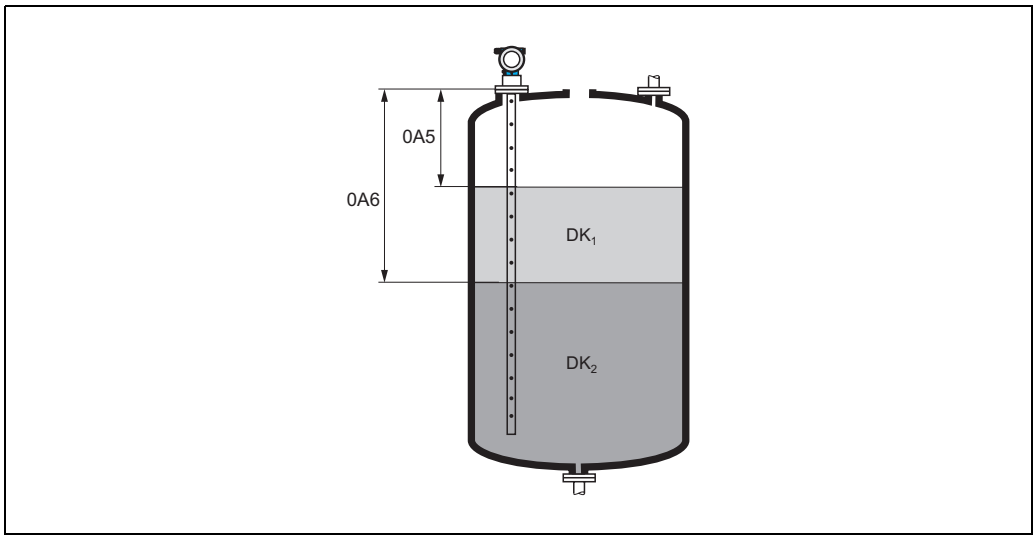
Use this function to display the current distance from the reference point of the measurement to the total level. The value is displayed in the selected "Distance Unit" (0C5).

11.7 Function "Dist. Interface" (0A6)

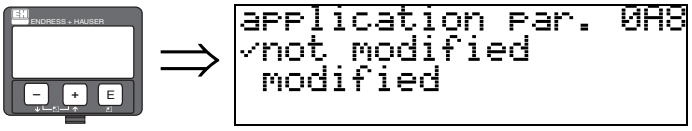




Use this function to display the current distance from the reference point of the measurement to the interface layer. The value is displayed in the selected "Distance Unit" (0C5).

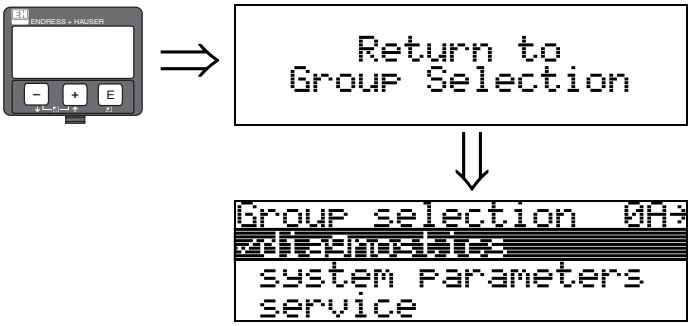


11.8 Function "Application Par." (0A8)



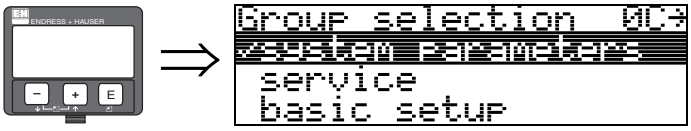
Indicates whether a setting that depends on the application parameters "**Tank Properties**" **(002)**, "**Medium Property**" **(003)** and "**Process Propert.**" **(004)** has been modified or not.
If, for example, the "**Output Damping**" **(058)** is modified, the "**Application Par.**" indicates "**Modified**".

Options:
- **Not Modified**
- Modified



After 3 s, the following message appears

12 Function group "System Parameter" (0C)

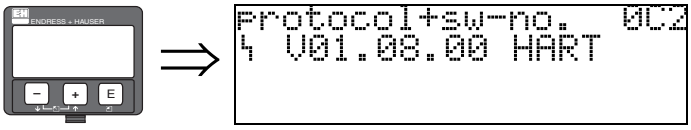


12.1 Function "Tag No." (0C0)

You can use this function to define a tag name.

User input:
- 16 alphanumeric characters for HART devices (8 via HART Universal Command)

12.2 Function "Protocol+SW No." (0C2)



This function indicates the version of the protocol, hardware and software: Vxx.yy.zz.prot.

Display:
xx: HW version
yy: SW version
zz: SW revision
prot: protocol type

12.3 Function "Serial No." (0C4)

This function displays the serial number of the device.

12.4 Function "Distance Unit" (0C5)

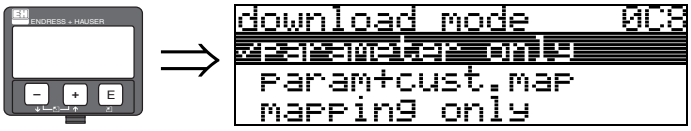
You can use this function to select the basic distance unit.

Options:
- **m**
- ft
- mm
- inch

Interdependency
m, mm: "**Format Display**" **(094)** can only be "**Decimal**".

The units for the following parameters are changed:
- Empty Calibr. (005)
- Full Calibr. (006)
- Safety Distance (015)
- Input Level (044)
- Diameter Vessel (047)
- Range of Mapping (052)
- Mapping (055)
- Offset (057)
- Simulation Value (066)
- Measured Dist. (0A5)
- Measured Level (0A6)

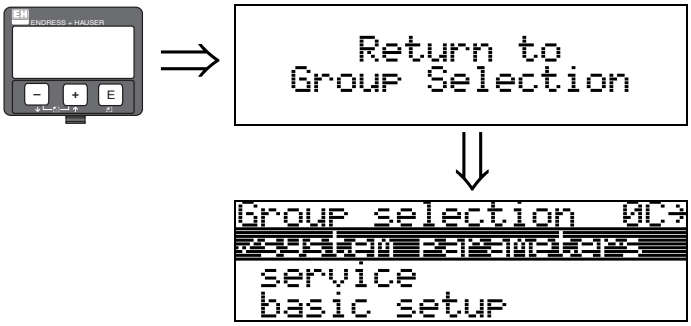
12.5 Function "Download Mode" (0C8)



This parameter is used to determine what values are written when downloading the configuration from the Endress+Hauser operating program to the device.

Options:
- **Parameter Only**
- Param.+Cust. Map
- Mapping

Note!
This parameter does not have to be configured explicitly in the Endress+Hauser operating program. The various options can be selected in the download dialog.



After 3 s, the following message appears

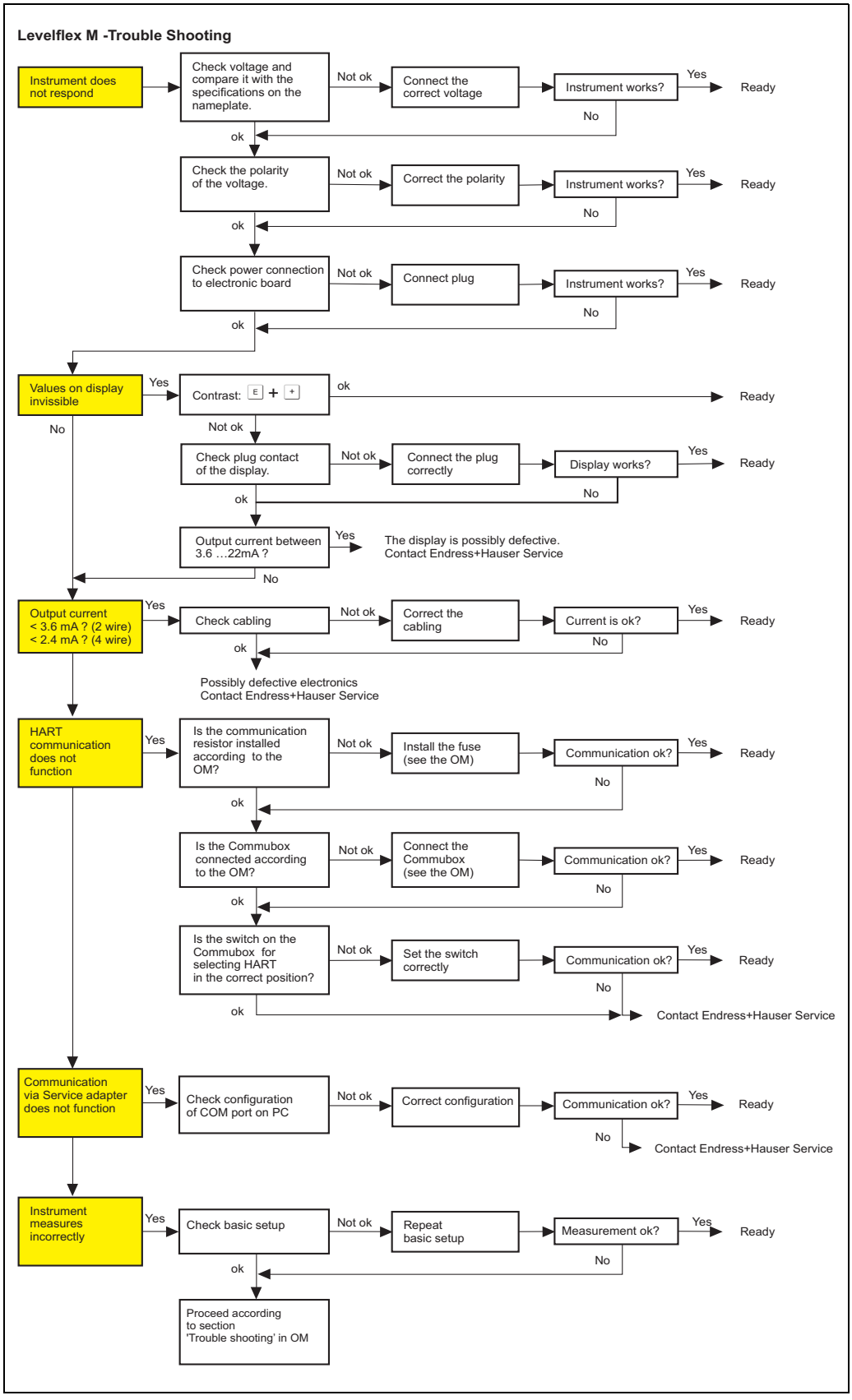
13 Function group "Service" (0D)

An indepth description of the "Service" function group, as well as a detailed overview of the function menu can be found in the Service Manual for Levelflex M.

14 Troubleshooting

If you have followed the instructions in these Operating Instructions, the Levelflex will now be successfully in operation. If this is not the case, Levelflex provides various ways of analyzing and correcting errors.
A structured troubleshooting procedure can be found → 65.

14.1 Troubleshooting instructions

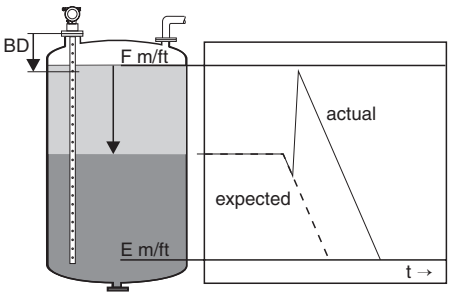
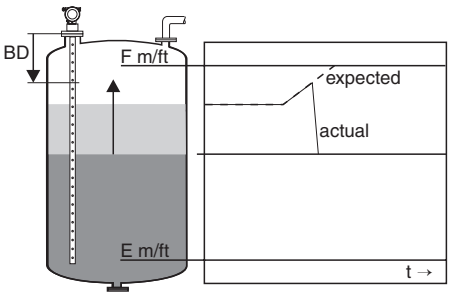
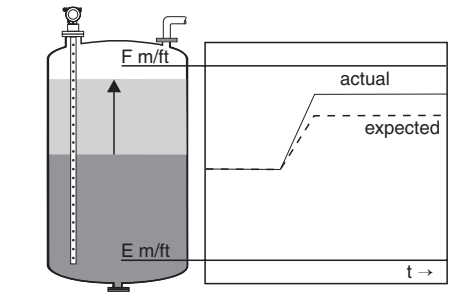


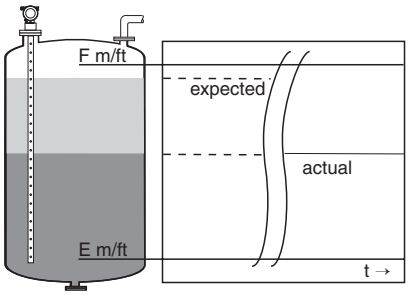
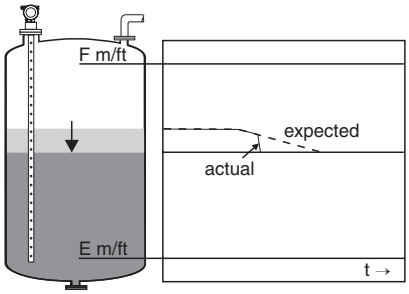
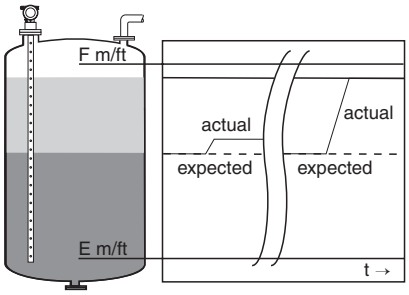
14.2 System error messages

Code	Description	Possible cause	Remedy
A102	Checksum error general reset & new calibr. required	Device was switched off before data could be 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 error prevails, exchange electronics
A106	Downloading – please wait	Processing data download	Wait until warning disappears after the download procedure
A110	Checksum error general reset & new calibr. required	Device was switched off before the data were saved 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 present E^2PROM cleared	Contact service
W153	Initializing – please wait	Initialization of electronics	Wait a few seconds; if warning prevails, switch off device and switch it on again
A160	Checksum error general reset & new calibr. required	Device was switched off before the data were saved 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 deviation from average values	HF module or cable between HF module and electronics defective	Check contacts on HF module If fault cannot be eliminated: Replace HF module
A251	Feedthrough	Lost contact in the process feedthrough	Replace process feedthrough.
A261	HF cable defective	HF cable defective or HF connector removed	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	Mapping active	Wait a few seconds until alarm disappears
W601	Linearization ch1 curve not monotone	Linearization not monotone increasing	Correct table

Code	Description	Possible cause	Remedy
W611	Less than 2 linearization points for channel 1	Number of linearization points entered < 2	Correct table
W621	Simulation ch. 1 on	Simulation mode is switched on	Switch off simulation mode
E641	No usable echo channel 1 Check calibr.	Echo lost due to application conditions or buildup Probe defective	Check basic setup Clean probe (cf. Operating Instructions)
W650	Signal/noise ratio too low or no echo	Noise amplitude too high	Eliminate electromagnetic interference
E651	Level in safety distance – risk of overspill	Level in safety distance	Alarm will disappear as soon as the level leaves safety distance Perform a reset if necessary
A671	Linearization ch1 not complete, not usable	Linearization table is in edit mode	Switch on linearization table
W681	Current ch1 out of range	Current out of valid range (3.8 mA to 21.5 mA)	Check calibration and linearization

14.3 Application errors

Error	Output	Possible cause		Remedy
A warning or an alarm is indicated	depending on configuration	see table "System error messages" (→ 66)		see table "System error messages" (→ 66)
Measured value jumps when emptying the vessel with the setting "flooded" in "Tank Properties" (002)		Total level is detected outside the "Upper Block. Dist." (059)	yes →	Increase "Upper Block. Dist." (059) Option "Partially filled" in "Tank Properties" (002)
Measured value jumps when filling the vessel with the setting "Partially Filled" in "Tank Properties" (002)		Total level runs into the defined "Upper Block. Dist." (059)	yes →	Decrease "Upper Block. Dist." (059)
Wrong slope of the interface measurement value		Wrong DK value in " Medium Property" (003)	yes →	Check setting of DK value in " Medium Property" (003)

Measured value for interface mesurement and total level are the same.		Echo threshold for the total level too high.	yes →	Check DK value in " Medium Property" (003).
With thin interfaces the total level jumps to the interface level.		The thickenss of the upper phase is less than 60 mm.	yes →	Measurement of the interface is only possible for interface thicknesses above 60 mm.
Interface measured value jumps		Emulsion layer present	yes →	Emulsion layer affects the measurement. Please contact Endress+Hauser

14.4 Software history

Levelflex M FMP40

Date	Software version	Software modifications	Documentation	
			HART	Description of Device Functions
01.2008	01.08.zz	Original software. Operated via: – FieldCare – HART-Communicator DXR375 with Rev. 1, DD 1.	BA363F/00/en/02.08 71060231	BA366F/00/en/01.08 71060890

Levelflex M FMP41C

Date	Software version	Software modifications	Documentation	
			HART	Description of Device Functions
01.2008	01.08.zz	Original software. Operated via: – FieldCare – HART-Communicator DXR375 with Rev. 1, DD 1.	BA364F/00/en/02.08 71060883	BA366F/00/en/01.08 71060890

Levelflex M FMP45

Date	Software version	Software modifications	Documentation	
			HART	Description of Device Functions
01.2008	01.08.zz	Original software. Operated via: – FieldCare – HART-Communicator DXR375 with Rev. 1, DD 1.	BA365F/00/en/02.08 71060887	BA366F/00/en/01.08 71060890

Function menu index

Function group

Function

www.endress.com/worldwide

Endress+Hauser

People for Process Automation

BA366F/00/en/01.08
No. 71060890
CCS/FM+SGML 6.0

71060890