

Description of Device Parameters

Micropilot NMR81

Tank Gauging



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1 About this document

1.1 Document function

The document is part of the Operating Instructions and serves as a reference for parameters, providing a detailed explanation of each individual parameter of the operating menu.

1.2 Symbols

1.2.1 Safety symbols

DANGER

This symbol alerts you to a dangerous situation. Failure to avoid this situation will result in serious or fatal injury.

WARNING

This symbol alerts you to a dangerous situation. Failure to avoid this situation can result in serious or fatal injury.

CAUTION

This symbol alerts you to a dangerous situation. Failure to avoid this situation can result in minor or medium injury.

NOTICE

This symbol contains information on procedures and other facts which do not result in personal injury.

1.2.2 Electrical symbols



Alternating current



Direct current and alternating current



Direct current



Ground connection

A grounded terminal which, as far as the operator is concerned, is grounded via a grounding system.

Protective earth (PE)

Ground terminals that must be connected to ground prior to establishing any other connections.

The ground terminals are located on the interior and exterior of the device:

- Interior ground terminal: protective earth is connected to the mains supply.
- Exterior ground terminal: device is connected to the plant grounding system.

1.2.3 Tool symbols



Phillips head screwdriver



Flat blade screwdriver



Torx screwdriver



Allen key



Open-ended wrench

1.2.4 Symbols for certain types of information and graphics

Permitted

Procedures, processes or actions that are permitted

Preferred

Procedures, processes or actions that are preferred

Forbidden

Procedures, processes or actions that are forbidden

Tip

Indicates additional information



Reference to documentation



Reference to graphic



Notice or individual step to be observed

1, 2, 3.

Series of steps



Result of a step



Visual inspection



Operation via operating tool



Write-protected parameter

1, 2, 3, ...

Item numbers

A, B, C, ...

Views

→ **Safety instructions**

Observe the safety instructions contained in the associated Operating Instructions

Temperature resistance of the connection cables

Specifies the minimum value of the temperature resistance of the connection cables

1.3 Documentation

The following documentation types are available in the Downloads area of the Endress +Hauser website (www.endress.com/downloads):

-  For an overview of the scope of the associated Technical Documentation, refer to the following:
- *W@M Device Viewer* (www.endress.com/deviceviewer): Enter the serial number from the nameplate
 - *Endress+Hauser Operations App*: Enter the serial number from the nameplate or scan the matrix code on the nameplate

1.3.1 Technical Information (TI)

Planning aid

The document contains all the technical data on the device and provides an overview of the accessories and other products that can be ordered for the device.

1.3.2 Brief Operating Instructions (KA)

Guide that takes you quickly to the 1st measured value

The Brief Operating Instructions contain all the essential information from incoming acceptance to initial commissioning.

1.3.3 Operating Instructions (BA)

The Operating Instructions contain all the information that is required in various phases of the life cycle of the device: from product identification, incoming acceptance and storage, to mounting, connection, operation and commissioning through to troubleshooting, maintenance and disposal.

It also contains a detailed explanation of each individual parameter in the operating menu (except the **Expert** menu). The description is aimed at those who work with the device over the entire life cycle and perform specific configurations.

1.3.4 Description of Device Parameters (GP)

The Description of Device Parameters provides a detailed explanation of each individual parameter in the 2nd part of the operating menu: the **Expert** menu. It contains all the device parameters and allows direct access to the parameters by entering a specific code. The description is aimed at those who work with the device over the entire life cycle and perform specific configurations.

1.3.5 Safety Instructions (XA)

Depending on the approval, the following Safety Instructions (XA) are supplied with the device. They are an integral part of the Operating Instructions.

-  The nameplate indicates the Safety Instructions (XA) that are relevant to the device.

1.3.6 Installation instructions (EA)

Installation Instruction are used to replace a faulty unit with a functioning unit of the same type.

2 Overview of the operating menu



- The following table lists all parameters the "Expert" menu may contain. The page number refers to where a description of the parameter can be found.
- Depending on the device version and parametrization some parameters will not be available in a given situation. For details on the conditions refer to the "Prerequisite" category in the description of the respective parameter.
- The representation essentially corresponds to the menu seen when using an operating tool (e.g. FieldCare). On the local display there may be minor differences in the menu structure. Details are mentioned in the description of the respective submenu.

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3 The "Expert" menu

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Direct access



Navigation  Expert → Direct access (0106)

User entry 0 to 65 535

Factory setting 0

Additional information Enter the access code of a parameter in order to access this parameter directly (i.e. without navigation).

The direct access code consists of a five digit number and an optional channel code, which specifies an input or output channel, e.g. 00353-2

- Leading zeros need not to be entered.
- If the channel code is not entered, channel 1 is automatically selected.
- In order to access a different channel: Enter the direct access code with the channel code.

 In this document, the direct access code is added in brackets after the parameter name in the *Navigation* category.

Locking status

Navigation
 Expert → Locking status (0004)
Description

Indicates the type of locking.

'Hardware locked' (HW)

The device is locked by the 'WP' switch on the main electronics module. To unlock, set the switch into the OFF position.

'WHG locked' (SW)

Unlock the device by entering the appropriate access code in 'Enter access code'.

'SIL locked' (SW)

Unlock the device by entering the appropriate access code in 'Enter access code'.

'Temporarily locked' (SW)

The device is temporarily locked by processes in the device (e.g. data upload/download, reset). The device will automatically be unlocked after completion of these processes.

Additional information

Read access	Operator
Write access	-

Access status display

Navigation
 Expert → Access stat.disp (0091)
Prerequisite

The device has a local display.

Description

Indicates access authorization to parameters via local display.

Additional information

Read access	Operator
Write access	-

 The access authorization can be changed via the **Enter access code** parameter (→  28).

 If an additional write protection is active, this restricts the current access authorization even further. The write protection status can be viewed via the **Locking status** parameter (→  27).

User role

Navigation
 Expert → User role (0005)
Description

Shows the access authorization to the parameters via the operating tool.

Additional information

Read access	Operator
Write access	-

Enter access code

Navigation Expert → Ent. access code (0003)**Description**

Enter access code to disable write protection of parameters.

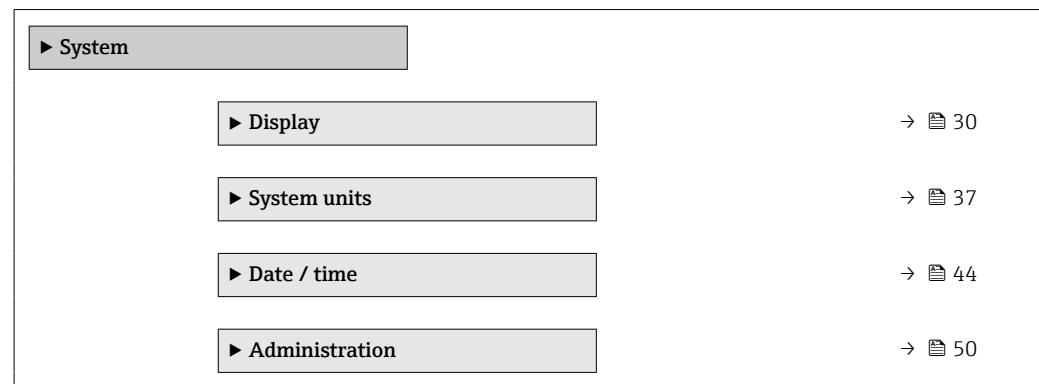
Additional information

Read access	Operator
Write access	Operator

3.1 "System" submenu

Navigation

☰ ☰ Expert → System



3.1.1 "Display" submenu

Navigation

Expert → System → Display

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Language

Navigation

Expert → System → Display → Language (0104)

Prerequisite

The device has a local display.

Description

Set display language.

Selection

- English
- Deutsch
- русский язык (Russian)
- 日本語 (Japanese)

Factory setting

English

Additional information

Read access	Operator
Write access	Operator

Format display

Navigation

 Expert → System → Display → Format display (0098)

Prerequisite

The device has a local display.

Description

Select how measured values are shown on the display.

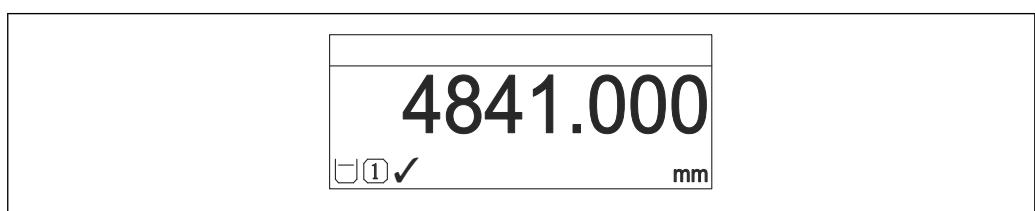
Selection

- 1 value, max. size
- 1 bargraph + 1 value
- 2 values
- 1 value large + 2 values
- 4 values

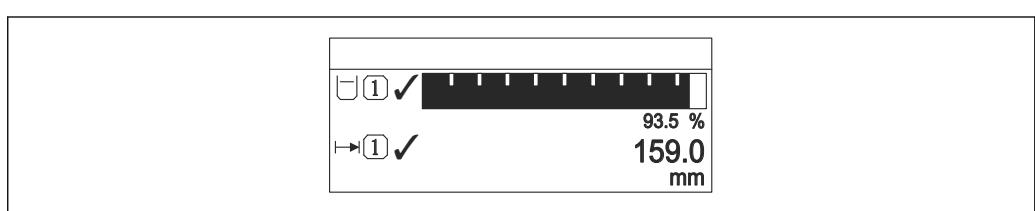
Factory setting

1 value, max. size

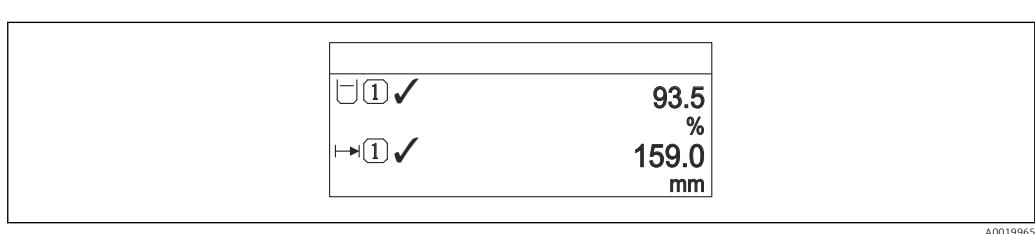
Additional information



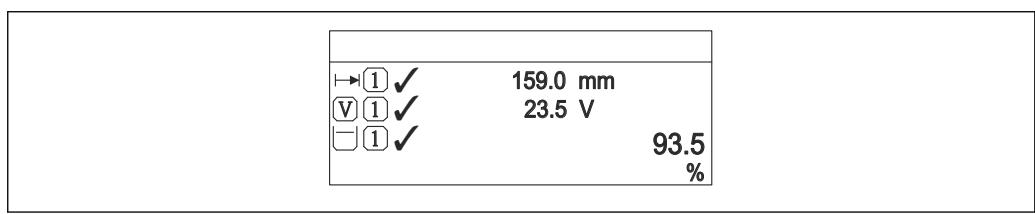
 1 "Format display" = "1 value, max. size"



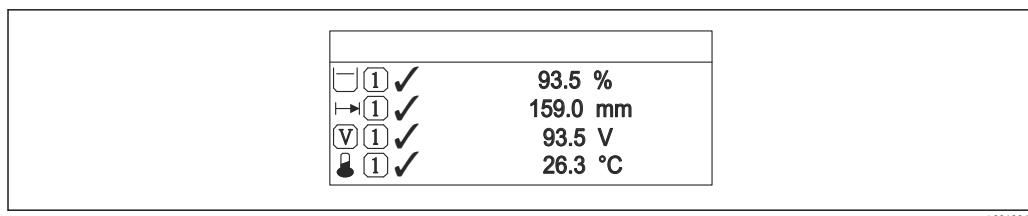
 2 "Format display" = "1 bargraph + 1 value"



 3 "Format display" = "2 values"



 4 "Format display" = "1 value large + 2 values"



5 "Format display" = "4 values"

Read access	Operator
Write access	Operator

- The **Value 1 to 4 display** (→ 32) parameters specify which measured values are shown on the display and in which order.
- If more measured values are specified than the current display mode permits, the values alternate on the device display. The display time until the next change is configured in the **Display interval** parameter (→ 35).

Value 1 to 4 display



Navigation

Expert → System → Display → Value 1 display (0107)

Prerequisite

The device has a local display.

Description

Select the measured value that is shown on the local display.

Selection

- None ¹⁾
- Tank level
- Measured level
- Level linearized
- Tank level %
- Water level ¹⁾
- Liquid temperature ¹⁾
- Vapor temperature ¹⁾
- Air temperature ¹⁾
- Tank ullage
- Tank ullage %
- Observed density value ¹⁾
- P1 (bottom) ¹⁾
- P2 (middle) ¹⁾
- P3 (top) ¹⁾
- GP 1 value ¹⁾
- GP 2 value ¹⁾
- GP 3 value ¹⁾
- GP 4 value ¹⁾
- Gauge command ¹⁾
- Gauge status ¹⁾
- AIO B1-3 value ¹⁾
- AIO B1-3 value mA ¹⁾
- AIO B1-3 value % ¹⁾

1) not available for the **Value 1 display** parameter

- AIO C1-3 value ¹⁾
- AIO C1-3 value mA ¹⁾
- AIO C1-3 value % ¹⁾
- AIP B4-8 value ¹⁾
- AIP B4-8 value mA ¹⁾
- AIP B4-8 value % ¹⁾
- AIP C4-8 value ¹⁾
- AIP C4-8 value mA ¹⁾
- AIP C4-8 value % ¹⁾

Factory setting Depending on device version

Additional information

Read access	Operator
Write access	Maintenance

Decimal places 1 to 4



Navigation Expert → System → Display → Decimal places 1 (0095)

Prerequisite The device has a local display.

Description This selection does not affect the measurement and calculation accuracy of the device.

Selection

- X
- X.X
- X.XX
- X.XXX
- X.XXXX

Factory setting X.X

Additional information The setting does not affect the measuring or computational accuracy of the device.

Read access	Operator
Write access	Maintenance

Separator



Navigation Expert → System → Display → Separator (0101)

Prerequisite The device has a local display.

Description Select decimal separator for displaying numerical values.

Selection

- .
- ,

Factory setting .

Additional information

Read access	Operator
Write access	Maintenance

Number format**Navigation**

Expert → System → Display → Number format (0099)

Prerequisite

The device has a local display.

Description

Choose number format for the display.

Selection

- Decimal
- ft-in-1/16"

Factory setting

Decimal

Additional information

Read access	Operator
Write access	Maintenance

The **ft-in-1/16"** option is only valid for distance values.

Header**Navigation**

Expert → System → Display → Header (0097)

Prerequisite

The device has a local display.

Description

Select header contents on local display.

Selection

- Device tag
- Free text

Factory setting

Device tag

Additional information

Read access	Operator
Write access	Maintenance

Meaning of the options**▪ Device tag**

The header contents is defined in the **Device tag** parameter (→ 178).

▪ Free text

The header contents is defined in the **Header text** parameter (→ 35).

Header text**Navigation** Expert → System → Display → Header text (0112)**Prerequisite** **Header** (→ 34) = **Free text****Description** Enter display header text.**User entry** Character string comprising numbers, letters and special characters (11)**Factory setting** TG-Platform**Additional information**

Read access	Operator
Write access	Maintenance

Display interval**Navigation** Expert → System → Display → Display interval (0096)**Description** Set time measured values are shown on display if display alternates between values.**User entry** 1 to 10 s**Factory setting** 5 s**Additional information** This parameter is only relevant if the number of selected measuring values exceeds the number of values the selected display format can display simultaneously.

Read access	Operator
Write access	Operator

Display damping**Navigation** Expert → System → Display → Display damping (0094)**Prerequisite** The device has a local display.**Description** Set display reaction time to fluctuations in the measured value.**User entry** 0.0 to 999.9 s**Factory setting** 0.0 s**Additional information**

Read access	Operator
Write access	Maintenance

Backlight

Navigation  Expert → System → Display → Backlight (0111)

Prerequisite The device has a local display.

Description Switch the local display backlight on and off.

- Selection**
- Disable
 - Enable

Factory setting Enable

Additional information

Read access	Operator
Write access	Operator

Contrast display

Navigation  Expert → System → Display → Contrast display (0105)

Prerequisite The device has a local display.

Description Adjust local display contrast setting to ambient conditions (e.g. lighting or reading angle).

User entry 20 to 80 %

Factory setting 30 %

Additional information

Read access	Operator
Write access	Operator

3.1.2 "System units" submenu

Navigation

Expert → System → System units

► System units	
Units preset	→ 37
Distance unit	→ 38
Pressure unit	→ 38
Temperature unit	→ 38
Density unit	→ 39
Decimal places length	→ 39
Decimal places pressure	→ 40
Decimal places temperature	→ 40
Decimal places density	→ 40

Units preset



Navigation

Expert → System → System units → Units preset (0605)

Description

Defines a set of units for length, pressure and temperature.

Selection

- mm, bar, °C
- m, bar, °C
- mm, PSI, °C
- ft, PSI, °F
- ft-in-16, PSI, °F
- ft-in-8, PSI, °F
- Customer value

Factory setting

mm, bar, °C

Additional information

Read access	Operator
Write access	Maintenance

If the **Customer value** option is selected, the units are defined in the following parameters. In any other case these are read-only parameters used to indicate the respective unit:

- Distance unit (→ 38)
- Pressure unit (→ 38)
- Temperature unit (→ 38)

Distance unit**Navigation**

Expert → System → System units → Distance unit (0551)

Description

Select distance unit.

Selection*SI units*

- m
- mm
- cm

US units

- ft
- in
- ft-in-16
- ft-in-8

Factory setting

mm

Additional information

Read access	Operator
Write access	Maintenance (if Units preset (→ 37) = Customer value)

Pressure unit**Navigation**

Expert → System → System units → Pressure unit (0564)

Description

Select process pressure unit.

Selection*SI units*

- bar
- Pa
- kPa
- MPa
- mbar a

US units

psi

Other units

- inH₂O
- inH₂O (68°F)
- ftH₂O (68°F)
- mmH₂O
- mmHg

Factory setting

bar

Additional information

Read access	Operator
Write access	Maintenance (if Units preset (→ 37) = Customer value)

Temperature unit**Navigation**

Expert → System → System units → Temperature unit (0557)

Description

Select temperature unit.

Selection*SI units*

- °C
- K

US units

- °F
- °R

Factory setting

°C

Additional information

Read access	Operator
Write access	Maintenance (if Units preset (→ 37) = Customer value)

Density unit**Navigation**

Expert → System → System units → Density unit (0555)

Description

Select density unit.

Selection*SI units*

- g/cm³
- g/ml
- g/l
- kg/l
- kg/dm³
- kg/m³

US units

- lb/ft³
- lb/gal (us)
- lb/in³
- STon/yd³

Other units

- °API
- SGU

Factory settingkg/m³**Additional information**

Read access	Operator
Write access	Maintenance (if Units preset (→ 37) = Customer value)

Decimal places length**Navigation**

Expert → System → System units → Decimal length (0573)

Description

Number of decimal places for length values.

Selection

- X
- X.X
- X.XX
- X.XXX
- X.XXXX

Factory setting

X.X

Additional information

Read access	Operator
Write access	Maintenance



The setting does not affect the accuracy of the measurement or the calculations.

Decimal places pressure**Navigation**

Expert → System → System units → Decimal pressure (0608)

Description

Number of decimal places for pressure values.

Selection

- X
- X.X
- X.XX
- X.XXX
- X.XXXX

Factory setting

X.XXX

Additional information

Read access	Operator
Write access	Maintenance

The setting does not affect the accuracy of the measurement or the calculations.

Decimal places temperature**Navigation**

Expert → System → System units → Decimal temp. (0614)

Description

Number of decimal places for temperature values.

Selection

- X
- X.X
- X.XX
- X.XXX
- X.XXXX

Factory setting

X.X

Additional information

Read access	Operator
Write access	Maintenance

The setting does not affect the accuracy of the measurement or the calculations.

Decimal places density**Navigation**

Expert → System → System units → Decimal density (0609)

Description

Number of decimal places for density values.

Selection

- X
- X.X
- X.XX
- X.XXX
- X.XXXX

Factory setting

X.X

Additional information

Read access	Operator
Write access	Maintenance



The setting does not affect the accuracy of the measurement or the calculations.

3.1.3 "Date / time" submenu

The **Date / time** submenu is used to set the real-time clock of the device.

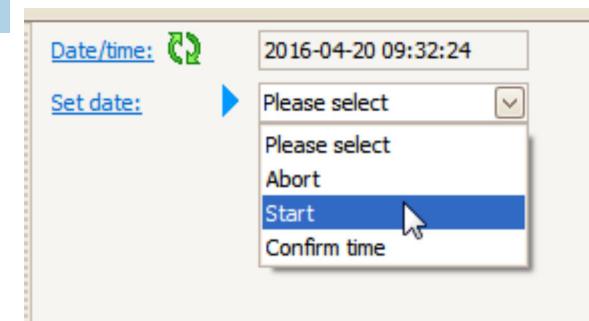
Setting the real-time clock via the display and operating module

1. Navigate to Expert → System → Date / time → Set date.
↳ The current value of the real-time clock is displayed.
2. If the displayed value is correct: Press to terminate the wizard.
3. If the displayed value is not correct: Press to edit it.
↳ The current value of the **Year** parameter is displayed.
4. If the displayed value is correct: Press to go to the next value.
5. If the displayed value is incorrect: Press and enter the correct value. Confirm the new value by pressing .
6. Repeat the last two steps for the following parameters: **Month, Day, Hour, Minute**.
↳ The new value of the real-time clock is displayed.
7. Confirm the new value of the real-time clock by pressing .
8. Quit the wizard by pressing again.

Setting the real-time clock via an operating tool (e.g. FieldCare)

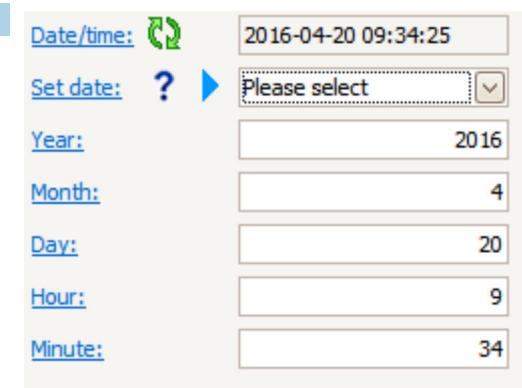
1. Navigate to: Expert → System → Date / time

2.



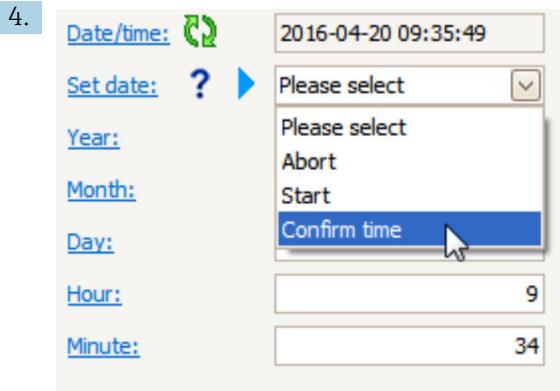
Go to the **Set date** parameter (→ 45) and select the **Start** option.

3.



Use the following parameters to set the date and time: **Year**, **Month**, **Day**, **Hour**, **Minutes**.

4.

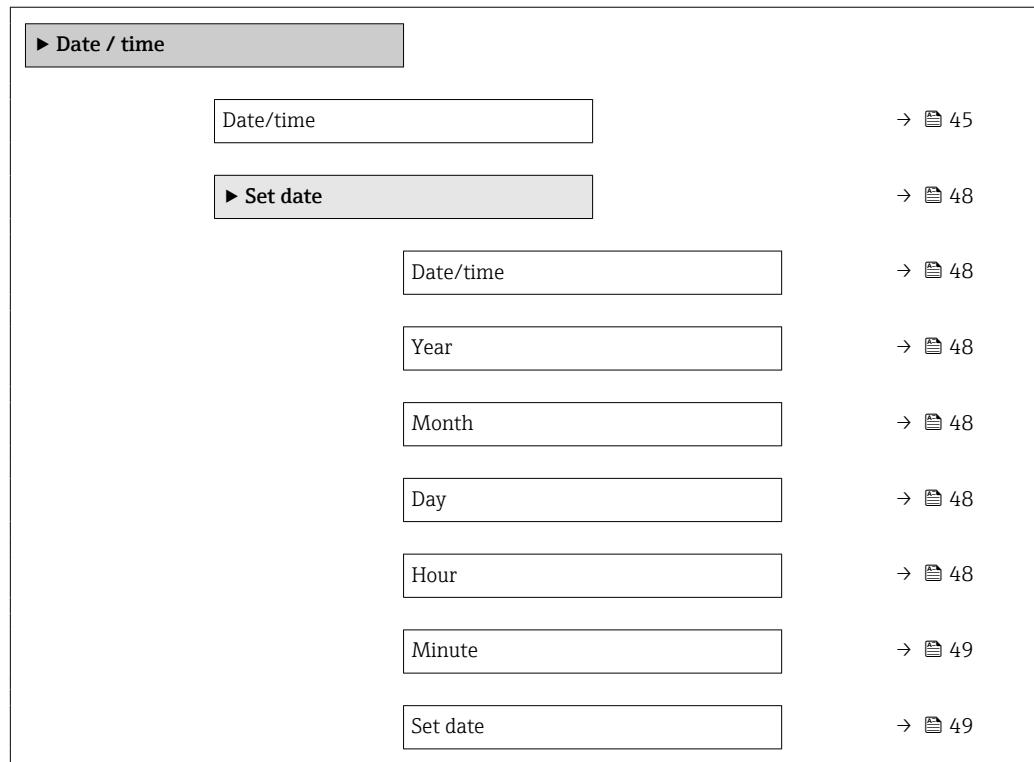


Go to the **Set date** parameter (→ 45) and select the **Confirm time** option.

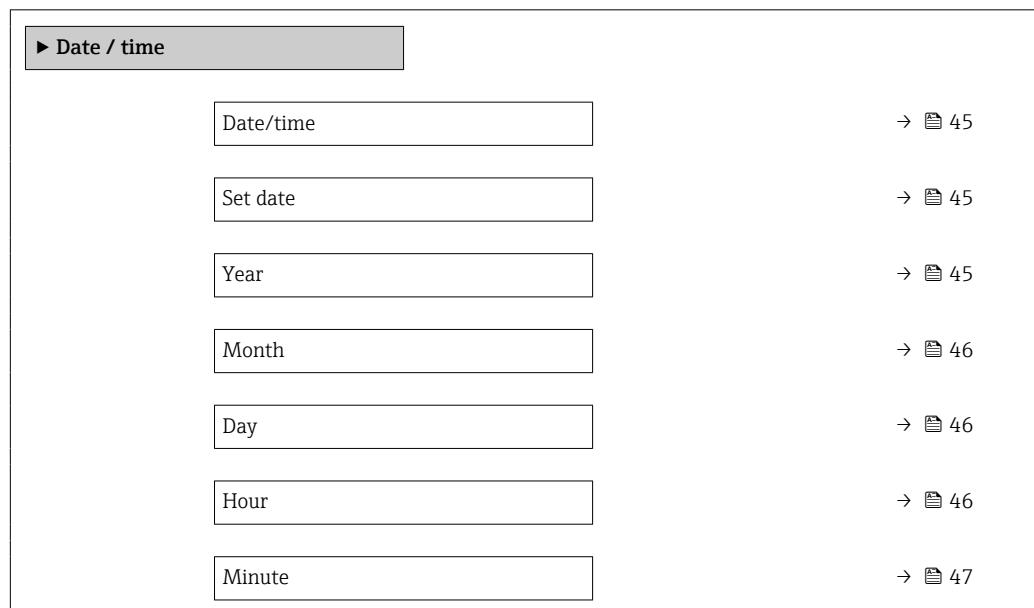
► The real-time clock is set to the current date and time.

Structure of the submenu on the display and operating module*Navigation*

Expert → System → Date / time

**Structure of the submenu in an operating tool (e.g. FieldCare)***Navigation*

Expert → System → Date / time



Description of parameters

Navigation

  Expert → System → Date / time

Date/time

Navigation

  Expert → System → Date / time → Date/time (0790)

Description

Displays the device internal real time clock.

Additional information

Read access	Operator
Write access	-

Set date



Navigation

 Expert → System → Date / time → Set date (0792)

Description

Controls the setting of the real-time clock.

Selection

- Please select
- Abort
- Start
- Confirm time

Factory setting

Please select

Additional information

Read access	Operator
Write access	Maintenance

Meaning of the options

■ Please select

Prompts the user to select an action.

■ Abort

Discards the entered date and time.

■ Start

Starts the setting of the real time clock.

■ Confirm time

Sets the real-time clock to the entered date and time.

Year



Navigation

 Expert → System → Date / time → Year (0782)

Prerequisite

Set date (→  45) = Start

Description Enter the current year.

User entry 2016 to 2079

Factory setting 2016

Additional information

Read access	Operator
Write access	Maintenance

Month



Navigation ☰ Expert → System → Date / time → Month (0787)

Prerequisite Set date (→ ☰ 45) = Start

Description Enter the current month.

User entry 1 to 12

Factory setting 1

Additional information

Read access	Operator
Write access	Maintenance

Day



Navigation ☰ Expert → System → Date / time → Day (0788)

Prerequisite Set date (→ ☰ 45) = Start

Description Enter the current day.

User entry 1 to 31

Factory setting 1

Additional information

Read access	Operator
Write access	Maintenance

Hour



Navigation ☰ Expert → System → Date / time → Hour (0789)

Prerequisite Set date (→ ☰ 45) = Start

Description Enter the current hour.

User entry 0 to 23

Factory setting 0

Additional information

Read access	Operator
Write access	Maintenance

Minute



Navigation ☰ Expert → System → Date / time → Minute (0791)

Prerequisite Set date (→ ☰ 45) = Start

Description Enter the current minute.

User entry 0 to 59

Factory setting 0

Additional information

Read access	Operator
Write access	Maintenance

*"Set date" wizard**Navigation*

Expert → System → Date / time → Set date

Date/time**Navigation**

Expert → System → Date / time → Set date → Date/time (0790)

Description

→ 45

Year**Navigation**

Expert → System → Date / time → Set date → Year (0782)

Description

→ 45

Month**Navigation**

Expert → System → Date / time → Set date → Month (0787)

Description

→ 46

Day**Navigation**

Expert → System → Date / time → Set date → Day (0788)

Description

→ 46

Hour**Navigation**

Expert → System → Date / time → Set date → Hour (0789)

Description

→ 46

Minute

Navigation Expert → System → Date / time → Set date → Minute (0791)

Description → 47

Set date

Navigation Expert → System → Date / time → Set date → Set date

Description Confirm the displayed new value of the real-time clock by pressing .

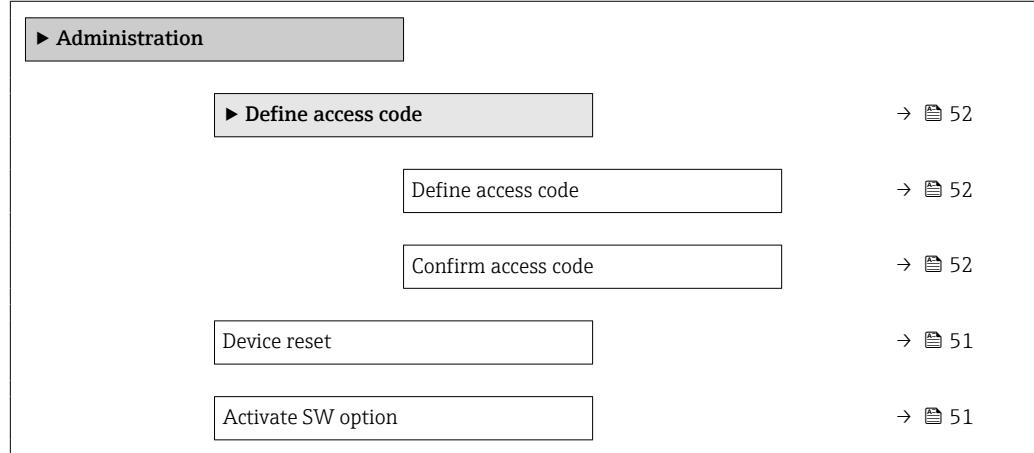
3.1.4 "Administration" submenu

Structure of the submenu on the display and operating module

Navigation



Expert → System → Administration

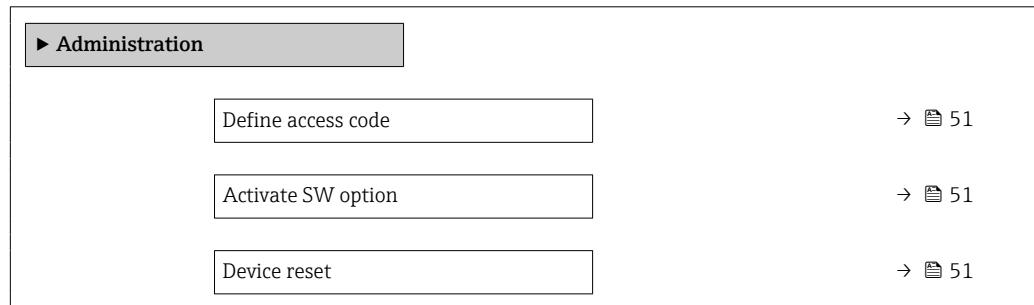


Structure of the submenu in an operating tool (e.g. FieldCare)

Navigation



Expert → System → Administration



Description of parameters

Navigation

Diagram Expert → System → Administration



Define access code

Navigation Expert → System → Administration → Def. access code (0093)

Description Define release code for write access to parameters.

User entry 0 to 9 999

Factory setting 0

Additional information

Read access	Operator
Write access	Maintenance

If the factory setting is not changed or 0 is defined as the access code, the parameters are not write-protected and the configuration data of the device can then always be modified. The user is logged on in the *Maintenance* role.

The write protection affects all parameters marked with the symbol in this document.

Once the access code has been defined, write-protected parameters can only be modified if the access code is entered in the **Enter access code** parameter (→ 28).



Activate SW option

Navigation Expert → System → Administration → Activate SW opt. (0029)

Description Activates software options.

User entry Positive integer

Factory setting 0

Additional information

Read access	Operator
Write access	Maintenance



Device reset

Navigation Expert → System → Administration → Device reset (0000)

Description Reset the device configuration - either entirely or in part - to a defined state.

Selection	<ul style="list-style-type: none"> ▪ Cancel ▪ To factory defaults ▪ Restart device
Factory setting	Cancel
Additional information	<p>Meaning of the options</p> <ul style="list-style-type: none"> ▪ Cancel No action ▪ To factory defaults All parameters are reset to the order-code specific factory setting. ▪ Restart device The restart resets every parameter which is stored in the volatile memory (RAM) to the factory setting (e.g. measured value data). The device configuration remains unchanged.

Read access	Operator
Write access	Maintenance

"Define access code" wizard

Navigation  Expert → System → Administration → Def. access code

Define access code



Navigation  Expert → System → Administration → Def. access code → Def. access code

Description →  51

Confirm access code



Navigation  Expert → System → Administration → Def. access code → Confirm code

Description Confirm the entered access code.

User entry 0 to 9 999

Factory setting 0

Additional information

Read access	Operator
Write access	Maintenance

3.2 "Sensor" submenu

The Sensor submenu contains all parameters related to the measurement and the sensor settings.

Navigation

Diagram Expert → Sensor

► Sensor	
► Information	→ 54
► Filter options	→ 59
► Sensor diagnostics	→ 61
► Safety settings	→ 63
► Mapping	→ 71
► Echo tracking	→ 78
► Tank bottom evaluation	→ 81

3.2.1 "Information" submenu

The **Information** submenu comprises all display parameters which give information about the current state of the measurement.

Structure of the submenu

Navigation

☰ ☰ Expert → Sensor → Information

▶ Information	
Distance	→ ☰ 55
Sensor temperature	→ ☰ 55
Signal quality	→ ☰ 55
Absolute echo amplitude	→ ☰ 56
Relative echo amplitude	→ ☰ 56
Tank bottom echo amplitude	→ ☰ 56
Found echoes	→ ☰ 56
Used calculation	→ ☰ 57

Description of parameters

Navigation

Diagram Expert → Sensor → Information

Distance

Navigation

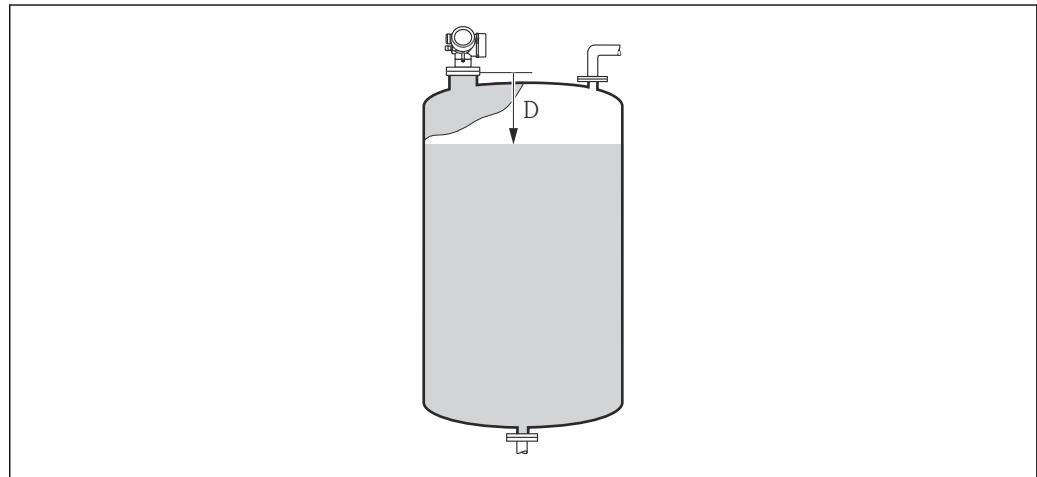
Diagram Expert → Sensor → Information → Distance (12401)

Description

Distance from lower edge of device flange to product surface.

Additional information

Read access	Operator
Write access	-



D Distance (→ Diagram 55)

Sensor temperature

Navigation

Diagram Expert → Sensor → Information → Sensor temp. (12499)

Description

Shows the temperature of the sensor electronics.

Additional information

Read access	Operator
Write access	-

Signal quality

Navigation

Diagram Expert → Sensor → Information → Signal quality (12477)

Description

Shows the quality of the evaluated level signal.

Additional information

Read access	Operator
Write access	-

Absolute echo amplitude

Navigation Expert → Sensor → Information → Abs. echo ampl. (12457)**Description**

Shows the absolute amplitude of the evaluated level signal.

Additional information

Read access	Operator
Write access	-

Relative echo amplitude

Navigation Expert → Sensor → Information → Relat.echo ampl. (12468)**Description**

Shows the relative amplitude (i.e. the distance to the evaluation curve) of the evaluated level signal.

Additional information

Read access	Operator
Write access	-

Tank bottom echo amplitude

Navigation Expert → Sensor → Information → Tank bottom ampl (12467)**Description**

Shows the absolute amplitude of the tank bottom echo.

Additional information

Read access	Operator
Write access	-

Found echoes

Navigation Expert → Sensor → Information → Found echoes (12492)**Description**

Shows the found echo type.

Additional information

Read access	Operator
Write access	-

Used calculation

Navigation Expert → Sensor → Information → Used calculation (12488)**Description**

Target used for distance calculation.

User interface

- None
- Level
- EOP
- EOP (TT)
- Multiple echo (TT)
- Level and EOP

Additional information

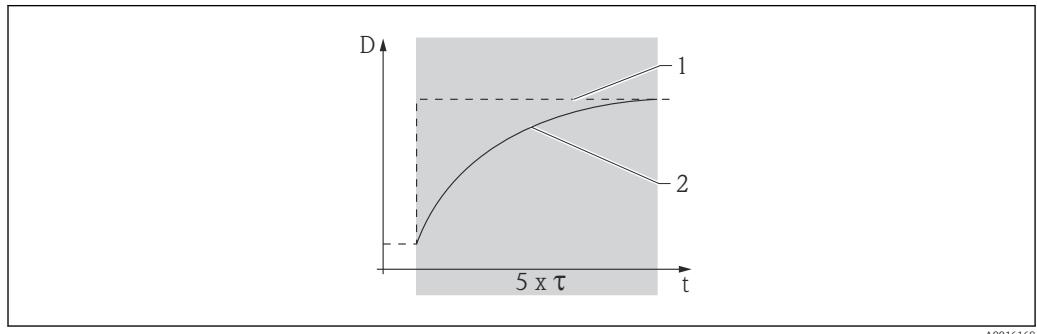
Read access	Operator
Write access	-

3.2.2 "Filter options" submenu

The **Filter options** submenu contains the parameters controlling the filtering of the distance signal. It consists of a low pass filter and a dead time.

Low pass filter

The low pass filter dampens the distance signal with a user defined integration time τ (Integration time (\rightarrow  60)). After a sudden change of the level, it takes about $5 \times \tau$, until the new measured value is obtained.

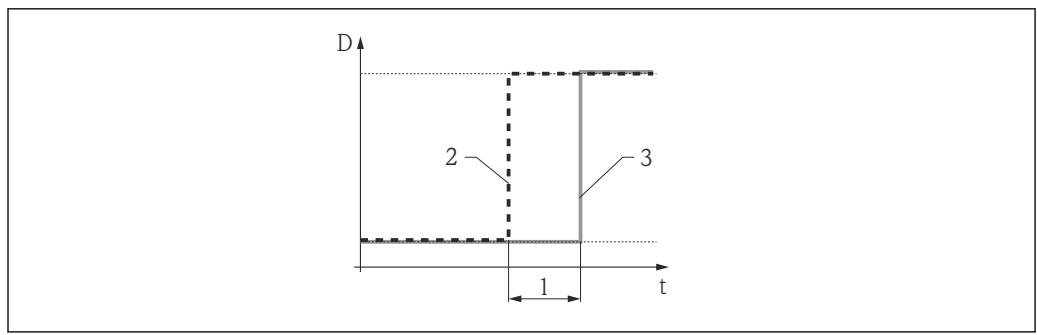


 6 Low pass filter

- 1 Signal before the low pass filter
- 2 Signal after the low pass filter
- τ Integration time (\rightarrow  60)

Dead time

Sudden changes of the measured distance are ignored during the **Dead time** (\rightarrow  60).



 7 Effect of the "Dead time" parameter (\rightarrow  60)

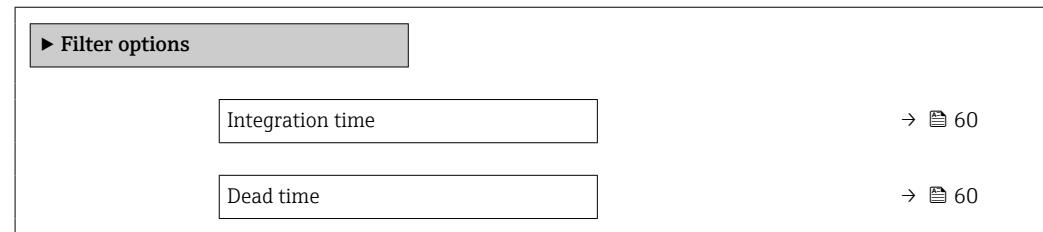
- 1 Dead time
- 2 Signal before the Dead time filter
- 3 Signal after the Dead time filter

Advantages

The **Dead time** filter prevents short-term interferences from disturbing the output signal.

Disadvantages

- The device slows down.
- Fast level changes are registered with a delay.

Structure of the submenu*Navigation*  Expert → Sensor → Filter options

Description of parameters*Navigation* Expert → Sensor → Filter options**Integration time****Navigation** Expert → Sensor → Filter options → Integration time (12489)**Description**

Sets the integration time of the distance filter.

User entry

0.0 to 200 000.0 s

Factory setting

20.0 s

Additional information

Read access	Operator
Write access	Maintenance

Dead time**Navigation** Expert → Sensor → Filter options → Dead time (12521)**Description**

Dead time (delay time) of the shown distance.

User entry

0 to 60 s

Factory setting

5 s

Additional information

Read access	Operator
Write access	Maintenance

3.2.3 "Sensor diagnostics" submenu

The **Sensor diagnostics** submenu is used to check the analog signal path. The test is started by the **Start self check** parameter (→ 61). A test signal is generated in the sensor module and fed onto the analog path. It is checked whether the signal arrives in the expected time window and whether it has a sufficient amplitude. The test result is indicated in the **Result self check** parameter (→ 61).

Navigation

Expert → Sensor → Sensor diag.



Start self check

Navigation

Expert → Sensor → Sensor diag. → Start self check (12496)

Description

Starts the self check of the sensor module.

Selection

- No
- Yes

Factory setting

No

Additional information

Read access	Operator
Write access	Maintenance



Result self check

Navigation

Expert → Sensor → Sensor diag. → Result selfcheck (12497)

Description

Shows the result of the self check.

Additional information

Read access	Operator
Write access	-

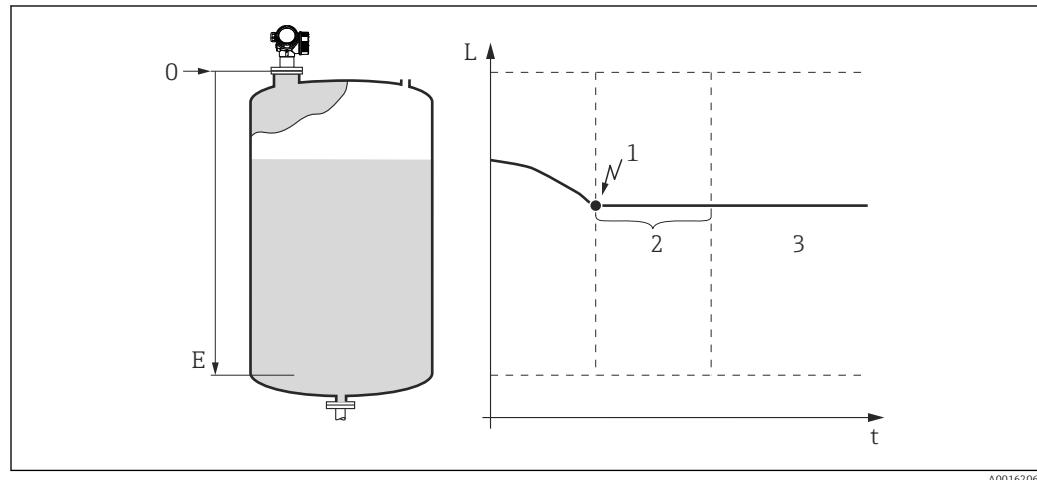
3.2.4 "Safety settings" submenu

The **Safety settings** submenu contains all parameters which determine the behavior in case of an echo loss.

Behavior in the case of an echo loss

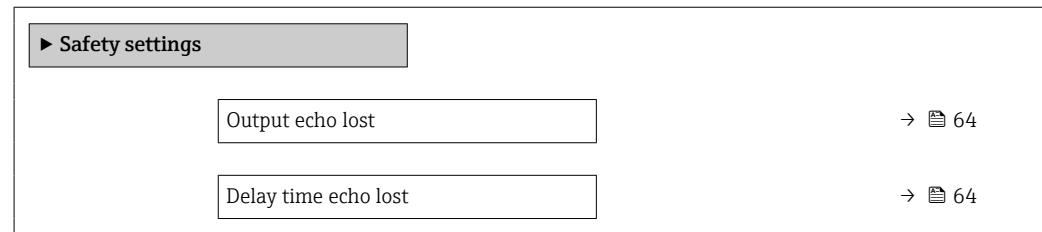
The behavior in case of an echo loss is defined in the **Output echo lost** parameter (→ 64):

"Output echo lost (→ 64)"	Remarks
Last valid value	The last value before the echo loss is held.
Alarm	The device generates an alarm.



A0016206

- 1 Echo loss
- 2 Delay echo lost
- 3 The last valid measured value is held.

Structure of the submenu*Navigation*  Expert → Sensor → Safety sett.

Description of parameters*Navigation* Expert → Sensor → Safety sett.**Output echo lost****Navigation** Expert → Sensor → Safety sett. → Output echo lost (12523)**Description**

Defines the output behavior in case of a lost echo.

Additional information

Read access	Operator
Write access	Service

Meaning of the options**■ Last valid value**

The last value before the occurrence of the echo is kept.

■ Alarm

The device generates an alarm.

Delay time echo lost**Navigation** Expert → Sensor → Safety sett. → Delay echo lost (12456)**Description**

Time between the echo loss and the reaction defined for the output.

User entry

0 to 99 999.9 s

Factory setting

60.0 s

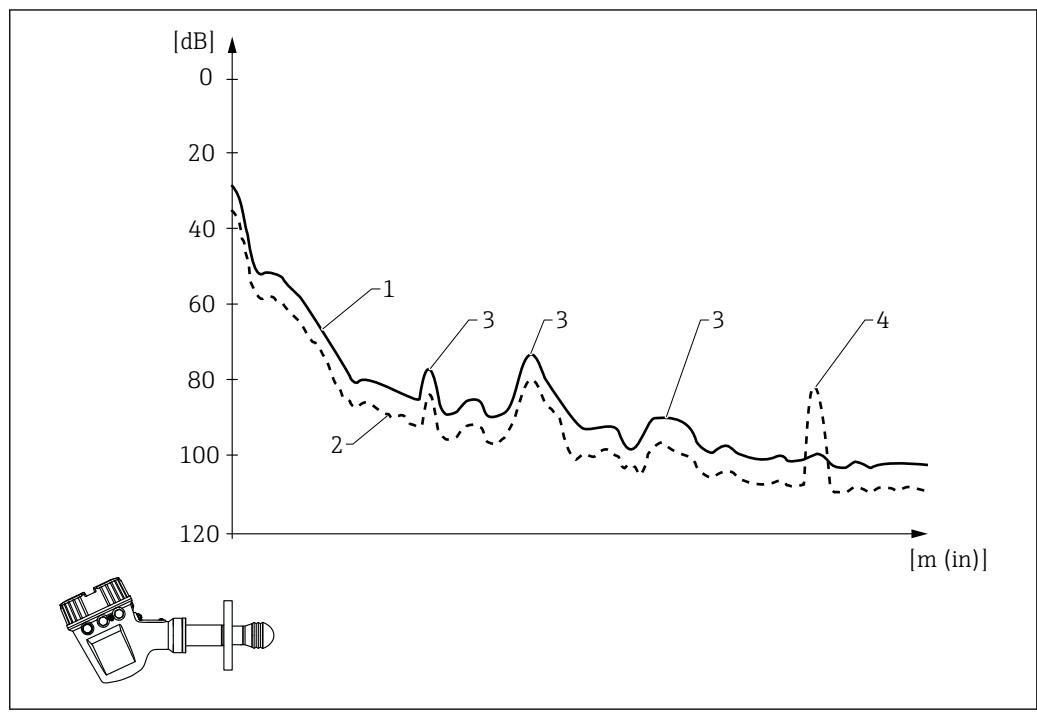
Additional information

Read access	Operator
Write access	Maintenance

3.2.5 "Mapping" submenu

The mapping is used to suppress static interference signals which may be generated by internal tank or silo fittings. A **mapping curve**, representing the **envelope curve** of an empty tank or silo as precisely as possible, is used for the mapping.

In the case of a **static envelope curve evaluation**²⁾ all echos below the mapping curve are ignored in the signal evaluation.



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- 1 Mapping curve
- 2 Envelope curve
- 3 Interference echos; covered by the mapping curve
- 4 Level echo; exceeds the envelope curve

In the case of a **dynamic envelope curve evaluation**²⁾ echoes from below the map can also be taken into account. In this case the static envelope curve evaluation serves as a starting point as long as enough history information is not yet available.

2) For the difference between static and dynamic envelope curve evaluation refer to the Expert (→ 7) → Sensor (→ 53) → Echo tracking (→ 78) submenu.

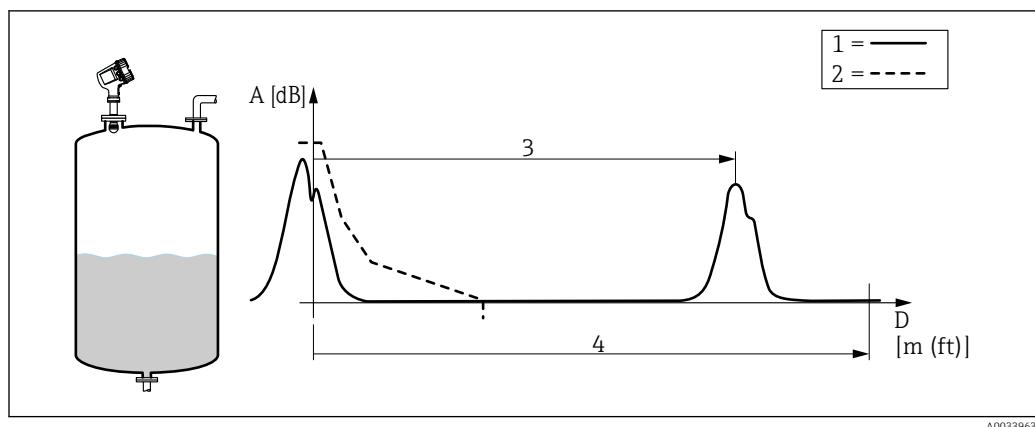
Types of mapping

Depending on the **Confirm distance** parameter (→ 73) there are different types of mapping:

Confirm distance (→ 73)	Type of mapping	Description
Factory map	Factory map	→ 66
▪ Distance ok ▪ Tank empty	Overlay map	→ 66
Manual map	New map	→ 66

Factory map

The factory map is optimized for the individual antenna and is therefore permanently stored in the device. It covers the near field of the antenna (ringing area).



- 1 Envelope curve
- 2 Factory map
- 3 Level distance
- 4 Empty distance

If a new mapping is recorded, the factory map nevertheless remains in the device and can be reactivated when required by selecting the **Factory map** option in the **Confirm distance** parameter (→ 73).

Overlay map

In this case the existing mapping curve (i.e. the factory map or a previously recorded map) initially remains valid.

The envelope curve is observed during a specific overlay time. At each distance the highest value reached during this time is used for the new mapping curve. Depending on the circumstances this may be the amplitude of the old mapping curve or an amplitude obtained during the overlay time.

With the help of the overlay mapping it is possible to map not only static but also dynamic signals (e.g. from an agitator).

To record an overlay map, proceed as follows:

1. Go to the **Confirm distance** parameter (→ 73) and select the **Distance ok** or **Tank empty** option.
2. Go to the **Record map** parameter (→ 75) and select the **Record map** option.

New map

In this case the existing map is deleted and a new map is recorded.

In contrast to the overlay map, only the current envelope curve is used and there is no mapping overlay time. Therefore the new recording is faster than with the overlay map. However, dynamic interference echoes can not be suppressed in this way.

A new recording of the map is started in the following way:

1. Go to the **Confirm distance** parameter (→ 73) and select the **Manual map** option.
2. Go to the **Mapping end point** parameter (→ 75) and specify up to which distance the mapping is to be recorded.
3. Go to the **Record map** parameter (→ 75) and select the **Record map** option.

Mapping range

Depending on the **Confirm distance** parameter (→ 73), the mapping range is defined as follows:

Confirm distance (→ 73)	Starting point of mapping	End point of mapping
■ Distance ok ■ Tank empty	-250 mm (-9.8 in)	automatically assigned according to the current level
Manual map	-250 mm (-9.8 in)	Mapping end point (→ 75)

After these settings, the recording of the mapping curve is started as described above.

Mapping in the tank bottom area

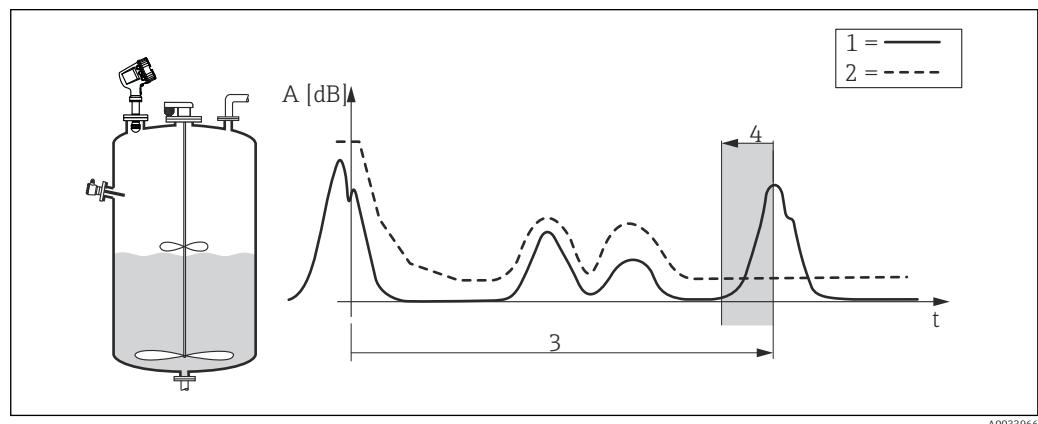
Irrespective of the defined mapping range, no mapping is recorded in a gap near the end of the measuring range.

The value of the map in this gap is defined by the following parameters:

- End of mapping (→ [图 76](#))
- End map. ampl. (→ [图 76](#))

"End of mapping" = "Last map value"

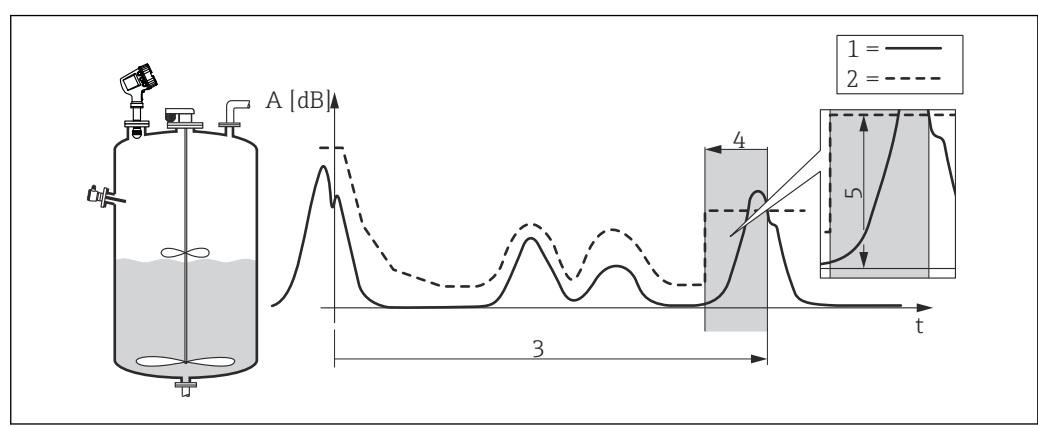
With this setting, the last value of the map remains valid within the tank bottom area.



- 1 Envelope curve
- 2 Map
- 3 Empty (→ [图 183](#))
- 4 Mapping gap

"End of mapping" = "Adjustable"

With this setting, the value of the mapping curve within the tank bottom area is defined in the **End map. ampl.** parameter (→ [图 76](#))

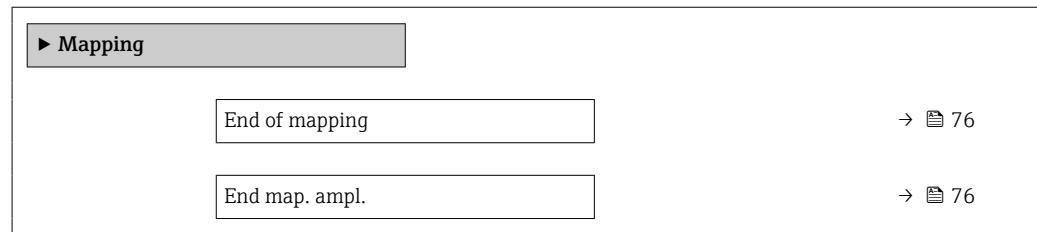
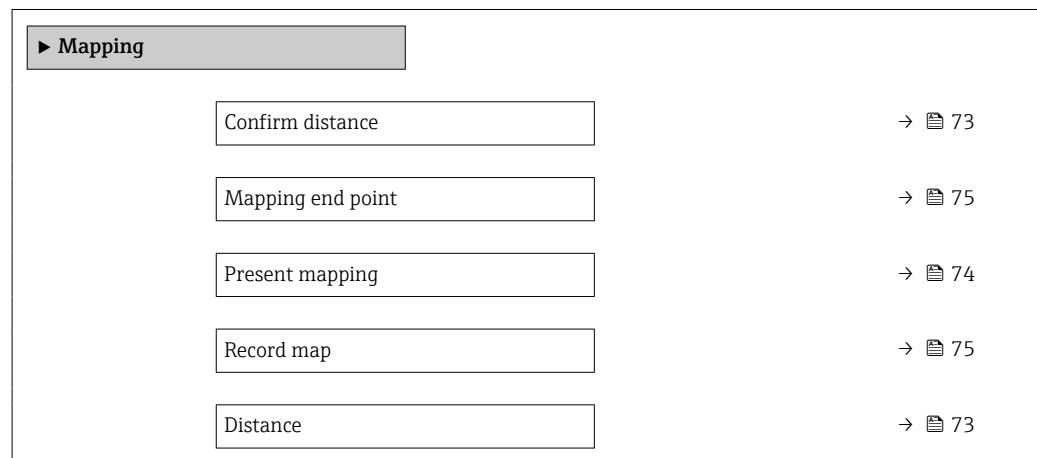


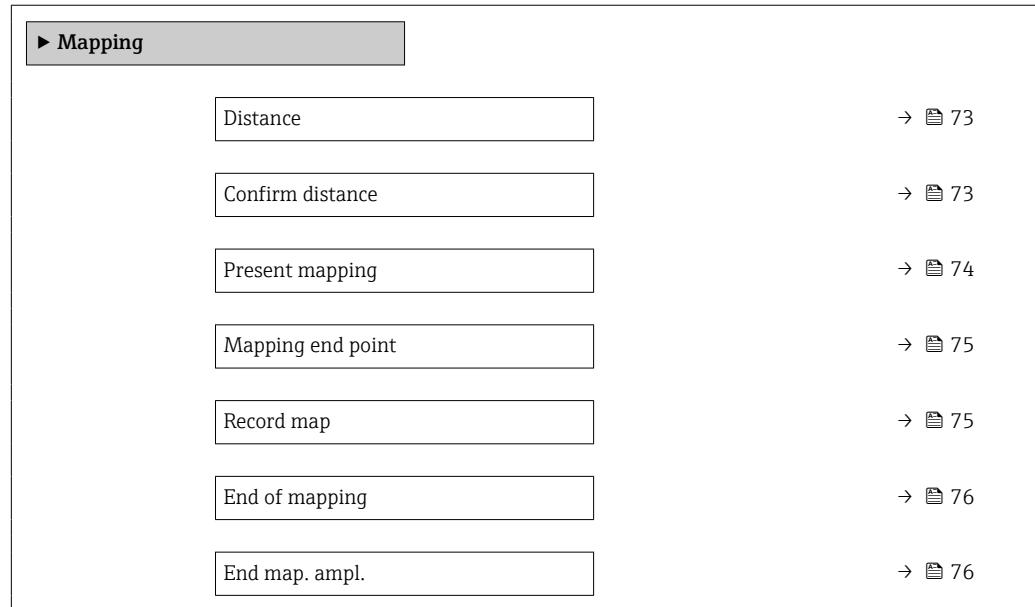
- 1 Envelope curve
- 2 Map
- 3 Empty (→ [图 183](#))
- 4 Mapping gap
- 5 End map. ampl. (→ [图 76](#))

Deleting a map

To delete a part of the map, proceed as follows:

1. Enter the end point of the area to be deleted into the **Mapping end point** parameter (→ 75).
2. Go to the **Record map** parameter (→ 75) and select the **Delete partial map** option.

Structure of the submenu on the local display*Navigation* Expert → Sensor → Mapping**Structure of the mapping wizard on the local display***Navigation* Expert → Sensor → Mapping

Structure of the submenu in an operating tool*Navigation*  Expert → Sensor → Mapping

Description of parameters

Navigation

Diagram Expert → Sensor → Mapping

Distance

Navigation

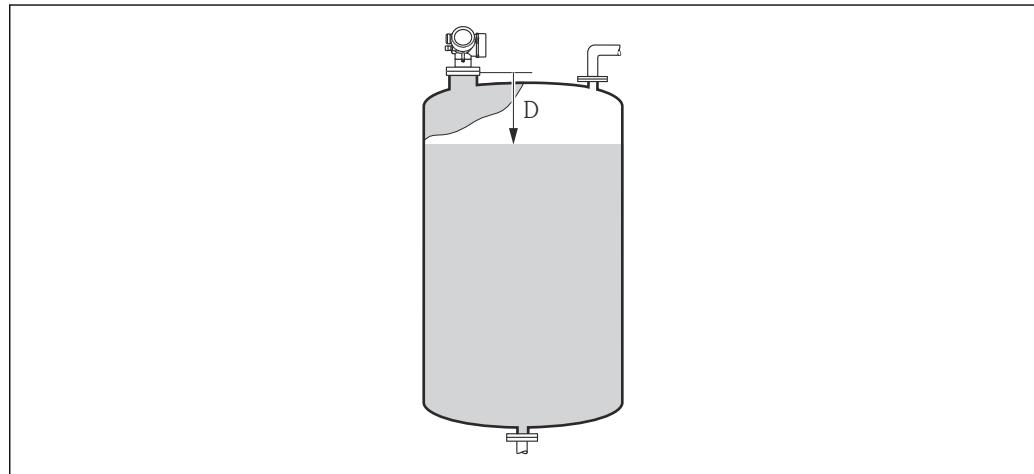
Diagram Expert → Sensor → Mapping → Distance (12401)

Description

Distance from lower edge of device flange to product surface.

Additional information

Read access	Operator
Write access	-



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D Distance (→ Diagram 55)

Confirm distance



Navigation

Diagram Expert → Sensor → Mapping → Confirm distance (12462)

Description

Specify, whether the measured distance matches the real distance. Depending on the selection the device automatically sets the range of mapping.

Selection

- Distance ok
- Distance unknown
- Distance too small *
- Distance too big *
- Tank empty
- Manual map
- Factory map

Factory setting

Distance unknown

* Visibility depends on order options or device settings

Additional information

Read access	Operator
Write access	Maintenance

Meaning of the options**▪ Distance ok**

To be selected if the measured distance matches the actual distance. The device performs a mapping.

▪ Distance unknown

To be selected if the actual distance is unknown. No mapping will be recorded in this case.

▪ Distance too small³⁾

To be selected if the measured distance is smaller than the actual distance. The device searches for the next echo and returns to the **Confirm distance** parameter (→ 73). The distance is recalculated and displayed. The comparison must be repeated until the displayed distance matches the actual distance. After this, the recording of the map can be started by selecting "**Distance ok**" option.

▪ Distance too big³⁾

To be selected if the measured distance exceeds the actual distance. The device adjusts the signal evaluation and returns to the **Confirm distance** parameter (→ 73). The distance is recalculated and displayed. The comparison must be repeated until the displayed distance matches the actual distance. After this, the recording of the map can be started by selecting "**Distance ok**" option.

▪ Tank empty

To be selected if the tank is completely empty. The device records a mapping covering the complete measuring range as defined by the **Empty** parameter (→ 183).

▪ Manual map

To be selected if the range of mapping is to be defined manually in the **Mapping end point** parameter (→ 75). In this case it is not necessary to confirm the distance.

▪ Factory map

To be selected if the present mapping curve (if one exists) is to be deleted. The factory map is used, instead.

i When operating via the display module, the measured distance is displayed together with this parameter for reference purposes.

i If the teaching procedure with the **Distance too small** or **Distance too big** option is quit before the distance has been confirmed, a map is **not** recorded and the teaching procedure is reset after 60 s.

Present mapping

Navigation

Expert → Sensor → Mapping → Present mapping (12487)

Description

Present end of mapping.

Additional information

Read access	Operator
Write access	-

3) Only available for "Evaluation mode (→ 79)" = "Short time history"

Mapping end point

Navigation Expert → Sensor → Mapping → Map. end point (12459)

Prerequisite **Confirm distance (→ 73) = Manual map**

Description Defines up to which distance the new mapping has to be recorded.

Remark: Make sure the level signal is not covered by the mapping.

User entry 100 to 999 999.9 mm

Factory setting 100 mm

Additional information

Read access	Operator
Write access	Maintenance

Record map

Navigation Expert → Sensor → Mapping → Record map (12448)

Prerequisite **Confirm distance (→ 73) = Manual map**

Description Controls the recording of the map.

Selection

- No
- Record map
- Overlay map
- Factory map
- Delete partial map

Factory setting No

Additional information

Read access	Operator
Write access	Maintenance

Meaning of the options**■ No**

The map is not recorded.

■ Record map

The map is recorded. After the recording is completed, the new measured distance and the new mapping range appear on the display. When operating via the local display, these values must be confirmed by pressing .

■ Recalculate map

Used internally by the software. Initiates a new calculation of the map from the new data points.

■ Overlay map

The new mapping curve is generated by overlaying the old and the current envelope curves.

■ Factory map

The factory map stored in the ROM of the device is used.

■ Delete partial map

The mapping curve is deleted up to **Mapping end point** (→ 75).

■ Stop overlay

Stops the overlaying of the map.

End of mapping**Navigation**

Expert → Sensor → Mapping → End of mapping (12461)

Description

Defines the behavior of the mapping curve in the tank bottom area.

Selection

- Adjustable
- Last map value

Factory setting

Adjustable

Additional information

Read access	Operator
Write access	Maintenance

End map. ampl.**Navigation**

Expert → Sensor → Mapping → End map. ampl. (12478)

Description

Specify the amplitude of the mapping curve in the tank bottom area.

User entry

-99 999.0 to 99 999.0 dB

Factory setting

-90 dB

Additional information

Read access	Operator
Write access	Maintenance

3.2.6 "Echo tracking" submenu

The echo tracking algorithm takes into account the short-time history of individual echoes when evaluating the envelope curve. This improves the identification of the level signal. The echo tracking can be activated in the **Evaluation mode** parameter (→ 79). A number of further parameters is used to configure the echo tracking more precisely.

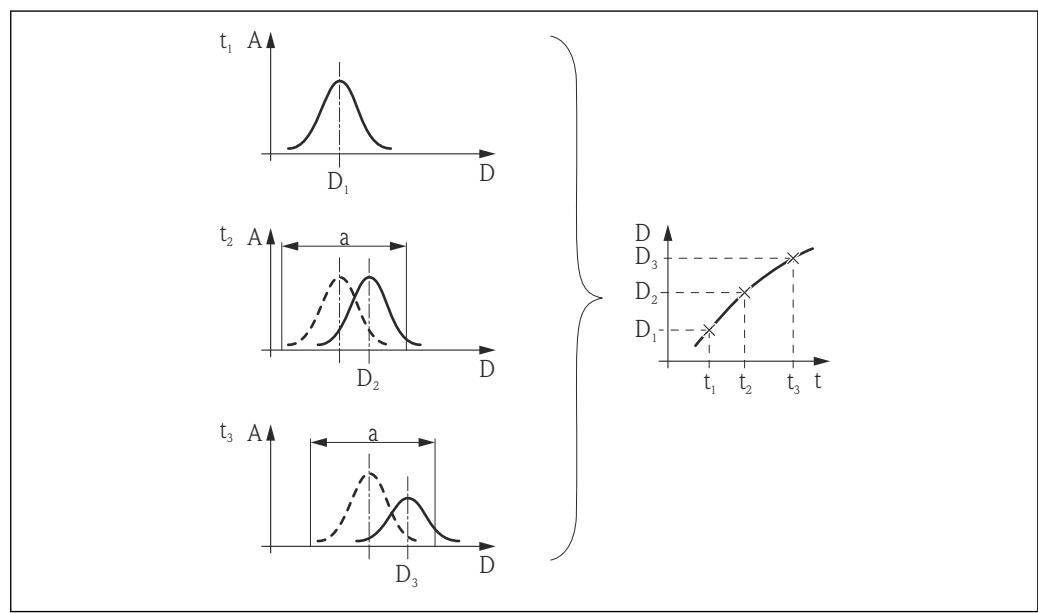
"Evaluation mode" = "History off"

The envelope curve is evaluated statically, taking the mapping into account.

"Evaluation mode" = "Short time history"

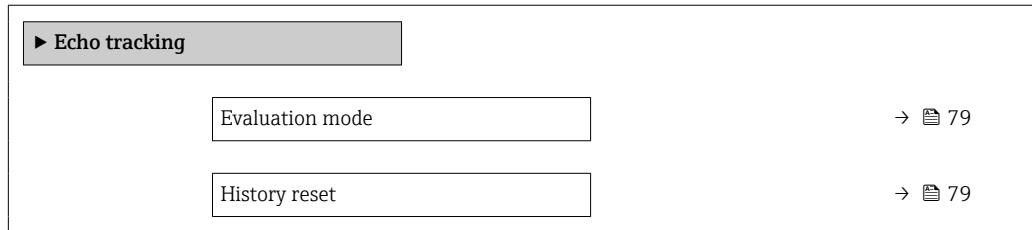
The echo is tracked without consideration of the mapping.

The position of the individual echoes is tracked. The track contains the position, the velocity, the relative and the absolute echo amplitude. Normally the strongest echo within a search window is selected and allocated to the track.



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8 Definition of a track: In a new envelope curve, the echo is searched for in a window of width "a" centered around the echo position in the previous envelope curve. The change of the echo position in the course of time defines the track.

Structure of the submenu*Navigation*  Expert → Sensor → Echo tracking

Description of parameters

Navigation

  Expert → Sensor → Echo tracking

Evaluation mode



Navigation

  Expert → Sensor → Echo tracking → Evaluation mode (12411)

Description

Defines the evaluation mode for the echo tracking.

Selection

- Short time history
- History off

Factory setting

Short time history

Additional information

Read access	Operator
Write access	Maintenance

Meaning of the options

▪ Short time history

In addition to the static algorithms a dynamic echo trace is continuously generated and evaluated.

▪ History off

The envelope curve is evaluated only statically.

History reset



Navigation

  Expert → Sensor → Echo tracking → History reset (12449)

Description

Resets the history of the echo tracking.

Selection

- Reset done
- Restart echo tracking
- Delete history

Factory setting

Reset done

Additional information

Read access	Operator
Write access	Maintenance

Meaning of options:

▪ Reset done

Does not initiate an action but is only a display option. It is displayed as soon as the reset operation has been accomplished.

▪ Delete history

The echo tracking and tank trace are reset.

3.2.7 "Tank bottom evaluation" submenu

The tank bottom evaluation is used to prevent an echo loss if the tank is empty.

The level echo is searched for in the measuring range defined by the **Empty** parameter (→ 183). If no level echo is found, a tank bottom echo is searched for. The tank bottom echo is assumed to be within the area defined by the **Max. TB off sample distance** parameter (→ 81).

If a tank bottom echo has been found, a level of 0% is assumed. If neither a direct level echo nor a tank bottom echo has been found, an echo loss is reported (error message S941).



- Level echoes from within the measruing range always have a higher priority than the tank bottom echo.
- The first echo factor is not applied to the tank bottom echo.

Structure of the "Tank bottom evaluation" submenu*Navigation*

[] [] Expert → Sensor → Tank bottom eval

▶ **Tank bottom evaluation**

Max. TB off sample distance

→ [] 81

Description of parameters*Navigation*

[] [] Expert → Sensor → Tank bottom eval

Max. TB off sample distance**Navigation**

[] [] Expert → Sensor → Tank bottom eval → Max.TB off dist. (12463)

Description

Defines the range in which the tank bottom echo is searched for.

User entry

Positive floating-point number

Factory setting

15 000 mm

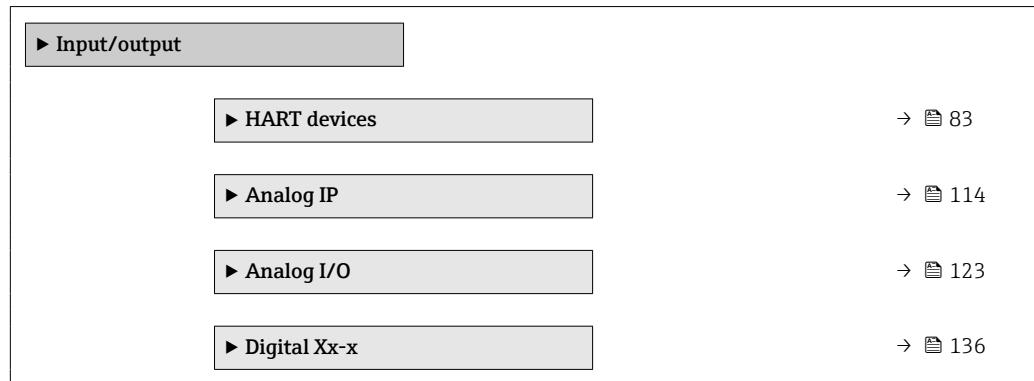
Additional information

Read access	Operator
Write access	Maintenance

3.3 "Input/output" submenu

Navigation

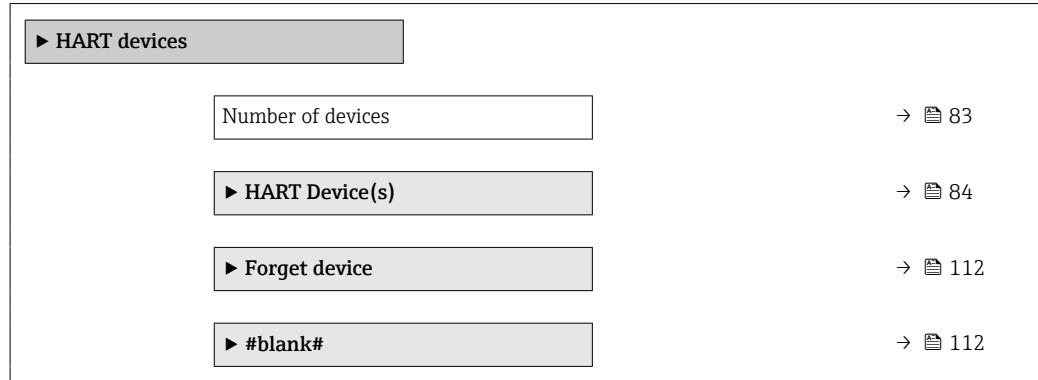
☰ ☰ Expert → Input/output



3.3.1 "HART devices" submenu

Navigation

Expert → Input/output → HART devices



Number of devices

Navigation

Expert → Input/output → HART devices → Number devices (13051)

Description

Shows the number of devices on the HART bus.

Additional information

Read access	Operator
Write access	-

Scanner status

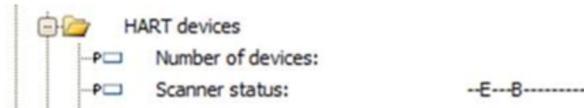
Navigation

Expert → Input/output → HART devices → Scanner status (13052)

Description

Shows the current scanner polling status.

Additional information



2

9 Example for scanner polling status display

Read access	Service
Write access	-

"HART Device(s)" submenu

 There is a **HART Device(s)** submenu for each HART slave device found on the HART loop.

Navigation  Expert → Input/output → HART devices → HART Device(s)

► HART Device(s)	
Device name	→  85
Polling address	→  85
Device tag	→  85
Operating mode	→  85
Communication status	→  86
#blank# (PV - designation dependent on device)	→  86
#blank#(SV - designation dependent on device)	→  86
#blank#(TV - designation dependent on device)	→  86
#blank#(QV - designation dependent on device)	→  86
HART device PV mA	→  87
HART device PV %	→  88
Output pressure	→  88
Output density	→  88
Output temperature	→  89
Output vapor temperature	→  89
Output level	→  90
► HART device information	→  91
► Element values	→  97
► Diagnostics	→  98

► Diagnostics	→ 99
► NMT device config	→ 101

Device name

Navigation Expert → Input/output → HART devices → HART Device(s) → Device name (14722)

Description Shows the name of the transmitter.

Additional information

Read access	Operator
Write access	-

Polling address

Navigation Expert → Input/output → HART devices → HART Device(s) → Polling address (14712)

Description Shows the polling address of the transmitter.

Additional information

Read access	Operator
Write access	-

Device tag

Navigation Expert → Input/output → HART devices → HART Device(s) → Device tag (14713)

Description Shows the device tag of the transmitter.

Additional information

Read access	Operator
Write access	-

Operating mode



Navigation Expert → Input/output → HART devices → HART Device(s) → Operating mode (14745)

Prerequisite Not available if the HART device is a Prothermo NMT.

Description Selection of the operation mode PV only or PV,SV,TV,QV. Devines which values are polled from the connected HART Device.

Selection

- PV only
- PV,SV,TV & QV
- Level⁴⁾
- Measured level⁴⁾

Factory setting PV,SV,TV & QV

Additional information

Read access	Operator
Write access	Maintenance

Communication status

Navigation   Expert → Input/output → HART devices → HART Device(s) → Comm. status (14710)

Description Shows the operating status of the transmitter.

User interface

- Operating normally
- Device offline

Additional information

Read access	Operator
Write access	-

#blank# (HART PV - designation dependent on device)

Navigation   Expert → Input/output → HART devices → HART Device(s) → #blank# (14716)

Description Shows the first HART variable (PV).

Additional information

Read access	Operator
Write access	-

#blank# (HART SV - designation dependent on device)

Navigation   Expert → Input/output → HART devices → HART Device(s) → #blank# (14705)

Prerequisite For HART devices other than NMT: **Operating mode** (→  85) = PV,SV,TV & QV

Description Shows the second HART variable (SV).

4) only visible if the connected device is a Micropilot

Additional information

Read access	Operator
Write access	-

#blank# (HART TV - designation dependent on device)**Navigation**

④ ⑤ Expert → Input/output → HART devices → HART Device(s) → #blank# (14706)

Prerequisite

For HART devices other than NMT: **Operating mode** (→ ④ 85) = PV,SV,TV & QV

Description

Shows the third HART variable (TV).

Additional information

Read access	Operator
Write access	-

#blank# (HART QV - designation dependent on device)**Navigation**

④ ⑤ Expert → Input/output → HART devices → HART Device(s) → #blank# (14716)

Prerequisite

For HART devices other than NMT: **Operating mode** (→ ④ 85) = PV,SV,TV & QV

Description

Shows the fourth HART variable (QV).

Additional information

Read access	Operator
Write access	-

HART device PV mA**Navigation**

④ ⑤ Expert → Input/output → HART devices → HARTDEV PV mA (14708)

Prerequisite

Not available for Micropilot S FMR5xx and Prothermo 53x.

Description

Shows the first HART variable (PV) in mA.

Additional information

Read access	Operator
Write access	-

HART device PV %**Navigation**

  Expert → Input/output → HART devices → HART Device(s) → HARTDEV PV % (14709)

Prerequisite

Not available for Micropilot S FMR5xx and Prothermo 53x.

Description

Shows the first HART variable (PV) in percentage.

Additional information

Read access	Operator
Write access	-

Output pressure**Navigation**

  Expert → Input/output → HART devices → HART Device(s) → Output pressure (14719)

Prerequisite

Not available for Micropilot S FMR5xx, Prothermo NMT53x and Prothermo NMT8x. In these cases the measured variables are allocated automatically.

Description

Defines which HART variable is the pressure.

Selection

- No value
- Primary variable (PV)
- Secondary variable (SV)
- Tertiary variable (TV)
- Quaternary variable (QV)

Factory setting

No value

Additional information

Read access	Operator
Write access	Maintenance

Output density**Navigation**

  Expert → Input/output → HART devices → HART Device(s) → Output density (14720)

Prerequisite

Not available for Micropilot S FMR5xx, Prothermo NMT53x and Prothermo NMT8x. In these cases the measured variables are allocated automatically.

Description

Defines which HART variable is the density.

Selection

- No value
- Primary variable (PV)
- Secondary variable (SV)
- Tertiary variable (TV)
- Quaternary variable (QV)

Factory setting No value

Additional information

Read access	Operator
Write access	Maintenance

Output temperature



Navigation Expert → Input/output → HART devices → HART Device(s) → Output temp. (14721)

Prerequisite Not available for Micropilot S FMR5xx, Prothermo NMT53x and Prothermo NMT8x. In these cases the measured variables are allocated automatically.

Description Defines which HART variable is the temperature.

Selection

- No value
- Primary variable (PV)
- Secondary variable (SV)
- Tertiary variable (TV)
- Quaternary variable (QV)

Factory setting No value

Additional information

Read access	Operator
Write access	Maintenance

Output vapor temperature



Navigation Expert → Input/output → HART devices → HART Device(s) → Output vapor tmp (14726)

Prerequisite Not available for Micropilot S FMR5xx, Prothermo NMT53x and Prothermo NMT8x. In these cases the measured variables are allocated automatically.

Description Defines which HART variable is the vapor temperature.

Selection

- No value
- Primary variable (PV)
- Secondary variable (SV)
- Tertiary variable (TV)
- Quaternary variable (QV)

Factory setting No value

Additional information

Read access	Operator
Write access	Maintenance

Output level**Navigation**

Expert → Input/output → HART devices → HART Device(s) → Output level (14718)

Prerequisite

Not available for Micropilot S FMR5xx, Prothermo NMT53x and Prothermo NMT8x. In these cases the measured variables are allocated automatically.

Description

Defines which HART variable is the level.

Selection

- No value
- Primary variable (PV)
- Secondary variable (SV)
- Tertiary variable (TV)
- Quaternary variable (QV)

Factory setting

No value

Additional information

Read access	Operator
Write access	Maintenance

*"HART device information" submenu**Navigation*

Diagram Expert → Input/output → HART devices → HART Device(s)
 → HART device info

► HART device information	
Pressure	→ 91
Density	→ 92
Temperature	→ 92
Vapor temperature	→ 92
Water level	→ 93
Level source	→ 93
Tank level to NMT	→ 93
Manual value	→ 94
HART bus	→ 94
Device type	→ 94
Device ID	→ 94
Device date	→ 95
Device description	→ 95
Device message	→ 95
Software version	→ 95
Firmware CRC	→ 96
Custody transfer	→ 96

Pressure**Navigation**

Diagram Expert → Input/output → HART devices → HART Device(s) → HART device info
 → Pressure (14723)

Prerequisite

Output pressure (→ [88](#)) ≠ No value

Description Shows the pressure value measured by the connected HART device.

Additional information

Read access	Operator
Write access	-

Density

Navigation   Expert → Input/output → HART devices → HART Device(s) → HART device info
→ Density (14724)

Prerequisite

Output density (→  88) ≠ No value

Description

Shows the density value measured by the connected HART device.

Additional information

Read access	Operator
Write access	-

Temperature

Navigation   Expert → Input/output → HART devices → HART Device(s) → HART device info
→ Temperature (14725)

Prerequisite

Output temperature (→  89) ≠ No value

Description

Shows the temperature measured by the connected HART device.

Additional information

Read access	Operator
Write access	-

Vapor temperature

Navigation   Expert → Input/output → HART devices → HART Device(s) → HART device info
→ Vapor temp. (14727)

Prerequisite

Output vapor temperature (→  89) ≠ No value

Description

Shows the temperature value of the vapor phase measured by the connected HART device.

Additional information

Read access	Operator
Write access	-

Water level

Navigation   Expert → Input/output → HART devices → HART Device(s) → HART device info
→ Water level (14717)

Prerequisite Output level (→  90) ≠ No value

Description Shows the water level value measured by the connected HART device.

Additional information

Read access	Operator
Write access	-

Level source

Navigation   Expert → Input/output → HART devices → HART Device(s) → HART device info
→ Level source (14749)

Prerequisite Prothermo NMT53x

Description Shows which source should be used for level reference sent to NMT to determine liquid/vapour temperature. Tank level or manual level.

Selection

- Manual value
- Tank level

Factory setting Tank level

Additional information

Read access	Maintenance
Write access	Maintenance

Tank level to NMT

Navigation   Expert → Input/output → HART devices → HART Device(s) → HART device info
→ Tank lvl to NMT (14750)

Prerequisite Prothermo NMT53x with level measurement

Description Shows the level transferred to NMT.

Additional information

Read access	Maintenance
Write access	-

Manual value

Navigation Expert → Input/output → HART devices → HART Device(s) → HART device info
→ Manual value (14746)

Prerequisite Prothermo NMT53x with level measurement

Description Shows the manual set level.

User entry Signed floating-point number

Factory setting 0 mm

Additional information

Read access	Maintenance
Write access	Maintenance

HART bus

Navigation Expert → Input/output → HART devices → HART Device(s) → HART device info
→ HART bus (14711)

Description Information about the used IO-Slot.

Additional information

Read access	Operator
Write access	-

Device type

Navigation Expert → Input/output → HART devices → HART Device(s) → HART device info
→ Device type (14701)

Description Shows the device type with which the measuring device is registered with the HART Communication Foundation.

Additional information

Read access	Operator
Write access	-

Device ID

Navigation Expert → Input/output → HART devices → HART Device(s) → HART device info
→ Device ID (14702)

Description Shows the device ID of the connected HART device.

Additional information

Read access	Operator
Write access	-

Device date**Navigation**

Expert → Input/output → HART devices → HART Device(s) → HART device info
→ Device date (14707)

Description

Shows the date of the connected HART device. (e.g.: the last configuration change).

Additional information

Read access	Operator
Write access	-

Device description**Navigation**

Expert → Input/output → HART devices → HART Device(s) → HART device info
→ Device descrip. (14704)

Description

Shows a user defined HART descriptor of the connected device.

Additional information

Read access	Operator
Write access	-

Device message**Navigation**

Expert → Input/output → HART devices → HART Device(s) → HART device info
→ Device message (14703)

Description

Shows a user defined HART message of the connected device.

Additional information

Read access	Operator
Write access	-

Software version**Navigation**

Expert → Input/output → HART devices → HART Device(s) → HART device info
→ Software version (14747)

Prerequisite

Prothermo NMT53x

Description

Shows the software version of the NMT device.

Additional information

Read access	Maintenance
Write access	-

Firmware CRC

Navigation

Expert → Input/output → HART devices → HART Device(s) → HART device info
→ Firmware CRC (14758)

User interface

Positive integer

Factory setting

0

Additional information

Read access	Maintenance
Write access	-

Custody transfer

Navigation

Expert → Input/output → HART devices → HART Device(s) → HART device info
→ Custody transfer (14748)

Prerequisite

Prothermo NMT53x with temperature measurement

Description

Shows information about hardware lock of NMT device. Off -> NMT parameter can be changed. On -> NMT parameter can not be changed.

Additional information

Read access	Maintenance
Write access	-

"Element values" submenu

This submenu is only available for Prothermo NMT53x.

Navigation

Expert → Input/output → HART devices → HART Device(s)
→ Element values

*"Element temperature" submenu**Navigation*

Expert → Input/output → HART devices → HART Device(s)
→ Element values → Element temp.

Element temperature 1 to 24**Navigation**

Expert → Input/output → HART devices → HART Device(s) → Element values
→ Element temp. → Element temp. 1 to 24 (14984–1 to 24)

Description

Shows the temperature of an element in the NMT.

Additional information

Read access	Operator
Write access	-

*"Element position" submenu**Navigation*

Expert → Input/output → HART devices → HART Device(s)
→ Element values → Element position

Element position 1 to 24**Navigation**

Expert → Input/output → HART devices → HART Device(s) → Element values
→ Element position → Element pos. 1 to 24 (15014–1 to 24)

Description

Shows the position of the selected element in the NMT.

Additional information

Read access	Operator
Write access	-

"Diagnostics" submenu

 This submenu is only available for Prothermo NMT53x.

Navigation

Expert → Input/output → HART devices → HART Device(s)
→ Diagnostics

► Diagnostics	
Diagnostic code	→  98
Last diagnostic	→  98
Reference 0	→  98
Reference 17	→  99

Diagnostic code

Navigation

Expert → Input/output → HART devices → HART Device(s) → Diagnostics → Diag. code (14739)

Description

Shows the current diagnostic code of NMT. Check NMT manual for details.

Additional information

Read access	Operator
Write access	-

Last diagnostic

Navigation

Expert → Input/output → HART devices → HART Device(s) → Diagnostics → Last Diagnostic (14742)

Description

Shows the previous diagnostic code of NMT. Check NMT manual for details.

Additional information

Read access	Operator
Write access	-

Reference 0

Navigation

Expert → Input/output → HART devices → HART Device(s) → Diagnostics
→ Reference 0 (14740)

Prerequisite

Prothermo NMT53x with temperature measurement.

Description Shows the temperature of internal reference element 0.

Additional information

Read access	Operator
Write access	-

Reference 17

Navigation  Expert → Input/output → HART devices → HART Device(s) → Diagnostics
→ Reference 17 (14741)

Prerequisite Prothermo NMT53x with temperature measurement.

Description Shows the temperature of internal reference element 17.

Additional information

Read access	Operator
Write access	-

"Diagnostics" submenu

 This submenu is only available for Prothermo NMT8x.

Navigation  Expert → Input/output → HART devices → HART Device(s)
→ Diagnostics

 Diagnostics	
Active diagnostics	→  99
Previous diagnostics	→  100
Test resistance	→  100
WB frequency ratio	→  100

Active diagnostics

Navigation  Expert → Input/output → HART devices → HART Device(s) → Diagnostics → Active diagnos. (14754)

User interface Character string comprising numbers, letters and special characters

Factory setting

Additional information

Read access	Operator
Write access	-

Previous diagnostics**Navigation**

  Expert → Input/output → HART devices → HART Device(s) → Diagnostics
→ Prev.diagnostics (14755)

User interface

Character string comprising numbers, letters and special characters

Factory setting**Additional information**

Read access	Operator
Write access	-

Test resistance**Navigation**

  Expert → Input/output → HART devices → HART Device(s) → Diagnostics → Test resistance (14752)

User interface

Signed floating-point number

Factory setting

0 Ohm

Additional information

Read access	Operator
Write access	-

WB frequency ratio**Navigation**

  Expert → Input/output → HART devices → HART Device(s) → Diagnostics → WB freq. ratio (14753)

User interface

Signed floating-point number

Factory setting

0

Additional information

Read access	Operator
Write access	-

"NMT device config" submenu

 This submenu is only present if the connected HART device is a Prothermo NMT5xx.

Navigation

 Expert → Input/output → HART devices → HART Device(s) → NMT dev. config

► NMT device config	
Configure device?	→  101
Access code	→  102
Total no. element	→  102
Bottom point	→  103
Temperature element short	→  103
Temperature element open	→  103
Output at error	→  104
Gain adjust	→  104
Kind of interval	→  104
Element interval	→  105
Update water level	→  105
► Element setup	
Select element	→  106
Zero adjust	→  106
Element temperature	→  107
Element position	→  107

Configure device?**Navigation**

 Expert → Input/output → HART devices → HART Device(s) → NMT dev. config
→ Config. device? (14728)

Description

Enable NMT device configuration.

Selection	<ul style="list-style-type: none"> ■ No ■ Yes 				
Factory setting	No				
Additional information	Meaning of the options <ul style="list-style-type: none"> ■ No Not configurable ■ Yes Configurable 				
	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="padding: 2px;">Read access</td> <td style="padding: 2px;">Operator</td> </tr> <tr> <td style="padding: 2px;">Write access</td> <td style="padding: 2px;">Maintenance</td> </tr> </table>	Read access	Operator	Write access	Maintenance
Read access	Operator				
Write access	Maintenance				

Access code					
Navigation	  Expert → Input/output → HART devices → HART Device(s) → NMT dev. config → Access code (14714)				
Prerequisite	Configure device? (→  101) = Yes				
Description	Shows the access code to configure the NMT device. Code is read from NMT device at start up.				
User entry	0 to 65 535				
Factory setting	0				
Additional information	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="padding: 2px;">Read access</td> <td style="padding: 2px;">Operator</td> </tr> <tr> <td style="padding: 2px;">Write access</td> <td style="padding: 2px;">Maintenance</td> </tr> </table>	Read access	Operator	Write access	Maintenance
Read access	Operator				
Write access	Maintenance				

Total no. element					
Navigation	  Expert → Input/output → HART devices → HART Device(s) → NMT dev. config → Total elements (14730)				
Description	Shows the total amount of configurable temperature elements.				
Additional information	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="padding: 2px;">Read access</td> <td style="padding: 2px;">Operator</td> </tr> <tr> <td style="padding: 2px;">Write access</td> <td style="padding: 2px;">-</td> </tr> </table>	Read access	Operator	Write access	-
Read access	Operator				
Write access	-				

Bottom point

Navigation Expert → Input/output → HART devices → HART Device(s) → NMT dev. config
→ Bottom point (14729)

Description Shows the bottom clearance from the end of temperature probe or WB probe.

User entry Signed floating-point number

Factory setting 0 mm

Additional information

Read access	Operator
Write access	Maintenance

Temperature element short

Navigation Expert → Input/output → HART devices → HART Device(s) → NMT dev. config
→ Temp elem. short (14731)

Description Sets the displayed temperature if element is broken (shorten).

User entry Signed floating-point number

Factory setting 0 °C

Additional information

Read access	Operator
Write access	Maintenance

Temperature element open

Navigation Expert → Input/output → HART devices → HART Device(s) → NMT dev. config
→ Temp. elem. open (14732)

Description Sets the displayed temperature if element is not connected (open).

User entry Signed floating-point number

Factory setting 0 °C

Additional information

Read access	Operator
Write access	Maintenance

Output at error**Navigation**

Expert → Input/output → HART devices → HART Device(s) → NMT dev. config
→ Output at error (14733)

Description

Off -> Defective element will not be used in average calculation. On -> Defective element generate error at output value.

Selection

- Off
- On

Factory setting

Off

Additional information

Read access	Operator
Write access	Maintenance

Gain adjust**Navigation**

Expert → Input/output → HART devices → HART Device(s) → NMT dev. config
→ Gain adjust (14736)

Description

Adjustment of all shown temperature elements. Also reference elements 0 and 17. e.g. 0.8 -> 80% 1.0 -> 100% of factory calibration 1.2 -> 120%.

User entry

Signed floating-point number

Factory setting

0

Additional information

Read access	Operator
Write access	Maintenance

Kind of interval**Navigation**

Expert → Input/output → HART devices → HART Device(s) → NMT dev. config
→ Kind of interval (14744)

Description

Determines how the element positions are defined.

Selection

- Even
- Not even

Factory setting

Even

Additional information**Meaning of the options**

- **Even**
First position bottom point + element interval for every next element.
- **Not even**
Position of elements can be set manually.

Read access	Operator
Write access	Maintenance

Element interval**Navigation**

Diagram: Expert → Input/output → HART devices → HART Device(s) → NMT dev. config
→ Element interval (14743)

Prerequisite

Kind of interval (→ 104) = Even

Description

Shows the distance between the temperature elements used if kind of interval parameter is set to even.

User entry

Signed floating-point number

Factory setting

0 mm

Additional information

Read access	Operator
Write access	Maintenance

Update water level**Navigation**

Diagram: Expert → Input/output → HART devices → HART Device(s) → NMT dev. config
→ Water level upd. (14751)

Description

Select if water level value is transferred to NMT or not.

Selection

- Enabled
- Disabled

Factory setting

Disabled

Additional information

- Enabled: Water level value is transferred
- Disabled: Water level value is **not** transferred

The NMT delivers the average liquid temperature value in a tank by picking up the value of all temperature elements which are covered by liquid and calculating the average value. To select the submerged temperature elements, the NMT receives level information from a tank gauging device. If the water bottom temperature shall be excluded from the measurement, the water level value is used to exclude the temperature elements which are submerged in water.

Read access	Operator
Write access	Maintenance

*"Element setup" submenu***Navigation**

Expert → Input/output → HART devices → HART Device(s)
→ NMT dev. config → Element setup

Select element**Navigation**

Expert → Input/output → HART devices → HART Device(s) → NMT dev. config
→ Element setup → Select element (14734)

Description

Chooses the temperature element to be configured manually.

User entry

1 to 24

Factory setting

1

Additional information

Read access	Operator
Write access	Maintenance

Zero adjust**Navigation**

Expert → Input/output → HART devices → HART Device(s) → NMT dev. config
→ Element setup → Zero adjust (14735)

Description

Adjusts the offset of the selected temperature element.

User interface

Signed floating-point number

Factory setting

0 None

Additional information

Read access	Operator
Write access	Service

Element temperature

Navigation  Expert → Input/output → HART devices → HART Device(s) → NMT dev. config
→ Element setup → Element temp. (14737)

Description Shows the temperature of the element.

Additional information

Read access	Operator
Write access	-

Element position

Navigation  Expert → Input/output → HART devices → HART Device(s) → NMT dev. config
→ Element setup → Element position (14738)

Description Shows the position of the temperature element.

User interface Signed floating-point number

Factory setting 0 mm

Additional information

Read access	Operator
Write access	Service

"NMT device config" submenu

 This submenu is only present if the connected HART device is a Prothermo NMT8x.

Navigation  Expert → Input/output → HART devices → HART Device(s)
→ NMT dev. config

► NMT device config

Configure device?	 108
Total no. element	 108
Bottom point	 109
NMT8NoElementInPhase	 109
Water bottom level offset	 109

Update water level	→ 110
► Element setup	→ 110
Select element	→ 110
Zero adjust	→ 111
Element temperature	→ 111
Element position	→ 111

Configure device?**Navigation**

Expert → Input/output → HART devices → HART Device(s) → NMT dev. config
→ Config. device? (14728)

Description

Enable NMT device configuration.

Selection

- No
- Yes

Factory setting

No

Additional information**Meaning of the options**

- **No**
Not configurable
- **Yes**
Configurable

Read access	Operator
Write access	Maintenance

Total no. element**Navigation**

Expert → Input/output → HART devices → HART Device(s) → NMT dev. config
→ Total elements (14730)

Description

Shows the total amount of configurable temperature elements.

Additional information

Read access	Operator
Write access	-

Bottom point

Navigation Expert → Input/output → HART devices → HART Device(s) → NMT dev. config
→ Bottom point (14729)

Description Shows the bottom clearance from the end of temperature probe or WB probe.

User entry Signed floating-point number

Factory setting 0 mm

Additional information

Read access	Operator
Write access	Maintenance

NMT8NoElementInPhase

Navigation Expert → Input/output → HART devices → HART Device(s) → NMT dev. config
→ NMT8NoElemInPhas (14756)

Selection

- Alarm
- Warning
- Logbook entry only

Factory setting Alarm

Additional information

Read access	Operator
Write access	Operator

Water bottom level offset

Navigation Expert → Input/output → HART devices → HART Device(s) → NMT dev. config
→ WB level offset (14757)

User entry Signed floating-point number

Factory setting 0 mm

Additional information

Read access	Operator
Write access	Operator

Update water level**Navigation**

Expert → Input/output → HART devices → HART Device(s) → NMT dev. config
→ Water level upd. (14751)

Description

Select if water level value is transferred to NMT or not.

Selection

- Enabled
- Disabled

Factory setting

Disabled

Additional information

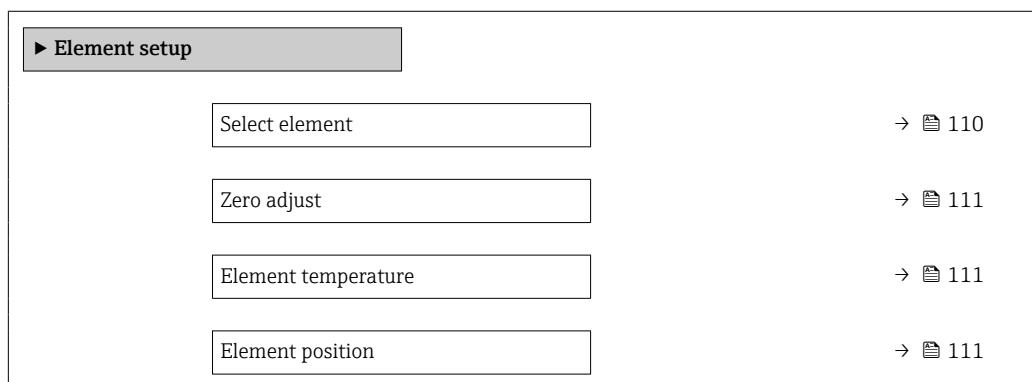
- Enabled: Water level value is transferred
- Disabled: Water level value is **not** transferred

The NMT delivers the average liquid temperature value in a tank by picking up the value of all temperature elements which are covered by liquid and calculating the average value. To select the submerged temperature elements, the NMT receives level information from a tank gauging device. If the water bottom temperature shall be excluded from the measurement, the water level value is used to exclude the temperature elements which are submerged in water.

Read access	Operator
Write access	Maintenance

*"Element setup" submenu***Navigation**

Expert → Input/output → HART devices → HART Device(s)
→ NMT dev. config → Element setup

**Select element****Navigation**

Expert → Input/output → HART devices → HART Device(s) → NMT dev. config
→ Element setup → Select element (14734)

Description

Chooses the temperature element to be configured manually.

User entry 1 to 24

Factory setting 1

Additional information

Read access	Operator
Write access	Maintenance

Zero adjust



Navigation Expert → Input/output → HART devices → HART Device(s) → NMT dev. config
→ Element setup → Zero adjust (14759)

User interface Signed floating-point number

Factory setting 0 °C

Additional information

Read access	Operator
Write access	Maintenance

Element temperature



Navigation Expert → Input/output → HART devices → HART Device(s) → NMT dev. config
→ Element setup → Element temp. (14737)

Description Shows the temperature of the element.

Additional information

Read access	Operator
Write access	-

Element position



Navigation Expert → Input/output → HART devices → HART Device(s) → NMT dev. config
→ Element setup → Element position (14738)

Description Shows the position of the temperature element.

User interface Signed floating-point number

Factory setting 0 mm

Additional information

Read access	Operator
Write access	Service

"Forget device" wizard

 This submenu is only available if there is at least one unlocked device at the bus.

Navigation

 Expert → Input/output → HART devices → Forget device
Forget device**Navigation**
 Expert → Input/output → HART devices → Forget device → Forget device
Description

With this function an offline device can be deleted from the device list.

Selection

- HART Device 1 *
- HART Device 2 *
- HART Device 3 *
- HART Device 4 *
- HART Device 5 *
- HART Device 6 *
- HART Device 7 *
- HART Device 8 *
- HART Device 9 *
- HART Device 10 *
- HART Device 11 *
- HART Device 12 *
- HART Device 13 *
- HART Device 14 *
- HART Device 15 *
- None

Factory setting

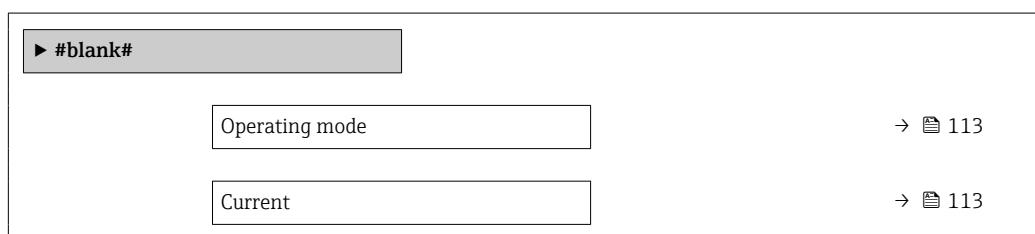
None

Additional information

Read access	Operator
Write access	Maintenance

HART Bus interface

Navigation

 Expert → Input/output → HART devices → #blank#


* Visibility depends on order options or device settings

Operating mode

Navigation  Expert → Input/output → HART devices → #blank# → Operating mode (14453)

Description Shows the operation mode of this HART bus.

User interface

- None
- Disable
- HART master
- HART slave +4..20mA output
- HART tunnel

Factory setting None

Additional information	Read access	Operator
	Write access	-

Current

Navigation  Expert → Input/output → HART devices → #blank# → Current (14457)

Description Shows the actual current on this HART bus.

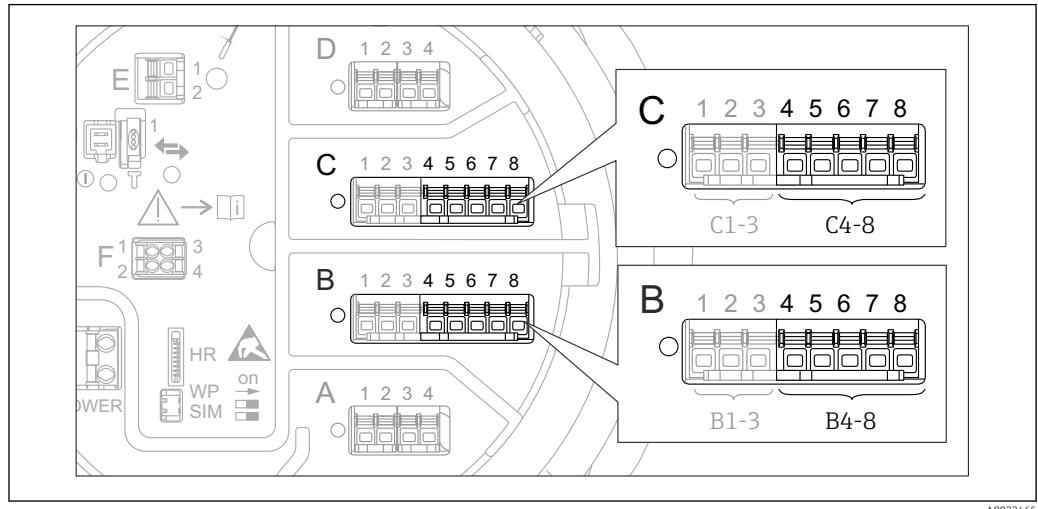
User interface 0 to 100 000 mA

Factory setting 0 mA

Additional information	Read access	Operator
	Write access	-

3.3.2 "Analog IP" submenu

i There is an **Analog IP** submenu (→ 114) for each Analog I/O module of the device. This submenu refers to terminals 4 to 8 of this module (the analog input). They are primarily used to connect an RTD. For terminals 1 to 3 (analog input or output) refer to → 123.



10 Terminals for the "Analog IP" submenu (→ 114) ("B4-8" or "C4-8", respectively)

Navigation

Expert → Input/output → Analog IP

► Analog IP	
Operating mode	→ 115
RTD type	→ 115
Ohms offset	→ 116
Thermocouple type	→ 116
RTD connection type	→ 117
Process value	→ 117
Process variable	→ 117
0 % value	→ 118
100 % value	→ 118
Input value percent	→ 118
Input value	→ 119
Temperature offset after conversion	→ 119

Minimum probe temperature	→ 119
Maximum probe temperature	→ 120
Probe position	→ 120
Calibration type AIP	→ 121
Active calibration	→ 121
Damping factor	→ 121
Gauge current	→ 122

Operating mode

**Navigation**

Expert → Input/output → Analog IP → Operating mode (14014)

Description

Defines the operating mode of the analog input.

Selection

- Disabled
- RTD temperature input
- Gauge power supply

Factory setting

Disabled

Additional information

Read access	Operator
Write access	Maintenance

RTD type

**Navigation**

Expert → Input/output → Analog IP → RTD type (14021)

Prerequisite**Operating mode (→ 115) = RTD temperature input****Description**

Defines the type of the connected RTD.

Selection

- Cu50 (w=1.428, GOST)
- Cu53 (w=1.426, GOST)
- Cu90; 0°C (w=1.4274, GOST)
- Cu100; 25°C (w=1.4274, GOST)
- Cu100; 0°C(w=1.4274, GOST)
- Pt46 (w=1.391, GOST)
- Pt50 (w=1.391, GOST)
- Pt100(385) (a=0.00385, IEC751)
- Pt100(389) (a=0.00389, Canadian)
- Pt100(391) (a=0.003916, JIS1604)

- Pt100 (w=1.391, GOST)
- Pt500(385) (a=0.00385, IEC751)
- Pt1000(385) (a=0.00385, IEC751)
- Ni100(617) (a=0.00617, DIN43760)
- Ni120(672) (a=0.00672, DIN43760)
- Ni1000(617) (a=0.00617, DIN43760)

Factory setting Pt100(385) (a=0.00385, IEC751)

Additional information

Read access	Operator
Write access	Maintenance

Ohms offset



Navigation Expert → Input/output → Analog IP → Ohms offset (14026)

Prerequisite

Operating mode (→ 115) = RTD temperature input

Description

Defines a offset for the resistance.

This value is added to the measured resistance before the calculation of the temperature.

User entry

-10.0 to 10.0 Ohm

Factory setting

0 Ohm

Additional information

The value entered in this parameter is added to the measured resistance before the calculation of the temperature.

Read access	Operator
Write access	Maintenance

Thermocouple type



Navigation Expert → Input/output → Analog IP → Thermocouple typ (14008)

Description

Defines the type of the connected thermocouple.

Selection

- N type
- B type
- C type
- D type
- J type
- K type
- L type
- L GOST type
- R type
- S type
- T type
- U type

Factory setting N type

RTD connection type



Navigation Expert → Input/output → Analog IP → RTD connect type (14022)

Prerequisite **Operating mode (→ 115) ≠ RTD temperature input**

Description Defines the connection type of the RTD.

Selection

- 4 wire RTD connection
- 2 wire RTD connection
- 3 wire RTD connection

Factory setting 4 wire RTD connection

Additional information

Read access	Operator
Write access	Maintenance

Process value

Navigation Expert → Input/output → Analog IP → Process value (14003)

Prerequisite **Operating mode (→ 115) ≠ Disabled**

Description Shows the measured value received via the analog input.

Additional information

Read access	Operator
Write access	-

Process variable



Navigation Expert → Input/output → Analog IP → Process variable (14016)

Prerequisite **Operating mode (→ 115) ≠ RTD temperature input**

Description Determines type of measured value.

Selection

- Level linearized
- Temperature
- Pressure
- Density

Factory setting Level linearized

Additional information

Read access	Operator
Write access	Maintenance

0 % value**Navigation**

Expert → Input/output → Analog IP → 0 % value (14001)

Prerequisite

Operating mode (→ 115) = 4..20mA input

Description

Defines the value represented by a current of 4mA.

User entry

Signed floating-point number

Factory setting

0 mm

Additional information

Read access	Operator
Write access	Maintenance

100 % value**Navigation**

Expert → Input/output → Analog IP → 100 % value (14013)

Prerequisite

Operating mode (→ 115) = 4..20mA input

Description

Defines the value represented by a current of 20mA.

User entry

Signed floating-point number

Factory setting

0 mm

Additional information

Read access	Operator
Write access	Maintenance

Input value percent**Navigation**

Expert → Input/output → Analog IP → Input value [%] (14002)

Prerequisite

Operating mode (→ 115) = 4..20mA input

Description

Shows the input value in percent.

0% corresponds to 4 mA.

100% corresponds to 20 mA.

Additional information

- 0% corresponds to 4 mA
- 100% corresponds to 20 mA

Read access	Operator
Write access	-

Input value**Navigation**

Expert → Input/output → Analog IP → Input value (14015)

Prerequisite

Operating mode (→ 115) ≠ Disabled

Description

Shows the value received via the analog input.

Additional information

Read access	Operator
Write access	-

Temperature offset after conversion**Navigation**

Expert → Input/output → Analog IP → Temp. offset (14025)

Prerequisite

Operating mode (→ 115) = RTD temperature input

Description

Defines an offset for the measured temperature.
The offset is applied after the resistance of the RTD has been converted to a temperature.

User entry

-20 to 20 °C

Factory setting

0 °C

Additional information

The offset defined in this parameter is applied after the resistance of the RTD has been converted to a temperature.

Read access	Operator
Write access	Maintenance

Minimum probe temperature**Navigation**

Expert → Input/output → Analog IP → Min. probe temp (14010)

Prerequisite

Operating mode (→ 115) = RTD temperature input

Description

Minimum approved temperature of the connected probe.
If the temperature falls below this value, the W&M status will be 'invalid'.

User entry -213 to 927 °C

Factory setting -100 °C

Additional information

Read access	Operator
Write access	Maintenance

Maximum probe temperature



Navigation Expert → Input/output → Analog IP → Max. probe temp (14011)

Prerequisite **Operating mode (→ 115) = RTD temperature input**

Description Maximum approved temperature of the connected probe.
If the temperature rises above this value, the W&M status will be 'invalid'.

User entry -213 to 927 °C

Factory setting 250 °C

Additional information

Read access	Operator
Write access	Maintenance

Probe position



Navigation Expert → Input/output → Analog IP → Probe position (14009)

Prerequisite **Operating mode (→ 115) = RTD temperature input**

Description Position of the temperature probe, measured from zero position (tank bottom or datum plate). This parameter, in conjunction with the measured level, determines whether the temperature probe is still covered by the product. If this is no longer the case, the status of the temperature value will be 'invalid'.

User entry -5 000 to 30 000 mm

Factory setting 5 000 mm

Additional information

Read access	Operator
Write access	Maintenance

Calibration type AIP

**Navigation** Expert → Input/output → Analog IP → Cal type AIP (14018)**Prerequisite** Operating mode (→ [115](#)) ≠ Disabled**Description** Select calibration state of the analog input or output.**Selection**

- User calibration
- Factory calibration

Factory setting Factory calibration**Additional information** **Meaning of the options**

- Not calibrated
This is a display option only. It can not be selected. It is shown if the analog input is not in a calibrated state.
- User calibration
Activates a user calibration. The user calibration itself is defined in the **User calibration** wizard.
- Factory calibration
Activates the factory calibration which is permanently stored in the device.

Read access	Operator
Write access	Maintenance

Active calibration

Navigation Expert → Input/output → Analog IP → Act. calibration (14012)**Prerequisite** Operating mode (→ [115](#)) ≠ Disabled**Description** Shows calibration state of the analog input.**Additional information**

Read access	Operator
Write access	-

Damping factor

**Navigation** Expert → Input/output → Analog IP → Damping factor (14004)**Prerequisite** Operating mode (→ [115](#)) ≠ Disabled**Description** Defines the damping constant (in seconds).**User entry** 0 to 999.9 s

Factory setting 0 s

Additional information

Read access	Operator
Write access	Maintenance

Gauge current

Navigation   Expert → Input/output → Analog IP → Gauge current (14027)

Prerequisite **Operating mode (→  115) = Gauge power supply**

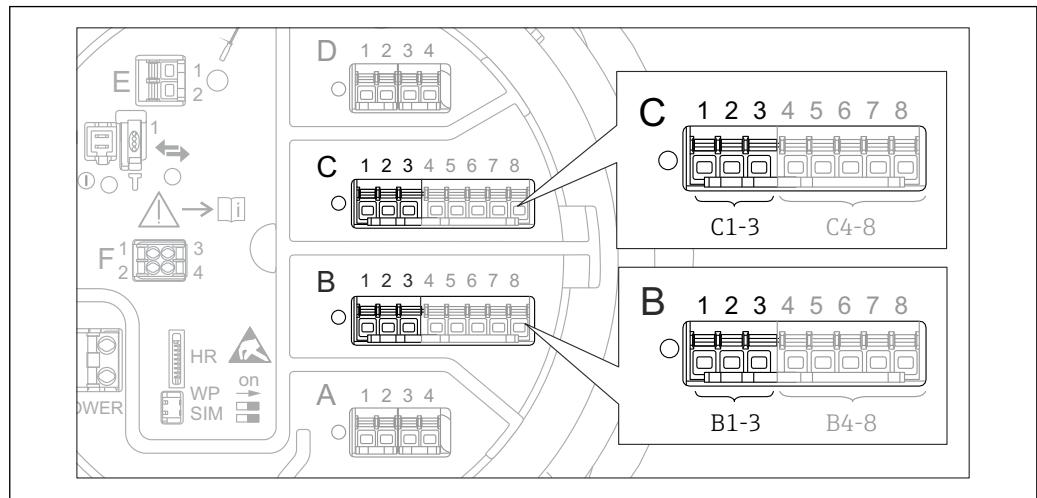
Description Shows the current on the power supply line for the connected device.

Additional information

Read access	Operator
Write access	-

3.3.3 "Analog I/O" submenu

i There is a **Analog I/O** submenu (→ 123) for each Analog I/O module of the device.
This submenu refers to terminals 1 to 3 of this module (an analog input or output).
For terminals 4 to 8 (always an analog input) refer to → 114.



A0032464

11 Terminals for the "Analog I/O" submenu (→ 123) ("B1-3" or "C1-3", respectively)

Navigation

Expert → Input/output → Analog I/O

► Analog I/O	
Operating mode	→ 124
Current span	→ 125
Fixed current	→ 126
Analog input source	→ 126
Failure mode	→ 127
Error value	→ 128
Output out of range	→ 128
Error on event	→ 128
Input value	→ 129
0 % value	→ 129
100 % value	→ 129
Input value %	→ 130

Output value	→ 130
Readback value	→ 130
Feedback threshold	→ 131
Process variable	→ 131
Analog input 0% value	→ 131
Analog input 100% value	→ 132
Error event type	→ 132
Process value	→ 132
Input value in mA	→ 133
Input value percent	→ 133
Damping factor	→ 133
Calibration	→ 134
Active calibration	→ 134
Used for SIL/WHG	→ 134

Operating mode**Navigation**

Expert → Input/output → Analog I/O → Operating mode (13958)

Description

Defines the operating mode of the analog I/O module.

Selection

- Disabled
- 4..20mA input
- HART master+4..20mA input
- HART master
- 4..20mA output
- HART slave +4..20mA output

Factory setting

Disabled

Additional information

Read access	Operator
Write access	Maintenance

Meaning of the options

Operating mode (→ 124)	Direction of signal	Type of signal
Disabled	-	-
4..20mA input	Input from 1 external device	Analog (4...20mA)
HART master+4..20mA input	Input from 1 external device	■ Analog (4...20mA) ■ HART
HART master	Input from up to 6 external devices	HART
4..20mA output	Output to higher-level unit	Analog (4...20mA)
HART slave +4..20mA output	Output to higher-level unit	■ Analog (4...20mA) ■ HART

Depending on the terminals used, the Analog I/O module is used in the passive or active mode.

Mode	Terminals of the I/O module		
	1	2	3
Passive (power supply from external source)	-	+	not used
Active (power supplied by the device itself)	not used	-	+



In the active mode the following conditions must be met:

- Maximum current consumption of the connected HART devices: 24 mA (i.e. 4 mA per device if 6 devices are connected).
- Output voltage of the Ex-d module: 17.0 V@4 mA to 10.5 V@22 mA
- Output voltage of the Ex-ia module: 18.5 V@4 mA to 12.5 V@22 mA

Current span**Navigation**

Expert → Input/output → Analog I/O → Current span (13987)

Prerequisite

Operating mode parameter (→ 124) ≠ **Disabled** option or **HART master** option

Description

Defines the current range for the measured value transmission.

Selection

- 4...20 mA NE (3.8...20.5 mA)
- 4...20 mA US (3.9...20.8 mA)
- 4...20 mA (4... 20.5 mA)
- Fixed value ^{*}

Factory setting

4...20 mA NE (3.8...20.5 mA)

Additional information

Read access	Operator
Write access	Maintenance

* Visibility depends on order options or device settings

Meaning of the options

Option	Current range for process variable	Minimum value	Lower alarm signal level	Upper alarm signal level	Maximum value
4...20 mA (4... 20.5 mA)	4 to 20.5 mA	3.5 mA	< 3.6 mA	> 21.95 mA	22.6 mA
4...20 mA NE (3.8...20.5 mA)	3.8 to 20.5 mA	3.5 mA	< 3.6 mA	> 21.95 mA	22.6 mA
4...20 mA US (3.9...20.8 mA)	3.9 to 20.8 mA	3.5 mA	< 3.6 mA	> 21.95 mA	22.0 mA
Fixed current	Constant current, defined in the Fixed current parameter (→ 126).				

 In the case of an error, the output current assumes the value defined in the **Failure mode** parameter (→ 127).

Fixed current**Navigation**

 Expert → Input/output → Analog I/O → Fixed current (13989)

Prerequisite

Current span (→ 125) = **Fixed current**

Description

Defines the fixed output current.

User entry

4 to 22.5 mA

Factory setting

4 mA

Additional information

Read access	Operator
Write access	Maintenance

Analog input source**Navigation**

 Expert → Input/output → Analog I/O → Analog source (13974)

Prerequisite

- **Operating mode** (→ 124) = 4..20mA output or HART slave +4..20mA output
- **Current span** (→ 125) ≠ **Fixed current**

Description

Defines the process variable transmitted via the AIO.

Selection

- None
- Tank level
- Tank level %
- Tank ullage
- Tank ullage %
- Measured level
- Distance
- Displacer position
- Water level

- Upper interface level
- Lower interface level
- Bottom level
- Tank reference height
- Liquid temperature
- Vapor temperature
- Air temperature
- Observed density value
- Average profile density⁵⁾
- Upper density
- Middle density
- Lower density
- P1 (bottom)
- P2 (middle)
- P3 (top)
- GP 1 ... 4 value
- AIO B1-3 value⁵⁾
- AIO B1-3 value mA⁵⁾
- AIO C1-3 value⁵⁾
- AIO C1-3 value mA⁵⁾
- AIP B4-8 value⁵⁾
- AIP C4-8 value⁵⁾
- Element temperature 1 ... 24⁵⁾
- HART device 1...15 PV⁵⁾
- HART device 1 ... 15 PV mA⁵⁾
- HART device 1 ... 15 PV %⁵⁾
- HART device 1 ... 15 SV⁵⁾
- HART device 1 ... 15 TV⁵⁾
- HART device 1 ... 15 QV⁵⁾

Factory setting Tank level

Additional information

Read access	Operator
Write access	Maintenance

Failure mode



Navigation

Diagram: Expert → Input/output → Analog I/O → Failure mode (13988)

Prerequisite

Operating mode (→ 124) = 4..20mA output or HART slave +4..20mA output

Description

Defines the output behavior in case of an error.

Selection

- Min.
- Max.
- Last valid value
- Actual value
- Defined value

Factory setting

Max.

5) Visibility depends on order options or device settings

Additional information

Read access	Operator
Write access	Maintenance

Error value**Navigation**

Expert → Input/output → Analog I/O → Error value (13972)

Prerequisite

Failure mode (→ 127) = Defined value

Description

Defines the output value in case of an error.

User entry

3.4 to 22.6 mA

Factory setting

22 mA

Additional information

Read access	Operator
Write access	Maintenance

Output out of range**Navigation**

Expert → Input/output → Analog I/O → Output out range (13971)

Prerequisite

Operating mode (→ 124) = 4..20mA output or HART slave +4..20mA output

Description

Behavior of current output if the value is out of allowed range.

Selection

- Last valid value
- Alarm
- None

Factory setting

Alarm

Additional information

Read access	Operator
Write access	Maintenance

Error on event**Navigation**

Expert → Input/output → Analog I/O → Error on event (13967)

Prerequisite

Operating mode (→ 124) = 4..20mA output or HART slave +4..20mA output

Description

Defines to which type of event (alarm or warning) the output responds.

Selection	<ul style="list-style-type: none"> ■ Output related error ■ Any error ■ Any error or warning 				
Factory setting	Output related error				
Additional information	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="padding: 2px;">Read access</td> <td style="padding: 2px;">Operator</td> </tr> <tr> <td style="padding: 2px;">Write access</td> <td style="padding: 2px;">Maintenance</td> </tr> </table>	Read access	Operator	Write access	Maintenance
Read access	Operator				
Write access	Maintenance				

Input value

Navigation	Expert → Input/output → Analog I/O → Input value (13979)				
Prerequisite	<ul style="list-style-type: none"> ■ Operating mode (→ 124) = 4..20mA output or HART slave +4..20mA output ■ Current span (→ 125) ≠ Fixed current 				
Description	Shows the input value of the analog I/O module.				
Additional information	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="padding: 2px;">Read access</td> <td style="padding: 2px;">Operator</td> </tr> <tr> <td style="padding: 2px;">Write access</td> <td style="padding: 2px;">-</td> </tr> </table>	Read access	Operator	Write access	-
Read access	Operator				
Write access	-				

0 % value

Navigation	Expert → Input/output → Analog I/O → 0 % value (13954)				
Prerequisite	<ul style="list-style-type: none"> ■ Operating mode (→ 124) = 4..20mA output or HART slave +4..20mA output ■ Current span (→ 125) ≠ Fixed current 				
Description	Value corresponding to an output current of 0% (4mA).				
User entry	Signed floating-point number				
Factory setting	0 Unitless				
Additional information	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="padding: 2px;">Read access</td> <td style="padding: 2px;">Operator</td> </tr> <tr> <td style="padding: 2px;">Write access</td> <td style="padding: 2px;">Maintenance</td> </tr> </table>	Read access	Operator	Write access	Maintenance
Read access	Operator				
Write access	Maintenance				

100 % value

Navigation	Expert → Input/output → Analog I/O → 100 % value (13968)
Prerequisite	<ul style="list-style-type: none"> ■ Operating mode (→ 124) = 4..20mA output or HART slave +4..20mA output ■ Current span (→ 125) ≠ Fixed current

Description Value corresponding to an output current of 100% (20mA).

User entry Signed floating-point number

Factory setting 0 Unitless

Additional information

Read access	Operator
Write access	Maintenance

Input value %

Navigation Expert → Input/output → Analog I/O → Input value % (13955)

Prerequisite

- **Operating mode** (→ 124) = 4..20mA output or HART slave +4..20mA output
- **Current span** (→ 125) ≠ Fixed current

Description Shows the output value as a percentage of the complete 4...20mA range.

Additional information

Read access	Operator
Write access	-

Output value

Navigation Expert → Input/output → Analog I/O → Output value (13969)

Prerequisite **Operating mode** (→ 124) = 4..20mA output or HART slave +4..20mA output

Description Shows the output value in mA.

Additional information

Read access	Operator
Write access	-

Readback value

Navigation Expert → Input/output → Analog I/O → Readback value (13957)

Prerequisite **Operating mode** (→ 124) = 4..20mA output or HART slave +4..20mA output

Description Shows the measured (feedback) current at the output.

User interface 0 to 65 535 µA

Factory setting 0 µA

Additional information

Read access	Operator
Write access	-

Feedback threshold**Navigation**

Diagram: Expert → Input/output → Analog I/O → Feedback thresh. (13956)

Prerequisite

Operating mode (→ 124) = 4..20mA output or HART slave +4..20mA output

Description

Shows the feedback threshold.

Additional information

Read access	Operator
Write access	-

Process variable**Navigation**

Diagram: Expert → Input/output → Analog I/O → Process variable (13964)

Prerequisite

Operating mode (→ 124) = 4..20mA input or HART master+4..20mA input

Description

Defines the type of measuring variable.

Selection

- Level linearized
- Temperature
- Pressure
- Density

Factory setting

Level linearized

Additional information

Read access	Operator
Write access	Maintenance

Analog input 0% value**Navigation**

Diagram: Expert → Input/output → Analog I/O → AI 0% value (13977)

Prerequisite

Operating mode (→ 124) = 4..20mA input or HART master+4..20mA input

Description

Value corresponding to an input current of 0% (4mA).

User entry

Signed floating-point number

Factory setting

0 mm

Additional information

Read access	Operator
Write access	Maintenance

Analog input 100% value**Navigation**

Diagram: Expert → Input/output → Analog I/O → AI 100% value (13965)

Prerequisite

Operating mode (→ [124](#)) = 4..20mA input or HART master+4..20mA input

Description

Value corresponding to an input current of 100% (20mA).

User entry

Signed floating-point number

Factory setting

0 mm

Additional information

Read access	Operator
Write access	Maintenance

Error event type**Navigation**

Diagram: Expert → Input/output → Analog I/O → Error event type (13953)

Prerequisite

Operating mode (→ [124](#)) ≠ Disabled or HART master

Description

Defines the type of event message (alarm/warning) in case of an error or output out of range in the analog I/O module.

Selection

- None
- Warning
- Alarm

Factory setting

Warning

Additional information

Read access	Operator
Write access	Maintenance

Process value**Navigation**

Diagram: Expert → Input/output → Analog I/O → Process value (13963)

Prerequisite

Operating mode (→ [124](#)) = 4..20mA input or HART master+4..20mA input

Description

Shows the input value scaled to customer units.

Additional information

Read access	Operator
Write access	-

Input value in mA**Navigation**

Expert → Input/output → Analog I/O → Input val. in mA (13970)

Prerequisite

Operating mode (→ 124) = 4..20mA input or HART master+4..20mA input

Description

Shows the input value in mA.

Additional information

Read access	Operator
Write access	-

Input value percent**Navigation**

Expert → Input/output → Analog I/O → Input value [%] (13978)

Prerequisite

Operating mode (→ 124) = 4..20mA input or HART master+4..20mA input

Description

Shows the input value as a percentage of the complete 4...20mA current range.

Additional information

Read access	Operator
Write access	-

Damping factor**Navigation**

Expert → Input/output → Analog I/O → Damping factor (13951)

Prerequisite

Operating mode (→ 124) ≠ Disabled or HART master

Description

Defines the damping constant (in seconds).

User entry

0 to 999.9 s

Factory setting

0 s

Additional information

Read access	Operator
Write access	Maintenance

Calibration**Navigation**

Expert → Input/output → Analog I/O → Calibration (13966)

Prerequisite

Operating mode (→ 124) ≠ Disabled or HART master

Description

Select calibration state of the analog input or output.

Selection

- User calibration
- Factory calibration

Factory setting

Factory calibration

Additional information

Read access	Operator
Write access	Maintenance

Active calibration**Navigation**

Expert → Input/output → Analog I/O → Act. calibration (13981)

Prerequisite

Operating mode (→ 124) ≠ Disabled or HART master

Description

Indicates the calibration status of the Analog I/O module.

Additional information**Meaning of the options**

- **User calibration**
The calibration entered by the user is active.
- **Factory calibration**
The calibration stored permanently in the device is active.

Read access	Operator
Write access	-

Used for SIL/WHG**Navigation**

Expert → Input/output → Analog I/O → Used for SIL/WHG (13980)

Prerequisite

- **Operating mode (→ 124) = 4..20mA output or HART slave +4..20mA output**
- The device has a SIL approval.

Description

Determines whether the discrete I/O module is in SIL/WHG mode.

Selection

- Enabled
- Disabled

Factory setting

Disabled

Additional information

Read access	Operator
Write access	Maintenance

Expected SIL/WHG chain

Navigation Expert → Input/output → Analog I/O → SIL/WHG chain (13952)**Prerequisite**

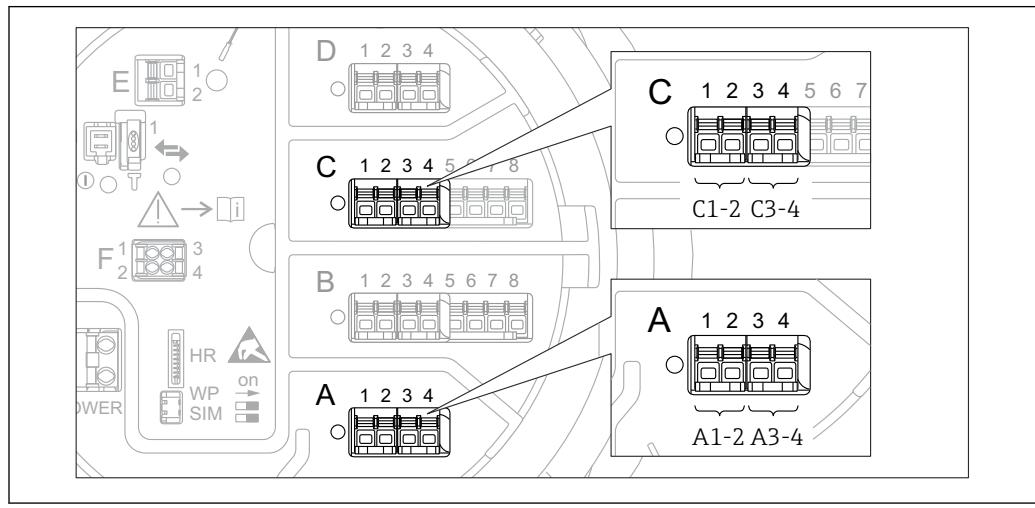
- **Operating mode (→ 124) = 4..20mA output or HART slave +4..20mA output**
- The device has a SIL approval.

Additional information

Read access	Operator
Write access	-

3.3.4 "Digital Xx-x" submenu

- i** In the operating menu, each digital input or output is designated by the respective slot of the terminal compartment and two terminals within this slot. **A1-2**, for example, denotes terminals 1 and 2 of slot **A**. The same is valid for slots **B**, **C** and **D** if they contain a Digital IO module.
- In this document, **Xx-x** designates any of these submenus. The structure of all these submenus is the same.



■ 12 Designation of the digital inputs or outputs (examples)

Navigation

■ ■ Expert → Input/output → Digital Xx-x → Operating mode (13911)

► Digital Xx-x	
Operating mode	→ ■ 137
Digital input source	→ ■ 137
Input value	→ ■ 138
Contact type	→ ■ 138
Output simulation	→ ■ 139
Output value	→ ■ 140
Readback value	→ ■ 140
Error on event	→ ■ 140
Damping factor	→ ■ 141
Used for SIL/WHG	→ ■ 141

Operating mode**Navigation**

Expert → Input/output → Digital Xx-x → Operating mode (13911)

Description

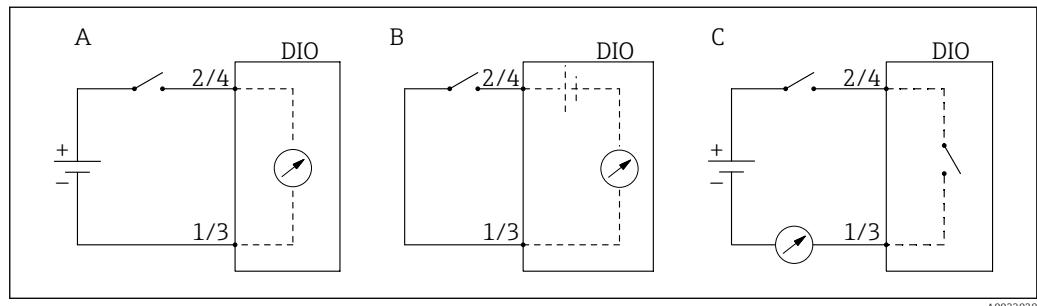
Defines the operating mode of the discrete I/O module.

Selection

- Disabled
- Output passive
- Input passive
- Input active

Factory setting

Disabled

Additional information

13 Operating modes of the Digital I/O module

- A Input passive
B Input active
C Output passive

Read access	Operator
Write access	Maintenance

Digital input source**Navigation**

Expert → Input/output → Digital Xx-x → Digital source (13907)

Prerequisite

Operating mode (→ 137) = Output passive

Description

Defines which device state is indicated by the digital output.

Selection

- None
- Alarm x any
- Alarm x High
- Alarm x HighHigh
- Alarm x High or HighHigh
- Alarm x Low
- Alarm x LowLow
- Alarm x Low or LowLow
- Digital Xx-x
- Primary Modbus x
- Secondary Modbus x

Factory setting

None

Additional information**Meaning of the options**

- **Alarm x any, Alarm x High, Alarm x HighHigh, Alarm x High or HighHigh, Alarm x Low, Alarm x LowLow, Alarm x Low or LowLow**

The digital output indicates if the selected alarm is currently active. The alarms themselves are defined in the **Alarm 1 to 4** submenus.

- **Digital Xx-x⁶⁾**

The digital signal present at the digital input **Xx-x** is passed through to the digital output.

- **Modbus A1-4 Discrete x**

Modbus B1-4 Discrete x

Modbus C1-4 Discrete x

Modbus D1-4 Discrete x

The digital value written by the Modbus Master device to the **Modbus discrete x** parameter⁷⁾ is passed to the digital output. For details refer to Special Documentation SD02066G.

Read access	Operator
Write access	Maintenance

Input value**Navigation**

④ ⑤ Expert → Input/output → Digital Xx-x → Input value (13901)

Prerequisite

Operating mode (→ ④ 137) = "Input passive" option or "Input active" option

Description

Shows the digital input value.

Additional information

Read access	Operator
Write access	-

Contact type**Navigation**

④ ⑤ Expert → Input/output → Digital Xx-x → Contact type (13912)

Prerequisite

Operating mode (→ ④ 137) ≠ Disabled

Description

Determines the switching behavior of the input or output.

Selection

- Normally open
- Normally closed

Factory setting

Normally open

Additional information

Read access	Operator
Write access	Maintenance

6) Only present if "Operating mode (→ ④ 137)" = "Input passive" or "Input active" for the respective Digital I/O module.

7) Expert → Communication → Modbus Xx-x → Modbus discrete x

Output simulation**Navigation**

Expert → Input/output → Digital Xx-x → Output sim (13909)

Prerequisite

Operating mode (→ 137) = Output passive

Description

Sets the output to a specific simulated value.

Selection

- Disable
- Simulating active
- Simulating inactive
- Fault 1
- Fault 2

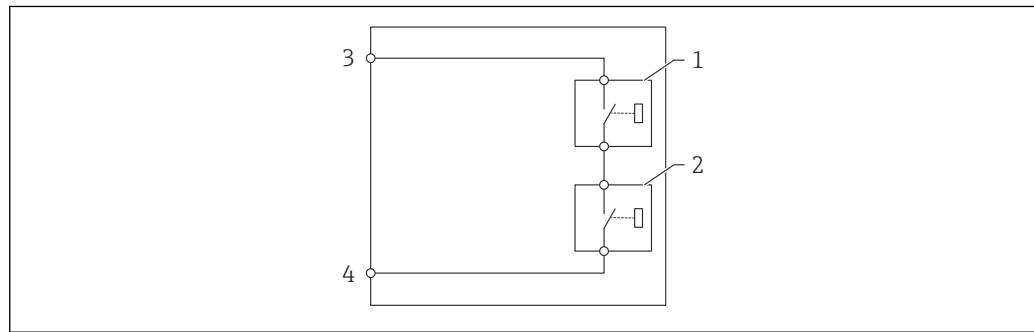
Factory setting

Disable

Additional information

Read access	Operator
Write access	Maintenance

The digital output consists of two relays connected in series:



14 The two relays of a digital output

1/2 The relays

3/4 The terminals of the digital output

The switching state of these relays is defined by the **Output simulation** parameter as follows:

Output simulation	State of relay 1	State of relay 2	Expected result on the terminals of the I/O module
Simulating active	Closed	Closed	Closed
Simulating inactive	Open	Open	Open
Fault 1	Closed	Open	Open
Fault 2	Open	Closed	Open

The **Fault 1** and **Fault 2** options can be used to check the correct switching behavior of the two relays.

Output value

Navigation

  Expert → Input/output → Digital Xx-x → Output value (13902)

Prerequisite

Operating mode (→  137) = Output passive

Description

Shows the digital output value.

Additional information

Read access	Operator
Write access	-

Readback value

Navigation

  Expert → Input/output → Digital Xx-x → Readback value (13903)

Prerequisite

Operating mode (→  137) = Output passive

Description

Shows the value read back from the output.

Additional information

Read access	Operator
Write access	-

Error on event

**Navigation**

  Expert → Input/output → Digital Xx-x → Error on event (13916)

Prerequisite

Operating mode (→  137) = Output passive

Description

Defines to which type of events (error or warning) the output responds. Choice: only output related or all.

Selection

- Output related error
- Any error
- Any error or warning

Factory setting

Output related error

Additional information

Read access	Operator
Write access	Maintenance

Damping factor

Navigation Expert → Input/output → Digital Xx-x → Damping factor (13904)

Prerequisite Operating mode (→ [137](#)) ≠ Disabled

Description Defines the damping constant.

User entry 1 to 10 s

Factory setting 5 s

Additional information

Read access	Operator
Write access	Maintenance

Used for SIL/WHG

Navigation Expert → Input/output → Digital Xx-x → Used for SIL/WHG (13910)

Prerequisite
■ Operating mode (→ [137](#)) = Output passive
■ The device has a SIL certificate.

Description Determines whether the discrete I/O module is in SIL/WHG mode.

Selection
■ Enabled
■ Disabled

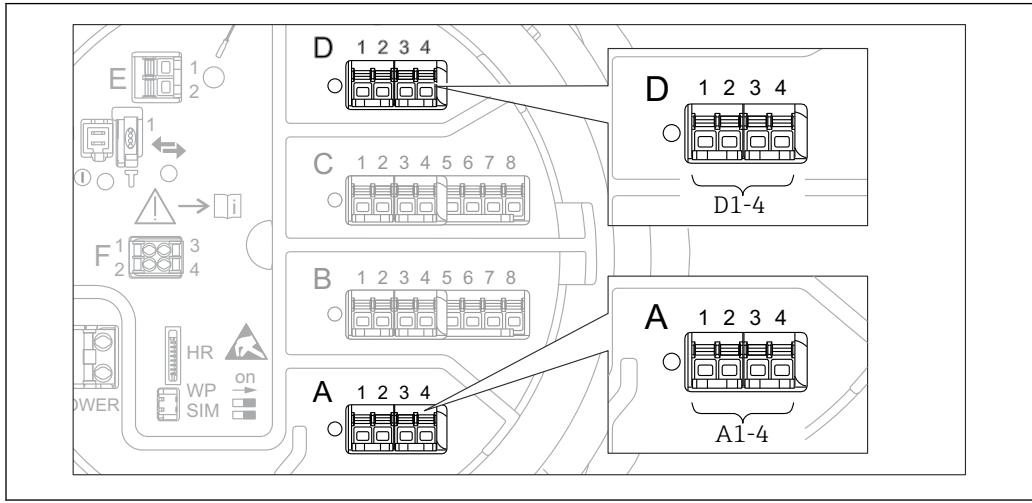
Factory setting Disabled

Additional information

Read access	Operator
Write access	Maintenance

3.4 "Communication" submenu

This menu contains a submenu for each digital communication interface of the device. The communication interfaces are designated by "X1-4" where "X" specifies the slot in the terminal compartment and "1-4" the terminals within this slot.



A0031200

■ 15 Designation of the "Modbus" or "V1" modules (examples); depending on the device version these modules may also be in slot B or C.

Navigation

■ ■ Expert → Communication

3.4.1 "Modbus Xx-x" or "V1 Xx-x" submenu

This submenu is only present for devices with **MODBUS** and/or **V1** communication interface. There is one submenu of this type for each communication interface.

Navigation

Expert → Communication → Modbus Xx-x / V1 Xx-x

▶ Modbus Xx-x	
Communication interface protocol	→ 143
Modbus value 1 to 4	→ 144
Modbus discrete 1 to 4	→ 144
▶ Configuration	→ 145
▶ Integer conversion	→ 149
▶ User value source	→ 154
▶ GP values	→ 155
▶ Discrete selector	→ 158

▶ V1 Xx-x	
Communication interface protocol	→ 143
▶ Configuration	→ 159
▶ V1 input selector	→ 162

Communication interface protocol

Navigation

Expert → Communication → Modbus X1-4 / V1 X1-4 / WM550 X1-4 → Commu I/F protoc (13201)

Description

Shows the type of communication protocol.

Additional information

Read access	Operator
Write access	-

Modbus value 1 to 4

Navigation

  Expert → Communication → Modbus Xx-x → Modbus value 1 to 4 (13206-1 to 4)

Prerequisite

Communication interface protocol (→  143) = MODBUS

Description

Shows the respective floating point value written by the host system.

Additional information

Read access	Operator
Write access	-

 The Modbus interface provides four floating point values which can be written to by the Host system. These values can be linked to specific functions (e.g. providing the air temperature value).

Modbus discrete 1 to 4

Navigation

  Expert → Communication → Modbus Xx-x → Modbus discr. 1 to 4 (13240-1 to 4)

Prerequisite

Communication interface protocol (→  143) = MODBUS

Description

Shows the integer value written by the host-system.

Additional information

Read access	Operator
Write access	-

 The Modbus interface provides four discrete (integer) registers which can be written to by the Host system. These values can be linked to specific functions (e.g. controlling a discrete output).

In the device these values are converted into the following discrete state values:

- Unknown (integer value 0)
- Inactive (integer value 1)
- Active (integer value 2)
- Invalid (integer value >= 3)

"Configuration" submenu (Modbus)

Only visible for devices with a Modbus I/O module.

Navigation

Expert → Communication → Modbus Xx-x → Configuration

► Configuration	
Baudrate	→ 145
Parity	→ 146
Modbus address	→ 146
Float swap mode	→ 146
Invalid data	→ 147
Word type	→ 147
CRC seed	→ 147
Old TSM mode	→ 148
Bus termination	→ 148

Baudrate**Navigation**

Expert → Communication → Modbus X1-4 → Configuration → Baudrate (13203)

Prerequisite**Communication interface protocol (→ 143) = MODBUS****Description**

Defines the baud rate of the communication.

Selection

- 600 BAUD
- 1200 BAUD
- 2400 BAUD
- 4800 BAUD
- 9600 BAUD *
- 19200 BAUD *

Factory setting

9600 BAUD

Additional information

Read access	Operator
Write access	Maintenance

* Visibility depends on order options or device settings

Parity █

Navigation Expert → Communication → Modbus X1-4 → Configuration → Parity (13204)

Prerequisite **Communication interface protocol** (→ [143](#)) = MODBUS

Description Defines the parity of the Modbus communication.

- Selection**
- Odd
 - Even
 - None / 1 stop bit
 - None / 2 stop bits

Factory setting None / 1 stop bit

Additional information	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%;">Read access</td><td style="width: 50%;">Operator</td></tr> <tr> <td>Write access</td><td>Maintenance</td></tr> </table>	Read access	Operator	Write access	Maintenance
Read access	Operator				
Write access	Maintenance				

Modbus address █

Navigation Expert → Communication → Modbus X1-4 → Configuration → Modbus address (13205)

Prerequisite **Communication interface protocol** (→ [143](#)) = MODBUS

Description Defines the Modbus address of the device.

User entry 1 to 247

Factory setting 1

Additional information	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%;">Read access</td><td style="width: 50%;">Operator</td></tr> <tr> <td>Write access</td><td>Maintenance</td></tr> </table>	Read access	Operator	Write access	Maintenance
Read access	Operator				
Write access	Maintenance				

Float swap mode █

Navigation Expert → Communication → Modbus X1-4 → Configuration → Float swap mode (13232)

Prerequisite **Communication interface protocol** (→ [143](#)) = MODBUS

Description Sets the format of how the floating point value is transferred on Modbus.

- Selection**
- Normal 3-2-1-0
 - Swap 0-1-2-3
 - WW Swap 1-0-3-2

Factory setting Swap 0-1-2-3

Additional information

Read access	Operator
Write access	Maintenance

Invalid data



Navigation Expert → Communication → Modbus Xx-x → Configuration → Invalid data (13243)

Prerequisite **Communication interface protocol (→ 143) = MODBUS**

Description Sets what byte is sent in a message that contains invalid data.

Selection

- 0x00
- 0xFF

Factory setting 0x00

Additional information

Read access	Operator
Write access	Maintenance

Word type



Navigation Expert → Communication → Modbus Xx-x → Configuration → Word type (13208)

Prerequisite **Communication interface protocol (→ 143) = MODBUS**

Description Selects if the integer value has the range 0 to +65535 or -32768 to +32767.

Selection

- Unsigned
- Signed

Factory setting Unsigned

Additional information

Read access	Operator
Write access	Maintenance

CRC seed



Navigation Expert → Communication → Modbus Xx-x → Configuration → CRC seed (13248)

Prerequisite **Communication interface protocol (→ 143) = MODBUS**

Description CRC seed value selection used for all communication CRC calculations.

Selection	<ul style="list-style-type: none"> ■ 0x0000 ■ 0xFFFF 				
Factory setting	0xFFFF				
Additional information	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="padding: 2px;">Read access</td> <td style="padding: 2px;">Operator</td> </tr> <tr> <td style="padding: 2px;">Write access</td> <td style="padding: 2px;">Maintenance</td> </tr> </table>	Read access	Operator	Write access	Maintenance
Read access	Operator				
Write access	Maintenance				

Old TSM mode



Navigation	Expert → Communication → Modbus Xx-x → Configuration → Old TSM mode (13213)				
Prerequisite	Communication interface protocol (→ 143) = MODBUS				
Description	Selects the type of value available at the NRF590 SW vers.1 compatible modbus map (Address 3000-3195) addresses.				
Selection	<ul style="list-style-type: none"> ■ Float values ■ Integer values 				
Factory setting	Float values				
Additional information	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="padding: 2px;">Read access</td> <td style="padding: 2px;">Operator</td> </tr> <tr> <td style="padding: 2px;">Write access</td> <td style="padding: 2px;">Maintenance</td> </tr> </table>	Read access	Operator	Write access	Maintenance
Read access	Operator				
Write access	Maintenance				

Bus termination



Navigation	Expert → Communication → Modbus X1-4 → Configuration → Bus termination (13249)				
Prerequisite	Communication interface protocol (→ 143) = MODBUS				
Description	Activates or deactivates the bus termination at the device. Should only be activated on the last device in a loop.				
Selection	<ul style="list-style-type: none"> ■ Off ■ On 				
Factory setting	Off				
Additional information	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="padding: 2px;">Read access</td> <td style="padding: 2px;">Operator</td> </tr> <tr> <td style="padding: 2px;">Write access</td> <td style="padding: 2px;">Maintenance</td> </tr> </table>	Read access	Operator	Write access	Maintenance
Read access	Operator				
Write access	Maintenance				

"Integer conversion" submenu

 Only visible for devices with a Modbus I/O module.

Navigation

 Expert → Communication → Modbus Xx-x → Integer convers

 Integer conversion	
Level 0%	→  149
Level 100%	→  150
Temperature 0%	→  150
Temperature 100%	→  150
Pressure 0%	→  151
Pressure 100%	→  151
Density 0%	→  151
Density 100%	→  152
User 0%	→  152
User 100%	→  152
Percent 0%	→  153
Percent 100%	→  153

Level 0%**Navigation**

 Expert → Communication → Modbus Xx-x → Integer convers → Level 0% (13214)

Description

Defines the level that represents 0% on the integer value scale.

User entry

Signed floating-point number

Factory setting

0.00 mm

Additional information

Read access	Operator
Write access	Maintenance

Level 100%

Navigation Expert → Communication → Modbus Xx-x → Integer convers → Level 100% (13250)

Description Defines the level that represents 100% on the integer value scale.

User entry Signed floating-point number

Factory setting 30.0 mm

Additional information

Read access	Operator
Write access	Maintenance

Temperature 0%

Navigation Expert → Communication → Modbus Xx-x → Integer convers → Temperature 0% (13215)

Description Defines the temperature that represents 0% on the integer value scale.

User entry Signed floating-point number

Factory setting 273.15 °C

Additional information

Read access	Operator
Write access	Maintenance

Temperature 100%

Navigation Expert → Communication → Modbus Xx-x → Integer convers → Temperature 100% (13216)

Description Defines the temperature that represents 100% on the integer value scale.

User entry Signed floating-point number

Factory setting 273.15 °C

Additional information

Read access	Operator
Write access	Maintenance

Pressure 0%

Navigation Expert → Communication → Modbus Xx-x → Integer convers → Pressure 0% (13217)

Description Defines the pressure that represents 0% on the integer value scale.

User entry Signed floating-point number

Factory setting 0 bar

Additional information

Read access	Operator
Write access	Maintenance

Pressure 100%

Navigation Expert → Communication → Modbus Xx-x → Integer convers → Pressure 100% (13251)

Description Defines the pressure that represents 100% on the integer value scale.

User entry Signed floating-point number

Factory setting 25 000 bar

Additional information

Read access	Operator
Write access	Maintenance

Density 0%

Navigation Expert → Communication → Modbus Xx-x → Integer convers → Density 0% (13252)

Description Defines the density that represents 0% on the integer value scale.

User entry Signed floating-point number

Factory setting 0 kg/m³

Additional information

Read access	Operator
Write access	Maintenance

Density 100%**Navigation**

Diagram: Expert → Communication → Modbus Xx-x → Integer convers → Density 100% (13218)

Description

Defines the density that represents 100% on the integer value scale.

User entry

Signed floating-point number

Factory setting

1 000 kg/m³

Additional information

Read access	Operator
Write access	Maintenance

User 0%**Navigation**

Diagram: Expert → Communication → Modbus Xx-x → Integer convers → User 0% (13221)

Description

Defines the value of the user selected variable that represents 0% on the integer value scale.

User entry

Signed floating-point number

Factory setting

0

Additional information

Read access	Operator
Write access	Maintenance

User 100%**Navigation**

Diagram: Expert → Communication → Modbus Xx-x → Integer convers → User 100% (13222)

Description

Defines the value of the user selected variable that represents 100% on the integer value scale.

User entry

Signed floating-point number

Factory setting

0

Additional information

Read access	Operator
Write access	Maintenance

Percent 0%**Navigation**

Expert → Communication → Modbus Xx-x → Integer convers → Percent 0% (13202)

Description

Defines the percentage of the measured value that represents 0% on the integer value scale.

User entry

-200 to +400 %

Factory setting

0.00 %

Additional information

Read access	Operator
Write access	Maintenance

Percent 100%**Navigation**

Expert → Communication → Modbus Xx-x → Integer convers → Percent 100% (13234)

Description

Defines the percentage of the measured value that represents 100% on the integer value scale.

User entry

-200 to +400 %

Factory setting

100 %

Additional information

Read access	Operator
Write access	Maintenance

"User value source" submenu

 Only visible for devices with a Modbus I/O module.

Navigation

 Expert → Communication → Modbus Xx-x → UserVal source
→ UserVal 1 source (13209)

User value 1 to 8 source**Navigation**

 Expert → Communication → Modbus Xx-x → UserVal source → UserVal 1 to 8 source
(13209-1 to 8)

Description

Selects which parameter shall be transmitted as User value x.

Selection

- None
- Tank ullage
- Distance
- Upper interface level
- Lower interface level
- Bottom level
- Average profile density⁸⁾
- Vapor density
- Manual density
- P1 position
- P3 position
- GP 1...4 value
- AIO B1-3 value
- AIO C1-3 value
- AIP B4-8 value
- AIP C4-8 value
- HART device 1...15 PV
- HART device 1...15 PV mA
- HART device 1...15 PV %
- HART device 1...15 SV
- HART device 1...15 TV
- HART device 1...15 QV

Factory setting

None

Additional information

Read access	Operator
Write access	Maintenance

8) Visibility depends on order options or device settings

"GP values" submenu*Navigation*

  Expert → Communication → Modbus Xx-x → GP values → GP 1 value 0% (13223)

 GP values	
GP 1 value 0%	→  155
GP 1 value 100%	→  155
GP 2 value 0%	→  156
GP 2 value 100%	→  156
GP 3 value 0%	→  156
GP 3 value 100%	→  157
GP 4 value 0%	→  157
GP 4 value 100%	→  157

GP 1 value 0%**Navigation**

  Expert → Communication → Modbus Xx-x → GP values → GP 1 value 0% (13223)

Description

Defines the GP1 value that represents 0% on the integer value scale.

User entry

Signed floating-point number

Factory setting

0 Unitless

Additional information

Read access	Operator
Write access	Maintenance

GP 1 value 100%**Navigation**

  Expert → Communication → Modbus Xx-x → GP values → GP 1 value 100% (13224)

Description

Defines the GP1 value that represents 100% on the integer value scale.

User entry

Signed floating-point number

Factory setting

0 Unitless

Additional information

Read access	Operator
Write access	Maintenance

GP 2 value 0%**Navigation**

Expert → Communication → Modbus Xx-x → GP values → GP 2 value 0% (13257)

Description

Defines the GP2 value that represents 0% on the integer value scale.

User entry

Signed floating-point number

Factory setting

0 None

Additional information

Read access	Operator
Write access	Maintenance

GP 2 value 100%**Navigation**

Expert → Communication → Modbus Xx-x → GP values → GP 2 value 100% (13258)

Description

Defines the GP2 value that represents 100% on the integer value scale.

User entry

Signed floating-point number

Factory setting

0 None

Additional information

Read access	Operator
Write access	Maintenance

GP 3 value 0%**Navigation**

Expert → Communication → Modbus Xx-x → GP values → GP 3 value 0% (13259)

Description

Defines the GP3 value that represents 0% on the integer value scale.

User entry

Signed floating-point number

Factory setting

0 Unitless

Additional information

Read access	Operator
Write access	Maintenance

GP 3 value 100%

Navigation	Expert → Communication → Modbus Xx-x → GP values → GP 3 value 100% (13226)				
Description	Defines the GP3 value that represents 100% on the integer value scale.				
User entry	Signed floating-point number				
Factory setting	0 Unitless				
Additional information	<table border="1"><tr><td>Read access</td><td>Operator</td></tr><tr><td>Write access</td><td>Maintenance</td></tr></table>	Read access	Operator	Write access	Maintenance
Read access	Operator				
Write access	Maintenance				

GP 4 value 0%

Navigation	Expert → Communication → Modbus Xx-x → GP values → GP 4 value 0% (13225)				
Description	Defines the GP4 value that represents 0% on the integer value scale.				
User entry	Signed floating-point number				
Factory setting	0 Unitless				
Additional information	<table border="1"><tr><td>Read access</td><td>Operator</td></tr><tr><td>Write access</td><td>Maintenance</td></tr></table>	Read access	Operator	Write access	Maintenance
Read access	Operator				
Write access	Maintenance				

GP 4 value 100%

Navigation	Expert → Communication → Modbus Xx-x → GP values → GP 4 value 100% (13227)				
Description	Defines the GP4 value that represents 100% on the integer value scale.				
User entry	Signed floating-point number				
Factory setting	0 Unitless				
Additional information	<table border="1"><tr><td>Read access</td><td>Operator</td></tr><tr><td>Write access</td><td>Maintenance</td></tr></table>	Read access	Operator	Write access	Maintenance
Read access	Operator				
Write access	Maintenance				

"Discrete selector" submenu*Navigation* Expert → Communication → Modbus Xx-x → Discreteselect**Discrete 1 selector****Navigation** Expert → Communication → WM550 X1-4 → Discreteselect → Discrete 1select (13260)**Description**

Determines the input source which is transferred as Alarm bit [n] value in the corresponding WM550 tasks.

Selection

- None
- **Balance flag** optionVisibility depends on order options or device settings
- Alarm 1...4 any
- Alarm 1...4 HighHigh
- Alarm 1...4 High or HighHigh
- Alarm 1...4 High
- Alarm 1...4 Low
- Alarm 1...4 Low or LowLow
- Alarm 1...4 LowLow
- Digital Xx-x

Factory setting

None

Additional information

Read access	Operator
Write access	Maintenance

"Configuration" submenu (V1)

 Only visible for devices with a V1 I/O module.

Navigation

 Expert → Communication → V1 Xx-x → Configuration

▶ Configuration	
Communication interface protocol variant	→  159
V1 addressV1/MDP	→  159
V1 addressBBB/MIC+232	→  160
Level mapping	→  160
Line impedance	→  161
Compatibility mode	→  161

Communication interface protocol variant**Navigation**

 Expert → Communication → V1 Xx-x → Configuration → Protocol variant (13269)

Description

Determines which variant of the V1 protocol is used.

User interface

- None
- V1*

Factory setting

None

Additional information

Read access	Operator
Write access	Maintenance

V1 address**Navigation**

 Expert → Communication → V1 Xx-x → Configuration → V1 address (13235)

Prerequisite

Communication interface protocol variant (→  159) = V1

Description

Identifier of the device for the V1 communication.

User entry

0 to 99

* Visibility depends on order options or device settings

Factory setting 1

Additional information

Read access	Operator
Write access	Maintenance

V1 address



Navigation Expert → Communication → V1 Xx-x → Configuration → V1 address (13236)

Prerequisite

Communication interface protocol variant (→ [159](#))

Description

Identifier of the previous device for V1 communication.

User entry

0 to 255

Factory setting

1

Additional information

Read access	Operator
Write access	Maintenance

Level mapping



Navigation Expert → Communication → V1 Xx-x → Configuration → Level mapping (13268)

Prerequisite

Communication interface protocol (→ [143](#)) = V1

Description

Determines the transmittable range of levels.

Selection

- +ve
- +ve & -ve

Factory setting

+ve

Additional information

Read access	Operator
Write access	Maintenance

In V1, the level is always represented by a number in the range from 0 to 999 999. This number corresponds to a level as follows:

"Level mapping" = "+ve"

Number	Corresponding level
0	0.0 mm
999 999	99 999.9 mm

"Level mapping" = "+ve & -ve"

Number	Corresponding level
0	0.0 mm
500 000	50 000.0 mm
500 001	-0.1 mm
999 999	-49 999.9 mm

Line impedance



- Navigation** Expert → Communication → V1 Xx-x → Configuration → Line impedance (13266)
- Prerequisite** **Communication interface protocol (→ 143) = V1**
- Description** Adjusts the impedance of the communication line.
- User entry** 0 to 15
- Factory setting** 15

Additional information

Read access	Operator
Write access	Maintenance



The line impedance affects the voltage difference between a logical 0 and a logical 1 on the message of the device to the bus. The default setting is suitable for most applications.

Compatibility mode



- Navigation** Expert → Communication → Modbus Xx-x / V1 Xx-x → Configuration → Comp. mode (13281)
- Description** Defines the compatibility mode.
- Selection**
 - Nxx5xx
 - Nxx8x
- Factory setting** Nxx8x
- Additional information**

In **NMS5x** mode: Only values which have also existed on NMS5x Gauge status are output on the bus.

In **NMS8x** mode: All Gauge status are available at this parameter.

Read access	Operator
Write access	Maintenance

"V1 input selector" submenu (V1)

 Only visible for devices with a V1 I/O module.

Navigation

Expert → Communication → V1 Xx-x → V1 input select.

► V1 input selector	
User value 1 to 8 source	→ 162
Alarm 1 input source	→ 163
Alarm 2 input source	→ 163
Alarm 3 input source	→ 164
Alarm 4 input source	→ 164
SP 1 value selector	→ 165
SP 2 value selector	→ 165
SP 3 value selector	→ 166
SP 4 value selector	→ 166
Value percent selector	→ 167

User value 1 to 8 source**Navigation**

Expert → Communication → V1 Xx-x → V1 input select. → UserVal 1 to 8 source (13209-1 to 8)

Description

Selects which parameter shall be transmitted as User value x.

Selection

- None
- Tank ullage
- Distance
- Upper interface level
- Lower interface level
- Bottom level
- Average profile density⁹⁾
- Vapor density
- Manual density
- P1 position
- P3 position
- GP 1...4 value

9) Visibility depends on order options or device settings

- AIO B1-3 value
- AIO C1-3 value
- AIP B4-8 value
- AIP C4-8 value
- HART device 1...15 PV
- HART device 1...15 PV mA
- HART device 1...15 PV %
- HART device 1...15 SV
- HART device 1...15 TV
- HART device 1...15 QV

Factory setting None

Additional information

Read access	Operator
Write access	Maintenance

Alarm 1 input source



Navigation Expert → Communication → V1 Xx-x → V1 input select. → Alarm1 input src (13270)

Description Determines which discrete value will be transmitted as V1 alarm 1 status.

Selection

- None
- Alarm 1-4 any
- Alarm 1-4 HighHigh
- Alarm 1-4 High or HighHigh
- Alarm 1-4 High
- Alarm 1-4 Low
- Alarm 1-4 Low or LowLow
- Alarm 1-4 LowLow

Factory setting None

Additional information

Read access	Operator
Write access	Maintenance

Alarm 2 input source



Navigation Expert → Communication → V1 Xx-x → V1 input select. → Alarm2 input src (13271)

Description Determines which discrete value will be transmitted as V1 alarm 2 status.

Selection

- None
- Alarm 1-4 any
- Alarm 1-4 HighHigh
- Alarm 1-4 High or HighHigh
- Alarm 1-4 High

- Alarm 1-4 Low
- Alarm 1-4 Low or LowLow
- Alarm 1-4 LowLow

Factory setting None

Additional information

Read access	Operator
Write access	Maintenance

Alarm 3 input source



Navigation Expert → Communication → V1 Xx-x → V1 input select. → Alarm3 in-source (13283)

Description Determines which discrete value will be transmitted as V1 alarm 3 status in Z0 and Z1 message.

- Selection**
- None
 - Alarm 1-4 any
 - Alarm 1-4 HighHigh
 - Alarm 1-4 High or HighHigh
 - Alarm 1-4 High
 - Alarm 1-4 Low
 - Alarm 1-4 Low or LowLow
 - Alarm 1-4 LowLow

Factory setting None

Additional information

Read access	Operator
Write access	Maintenance

Alarm 4 input source



Navigation Expert → Communication → V1 Xx-x → V1 input select. → Alarm4 in-source (13284)

Description Determines which discrete value will be transmitted as V1 alarm 4 status in Z0 and Z1 message.

- Selection**
- None
 - Alarm 1-4 any
 - Alarm 1-4 HighHigh
 - Alarm 1-4 High or HighHigh
 - Alarm 1-4 High
 - Alarm 1-4 Low
 - Alarm 1-4 Low or LowLow
 - Alarm 1-4 LowLow

Factory setting None

Additional information

Read access	Operator
Write access	Maintenance

SP 1 value selector**Navigation**

Expert → Communication → V1 → V1 input select. → SP1 value select (13274)

Description

Selects which discrete value will be transmitted as V1 External Status bit 1 in Z0/Z1 message.

Selection

- None
- Digital A1-2 *
- Digital A3-4 *
- Digital B1-2 *
- Digital B3-4 *
- Digital C1-2 *
- Digital C3-4 *
- Digital D1-2 *
- Digital D3-4 *

Factory setting

None

Additional information

Read access	Operator
Write access	Maintenance

SP 2 value selector**Navigation**

Expert → Communication → V1 → V1 input select. → SP2 value select (13275)

Description

Selects which discrete value will be transmitted as V1 external status bit 2 in Z0/Z1 message.

Selection

- None
- Digital A1-2 *
- Digital A3-4 *
- Digital B1-2 *
- Digital B3-4 *
- Digital C1-2 *
- Digital C3-4 *
- Digital D1-2 *
- Digital D3-4 *

Factory setting

None

Additional information

Read access	Operator
Write access	Maintenance

* Visibility depends on order options or device settings

SP 3 value selector**Navigation**

Expert → Communication → V1 → V1 input select. → SP3 value select (13276)

Description

Selects which discrete value will be transmitted as V1 external status bit 3 in Z0/Z1 message.

Selection

- None
- Digital A1-2 *
- Digital A3-4 *
- Digital B1-2 *
- Digital B3-4 *
- Digital C1-2 *
- Digital C3-4 *
- Digital D1-2 *
- Digital D3-4 *

Factory setting

None

Additional information

Read access	Operator
Write access	Maintenance

SP 4 value selector**Navigation**

Expert → Communication → V1 → V1 input select. → SP4 value select (13277)

Description

Selects which discrete value will be transmitted as V1 external status bit 4 in Z0/Z1 message.

Selection

- None
- Digital A1-2 *
- Digital A3-4 *
- Digital B1-2 *
- Digital B3-4 *
- Digital C1-2 *
- Digital C3-4 *
- Digital D1-2 *
- Digital D3-4 *

Factory setting

None

Additional information

Read access	Operator
Write access	Maintenance

* Visibility depends on order options or device settings

Value percent selector**Navigation**

Expert → Communication → V1 → V1 input select. → Value % select (13282)

Description

Selects which value shall be transmitted as a 0..100% value in the V1 Z0/Z1 message.

Selection

- None
- Tank level %
- Tank ullage %
- AIO B1-3 value % ^{*}
- AIO C1-3 value % ^{*}

Factory setting

None

Additional information

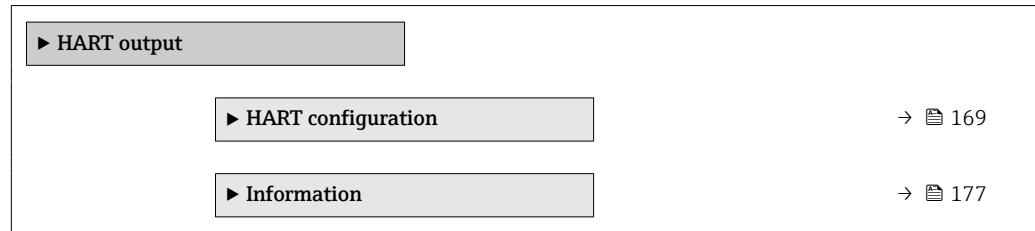
Read access	Operator
Write access	Maintenance

* Visibility depends on order options or device settings

3.4.2 "HART output" submenu

Navigation

☰ ☰ Expert → Communication → HART output



"HART configuration" submenu*Navigation*
 Expert → Communication → HART output → HART config.

► HART configuration	
System polling address	→  169
No. of preambles	→  170
PV source	→  170
Assign PV	→  170
0 % value	→  171
100 % value	→  172
PV mA selector	→  172
Primary variable (PV)	→  172
Percent of range	→  173
Assign SV	→  173
Secondary variable (SV)	→  174
Assign TV	→  174
Tertiary variable (TV)	→  175
Assign QV	→  175
Quaternary variable (QV)	→  176

System polling address**Navigation**
 Expert → Communication → HART output → HART config. → Polling address (0219)
Description

Device address for HART communication.

User entry

0 to 63

Factory setting

15

Additional information

Read access	Operator
Write access	Maintenance

No. of preambles**Navigation**

Expert → Communication → HART output → HART config. → No. of preambles (0217)

Description

Defines the number of preambles in the HART telegram.

User entry

5 to 20

Factory setting

5

Additional information

Read access	Operator
Write access	Maintenance

PV source**Navigation**

Expert → Communication → HART output → HART config. → PV source (11634)

Description

Decides, if the PV configuration is according to an analog output (HART slave) or customized (in case of HART tunneling only).

Selection

- AIO B1-3 *
- AIO C1-3 *
- Custom

Factory setting

Custom

Additional information

Read access	Maintenance
Write access	Maintenance

Assign PV**Navigation**

Expert → Communication → HART output → HART config. → Assign PV (0234)

Prerequisite

PV source (→ 170) = Custom

Description

Assign a measured variable to the primary dynamic variable (PV).

Additional information:

The assigned measured variable is also used by the current output.

* Visibility depends on order options or device settings

Selection

- None
- Tank level
- Tank ullage
- Measured level
- Distance
- Displacer position
- Water level
- Upper interface level
- Lower interface level
- Bottom level
- Tank reference height
- Liquid temperature
- Vapor temperature
- Air temperature
- Observed density value
- Average profile density
- Upper density
- Middle density
- Lower density
- P1 (bottom)
- P2 (middle)
- P3 (top)
- GP 1 value
- GP 2 value
- GP 3 value
- GP 4 value

Factory setting

Tank level

Additional information

Read access	Operator
Write access	Maintenance

 The **Measured level** option doesn't contain a unit. If a unit is needed, select the **Tank level** option.

0 % value**Navigation**
 Expert → Communication → HART output → HART config. → 0 % value (11632)
Prerequisite**PV source = Custom****Description**

0% value of the primary variable (PV).

User entry

Signed floating-point number

Factory setting

0 mm

Additional information

Read access	Operator
Write access	Maintenance

100 % value**Navigation**

Expert → Communication → HART output → HART config. → 100 % value (11633)

Prerequisite

PV source = Custom

Description

100% value of the primary variable (PV).

User entry

Signed floating-point number

Factory setting

0 mm

Additional information

Read access	Operator
Write access	Maintenance

PV mA selector**Navigation**

Expert → Communication → HART output → HART config. → PV mA selector (11631)

Prerequisite

PV source = Custom

Description

Assigns a current to the primary HART variable (PV).

Selection

- None
- AIO B1-3 value mA *
- AIO C1-3 value mA *

Factory setting

None

Additional information

Read access	Operator
Write access	Maintenance

Primary variable (PV)**Navigation**

Expert → Communication → HART output → HART config. → Primary var (PV) (0201)

Description

Shows the value of the primary HART variable (PV).

Additional information

Read access	Operator
Write access	-

* Visibility depends on order options or device settings

Percent of range

Navigation	 Expert → Communication → HART output → HART config. → Percent of range (0274)				
Description	Shows the value of the primary variable (PV) as a percentage of the defined 0% to 100% range.				
Additional information	<table border="1"> <tr> <td>Read access</td> <td>Operator</td> </tr> <tr> <td>Write access</td> <td>-</td> </tr> </table>	Read access	Operator	Write access	-
Read access	Operator				
Write access	-				

Assign SV



Navigation	 Expert → Communication → HART output → HART config. → Assign SV (0235)				
Description	Assign a measured variable to the second dynamic variable (SV).				
Selection	<ul style="list-style-type: none"> ▪ None ▪ Tank level ▪ Tank ullage ▪ Measured level ▪ Distance ▪ Displacer position ▪ Water level ▪ Upper interface level ▪ Lower interface level ▪ Bottom level ▪ Tank reference height ▪ Liquid temperature ▪ Vapor temperature ▪ Air temperature ▪ Observed density value ▪ Average profile density ▪ Upper density ▪ Middle density ▪ Lower density ▪ P1 (bottom) ▪ P2 (middle) ▪ P3 (top) ▪ GP 1 value ▪ GP 2 value ▪ GP 3 value ▪ GP 4 value 				
Factory setting	Liquid temperature				
Additional information	<table border="1"> <tr> <td>Read access</td> <td>Operator</td> </tr> <tr> <td>Write access</td> <td>Maintenance</td> </tr> </table>	Read access	Operator	Write access	Maintenance
Read access	Operator				
Write access	Maintenance				



The **Measured level** option doesn't contain a unit. If a unit is needed, select the **Tank level** option.

Secondary variable (SV)

Navigation  Expert → Communication → HART output → HART config. → Second.var(SV) (0226)

Prerequisite **Assign SV (→  173) ≠ None**

Description Shows the value of the secondary HART variable (SV).

Additional information

Read access	Operator
Write access	-

Assign TV

Navigation  Expert → Communication → HART output → HART config. → Assign TV (0236)

Description Assign a measured variable to the tertiary dynamic variable (TV).

Selection

- None
- Tank level
- Tank ullage
- Measured level
- Distance
- Displacer position
- Water level
- Upper interface level
- Lower interface level
- Bottom level
- Tank reference height
- Liquid temperature
- Vapor temperature
- Air temperature
- Observed density value
- Average profile density
- Upper density
- Middle density
- Lower density
- P1 (bottom)
- P2 (middle)
- P3 (top)
- GP 1 value
- GP 2 value
- GP 3 value
- GP 4 value

Factory setting

Water level

Additional information

Read access	Operator
Write access	Maintenance

 The **Measured level** option doesn't contain a unit. If a unit is needed, select the **Tank level** option.

Tertiary variable (TV)

Navigation  Expert → Communication → HART output → HART config. → Tertiary var(TV) (0228)

Prerequisite **Assign TV (→  174) ≠ None**

Description Shows the value of the third HART variable (TV).

Additional information

Read access	Operator
Write access	-

Assign QV

Navigation  Expert → Communication → HART output → HART config. → Assign QV (0237)

Description Assign a measured variable to the quaternary dynamic variable (QV).

Selection

- None
- Tank level
- Tank ullage
- Measured level
- Distance
- Displacer position
- Water level
- Upper interface level
- Lower interface level
- Bottom level
- Tank reference height
- Liquid temperature
- Vapor temperature
- Air temperature
- Observed density value
- Average profile density
- Upper density
- Middle density
- Lower density
- P1 (bottom)
- P2 (middle)
- P3 (top)
- GP 1 value
- GP 2 value
- GP 3 value
- GP 4 value

Factory setting Observed density value

Additional information

Read access	Operator
Write access	Maintenance

 The **Measured level** option doesn't contain a unit. If a unit is needed, select the **Tank level** option.

Quaternary variable (QV)

Navigation

  Expert → Communication → HART output → HART config. → Quaterna.var(QV) (0203)

Prerequisite

 **Assign QV (→ [175](#)) ≠ None**

Description

Shows the value of the fourth HART variable (QV).

Additional information

Read access	Operator
Write access	-

"Information" submenu*Navigation*

Expert → Communication → HART output → Information

► Information	
HART short tag	→ 177
Device tag	→ 178
Device revision	→ 178
Device ID	→ 178
Device type	→ 179
Manufacturer ID	→ 179
HART revision	→ 179
HART descriptor	→ 180
HART message	→ 180
Hardware revision	→ 180
Software revision	→ 181
HART date code	→ 181

HART short tag**Navigation**

Expert → Communication → HART output → Information → HART short tag (0220)

Description

Defines the short tag for the measuring point.

Maximum length: 8 characters

Allowed characters: A-Z, 0-9, certain special characters

User entry

Character string comprising numbers, letters and special characters (8)

Factory setting

NMR8x

Additional information

Read access	Operator
Write access	Maintenance

Device tag

Navigation	Expert → Communication → HART output → Information → Device tag (0215)				
Description	Enter a unique name for the measuring point to identify the device quickly within the plant.				
User entry	Character string comprising numbers, letters and special characters (32)				
Factory setting	NMR8x				
Additional information	<table border="1"><tr><td>Read access</td><td>Operator</td></tr><tr><td>Write access</td><td>Maintenance</td></tr></table>	Read access	Operator	Write access	Maintenance
Read access	Operator				
Write access	Maintenance				

Device revision

Navigation	Expert → Communication → HART output → Information → Device revision (0204)				
Description	Shows the device revision with which the device is registered with the HART Communication Foundation.				
User interface	0 to 255				
Factory setting	5				
Additional information	<table border="1"><tr><td>Read access</td><td>Operator</td></tr><tr><td>Write access</td><td>-</td></tr></table>	Read access	Operator	Write access	-
Read access	Operator				
Write access	-				

Device ID

Navigation	Expert → Communication → HART output → Information → Device ID (0221)				
Description	Shows the device ID for identifying the device in a HART network.				
User interface	Positive integer				
Factory setting	123 456				
Additional information	<table border="1"><tr><td>Read access</td><td>Operator</td></tr><tr><td>Write access</td><td>-</td></tr></table>	Read access	Operator	Write access	-
Read access	Operator				
Write access	-				

Device type

Navigation  Expert → Communication → HART output → Information → Device type (0209)

Description Shows the device type with which the measuring device is registered with the HART Communication Foundation.

User interface 0 to 65 535

Factory setting 4 398

Additional information

Read access	Operator
Write access	-

Manufacturer ID

Navigation  Expert → Communication → HART output → Information → Manufacturer ID (0259)

Description Shows the device's manufacturer ID registered with the HART Communication Foundation.

User interface 0 to 65 535

Factory setting 17

Additional information

Read access	Operator
Write access	-

HART revision

Navigation  Expert → Communication → HART output → Information → HART revision (0205)

Description HART revision used by the device.

User interface 5 to 7

Factory setting 7

Additional information

Read access	Operator
Write access	-

HART descriptor

Navigation	Expert → Communication → HART output → Information → HART descriptor (0212)				
Description	Enter description for the measuring point				
User entry	Character string comprising numbers, letters and special characters (16)				
Factory setting	NMR8x				
Additional information	<table border="1"><tr><td>Read access</td><td>Operator</td></tr><tr><td>Write access</td><td>Maintenance</td></tr></table>	Read access	Operator	Write access	Maintenance
Read access	Operator				
Write access	Maintenance				

HART message

Navigation	Expert → Communication → HART output → Information → HART message (0216)				
Description	Use this function to define a HART message which is sent via the HART protocol when requested by the master. Maximum length: 32 characters Allowed characters: A-Z, 0-9, certain special characters				
User entry	Character string comprising numbers, letters and special characters (32)				
Factory setting	NMR8x				
Additional information	<table border="1"><tr><td>Read access</td><td>Operator</td></tr><tr><td>Write access</td><td>Maintenance</td></tr></table>	Read access	Operator	Write access	Maintenance
Read access	Operator				
Write access	Maintenance				

Hardware revision

Navigation	Expert → Communication → HART output → Information → Hardware rev. (0206)				
Description	Hardware revision of the device.				
User interface	0 to 30				
Factory setting	1				
Additional information	<table border="1"><tr><td>Read access</td><td>Operator</td></tr><tr><td>Write access</td><td>-</td></tr></table>	Read access	Operator	Write access	-
Read access	Operator				
Write access	-				

Software revision

Navigation  Expert → Communication → HART output → Information → Software rev. (0224)

Description Software revision of the device.

User interface 0 to 255

Factory setting 5

Additional information

Read access	Operator
Write access	-

HART date code



Navigation  Expert → Communication → HART output → Information → HART date code (0202)

Description Enter date of the last configuration change. Use this format yyyy-mm-dd

User entry Character string comprising numbers, letters and special characters (10)

Factory setting 2009-07-20

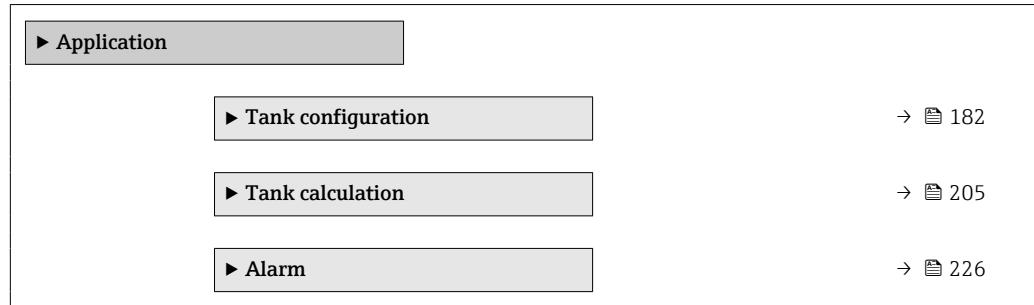
Additional information

Read access	Operator
Write access	Maintenance

3.5 "Application" submenu

Navigation

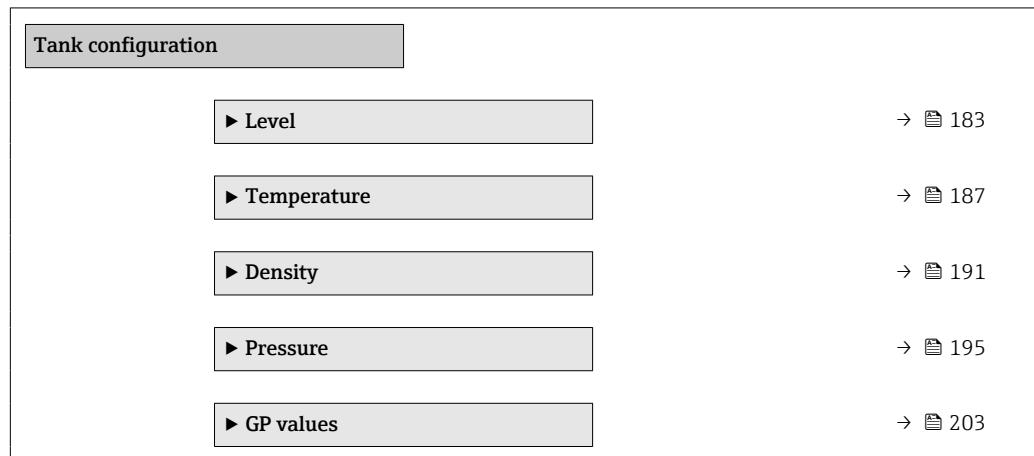
☰ ☰ Expert → Application



3.5.1 "Tank configuration" submenu

Navigation

☰ ☰ Expert → Application → Tank config



"Level" submenu*Navigation*

Expert → Application → Tank config → Level

► Level	
Empty	→ 183
Tank reference height	→ 184
Tank level	→ 184
Set level	→ 184
Upper interface level	→ 185
Lower interface level	→ 185
Water level source	→ 185
Water level	→ 185
Manual water level	→ 186
Blocking distance	→ 186

Empty**Navigation**

Expert → Application → Tank config → Level → Empty (14602)

Description

Distance from reference point to zero position (tank bottom or datum plate).

User entry

0 to 10 000.00 mm

Factory setting

Dependent on the device version

Additional information

Read access	Operator
Write access	Maintenance

The reference point is the lower edge of the device flange.

- After changing the **Empty** parameter (→ 183), the **Table mode** parameter (→ 225) is automatically set to **Disable**.
- If **Empty** (→ 183) has been changed by more than 20 mm (0.8 in), it is recommended to delete the dip table.
- The dip table values are not affected by a change of the **Empty** parameter (→ 183).

Tank reference height



Navigation

Expert → Application → Tank config → Level → Tank ref height (14603)

Description

Defines the distance from the dipping reference point to the zero position (tank bottom or datum plate).

User entry

0 to 10 000.00 mm

Factory setting

Dependent on the device version

Additional information

Read access	Operator
Write access	Maintenance

Tank level



Navigation

Expert → Application → Tank config → Level → Tank level (14655)

Description

Shows the distance from the zero position (tank bottom or datum plate) to the product surface.

Additional information

Read access	Operator
Write access	-

Set level



Navigation

Expert → Application → Tank config → Level → Set level (14604)

Description

If the level measured by the device does not match the actual level obtained by a manual dip, enter the correct level into this parameter.

User entry

0 to 10 000.00 mm

Factory setting

0 mm

Additional information

Read access	Operator
Write access	Maintenance

The device adjusts the **Empty** parameter (→ 183) according to the entered value, such that the measured level will match the actual level.

- After the change of the **Empty** parameter (→ 183), the **Table mode** parameter (→ 225) is automatically set to **Disable**.
■ If **Empty** has been changed by more than 20 mm (0.8 in), it is recommended to delete the dip table.
■ The dip table values are not affected by a change of the **Empty** parameter.

Upper interface level

Navigation
 Expert → Application → Tank config → Level → Upper I/F level (15003)
Description

Shows measured interface level from zero position (tank bottom or datum plate). Value is updated when device generates a valid Interface measurement.

Additional information

Read access	Maintenance
Write access	-

Lower interface level

Navigation
 Expert → Application → Tank config → Level → Lower I/F level (15004)
Description

Shows measured interface level from zero position (tank bottom or datum plate). Value is updated when device generates a valid interface measurement.

Additional information

Read access	Maintenance
Write access	-

Water level source

**Navigation**
 Expert → Application → Tank config → Level → Water level src (14971)
Description

Defines the source of the bottom water level.

Selection

- Manual value
- Bottom level
- HART device 1 ... 15 level
- AIO B1-3 value
- AIO C1-3 value
- AIP B4-8 value
- AIP C4-8 value

Factory setting

Manual value

Additional information

Read access	Operator
Write access	Maintenance

Water level

Navigation
 Expert → Application → Tank config → Level → Water level (14970)
Description

Shows the bottom water level.

Additional information

Read access	Operator
Write access	-

Manual water level**Navigation**

Diagram: Expert → Application → Tank config → Level → Man. water level (14959)

Prerequisite

Water level source (→ **185**) = Manual value

Description

Defines the manual value of the bottom water level.

User entry

-2 000 to 5 000 mm

Factory setting

0 mm

Additional information

Read access	Operator
Write access	Maintenance

Blocking distance**Navigation**

Diagram: Expert → Application → Tank config → Level → Blocking dist. (12424)

Description

No echos are evaluated within the blocking distance BD. Therefore, BD can be used to suppress interference echos in the vicinity of the antenna.

User entry

Positive floating-point number

Factory setting

800 mm

Additional information

Read access	Operator
Write access	Maintenance

"Temperature" submenu*Navigation*
 Expert → Application → Tank config → Temperature

► Temperature	
Liquid temp source	→  187
Manual liquid temperature	→  188
Liquid temperature	→  188
Air temperature source	→  188
Manual air temperature	→  189
Air temperature	→  189
Vapor temp source	→  189
Manual vapor temperature	→  190
Vapor temperature	→  190

Liquid temp source**Navigation**
 Expert → Application → Tank config → Temperature → Liq temp source (14972)
Description

Defines source from which the liquid temperature is obtained.

Selection

- Manual value
- HART device 1 ... 15 temperature
- AIO B1-3 value
- AIO C1-3 value
- AIP B4-8 value
- AIP C4-8 value

Factory setting

Manual value

Additional information

Read access	Operator
Write access	Maintenance

Manual liquid temperature

Navigation	Expert → Application → Tank config → Temperature → Man. liquid temp (15015)				
Prerequisite	Liquid temp source (→ 187) = Manual value				
Description	Defines the manual value of the liquid temperature.				
User entry	-50 to 300 °C				
Factory setting	25 °C				
Additional information	<table border="1"><tr><td>Read access</td><td>Operator</td></tr><tr><td>Write access</td><td>Maintenance</td></tr></table>	Read access	Operator	Write access	Maintenance
Read access	Operator				
Write access	Maintenance				

Liquid temperature

Navigation	Expert → Application → Tank config → Temperature → Liquid temp. (14978)				
Description	Shows the average or spot temperature of the measured liquid.				
Additional information	<table border="1"><tr><td>Read access</td><td>Operator</td></tr><tr><td>Write access</td><td>-</td></tr></table>	Read access	Operator	Write access	-
Read access	Operator				
Write access	-				

Air temperature source

Navigation	Expert → Application → Tank config → Temperature → Air temp. source (14993)				
Description	Defines source from which the air temperature is obtained.				
Selection	<ul style="list-style-type: none">■ Manual value■ HART device 1 ... 15 temperature■ AIO B1-3 value■ AIO C1-3 value■ AIP B4-8 value■ AIP C4-8 value				
Factory setting	Manual value				
Additional information	<table border="1"><tr><td>Read access</td><td>Operator</td></tr><tr><td>Write access</td><td>Maintenance</td></tr></table>	Read access	Operator	Write access	Maintenance
Read access	Operator				
Write access	Maintenance				

Manual air temperature



Navigation	Expert → Application → Tank config → Temperature → Manual air temp. (14961)				
Prerequisite	Air temperature source (→ 188) = Manual value				
Description	Defines the manual value of the air temperature.				
User entry	-50 to 300 °C				
Factory setting	25 °C				
Additional information	<table border="1"> <tr> <td>Read access</td> <td>Operator</td> </tr> <tr> <td>Write access</td> <td>Maintenance</td> </tr> </table>	Read access	Operator	Write access	Maintenance
Read access	Operator				
Write access	Maintenance				

Air temperature

Navigation	Expert → Application → Tank config → Temperature → Air temp. (14986)				
Description	Shows the air temperature.				
Additional information	<table border="1"> <tr> <td>Read access</td> <td>Operator</td> </tr> <tr> <td>Write access</td> <td>-</td> </tr> </table>	Read access	Operator	Write access	-
Read access	Operator				
Write access	-				

Vapor temp source



Navigation	Expert → Application → Tank config → Temperature → Vapor temp src (14973)				
Description	Defines the source from which the vapor temperature is obtained.				
Selection	<ul style="list-style-type: none"> ■ Manual value ■ HART device 1 ... 15 vapor temp ■ AIO B1-3 value ■ AIO C1-3 value ■ AIP B4-8 value ■ AIP C4-8 value 				
Factory setting	Manual value				
Additional information	<table border="1"> <tr> <td>Read access</td> <td>Operator</td> </tr> <tr> <td>Write access</td> <td>Maintenance</td> </tr> </table>	Read access	Operator	Write access	Maintenance
Read access	Operator				
Write access	Maintenance				

Manual vapor temperature

Navigation Expert → Application → Tank config → Temperature → Man. vapor temp. (14960)

Prerequisite Vapor temp source (→ 189) = Manual value

Description Defines the manual value of the vapor temperature.

User entry -50 to 300 °C

Factory setting 25 °C

Additional information

Read access	Operator
Write access	Maintenance

Vapor temperature

Navigation Expert → Application → Tank config → Temperature → Vapor temp. (14985)

Description Shows the measured vapor temperature.

Additional information

Read access	Operator
Write access	-

"Density" submenu*Navigation*
 Expert → Application → Tank config → Density

► Density	
Observed density source	→  191
Observed density	→  192
Air density	→  192
Vapor density	→  192
Upper density input source	→  192
Manual upper density	→  193
Measured upper density	→  194
Measured middle density	→  194
Measured lower density	→  194
Water density	→  194

Observed density source**Navigation**
 Expert → Application → Tank config → Density → Density source (13454)
Description

Determines how the density is obtained.

Selection

- HTG *
- HTMS *
- Average profile density *
- Upper density
- Middle density
- Lower density

Factory setting

Dependent on the device version

Additional information

Read access	Operator
Write access	Maintenance

* Visibility depends on order options or device settings

Observed density**Navigation**  Expert → Application → Tank config → Density → Observed density (13452)**Description**

Shows the measured or calculated density.

Additional information

Read access	Operator
Write access	-

Air density**Navigation**  Expert → Application → Tank config → Density → Air density (14980)**Description**

Defines the density of the air surrounding the tank.

User entry0.0 to 500.0 kg/m³**Factory setting**1.2 kg/m³**Additional information**

Read access	Operator
Write access	Maintenance

Vapor density**Navigation**  Expert → Application → Tank config → Density → Vapor density (14981)**Description**

Defines the density of the gas phase in the tank.

User entry0.0 to 500.0 kg/m³**Factory setting**1.2 kg/m³**Additional information**

Read access	Operator
Write access	Maintenance

Upper density input source**Navigation**  Expert → Application → Tank config → Density → UpDensity source (15006)**Description**

Defines the input source for the upper density value.

Selection

- Manual value
- HART device 1 density *
- HART device 2 density *
- HART device 3 density *
- HART device 4 density *
- HART device 5 density *
- HART device 6 density *
- HART device 7 density *
- HART device 8 density *
- HART device 9 density *
- HART device 10 density *
- HART device 11 density *
- HART device 12 density *
- HART device 13 density *
- HART device 14 density *
- HART device 15 density *
- Upper density *
- Middle density *
- Lower density *
- Average profile density *
- AIO B1-3 value *
- AIO C1-3 value *
- AIP B4-8 value *
- AIP C4-8 value *

Factory setting

Manual value

Additional information

Read access	Operator
Write access	Maintenance

Manual upper density**Navigation**

Expert → Application → Tank config → Density → Manual density (14998)

Prerequisite

Upper density input source (→ 192) = Manual value

Description

Defines the manual upper density of the medium.

User entry0 to 3 000 kg/m³**Factory setting**800 kg/m³**Additional information**

Read access	Operator
Write access	Maintenance

* Visibility depends on order options or device settings

Measured upper density

Navigation Expert → Application → Tank config → Density → Meas upper dens. (15001)**Description**

Shows the density of the upper phase.

Additional information

Read access	Operator
Write access	-

Measured middle density

Navigation Expert → Application → Tank config → Density → Meas middle dens (14997)**Description**

Density of the middle phase.

Additional information

Read access	Operator
Write access	-

Measured lower density

Navigation Expert → Application → Tank config → Density → Meas lower dens. (15002)**Description**

Density of the lower phase.

Additional information

Read access	Maintenance
Write access	-

Water density

**Navigation** Expert → Application → Tank config → Density → Water density (13757)**Description**

Density of the water in the tank.

User entry

Signed floating-point number

Factory setting1 000 kg/m³**Additional information**

Read access	Operator
Write access	Maintenance

"Pressure" submenu*Navigation*

Expert → Application → Tank config → Pressure

► Pressure	
P1 (bottom) source	→ 196
P1 (bottom)	→ 196
P1 (bottom) manual pressure	→ 196
P1 position	→ 197
P1 offset	→ 197
P1 absolute / gauge	→ 197
P2 (middle) source	→ 198
P2 (middle)	→ 198
P2 (middle) manual pressure	→ 198
P2 offset	→ 199
P1-2 distance	→ 199
P2 absolute / gauge	→ 199
P3 (top) source	→ 200
P3 (top)	→ 200
P3 (top) manual pressure	→ 200
P3 position	→ 201
P3 offset	→ 201
P3 absolute / gauge	→ 201
Ambient pressure	→ 202

P1 (bottom) source

Navigation Expert → Application → Tank config → Pressure → P1 (bot) source (14994)

Description Defines the source of the bottom pressure (P1).

- Selection**
- Manual value
 - HART device 1 ... 15 pressure
 - AIO B1-3 value
 - AIO C1-3 value
 - AIP B4-8 value
 - AIP C4-8 value

Factory setting Manual value

Additional information

Read access	Operator
Write access	Maintenance

P1 (bottom)

Navigation Expert → Application → Tank config → Pressure → P1 (bottom) (14983)

Description Shows the pressure at the tank bottom.

Additional information

Read access	Operator
Write access	-

P1 (bottom) manual pressure

Navigation Expert → Application → Tank config → Pressure → P1 (bot) manual (14951)

Prerequisite **P1 (bottom) source (→ 196) = Manual value**

Description Defines the manual value of the bottom pressure (P1).

User entry -25 to 25 bar

Factory setting 0 bar

Additional information

Read access	Operator
Write access	Maintenance

P1 position**Navigation**

Expert → Application → Tank config → Pressure → P1 position (14952)

Description

Defines the position of the bottom pressure transmitter (P1), measured from zero position (tank bottom or datum plate).

User entry

-10 000 to 100 000 mm

Factory setting

5 000 mm

Additional information

Read access	Operator
Write access	Maintenance

P1 offset**Navigation**

Expert → Application → Tank config → Pressure → P1 offset (14953)

Description

Offset for the bottom pressure (P1).

The offset is added to the measured pressure prior to any tank calculation.

User entry

-25 to 25 bar

Factory setting

0 bar

Additional information

Read access	Operator
Write access	Maintenance

P1 absolute / gauge**Navigation**

Expert → Application → Tank config → Pressure → P1 absolut/gauge (14954)

Description

Defines whether the connected pressure transmitter measures an absolute or a gauge pressure.

Selection

- Absolute
- Gauge

Factory setting

Gauge

Additional information

Read access	Operator
Write access	Maintenance

P2 (middle) source

Navigation Expert → Application → Tank config → Pressure → P2 (mid) source (14995)

Description Defines the source of the middle pressure (P2).

- Selection**
- Manual value
 - HART device 1 ... 15 pressure
 - AIO B1-3 value
 - AIO C1-3 value
 - AIP B4-8 value
 - AIP C4-8 value

Factory setting Manual value

Additional information

Read access	Operator
Write access	Maintenance

P2 (middle)

Navigation Expert → Application → Tank config → Pressure → P2 (middle) (14987)

Description Shows the pressure (P2) at the middle transmitter.

Additional information

Read access	Operator
Write access	-

P2 (middle) manual pressure

Navigation Expert → Application → Tank config → Pressure → P2 (mid) manual (14955)

Prerequisite **P2 (middle) source (→ 198) = Manual value**

Description Defines the manual value of the middle pressure (P2).

User entry -25 to 25 bar

Factory setting 0 bar

Additional information

Read access	Operator
Write access	Maintenance

P2 offset**Navigation**

Expert → Application → Tank config → Pressure → P2 offset (14975)

Description

Defines the offset for the middle pressure (P2).

The offset is added to the measured pressure prior to any tank calculation.

User entry

-25 to 2.5 bar

Factory setting

0 bar

Additional information

Read access	Operator
Write access	Maintenance

P1-2 distance**Navigation**

Expert → Application → Tank config → Pressure → P1-2 distance (14974)

Description

Defines the distance between the bottom and the middle pressure transmitter.

User entry

0 to 100 000 mm

Factory setting

2 000 mm

Additional information

Read access	Operator
Write access	Maintenance

P2 absolute / gauge**Navigation**

Expert → Application → Tank config → Pressure → P2 absolut/gauge (14976)

Description

Defines whether the connected pressure transmitter measures an absolute or a gauge pressure.

Selection

- Absolute
- Gauge

Factory setting

Gauge

Additional information

Read access	Operator
Write access	Maintenance

P3 (top) source



Navigation

Expert → Application → Tank config → Pressure → P3 (top) source (14996)

Description

Defines the source of the top pressure (P3).

Selection

- Manual value
- HART device 1 ... 15 pressure
- AIO B1-3 value
- AIO C1-3 value
- AIP B4-8 value
- AIP C4-8 value

Factory setting

Manual value

Additional information

Read access	Operator
Write access	Maintenance

P3 (top)

Navigation

Expert → Application → Tank config → Pressure → P3 (top) (14988)

Description

Shows the pressure (P3) at the top transmitter.

Additional information

Read access	Operator
Write access	-

P3 (top) manual pressure



Navigation

Expert → Application → Tank config → Pressure → P3 (top) manual (14977)

Prerequisite

P3 (top) source (→ 200) = Manual value

Description

Defines the manual value of the top pressure (P3).

User entry

-2.5 to 2.5 bar

Factory setting

0 bar

Additional information

Read access	Operator
Write access	Maintenance

P3 position**Navigation** Expert → Application → Tank config → Pressure → P3 position (14956)**Description** Defines the position of the top pressure transmitter (P3), measured from zero position (tank bottom or datum plate).**User entry** 0 to 100 000 mm**Factory setting** 20 000 mm**Additional information**

Read access	Operator
Write access	Maintenance

P3 offset**Navigation** Expert → Application → Tank config → Pressure → P3 offset (14957)**Description** Offset for the top pressure (P3).

The offset is added to the measured pressure prior to any tank calculation.

User entry -2.5 to 2.5 bar**Factory setting** 0 bar**Additional information**

Read access	Operator
Write access	Maintenance

P3 absolute / gauge**Navigation** Expert → Application → Tank config → Pressure → P3 absolut/gauge (14958)**Description** Defines whether the connected pressure transmitter measures an absolute or a gauge pressure.**Selection**

- Absolute
- Gauge

Factory setting Gauge**Additional information**

Read access	Operator
Write access	Maintenance

Ambient pressure

Navigation Expert → Application → Tank config → Pressure → Ambient pressure (14962)

Description Defines the manual value of the ambient pressure.

User entry 0 to 2.5 bar

Factory setting 1 bar

Additional information

Read access	Operator
Write access	Maintenance

"GP values" submenu*Navigation*
  Expert → Application → Tank config → GP values

► GP values	
GP 1 to 4 source	→  203
GP 1 to 4 name	→  204
GP Value 1	→  204
GP Value 2	→  204
GP Value 3	→  204
GP Value 4	→  205

GP 1 to 4 source**Navigation**
  Expert → Application → Tank config → GP values → GP 1 to 4 source (14989–1 to 4)
Description

Source of the general purpose value 1 GP1.

Selection

- No input value
- SM R distance
- Average profile density
- Net weight
- AIO B1-3 value
- AIO C1-3 value
- AIP B4-8 value
- AIP C4-8 value
- HART device 1...15 PV
- HART device 1...15 SV
- HART device 1...15 TV
- HART device 1...15 QV
- Modbus A1-4 Value 1...4
- Modbus B1-4 Value 1...4
- Modbus C1-4 Value 1...4
- Modbus D1-4 Value 1...4

Factory setting

No input value

Additional information

Read access	Operator
Write access	Maintenance

GP 1 to 4 name

Navigation Expert → Application → Tank config → GP values → GP 1 name (14963)

Description Defines the label associated with the respective GP value.

User entry Character string comprising numbers, letters and special characters (15)

Factory setting GP Value 1

Additional information

Read access	Operator
Write access	Maintenance

GP Value 1

Navigation Expert → Application → Tank config → GP values → GP Value 1 (14966)

Description Displays the value that will be used as general purpose value.

Additional information

Read access	Operator
Write access	-

GP Value 2

Navigation Expert → Application → Tank config → GP values → GP Value 2 (14967)

Description Displays the value that will be used as general purpose value.

Additional information

Read access	Operator
Write access	-

GP Value 3

Navigation Expert → Application → Tank config → GP values → GP Value 3 (14968)

Description Displays the value that will be used as general purpose value.

Additional information

Read access	Operator
Write access	-

GP Value 4

Navigation

Diagram Expert → Application → Tank config → GP values → GP Value 4 (14969)

Description

Displays the value that will be used as general purpose value.

Additional information

Read access	Operator
Write access	-

3.5.2 "Tank calculation" submenu

Navigation

Diagram Expert → Application → Tank calculation

▶ Tank calculation	
Local gravity	→ Diagram 205
▶ HyTD	→ Diagram 208
▶ CTSh	→ Diagram 213
▶ HTMS	→ Diagram 218
▶ Dip-table	→ Diagram 224

Local gravity**Navigation**

Diagram Expert → Application → Tank calculation → Local gravity (14979)

Description

Shows the manually entered local gravity value.

User entry

9.0 to 10.0 m/s²

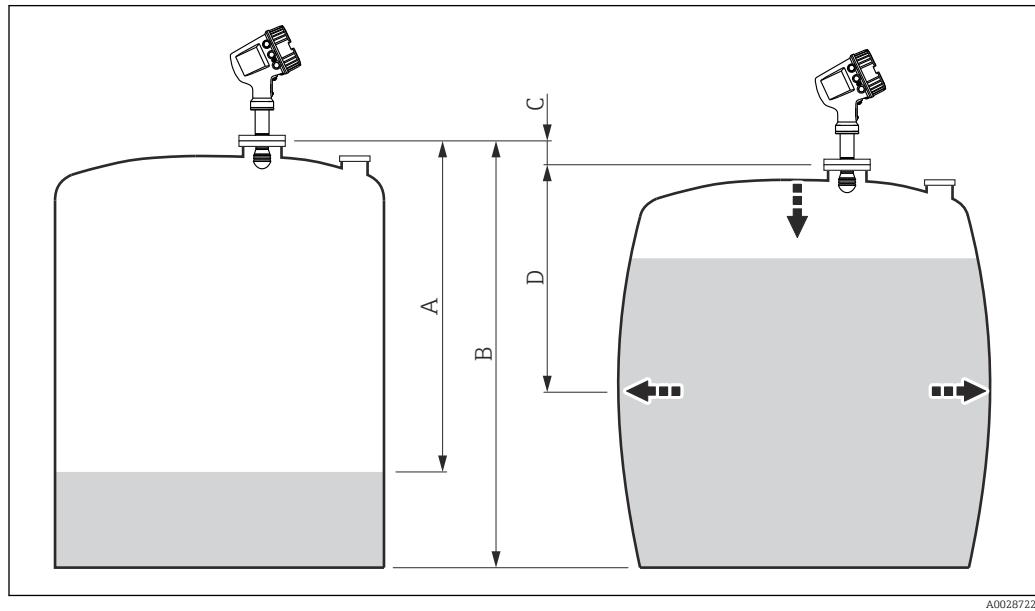
Factory setting

9.807 m/s²

"HyTD" submenu

Overview

Hydrostatic Tank Deformation can be used to compensate the vertical movement of the Gauge Reference Height (GRH) due to bulging of the tank shell caused by the hydrostatic pressure exerted by the liquid stored in the tank. The compensation is based on a linear approximation obtained from manual hand dips at several levels distributed over the full range of the tank.



■ 16 Correction of the hydrostatic tank deformation (HyTD)

- A "Distance" (level below L_0 → "HyTD correction value" = 0)
- B Gauge Reference Height (GRH)
- C HyTD correction value
- D "Distance" (level above L_0 → "HyTD correction value" > 0)

Linear approximation of the HyTD correction

The real amount of deformation varies non-linearly with the level due to the construction of the tank. However, as the correction values are typically small compared to the measured level, a simple straight line method can be used with good results.

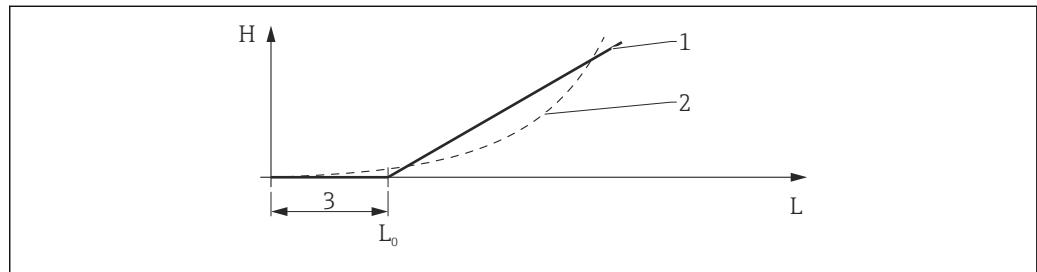


图 17 Calculation of the HyTD correction

- 1 Linear correction according to "Deformation factor (→ 图 209)"
- 2 Real correction
- 3 Starting level (→ 图 208)
- L Measured level
- H HyTD correction value (→ 图 208)

Calculation of the HyTD correction

$L \leq L_0$	\Rightarrow	$C_{\text{HyTD}} = 0$
$L > L_0$	\Rightarrow	$C_{\text{HyTD}} = - (L - L_0) \times D$

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L	Measured level
L₀	Starting level
C_{HyTD}	HyTD correction value
D	Deformation factor

*Description of parameters**Navigation*

Expert → Application → Tank calculation → HyTD

► HyTD	
HyTD correction value	→ 208
HyTD mode	→ 208
Starting level	→ 208
Deformation factor	→ 209

HyTD correction value**Navigation**

Expert → Application → Tank calculation → HyTD → HyTD corr. value (13603)

Description

Shows the correction value from the Hydrostatic Tank Deformation.

Additional information

Read access	Operator
Write access	-

HyTD mode**Navigation**

Expert → Application → Tank calculation → HyTD → HyTD mode (14652)

Description

Activates or deactivates the calculation of the Hydrostatic Tank Deformation.

Selection

- No
- Yes

Factory setting

No

Additional information

Read access	Operator
Write access	Maintenance

Starting level**Navigation**

Expert → Application → Tank calculation → HyTD → Starting level (13601)

Description

Defines the starting level for the Hydrostatic Tank Deformation. Levels below this value are not corrected.

User entry 0 to 5 000 mm

Factory setting 500 mm

Additional information

Read access	Operator
Write access	Maintenance

Deformation factor



Navigation Expert → Application → Tank calculation → HyTD → Deform factor (13602)

Description Defines the deformation factor for the HyTD (change of device position per change of level).

User entry -1.0 to 1.0 %

Factory setting 0.2 %

Additional information

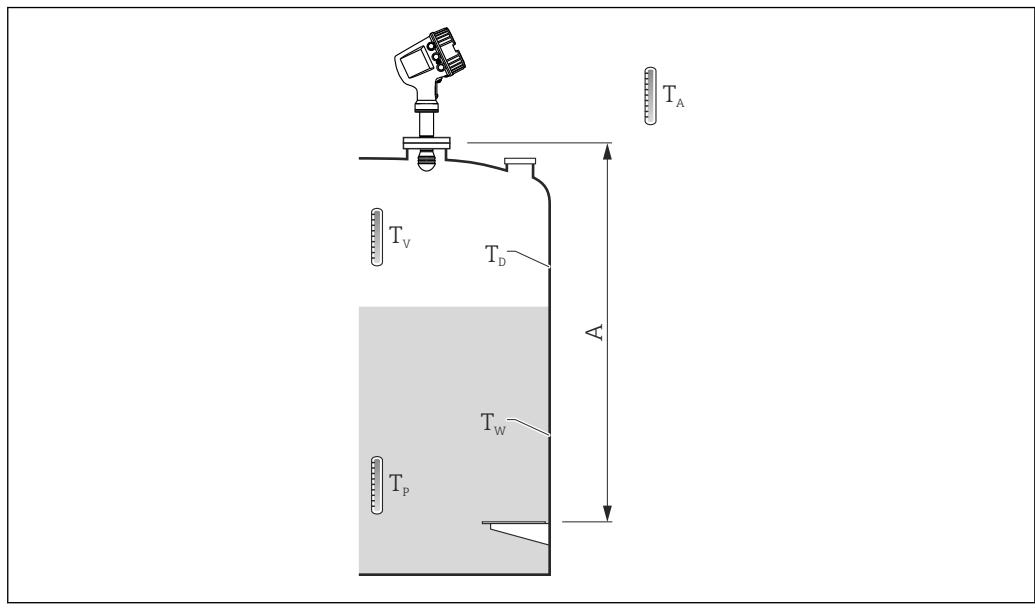
Read access	Operator
Write access	Maintenance

"CTSh" submenu

Overview

CTSh (correction for the thermal expansion of the tank shell) compensates for effects on the Gauge Reference Height (GRH) and on the expansion or contraction of the measuring wire due to temperature effects on the tank shell or stilling well. The temperature effects are separated into two parts, respectively affecting the 'dry' and 'wetted' part of the tank shell or stilling well. The correction function is based on thermal expansion coefficients of steel and insulation factors for both the 'dry' and 'wet' parts of the wire and the tank shell. The temperatures used for the correction can be selected from on manual or measured values.

- i** This correction is recommended for the following situations:
 - if the operating temperature deviates considerably from the temperature during calibration ($\Delta T > 10 \text{ }^{\circ}\text{C}$ (18 $^{\circ}\text{F}$))
 - for extremely high tanks
 - for refrigerated, cryogenic or heated applications
- i** As the use of this correction will influence the innage level reading, it is recommended to ensure the manual hand dip and level verification procedures are being conducted correctly before enabling this correction method.
- i** This mode cannot be used in conjunction with HTG because the level is not measured relative to the gauge reference height with HTG.

CTS_h: Calculation of the wall temperature

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图 18 Parameters for the CTS_h calculation

A Gauge Reference Height (GRH)

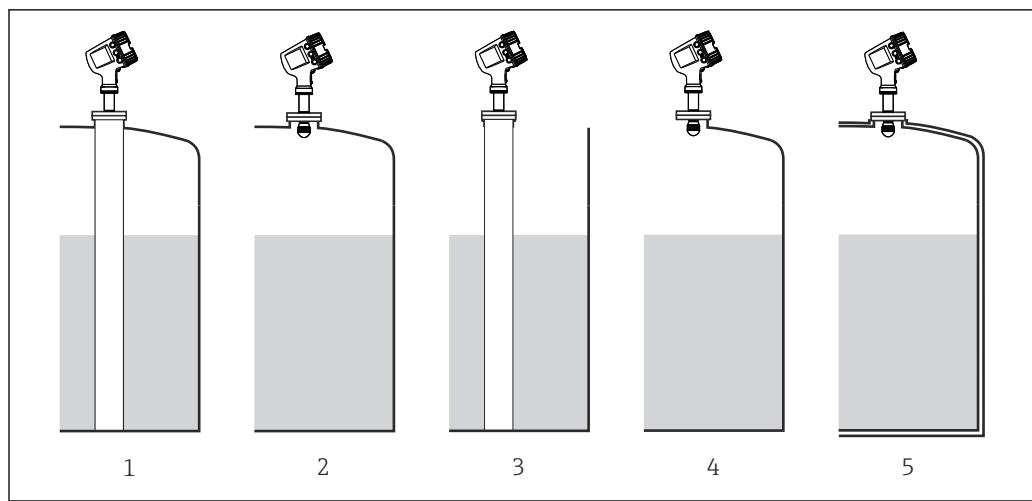
T_w	Temperature of the wetted part of the tank shell
T_d	Temperature of the dry part of the tank shell
T_p	Product temperature
T_v	Vapor temperature (in the tank)
T_a	Ambient temperature (atmosphere surrounding the tank)

CTS_h: Calculation of the wall temperature

Depending on the parameters **Covered tank** (→ **图 214**) and **Stilling well** (→ **图 214**), the temperatures T_w of the wetted and T_d of the dry part of the tank wall are calculated as follows:

Covered tank (→ 图 214)	Stilling well (→ 图 214)	T_w	T_d
Covered	Yes ¹⁾	T_p	T_v
	No	$(7/8) T_p + (1/8) T_a$	$(1/2) T_v + (1/2) T_a$
Open top	Yes	T_p	T_a
	No	$(7/8) T_p + (1/8) T_a$	T_a

1) This option is also valid for insulated tanks without a stilling well. This is due to the temperature inside and outside of the tank shell being the same due to the insulation of the tank.



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- 1 *Covered tank (\rightarrow 214) = Covered; Stilling well (\rightarrow 214) = Yes*
- 2 *Covered tank (\rightarrow 214) = Covered; Stilling well (\rightarrow 214) = No*
- 3 *Covered tank (\rightarrow 214) = Open top; Stilling well (\rightarrow 214) = Yes*
- 4 *Covered tank (\rightarrow 214) = Open top; Stilling well (\rightarrow 214) = No*
- 5 *Insulated tank: Covered tank (\rightarrow 214) = Open top; Stilling well (\rightarrow 214) = Yes*

CTSh: Calculation of the correction

$$C_{CTSh} = \alpha (H - L) (T_D - T_{cal}) + \alpha L (T_W - T_{cal})$$

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H	Gauge Reference Height
L	Measured level
T_D	Temperature of the dry part of the tank shell (calculated from T _P , T _V and T _A)
T_W	Temperature of the wetted part of the tank shell (calculated from T _P , T _V and T _A)
T_{cal}	Temperature at which the measurement has been calibrated
α	Linear expansion coefficient
c_{CTSh}	CTSh correction value

*Description of parameters**Navigation*
 Expert → Application → Tank calculation → CTSh

► CTSh	
CTSh correction value	→  213
CTSh mode	→  214
Covered tank	→  214
Stilling well	→  214
Calibration temperature	→  215
Linear expansion coefficient	→  215

CTSh correction value*Navigation*
 Expert → Application → Tank calculation → CTSh → CTSh corr value (13651)
Description

Shows the CTSh correction value.

Additional information

Read access	Operator
Write access	-

CTSh mode**Navigation**

Expert → Application → Tank calculation → CTSh → CTSh mode (14651)

Description

Activates or deactivates the CTSh.

Selection

- No
- Yes
- With wire ^{*}
- Only wire ^{*}

Factory setting

No

Additional information

Read access	Operator
Write access	Maintenance

Covered tank**Navigation**

Expert → Application → Tank calculation → CTSh → Covered tank (13654)

Description

Determines whether the tank is covered.

Selection

- Open top
- Covered

Factory setting

Open top

Additional information

Read access	Operator
Write access	Maintenance

The **Covered** option is only valid for fixed tank roofs. For a floating roof select **Open top**.

Stilling well**Navigation**

Expert → Application → Tank calculation → CTSh → Stilling well (13653)

Description

Determines whether the device is mounted on a stilling well.

Selection

- No
- Yes

Factory setting

No

* Visibility depends on order options or device settings

Additional information

Read access	Operator
Write access	Maintenance

Calibration temperature**Navigation**

Expert → Application → Tank calculation → CTSh → Calibration temp (13652)

Description

Specify temperature at which the measurement has been calibrated.

User entry

-50 to 250 °C

Factory setting

25 °C

Additional information

Read access	Operator
Write access	Maintenance

Linear expansion coefficient**Navigation**

Expert → Application → Tank calculation → CTSh → Linear exp coeff (13655)

Description

Defines the linear expansion coefficient of the tank shell material.

User entry

0 to 100 ppm

Factory setting

15 ppm

Additional information

Read access	Operator
Write access	Maintenance

Wire expansion coefficient**Navigation**

Expert → Application → Tank calculation → CTSh → Wire exp coeff (13656)

Description

Defines the expansion coefficient of the wire material of the drum. Value is programmed in factory.

User entry

0 to 100 ppm

Factory setting

15 ppm

"HTMS" submenu

Overview

The Hybrid Tank Measurement System (HTMS) is a method to calculate the density of a product in a tank based on both a (top mounted) level and at least one (bottom mounted) pressure measurement. An additional pressure sensor can be installed at the top of the tank to provide information about the vapor pressure and to make the density calculation more accurate. The calculation method also takes into account a possible level of water at the bottom of the tank to make density calculations as accurate as possible.

HTMS parameters

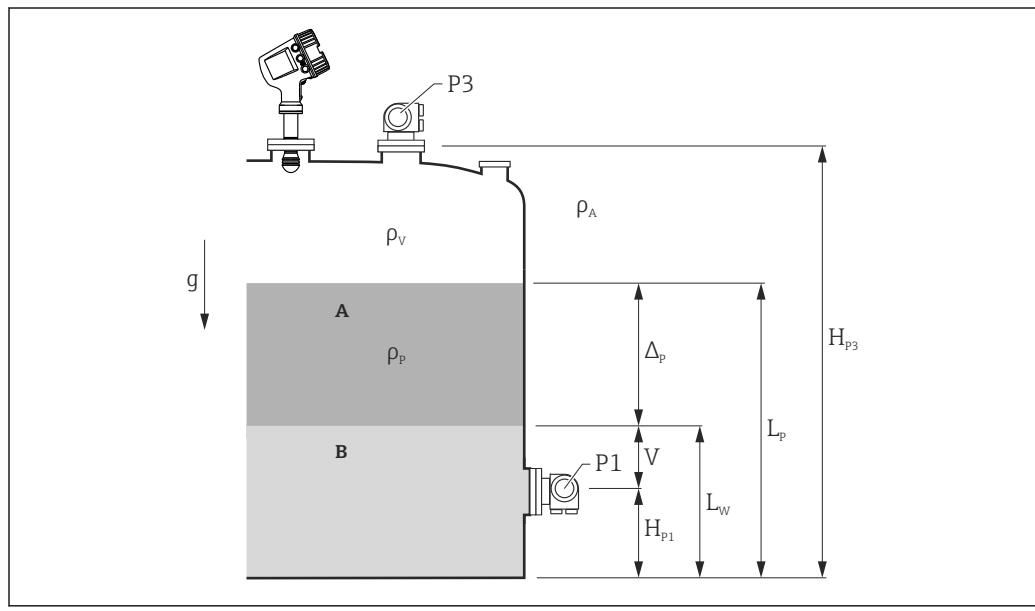


Fig. 19 HTMS parameters

A Product
B Water

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Parameter	Navigation path
P1 (Bottom pressure)	Setup → Advanced setup → Tank configuration → Pressure → P1 (bottom)
H_{P1} (Position of P1 transmitter)	Setup → Advanced setup → Tank configuration → Pressure → P1 position
P3 (Top pressure)	Setup → Advanced setup → Tank configuration → Pressure → P3 (top)
H_{P3} (Position of P3 transmitter)	Setup → Advanced setup → Tank configuration → Pressure → P3 position
ρ_p (Density of the product ¹⁾)	<ul style="list-style-type: none"> ▪ Measured value: Setup → Advanced setup → Calculation → HTMS → Density value (13753) ▪ User-defined value: Setup → Advanced setup → Calculation → HTMS → Manual upper density (14998)
ρ_v (Vapor density)	Expert → Application → Tank configuration → Density → Vapor density
ρ_A (Ambient air temperature)	Setup → Advanced setup → Tank configuration → Density → Air density
g (Local gravity)	Expert → Application → Tank Calculation → Local gravity
L_p (Level of the product)	Operation → Tank level (14655)
L_w (Bottom water level)	Operation → Water level (14970)
$V = L_w - H_{P1}$	
$\Delta_p = L_p - L_w = L_p - V - H_{P1}$	

1) Depending on the situation this parameter is measured or a user-defined value is used.

HTMS modes

Two HTMS modes can be selected in the **HTMS mode** parameter (→ 218). The mode determines whether one or two pressure values are used. Depending on the selected mode a number of additional parameters are required for the calculation of the product density.

 The **HTMS P1+P3** option must be used in pressurized tanks in order to compensate for the pressure of the vapor phase.

HTMS mode (→ 218)	Measured variables	Required additional parameters	Calculated variables
HTMS P1	■ P_1 ■ L_p	■ g ■ H_{P1} ■ L_w (optional)	ρ_p
HTMS P1+P3	■ P_1 ■ P_3 ■ L_p	■ ρ_v ■ ρ_A ■ g ■ H_{P1} ■ H_{P3} ■ L_w (optional)	ρ_p (more precise calculation for pressurized tanks)

Minimum level

The density of the product can only be calculated if the product has a minimum thickness :

$$\Delta_p \geq \Delta_{p,\min}$$

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This is equivalent to the following condition for the product level:

$$L_p - V \geq \Delta_{p,\min} + H_{P1} = L_{\min}$$

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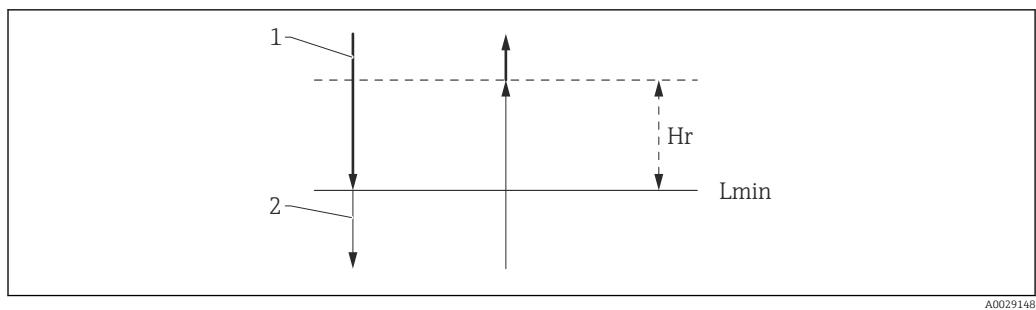
L_{\min} is defined in the **Minimum level** parameter (→ 219). As can be seen from the formula it always must be bigger than H_{P1} .

If $L_p - V$ falls below this limit, the density is calculated as follows:

- If a previous calculated value is available, this value will be kept as long as no new calculation is possible.
- If no value was previously calculated, the manual value (defined in the **Manual upper density** parameter (→ 193)) will be used.

Hysteresis

The level of the product in a tank is not constant but slightly varies, due for example to filling disturbances. If the level oscillates around the changeover level (**Minimum level** (→ 219)), the algorithm will constantly switch between calculating the value and holding the previous result. To avoid this effect a positional hysteresis is defined around the changeover point.



20 HTMS hysteresis

1 Value calculated

2 Value held/manual

L_{min} Minimum level (→ 219)

H_r Hysteresis (→ 220)

Description of parameters

Navigation

Expert → Application → Tank calculation → HTMS

HTMS	
HTMS mode	→ 218
Manual density	→ 219
Density value	→ 219
Minimum level	→ 219
Minimum pressure	→ 220
Safety distance	→ 220
Hysteresis	→ 220
Water density	→ 221

HTMS mode



Navigation

Expert → Application → Tank calculation → HTMS → HTMS mode (13751)

Description

Defines the HTMS mode. Depending on the mode one or two pressure transmitters are used.

Selection

- HTMS P1
- HTMS P1+P3

Factory setting

HTMS P1

Additional information

Read access	Operator
Write access	Maintenance

Meaning of the options

- HTMS P1
Only a bottom pressure transmitter (P1) is used.
- HTMS P1+P3
A bottom (P1) and top (P3) pressure transmitter are used. This option should be selected for pressurized tanks.

Manual density**Navigation**

Expert → Application → Tank calculation → HTMS → Manual density (15009)

Description

Defines the manual density.

User entry0 to 3 000 kg/m³**Factory setting**800 kg/m³**Additional information**

Read access	Maintenance
Write access	Maintenance

Density value**Navigation**

Expert → Application → Tank calculation → HTMS → Density value (13753)

Description

Shows the calculated product density.

Additional information

Read access	Operator
Write access	-

Minimum level**Navigation**

Expert → Application → Tank calculation → HTMS → Min. level (13752)

Description

Defines the minimum product level for a HTMS calculation.

If Lp - V falls below the limit defined in this parameter, the density retains its last value or the manual value is used instead.

User entry

0 to 20 000 mm

Factory setting

7 000 mm

Additional information

Read access	Operator
Write access	Maintenance

Minimum pressure**Navigation**

Expert → Application → Tank calculation → HTMS → Min. pressure (13754)

Description

Defines the minimum pressure for a HTMS calculation.

If the pressure P1 (or the difference P1 - P3) falls below the limit defined in this parameter, the density retains its last value or the manual value is used instead.

User entry

0 to 100 bar

Factory setting

0.1 bar

Additional information

Read access	Operator
Write access	Maintenance

Safety distance**Navigation**

Expert → Application → Tank calculation → HTMS → Safety distance (13756)

Description

Defines the minimum level which must be present above the bottom pressure sensor before its signal is used for the calculation.

User entry

0 to 10 000 mm

Factory setting

2 000 mm

Additional information

Read access	Operator
Write access	Maintenance

Hysteresis**Navigation**

Expert → Application → Tank calculation → HTMS → Hysteresis (13755)

Description

Defines the hysteresis for the HTMS calculation. Prevents constant switching if the level is near the switch-over point.

User entry

0 to 2 000 mm

Factory setting

50 mm

Additional information

Read access	Operator
Write access	Maintenance

Water density**Navigation**

Expert → Application → Tank calculation → HTMS → Water density (13757)

Description

Density of the water in the tank.

User entry

Signed floating-point number

Factory setting1 000 kg/m³**Additional information**

Read access	Operator
Write access	Maintenance

"Dip-table" submenu

Dip table

The dip table is used to correct the level readings using independently taken hand dips. The dip table is used in particular to adapt the level gauge to the specific application conditions such as a mechanical offset and the tank or stilling well design. Depending on national regulations, national inspectors will dip the tank at one to three levels during a calibration run and check the level readings.

Only one value pair must be entered into the dip table to correct the measurement offset. If a second value pair is entered into the dip table, the device accepts the corrected measured values identically for both value pairs. All other measured values are determined by linear extrapolation.

If more than two value pairs are entered, the system carries out a linear interpolation between adjacent value pairs. Outside these value pairs, extrapolation is also linear.

-  ▪ The offset should **not** be determined and entered within the close range of the antenna or immediately in the range of the tank bottom, because within these ranges interferences of the radar signal may occur.
- The entries of the dip table must be arranged in an ascending order of levels. If table values have not been entered in the correct order, they can automatically be rearranged by selecting **Table settings** (→ 225) = **Sort table**

Semiautomatic creation of a dip table

In order not to mix up measurement values corrected by the dip table with uncorrected measurement values, it is recommended to enter new data pairs semiautomatically into the table. This means: the uncorrected level is measured by the device and the user only enters the corresponding dip value.

The first dip value should be entered immediately after the basic calibration. Further dip points should be entered only after a level change of at least 2 m (6.6 ft) and a deviation between the uncorrected measurement value and the hand dip value of at least 4 mm (0.16 in).

If this procedure can not be followed, then **no** value pair should be entered into the dip table after basic calibration. Measurement data and hand dip values should be collected over the full measurement range and be evaluated with regard to a good linear fit. Only then characteristic value pairs should be entered into the dip table using the "manual mode" (see below).

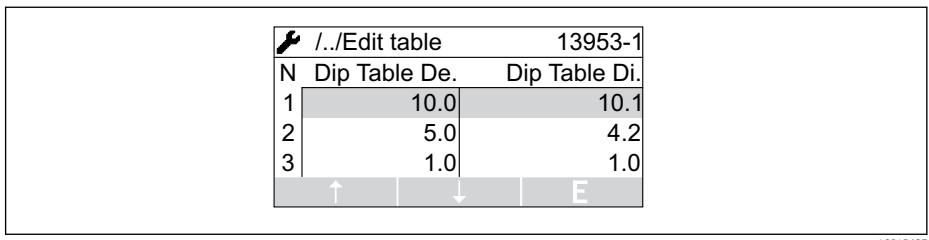
Manual creation of a dip table

Before creating a dip table manually, measured levels and dip values should be collected over the full measurement range and be evaluated with regard to a linear fit. Only then characteristic value pairs from this fit should be entered into the dip table using the manual mode. In the manual mode both, the measured level (without correction) and the corresponding dip value are entered by the user.

-  If further linearisation is needed, further hand dip values should be entered using only the "semi-automatic" mode (see above).

The table editor on the local display

1. Navigate to Setup → Advanced setup → Application → Tank calculation → Dip-table → Table mode (12516) and select the **Disable** option.
2. Navigate to Setup → Advanced setup → Application → Calculation → Dip-table → Edit table

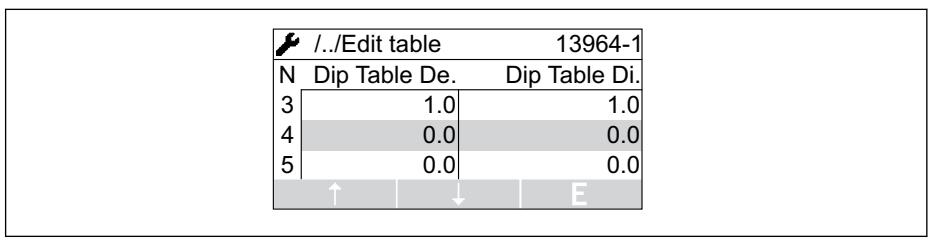
↳ 

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21 The dip table editor on the local display

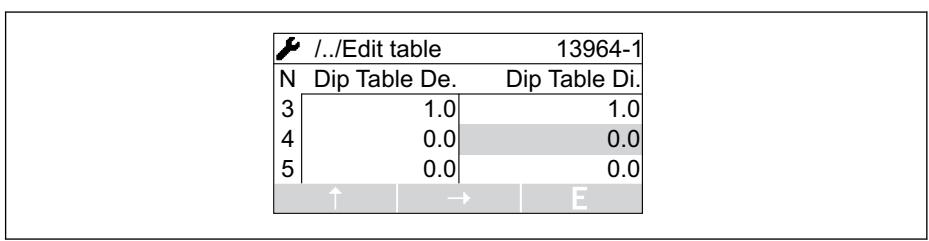
N Number of the line
De. Device level
Di. Dip level

3. Use the "**↑**" and "**↓**" keys to move to the line you want to edit.

↳ 

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4. Press "**E**" to open the line.
5. Use "**→**" to select the cell you want to edit.

↳ 

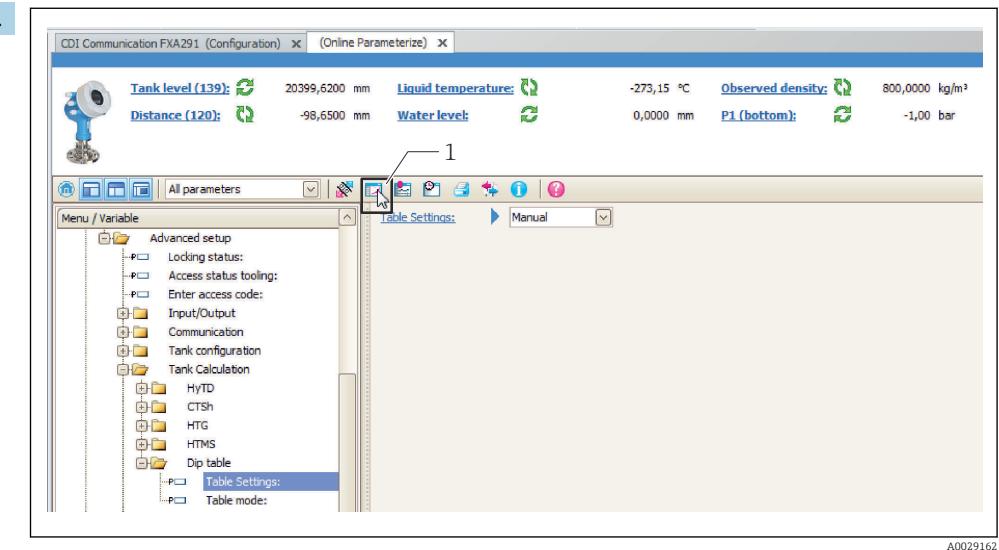
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6. Press "**E**" to open the cell.
7. Enter the required number.
8. Continue until all required table points have been entered.
9. Press "**-**" and "**+**" simultaneously to quit the table editor.
10. Navigate to Setup → Advanced setup → Application → Tank calculation → Dip-table → Table settings (12515) and select the **Sort table** option.
↳ The table points are arranged in an ascending order.
11. Navigate to Setup → Advanced setup → Application → Tank calculation → Dip-table → Table mode (12516) and select the **Enable** option.
↳ The new dip table is active.

The table editor in FieldCare

- i** In the FieldCare table editor the dip table can only be entered manually. Even if the semiautomatic method has been selected in the **Table settings** parameter (→ 225), the complete table will be written from the editor to the device in the manual mode.

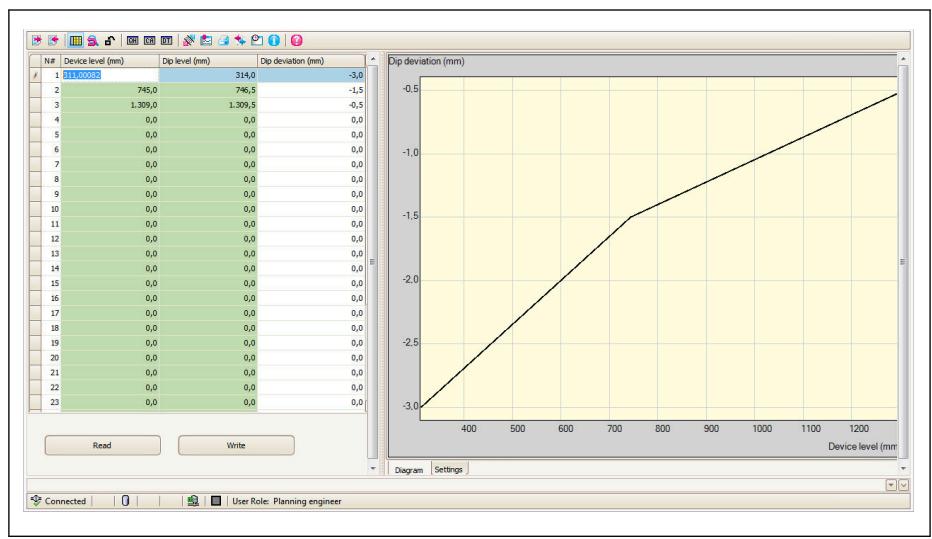
1.



1 Table icon; calls up the table editor.

Open the table editor by clicking on the table icon.

↳ The graphical table editor appears:



2. If the device already contains a dip table: Click "Read" to load it into the editor.
3. Enter or change table values in the table on the right. A graphical representation of the table is shown in the diagram on the right.
4. Click "Write" to write the table back to the device.

Description of parameters

Navigation

Expert → Application → Tank calculation → Dip-table



Table settings	→ 225
Table mode	→ 225

Table settings

Navigation Expert → Application → Tank calculation → Dip-table → Table settings (12515)

Description Defines the dip-table operation to be performed.

- Selection**
- Manual
 - Semiautomatic
 - Clear table
 - Sort table

Factory setting Manual

Additional information

Read access	Operator
Write access	Maintenance

Meaning of the options

- Manual
Both, the device level and the dip level for each table point have to be entered manually.
- Semiautomatic
The device level of each table point is measured by the device itself, the corresponding dip level must be entered manually.
- Clear table
Deletes the complete dip table.
- Sort table
Sorts the table points into an ascending order. This must be performed if table values have not been entered in the correct order.

Table mode

Navigation Expert → Application → Tank calculation → Dip-table → Table mode (12516)

Description Enables or disables the dip-table.

- Selection**
- Disable
 - Enable

Factory setting Disable

Additional information

Read access	Operator
Write access	Maintenance

3.5.3 "Alarm" submenu

Navigation

☰ ☰ Expert → Application → Alarm

"Alarm" submenu

Navigation

☰ ☰ Expert → Application → Alarm → Alarm

▶ Alarm	
Alarm mode	→ ☰ 227
Error value	→ ☰ 228
Alarm value source	→ ☰ 229
Alarm value	→ ☰ 230
HH alarm value	→ ☰ 230
H alarm value	→ ☰ 230
L alarm value	→ ☰ 231
LL alarm value	→ ☰ 231
HH alarm	→ ☰ 231
H alarm	→ ☰ 232
HH+H alarm	→ ☰ 232
L alarm	→ ☰ 232
LL alarm	→ ☰ 232
LL+L alarm	→ ☰ 233
Any error	→ ☰ 233
Clear alarm	→ ☰ 233
Alarm hysteresis	→ ☰ 234
Damping factor	→ ☰ 234

Alarm mode**Navigation**

Expert → Application → Alarm → Alarm mode (13864)

Description

Defines the alarm mode of the selected alarm.

Selection

- Off
- On
- Latching

Factory setting

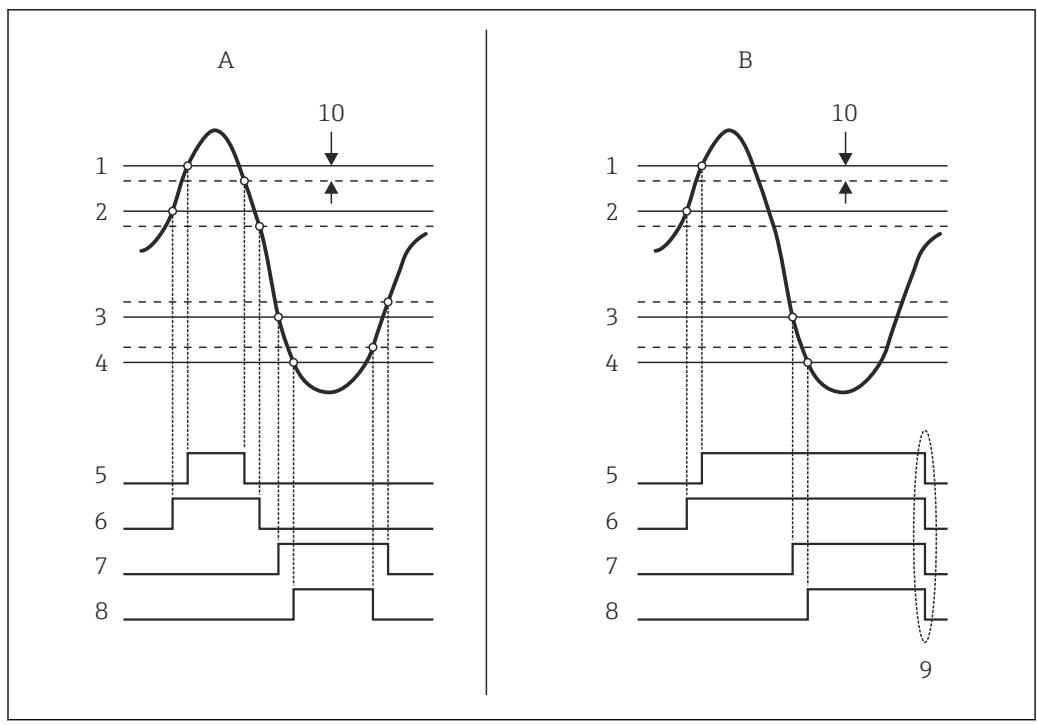
Off

Additional information

Read access	Operator
Write access	Maintenance

Meaning of the options

- **Off**
No alarms are generated.
- **On**
An alarm disappears if the alarm condition is no longer present (taking into consideration the hysteresis).
- **Latching**
All alarms remain active until the user selects **Clear alarm** (→ 233) = Yes or the power is switched off and on.



A0029539

22 Principle of the limit evaluation

- A Alarm mode (\rightarrow 227) = On
- B Alarm mode (\rightarrow 227) = Latching
- 1 HH alarm value (\rightarrow 230)
- 2 H alarm value (\rightarrow 230)
- 3 L alarm value (\rightarrow 231)
- 4 LL alarm value (\rightarrow 231)
- 5 HH alarm (\rightarrow 231)
- 6 H alarm (\rightarrow 232)
- 7 L alarm (\rightarrow 232)
- 8 LL alarm (\rightarrow 232)
- 9 "Clear alarm (\rightarrow 233)" = "Yes" or power off-on
- 10 Hysteresis (\rightarrow 234)

Error value**Navigation**

Expert → Application → Alarm → Alarm → Error value (13851)

PrerequisiteAlarm mode (\rightarrow 227) ≠ Off**Description**

Defines the alarm to be issued if the input value is invalid.

Selection

- No alarm
- HH+H alarm
- H alarm
- L alarm
- LL+L alarm
- All alarms

Factory setting

All alarms

Additional information

Read access	Operator
Write access	Maintenance

Alarm value source

Navigation Expert → Application → Alarm → Alarm source (13866)

Prerequisite **Alarm mode (→ 227) ≠ Off**

Description Determines the process variable to be monitored.

- Selection**
- Tank level
 - Liquid temperature
 - Vapor temperature
 - Water level
 - P1 (bottom)
 - P2 (middle)
 - P3 (top)
 - Observed density value
 - Volume
 - Flow velocity
 - Volume flow
 - Vapor density
 - Middle density
 - Upper density
 - Correction
 - Tank level %
 - GP 1...4 value
 - Measured level
 - P3 position
 - Tank reference height
 - Local gravity
 - P1 position
 - Manual density
 - Tank ullage
 - Average profile density
 - Lower density
 - Upper interface level
 - Lower interface level
 - Bottom level
 - Displacer position
 - HART device 1...15 PV
 - HART device 1...15 SV
 - HART device 1...15 TV
 - HART device 1...15 QV
 - HART device 1...15 PV mA
 - HART device 1...15 PV %
 - Element temperature 1...24
 - AIO B1-3 value
 - AIO C1-3 value
 - AIP B4-8 value
 - AIP C4-8 value
 - None

Factory setting None

Additional information

Read access	Operator
Write access	Maintenance

Alarm value

Navigation

Diagram Expert → Application → Alarm → Alarm value (13863)

Prerequisite

Alarm mode (→ [227](#)) ≠ Off

Description

Shows the current value of the process variable being monitored.

User interface

Signed floating-point number

Factory setting

0 None

Additional information

Read access	Operator
Write access	-

HH alarm value

**Navigation**

Diagram Expert → Application → Alarm → HH alarm value (13855)

Prerequisite

Alarm mode (→ [227](#)) ≠ Off

Description

Defines the high-high(HH) limit value.

User entry

Signed floating-point number

Factory setting

0 None

Additional information

Read access	Operator
Write access	Maintenance

H alarm value

**Navigation**

Diagram Expert → Application → Alarm → H alarm value (13854)

Prerequisite

Alarm mode (→ [227](#)) ≠ Off

Description

Defines the high(H) limit value.

User entry

Signed floating-point number

Factory setting

0 None

Additional information

Read access	Operator
Write access	Maintenance

L alarm value

Navigation Expert → Application → Alarm → Alarm → L alarm value (13853)

Prerequisite **Alarm mode (→ 227) ≠ Off**

Description Defines the low limit value.

User entry Signed floating-point number

Factory setting 0 None

Additional information

Read access	Operator
Write access	Maintenance

LL alarm value

Navigation Expert → Application → Alarm → Alarm → LL alarm value (13852)

Prerequisite **Alarm mode (→ 227) ≠ Off**

Description Defines the low-low(LL) limit value.

User entry Signed floating-point number

Factory setting 0 None

Additional information

Read access	Operator
Write access	Maintenance

HH alarm

Navigation Expert → Application → Alarm → Alarm → HH alarm (13857)

Prerequisite **Alarm mode (→ 227) ≠ Off**

Description Shows whether an HH alarm is currently active.

Additional information

Read access	Operator
Write access	-

H alarm

Navigation   Expert → Application → Alarm → Alarm → H alarm (13856)

Prerequisite **Alarm mode (→  227) ≠ Off**

Description Shows whether an H alarm is currently active.

Additional information

Read access	Operator
Write access	-

HH+H alarm

Navigation   Expert → Application → Alarm → Alarm → HH+H alarm (13858)

Prerequisite **Alarm mode (→  227) ≠ Off**

Description Shows whether an HH or H alarm is currently active.

Additional information

Read access	Operator
Write access	-

L alarm

Navigation   Expert → Application → Alarm → Alarm → L alarm (13859)

Prerequisite **Alarm mode (→  227) ≠ Off**

Description Shows whether an L alarm is currently active.

Additional information

Read access	Operator
Write access	-

LL alarm

Navigation   Expert → Application → Alarm → Alarm → LL alarm (13868)

Prerequisite **Alarm mode (→  227) ≠ Off**

Description Shows whether an LL alarm is currently active.

Additional information

Read access	Operator
Write access	-

LL+L alarm**Navigation**
  Expert → Application → Alarm → LL+L alarm (13869)
Prerequisite**Alarm mode (→  227) ≠ Off****Description**

Shows whether an LL or L alarm is currently active.

Additional information

Read access	Operator
Write access	-

Any error**Navigation**
  Expert → Application → Alarm → Any error (13867)
Prerequisite**Alarm mode (→  227) ≠ Off****Description**

Show whether any alarm is currently active.

User interface

- Unknown
- Inactive
- Active
- Error

Factory setting

Unknown

Additional information

Read access	Operator
Write access	-

Clear alarm**Navigation**
  Expert → Application → Alarm → Clear alarm (13861)
Prerequisite**Alarm mode (→  227) = Latching****Description**

Deletes an alarm which is still active although the alarm condition is no longer present.

Selection

- No
- Yes

Factory setting

No

Additional information

Read access	Operator
Write access	Maintenance

Alarm hysteresis**Navigation**

Diagram: Expert → Application → Alarm → Alarm → Alarm hysteresis (13862)

Prerequisite

Alarm mode (→ 227) ≠ Off

Description

Defines the hysteresis for the limit values. The hysteresis prevents constant changes of the alarm state if the level is near one of the limit values.

User entry

Signed floating-point number

Factory setting

0.001

Additional information

Read access	Maintenance
Write access	Maintenance

Damping factor**Navigation**

Diagram: Expert → Application → Alarm → Alarm → Damping factor (13860)

Description

Defines the damping constant (in seconds).

User entry

0 to 999.9 s

Factory setting

0 s

Additional information

Read access	Operator
Write access	Maintenance

3.6 "Tank values" submenu

Navigation

Expert → Tank values

► Tank values	
► Level	→ 235
► Temperature	→ 239
► Density	→ 242
► Pressure	→ 244
► GP values	→ 245

3.6.1 "Level" submenu

Navigation

Expert → Tank values → Level

► Level	
Tank level	→ 236
Tank Level %	→ 236
Tank ullage	→ 236
Tank ullage %	→ 236
Upper interface level	→ 237
Lower interface level	→ 237
Bottom level	→ 237
Water level	→ 237
Measured level	→ 238
Distance	→ 238

Tank level

Navigation Expert → Tank values → Level → Tank level (14655)**Description**

Shows the distance from the zero position (tank bottom or datum plate) to the product surface.

Additional information

Read access	Operator
Write access	-

Tank Level %

Navigation Expert → Tank values → Level → Tank Level % (14654)**Description**

Shows the level as a percentage of the full measuring range.

Additional information

Read access	Operator
Write access	-

Tank ullage

Navigation Expert → Tank values → Level → Tank ullage (14657)**Description**

Shows the remaining empty space in the tank.

Additional information

Read access	Operator
Write access	-

Tank ullage %

Navigation Expert → Tank values → Level → Tank ullage % (14658)**Description**

Shows the remaining empty space in percentage related to parameter tank reference height.

Additional information

Read access	Operator
Write access	-

Upper interface level

Navigation Expert → Tank values → Level → Upper I/F level (15003)**Description**

Shows measured interface level from zero position (tank bottom or datum plate). Value is updated when device generates a valid Interface measurement.

Additional information

Read access	Maintenance
Write access	-

Lower interface level

Navigation Expert → Tank values → Level → Lower I/F level (15004)**Description**

Shows measured interface level from zero position (tank bottom or datum plate). Value is updated when device generates a valid interface measurement.

Additional information

Read access	Maintenance
Write access	-

Bottom level

Navigation Expert → Tank values → Level → Bottom level (15018)**Description**

Shows the bottom level.

Additional information

Read access	Operator
Write access	-

Water level

Navigation Expert → Tank values → Level → Water level (14970)**Description**

Shows the bottom water level.

Additional information

Read access	Operator
Write access	-

Measured level

Navigation Expert → Tank values → Level → Measured level (14653)**Description**

Shows the measured level without any correction from the tank calculations.

Additional information

Read access	Operator
Write access	-

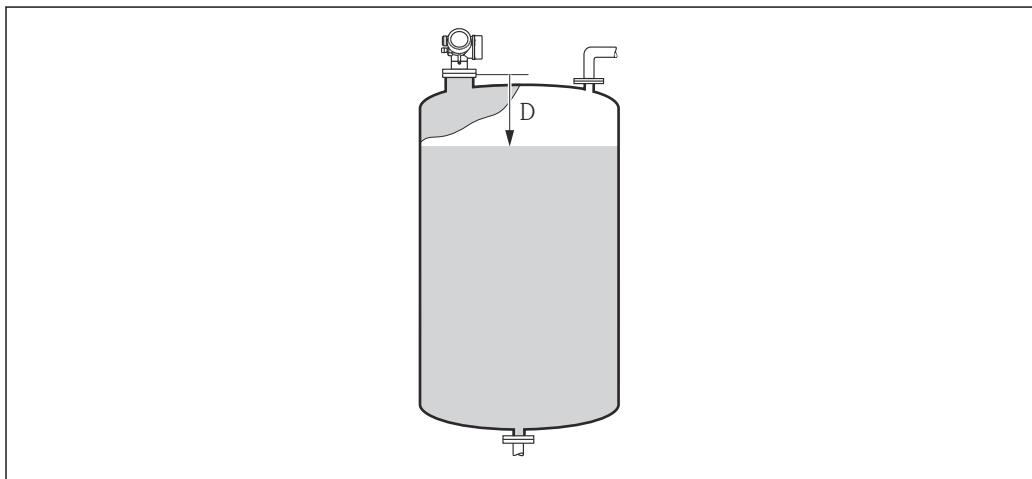
Distance

Navigation Expert → Tank values → Level → Distance (12401)**Description**

Distance from lower edge of device flange to product surface.

Additional information

Read access	Operator
Write access	-

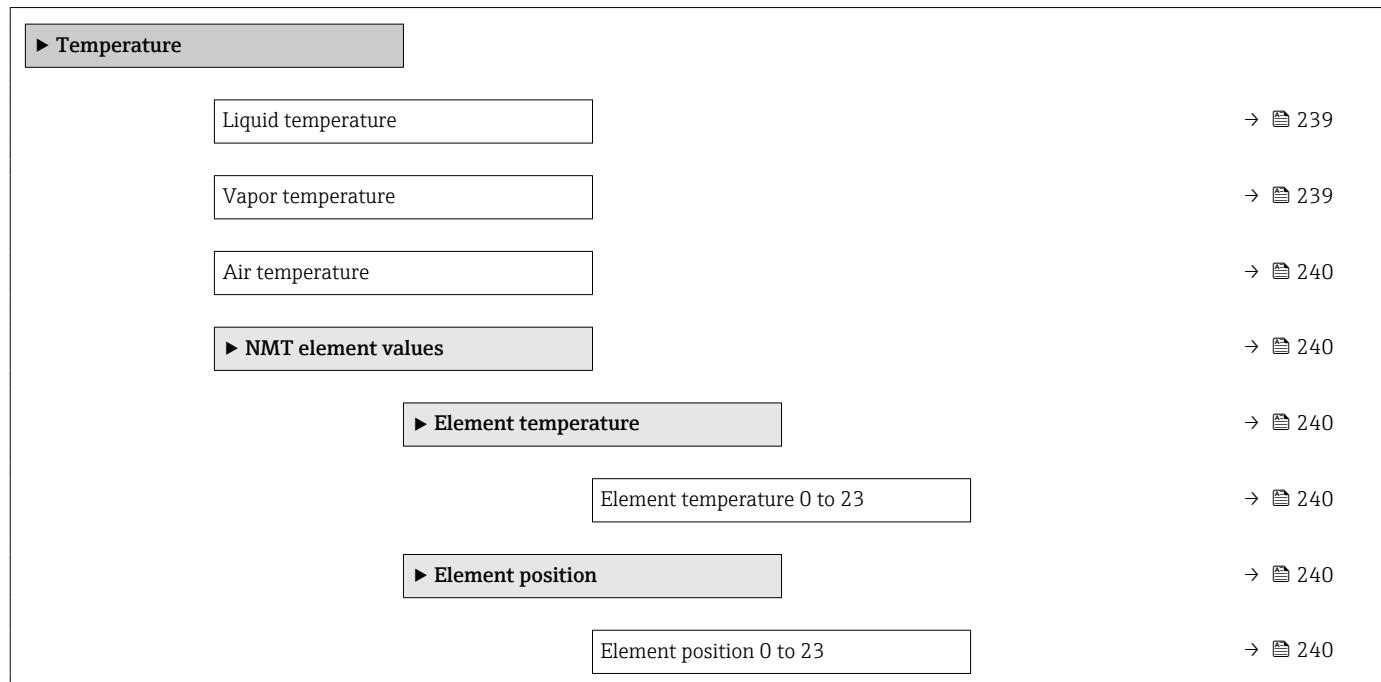


D Distance (→  55)

3.6.2 "Temperature" submenu

Navigation

Expert → Tank values → Temperature



Liquid temperature

Navigation

Expert → Tank values → Temperature → Liquid temp. (14978)

Description

Shows the average or spot temperature of the measured liquid.

Additional information

Read access	Operator
Write access	-

Vapor temperature

Navigation

Expert → Tank values → Temperature → Vapor temp. (14985)

Description

Shows the measured vapor temperature.

Additional information

Read access	Operator
Write access	-

Air temperature

Navigation

Diagram Expert → Tank values → Temperature → Air temp. (14986)

Description

Shows the air temperature.

Additional information

Read access	Operator
Write access	-

"NMT element values" submenu

Navigation Diagram Expert → Tank values → Temperature → NMT elem. values

"Element temperature" submenu

Navigation Diagram Expert → Tank values → Temperature → NMT elem. values
→ Element temp. → Element temp 0 to 23 (14984)

Element temperature 1 to 24

Navigation

Diagram Expert → Tank values → Temperature → NMT elem. values → Element temp.
→ Element temp 1 to 24 (14984-1 to 24)

Description

Shows the temperature of an element in the NMT.

Additional information

Read access	Operator
Write access	-

"Element position" submenu

Navigation Diagram Expert → Tank values → Temperature → NMT elem. values
→ Element position

Element position 1 to 24

Navigation

Diagram Expert → Tank values → Temperature → NMT elem. values → Element position
→ Element pos. 1 to 24 (15014-1 to 24)

Description

Shows the position of the selected element in the NMT.

Additional information

Read access	Operator
Write access	-

3.6.3 "Density" submenu

Navigation

Expert → Tank values → Density

► Density	
Observed density	→ 242
Vapor density	→ 242
Air density	→ 243
Measured upper density	→ 243
Measured middle density	→ 243
Measured lower density	→ 243

Observed density

Navigation

Expert → Tank values → Density → Observed density (13451)

Description

Calculated density of the product.

Additional information

Read access	Operator
Write access	-

 This value is calculated from different measured variables depending on the selected calculation method.

Vapor density



Navigation

Expert → Tank values → Density → Vapor density (14981)

Description

Defines the density of the gas phase in the tank.

User entry

0.0 to 500.0 kg/m³

Factory setting

1.2 kg/m³

Additional information

Read access	Operator
Write access	Maintenance

Air density**Navigation** Expert → Tank values → Density → Air density (14980)**Description** Defines the density of the air surrounding the tank.**User entry** 0.0 to 500.0 kg/m³**Factory setting** 1.2 kg/m³**Additional information**

Read access	Operator
Write access	Maintenance

Measured upper density**Navigation** Expert → Tank values → Density → Meas upper dens. (15001)**Description** Shows the density of the upper phase.**Additional information**

Read access	Operator
Write access	-

Measured middle density**Navigation** Expert → Tank values → Density → Meas middle dens (14997)**Description** Density of the middle phase.**Additional information**

Read access	Operator
Write access	-

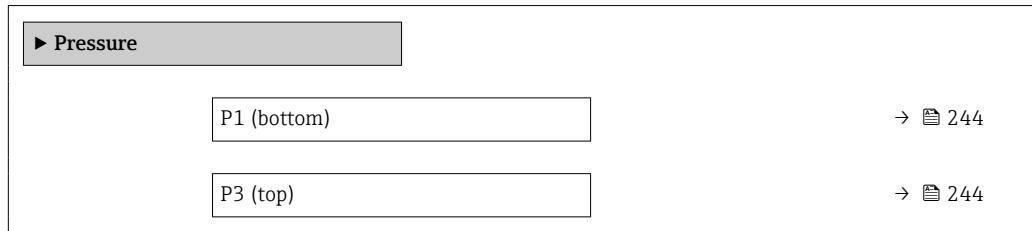
Measured lower density**Navigation** Expert → Tank values → Density → Meas lower dens. (15002)**Description** Density of the lower phase.**Additional information**

Read access	Maintenance
Write access	-

3.6.4 "Pressure" submenu

Navigation

Expert → Tank values → Pressure



P1 (bottom)

Navigation

Expert → Tank values → Pressure → P1 (bottom) (14983)

Description

Shows the pressure at the tank bottom.

Additional information

Read access	Operator
Write access	-

P3 (top)

Navigation

Expert → Tank values → Pressure → P3 (top) (14988)

Description

Shows the pressure (P3) at the top transmitter.

Additional information

Read access	Operator
Write access	-

3.6.5 "GP values" submenu

Navigation

Expert → Tank values → GP values

► GP values	
GP 1 to 4 name	→ 245
GP Value 1	→ 245
GP Value 2	→ 245
GP Value 3	→ 246
GP Value 4	→ 246

GP 1 to 4 name



Navigation

Expert → Tank values → GP values → GP 1 name (14963)

Description

Defines the label associated with the respective GP value.

User entry

Character string comprising numbers, letters and special characters (15)

Factory setting

GP Value 1

Additional information

Read access	Operator
Write access	Maintenance

GP Value 1

Navigation

Expert → Tank values → GP values → GP Value 1 (14966)

Description

Displays the value that will be used as general purpose value.

Additional information

Read access	Operator
Write access	-

GP Value 2

Navigation

Expert → Tank values → GP values → GP Value 2 (14967)

Description

Displays the value that will be used as general purpose value.

Additional information

Read access	Operator
Write access	-

GP Value 3

Navigation Expert → Tank values → GP values → GP Value 3 (14968)**Description**

Displays the value that will be used as general purpose value.

Additional information

Read access	Operator
Write access	-

GP Value 4

Navigation Expert → Tank values → GP values → GP Value 4 (14969)**Description**

Displays the value that will be used as general purpose value.

Additional information

Read access	Operator
Write access	-

3.7 "Diagnostics" submenu

Navigation

Diagram Expert → Diagnostics

► Diagnostics	
Actual diagnostics	→ 249
Timestamp	→ 249
Previous diagnostics	→ 249
Timestamp	→ 250
Operating time from restart	→ 250
Operating time	→ 250
Date/time	→ 251
► Diagnostic list	→ 252
Diagnostics 1 to 5	→ 252
Timestamp 1 to 5	→ 252
► Event logbook	→ 253
Filter options	→ 253
► Simulation	→ 255
Device alarm simulation	→ 255
Diagnostic event simulation	→ 255
Simulation distance on	→ 256
Simulation distance	→ 256
Current output 1 to 2 simulation	→ 256
Simulation value	→ 257
► Device information	→ 258
Device tag	→ 258
Serial number	→ 259

Firmware version	→ 259
Firmware CRC	→ 259
Weight and measures configuration CRC	→ 259
Device name	→ 260
Order code	→ 260
Extended order code 1 to 3	→ 260
ENP version	→ 260
Device type	→ 261
Module type	→ 261
Communication Slot	→ 261
► Board info	→ 262
Date/time	→ 251
System temperature	→ 262
W&M lock switch	→ 262
► Data logging	→ 264
Assign channel 1 to 4	→ 265
Logging interval	→ 266
Clear logging data	→ 267
► Device check	→ 269
Start device check	→ 269
Result device check	→ 269
Level signal	→ 270
Near distance	→ 270
Area of incoupling	→ 270

Actual diagnostics

Navigation
 Expert → Diagnostics → Actual diagnos. (0691)
Description

Shows the current occurred diagnostic event along with its diagnostic information.

Additional information

Read access	Operator
Write access	-

The display consists of:

- Symbol for event behavior
- Code for diagnostic behavior
- Operating time of occurrence
- Event text

 If several messages are active at the same time, the messages with the highest priority is displayed.

 Information on what is causing the message, and remedy measures, can be viewed via the ⓘ symbol on the display.

Timestamp

Navigation
 Expert → Diagnostics → Timestamp (0667)
Description

Displays the timestamp for the currently active diagnostic message.

Additional information

Read access	Operator
Write access	-

Previous diagnostics

Navigation
 Expert → Diagnostics → Prev.diagnostics (0690)
Description

Shows the diagnostic event that occurred prior to the current diagnostic event along with its diagnostic information.

Additional information

Read access	Operator
Write access	-

The display consists of:

- Symbol for event behavior
- Code for diagnostic behavior
- Operating time of occurrence
- Event text

 If several messages are active at the same time, the messages with the highest priority is displayed.

 Information on what is causing the message, and remedy measures, can be viewed via the  symbol on the display.

Timestamp

Navigation

 Expert → Diagnostics → Timestamp (0672)

Description

Shows the timestamp of the previous diagnostic message.

Additional information

Read access	Operator
Write access	-

Operating time from restart

Navigation

  Expert → Diagnostics → Time fr. restart (0653)

Description

Shows the time the device has been in operation since the last device restart.

Additional information

Read access	Operator
Write access	-

Operating time

Navigation

  Expert → Diagnostics → Operating time (0652)

Description

Indicates how long the device has been in operation.

Additional information

Read access	Operator
Write access	-

Date/time

Navigation Expert → Diagnostics → Date/time (0790)**Description**

Displays the device internal real time clock.

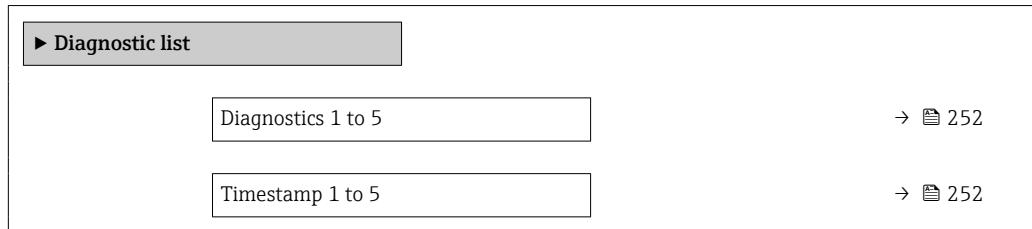
Additional information

Read access	Operator
Write access	-

3.7.1 "Diagnostic list" submenu

Navigation

Expert → Diagnostics → Diagnostic list



Diagnostics 1 to 5

Navigation

Expert → Diagnostics → Diagnostic list → Diagnostics 1 to 5 (0692–1 to 5)

Description

Displays the currently active diagnostic message with the highest priority.

Additional information

The display consists of:

- Symbol for event behavior
- Code for diagnostic behavior
- Operating time of occurrence
- Event text

Timestamp 1 to 5

Navigation

Expert → Diagnostics → Diagnostic list → Timestamp 1 to 5 (0683–1 to 5)

Description

Timestamp of the diagnostic message.

Additional information

Read access	Operator
Write access	-

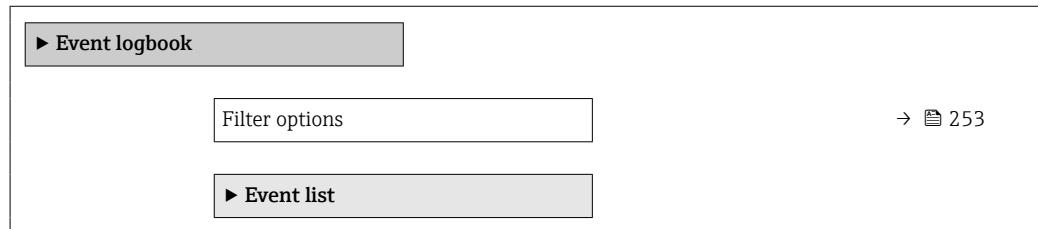
3.7.2 "Event logbook" submenu

Structure of the submenu on the local display

Navigation



Expert → Diagnostics → Event logbook



Description of parameters

Navigation



Expert → Diagnostics → Event logbook

Filter options



Navigation



Expert → Diagnostics → Event logbook → Filter options (0705)

Description

Define which category of event messages is shown in the Events list submenu.

Selection

- All
- Failure (F)
- Function check (C)
- Out of specification (S)
- Maintenance required (M)
- Information (I)
- Not categorized

Factory setting

All

Additional information



- This parameter is only used for operation via the local display.
- The status signals are categorized according to NAMUR NE 107.

Read access	Operator
Write access	Maintenance

"Event list" submenu

The **Event list** submenu (→ 253) is only available when operating via the local display.

The **Event list** submenu doesn't contain any parameters but only the list of events of the category selected in the **Filter options** parameter. A maximum of 100 event messages is displayed in chronological order.

The following status symbols indicate, whether an event has appeared or disappeared at the time stated:

- : Event appeared
- : Event disappeared

 Remedy measures concerning the cause of the message can be called up via the  symbol on the display.

Navigation



Expert → Diagnostics → Event logbook → Event list

3.7.3 "Simulation" submenu

Navigation

Expert → Diagnostics → Simulation

▶ Simulation	
Device alarm simulation	→ 255
Diagnostic event simulation	→ 255
Simulation distance on	→ 256
Simulation distance	→ 256
Current output 1 to 2 simulation	→ 256
Simulation value	→ 257

Device alarm simulation



Navigation

Expert → Diagnostics → Simulation → Dev. alarm sim. (0654)

Description

Switch the device alarm on and off.

Selection

- Off
- On

Factory setting

Off

Additional information

Read access	Operator
Write access	Maintenance

Diagnostic event simulation



Navigation

Expert → Diagnostics → Simulation → Diag. event sim. (0737)

Description

Select a diagnostic event to simulate this event.

Selection

The diagnostic events of the device

Factory setting

Off

Additional information

Read access	Operator
Write access	Maintenance

 To terminate the simulation, select **Off**.

Simulation distance on**Navigation**

  Expert → Diagnostics → Simulation → Sim distance on (12475)

Description

Switches the distance simulation on or off.

Selection

- Off
- On

Factory setting

Off

Additional information

Read access	Operator
Write access	Maintenance

Simulation distance**Navigation**

  Expert → Diagnostics → Simulation → Sim distance (12476)

Prerequisite

Simulation distance on (→  256) = On

Description

Defines the distance value to be simulated.

User entry

Signed floating-point number

Factory setting

0 mm

Additional information

Read access	Operator
Write access	Maintenance

Current output N simulation**Navigation**

  Expert → Diagnostics → Simulation → Curr.outp N sim. (13985)

Prerequisite

- The device has an Anlog I/O module.
- **Operating mode (→  124) = 4..20mA output or HART slave +4..20mA output**

Description

Switches the simulation of the current on or off.

Selection

- Off
- On

Factory setting

Off

Additional information

Read access	Operator
Write access	Maintenance

Simulation value



Navigation

Diagram: Expert → Diagnostics → Simulation → Simulation value (13976)

Prerequisite

Current output simulation (→ 256) = On

Description

Defines the current to be simulated.

User entry

3.4 to 23 mA

Factory setting

The current at the time the simulation was started.

Additional information

Read access	Operator
Write access	Maintenance

3.7.4 "Device information" submenu

Navigation

Expert → Diagnostics → Device info

► Device information	
Device tag	→ 258
Serial number	→ 259
Firmware version	→ 259
Firmware CRC	→ 259
Weight and measures configuration CRC	→ 259
Device name	→ 260
Order code	→ 260
Extended order code 1 to 3	→ 260
ENP version	→ 260
Device type	→ 261
Module type	→ 261
Communication Slot	→ 261
► Board info	

Device tag

Navigation

Expert → Diagnostics → Device info → Device tag (0011)

Description

Shows the device tag.

User interface

Character string comprising numbers, letters and special characters

Factory setting

- none -

Additional information

Read access	Operator
Write access	-

Serial number

Navigation Expert → Diagnostics → Device info → Serial number (0009)**Description**

The serial number is a unique alphanumerical code identifying the device.
It is printed on the nameplate.
In combination with the Operations app it allows to access all device related documentation.

Additional information

Read access	Operator
Write access	-

Firmware version

Navigation Expert → Diagnostics → Device info → Firmware version (0010)**Description**

Displays the device firmware version installed.

Additional information

Read access	Operator
Write access	-

Firmware CRC

Navigation Expert → Diagnostics → Device info → Firmware CRC (8563)**Description**

Result of the cyclic redundancy check of the firmware.

Additional information

Read access	Operator
Write access	-

Weight and measures configuration CRC

Navigation Expert → Diagnostics → Device info → W&M config CRC (8564)**Description**

Result of the cyclic redundancy check of the weights and measure relevant parameters.

Additional information

Read access	Operator
Write access	-

Device name**Navigation**  Expert → Diagnostics → Device info → Device name (0013)**Description**

Use this function to display the device name. It can also be found on the nameplate.

Additional information

Read access	Operator
Write access	-

Order code**Navigation**  Expert → Diagnostics → Device info → Order code (0008)**Description**

Shows the device order code.

Additional information

Read access	Operator
Write access	Service

Extended order code 1 to 3**Navigation**  Expert → Diagnostics → Device info → Ext. order cd. 1 (0023)**Description**

Display the three parts of the extended order code.

User interface

Character string comprising numbers, letters and special characters

Additional information

Read access	Operator
Write access	Service

The extended order code indicates the selected option of all ordering features and thus uniquely identifies the device.

ENP version**Navigation**  Expert → Diagnostics → Device info → ENP version (0012)**Description**

Shows the version of the electronic nameplate (ENP).

Additional information

Read access	Operator
Write access	-

Device type

Navigation  Expert → Diagnostics → Device info → Device type (8561)**Description** Displays the device type.**Additional information**

Read access	Operator
Write access	-

Module type

Navigation  Expert → Diagnostics → Device info → Module type (8526)**Description** Shows the type of installed IO module.**Additional information**

Read access	Operator
Write access	-

Communication Slot

Navigation  Expert → Diagnostics → Device info → Comm. Slot (13285)**Description** Indicates which IOM slot contains the communication protocol interface board.**Additional information**

Read access	Operator
Write access	-

"Board info" submenu**Navigation**

[Diagram] Expert → Diagnostics → Device info → Board info

► Board info	
Date/time	→ [Diagram] 262
System temperature	→ [Diagram] 262
W&M lock switch	→ [Diagram] 262

Date/time**Navigation**

[Diagram] Expert → Diagnostics → Device info → Board info → Date/time (0790)

Description

Displays the device internal real time clock.

Additional information

Read access	Operator
Write access	-

System temperature**Navigation**

[Diagram] Expert → Diagnostics → Device info → Board info → System temp. (8553)

Description

Shows the electronic temperature of the main board.

User interface

Signed floating-point number

Factory setting

0 °C

Additional information

Read access	Operator
Write access	-

W&M lock switch**Navigation**

[Diagram] Expert → Diagnostics → Device info → Board info → W&M lock switch (8558)

Description

Shows the position of the weights and measure (WP) switch.

User interface

- Enabled
- Disabled

Factory setting Enabled

Additional information

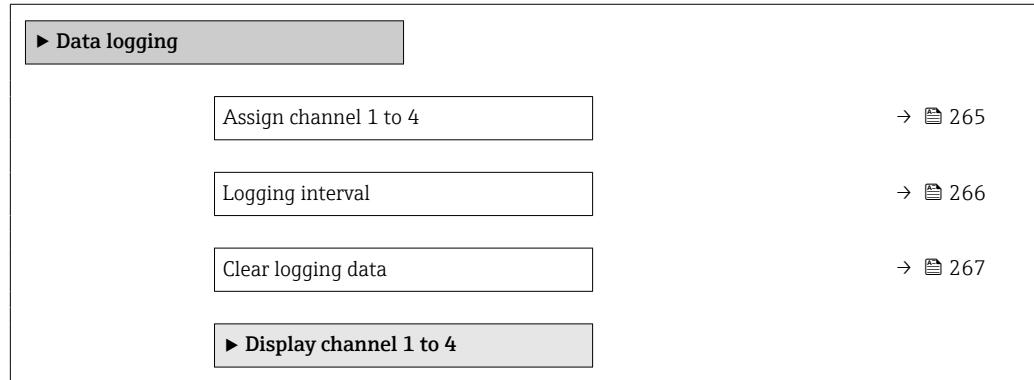
Read access	Operator
Write access	-

3.7.5 "Data logging" submenu

Structure of the submenu on the local display

Navigation

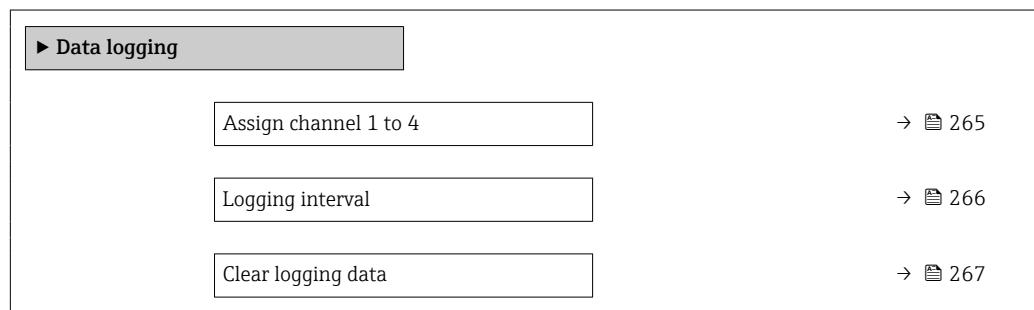
☰ ☰ Expert → Diagnostics → Data logging



Structure of the submenu in an operating tool

Navigation

☰ ☰ Expert → Diagnostics → Data logging



Description of parameters

Navigation

Expert → Diagnostics → Data logging

Assign channel 1 to 4



Navigation

Expert → Diagnostics → Data logging → Assign chan. 1 (0851)

Description

Assign a process variable to logging channel.

Selection

- Off
- Tank level
- Measured level
- Tank level %
- Distance
- Water level
- Upper interface level
- Lower interface level
- Displacer position *
- Upper density
- Middle density
- Lower density
- Bottom level
- Average profile density *
- Liquid temperature
- Vapor temperature
- Air temperature
- Tank ullage
- Tank ullage %
- Observed density value
- P1 (bottom)
- P2 (middle)
- P3 (top)
- GP 1 value
- GP 2 value
- GP 3 value
- GP 4 value
- AIO B1-3 value *
- AIO B1-3 value mA *
- AIO B1-3 value % *
- AIO C1-3 value *
- AIO C1-3 value mA *
- AIO C1-3 value % *
- AIP B4-8 value *
- AIP C4-8 value *
- Absolute echo amplitude *
- Amplitude eval distance *
- DiffPhase *

Factory setting

Off

* Visibility depends on order options or device settings

Additional information

A total of 1000 measured values can be logged. This means:

- 1000 data points if 1 logging channel is used
- 500 data points if 2 logging channels are used
- 333 data points if 3 logging channels are used
- 250 data points if 4 logging channels are used

If the maximum number of data points is reached, the oldest data points in the data log are cyclically overwritten in such a way that the last 1000, 500, 333 or 250 measured values are always in the log (ring memory principle).

 The logged data are deleted if a new option is selected in this parameter.

Read access	Operator
Write access	Maintenance

Logging interval**Navigation**

-  Expert → Diagnostics → Data logging → Logging interval (0856)
-  Expert → Diagnostics → Data logging → Logging interval (0856)

Description

Define the logging interval t_{\log} for data logging. This value defines the time interval between the individual data points in the memory.

User entry

1.0 to 3 600.0 s

Factory setting

10.0 s

Additional information

This parameter defines the interval between the individual data points in the data log, and thus the maximum loggable process time T_{\log} :

- If 1 logging channel is used: $T_{\log} = 1000 \cdot t_{\log}$
- If 2 logging channels are used: $T_{\log} = 500 \cdot t_{\log}$
- If 3 logging channels are used: $T_{\log} = 333 \cdot t_{\log}$
- If 4 logging channels are used: $T_{\log} = 250 \cdot t_{\log}$

Once this time elapses, the oldest data points in the data log are cyclically overwritten such that a time of T_{\log} always remains in the memory (ring memory principle).

 The logged data are deleted if this parameter is changed.

*Example***When using 1 logging channel**

- $T_{\log} = 1000 \cdot 1 \text{ s} = 1000 \text{ s} \approx 16.5 \text{ min}$
- $T_{\log} = 1000 \cdot 10 \text{ s} = 1000 \text{ s} \approx 2.75 \text{ h}$
- $T_{\log} = 1000 \cdot 80 \text{ s} = 80000 \text{ s} \approx 22 \text{ h}$
- $T_{\log} = 1000 \cdot 3600 \text{ s} = 3600000 \text{ s} \approx 41 \text{ d}$

Read access	Operator
Write access	Maintenance

Clear logging data

- Navigation**
- Expert → Diagnostics → Data logging → Clear logging (0855)
 - Expert → Diagnostics → Data logging → Clear logging (0855)

Description Clear the entire logging data.

Selection

- Cancel
- Clear data

Factory setting Cancel

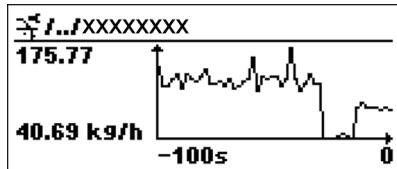
Additional information

Read access	Operator
Write access	Maintenance

"Display channel 1 to 4" submenu

i The **Display channel 1 to 4** submenu is only available when operating via the local display. When operating via FieldCare, the diagram can be displayed in the "Event List / HistoROM" function.

The **Display channel 1 to 4** submenu displays the measured value trend of the respective logging channel.



- x-axis: displays 125 to 500 measured values of a process variable (the number of values depending on the number of selected channels).
- y-axis: displays the approximate measured value span and constantly adapts this to the ongoing measurement.

i To quit the diagram and to return to the operating menu, press **⊕** and **⊖** simultaneously.

Navigation



Expert → Diagnostics → Data logging → Displ.channel 1 to 4

3.7.6 "Device check" submenu

Navigation

Expert → Diagnostics → Device check

▶ Device check	
Start device check	→ 269
Result device check	→ 269
Level signal	→ 270
Near distance	→ 270
Area of incoupling	→ 270

Start device check



Navigation

Expert → Diagnostics → Device check → Start dev. check (12481)

Description

Starts the device check.

Selection

- No
- Yes

Factory setting

No

Additional information

Read access	Operator
Write access	Maintenance

Result device check

Navigation

Expert → Diagnostics → Device check → Result dev.check (12482)

Description

Shows the overall result of the device check.

Additional information

Read access	Operator
Write access	-

The device has a function that detects and reports any interference by unfavorable installation situation. Here, the amplitudes of measured signals are monitored, which refer to interference in the near range.

Level signal

Navigation   Expert → Diagnostics → Device check → Level signal (12483)

Prerequisite Only visible after a device check.

Description Shows the result of the device check for the level signal.

Additional information

Read access	Operator
Write access	-

Near distance

Navigation   Expert → Diagnostics → Device check → Near distance (12484)

Prerequisite Only visible after a device check

Description Shows the result of the device check for the near distance area.

Additional information

Read access	Operator
Write access	-

Area of incoupling

Navigation   Expert → Diagnostics → Device check → Area incoupling (12525)

Description Shows the ringing area for build up detection.

Additional information

Read access	Operator
Write access	-

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- #blank# (Submenu) 112

0 ... 9

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Tank level to NMT (14750)	93	Distance unit (Parameter)	38																																																																																																																																																																																								
Tank reference height (14603)	184	Document																																																																																																																																																																																									
Tank ullage (14657)	236	Function	4	Tank ullage % (14658)	236	Document function	4	Temperature (14725)	92	E		Temperature 0% (13215)	150	Echo tracking (Submenu)	78, 79	Temperature 100% (13216)	150	Element interval (Parameter)	105	Temperature element open (14732)	103	Element position (Parameter)	107, 111	Temperature element short (14731)	103	Element position (Submenu)	97, 240	Temperature offset after conversion (14025)	119	Element position 1 to 24 (Parameter)	97, 240	Temperature unit (0557)	38	Element setup (Submenu)	106, 110	Tertiary variable (TV) (0228)	175	Element temperature (Parameter)	107, 111	Test resistance (14752)	100	Element temperature (Submenu)	97, 240	Thermocouple type (14008)	116	Element temperature 1 to 24 (Parameter)	97, 240	Timestamp (0667)	249	Element values (Submenu)	97	Timestamp (0672)	250	Empty (Parameter)	183	Timestamp 1 to 5 (0683-1 to 5)	252	End map. ampl. (Parameter)	76	Total no. element (14730)	102, 108	End of mapping (Parameter)	76	Units preset (0605)	37	ENP version (Parameter)	260	Update water level (14751)	105, 110	Enter access code (Parameter)	28	Upper density input source (15006)	192	Error event type (Parameter)	132	Upper interface level (15003)	185, 237	Error on event (Parameter)	128, 140	Used calculation (12488)	57	Error value (Parameter)	128, 228	Used for SIL/WHG		Evaluation mode (Parameter)	79	Digital Xx-x (13910)	141	Event list (Submenu)	253	Used for SIL/WHG (13980)	134	Event logbook (Submenu)	253	User 0% (13221)	152	Expected SIL/WHG chain (Parameter)	135	User 100% (13222)	152	Expert (Menu)	7, 26	User role (0005)	27	Extended order code 1 (Parameter)	260	User value 1 to 8 source (13209-1 to 8)	154, 162	F		V1 address (13235)	159	Failure mode (Parameter)	127	V1 address (13236)	160	Feedback threshold (Parameter)	131	Value 1 display (0107)	32	Filter options (Parameter)	253	Value percent selector (13282)	167	Filter options (Submenu)	59, 60	Vapor density (14981)	192, 242	Firmware CRC (Parameter)	96, 259	Vapor temp source (14973)	189	Firmware version (Parameter)	259	Vapor temperature (14727)	92	Fixed current (Parameter)	126	Vapor temperature (14985)	190, 239	Float swap mode (Parameter)	146	W&M lock switch (8558)	262	Forget device (Parameter)	112	Water bottom level offset (14757)	109	Forget device (Wizard)	112	Water density (13757)	194, 221	Format display (Parameter)	31	Water level (14717)	93	Found echoes (Parameter)	56	Water level (14970)	185, 237	G		Water level source (14971)	185	Gain adjust (Parameter)	104	WB frequency ratio (14753)	100	Gauge current (Parameter)	122	Weight and measures configuration CRC (8564)	259	GP 1 name (Parameter)	204, 245	Wire expansion coefficient (13656)	215			Word type (13208)	147			Year (0782)	45, 48		
Function	4																																																																																																																																																																																										
Tank ullage % (14658)	236	Document function	4	Temperature (14725)	92	E		Temperature 0% (13215)	150	Echo tracking (Submenu)	78, 79	Temperature 100% (13216)	150	Element interval (Parameter)	105	Temperature element open (14732)	103	Element position (Parameter)	107, 111	Temperature element short (14731)	103	Element position (Submenu)	97, 240	Temperature offset after conversion (14025)	119	Element position 1 to 24 (Parameter)	97, 240	Temperature unit (0557)	38	Element setup (Submenu)	106, 110	Tertiary variable (TV) (0228)	175	Element temperature (Parameter)	107, 111	Test resistance (14752)	100	Element temperature (Submenu)	97, 240	Thermocouple type (14008)	116	Element temperature 1 to 24 (Parameter)	97, 240	Timestamp (0667)	249	Element values (Submenu)	97	Timestamp (0672)	250	Empty (Parameter)	183	Timestamp 1 to 5 (0683-1 to 5)	252	End map. ampl. (Parameter)	76	Total no. element (14730)	102, 108	End of mapping (Parameter)	76	Units preset (0605)	37	ENP version (Parameter)	260	Update water level (14751)	105, 110	Enter access code (Parameter)	28	Upper density input source (15006)	192	Error event type (Parameter)	132	Upper interface level (15003)	185, 237	Error on event (Parameter)	128, 140	Used calculation (12488)	57	Error value (Parameter)	128, 228	Used for SIL/WHG		Evaluation mode (Parameter)	79	Digital Xx-x (13910)	141	Event list (Submenu)	253	Used for SIL/WHG (13980)	134	Event logbook (Submenu)	253	User 0% (13221)	152	Expected SIL/WHG chain (Parameter)	135	User 100% (13222)	152	Expert (Menu)	7, 26	User role (0005)	27	Extended order code 1 (Parameter)	260	User value 1 to 8 source (13209-1 to 8)	154, 162	F		V1 address (13235)	159	Failure mode (Parameter)	127	V1 address (13236)	160	Feedback threshold (Parameter)	131	Value 1 display (0107)	32	Filter options (Parameter)	253	Value percent selector (13282)	167	Filter options (Submenu)	59, 60	Vapor density (14981)	192, 242	Firmware CRC (Parameter)	96, 259	Vapor temp source (14973)	189	Firmware version (Parameter)	259	Vapor temperature (14727)	92	Fixed current (Parameter)	126	Vapor temperature (14985)	190, 239	Float swap mode (Parameter)	146	W&M lock switch (8558)	262	Forget device (Parameter)	112	Water bottom level offset (14757)	109	Forget device (Wizard)	112	Water density (13757)	194, 221	Format display (Parameter)	31	Water level (14717)	93	Found echoes (Parameter)	56	Water level (14970)	185, 237	G		Water level source (14971)	185	Gain adjust (Parameter)	104	WB frequency ratio (14753)	100	Gauge current (Parameter)	122	Weight and measures configuration CRC (8564)	259	GP 1 name (Parameter)	204, 245	Wire expansion coefficient (13656)	215			Word type (13208)	147			Year (0782)	45, 48						
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Temperature (14725)	92	E																																																																																																																																																																																									
Temperature 0% (13215)	150	Echo tracking (Submenu)	78, 79	Temperature 100% (13216)	150	Element interval (Parameter)	105	Temperature element open (14732)	103	Element position (Parameter)	107, 111	Temperature element short (14731)	103	Element position (Submenu)	97, 240	Temperature offset after conversion (14025)	119	Element position 1 to 24 (Parameter)	97, 240	Temperature unit (0557)	38	Element setup (Submenu)	106, 110	Tertiary variable (TV) (0228)	175	Element temperature (Parameter)	107, 111	Test resistance (14752)	100	Element temperature (Submenu)	97, 240	Thermocouple type (14008)	116	Element temperature 1 to 24 (Parameter)	97, 240	Timestamp (0667)	249	Element values (Submenu)	97	Timestamp (0672)	250	Empty (Parameter)	183	Timestamp 1 to 5 (0683-1 to 5)	252	End map. ampl. (Parameter)	76	Total no. element (14730)	102, 108	End of mapping (Parameter)	76	Units preset (0605)	37	ENP version (Parameter)	260	Update water level (14751)	105, 110	Enter access code (Parameter)	28	Upper density input source (15006)	192	Error event type (Parameter)	132	Upper interface level (15003)	185, 237	Error on event (Parameter)	128, 140	Used calculation (12488)	57	Error value (Parameter)	128, 228	Used for SIL/WHG		Evaluation mode (Parameter)	79	Digital Xx-x (13910)	141	Event list (Submenu)	253	Used for SIL/WHG (13980)	134	Event logbook (Submenu)	253	User 0% (13221)	152	Expected SIL/WHG chain (Parameter)	135	User 100% (13222)	152	Expert (Menu)	7, 26	User role (0005)	27	Extended order code 1 (Parameter)	260	User value 1 to 8 source (13209-1 to 8)	154, 162	F		V1 address (13235)	159	Failure mode (Parameter)	127	V1 address (13236)	160	Feedback threshold (Parameter)	131	Value 1 display (0107)	32	Filter options (Parameter)	253	Value percent selector (13282)	167	Filter options (Submenu)	59, 60	Vapor density (14981)	192, 242	Firmware CRC (Parameter)	96, 259	Vapor temp source (14973)	189	Firmware version (Parameter)	259	Vapor temperature (14727)	92	Fixed current (Parameter)	126	Vapor temperature (14985)	190, 239	Float swap mode (Parameter)	146	W&M lock switch (8558)	262	Forget device (Parameter)	112	Water bottom level offset (14757)	109	Forget device (Wizard)	112	Water density (13757)	194, 221	Format display (Parameter)	31	Water level (14717)	93	Found echoes (Parameter)	56	Water level (14970)	185, 237	G		Water level source (14971)	185	Gain adjust (Parameter)	104	WB frequency ratio (14753)	100	Gauge current (Parameter)	122	Weight and measures configuration CRC (8564)	259	GP 1 name (Parameter)	204, 245	Wire expansion coefficient (13656)	215			Word type (13208)	147			Year (0782)	45, 48														
Echo tracking (Submenu)	78, 79																																																																																																																																																																																										
Temperature 100% (13216)	150	Element interval (Parameter)	105	Temperature element open (14732)	103	Element position (Parameter)	107, 111	Temperature element short (14731)	103	Element position (Submenu)	97, 240	Temperature offset after conversion (14025)	119	Element position 1 to 24 (Parameter)	97, 240	Temperature unit (0557)	38	Element setup (Submenu)	106, 110	Tertiary variable (TV) (0228)	175	Element temperature (Parameter)	107, 111	Test resistance (14752)	100	Element temperature (Submenu)	97, 240	Thermocouple type (14008)	116	Element temperature 1 to 24 (Parameter)	97, 240	Timestamp (0667)	249	Element values (Submenu)	97	Timestamp (0672)	250	Empty (Parameter)	183	Timestamp 1 to 5 (0683-1 to 5)	252	End map. ampl. (Parameter)	76	Total no. element (14730)	102, 108	End of mapping (Parameter)	76	Units preset (0605)	37	ENP version (Parameter)	260	Update water level (14751)	105, 110	Enter access code (Parameter)	28	Upper density input source (15006)	192	Error event type (Parameter)	132	Upper interface level (15003)	185, 237	Error on event (Parameter)	128, 140	Used calculation (12488)	57	Error value (Parameter)	128, 228	Used for SIL/WHG		Evaluation mode (Parameter)	79	Digital Xx-x (13910)	141	Event list (Submenu)	253	Used for SIL/WHG (13980)	134	Event logbook (Submenu)	253	User 0% (13221)	152	Expected SIL/WHG chain (Parameter)	135	User 100% (13222)	152	Expert (Menu)	7, 26	User role (0005)	27	Extended order code 1 (Parameter)	260	User value 1 to 8 source (13209-1 to 8)	154, 162	F		V1 address (13235)	159	Failure mode (Parameter)	127	V1 address (13236)	160	Feedback threshold (Parameter)	131	Value 1 display (0107)	32	Filter options (Parameter)	253	Value percent selector (13282)	167	Filter options (Submenu)	59, 60	Vapor density (14981)	192, 242	Firmware CRC (Parameter)	96, 259	Vapor temp source (14973)	189	Firmware version (Parameter)	259	Vapor temperature (14727)	92	Fixed current (Parameter)	126	Vapor temperature (14985)	190, 239	Float swap mode (Parameter)	146	W&M lock switch (8558)	262	Forget device (Parameter)	112	Water bottom level offset (14757)	109	Forget device (Wizard)	112	Water density (13757)	194, 221	Format display (Parameter)	31	Water level (14717)	93	Found echoes (Parameter)	56	Water level (14970)	185, 237	G		Water level source (14971)	185	Gain adjust (Parameter)	104	WB frequency ratio (14753)	100	Gauge current (Parameter)	122	Weight and measures configuration CRC (8564)	259	GP 1 name (Parameter)	204, 245	Wire expansion coefficient (13656)	215			Word type (13208)	147			Year (0782)	45, 48																		
Element interval (Parameter)	105																																																																																																																																																																																										
Temperature element open (14732)	103	Element position (Parameter)	107, 111	Temperature element short (14731)	103	Element position (Submenu)	97, 240	Temperature offset after conversion (14025)	119	Element position 1 to 24 (Parameter)	97, 240	Temperature unit (0557)	38	Element setup (Submenu)	106, 110	Tertiary variable (TV) (0228)	175	Element temperature (Parameter)	107, 111	Test resistance (14752)	100	Element temperature (Submenu)	97, 240	Thermocouple type (14008)	116	Element temperature 1 to 24 (Parameter)	97, 240	Timestamp (0667)	249	Element values (Submenu)	97	Timestamp (0672)	250	Empty (Parameter)	183	Timestamp 1 to 5 (0683-1 to 5)	252	End map. ampl. (Parameter)	76	Total no. element (14730)	102, 108	End of mapping (Parameter)	76	Units preset (0605)	37	ENP version (Parameter)	260	Update water level (14751)	105, 110	Enter access code (Parameter)	28	Upper density input source (15006)	192	Error event type (Parameter)	132	Upper interface level (15003)	185, 237	Error on event (Parameter)	128, 140	Used calculation (12488)	57	Error value (Parameter)	128, 228	Used for SIL/WHG		Evaluation mode (Parameter)	79	Digital Xx-x (13910)	141	Event list (Submenu)	253	Used for SIL/WHG (13980)	134	Event logbook (Submenu)	253	User 0% (13221)	152	Expected SIL/WHG chain (Parameter)	135	User 100% (13222)	152	Expert (Menu)	7, 26	User role (0005)	27	Extended order code 1 (Parameter)	260	User value 1 to 8 source (13209-1 to 8)	154, 162	F		V1 address (13235)	159	Failure mode (Parameter)	127	V1 address (13236)	160	Feedback threshold (Parameter)	131	Value 1 display (0107)	32	Filter options (Parameter)	253	Value percent selector (13282)	167	Filter options (Submenu)	59, 60	Vapor density (14981)	192, 242	Firmware CRC (Parameter)	96, 259	Vapor temp source (14973)	189	Firmware version (Parameter)	259	Vapor temperature (14727)	92	Fixed current (Parameter)	126	Vapor temperature (14985)	190, 239	Float swap mode (Parameter)	146	W&M lock switch (8558)	262	Forget device (Parameter)	112	Water bottom level offset (14757)	109	Forget device (Wizard)	112	Water density (13757)	194, 221	Format display (Parameter)	31	Water level (14717)	93	Found echoes (Parameter)	56	Water level (14970)	185, 237	G		Water level source (14971)	185	Gain adjust (Parameter)	104	WB frequency ratio (14753)	100	Gauge current (Parameter)	122	Weight and measures configuration CRC (8564)	259	GP 1 name (Parameter)	204, 245	Wire expansion coefficient (13656)	215			Word type (13208)	147			Year (0782)	45, 48																						
Element position (Parameter)	107, 111																																																																																																																																																																																										
Temperature element short (14731)	103	Element position (Submenu)	97, 240	Temperature offset after conversion (14025)	119	Element position 1 to 24 (Parameter)	97, 240	Temperature unit (0557)	38	Element setup (Submenu)	106, 110	Tertiary variable (TV) (0228)	175	Element temperature (Parameter)	107, 111	Test resistance (14752)	100	Element temperature (Submenu)	97, 240	Thermocouple type (14008)	116	Element temperature 1 to 24 (Parameter)	97, 240	Timestamp (0667)	249	Element values (Submenu)	97	Timestamp (0672)	250	Empty (Parameter)	183	Timestamp 1 to 5 (0683-1 to 5)	252	End map. ampl. (Parameter)	76	Total no. element (14730)	102, 108	End of mapping (Parameter)	76	Units preset (0605)	37	ENP version (Parameter)	260	Update water level (14751)	105, 110	Enter access code (Parameter)	28	Upper density input source (15006)	192	Error event type (Parameter)	132	Upper interface level (15003)	185, 237	Error on event (Parameter)	128, 140	Used calculation (12488)	57	Error value (Parameter)	128, 228	Used for SIL/WHG		Evaluation mode (Parameter)	79	Digital Xx-x (13910)	141	Event list (Submenu)	253	Used for SIL/WHG (13980)	134	Event logbook (Submenu)	253	User 0% (13221)	152	Expected SIL/WHG chain (Parameter)	135	User 100% (13222)	152	Expert (Menu)	7, 26	User role (0005)	27	Extended order code 1 (Parameter)	260	User value 1 to 8 source (13209-1 to 8)	154, 162	F		V1 address (13235)	159	Failure mode (Parameter)	127	V1 address (13236)	160	Feedback threshold (Parameter)	131	Value 1 display (0107)	32	Filter options (Parameter)	253	Value percent selector (13282)	167	Filter options (Submenu)	59, 60	Vapor density (14981)	192, 242	Firmware CRC (Parameter)	96, 259	Vapor temp source (14973)	189	Firmware version (Parameter)	259	Vapor temperature (14727)	92	Fixed current (Parameter)	126	Vapor temperature (14985)	190, 239	Float swap mode (Parameter)	146	W&M lock switch (8558)	262	Forget device (Parameter)	112	Water bottom level offset (14757)	109	Forget device (Wizard)	112	Water density (13757)	194, 221	Format display (Parameter)	31	Water level (14717)	93	Found echoes (Parameter)	56	Water level (14970)	185, 237	G		Water level source (14971)	185	Gain adjust (Parameter)	104	WB frequency ratio (14753)	100	Gauge current (Parameter)	122	Weight and measures configuration CRC (8564)	259	GP 1 name (Parameter)	204, 245	Wire expansion coefficient (13656)	215			Word type (13208)	147			Year (0782)	45, 48																										
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Temperature offset after conversion (14025)	119	Element position 1 to 24 (Parameter)	97, 240	Temperature unit (0557)	38	Element setup (Submenu)	106, 110	Tertiary variable (TV) (0228)	175	Element temperature (Parameter)	107, 111	Test resistance (14752)	100	Element temperature (Submenu)	97, 240	Thermocouple type (14008)	116	Element temperature 1 to 24 (Parameter)	97, 240	Timestamp (0667)	249	Element values (Submenu)	97	Timestamp (0672)	250	Empty (Parameter)	183	Timestamp 1 to 5 (0683-1 to 5)	252	End map. ampl. (Parameter)	76	Total no. element (14730)	102, 108	End of mapping (Parameter)	76	Units preset (0605)	37	ENP version (Parameter)	260	Update water level (14751)	105, 110	Enter access code (Parameter)	28	Upper density input source (15006)	192	Error event type (Parameter)	132	Upper interface level (15003)	185, 237	Error on event (Parameter)	128, 140	Used calculation (12488)	57	Error value (Parameter)	128, 228	Used for SIL/WHG		Evaluation mode (Parameter)	79	Digital Xx-x (13910)	141	Event list (Submenu)	253	Used for SIL/WHG (13980)	134	Event logbook (Submenu)	253	User 0% (13221)	152	Expected SIL/WHG chain (Parameter)	135	User 100% (13222)	152	Expert (Menu)	7, 26	User role (0005)	27	Extended order code 1 (Parameter)	260	User value 1 to 8 source (13209-1 to 8)	154, 162	F		V1 address (13235)	159	Failure mode (Parameter)	127	V1 address (13236)	160	Feedback threshold (Parameter)	131	Value 1 display (0107)	32	Filter options (Parameter)	253	Value percent selector (13282)	167	Filter options (Submenu)	59, 60	Vapor density (14981)	192, 242	Firmware CRC (Parameter)	96, 259	Vapor temp source (14973)	189	Firmware version (Parameter)	259	Vapor temperature (14727)	92	Fixed current (Parameter)	126	Vapor temperature (14985)	190, 239	Float swap mode (Parameter)	146	W&M lock switch (8558)	262	Forget device (Parameter)	112	Water bottom level offset (14757)	109	Forget device (Wizard)	112	Water density (13757)	194, 221	Format display (Parameter)	31	Water level (14717)	93	Found echoes (Parameter)	56	Water level (14970)	185, 237	G		Water level source (14971)	185	Gain adjust (Parameter)	104	WB frequency ratio (14753)	100	Gauge current (Parameter)	122	Weight and measures configuration CRC (8564)	259	GP 1 name (Parameter)	204, 245	Wire expansion coefficient (13656)	215			Word type (13208)	147			Year (0782)	45, 48																														
Element position 1 to 24 (Parameter)	97, 240																																																																																																																																																																																										
Temperature unit (0557)	38	Element setup (Submenu)	106, 110	Tertiary variable (TV) (0228)	175	Element temperature (Parameter)	107, 111	Test resistance (14752)	100	Element temperature (Submenu)	97, 240	Thermocouple type (14008)	116	Element temperature 1 to 24 (Parameter)	97, 240	Timestamp (0667)	249	Element values (Submenu)	97	Timestamp (0672)	250	Empty (Parameter)	183	Timestamp 1 to 5 (0683-1 to 5)	252	End map. ampl. (Parameter)	76	Total no. element (14730)	102, 108	End of mapping (Parameter)	76	Units preset (0605)	37	ENP version (Parameter)	260	Update water level (14751)	105, 110	Enter access code (Parameter)	28	Upper density input source (15006)	192	Error event type (Parameter)	132	Upper interface level (15003)	185, 237	Error on event (Parameter)	128, 140	Used calculation (12488)	57	Error value (Parameter)	128, 228	Used for SIL/WHG		Evaluation mode (Parameter)	79	Digital Xx-x (13910)	141	Event list (Submenu)	253	Used for SIL/WHG (13980)	134	Event logbook (Submenu)	253	User 0% (13221)	152	Expected SIL/WHG chain (Parameter)	135	User 100% (13222)	152	Expert (Menu)	7, 26	User role (0005)	27	Extended order code 1 (Parameter)	260	User value 1 to 8 source (13209-1 to 8)	154, 162	F		V1 address (13235)	159	Failure mode (Parameter)	127	V1 address (13236)	160	Feedback threshold (Parameter)	131	Value 1 display (0107)	32	Filter options (Parameter)	253	Value percent selector (13282)	167	Filter options (Submenu)	59, 60	Vapor density (14981)	192, 242	Firmware CRC (Parameter)	96, 259	Vapor temp source (14973)	189	Firmware version (Parameter)	259	Vapor temperature (14727)	92	Fixed current (Parameter)	126	Vapor temperature (14985)	190, 239	Float swap mode (Parameter)	146	W&M lock switch (8558)	262	Forget device (Parameter)	112	Water bottom level offset (14757)	109	Forget device (Wizard)	112	Water density (13757)	194, 221	Format display (Parameter)	31	Water level (14717)	93	Found echoes (Parameter)	56	Water level (14970)	185, 237	G		Water level source (14971)	185	Gain adjust (Parameter)	104	WB frequency ratio (14753)	100	Gauge current (Parameter)	122	Weight and measures configuration CRC (8564)	259	GP 1 name (Parameter)	204, 245	Wire expansion coefficient (13656)	215			Word type (13208)	147			Year (0782)	45, 48																																		
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Tertiary variable (TV) (0228)	175	Element temperature (Parameter)	107, 111	Test resistance (14752)	100	Element temperature (Submenu)	97, 240	Thermocouple type (14008)	116	Element temperature 1 to 24 (Parameter)	97, 240	Timestamp (0667)	249	Element values (Submenu)	97	Timestamp (0672)	250	Empty (Parameter)	183	Timestamp 1 to 5 (0683-1 to 5)	252	End map. ampl. (Parameter)	76	Total no. element (14730)	102, 108	End of mapping (Parameter)	76	Units preset (0605)	37	ENP version (Parameter)	260	Update water level (14751)	105, 110	Enter access code (Parameter)	28	Upper density input source (15006)	192	Error event type (Parameter)	132	Upper interface level (15003)	185, 237	Error on event (Parameter)	128, 140	Used calculation (12488)	57	Error value (Parameter)	128, 228	Used for SIL/WHG		Evaluation mode (Parameter)	79	Digital Xx-x (13910)	141	Event list (Submenu)	253	Used for SIL/WHG (13980)	134	Event logbook (Submenu)	253	User 0% (13221)	152	Expected SIL/WHG chain (Parameter)	135	User 100% (13222)	152	Expert (Menu)	7, 26	User role (0005)	27	Extended order code 1 (Parameter)	260	User value 1 to 8 source (13209-1 to 8)	154, 162	F		V1 address (13235)	159	Failure mode (Parameter)	127	V1 address (13236)	160	Feedback threshold (Parameter)	131	Value 1 display (0107)	32	Filter options (Parameter)	253	Value percent selector (13282)	167	Filter options (Submenu)	59, 60	Vapor density (14981)	192, 242	Firmware CRC (Parameter)	96, 259	Vapor temp source (14973)	189	Firmware version (Parameter)	259	Vapor temperature (14727)	92	Fixed current (Parameter)	126	Vapor temperature (14985)	190, 239	Float swap mode (Parameter)	146	W&M lock switch (8558)	262	Forget device (Parameter)	112	Water bottom level offset (14757)	109	Forget device (Wizard)	112	Water density (13757)	194, 221	Format display (Parameter)	31	Water level (14717)	93	Found echoes (Parameter)	56	Water level (14970)	185, 237	G		Water level source (14971)	185	Gain adjust (Parameter)	104	WB frequency ratio (14753)	100	Gauge current (Parameter)	122	Weight and measures configuration CRC (8564)	259	GP 1 name (Parameter)	204, 245	Wire expansion coefficient (13656)	215			Word type (13208)	147			Year (0782)	45, 48																																						
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Test resistance (14752)	100	Element temperature (Submenu)	97, 240	Thermocouple type (14008)	116	Element temperature 1 to 24 (Parameter)	97, 240	Timestamp (0667)	249	Element values (Submenu)	97	Timestamp (0672)	250	Empty (Parameter)	183	Timestamp 1 to 5 (0683-1 to 5)	252	End map. ampl. (Parameter)	76	Total no. element (14730)	102, 108	End of mapping (Parameter)	76	Units preset (0605)	37	ENP version (Parameter)	260	Update water level (14751)	105, 110	Enter access code (Parameter)	28	Upper density input source (15006)	192	Error event type (Parameter)	132	Upper interface level (15003)	185, 237	Error on event (Parameter)	128, 140	Used calculation (12488)	57	Error value (Parameter)	128, 228	Used for SIL/WHG		Evaluation mode (Parameter)	79	Digital Xx-x (13910)	141	Event list (Submenu)	253	Used for SIL/WHG (13980)	134	Event logbook (Submenu)	253	User 0% (13221)	152	Expected SIL/WHG chain (Parameter)	135	User 100% (13222)	152	Expert (Menu)	7, 26	User role (0005)	27	Extended order code 1 (Parameter)	260	User value 1 to 8 source (13209-1 to 8)	154, 162	F		V1 address (13235)	159	Failure mode (Parameter)	127	V1 address (13236)	160	Feedback threshold (Parameter)	131	Value 1 display (0107)	32	Filter options (Parameter)	253	Value percent selector (13282)	167	Filter options (Submenu)	59, 60	Vapor density (14981)	192, 242	Firmware CRC (Parameter)	96, 259	Vapor temp source (14973)	189	Firmware version (Parameter)	259	Vapor temperature (14727)	92	Fixed current (Parameter)	126	Vapor temperature (14985)	190, 239	Float swap mode (Parameter)	146	W&M lock switch (8558)	262	Forget device (Parameter)	112	Water bottom level offset (14757)	109	Forget device (Wizard)	112	Water density (13757)	194, 221	Format display (Parameter)	31	Water level (14717)	93	Found echoes (Parameter)	56	Water level (14970)	185, 237	G		Water level source (14971)	185	Gain adjust (Parameter)	104	WB frequency ratio (14753)	100	Gauge current (Parameter)	122	Weight and measures configuration CRC (8564)	259	GP 1 name (Parameter)	204, 245	Wire expansion coefficient (13656)	215			Word type (13208)	147			Year (0782)	45, 48																																										
Element temperature (Submenu)	97, 240																																																																																																																																																																																										
Thermocouple type (14008)	116	Element temperature 1 to 24 (Parameter)	97, 240	Timestamp (0667)	249	Element values (Submenu)	97	Timestamp (0672)	250	Empty (Parameter)	183	Timestamp 1 to 5 (0683-1 to 5)	252	End map. ampl. (Parameter)	76	Total no. element (14730)	102, 108	End of mapping (Parameter)	76	Units preset (0605)	37	ENP version (Parameter)	260	Update water level (14751)	105, 110	Enter access code (Parameter)	28	Upper density input source (15006)	192	Error event type (Parameter)	132	Upper interface level (15003)	185, 237	Error on event (Parameter)	128, 140	Used calculation (12488)	57	Error value (Parameter)	128, 228	Used for SIL/WHG		Evaluation mode (Parameter)	79	Digital Xx-x (13910)	141	Event list (Submenu)	253	Used for SIL/WHG (13980)	134	Event logbook (Submenu)	253	User 0% (13221)	152	Expected SIL/WHG chain (Parameter)	135	User 100% (13222)	152	Expert (Menu)	7, 26	User role (0005)	27	Extended order code 1 (Parameter)	260	User value 1 to 8 source (13209-1 to 8)	154, 162	F		V1 address (13235)	159	Failure mode (Parameter)	127	V1 address (13236)	160	Feedback threshold (Parameter)	131	Value 1 display (0107)	32	Filter options (Parameter)	253	Value percent selector (13282)	167	Filter options (Submenu)	59, 60	Vapor density (14981)	192, 242	Firmware CRC (Parameter)	96, 259	Vapor temp source (14973)	189	Firmware version (Parameter)	259	Vapor temperature (14727)	92	Fixed current (Parameter)	126	Vapor temperature (14985)	190, 239	Float swap mode (Parameter)	146	W&M lock switch (8558)	262	Forget device (Parameter)	112	Water bottom level offset (14757)	109	Forget device (Wizard)	112	Water density (13757)	194, 221	Format display (Parameter)	31	Water level (14717)	93	Found echoes (Parameter)	56	Water level (14970)	185, 237	G		Water level source (14971)	185	Gain adjust (Parameter)	104	WB frequency ratio (14753)	100	Gauge current (Parameter)	122	Weight and measures configuration CRC (8564)	259	GP 1 name (Parameter)	204, 245	Wire expansion coefficient (13656)	215			Word type (13208)	147			Year (0782)	45, 48																																														
Element temperature 1 to 24 (Parameter)	97, 240																																																																																																																																																																																										
Timestamp (0667)	249	Element values (Submenu)	97	Timestamp (0672)	250	Empty (Parameter)	183	Timestamp 1 to 5 (0683-1 to 5)	252	End map. ampl. (Parameter)	76	Total no. element (14730)	102, 108	End of mapping (Parameter)	76	Units preset (0605)	37	ENP version (Parameter)	260	Update water level (14751)	105, 110	Enter access code (Parameter)	28	Upper density input source (15006)	192	Error event type (Parameter)	132	Upper interface level (15003)	185, 237	Error on event (Parameter)	128, 140	Used calculation (12488)	57	Error value (Parameter)	128, 228	Used for SIL/WHG		Evaluation mode (Parameter)	79	Digital Xx-x (13910)	141	Event list (Submenu)	253	Used for SIL/WHG (13980)	134	Event logbook (Submenu)	253	User 0% (13221)	152	Expected SIL/WHG chain (Parameter)	135	User 100% (13222)	152	Expert (Menu)	7, 26	User role (0005)	27	Extended order code 1 (Parameter)	260	User value 1 to 8 source (13209-1 to 8)	154, 162	F		V1 address (13235)	159	Failure mode (Parameter)	127	V1 address (13236)	160	Feedback threshold (Parameter)	131	Value 1 display (0107)	32	Filter options (Parameter)	253	Value percent selector (13282)	167	Filter options (Submenu)	59, 60	Vapor density (14981)	192, 242	Firmware CRC (Parameter)	96, 259	Vapor temp source (14973)	189	Firmware version (Parameter)	259	Vapor temperature (14727)	92	Fixed current (Parameter)	126	Vapor temperature (14985)	190, 239	Float swap mode (Parameter)	146	W&M lock switch (8558)	262	Forget device (Parameter)	112	Water bottom level offset (14757)	109	Forget device (Wizard)	112	Water density (13757)	194, 221	Format display (Parameter)	31	Water level (14717)	93	Found echoes (Parameter)	56	Water level (14970)	185, 237	G		Water level source (14971)	185	Gain adjust (Parameter)	104	WB frequency ratio (14753)	100	Gauge current (Parameter)	122	Weight and measures configuration CRC (8564)	259	GP 1 name (Parameter)	204, 245	Wire expansion coefficient (13656)	215			Word type (13208)	147			Year (0782)	45, 48																																																		
Element values (Submenu)	97																																																																																																																																																																																										
Timestamp (0672)	250	Empty (Parameter)	183	Timestamp 1 to 5 (0683-1 to 5)	252	End map. ampl. (Parameter)	76	Total no. element (14730)	102, 108	End of mapping (Parameter)	76	Units preset (0605)	37	ENP version (Parameter)	260	Update water level (14751)	105, 110	Enter access code (Parameter)	28	Upper density input source (15006)	192	Error event type (Parameter)	132	Upper interface level (15003)	185, 237	Error on event (Parameter)	128, 140	Used calculation (12488)	57	Error value (Parameter)	128, 228	Used for SIL/WHG		Evaluation mode (Parameter)	79	Digital Xx-x (13910)	141	Event list (Submenu)	253	Used for SIL/WHG (13980)	134	Event logbook (Submenu)	253	User 0% (13221)	152	Expected SIL/WHG chain (Parameter)	135	User 100% (13222)	152	Expert (Menu)	7, 26	User role (0005)	27	Extended order code 1 (Parameter)	260	User value 1 to 8 source (13209-1 to 8)	154, 162	F		V1 address (13235)	159	Failure mode (Parameter)	127	V1 address (13236)	160	Feedback threshold (Parameter)	131	Value 1 display (0107)	32	Filter options (Parameter)	253	Value percent selector (13282)	167	Filter options (Submenu)	59, 60	Vapor density (14981)	192, 242	Firmware CRC (Parameter)	96, 259	Vapor temp source (14973)	189	Firmware version (Parameter)	259	Vapor temperature (14727)	92	Fixed current (Parameter)	126	Vapor temperature (14985)	190, 239	Float swap mode (Parameter)	146	W&M lock switch (8558)	262	Forget device (Parameter)	112	Water bottom level offset (14757)	109	Forget device (Wizard)	112	Water density (13757)	194, 221	Format display (Parameter)	31	Water level (14717)	93	Found echoes (Parameter)	56	Water level (14970)	185, 237	G		Water level source (14971)	185	Gain adjust (Parameter)	104	WB frequency ratio (14753)	100	Gauge current (Parameter)	122	Weight and measures configuration CRC (8564)	259	GP 1 name (Parameter)	204, 245	Wire expansion coefficient (13656)	215			Word type (13208)	147			Year (0782)	45, 48																																																						
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