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01.07.zz (Device firmware)

Description of Device Parameters
Micropilot NMR84

Tank Gauging

Endress+Hauser
People for Process Automation

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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:
- *Device Viewer* (www.endress.com/deviceviewer): Enter the serial number from the nameplate
- *Endress+Hauser Operations app*: Enter serial number from nameplate or scan matrix code on 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 (→ 7) 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.

Navigation Expert

Expert

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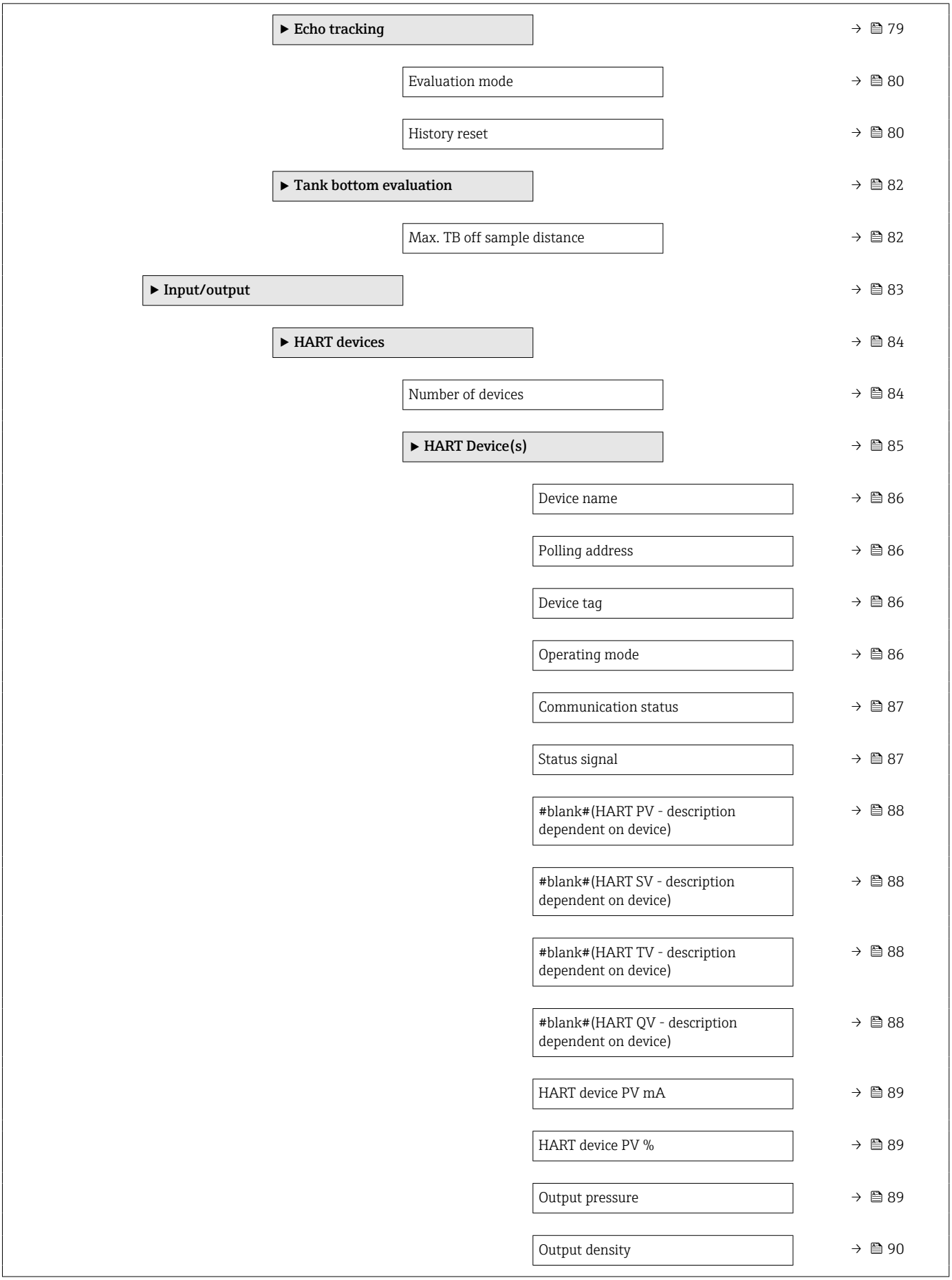
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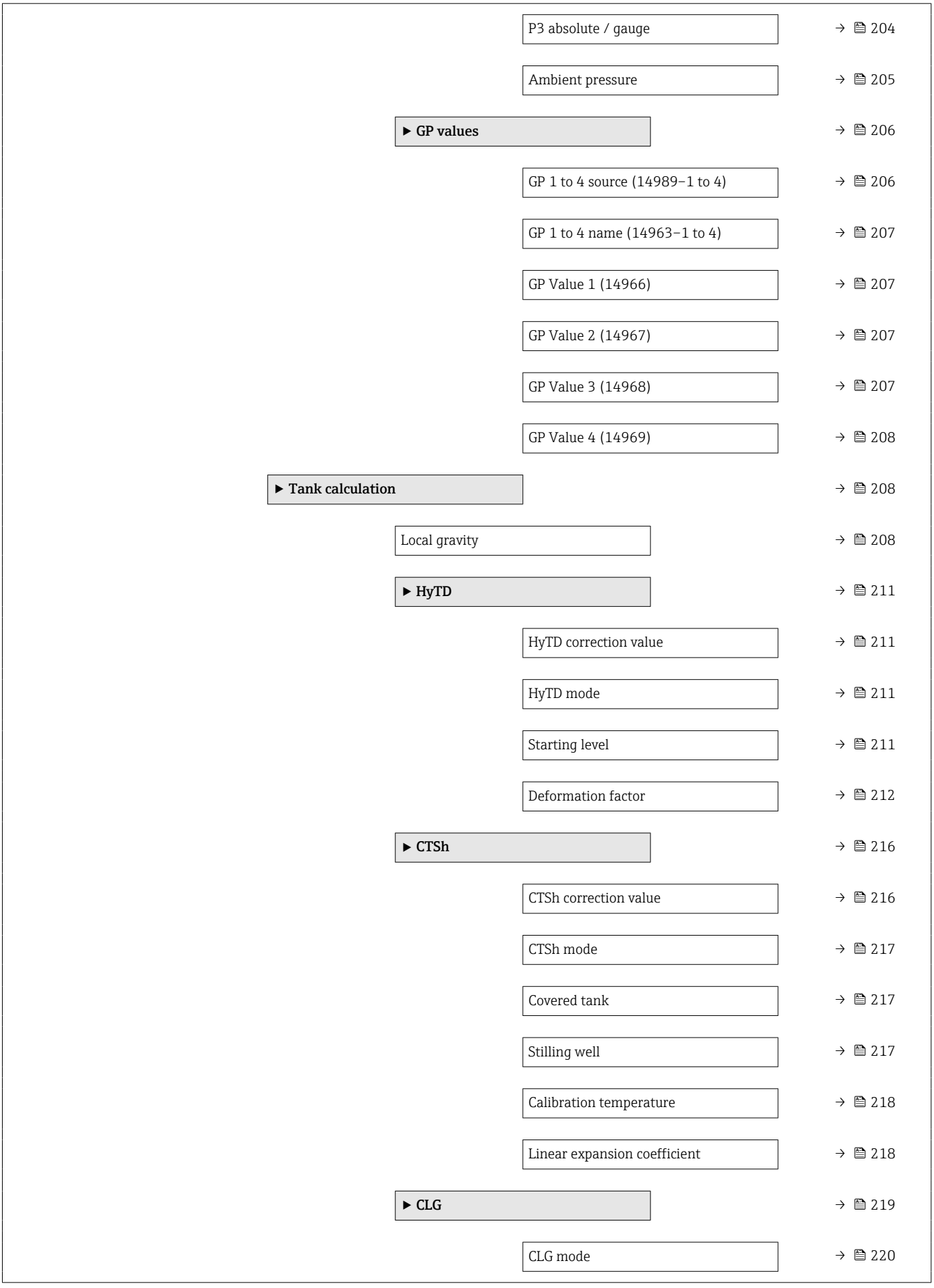
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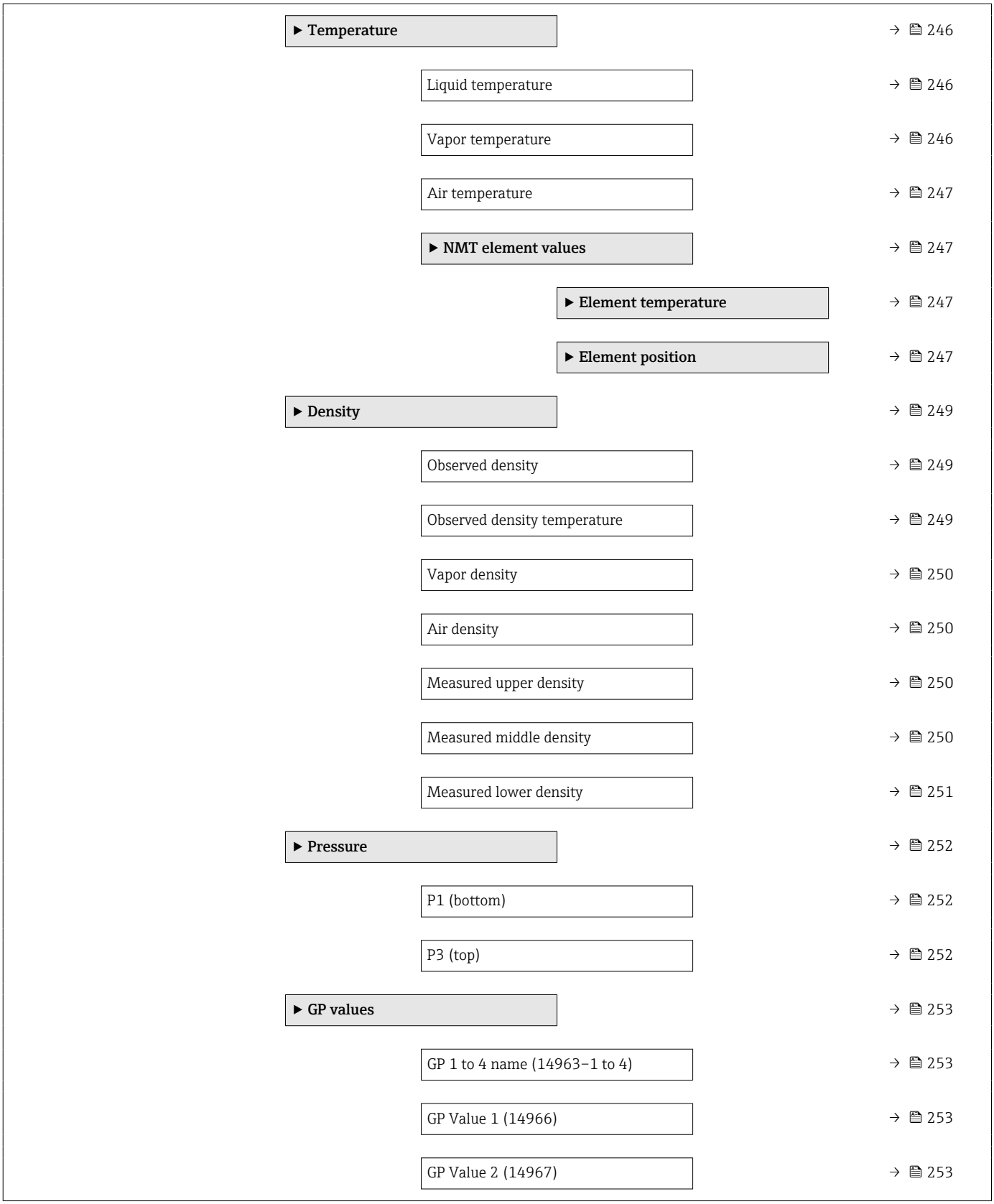
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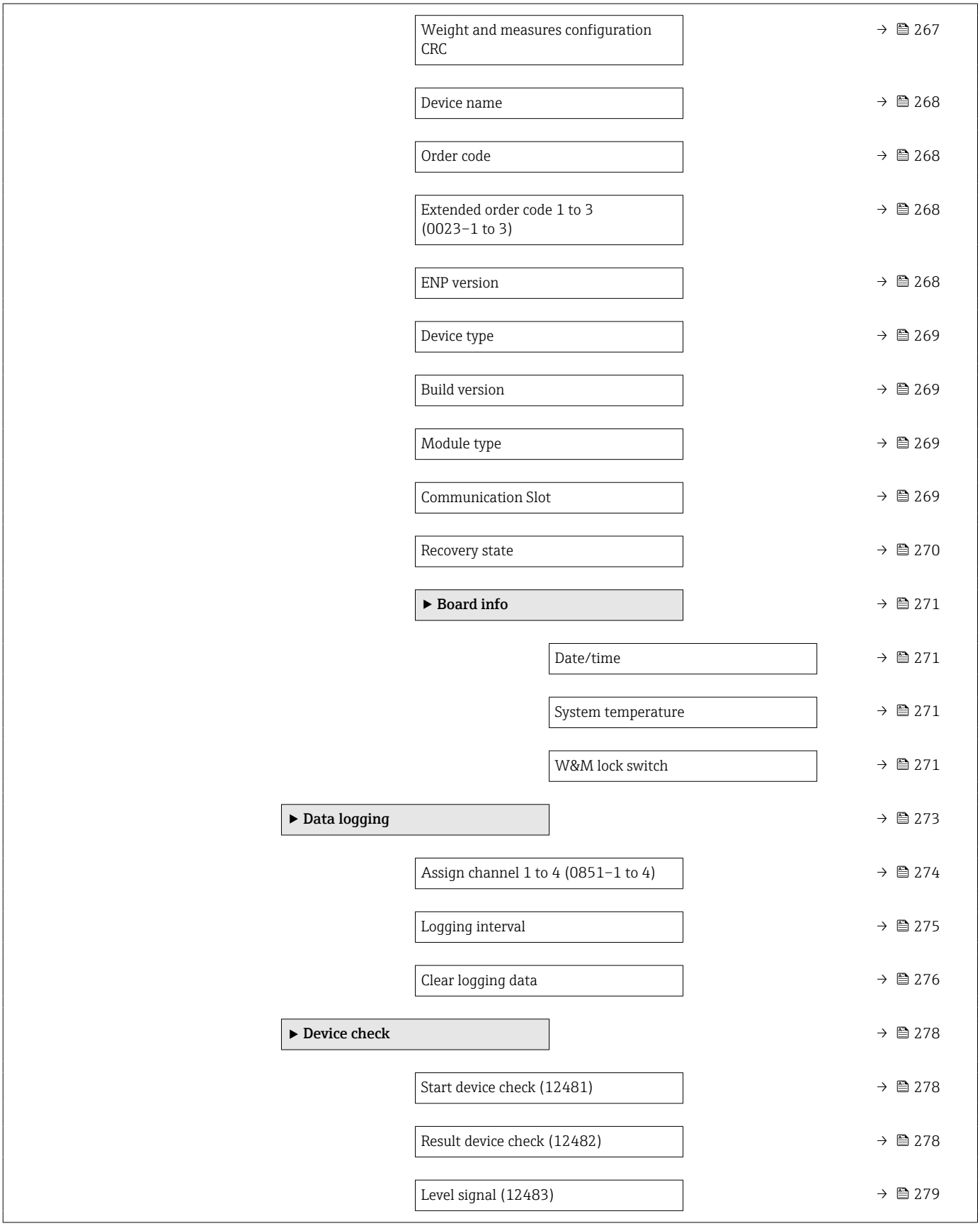
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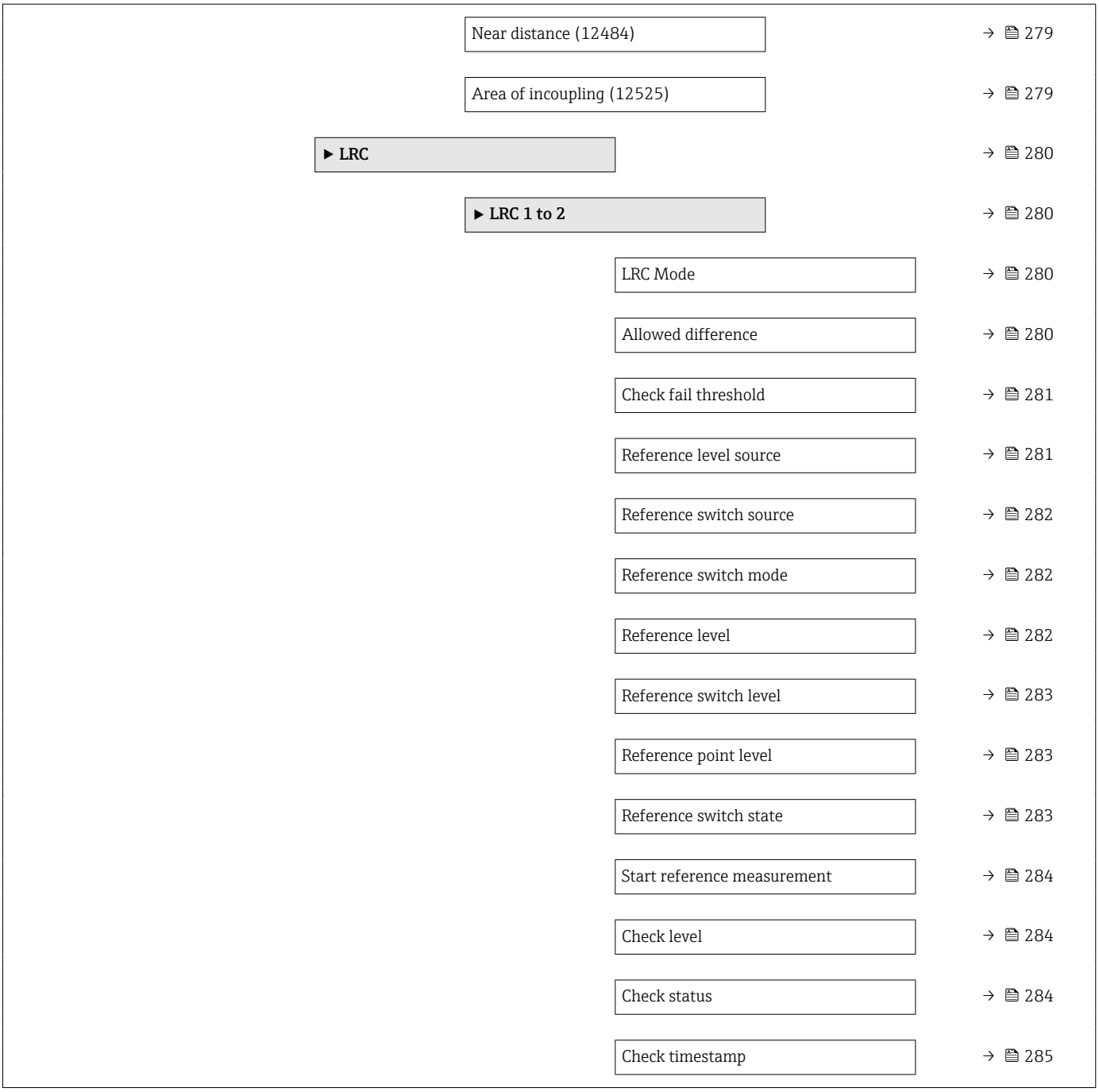
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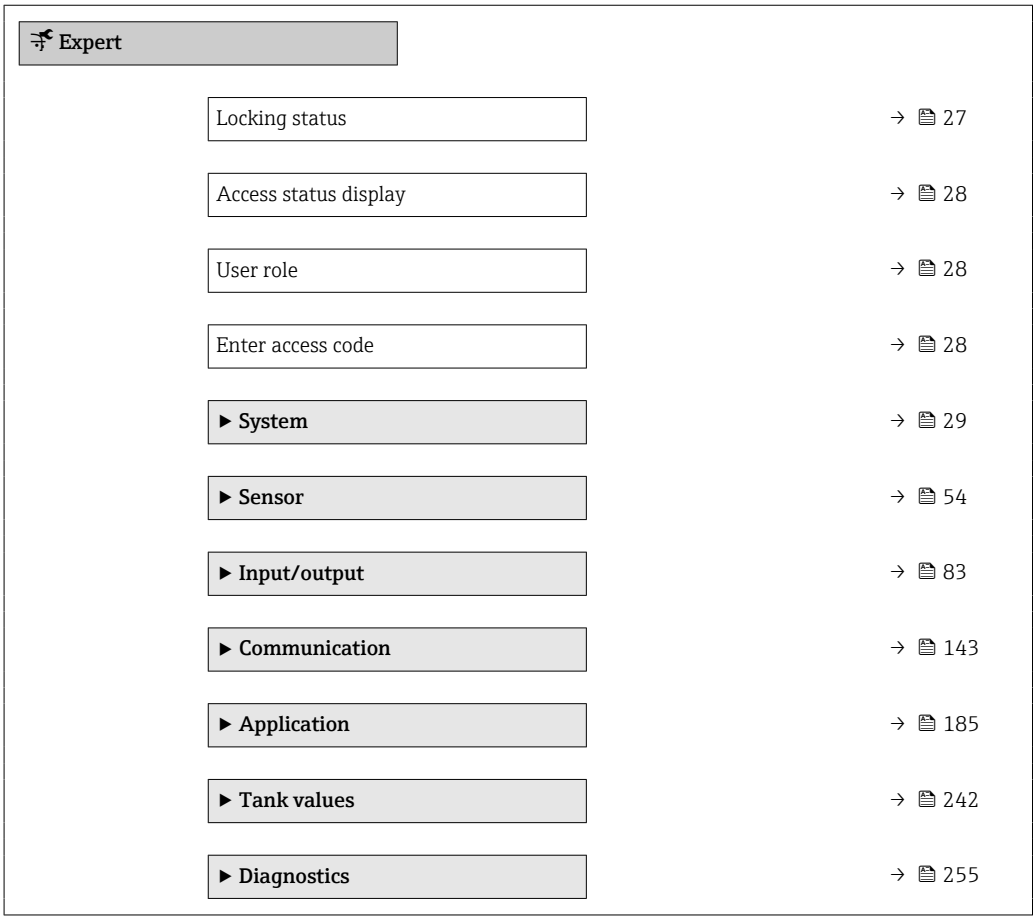
3 The "Expert" menu

Navigation Expert



Locking status

Navigation Expert → Locking status

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

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

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)

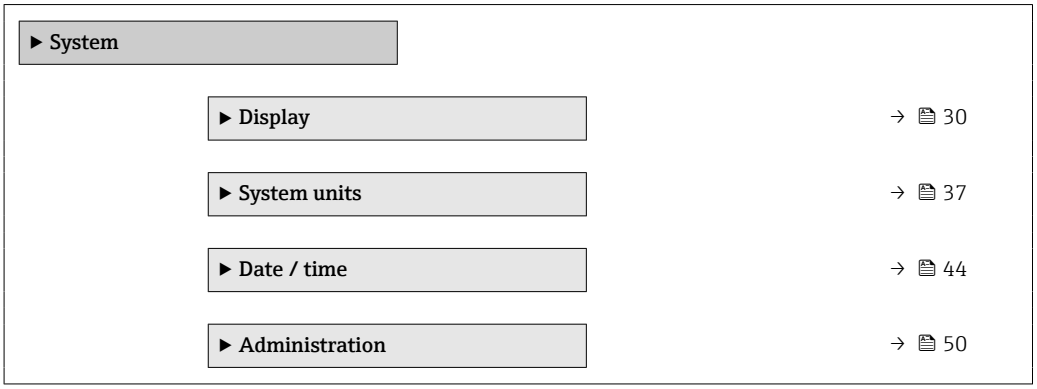
Description Enter access code to disable write protection of parameters.

Additional information

Read access	Operator
Write access	Operator

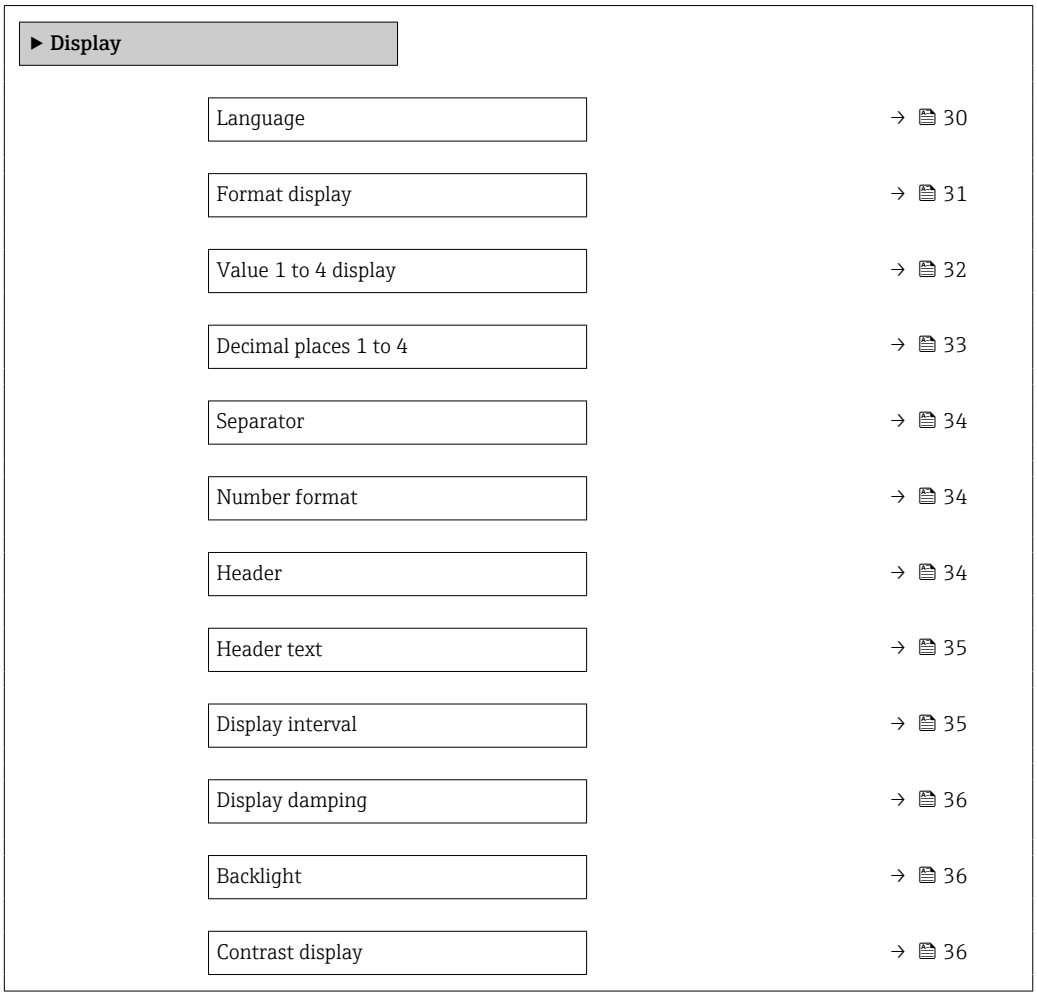
3.1 "System" submenu

Navigation Expert → System



3.1.1 "Display" submenu

Navigation Expert → System → Display



Language

Navigation Expert → System → Display → Language

Prerequisite The device has a local display.

Description Set display language.

Selection
- English
- Deutsch
- русский язык (Russian)
- 日本語 (Japanese)
- Español
- 中文 (Chinese)

Factory setting English

Additional information

Read access	Operator
Write access	Operator

Format display

Navigation Expert → System → Display → Format display

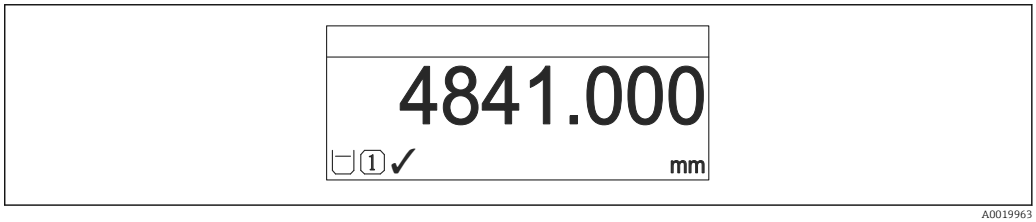
Prerequisite The device has a local display.

Description Select how measured values are shown on the display.

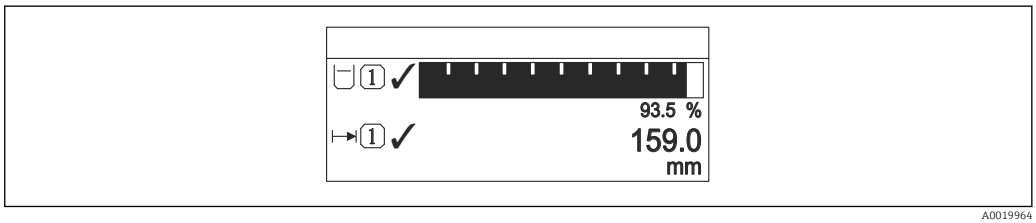
Selection
- 1 value, max. size
- 1 bargraph + 1 value
- 2 values
- 1 value large + 2 values
- 4 values

Factory setting 1 value, max. size

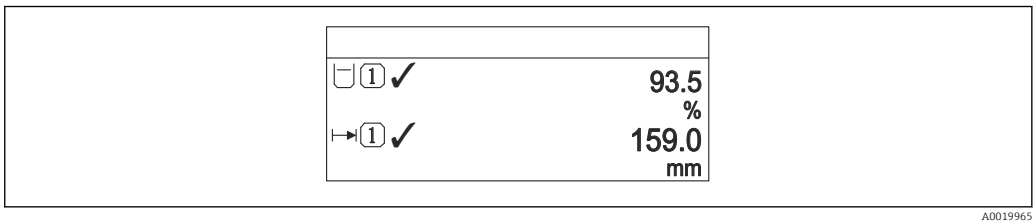
Additional information



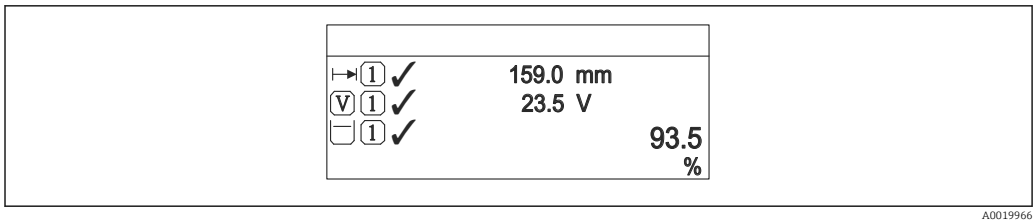
1 "Format display" = "1 value, max. size"



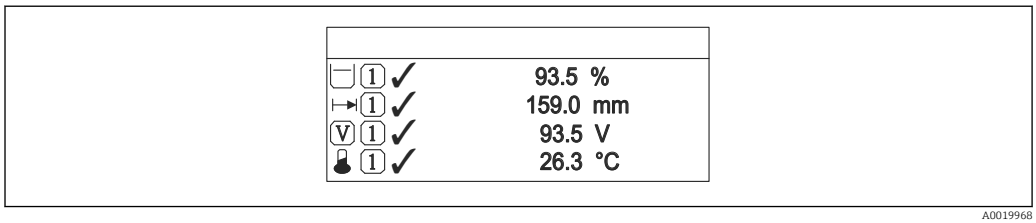
2 "Format display" = "1 bargraph + 1 value"



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

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]

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

- 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)]
- 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

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

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

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

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 (→ 181).
- **Free text**
  The header contents is defined in the **Header text** parameter (→ 35).

Header text

Navigation Expert → System → Display → Header text

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

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

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

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

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 %

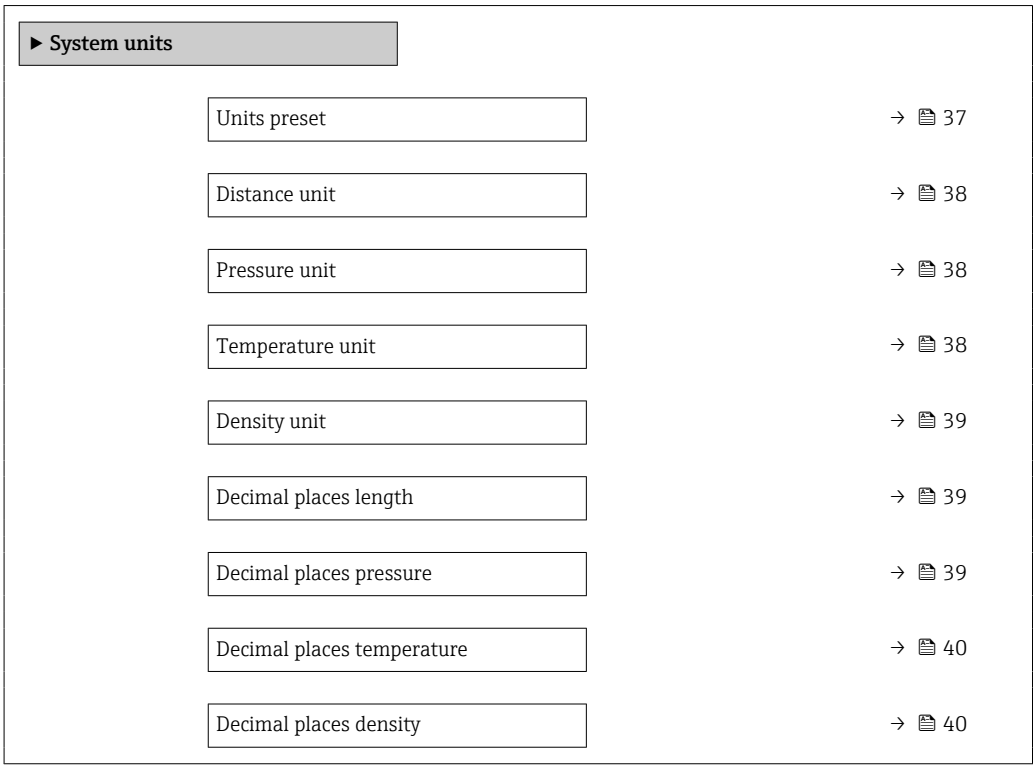
Factory setting 30 %

Additional information

Read access	Operator
Write access	Operator

3.1.2 "System units" submenu

Navigation Expert → System → System units



Units preset

Navigation Expert → System → System units → Units preset

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

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

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

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

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 setting kg/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

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

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.

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

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.

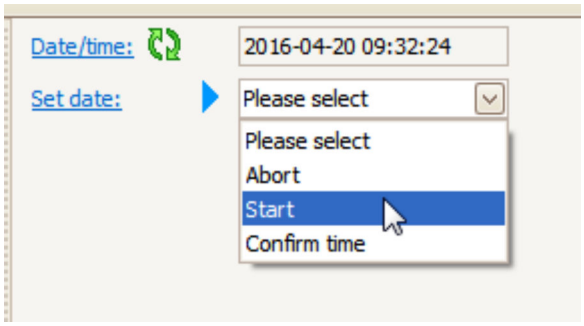
3.1.3 "Date / time" submenu

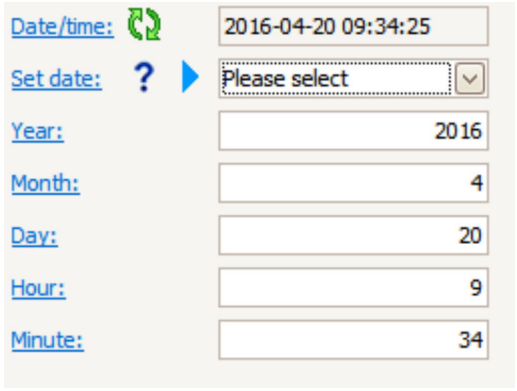
The **Date / time** submenu is used to set the real-time clock of the device.

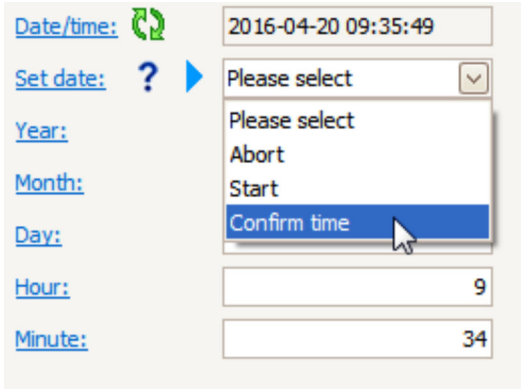
Setting the real-time clock via the display and operating module

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 E 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. 

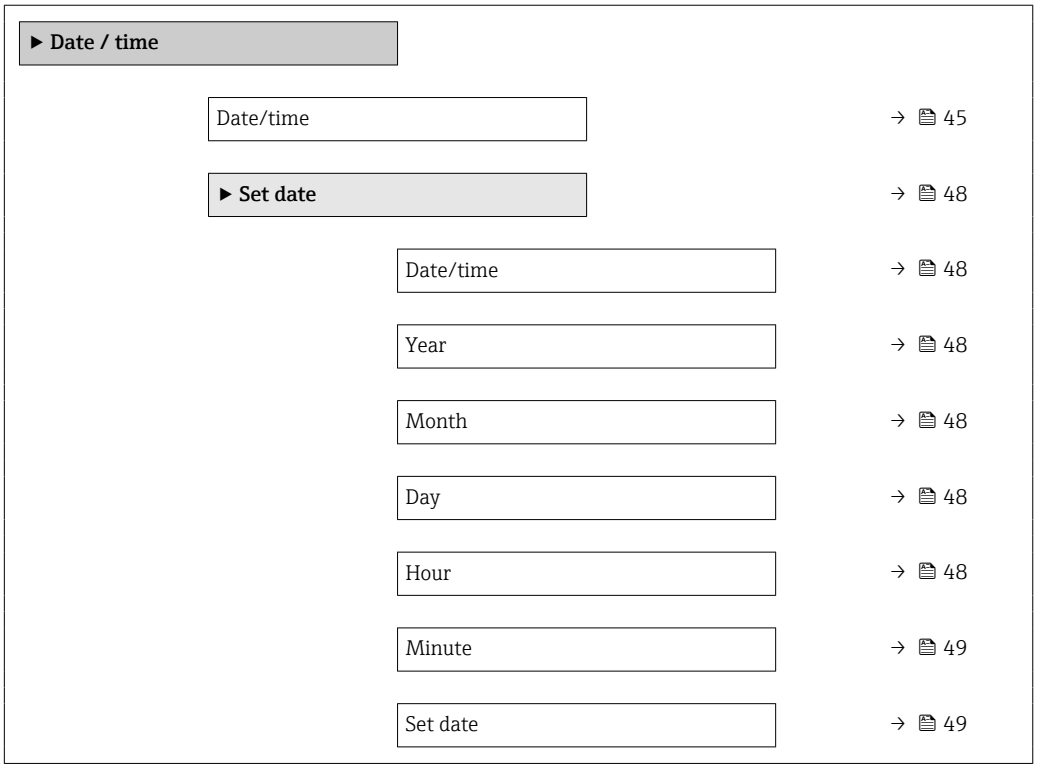
   Go to the **Set date** parameter (→ 🖹 45) and select the **Start** option.
3. 

   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.

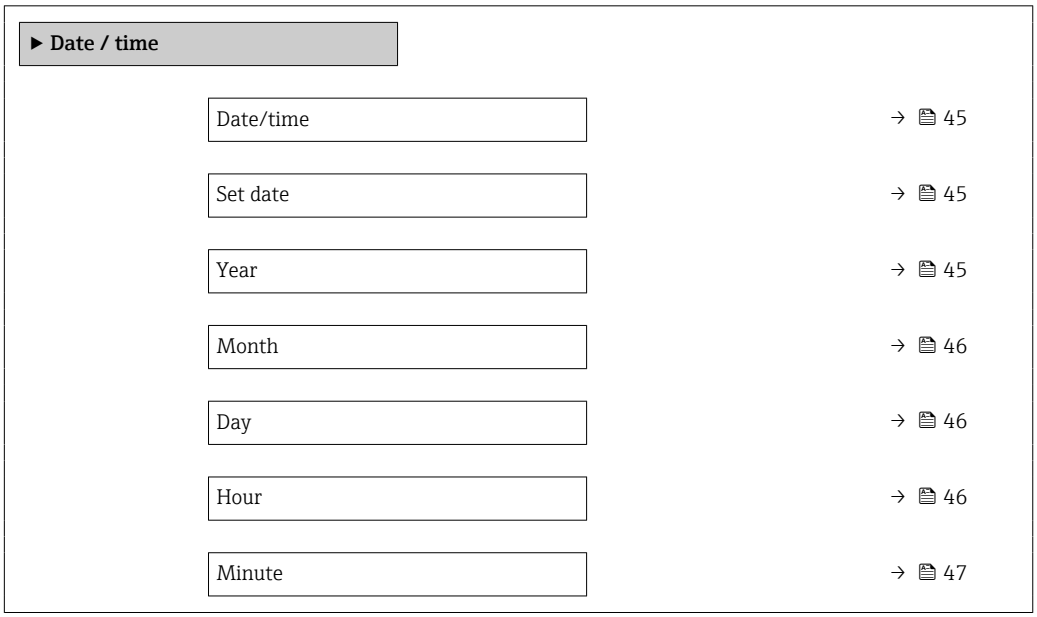
Structure of the submenu on the display and operating module

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

Description Displays the device internal real time clock.

Additional information

Read access	Operator
Write access	-

Set date

Navigation Expert → System → Date / time → Set date

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

Prerequisite **Set date (→ 45) = Start**

Description Enter the current year.

User entry 2 016 to 2 079

Factory setting 2 016

Additional information

Read access	Operator
Write access	Maintenance

Month

Navigation Expert → System → Date / time → Month

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

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

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

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

Description → 45

Year

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

Description → 45

Month

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

Description → 46

Day

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

Description → 46

Hour

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

Description → 46

Minute

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

Description → 47

Set date

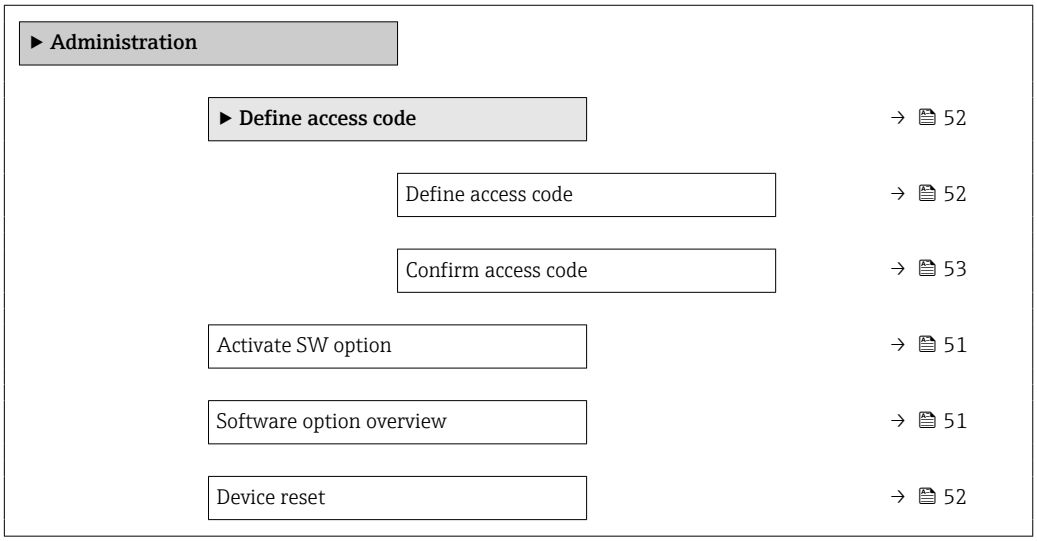
Navigation Expert → System → Date / time → Set date → Set date

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

3.1.4 "Administration" submenu

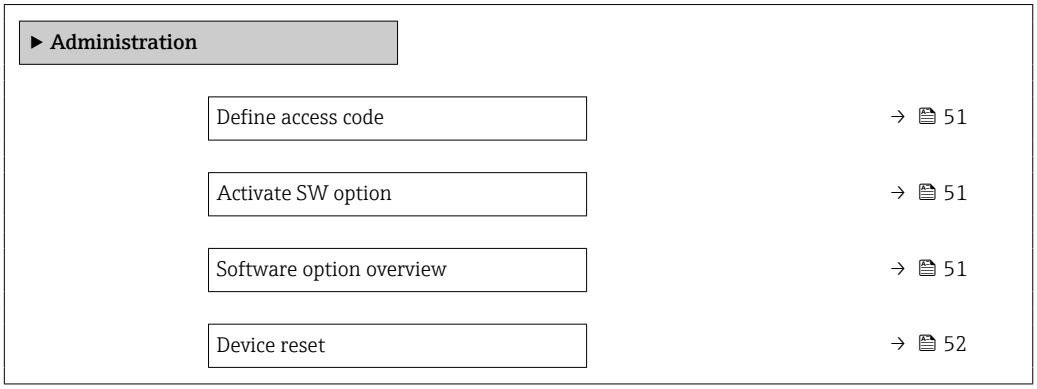
Structure of the submenu on the display and operating module

Navigation Expert → System → Administration



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

Navigation Expert → System → Administration



Description of parameters

Navigation Expert → System → Administration

Define access code

Navigation Expert → System → Administration → Def. access code

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.

Description Enter the application package code or code of another re-ordered functionality to enable it

User entry Positive integer

Factory setting 0

Additional information

Read access	Operator
Write access	Maintenance

Software option overview

Navigation Expert → System → Administration → SW option overv.

Description Shows all enabled software options

User interface
- Extended HistoROM
- SIL
- WHG
- CLG

Additional information

Read access	Operator
Write access	-

Device reset

Navigation Expert → System → Administration → Device reset

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

Selection
- Cancel
- To factory defaults
- Restart device

Factory setting Cancel

Additional information

Meaning of the options
- **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

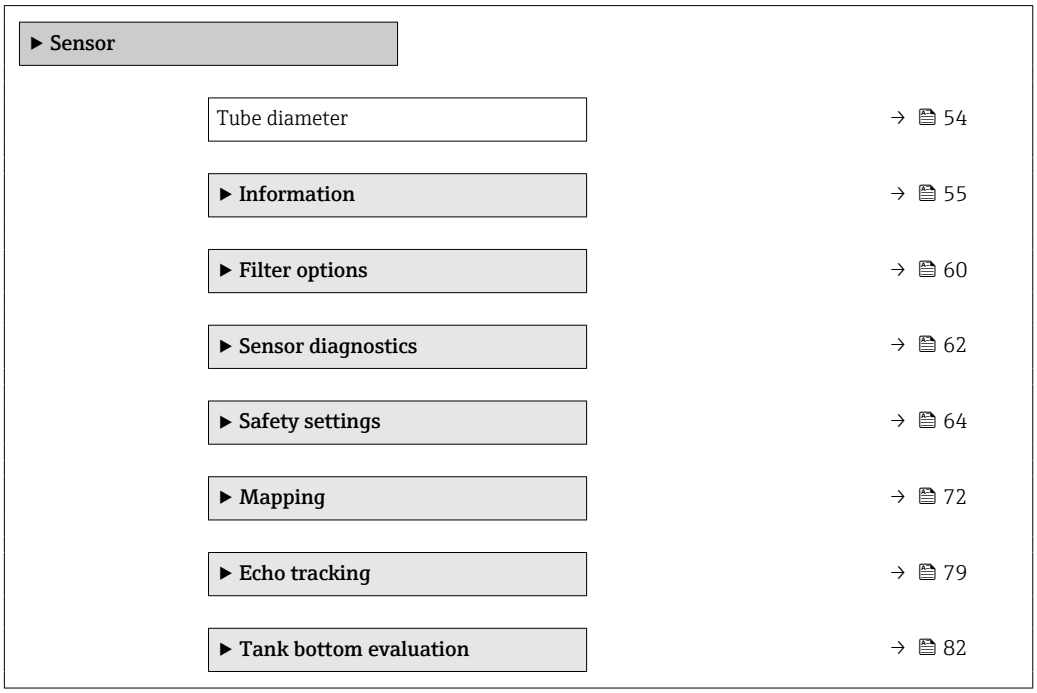
Additional information

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 Expert → Sensor



Tube diameter

Navigation Expert → Sensor → Tube diameter

Description Enter diameter of stilling well.

User entry Positive floating-point number

Factory setting 150 mm

Additional information

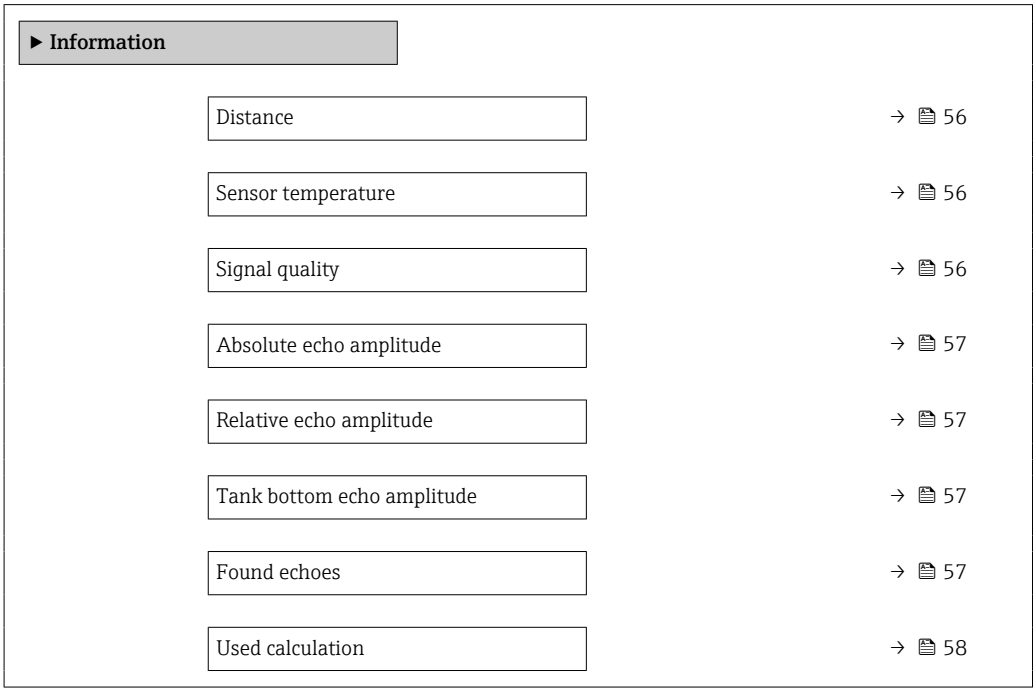
Read access	Operator
Write access	Maintenance

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



Description of parameters

Navigation Expert → Sensor → Information

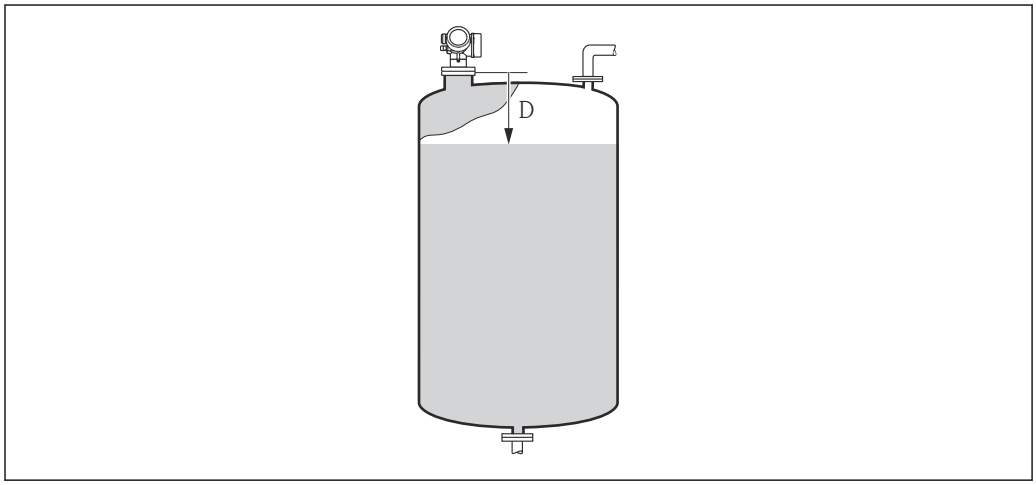
Distance

Navigation Expert → Sensor → Information → Distance

Description Distance from lower edge of device flange to product surface.

Additional information

Read access	Operator
Write access	-



D Distance (→ 56)

Sensor temperature

Navigation Expert → Sensor → Information → Sensor temp.

Description Shows the temperature of the sensor electronics.

Additional information

Read access	Operator
Write access	-

Signal quality

Navigation Expert → Sensor → Information → Signal quality

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.

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.

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

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

Description Shows the found echo type.

Additional information

Read access	Operator
Write access	-

Used calculation

Navigation Expert → Sensor → Information → Used calculation

Description Target used for distance calculation.

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

Additional information

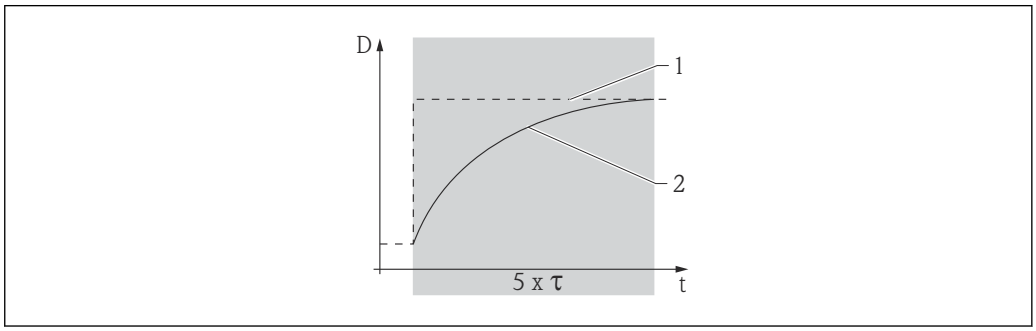
Read access	Operator
Write access	-

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 (→ 🖹 61)). After a sudden change of the level, it takes about 5 x τ, until the new measured value is obtained.

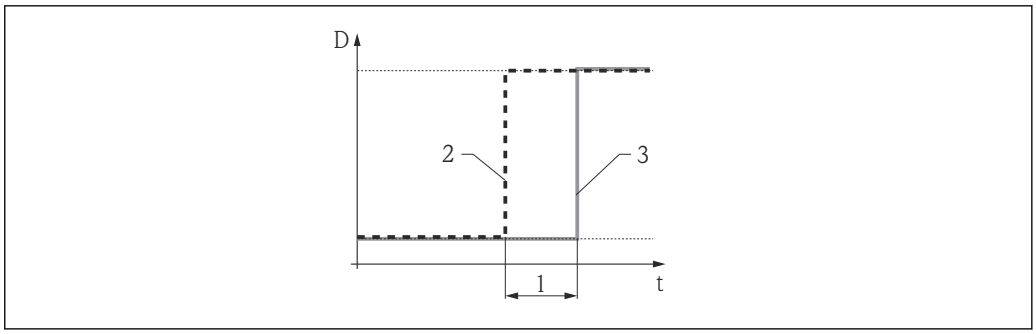


6 Low pass filter

1 Signal before the low pass filter
2 Signal after the low pass filter
τ Integration time (→ 🖹 61)

Dead time

Sudden changes of the measured distance are ignored during the **Dead time (→ 🖹 61)**.



7 Effect of the "Dead time" parameter (→ 🖹 61)

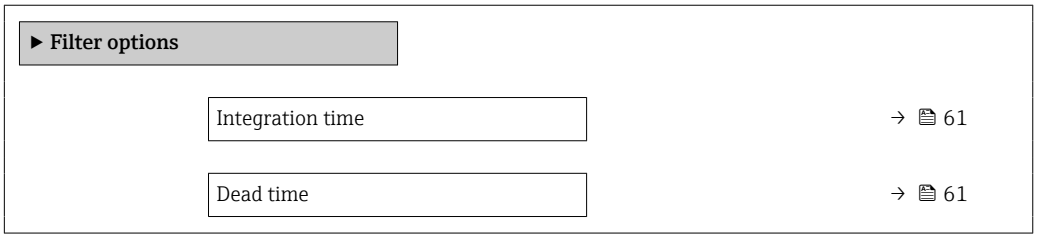
1 Dead time
2 Signal before the Dead time filter
3 Signal after the Dead time filter

Advantages
The **Dead time** filter prevents short-term interferences form 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

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

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 anlog signal path. The test is started by the **Start self check** parameter (→ 62). 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 (→ 62).

Navigation Expert → Sensor → Sensor diag.

Start self check

Navigation Expert → Sensor → Sensor diag. → Start self check

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

Description Shows the result of the self check.

Additional information

Read access	Operator
Write access	-

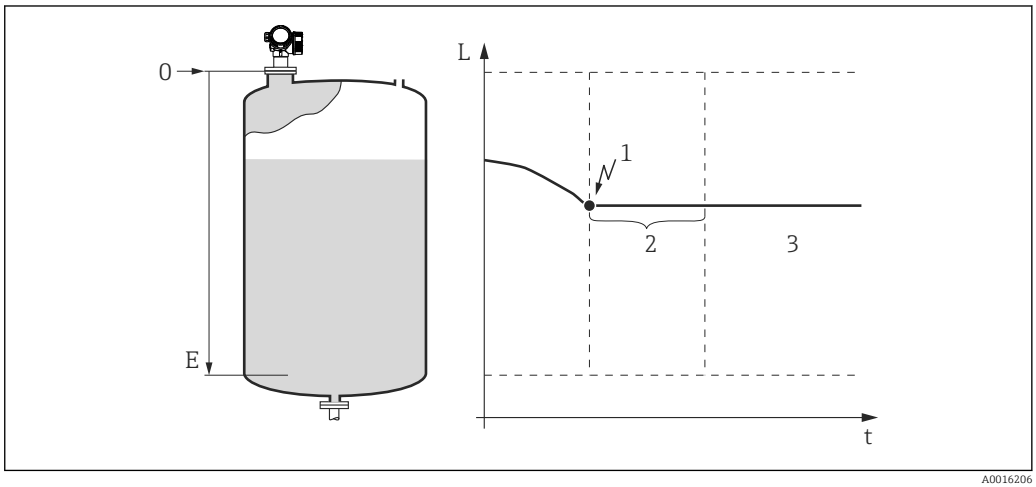
3.2.4 "Safety settings" submenu

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 (→ 🖹 65):

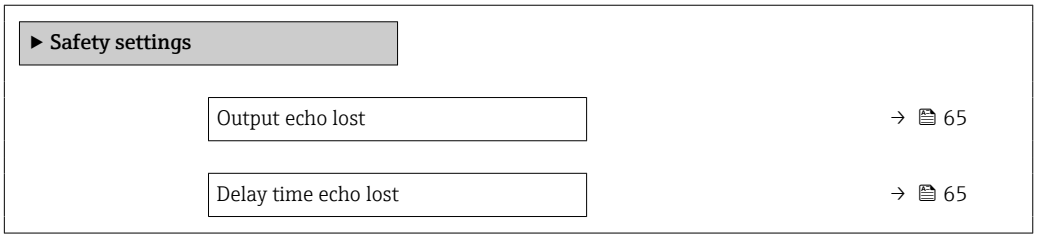
"Output echo lost (→ 🖹 65)"	Remarks
Last valid value	The last value before the echo loss is held.
Alarm	The device generates an alarm.



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

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 occurence of the echo is kept.
- **Alarm**
  The device generates an alarm.

Delay time echo lost

Navigation Expert → Sensor → Safety sett. → Delay echo lost

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

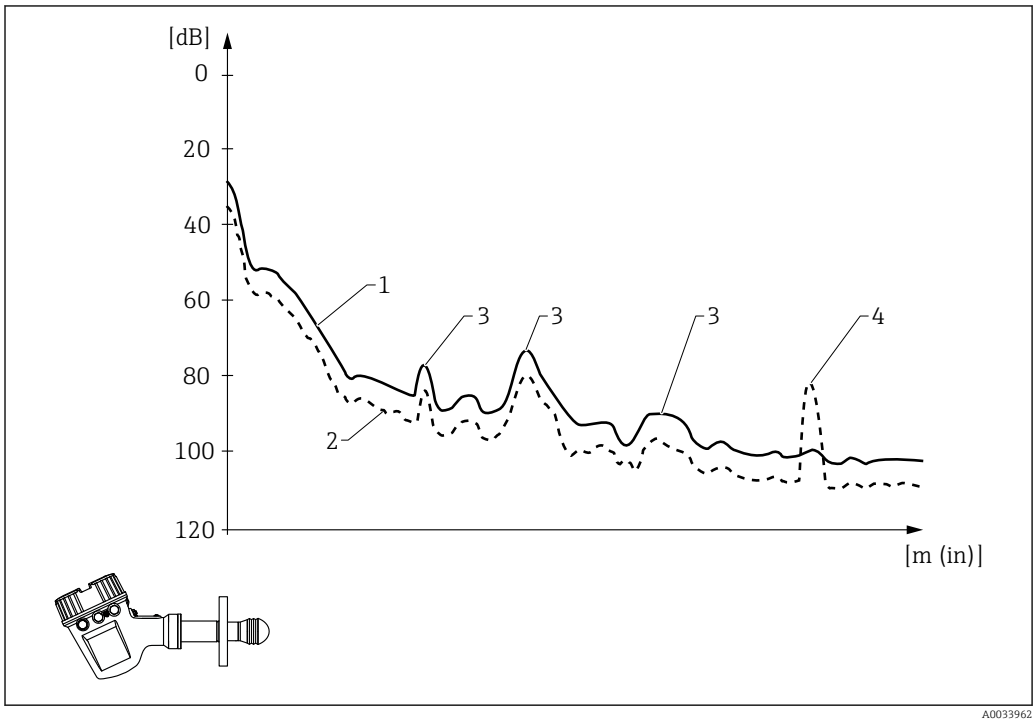
Additional information

Read access	Operator
Write access	Maintenance

3.2.5 "Mapping" submenu

The mapping is used to suppress static interference signals which may be generatet 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.



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 (→ 🖹 54) → Echo tracking (→ 🖹 79) submenu.

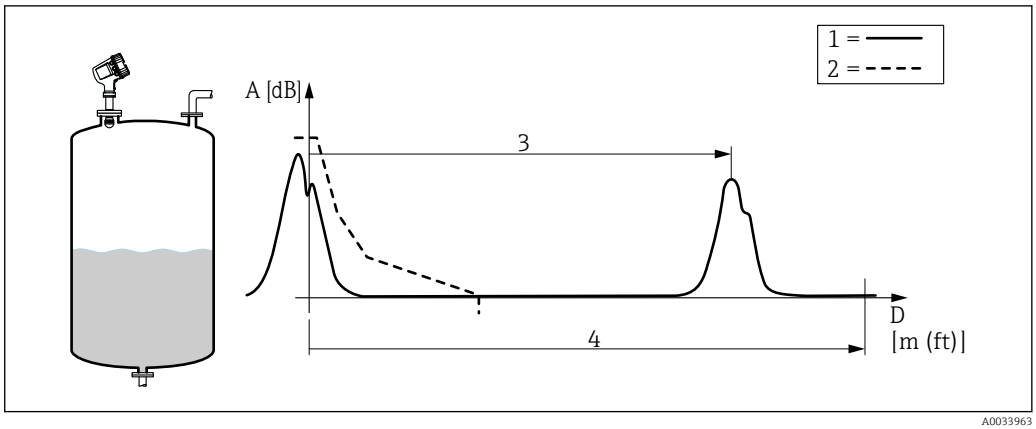
Types of mapping

Depending on the **Confirm distance** parameter (→ 74) there are different types of mapping:

Confirm distance (→ 74)	Type of mapping	Description
Factory map	Factory map	→ 67
▪ Distance ok ▪ Tank empty	Overlay map	→ 67
Manual map	New map	→ 67

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 (→ 74).

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 (→ 74) and select the **Distance ok** or **Tank empty** option.
2. Go to the **Record map** parameter (→ 76) 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 (→ 74) and select the **Manual map** option.
2. Go to the **Mapping end point** parameter (→ 76) and specify up to which distance the mapping is to be recorded.
3. Go to the **Record map** parameter (→ 76) and select the **Record map** option.

Mapping range

Depending on the **Confirm distance** parameter (→ 74), the mapping range is defined as follows:

Confirm distance (→ 74)	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 (→ 76)**

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

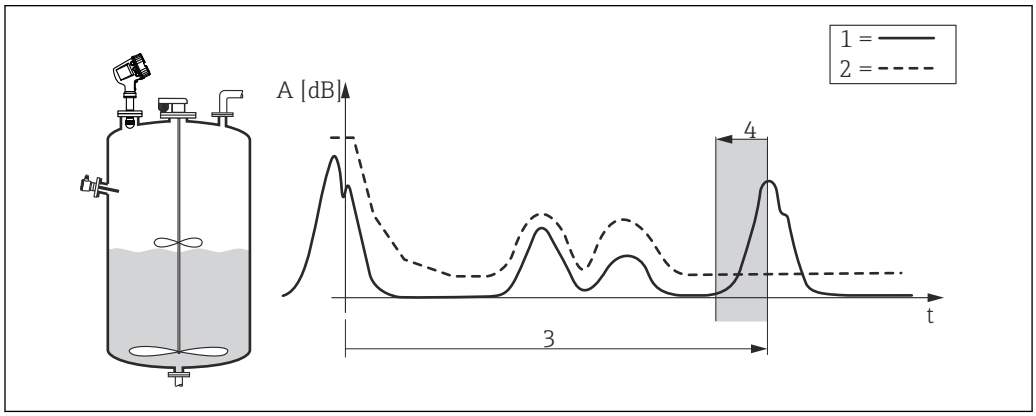
Mapping in the tank bottom area

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 follwong parameters:
- End of mapping (→ 77)
- End map. ampl. (→ 77)

"End of mapping" = "Last map value"

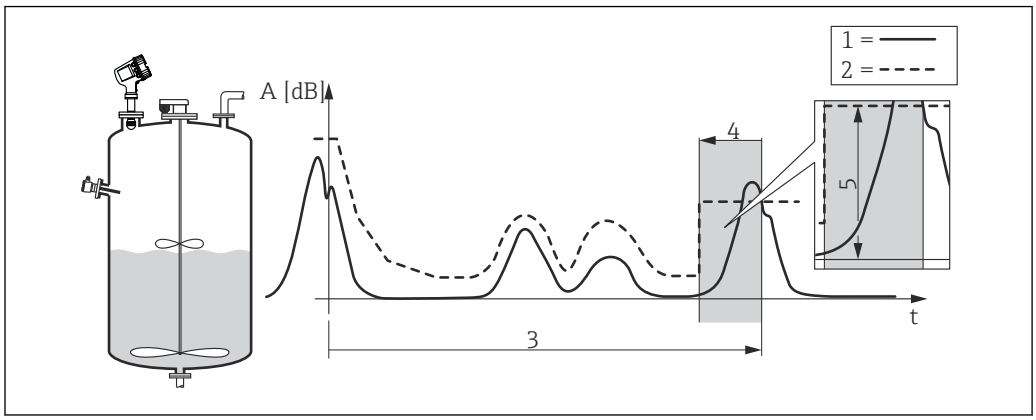
With this setting, the last value of the map remains valid within the tank bottom area.



1 Envelope curve
2 Map
3 Empty (→ 186)
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 (→ 77)



1 Envelope curve
2 Map
3 Empty (→ 186)
4 Mapping gap
5 End map. ampl. (→ 77)

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 (→ 🖹 76).
2. Go to the **Record map** parameter (→ 🖹 76) and select the **Delete partial map** option.

Structure of the submenu on the local display

Navigation Expert → Sensor → Mapping

▶ **Mapping**	
End of mapping	→ 77
End map. ampl.	→ 77

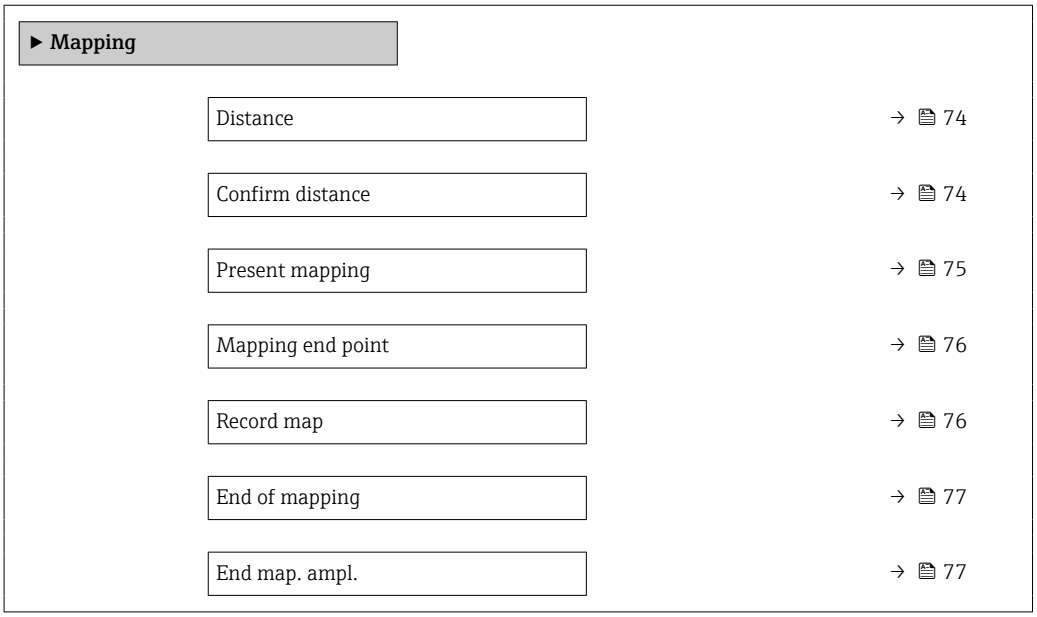
Structure of the mapping wizard on the local display

Navigation Expert → Sensor → Mapping

▶ **Mapping**	
Confirm distance	→ 74
Mapping end point	→ 76
Present mapping	→ 75
Record map	→ 76
Distance	→ 74

Structure of the submenu in an operating tool

Navigation Expert → Sensor → Mapping



Description of parameters

Navigation Expert → Sensor → Mapping

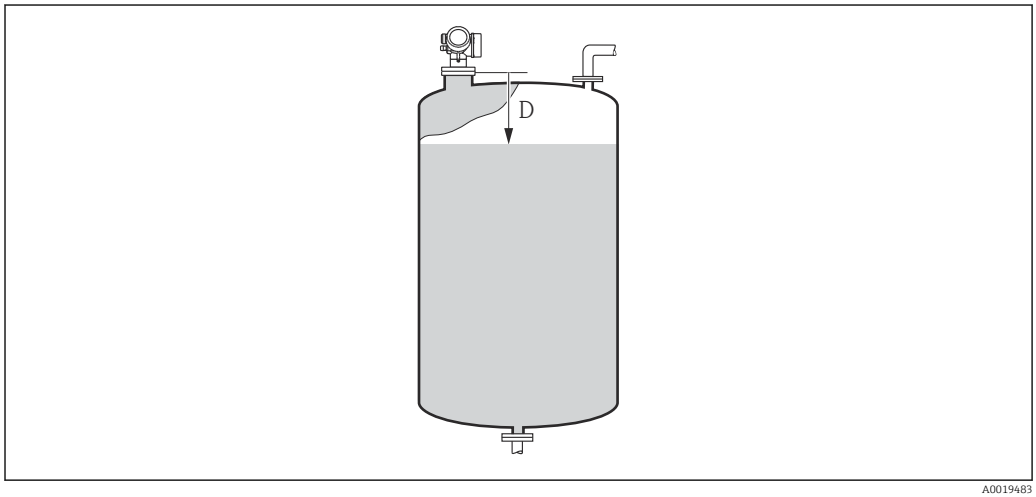
Distance

Navigation Expert → Sensor → Mapping → Distance

Description Distance from lower edge of device flange to product surface.

Additional information

Read access	Operator
Write access	-



D Distance (→ 56)

Confirm distance

Navigation Expert → Sensor → Mapping → Confirm distance

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 small** [3)]
  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 (→ 74). 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 big** [3)]
  To be selected if the measured distance exceeds the actual distance. The device adjusts the signal evaluation and returns to the **Confirm distance** parameter (→ 74). 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 (→ 186).
- **Manual map**
  To be selected if the range of mapping is to be defined manually in the **Mapping end point** parameter (→ 76). 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.

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

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 (→ 80)" = "Short time history"

Mapping end point

Navigation Expert → Sensor → Mapping → Map. end point

Prerequisite **Confirm distance (→ 74) = 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 (→ 74) = 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 (→ 76)**.
- **Stop overlay**
  Stops the overlaying of the map.

End of mapping

Navigation Expert → Sensor → Mapping → End of mapping

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.

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 (→ 80). A number of further parameters is used to configure the echo tracking more precisely.

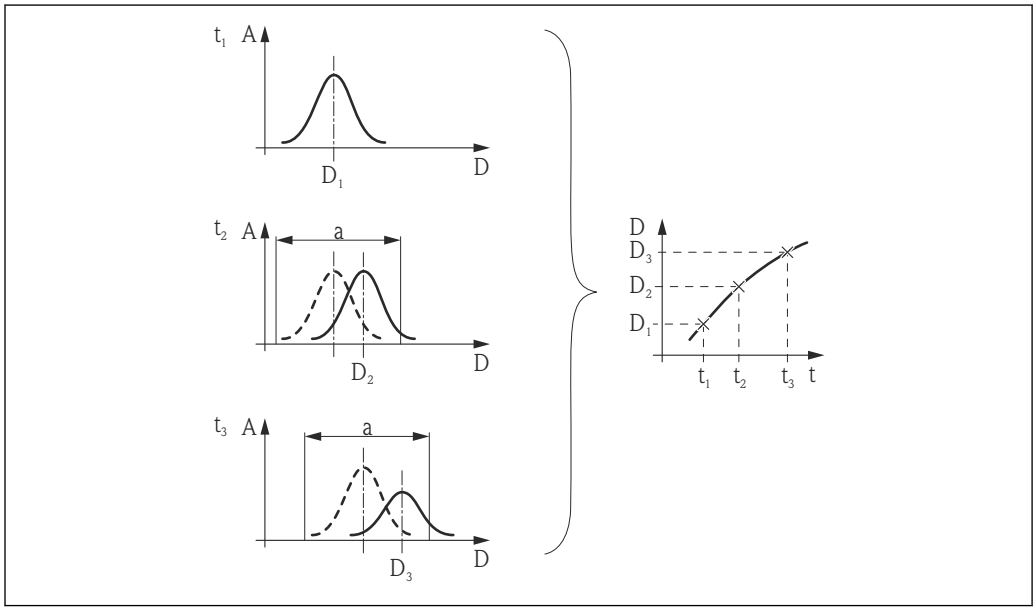
"Evaluation mode" = "History off"

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.

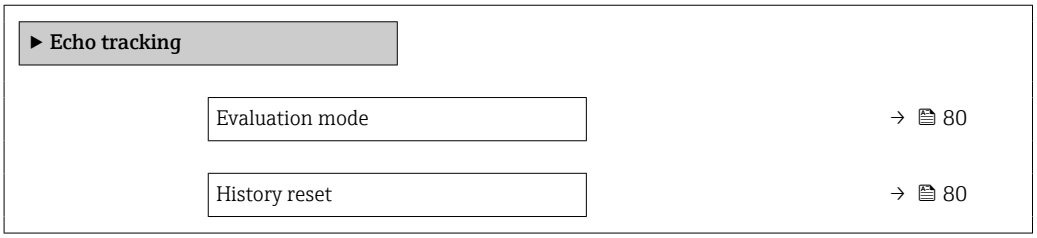
The position of the individual echoes is tracked. The track contains the position, the velocity, the relative and the absolute echo amplitude. Normally the strongest echo within a search window is selected and allocated to the track.



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

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

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 (→ 186). 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 (→ 82).

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

Description of parameters

Navigation Expert → Sensor → Tank bottom eval

Max. TB off sample distance

Navigation Expert → Sensor → Tank bottom eval → Max.TB off dist.

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

User entry Positive floating-point number

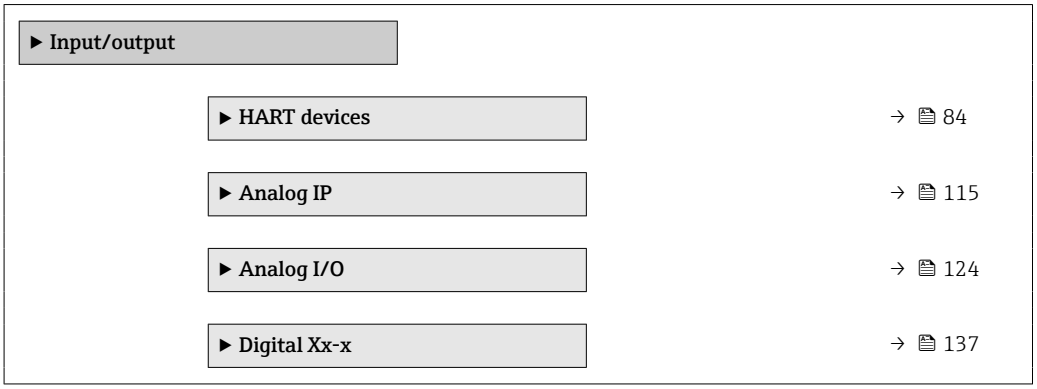
Factory setting 15 000 mm

Additional information

Read access	Operator
Write access	Maintenance

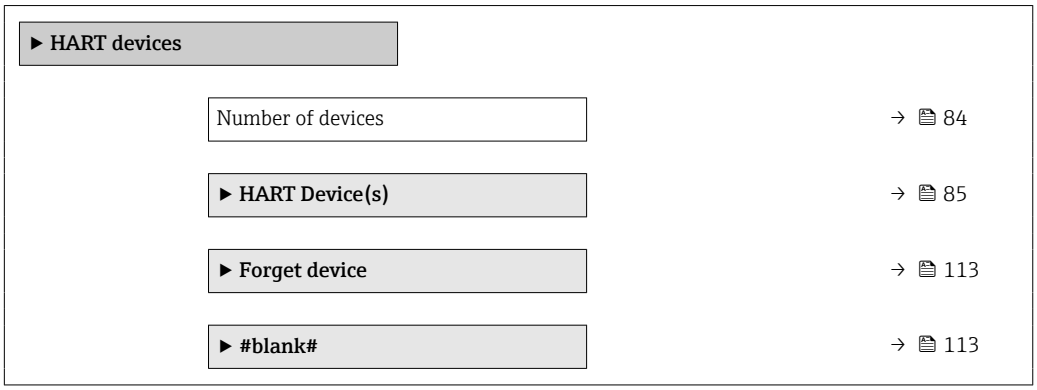
3.3 "Input/output" submenu

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

Description Shows the number of devices on the HART bus.

Additional information

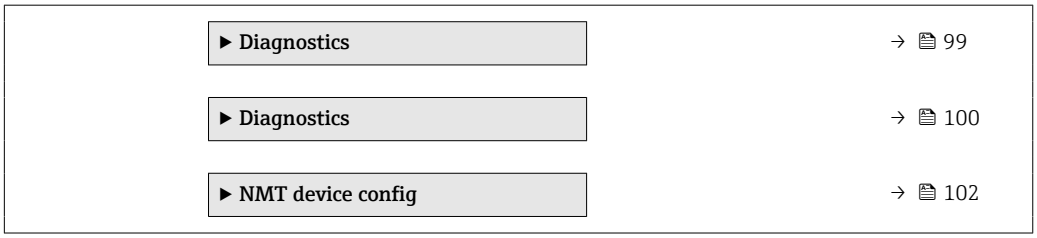
Read access	Operator
Write access	-

"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	→ 86
Polling address	→ 86
Device tag	→ 86
Operating mode	→ 86
Communication status	→ 87
Status signal	→ 87
#blank# (PV - designation dependent on device)	→ 88
#blank#(SV - designation dependent on device)	→ 88
#blank#(TV - designation dependent on device)	→ 88
#blank#(QV - designation dependent on device)	→ 88
HART device PV mA	→ 89
HART device PV %	→ 89
Output pressure	→ 89
Output density	→ 90
Output temperature	→ 90
Output vapor temperature	→ 90
Output level	→ 91
▶ **HART device information**	→ 92
▶ **Element values**	→ 98



Device name

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

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

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

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

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
- Level [4)]
- Measured level [4)]

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

Description Shows the operating status of the transmitter.

User interface
- Operating normally
- Device offline

Additional information

Read access	Operator
Write access	-

Status signal

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

Description Indicates the current device status in accordance with VDI/VDE 2650 and NAMUR Recommendation NE 107.

User interface
- OK
- Failure (F)
- Function check (C)
- Out of specification (S)
- Maintenance required (M)
- ---
- No effect (N)
- ---

Factory setting ---

4) only visible if the connected device is a Micropilot

#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 (→ 86)** = **PV,SV,TV & QV**

Description Shows the second HART variable (SV).

Additional information

Read access	Operator
Write access	-

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

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

Prerequisite For HART devices other than NMT: **Operating mode (→ 86)** = **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 Expert → Input/output → HART devices → HART Device(s) → #blank# (14716)

Prerequisite For HART devices other than NMT: **Operating mode (→ 86)** = **PV,SV,TV & QV**

Description Shows the fourth HART variable (QV).

Additional information

Read access	Operator
Write access	-

HART device PV mA

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

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 %

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

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

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.

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

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

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)

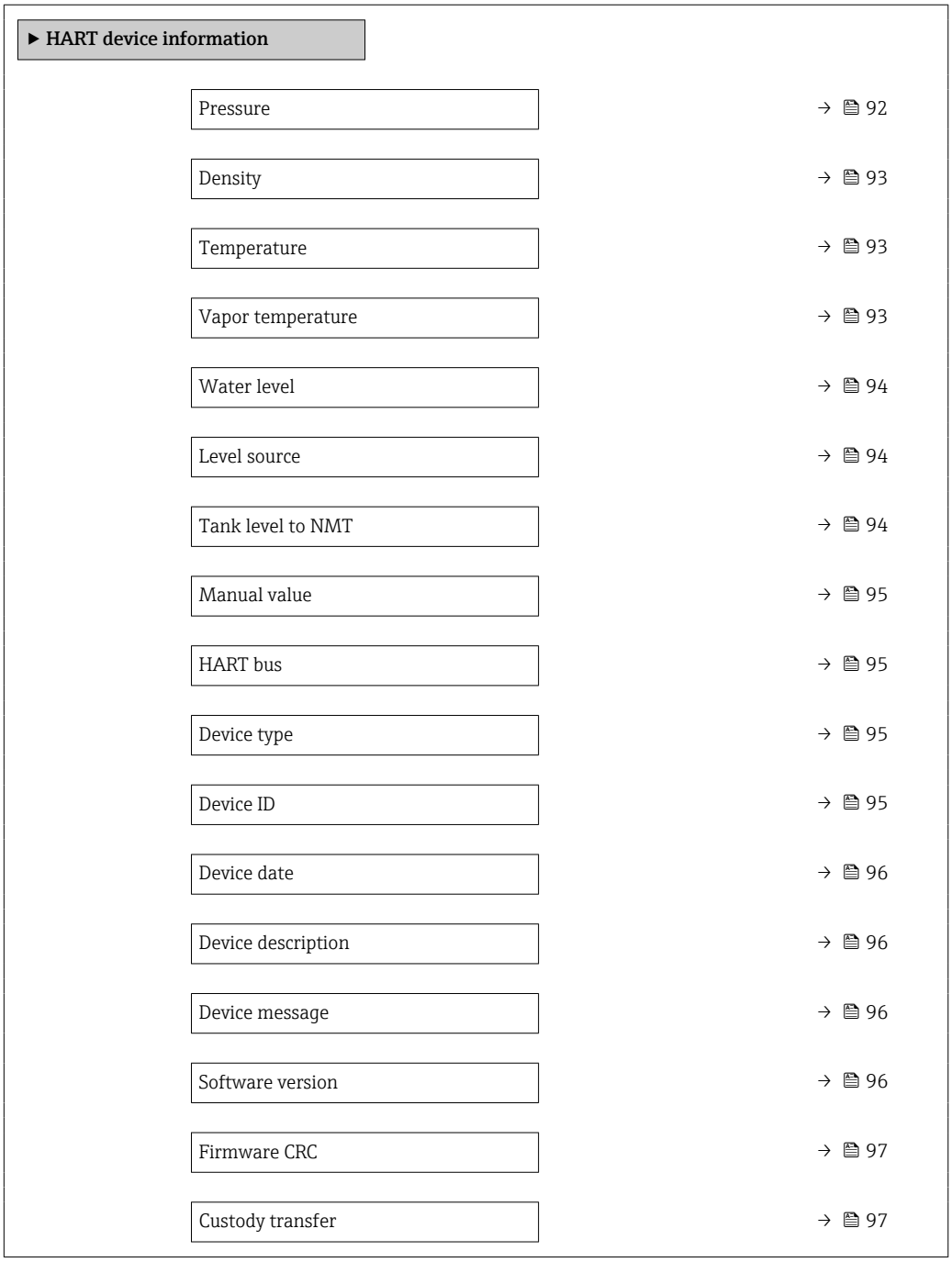
Factory setting No value

Additional information

Read access	Operator
Write access	Maintenance

"HART device information" submenu

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



Pressure

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

Prerequisite **Output pressure (→ 89) ≠ 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

Prerequisite **Output density (→ 90) ≠ 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

Prerequisite **Output temperature (→ 90) ≠ 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.

Prerequisite **Output vapor temperature (→ 90) ≠ No value**

Description Shows the temperature vaule 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

Prerequisite **Output level (→ 91) ≠ 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

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

Prerequisite Prothermo NMT53x with level measurement

Description Shows the level transfered 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

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

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

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

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

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.

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

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

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

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

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.

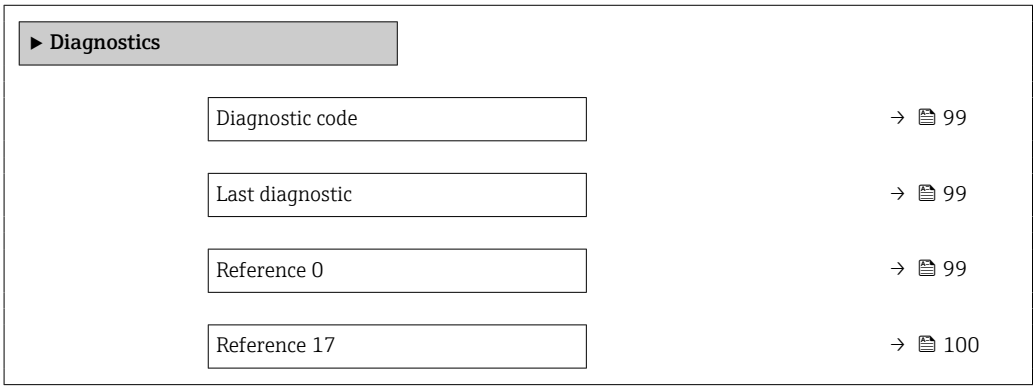
Additional information

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



Diagnostic code

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

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

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

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

Prerequisite Prothermo NMT53x with temperature measurement.

Description Shows the temperature of internal reference element 17.

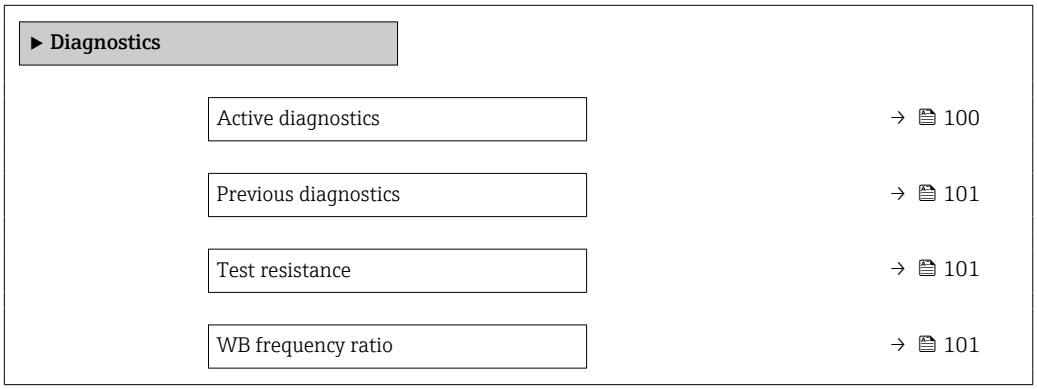
Additional information

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



Active diagnostics

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

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

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

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

User interface Signed floating-point number

Factory setting 0

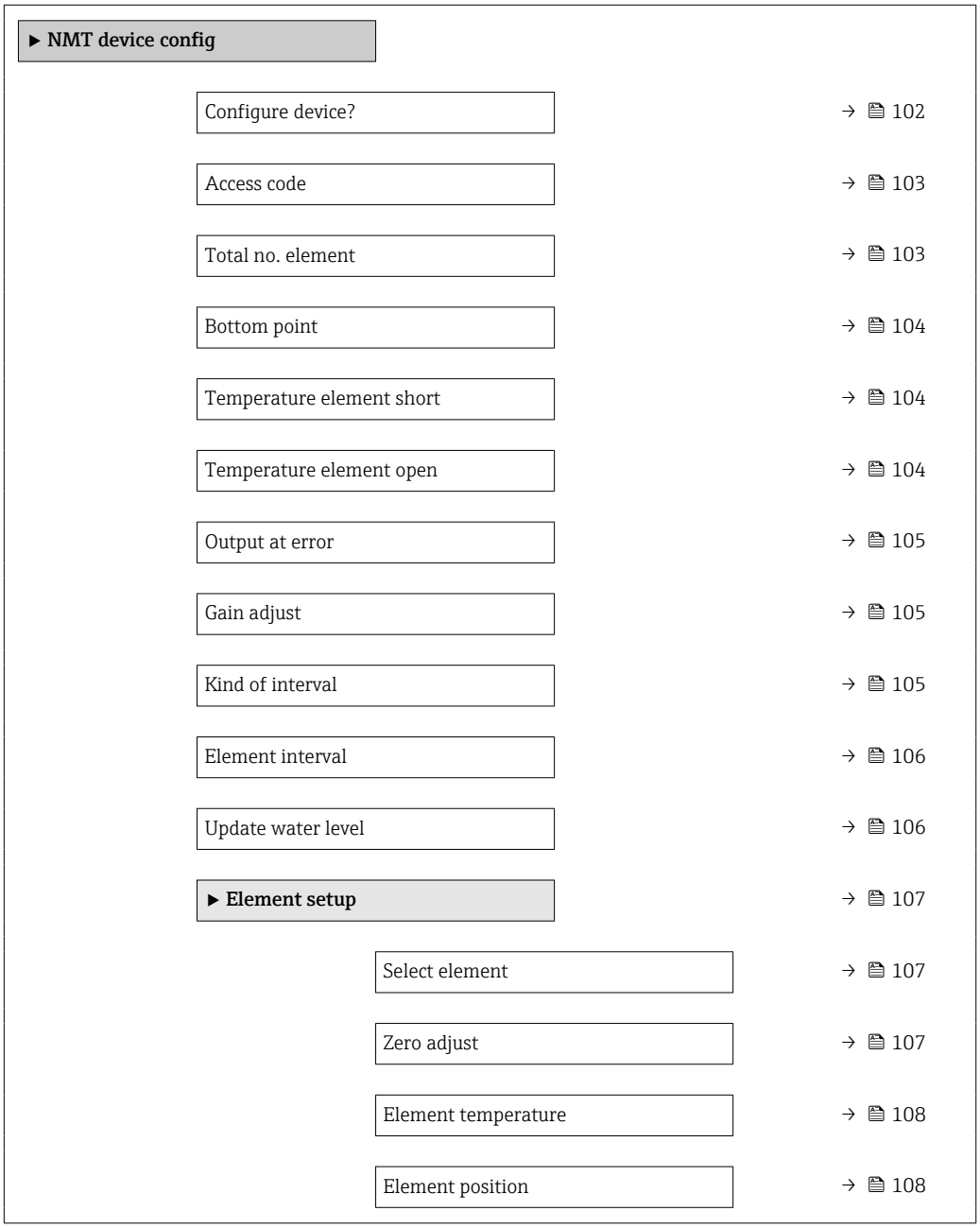
Additional information

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



Configure device?

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

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

Access code

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

Prerequisite
Configure device? (→ 102) = 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

Read access	Operator
Write access	Maintenance

Total no. element

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

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

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

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

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

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

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

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

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

Prerequisite

Kind of interval (→ 105) = 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

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

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

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

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.

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

Description Shows the position of the temperature element.

User interface Signed floating-point number

Factory setting 0 mm

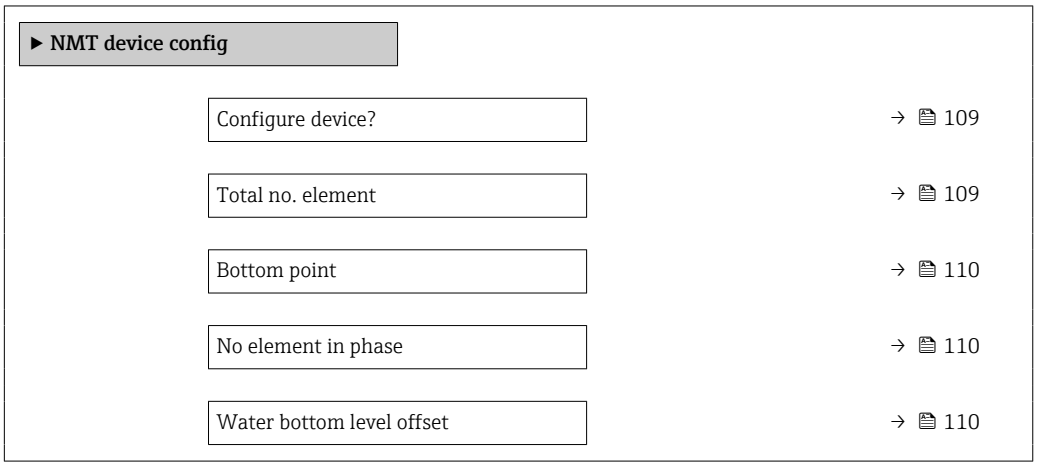
Additional information

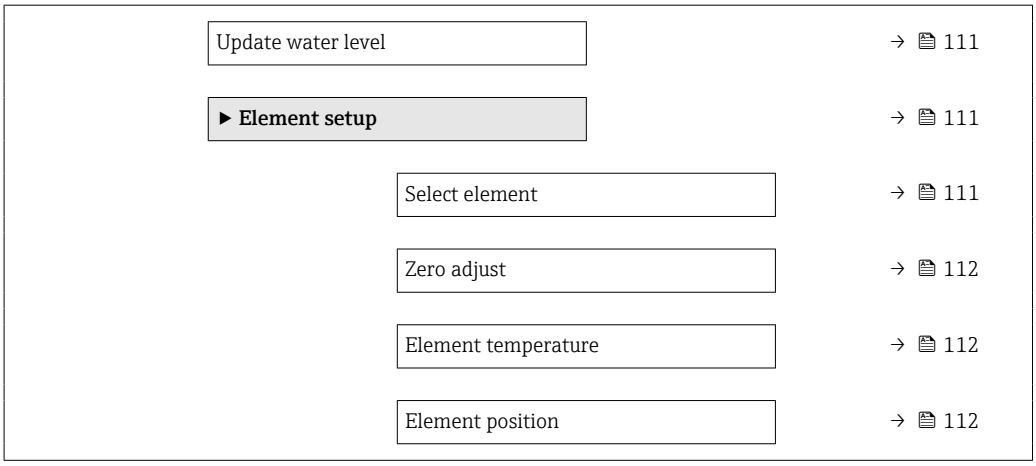
Read access	Operator
Write access	Service

"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





Configure device?

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

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

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

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

No element in phase

Navigation Expert → Input/output → HART devices → HART Device(s) → NMT dev. config → No elm. in phase

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

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.

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

Selection
- Enabled
- Disabled

Factory setting Disabled

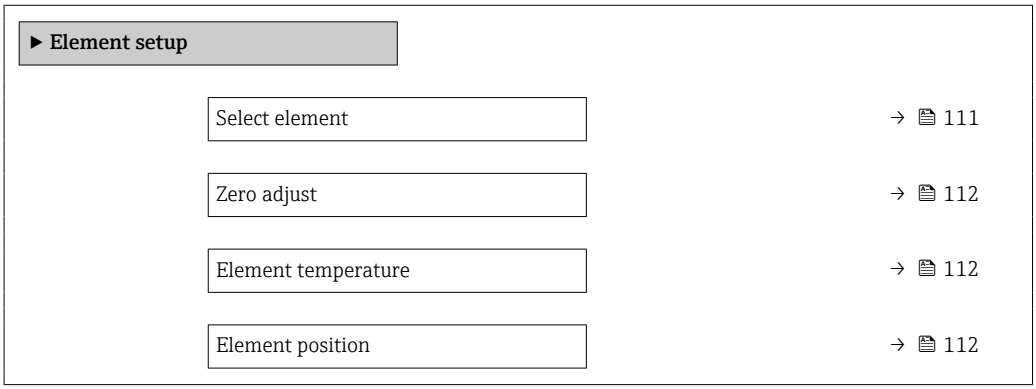
Additional information
- Enabled: Water level value is transferred
- Disabled: Water level value is **not** transferred

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

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

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.

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

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#

▶ **#blank#**		
	Operating mode	→ 114
	Current	→ 114

* Visibility depends on order options or device settings

Operating mode

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

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

Description Shows the actual current on this HART bus.

User interface 0 to 100 000 mA

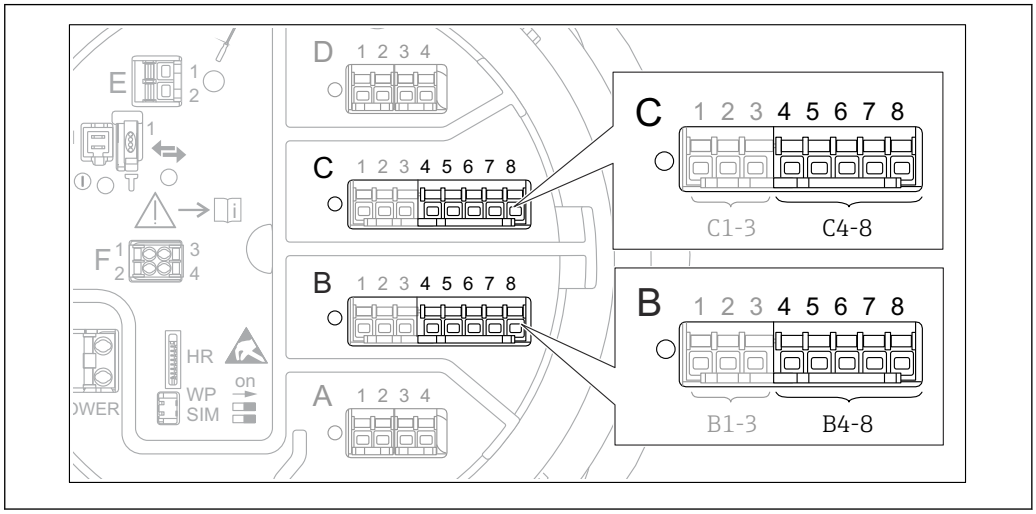
Factory setting 0 mA

Additional information

Read access	Operator
Write access	-

3.3.2 "Analog IP" submenu

There is an **Analog IP** submenu (→ 115) 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 → 124.

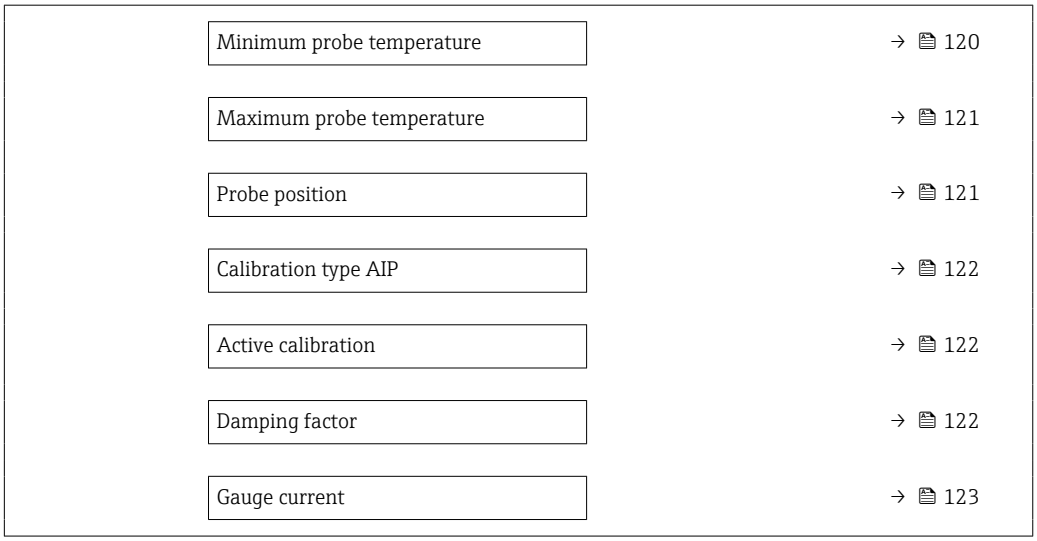


9 *Terminals for the "Analog IP" submenu (→ 115) ("B4-8" or "C4-8", respectively)*

Navigation Expert → Input/output → Analog IP

► **Analog IP**

Operating mode	→ 116
RTD type	→ 116
Ohms offset	→ 117
Thermocouple type	→ 117
RTD connection type	→ 118
Process value	→ 118
Process variable	→ 118
0 % value	→ 119
100 % value	→ 119
Input value percent	→ 119
Input value	→ 120
Temperature offset after conversion	→ 120



Operating mode

Navigation Expert → Input/output → Analog IP → Operating mode

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

Prerequisite **Operating mode (→ 116) = 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

Prerequisite **Operating mode (→ 116) = 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

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

Prerequisite **Operating mode (→ 116) = 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

Prerequisite **Operating mode (→ 116) ≠ 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

Prerequisite **Operating mode (→ 116) ≠ 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

Prerequisite **Operating mode (→ 116) = 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

Prerequisite **Operating mode (→ 116) = 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 [%]

Prerequisite **Operating mode (→ 116) = 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

Prerequisite **Operating mode (→ 116) ≠ 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

Prerequisite **Operating mode (→ 116) = 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

Prerequisite **Operating mode (→ 116) = 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

Prerequisite **Operating mode (→ 116) = 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

Prerequisite **Operating mode (→ 116) = 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

Prerequisite **Operating mode (→ 116) ≠ 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

Prerequisite **Operating mode (→ 116) ≠ 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

Prerequisite **Operating mode (→ 116) ≠ 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

Prerequisite **Operating mode (→ 116) = Gauge power supply**

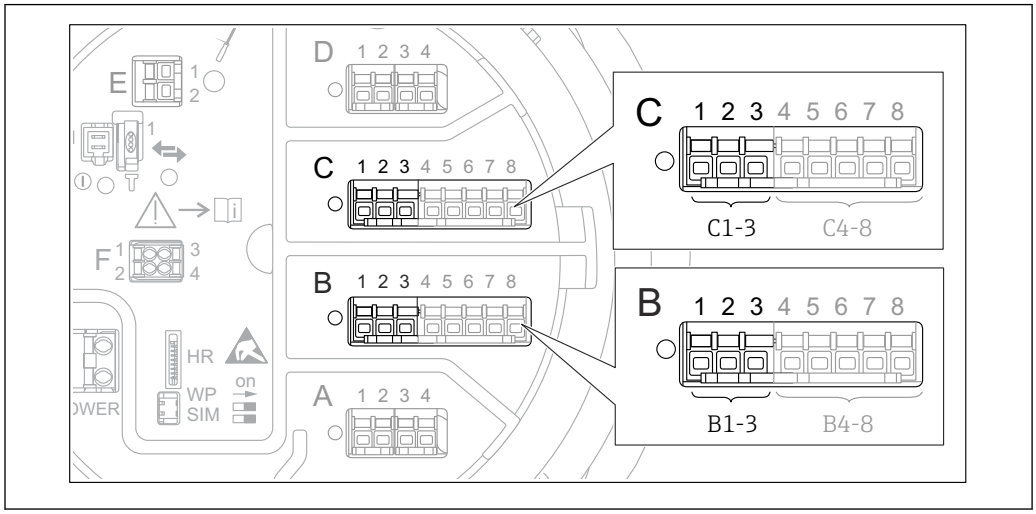
Description Shows the current on the power supply line for the connected device.

Additional information

Read access	Operator
Write access	-

3.3.3 "Analog I/O" submenu

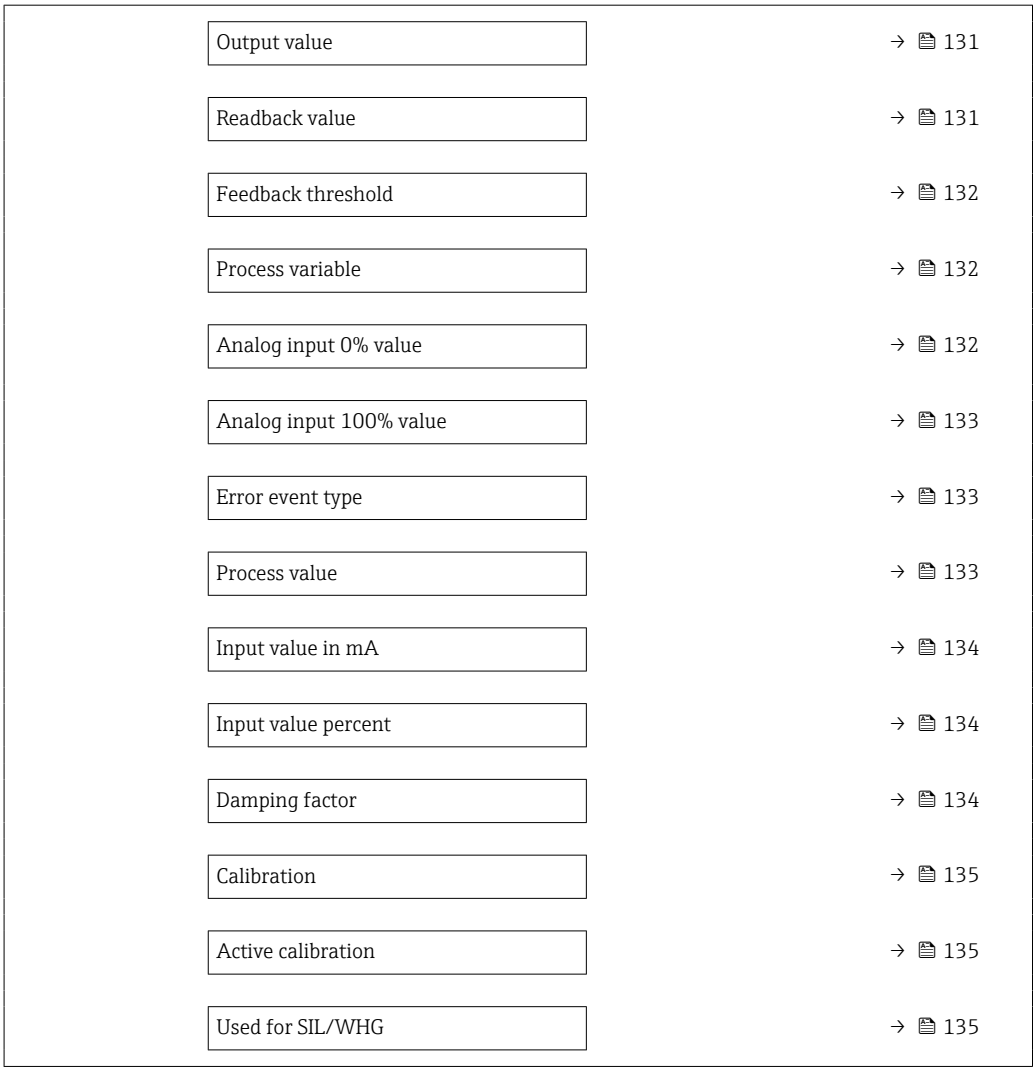
There is a **Analog I/O** submenu (→ 124) for each Analog I/O module of the device. This submenu refers to terminals 1 to 3 of this module (an analog input or output). For terminals 4 to 8 (always an analog input) refer to → 115.



10 *Terminals for the "Analog I/O" submenu (→ 124) ("B1-3" or "C1-3", respectively)*

Navigation Expert → Input/output → Analog I/O

▶ Analog I/O	
Operating mode	→ 125
Current span	→ 126
Fixed current	→ 127
Analog input source	→ 127
Failure mode	→ 128
Error value	→ 129
Output out of range	→ 129
Error on event	→ 129
Input value	→ 130
0 % value	→ 130
100 % value	→ 130
Input value %	→ 131



Operating mode

Navigation Expert → Input/output → Analog I/O → Operating mode

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 (→ 125)	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

Prerequisite **Operating mode** parameter (→ 125) ≠ **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 (→ 127).				

In the case of an error, the output current assumes the value defined in the **Failure mode** parameter (→ 128).

Fixed current

Navigation Expert → Input/output → Analog I/O → Fixed current

Prerequisite **Current span (→ 126) = 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

Prerequisite
- **Operating mode (→ 125) = 4..20mA output** or **HART slave +4..20mA output**
- **Current span (→ 126) ≠ 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 density [5)]
- Upper density
- Middle density
- Lower density
- P1 (bottom)
- P2 (middle)
- P3 (top)
- GP 1 ... 4 value
- AIO B1-3 value [5)]
- AIO B1-3 value mA [5)]
- AIO C1-3 value [5)]
- AIO C1-3 value mA [5)]
- AIP B4-8 value [5)]
- AIP C4-8 value [5)]
- Element temperature 1 ... 24 [5)]
- HART device 1...15 PV [5)]
- HART device 1 ... 15 PV mA [5)]
- HART device 1 ... 15 PV % [5)]
- HART device 1 ... 15 SV [5)]
- HART device 1 ... 15 TV [5)]
- HART device 1 ... 15 QV [5)]

Factory setting Tank level

Additional information

Read access	Operator
Write access	Maintenance

Failure mode

Navigation Expert → Input/output → Analog I/O → Failure mode

Prerequisite **Operating mode (→ 125)** = **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

Prerequisite **Failure mode (→ 128)** = **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

Prerequisite **Operating mode (→ 125)** = **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

Prerequisite **Operating mode (→ 125)** = **4..20mA output** or **HART slave +4..20mA output**

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

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

Factory setting
Output related error

Additional information

Read access	Operator
Write access	Maintenance

Input value

Navigation
Expert → Input/output → Analog I/O → Input value

Prerequisite
- **Operating mode (→ 125)** = **4..20mA output** or **HART slave +4..20mA output**
- **Current span (→ 126)** ≠ **Fixed current**

Description
Shows the input value of the analog I/O module.

Additional information

Read access	Operator
Write access	-

0 % value

Navigation
Expert → Input/output → Analog I/O → 0 % value

Prerequisite
- **Operating mode (→ 125)** = **4..20mA output** or **HART slave +4..20mA output**
- **Current span (→ 126)** ≠ **Fixed current**

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

User entry
Signed floating-point number

Factory setting
0 Unitless

Additional information

Read access	Operator
Write access	Maintenance

100 % value

Navigation
Expert → Input/output → Analog I/O → 100 % value

Prerequisite
- **Operating mode (→ 125)** = **4..20mA output** or **HART slave +4..20mA output**
- **Current span (→ 126)** ≠ **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 %

Prerequisite
- **Operating mode (→ 125)** = **4..20mA output** or **HART slave +4..20mA output**
- **Current span (→ 126)** ≠ **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

Prerequisite **Operating mode (→ 125)** = **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

Prerequisite **Operating mode (→ 125)** = **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 Expert → Input/output → Analog I/O → Feedback thresh.

Prerequisite **Operating mode (→ 125)** = **4..20mA output** or **HART slave +4..20mA output**

Description Shows the feedback threshold.

Additional information

Read access	Operator
Write access	-

Process variable

Navigation Expert → Input/output → Analog I/O → Process variable

Prerequisite **Operating mode (→ 125)** = **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 Expert → Input/output → Analog I/O → AI 0% value

Prerequisite **Operating mode (→ 125)** = **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 Expert → Input/output → Analog I/O → AI 100% value

Prerequisite **Operating mode (→ 125)** = **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 Expert → Input/output → Analog I/O → Error event type

Prerequisite **Operating mode (→ 125)** ≠ **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 Expert → Input/output → Analog I/O → Process value

Prerequisite **Operating mode (→ 125)** = **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

Prerequisite **Operating mode (→ 125)** = **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 [%]

Prerequisite **Operating mode (→ 125)** = **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

Prerequisite **Operating mode (→ 125)** ≠ **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

Prerequisite **Operating mode (→ 125) ≠ 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

Prerequisite **Operating mode (→ 125) ≠ 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

Prerequisite
- **Operating mode (→ 125) = 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

Prerequisite

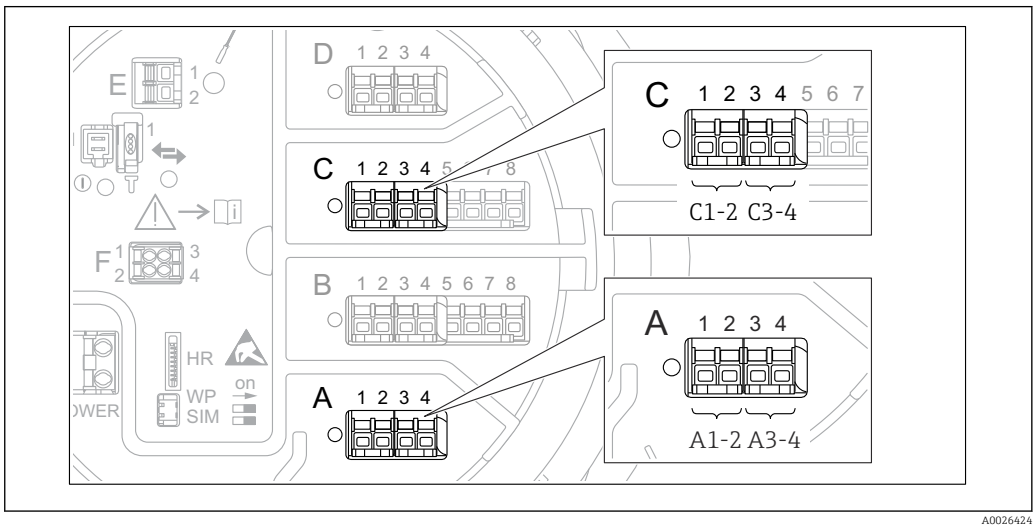
- **Operating mode (→ 125)** = **4..20mA output** or **HART slave +4..20mA output**
- The device has a SIL approval.

Additional information

Read access	Operator
Write access	-

3.3.4 "Digital Xx-x" submenu

- 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.



11 *Designation of the digital inputs or outputs (examples)*

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

▶ **Digital Xx-x**

Operating mode	→ 138
Digital input source	→ 138
Input value	→ 139
Contact type	→ 139
Output simulation	→ 140
Output value	→ 141
Readback value	→ 141
Error on event	→ 141
Damping factor	→ 142
Used for SIL/WHG	→ 142

Operating mode

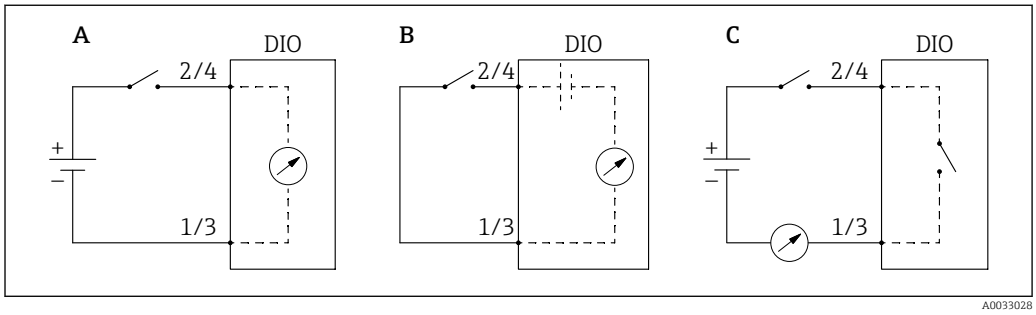
Navigation Expert → Input/output → Digital Xx-x → Operating mode (13911)

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

Selection
- Disabled
- Output passive
- Input passive
- Input active

Factory setting Disabled

Additional information



12 *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 (→ 138) = 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-x** [6]
  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** parameter [7] is passed to the digital output. For details refer to Special Documentation SD02066G.

Read access	Operator
Write access	Maintenance

Input value

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

Prerequisite **Operating mode (→ 138)** = **"Input passive" option** or **"Input active" option**

Description Shows the digital input value.

Additional information

Read access	Operator
Write access	-

Contact type

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

Prerequisite **Operating mode (→ 138)** ≠ **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 (→ 138)" = "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 (→ 138) = Output passive**

Description Sets the output to a specific simulated value.

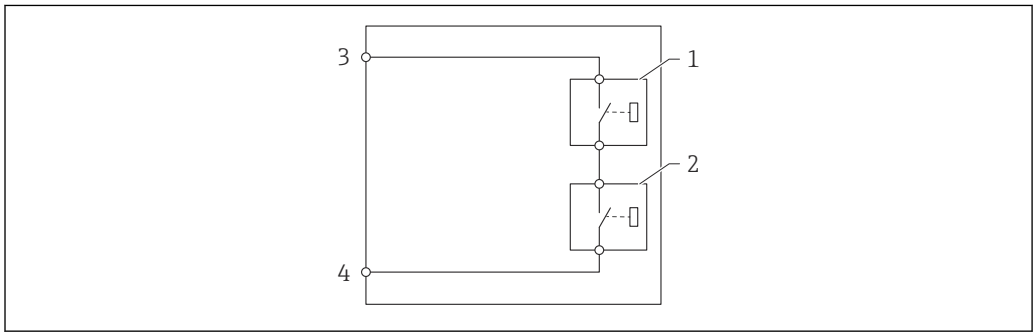
Selection
- Disable
- Simulating active
- Simulating inactive
- Fault 1
- Fault 2

Factory setting Disable

Additional information

Read access	Operator
Write access	Maintenance

The digital output consists of two relays connected in series:



13 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 (→ 138) = 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 (→ 138) = 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 (→ 138) = 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 (→ 138) ≠ 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 (→ 138) = Output passive**
- The device has a SIL certificate.

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

Selection
- Enabled
- Disabled

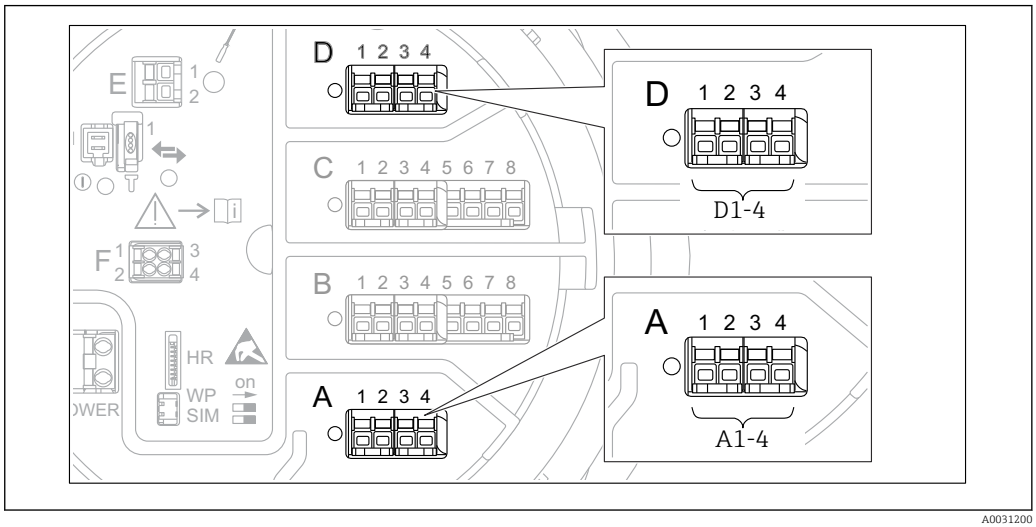
Factory setting Disabled

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.



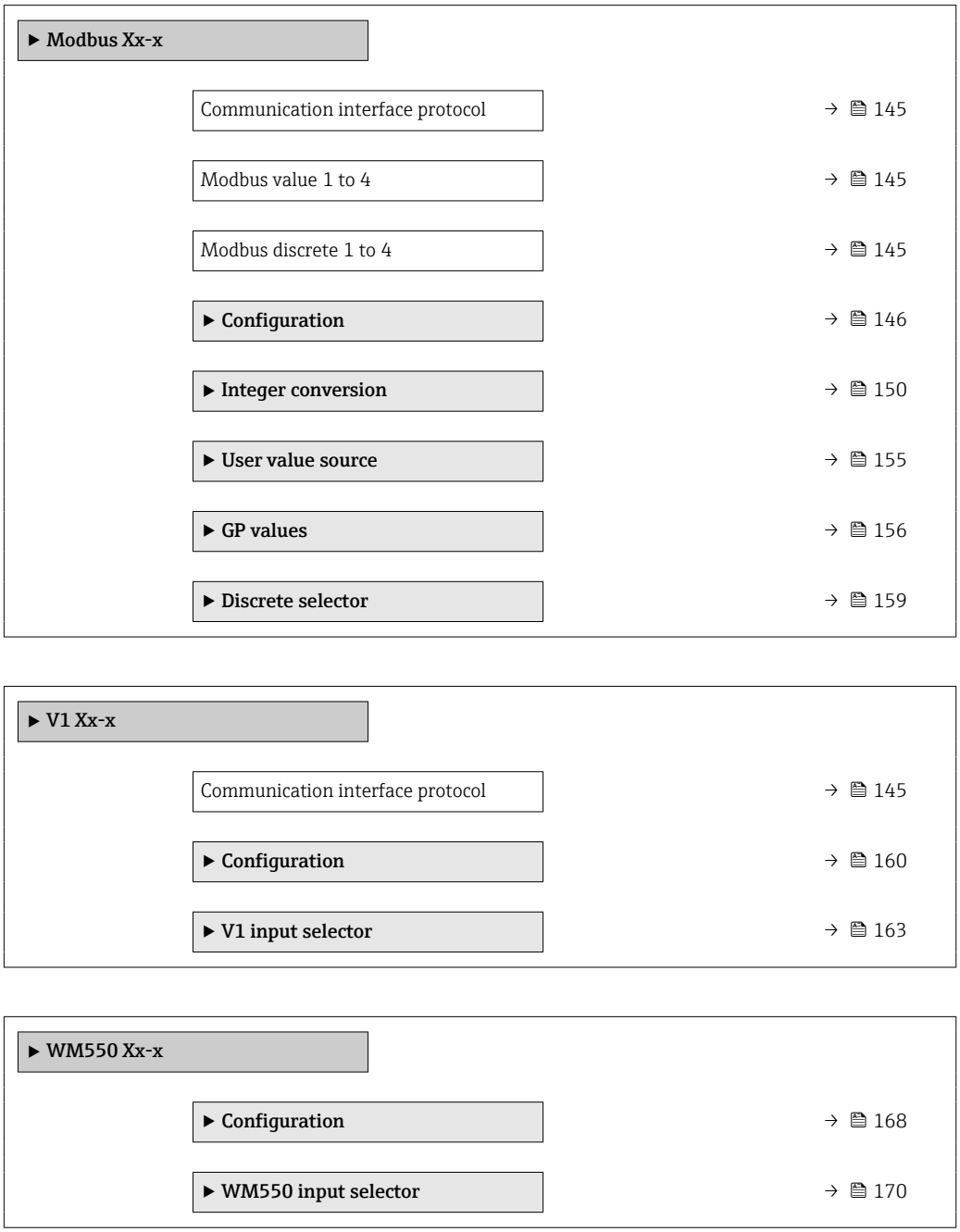
14 *Designation of the "Modbus" or "V1" modules (examples); depending on the device version these modules may also be in slot B or C.*

Navigation Expert → Communication

3.4.1 "Modbus Xx-x", "V1 Xx-x" or "WM550 Xx-x" submenu

This submenu is only present for devices with MODBUS, V1 and/or WM550 communication interface. There is one submenu of this type for each communication interface.

Navigation Expert → Communication → Modbus Xx-x / V1 Xx-x / WM550 Xx-x



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 (→ 145) = 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 (→ 145) = MODBUS**

Description Shows the integer value written by the host-system.

Additional information

Read access	Operator
Write access	-

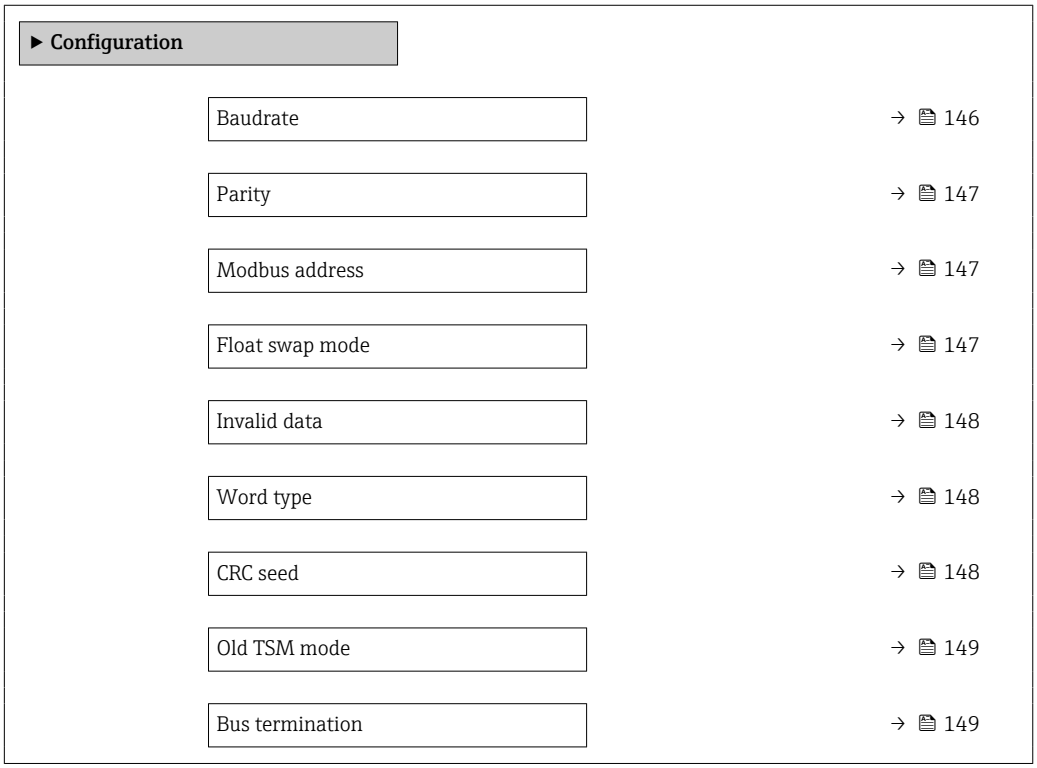
The Modbus interface provides four discrete (integer) registers which can be written to by the Host system. These values can be linked to specific functions (e.g. controlling a discrete output).

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



Baudrate

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

Prerequisite **Communication interface protocol (→ 145) = 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 (→ 145) = 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

Read access	Operator
Write access	Maintenance

Modbus address

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

Prerequisite **Communication interface protocol (→ 145) = MODBUS**

Description Defines the Modbus address of the device.

User entry 1 to 247

Factory setting 1

Additional information

Read access	Operator
Write access	Maintenance

Float swap mode

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

Prerequisite **Communication interface protocol (→ 145) = 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
- WW Swap 2-3-0-1

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 (→ 145) = 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 (→ 145) = 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 (→ 145) = MODBUS**

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

Selection
- 0x0000
- 0xFFFF

Factory setting 0xFFFF

Additional information

Read access	Operator
Write access	Maintenance

Old TSM mode

Navigation Expert → Communication → Modbus Xx-x → Configuration → Old TSM mode (13213)

Prerequisite **Communication interface protocol (→ 145) = MODBUS**

Description Selects the type of value available at the NRF590 SW vers.1 compatible modbus map (Address 3000-3195) addresses.

Selection
- Float values
- Integer values

Factory setting Float values

Additional information

Read access	Operator
Write access	Maintenance

Bus termination

Navigation Expert → Communication → Modbus X1-4 → Configuration → Bus termination (13249)

Prerequisite **Communication interface protocol (→ 145) = MODBUS**

Description Activates or deactivates the bus termination at the device. Should only be activated on the last device in a loop.

Selection
- Off
- On

Factory setting Off

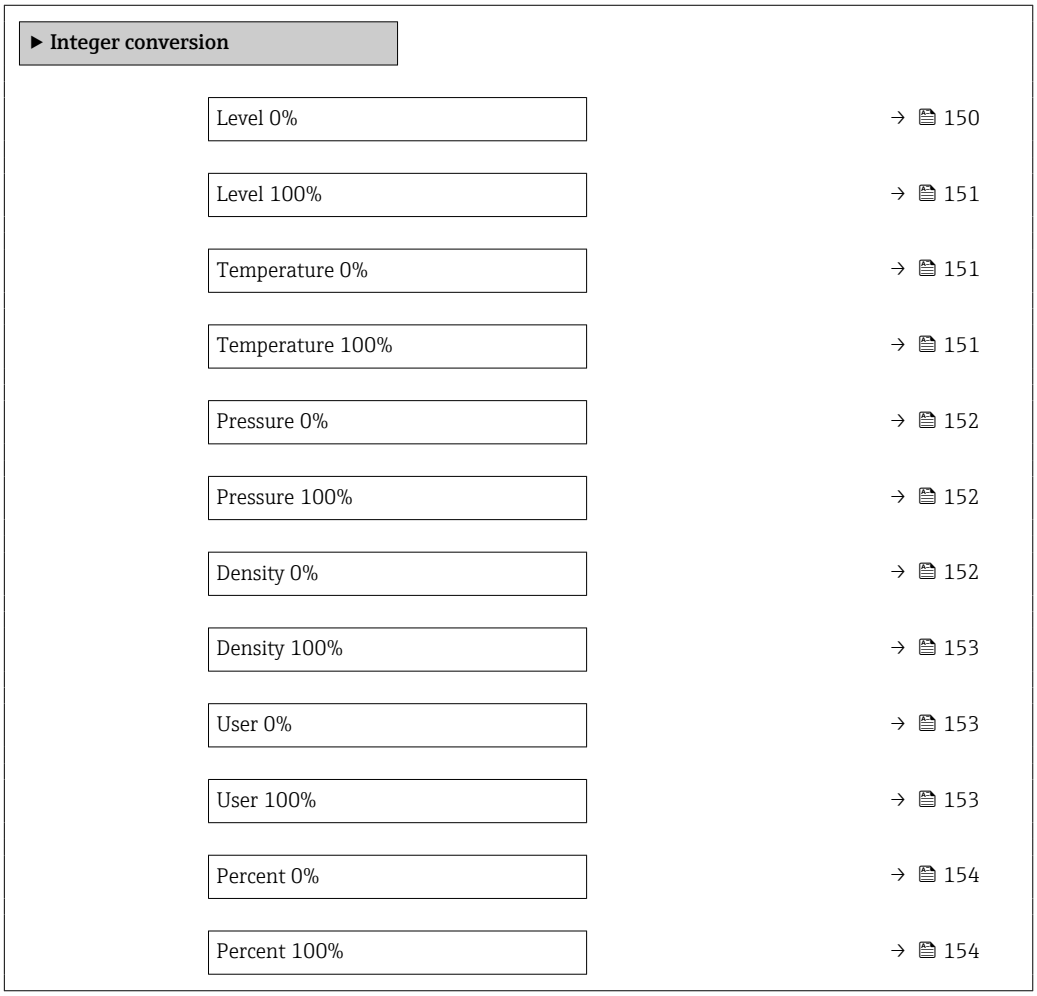
Additional information

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



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 233.15 °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 373.15 °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/m^3

Additional information

Read access	Operator
Write access	Maintenance

Density 100%

Navigation 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 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 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 density [8)]
- 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

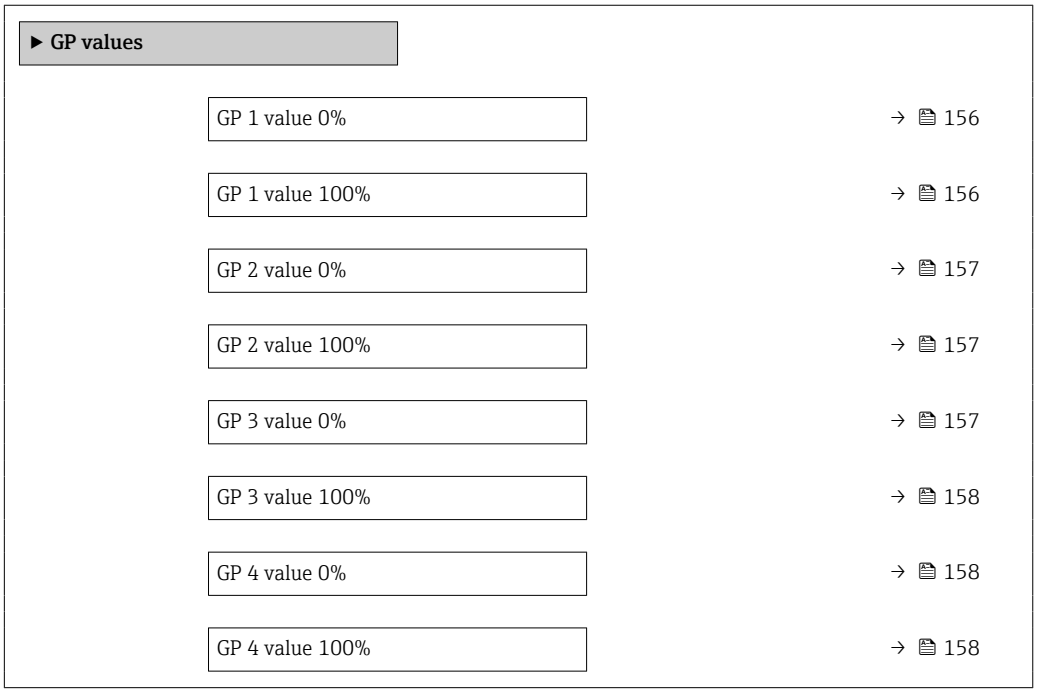
Additional information

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 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

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

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

Read access	Operator
Write access	Maintenance

"Discrete selector" submenu

Navigation Expert → Communication → Modbus Xx-x → Discreteselect

Discrete 1 to 4 selector

Navigation Expert → Communication → WM550 X1-4 → Discreteselect → Discrete 1 to 4select (13260–1 to 4)

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

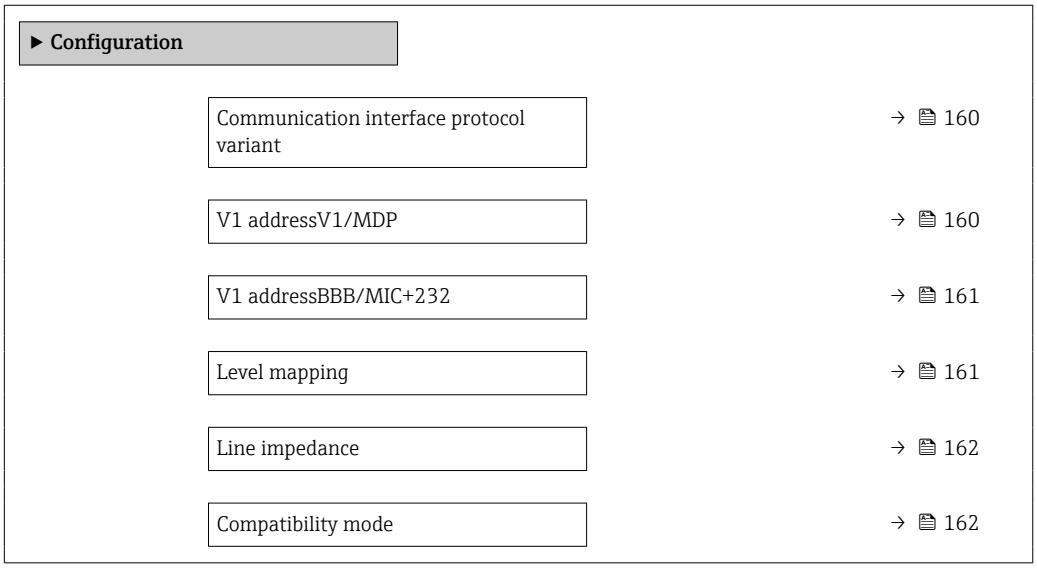
Additional information

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



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 (→ 160) = 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 (→ 160)**

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 (→ 145) = 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 (→ 145) = 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 → 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.

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 density [9)]
- 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

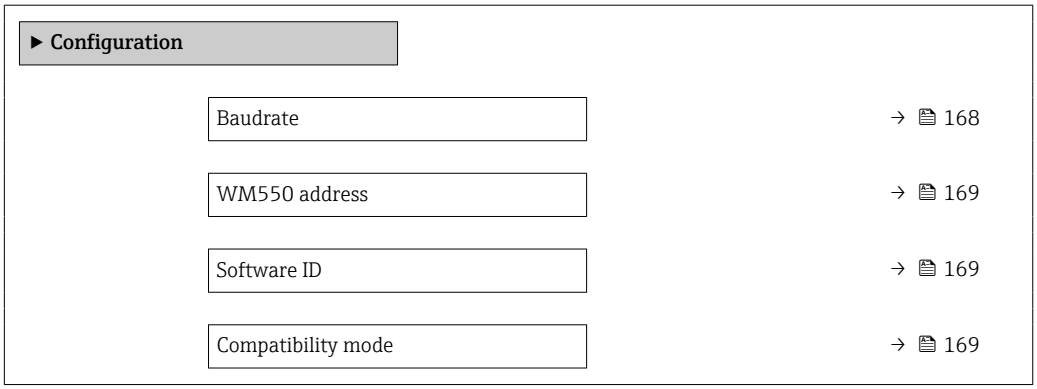
Additional information

Read access	Operator
Write access	Maintenance

"Configuration" submenu (WM550)

This submenu is only present for devices with a **WM550** option communication interface.

Navigation Expert → Communication → WM550 Xx-x → Configuration



Baudrate

Navigation Expert → Communication → WM550 Xx-x → Configuration → Baudrate (13203)

Prerequisite **Communication interface protocol (→ 145) = "WM550" option**

Description Defines the baud rate of the WM550 communication.

* Visibility depends on order options or device settings

Selection
- 600 BAUD
- 1200 BAUD
- 2400 BAUD
- 4800 BAUD

Factory setting 2400 BAUD

Additional information

Read access	Operator
Write access	Maintenance

WM550 address

Navigation Expert → Communication → WM550 Xx-x → Configuration → WM550 address (13286)

Description Describes the WM550 address of the device.

User entry 0 to 63

Factory setting 1

Software ID

Navigation Expert → Communication → WM550 Xx-x → Configuration → Software ID (13287)

Prerequisite **Communication interface protocol (→ 145) = "WM550" option**

Description Defines content for WM550 Task 32.
Detailed information on content for WM550 Task 32, Special Documentation SD02567G.

User entry 0 to 9 999

Factory setting 2 000

Compatibility mode

Navigation Expert → Communication → WM550 Xx-x → Configuration → Comp. mode

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.

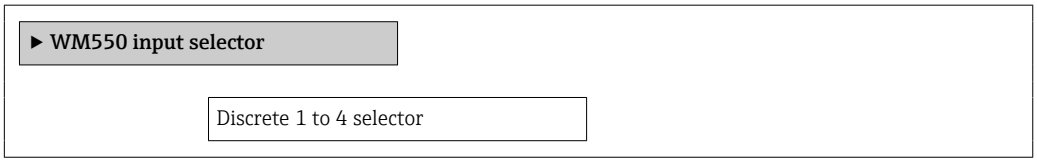
In **NMS8x** mode: All Gauge status are available at this parameter.

Read access	Operator
Write access	Maintenance

"WM550 input selector" submenu (WM550)

This submenu is only present for devices with a **WM550** option communication interface.

Navigation Expert → Communication → WM550 Xx-x → WM550 inp select



Discrete 1 to 4 selector

Navigation

Expert → Communication → WM550 Xx-x → WM550 inp select → Discrete 1 to 4select (13260–1 to 4)

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

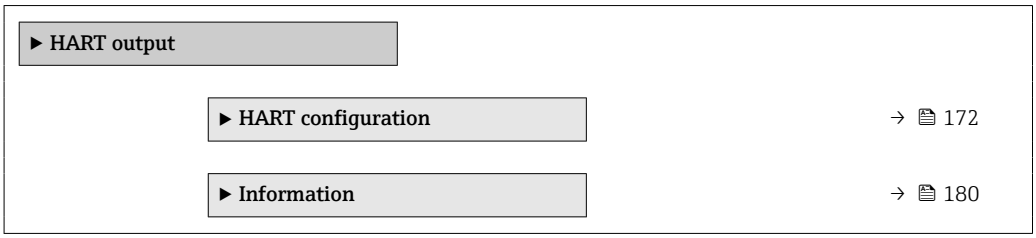
None

Additional information

Read access	Operator
Write access	Maintenance

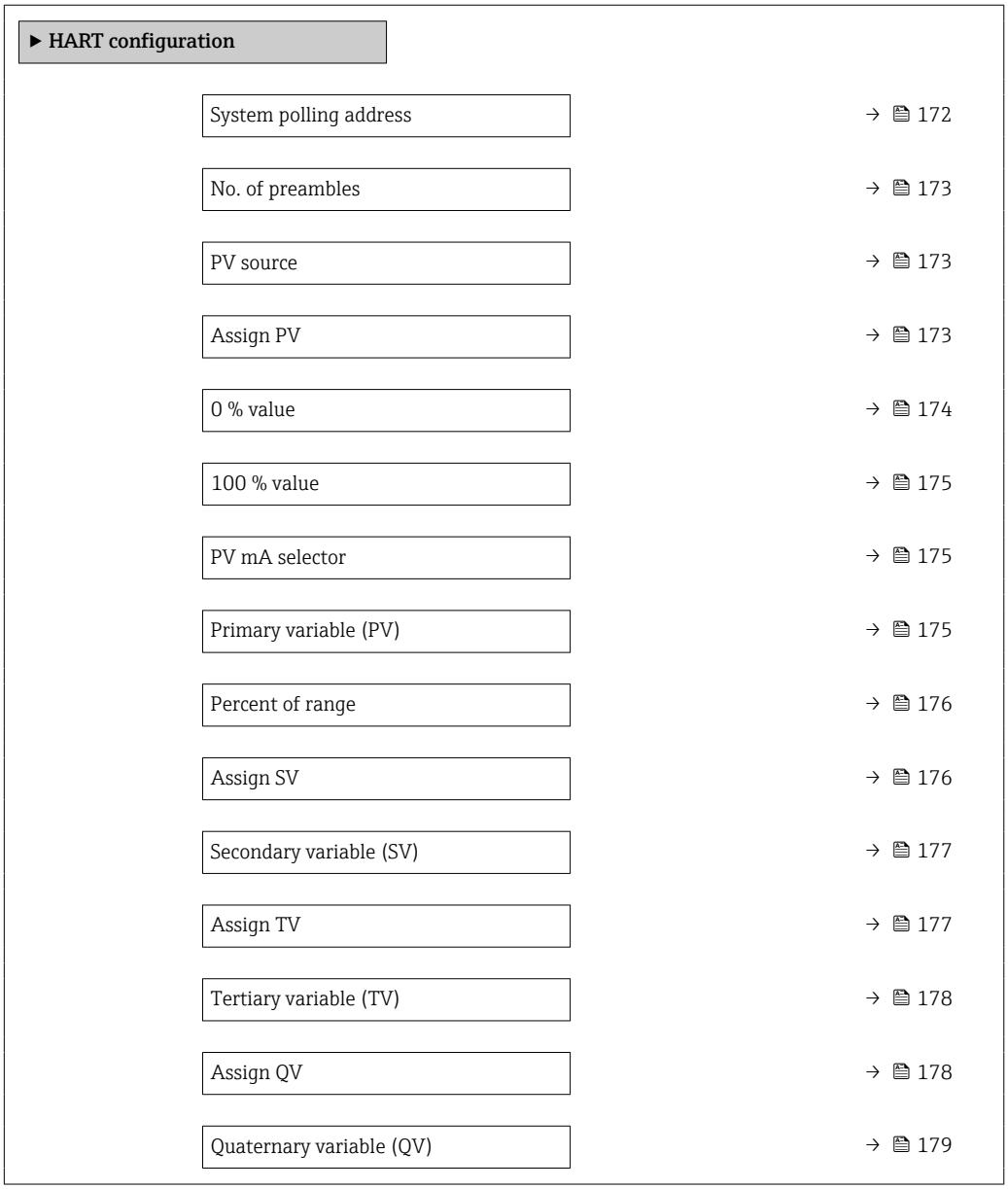
3.4.2 "HART output" submenu

Navigation Expert → Communication → HART output



"HART configuration" submenu

Navigation Expert → Communication → HART output → HART config.



System polling address

Navigation Expert → Communication → HART output → HART config. → Polling address

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

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

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

Prerequisite **PV source (→ 173) = 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

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

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

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)

Description Shows the current measured value of the primary dynamic 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

Description Shows the value of the primary variable (PV) as a percentage of the defined 0% to 100% range.

Additional information

Read access	Operator
Write access	-

Assign SV

Navigation Expert → Communication → HART output → HART config. → Assign SV

Description Assign a measured variable to the second dynamic variable (SV).

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 Liquid temperature

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.

Secondary variable (SV)

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

Prerequisite **Assign SV (→ 176) ≠ None**

Description Shows the current measured value of the secondary dynamic variable (SV)

Additional information

Read access	Operator
Write access	-

Assign TV

Navigation Expert → Communication → HART output → HART config. → Assign TV

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)

Prerequisite **Assign TV (→ 177) ≠ None**

Description Shows the current measured value of the tertiary (third) dynamic variable (TV)

Additional information

Read access	Operator
Write access	-

Assign QV

Navigation Expert → Communication → HART output → HART config. → Assign QV

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)

Prerequisite **Assign QV (→ 178) ≠ None**

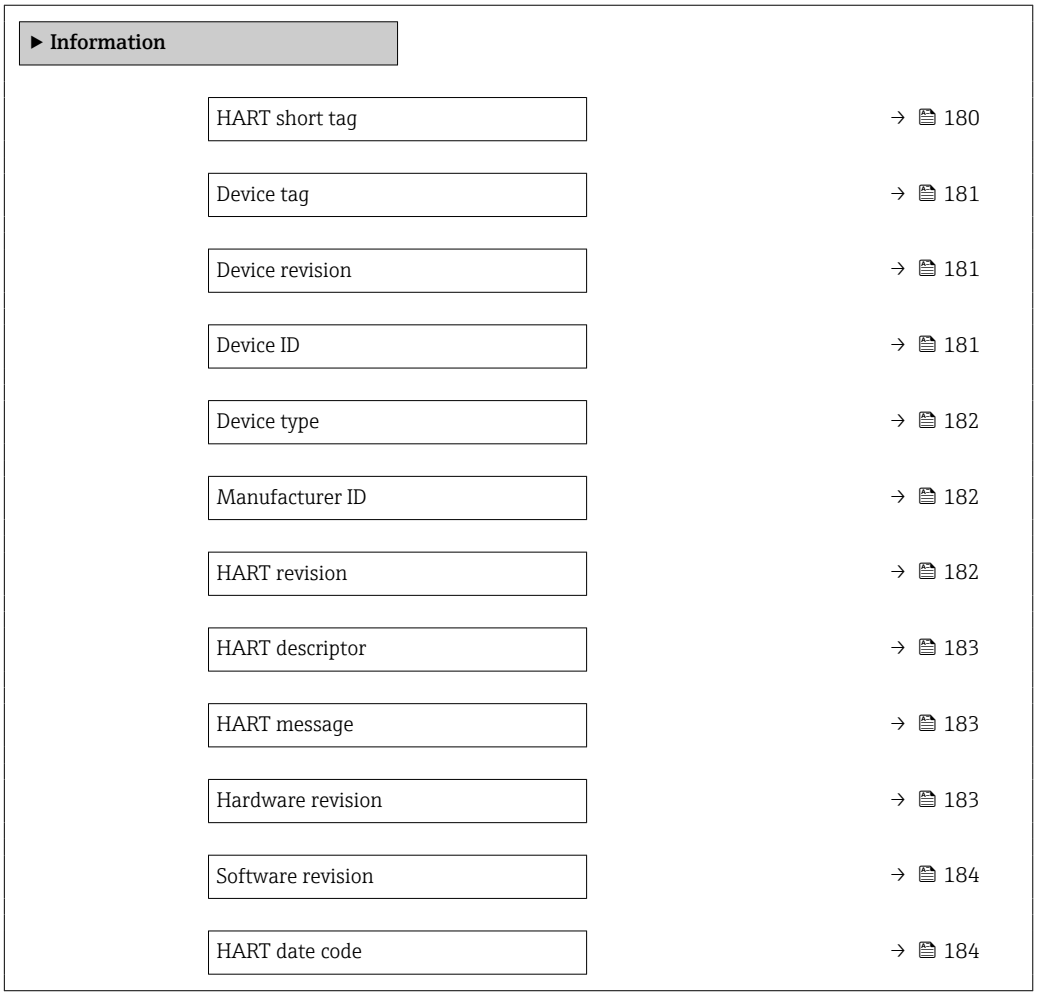
Description Shows the current measured value of the quaternary (fourth) dynamic variable (QV)

Additional information

Read access	Operator
Write access	-

"Information" submenu

Navigation Expert → Communication → HART output → Information



HART short tag

Navigation Expert → Communication → HART output → Information → HART short tag

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

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

Read access	Operator
Write access	Maintenance

Device revision

Navigation Expert → Communication → HART output → Information → Device revision

Description Shows the device revision with which the device is registered with the HART Communication Foundation

User interface 0 to 255

Factory setting 7

Additional information

Read access	Operator
Write access	-

Device ID

Navigation Expert → Communication → HART output → Information → Device ID

Description Shows the device ID for identifying the device in a HART network

User interface Positive integer

Factory setting 123 456

Additional information

Read access	Operator
Write access	-

Device type

Navigation Expert → Communication → HART output → Information → Device type

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

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

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

Description Enter description for the measuring point

User entry Character string comprising numbers, letters and special characters (16)

Factory setting NMR8x

Additional information

Read access	Operator
Write access	Maintenance

HART message

Navigation Expert → Communication → HART output → Information → HART message

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

Read access	Operator
Write access	Maintenance

Hardware revision

Navigation Expert → Communication → HART output → Information → Hardware rev.

Description Hardware revision of the device.

User interface 0 to 30

Factory setting 1

Additional information

Read access	Operator
Write access	-

Software revision

Navigation Expert → Communication → HART output → Information → Software rev.

Description Software revision of the device.

User interface 0 to 255

Factory setting 7

Additional information

Read access	Operator
Write access	-

HART date code

Navigation Expert → Communication → HART output → Information → HART date code

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)

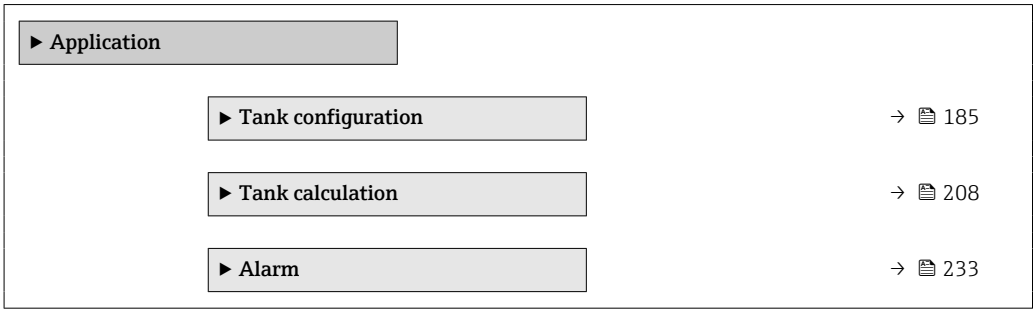
Factory setting 2009-07-20

Additional information

Read access	Operator
Write access	Maintenance

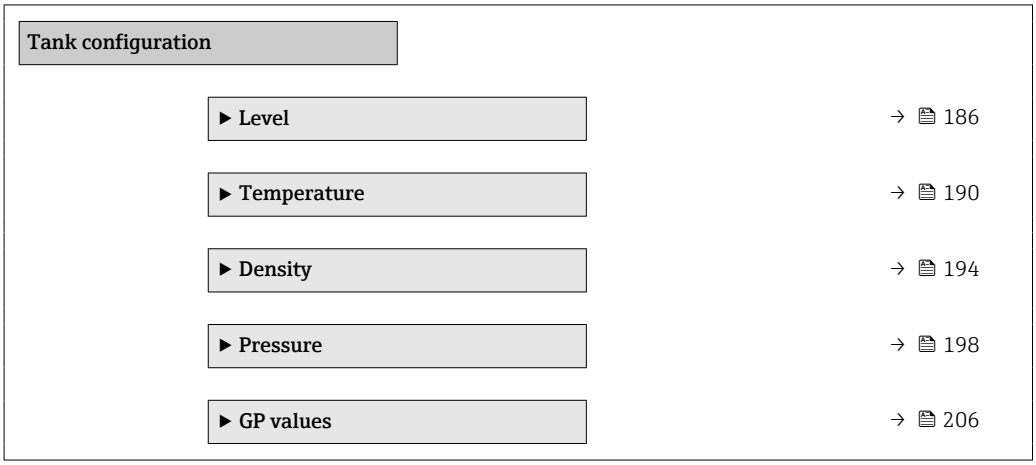
3.5 "Application" submenu

Navigation Expert → Application



3.5.1 "Tank configuration" submenu

Navigation Expert → Application → Tank config



"Level" submenu

Navigation Expert → Application → Tank config → Level

Empty

Navigation Expert → Application → Tank config → Level → Empty

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

User entry 0 to 10 000 000 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 (→ 186), the **Table mode** parameter (→ 232) is automatically set to **Disable**.
- If **Empty (→ 186)** 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 (→ 186).

Tank reference height

Navigation Expert → Application → Tank config → Level → Tank ref height

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

User entry 0 to 10 000 000 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

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

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 10 000 000 mm

Factory setting 0 mm

Additional information

Read access	Operator
Write access	Maintenance

The device adjusts the **Empty** parameter (→ 186) according to the entered value, such that the measured level will match the actual level.

- After the change of the **Empty** parameter (→ 186), the **Table mode** parameter (→ 232) 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

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

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

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

Description Shows the bottom water level.

Additional information

Read access	Operator
Write access	-

Manual water level

Navigation Expert → Application → Tank config → Level → Man. water level

Prerequisite **Water level source (→ 188) = 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 Expert → Application → Tank config → Level → Blocking dist.

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

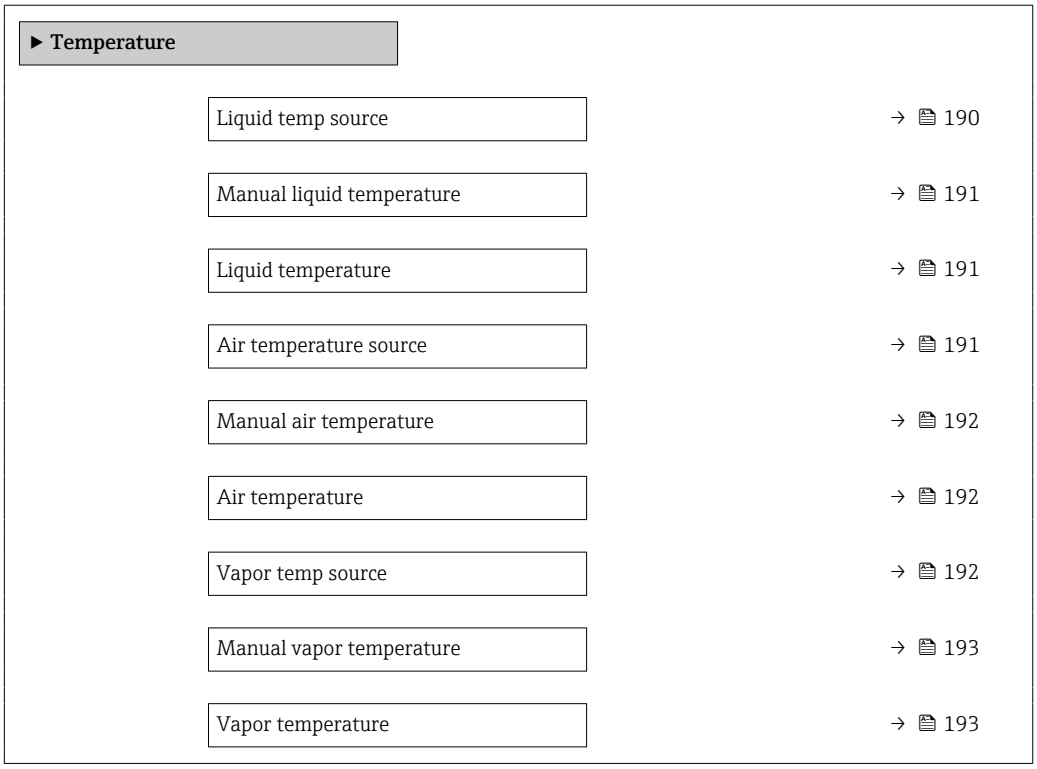
Factory setting 800 mm

Additional information

Read access	Operator
Write access	Maintenance

"Temperature" submenu

Navigation Expert → Application → Tank config → Temperature



Liquid temp source

Navigation Expert → Application → Tank config → Temperature → Liq temp source

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

Prerequisite **Liquid temp source (→ 190)** = **Manual value**

Description Defines the manual value of the liquid temperature.

User entry −50 to 300 °C

Factory setting 25 °C

Additional information

Read access	Operator
Write access	Maintenance

Liquid temperature

Navigation Expert → Application → Tank config → Temperature → Liquid temp.

Description Shows the average or spot temperature of the measured liquid.

Additional information

Read access	Operator
Write access	-

Air temperature source

Navigation Expert → Application → Tank config → Temperature → Air temp. source

Description Defines source from which the air 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 air temperature

Navigation Expert → Application → Tank config → Temperature → Manual air temp.

Prerequisite **Air temperature source (→ 191) = Manual value**

Description Defines the manual value of the air temperature.

User entry −50 to 300 °C

Factory setting 25 °C

Additional information

Read access	Operator
Write access	Maintenance

Air temperature

Navigation Expert → Application → Tank config → Temperature → Air temp.

Description Shows the air temperature.

Additional information

Read access	Operator
Write access	-

Vapor temp source

Navigation Expert → Application → Tank config → Temperature → Vapor temp src

Description Defines the source from which the vapor temperature is obtained.

Selection
- 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

Read access	Operator
Write access	Maintenance

Manual vapor temperature

Navigation Expert → Application → Tank config → Temperature → Man. vapor temp.

Prerequisite **Vapor temp source (→ 192)** = **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.

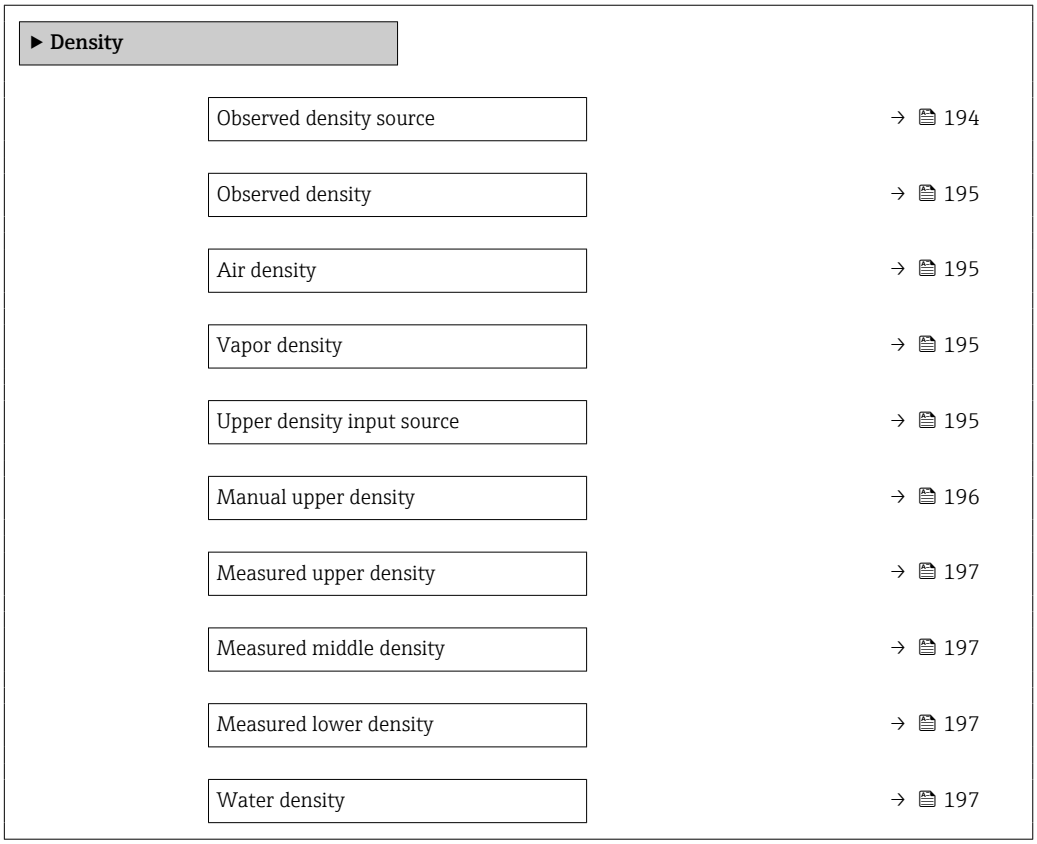
Description Shows the measured vapor temperature.

Additional information

Read access	Operator
Write access	-

"Density" submenu

Navigation Expert → Application → Tank config → Density



Observed density source

Navigation Expert → Application → Tank config → Density → Density source

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

Description Shows the measured or calculated density.

Additional information

Read access	Operator
Write access	-

Air density

Navigation Expert → Application → Tank config → Density → Air density

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

Vapor density

Navigation Expert → Application → Tank config → Density → Vapor density

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

Upper density input source

Navigation Expert → Application → Tank config → Density → UpDensity source

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

Prerequisite

Upper density input source (→ 195) = Manual value

Description

Defines the manual upper density of the medium.

User entry

0 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.

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

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.

Description Density of the lower phase.

Additional information

Read access	Maintenance
Write access	-

Water density

Navigation Expert → Application → Tank config → Density → Water density

Description Density of the water in the tank.

User entry Signed floating-point number

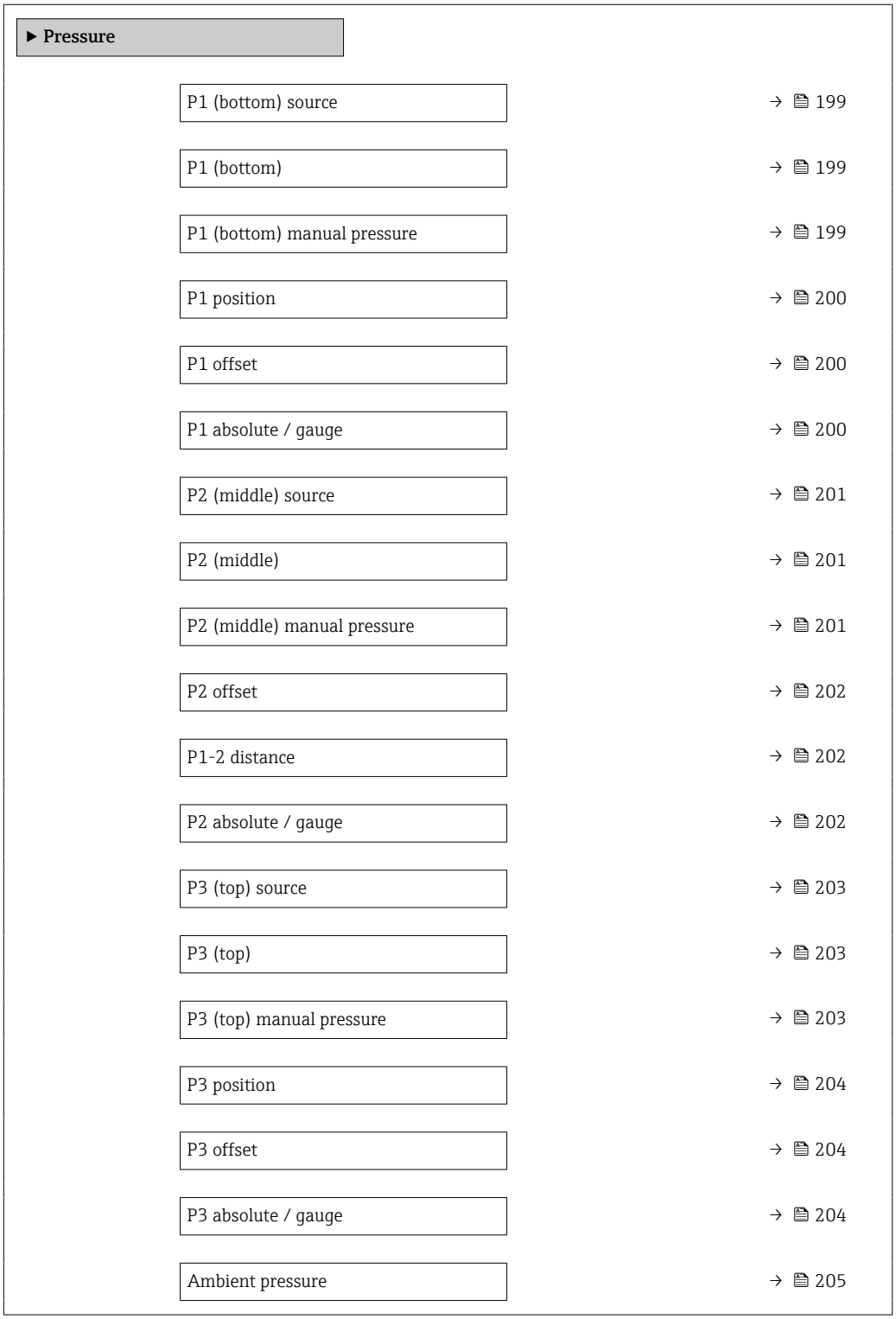
Factory setting 1 000 kg/m³

Additional information

Read access	Operator
Write access	Maintenance

"Pressure" submenu

Navigation Expert → Application → Tank config → Pressure



P1 (bottom) source

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

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)

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

Prerequisite **P1 (bottom) source (→ 199) = Manual value**

Description Defines the manual value of the bottom pressure (P1).

User entry −1.01325 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

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

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

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

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)

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

Prerequisite **P2 (middle) source (→ 201) = Manual value**

Description Defines the manual value of the middle pressure (P2).

User entry −1.01325 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

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 25 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

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

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

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)

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

Prerequisite **P3 (top) source (→ 203) = Manual value**

Description Defines the manual value of the top pressure (P3).

User entry −1.01325 to 25 bar

Factory setting 0 bar

Additional information

Read access	Operator
Write access	Maintenance

P3 position

Navigation Expert → Application → Tank config → Pressure → P3 position

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

Description Offset for the top pressure (P3).

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

P3 absolute / gauge

Navigation Expert → Application → Tank config → Pressure → P3 absolut/gauge

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

Description Defines the manual value of the ambient pressure.

User entry 0 to 2.5 bar

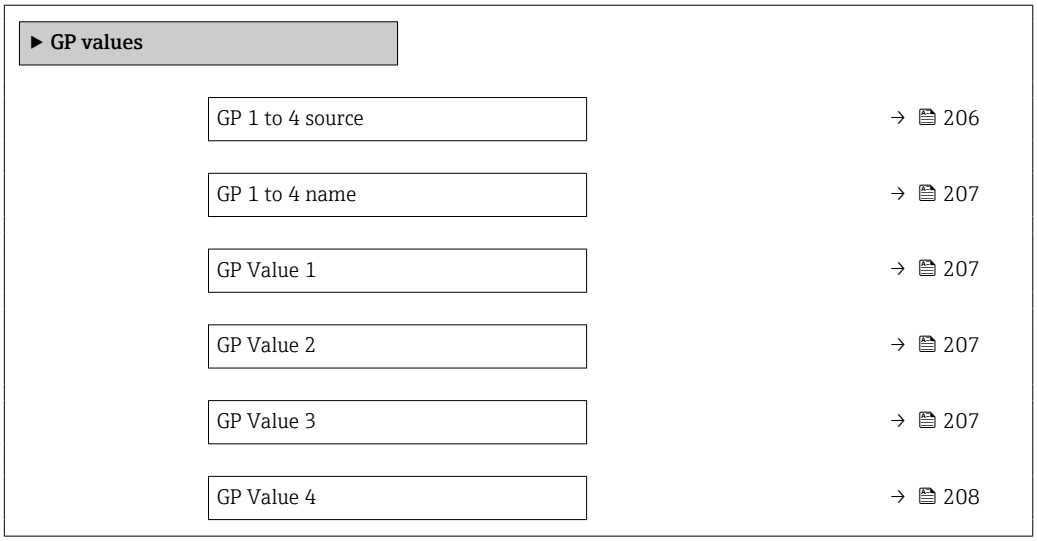
Factory setting 1 bar

Additional information

Read access	Operator
Write access	Maintenance

"GP values" submenu

Navigation Expert → Application → Tank config → GP values



GP 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

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

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

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

Description Displays the value that will be used as general purpose value.

Additional information

Read access	Operator
Write access	-

GP Value 4

Navigation Expert → Application → Tank config → GP values → GP Value 4

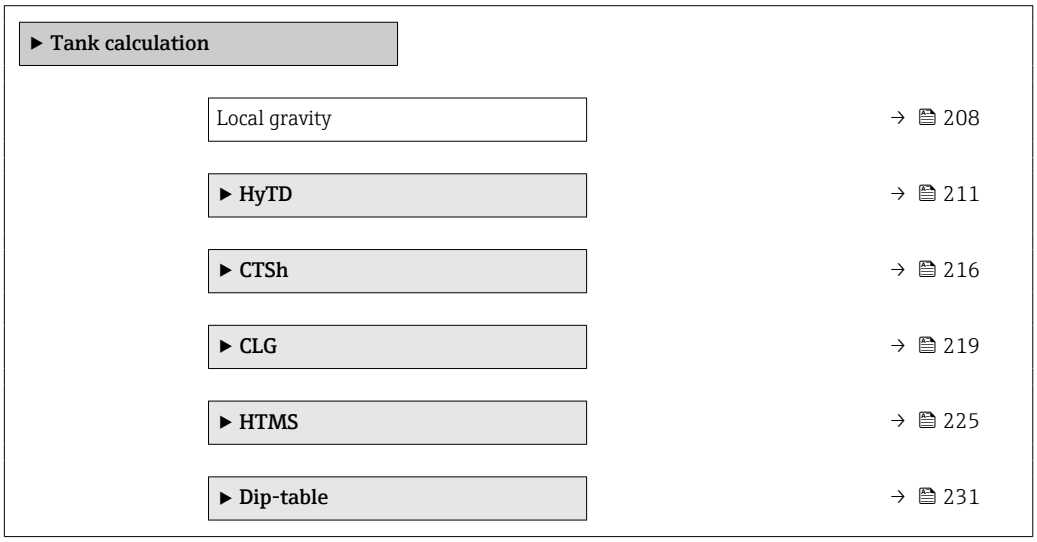
Description Displays the value that will be used as general purpose value.

Additional information

Read access	Operator
Write access	-

3.5.2 "Tank calculation" submenu

Navigation Expert → Application → Tank calculation



Local gravity

Navigation Expert → Application → Tank calculation → Local gravity

Description Shows the manually entered local gravity value.

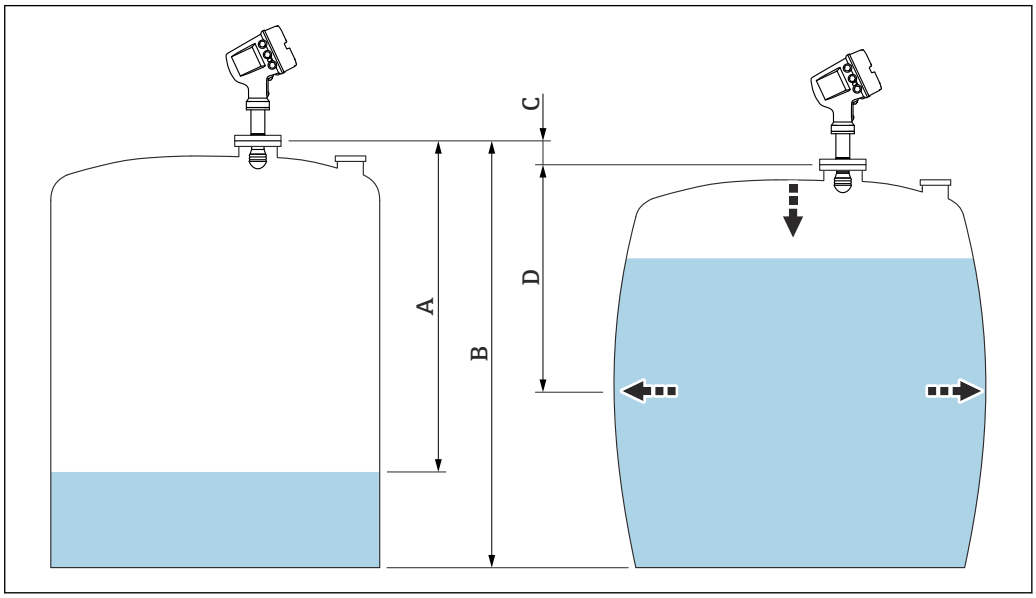
User entry 9.0 to 10.0 m/s^2

Factory setting 9.807 m/s^2

"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.

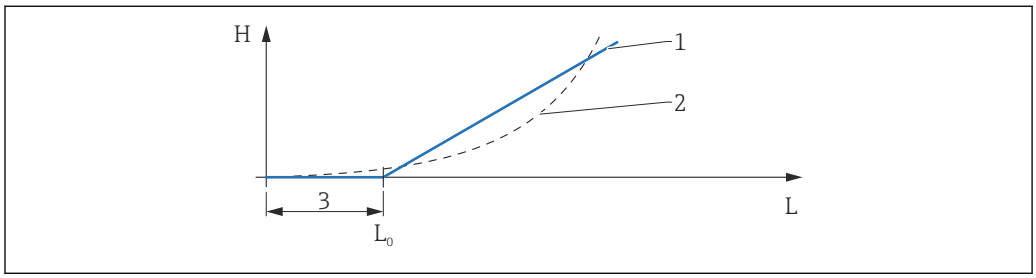


15 *Correction of the hydrostatic tank deformation (HyTD)*

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.



16 *Calculation of the HyTD correction*

1 Linear correction according to "Deformation factor (→ 212)"
2 Real correction
3 Starting level (→ 211)
L Measured level
H HyTD correction value (→ 211)

Calculation of the HyTD correction

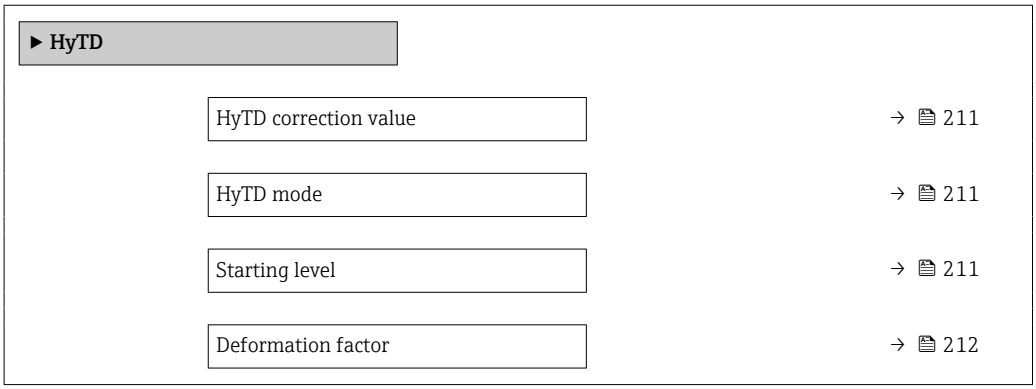
$$L \leqslant L_0 \quad \Rightarrow \quad C_{HyTD} = 0$$
$$L > L_0 \quad \Rightarrow \quad C_{HyTD} = -\ (L - L_0) \times D$$

A0028715

L	Measured level
L_0	Starting level
c_{HyTD}	HyTD correction value
D	Deformation factor

Description of parameters

Navigation Expert → Application → Tank calculation → HyTD



HyTD correction value

Navigation Expert → Application → Tank calculation → HyTD → HyTD corr. value

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

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

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

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

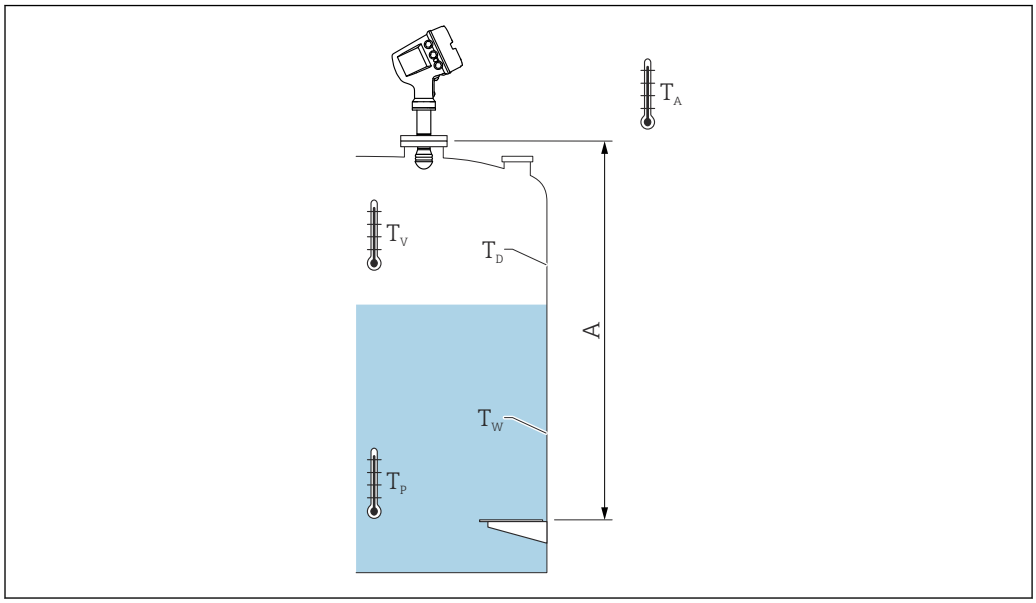
CTSh (correction for the thermal expansion of the tank shell) compensates for effects on the Gauge Reference Height (GRH) and on the expansion or contraction of the measuring wire due to temperature effects on the tank shell or stilling well. The temperature effects are separated into two parts, respectively 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.

This correction is recommended for the following situations:
- if the operating temperature deviates considederably from the temperature during calibration (ΔT > 10 °C (18 °F))
- for extremely high tanks
- for refrigerated, cryogenic or heated applications

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.

This mode cannot be used in conjunction with HTG because the level is not measured relative to the gauge reference height with HTG.

CTSh: Calculation of the wall temperature



17 Parameters for the CTSh calculation

A Gauge Reference Height (GRH)

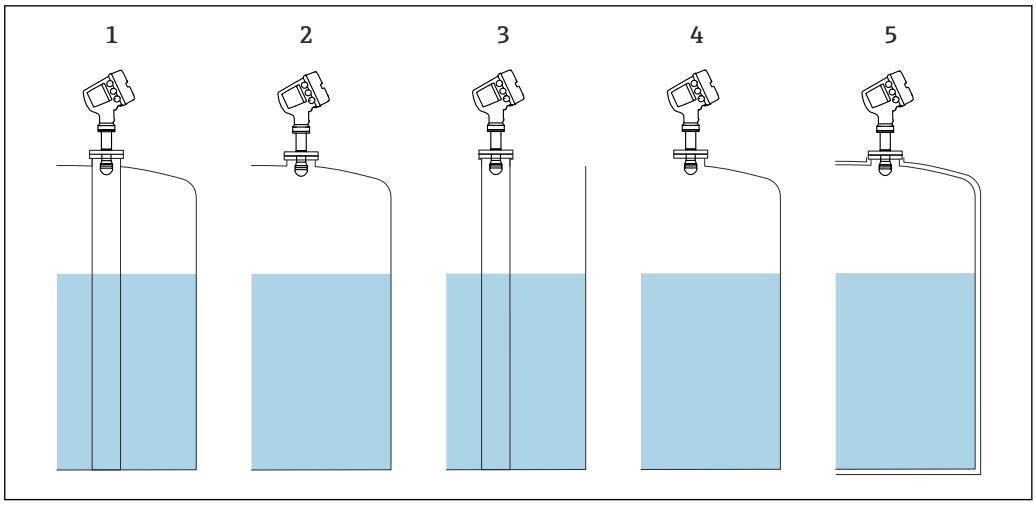
T_W	Temperature of the wetted part of the tank shell
T_D	Temperature of the dry part of the tank shell
T_P	Product temperature
T_V	Vapor temperature (in the tank)
T_A	Ambient temperature (atmosphere surrounding the tank)

CTSh: Calculation of the wall temperature

Depending on the parameters **Covered tank (→ 217)** and **Stilling well (→ 217)**, the temperatures T_W of the wetted and T_D of the dry part of the tank wall are calculated as follows:

Covered tank (→ 217)	Stilling well (→ 217)	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 welll. This is due to the temperature inside and outside of the tank shell being the same due to the insulation of the tank.



1 Covered tank (→ 🖹 217) = Covered; Stilling well (→ 🖹 217) = Yes
2 Covered tank (→ 🖹 217) = Covered; Stilling well (→ 🖹 217) = No
3 Covered tank (→ 🖹 217) = Open top; Stilling well (→ 🖹 217) = Yes
4 Covered tank (→ 🖹 217) = Open top; Stilling well (→ 🖹 217) = No
5 Insulated tank: Covered tank (→ 🖹 217) = Open top; Stilling well (→ 🖹 217) = 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	→ 216
CTSh mode	→ 217
Covered tank	→ 217
Stilling well	→ 217
Calibration temperature	→ 218
Linear expansion coefficient	→ 218
Wire expansion coefficient	→ 218

CTSh correction value

Navigation Expert → Application → Tank calculation → CTSh → CTSh corr value

Description Shows the CTSh correction value.

Additional information

Read access	Operator
Write access	-

CTSh mode

Navigation Expert → Application → Tank calculation → CTSh → CTSh mode

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

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

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

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

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

Description Defines the expansion coefficient of the wire material of the drum. Value is programmed in factory.

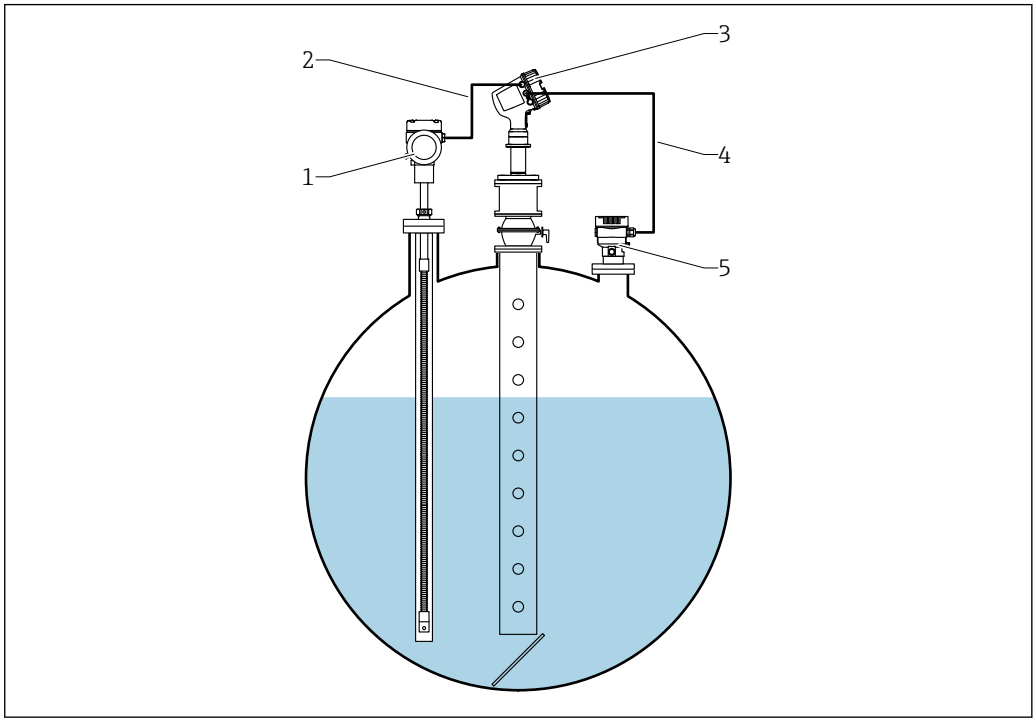
User entry 0 to 100 ppm

Factory setting 15 ppm

"CLG" submenu

Overview

The gas phase in pressurized tanks has a direct impact on the distance determination for time-of-flight sensors. This feature corrects the influences of the vapor phase based on its pressure, temperature and composition.



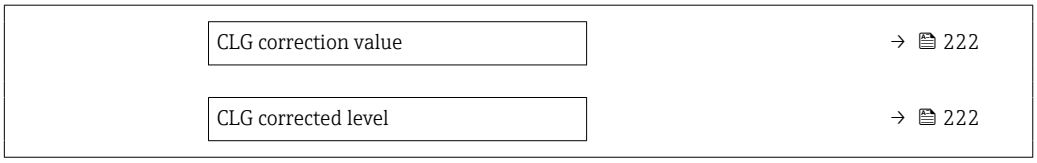
1 *Prothermo temperature measurement device, equipped with thermowell or protective pipe*
2 *HART connection*
3 *Radar level gauge Micropilot NMR84*
4 *HART connection*
5 *Digital pressure transmitter*

Description of parameters

Configuration of the gas phase correction for liquefied gases (CLG)

Navigation Expert → Application → Tank calculation → CLG

▶ CLG	
CLG mode	→ 220
CLG to tank level	→ 220
Gas 1 to 4	→ 221
Gas 1 to 4 refractive index	→ 221
Gas 1 to 4 ratio	→ 221



CLG mode

Navigation Expert → Application → Tank calculation → CLG → CLG mode

Description Activates or deactivates CLG for a mixture of up to four gases.

Selection
- Off
- Pure gas *
- Mix of two gases *
- Mix of three gases *
- Mix of four gases *

Factory setting Off

Additional information

Read access	Operator
Write access	Maintenance

CLG to tank level

Navigation Expert → Application → Tank calculation → CLG → CLG to level

Description Activates or deactivates the tank level correction by CLG. Additional information: SIL- or WHG-Mode sets this parameter to "No".

Selection
- No
- Yes

Factory setting No

Additional information

Read access	Operator
Write access	Maintenance

* Visibility depends on order options or device settings

Gas 1 to 4

Navigation Expert → Application → Tank calculation → CLG → Gas 1 to 4

Selection

- Chloroethylene C2H3Cl
- Ethylene C2H4
- Ethane C2H6
- Propadiene C3H4
- Propylene C3H6
- Propane C3H8
- Isobutane C4H10
- Butane C4H10
- Butylene C4H8
- Isobutylene C4H8
- Pentane C5H12
- Methane CH4
- Hydrogen H2
- Nitrogen N2
- Ammonia NH3
- Air
- Custom

Factory setting Air

Additional information

Read access	Operator
Write access	Maintenance

Gas 1 to 4 refractive index

Navigation Expert → Application → Tank calculation → CLG → Gas 1 to 4 RI

Description Gas refractive index at 0°C and 1bar with up to 6 decimal places.

User interface 1.0 to 2.0

Factory setting 1.000288

Additional information

Read access	Operator
Write access	Service

Gas 1 to 4 ratio

Navigation Expert → Application → Tank calculation → CLG → Gas 1 to 4 ratio

Description Defines the ratio of this gas in the mixture. Given as unitless integer value.

User entry 1 to 100

Factory setting 1

Additional information

Read access	Operator
Write access	Maintenance

CLG correction value

Navigation Expert → Application → Tank calculation → CLG → CLG correction

Description Shows the CLG correction value.

User interface Signed floating-point number

Factory setting 0 mm

Additional information

Read access	Operator
Write access	-

CLG corrected level

Navigation Expert → Application → Tank calculation → CLG → CLG corr. level

Description Shows the level with CLG correction only.

User interface Signed floating-point number

Factory setting 0 mm

Additional information

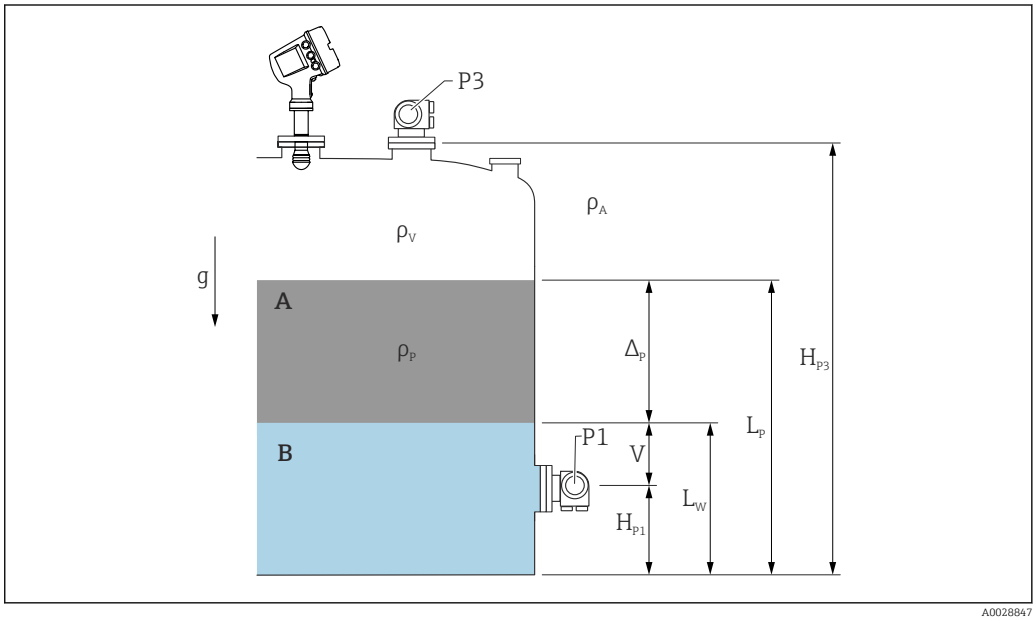
Read access	Operator
Write access	-

"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



18 *HTMS parameters*

A Product
B Water

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])	▪ 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 (→ 225). 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 (→ 225)	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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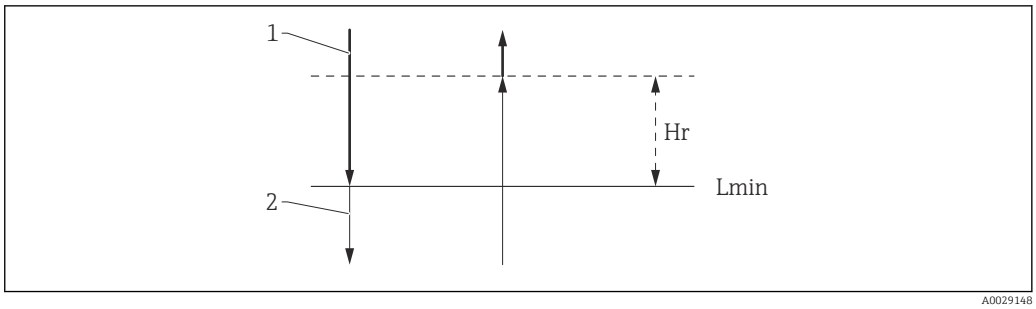
L_{min} is defined in the **Minimum level** parameter (→ 226). As can be seen from the formula it always must be bigger than H_{P1}.

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 (→ 196)) 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 (→ 226)**), 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.



19 *HTMS hysteresis*

1 Value calculated
2 Value held/manual
L_{min} Minimum level (→ 226)
H_r Hysteresis (→ 227)

Description of parameters

Navigation Expert → Application → Tank calculation → HTMS

▶ HTMS	
HTMS mode	→ 225
Manual density	→ 226
Density value	→ 226
Minimum level	→ 226
Minimum pressure	→ 227
Safety distance	→ 227
Hysteresis	→ 227
Water density	→ 228

HTMS mode

Navigation Expert → Application → Tank calculation → HTMS → HTMS mode

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

Description Defines the manual density.

User entry 0 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

Description Shows the calculated product density.

Additional information

Read access	Operator
Write access	-

Minimum level

Navigation Expert → Application → Tank calculation → HTMS → Min. level

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 → Minimum pressure

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

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

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

Description Density of the water in the tank.

User entry Signed floating-point number

Factory setting 1 000 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 (→ 232)** = **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).

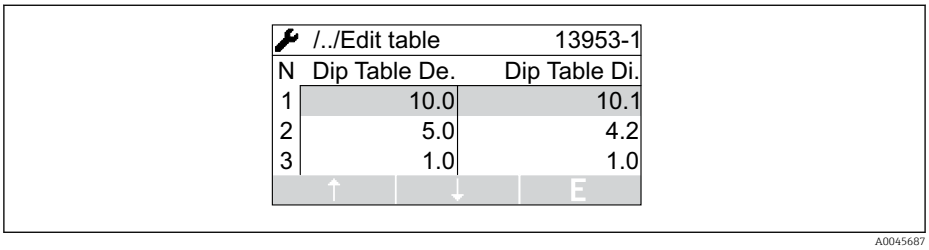
Manual creation of a dip table

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

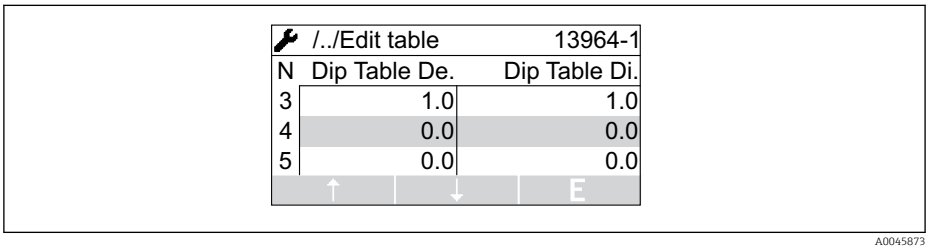
1. Navigate to Setup → Advanced setup → Application → Tank calculation → Dip-table → Table mode (12516) and select the **Disable** option.
2. Navigate to Setup → Advanced setup → Application → Calculation → Dip-table → Edit table
   ↳



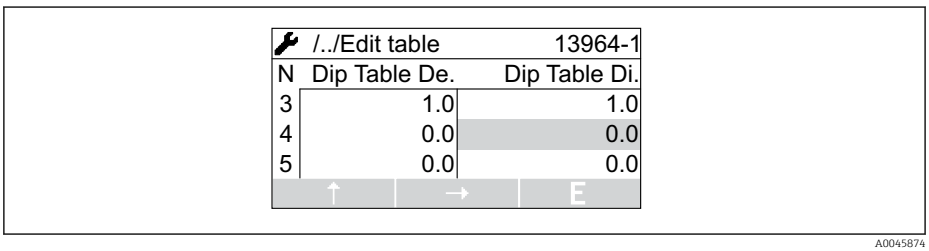
20 *The dip table editor on the local display*

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.
   ↳



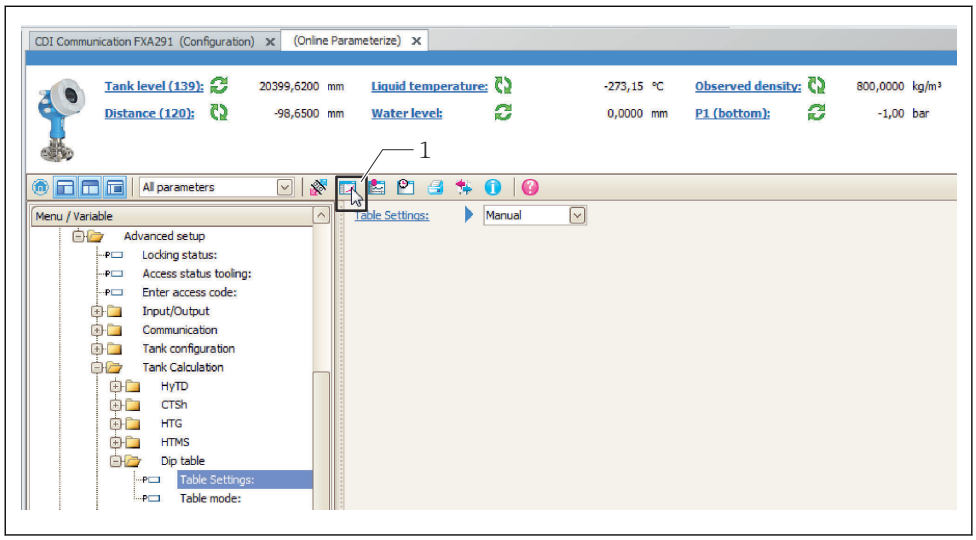
4. Press "E" to open the line.
5. Use "→" to select the cell you want to edit.
   ↳



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

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 (→ 232), the complete table will be written from the editor to the device in the manual mode.

1. 

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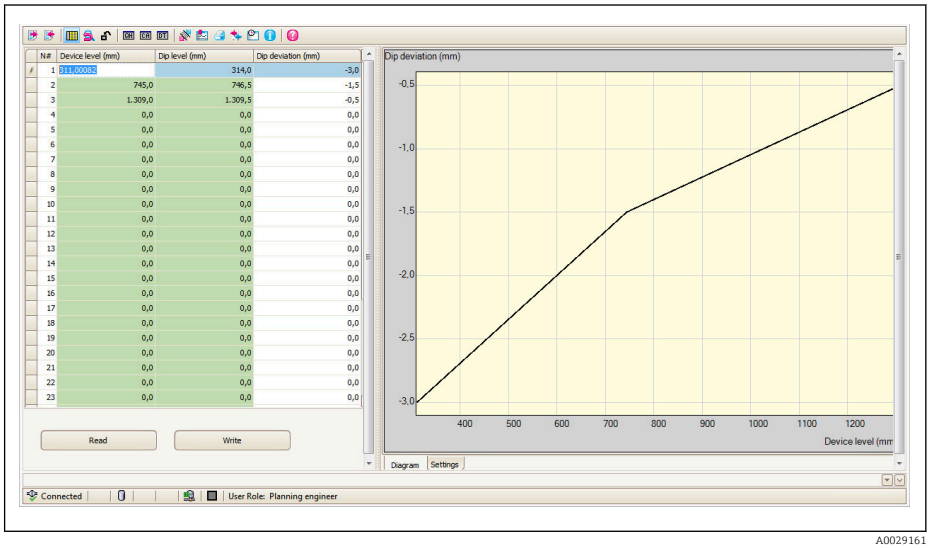
1 Table icon; calls up the table editor.

Open the table editor by clicking on the table icon.

↳ The graphical table editor appears:



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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

▶ **Dip-table**

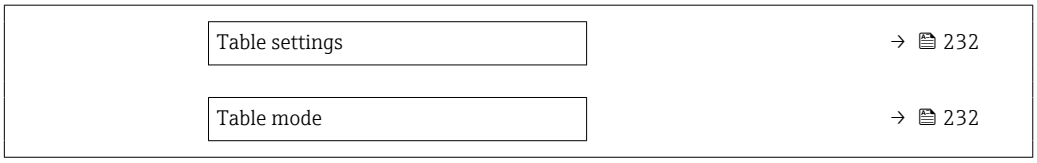


Table settings

Navigation Expert → Application → Tank calculation → Dip-table → Table settings

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

Description Enables or disables the dip-table.

Selection
- Disable
- Enable

Factory setting Disable

Additional information

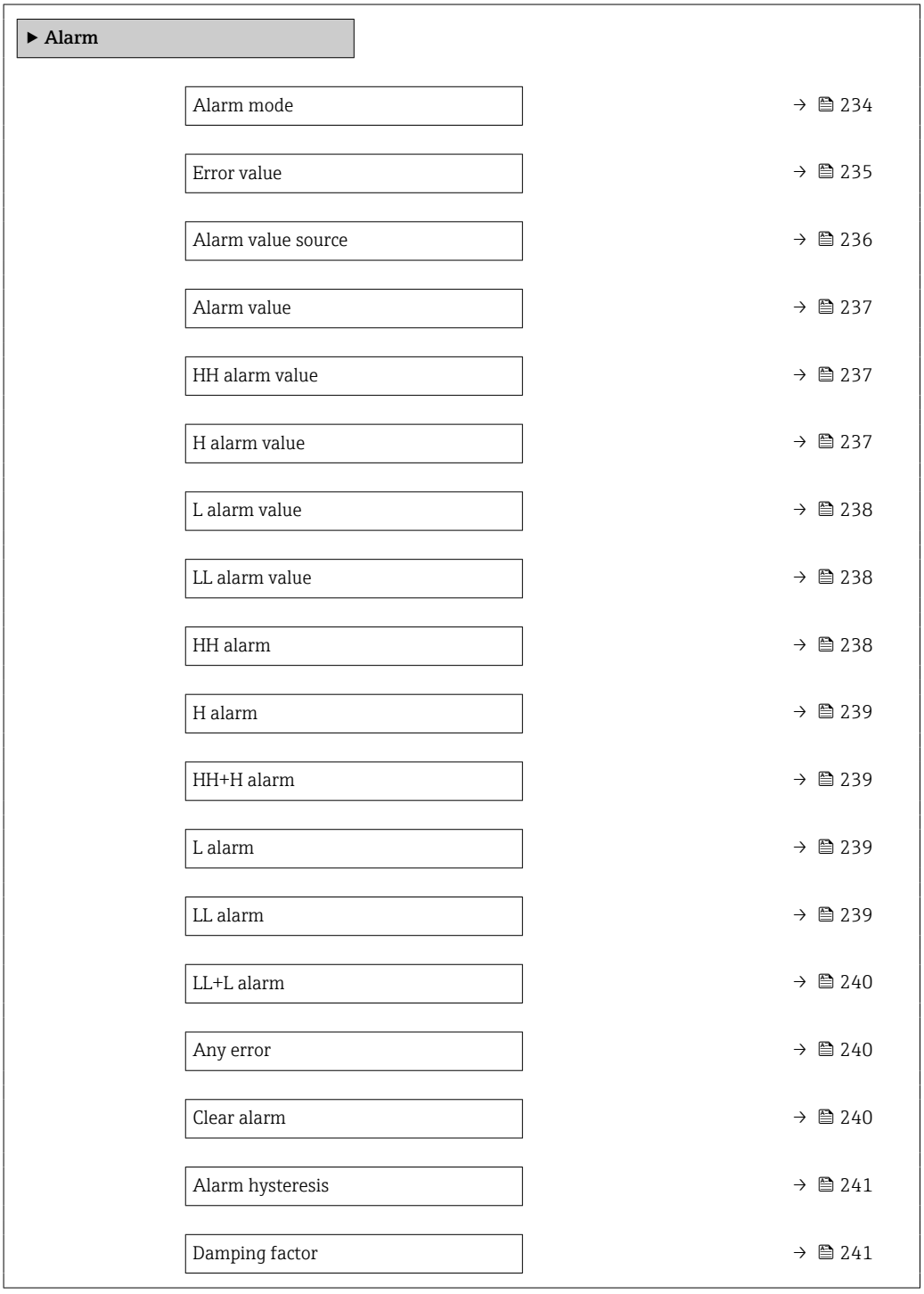
Read access	Operator
Write access	Maintenance

3.5.3 "Alarm" submenu

Navigation Expert → Application → Alarm

"Alarm" submenu

Navigation Expert → Application → Alarm → Alarm



Alarm mode

Navigation Expert → Application → Alarm → Alarm → Alarm mode

Description Defines the alarm mode of the selected alarm.

Selection
- Off
- On
- Latching

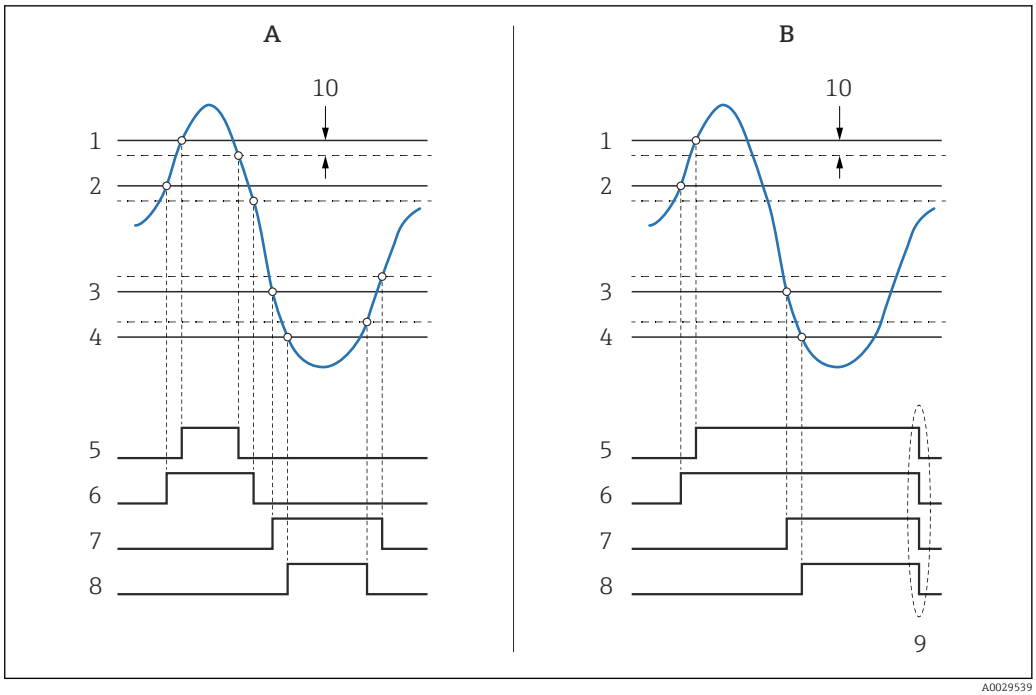
Factory setting Off

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 (→ 240)** = **Yes** or the power is switched off and on.



21 *Principle of the limit evaluation*

A Alarm mode (→ 234) = On
B Alarm mode (→ 234) = Latching
1 HH alarm value (→ 237)
2 H alarm value (→ 237)
3 L alarm value (→ 238)
4 LL alarm value (→ 238)
5 HH alarm (→ 238)
6 H alarm (→ 239)
7 L alarm (→ 239)
8 LL alarm (→ 239)
9 "Clear alarm (→ 240)" = "Yes" or power off-on
10 Hysteresis (→ 241)

Error value

Navigation Expert → Application → Alarm → Alarm → Error value

Prerequisite **Alarm mode (→ 234) ≠ 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 → Alarm source

Prerequisite **Alarm mode (→ 234) ≠ 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 Expert → Application → Alarm → Alarm → Alarm value

Prerequisite **Alarm mode (→ 234) ≠ 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 Expert → Application → Alarm → Alarm → HH alarm value

Prerequisite **Alarm mode (→ 234) ≠ 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 Expert → Application → Alarm → Alarm → H alarm value

Prerequisite **Alarm mode (→ 234) ≠ 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

Prerequisite **Alarm mode (→ 234) ≠ 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

Prerequisite **Alarm mode (→ 234) ≠ 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

Prerequisite **Alarm mode (→ 234) ≠ 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

Prerequisite **Alarm mode (→ 234) ≠ 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

Prerequisite **Alarm mode (→ 234) ≠ 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

Prerequisite **Alarm mode (→ 234) ≠ 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

Prerequisite **Alarm mode (→ 234) ≠ Off**

Description Shows whether an LL alarm is currently active.

Additional information

Read access	Operator
Write access	-

LL+L alarm

Navigation Expert → Application → Alarm → Alarm → LL+L alarm

Prerequisite **Alarm mode (→ 234) ≠ 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 → Alarm → Any error

Prerequisite **Alarm mode (→ 234) ≠ 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 → Alarm → Clear alarm

Prerequisite **Alarm mode (→ 234) = 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 Expert → Application → Alarm → Alarm → Alarm hysteresis

Prerequisite **Alarm mode (→ 234) ≠ Off**

Description Defines the hysteresis for the limit values. The hystersis 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 Expert → Application → Alarm → Alarm → Damping factor

Description Defines the damping constant (in seconds).

User entry 0 to 999.9 s

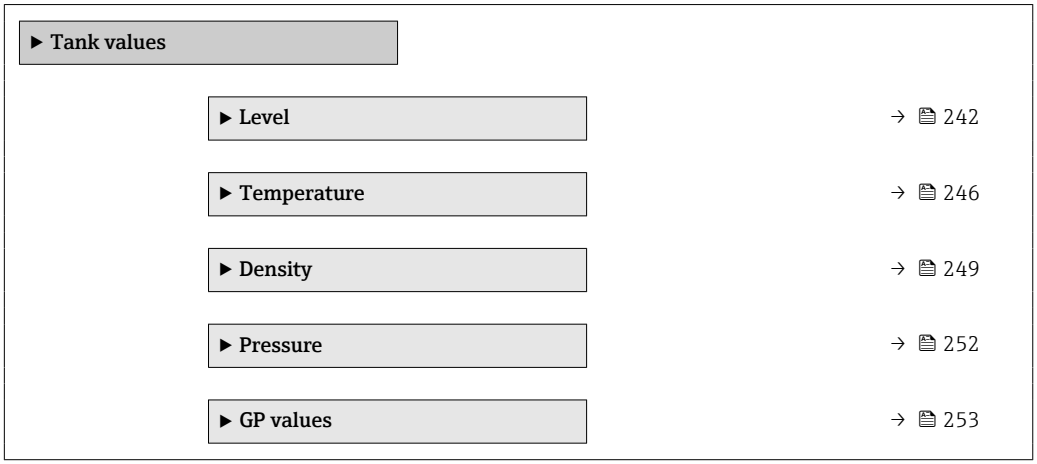
Factory setting 0 s

Additional information

Read access	Operator
Write access	Maintenance

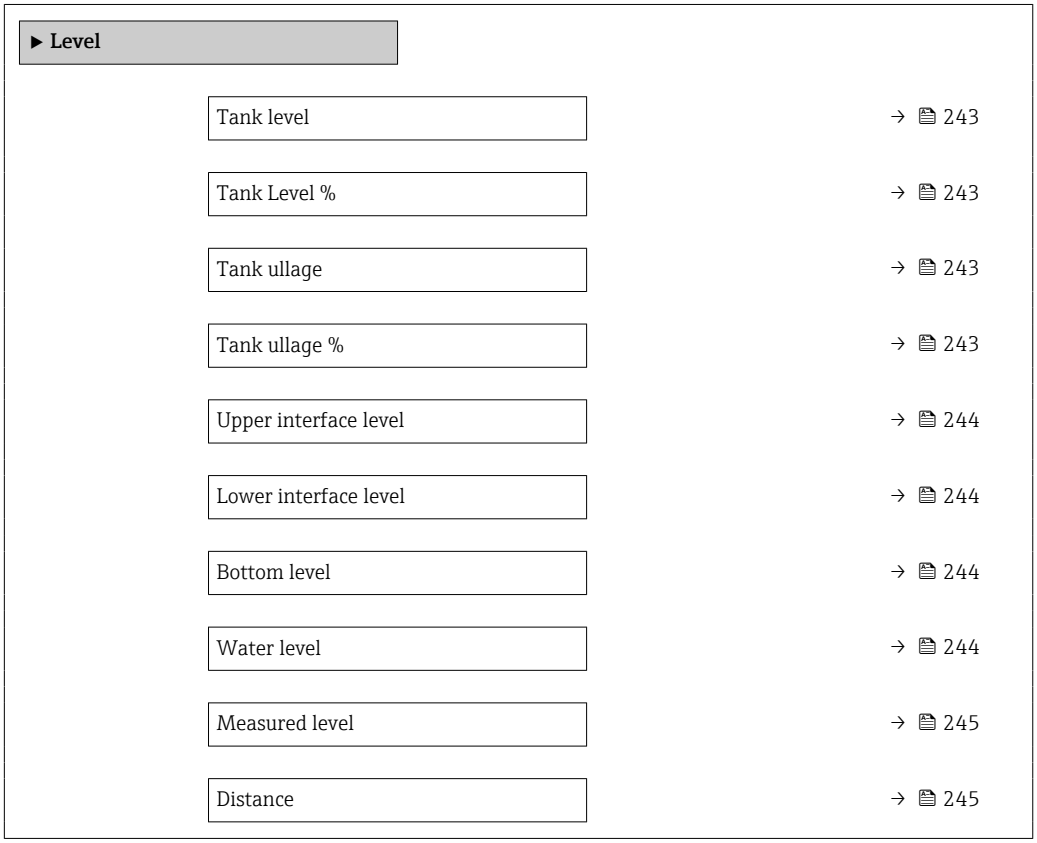
3.6 "Tank values" submenu

Navigation Expert → Tank values



3.6.1 "Level" submenu

Navigation Expert → Tank values → Level



Tank level

Navigation Expert → Tank values → Level → Tank level

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 %

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

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 %

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

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

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

Description Shows the bottom level.

Additional information

Read access	Operator
Write access	-

Water level

Navigation Expert → Tank values → Level → Water level

Description Shows the bottom water level.

Additional information

Read access	Operator
Write access	-

Measured level

Navigation Expert → Tank values → Level → Measured level

Description Shows the measured level without any correction from the tank calculations.

Additional information

Read access	Operator
Write access	-

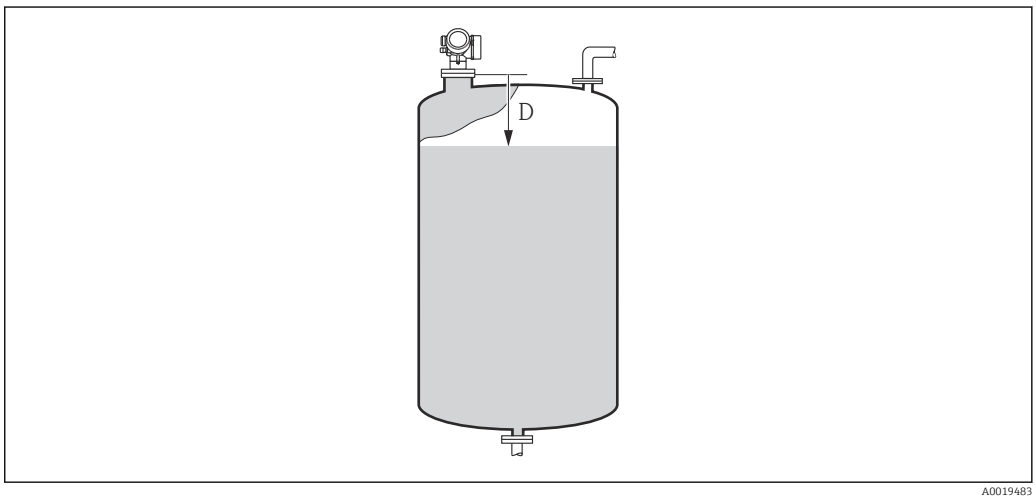
Distance

Navigation Expert → Tank values → Level → Distance

Description Distance from lower edge of device flange to product surface.

Additional information

Read access	Operator
Write access	-

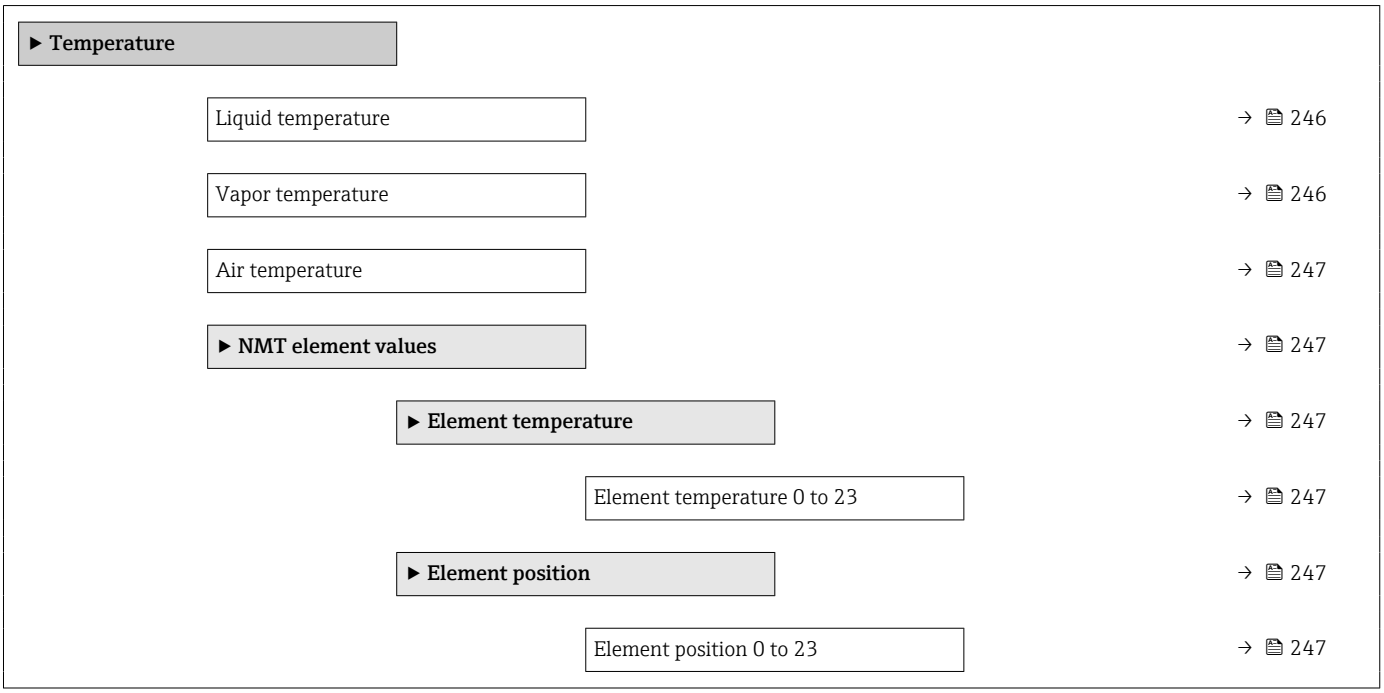


A0019483

D Distance (→ 56)

3.6.2 "Temperature" submenu

Navigation Expert → Tank values → Temperature



Liquid temperature

Navigation Expert → Tank values → Temperature → Liquid temp.

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.

Description Shows the measured vapor temperature.

Additional information

Read access	Operator
Write access	-

Air temperature

Navigation Expert → Tank values → Temperature → Air temp.

Description Shows the air temperature.

Additional information

Read access	Operator
Write access	-

"NMT element values" submenu

Navigation Expert → Tank values → Temperature → NMT elem. values

"Element temperature" submenu

Navigation Expert → Tank values → Temperature → NMT elem. values → Element temp. → Element temp 0 to 23 (14984)

Element temperature 1 to 24

Navigation 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 Expert → Tank values → Temperature → NMT elem. values → Element position

Element position 1 to 24

Navigation Expert → Tank values → Temperature → NMT elem. values → Element position → Element pos. 1 to 24 (15014–1 to 24)

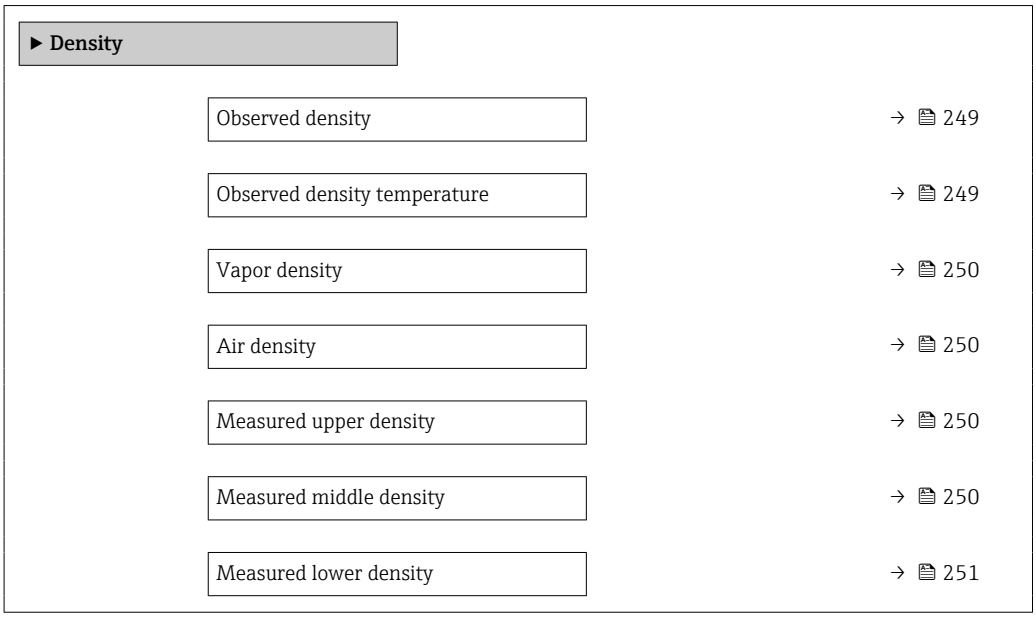
Description Shows the position of the selected element in the NMT.

Additional information

Read access	Operator
Write access	-

3.6.3 "Density" submenu

Navigation Expert → Tank values → Density



Observed density

Navigation Expert → Tank values → Density → Observed density

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.

Observed density temperature

Navigation Expert → Tank values → Density → Obs. dens. temp.

Description Corresponding temperature of measured density. Can be used for reference density calculation.

User interface Signed floating-point number

Factory setting 0 °C

Vapor density

Navigation Expert → Tank values → Density → Vapor density

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

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.

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

Description Density of the middle phase.

Additional information

Read access	Operator
Write access	-

Measured lower density

Navigation Expert → Tank values → Density → Meas lower dens.

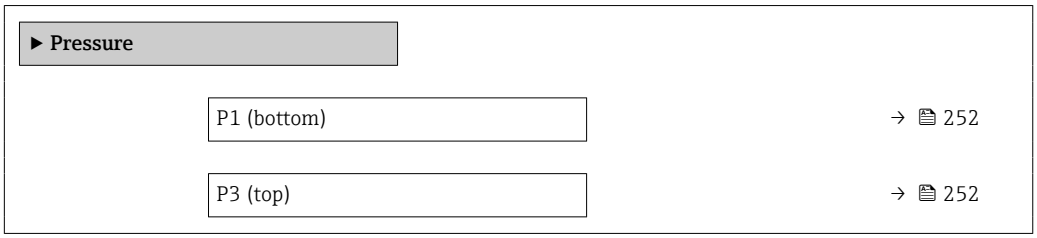
Description Density of the lower phase.

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)

Description Shows the pressure at the tank bottom.

Additional information

Read access	Operator
Write access	-

P3 (top)

Navigation Expert → Tank values → Pressure → P3 (top)

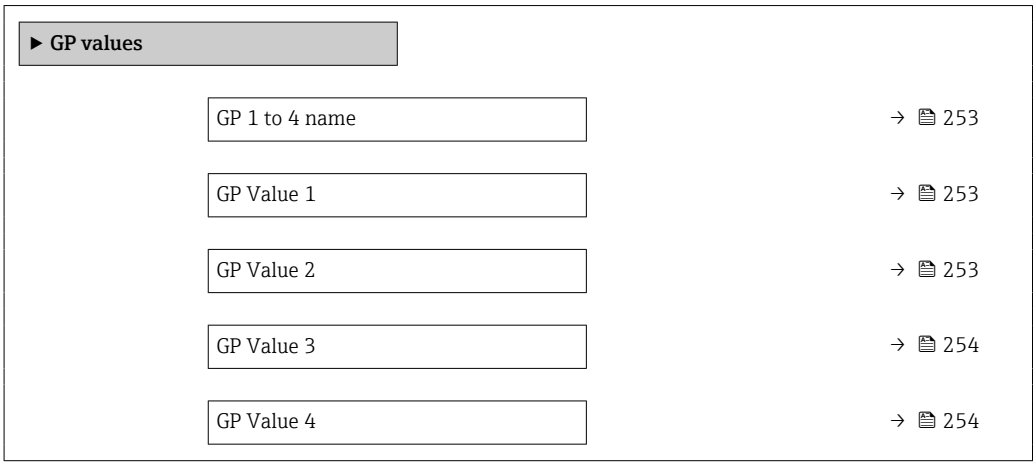
Description Shows the pressure (P3) at the top transmitter.

Additional information

Read access	Operator
Write access	-

3.6.5 "GP values" submenu

Navigation Expert → Tank values → GP values



GP 1 to 4 name

Navigation Expert → Tank values → GP values → GP 1 name

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

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

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

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

Description Displays the value that will be used as general purpose value.

Additional information

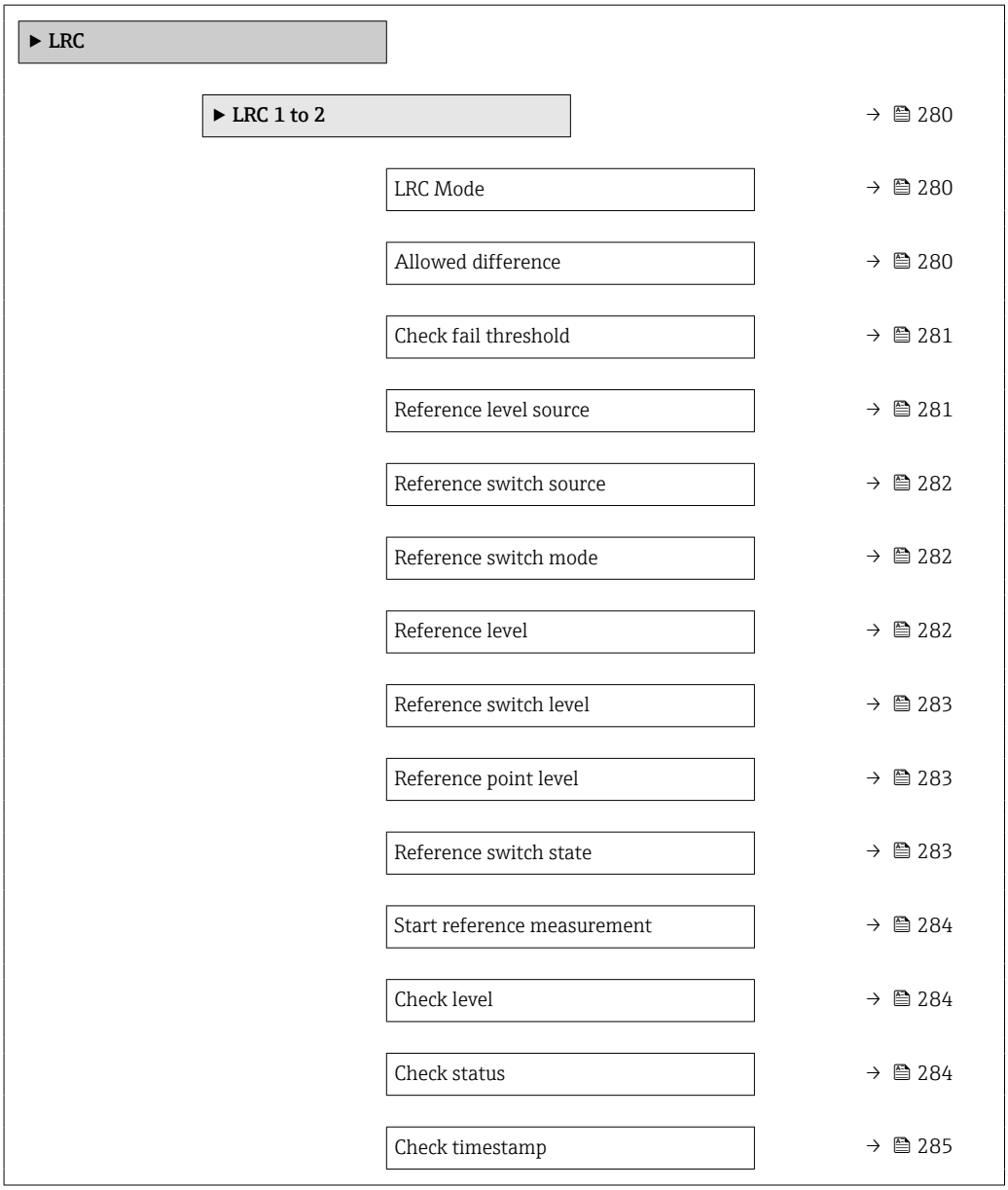
Read access	Operator
Write access	-

3.7 "Diagnostics" submenu

Navigation Expert → Diagnostics

- ▶ **Diagnostics**
  - Actual diagnostics → 257
  - Timestamp → 258
  - Previous diagnostics → 258
  - Timestamp → 258
  - Operating time from restart → 259
  - Operating time → 259
  - Date/time → 259
  - ▶ **Diagnostic list** → 260
    - Diagnostics 1 to 5 → 260
    - Timestamp 1 to 5 → 260
  - ▶ **Event logbook** → 261
    - Filter options → 261
  - ▶ **Simulation** → 263
    - Device alarm simulation → 263
    - Diagnostic event simulation → 263
    - Simulation distance on → 264
    - Simulation distance → 264
    - Current output 1 to 2 simulation → 264
    - Simulation value → 265
  - ▶ **Device information** → 266
    - Device tag → 266
    - Serial number → 267

- Firmware version → 267
- Firmware CRC → 267
- Weight and measures configuration CRC → 267
- Device name → 268
- Order code → 268
- Extended order code 1 to 3 → 268
- ENP version → 268
- Device type → 269
- Module type → 269
- Communication Slot → 269
- **▶ Board info** → 271
  - Date/time → 259
  - System temperature → 271
  - W&M lock switch → 271
- **▶ Data logging** → 273
  - Assign channel 1 to 4 → 274
  - Logging interval → 275
  - Clear logging data → 276
- **▶ Device check** → 278
  - Start device check → 278
  - Result device check → 278
  - Level signal → 279
  - Near distance → 279
  - Area of incoupling → 279



Actual diagnostics

Navigation Expert → Diagnostics → Actual diagnos.

Description Displays the currently active diagnostic message.

If there is more than one pending diagnostic event, the message for the diagnostic event with the highest priority is displayed.

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

Description Displays the timestamp for the currently active diagnostic message.

Additional information

Read access	Operator
Write access	-

Previous diagnostics

Navigation Expert → Diagnostics → Prev.diagnostics

Description Displays the diagnostic message for the last diagnostic event that has ended.

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

Description Displays the timestamp of the diagnostic message generated for the last diagnostic event that has ended.

Additional information

Read access	Operator
Write access	-

Operating time from restart

Navigation Expert → Diagnostics → Time fr. restart

Description Indicates how long the device has been in operation since the last time the device was restarted.

Additional information

Read access	Operator
Write access	-

Operating time

Navigation Expert → Diagnostics → Operating time

Description Indicates how long the device has been in operation.

Additional information

Read access	Operator
Write access	-

Date/time

Navigation Expert → Diagnostics → Date/time

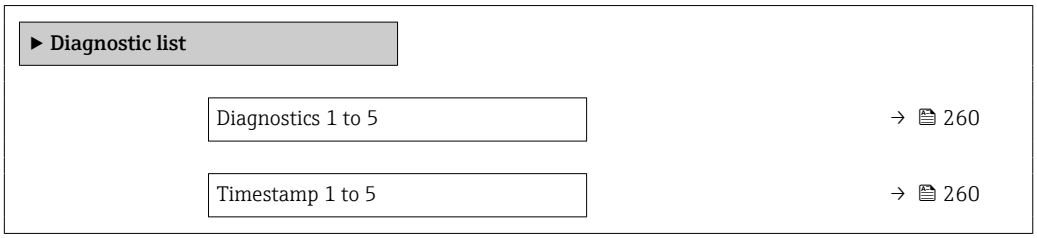
Description Displays the device internal real time clock.

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.

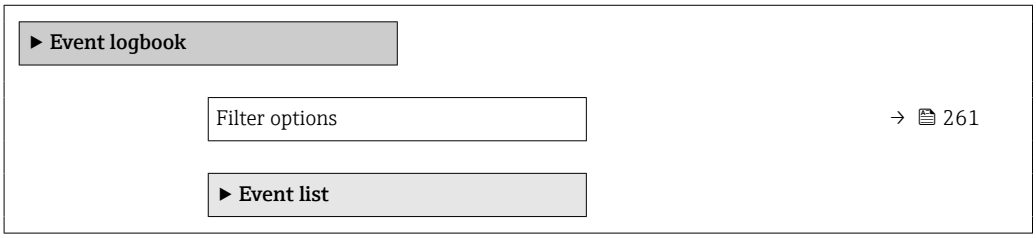
Additional information

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

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 (→ 261) 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.

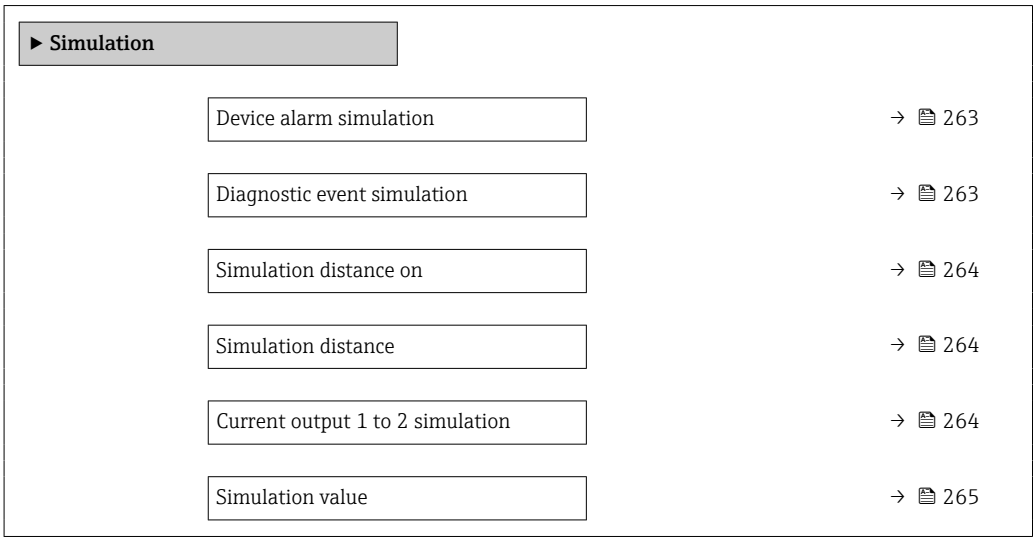
The following status symbols indicate, whether an event has appeared or disappeared at the time stated:
- : Event appeared
- : Event disappeared

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



Device alarm simulation

Navigation Expert → Diagnostics → Simulation → Dev. alarm sim.

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 → Diagnostic event

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

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

Prerequisite **Simulation distance on (→ 264) = 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 (→ 125) = 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
Expert → Diagnostics → Simulation → Simulation value (13976)

Prerequisite
Current output simulation (→ 264) = On

Description
Defines the current to be simulated.

User entry
3.4 to 23 mA

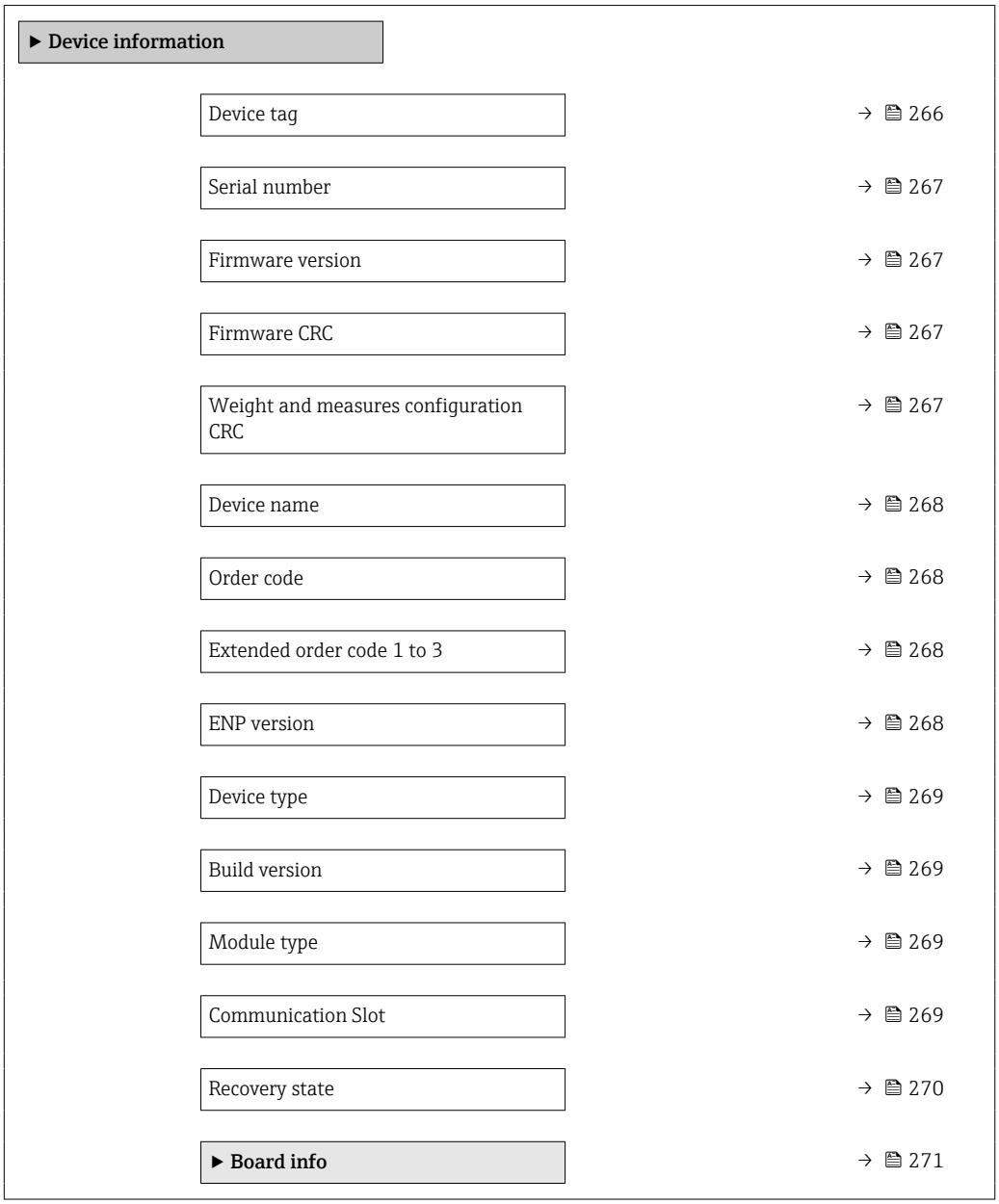
Factory setting
The current at the time the simulation was started.

Additional information

Read access	Operator
Write access	Maintenance

3.7.4 "Device information" submenu

Navigation Expert → Diagnostics → Device info



Device tag

Navigation Expert → Diagnostics → Device info → Device tag

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

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

Description Displays the device firmware version installed.

Additional information

Read access	Operator
Write access	-

Firmware CRC

Navigation Expert → Diagnostics → Device info → Firmware CRC

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

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

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

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

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

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

Description Displays the device type.

Additional information

Read access	Operator
Write access	-

Build version

Navigation Expert → Diagnostics → Device info → Build version

Description Shows the device firmware build version installed.

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	-

Recovery state

Navigation Expert → Diagnostics → Device info → Recovery state

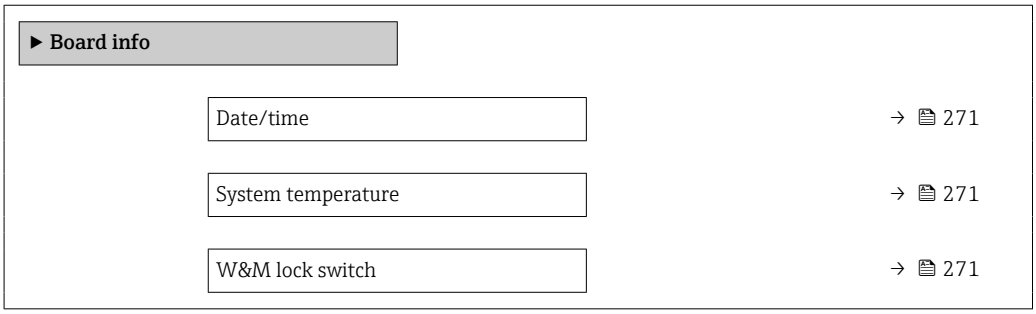
Description Indicate the state of the backup data process.

User interface
- Inactive
- distributing
- restoring
- Distribution done
- Distribution failed
- Operating normally
- Restore done
- Restore failed

Factory setting Inactive

"Board info" submenu

Navigation Expert → Diagnostics → Device info → Board info



Date/time

Navigation Expert → Diagnostics → Device info → Board info → Date/time

Description Displays the device internal real time clock.

Additional information

Read access	Operator
Write access	-

System temperature

Navigation Expert → Diagnostics → Device info → Board info → System temp.

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 Expert → Diagnostics → Device info → Board info → W&M lock switch

Description Shows the position of the weights and measure (WP) switch.

User interface
- Enabled
- Disabled

Factory setting Enabled

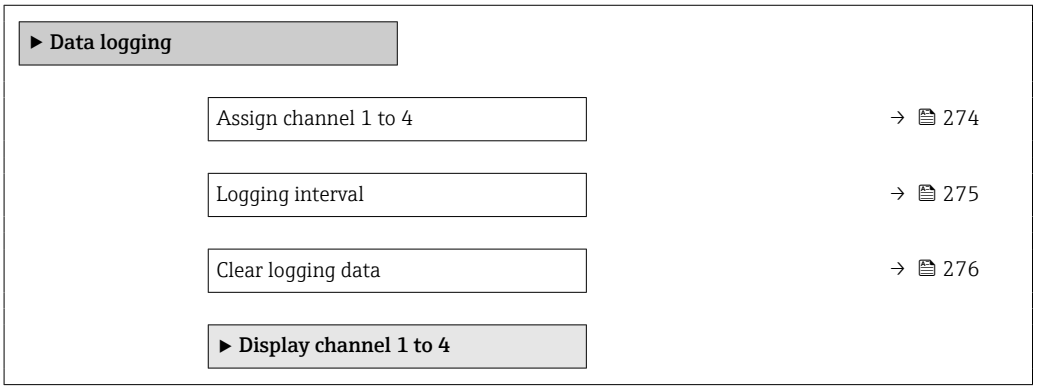
Additional information

Read access	Operator
Write access	-

3.7.5 "Data logging" submenu

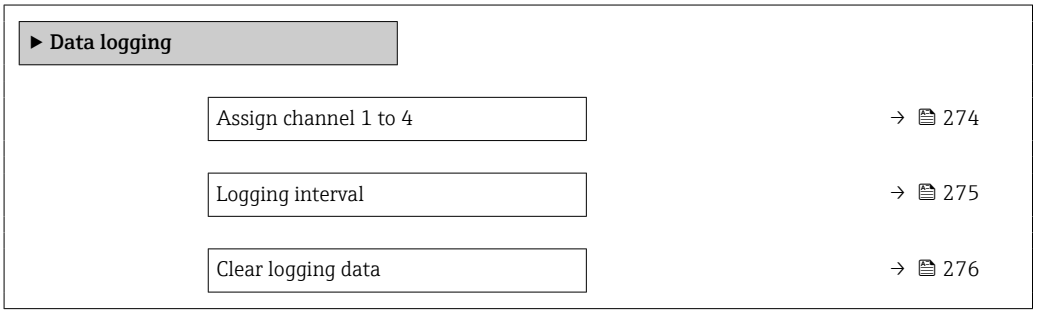
Structure of the submenu on the local display

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

Expert → Diagnostics → Data logging → Logging interval

Description

Define the logging interval tlog 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
- $T_{log} = 1000 \cdot 1\ s = 1\,000\ s \approx 16.5\ min$
- $T_{log} = 1000 \cdot 10\ s = 1\,000\ s \approx 2.75\ h$
- $T_{log} = 1000 \cdot 80\ s = 80\,000\ s \approx 22\ h$
- $T_{log} = 1000 \cdot 3\,600\ s = 3\,600\,000\ s \approx 41\ d$

Read access	Operator
Write access	Maintenance

Clear logging data

Navigation

Expert → Diagnostics → Data logging → Clear logging

Expert → Diagnostics → Data logging → Clear logging

Description

Clear the entire logging data.

Selection

- Cancel
- Clear data

Factory setting

Cancel

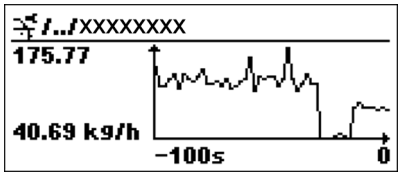
Additional information

Read access	Operator
Write access	Maintenance

"Display channel 1 to 4" submenu

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.



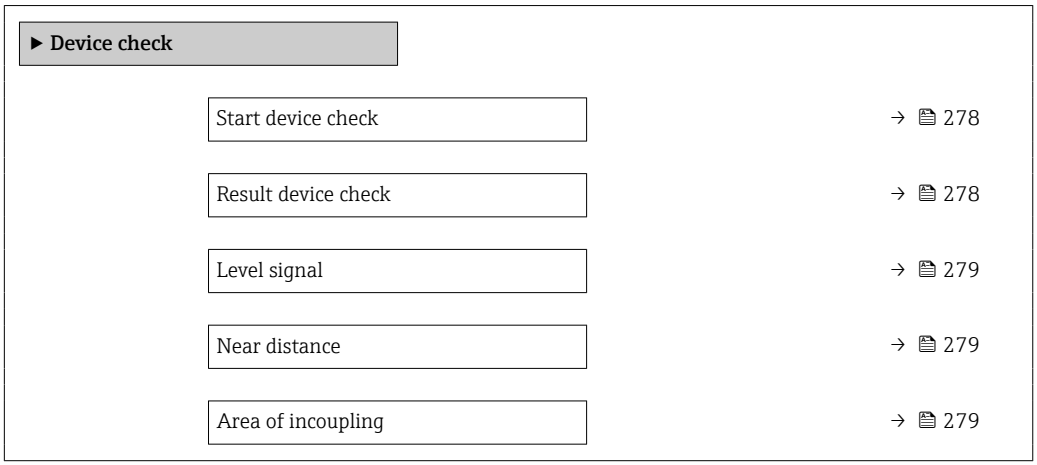
- x-axis: displays 125 to 500 measured values of a process variable (the number of values depending on the number of selected channels).
- y-axis: displays the approximate measured value span and constantly adapts this to the ongoing measurement.

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



Start device check

Navigation Expert → Diagnostics → Device check → Start dev. check

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

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

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

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

Description Shows the ringing area for build up detection.

Additional information

Read access	Operator
Write access	-

3.7.7 "LRC 1 to 2" submenu

Additional information about the configuration of the level reference check (LRC) function: Operating instructions

Navigation Diagnostics → LRC → LRC 1 to 2

LRC Mode

Navigation Diagnostics → LRC → LRC 1 to 2 → LRC Mode

Description Activates or deactivates one of the level reference check (LRC) modes.

Selection
- Off
- Compare with level device
- Compare with level switch
- Measure reference point *

Factory setting Off

Additional information

Read access	Operator
Write access	Maintenance

Additional information The option of the Measure reference point is not available for NMS8x.

Allowed difference

Navigation Diagnostics → LRC → LRC 1 to 2 → Allowed diff.

Description Defines the allowed difference between the tank level and the reference.

User entry 1 to 1 000 mm

Factory setting 10 mm

Additional information

Read access	Operator
Write access	Maintenance

* Visibility depends on order options or device settings

Check fail threshold

Navigation Diagnostics → LRC → LRC 1 to 2 → Fail threshold

Description Defines how many minutes the comparison has to fail before the check is failed. Note: Only for mode "Compare with level device".

User entry 1 to 60

Factory setting 3

Additional information

Read access	Operator
Write access	Maintenance

Reference level source

Navigation Diagnostics → LRC → LRC 1 to 2 → Reference source

Description Defines the source for the reference level. Note: Only for mode "Compare with level device".

Selection

- No input value
- HART device 1 level *
- HART device 2 level *
- HART device 3 level *
- HART device 4 level *
- HART device 5 level *
- HART device 6 level *
- HART device 7 level *
- HART device 8 level *
- HART device 9 level *
- HART device 10 level *
- HART device 11 level *
- HART device 12 level *
- HART device 13 level *
- HART device 14 level *
- HART device 15 level *

Factory setting No input value

Additional information

Read access	Operator
Write access	Maintenance

* Visibility depends on order options or device settings

Reference switch source

Navigation Diagnostics → LRC → LRC 1 to 2 → Reference source

Description Defines the source for the reference switch. Note: Only for mode "Compare with level switch".

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

Reference switch mode

Navigation Diagnostics → LRC → LRC 1 to 2 → Ref. switch mode

Description Defines the switch direction for which the reference check is executed. Note: Only for mode "Compare with level switch".

Selection
- Active -> Inactive
- Inactive -> Active

Factory setting Active -> Inactive

Additional information

Read access	Operator
Write access	Maintenance

Reference level

Navigation Diagnostics → LRC → LRC 1 to 2 → Reference level

Description Shows the current reference level. Note: Only for mode "Compare with level device".

User interface Signed floating-point number

Factory setting 0 mm

Additional information

Read access	Operator
Write access	-

Reference switch level

Navigation Diagnostics → LRC → LRC 1 to 2 → Reference level

Description Defines the position of the reference switch as level. Note: Only for mode "Compare with level switch".

User entry 0 to 10 000.00 mm

Factory setting 0 mm

Additional information

Read access	Operator
Write access	Maintenance

Reference point level

Navigation Diagnostics → LRC → LRC 1 to 2 → Ref. point level

Description Defines the position of the reference point as level. Note: Only for mode "Measure reference point".

User entry 0 to 10 000.00 mm

Factory setting 0 mm

Additional information

Read access	Operator
Write access	Maintenance

Reference switch state

Navigation Diagnostics → LRC → LRC 1 to 2 → Ref.switch state

Description Shows the current state of the reference switch (e.g. "active"). Note: Only for mode "Compare with level switch".

User interface

- Unknown
- Inactive
- Active
- Error

Factory setting Unknown

Additional information

Read access	Operator
Write access	-

Start reference measurement

Navigation Diagnostics → LRC → LRC 1 to 2 → Start ref. meas.

Description Starts the measurement of the reference point and executes the check. Note: Only for mode "Measure reference point".

Selection
- No
- Yes

Factory setting No

Additional information

Read access	Operator
Write access	Maintenance

Check level

Navigation Diagnostics → LRC → LRC 1 to 2 → Check level

Description Shows the tank level at which the reference check has been executed.

User interface Signed floating-point number

Factory setting 0 mm

Additional information

Read access	Operator
Write access	Development

Check status

Navigation Diagnostics → LRC → LRC 1 to 2 → Check status

Description Shows the status of the reference check execution (e.g. "passed").

User interface
- not executed
- Passed
- Failed
- Not possible

Factory setting not executed

Additional information

Read access	Operator
Write access	Development

Check timestamp

Navigation Diagnostics → LRC → LRC 1 to 2 → Check timestamp

Description Shows the timestamp at which the reference check has been executed.

User interface Character string comprising numbers, letters and special characters

Factory setting

Additional information

Read access	Operator
Write access	-

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