

Description of Device Parameters

Tankside Monitor NRF81

Tank Gauging



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1 About this document

1.1 Document function

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

1.2 Symbols

1.2.1 Safety symbols



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



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



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



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.



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



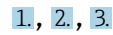
Reference to documentation



Reference to graphic



Notice or individual step to be observed



Series of steps



Result of a step



Visual inspection



Operation via operating tool



Write-protected parameter

1, 2, 3, ...

Item numbers

A, B, C, ...

Views



Safety instructions

Observe the safety instructions contained in the associated Operating Instructions



Temperature resistance of the connection cables

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

1.3 Documentation

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

 For an overview of the scope of the associated Technical Documentation, refer to the following:

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

1.3.1 Technical Information (TI)

Planning aid

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

1.3.2 Brief Operating Instructions (KA)

Guide that takes you quickly to the 1st measured value

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

1.3.3 Operating Instructions (BA)

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

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

1.3.4 Description of Device Parameters (GP)

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

1.3.5 Safety Instructions (XA)

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

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

1.3.6 Installation instructions (EA)

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

2 Overview of the operating menu

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

Navigation  Expert

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3 The "Expert" menu

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▶ Communication	→ 	112
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Direct access

Navigation	 Expert → Direct access (0106)
User entry	0 to 65 535
Factory setting	0
Additional information	Enter the access code of a parameter in order to access this parameter directly (i.e. without navigation). The direct access code consists of a five digit number and an optional channel code, which specifies an input or output channel, e.g. 00353-2 ■ Leading zeros need not to be entered. ■ If the channel code is not entered, channel 1 is automatically selected. ■ In order to access a different channel: Enter the direct access code with the channel code.  In this document, the direct access code is added in brackets after the parameter name in the <i>Navigation</i> category.

Locking status

Navigation

 Expert → Locking status (0004)

Description

Indicates the type of locking.

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

'WHG locked' (SW)
Unlock the device by entering the appropriate access code in 'Enter access code'.

'SIL locked' (SW)
Unlock the device by entering the appropriate access code in 'Enter access code'.

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

Additional information

Read access	Operator
Write access	-

Access status display

Navigation

 Expert → Access stat.disp (0091)

Prerequisite

The device has a local display.

Description

Indicates access authorization to parameters via local display.

Additional information

Read access	Operator
Write access	-

 The access authorization can be changed via the **Enter access code** parameter (→  27).

 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 (→  26).

User role

Navigation

 Expert → User role (0005)

Description

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

Additional information

Read access	Operator
Write access	-

Enter access code

Navigation	 Expert → Ent. access code (0003)	
Description	Enter access code to disable write protection of parameters.	
Additional information	Read access	Operator
	Write access	Operator

3.1 "System" submenu

Navigation  Expert → System

▶ System		
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3.1.1 "Display" submenu

Navigation  Expert → System → Display

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Display damping	→ 	34
Backlight	→ 	35
Contrast display	→ 	35

Language

Navigation  Expert → System → Display → Language (0104)

Prerequisite The device has a local display.

Description Set display language.

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

Factory setting English

Read access	Operator
Write access	Operator

Format display

Navigation  Expert → System → Display → Format display (0098)

Prerequisite The device has a local display.

Description Select how measured values are shown on the display.

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

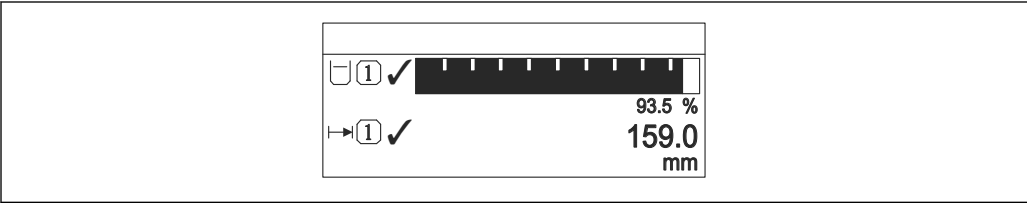
Factory setting 1 value, max. size

Additional information



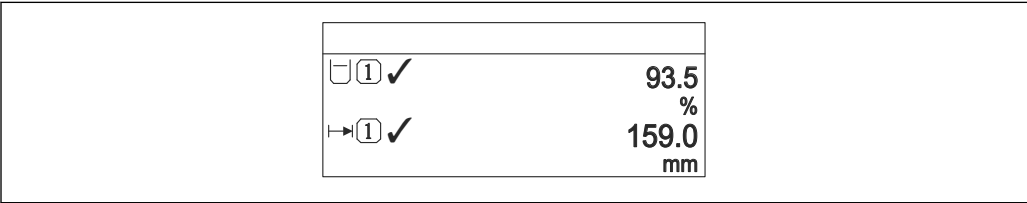
A0019963

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



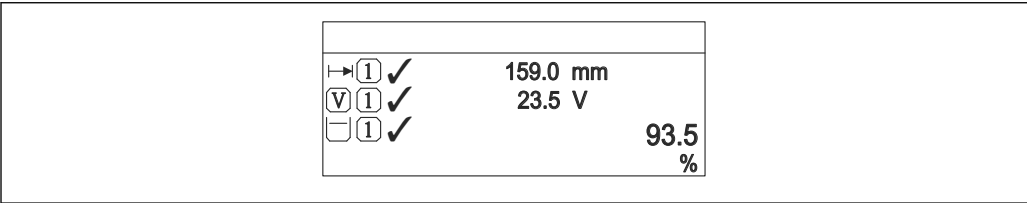
A0019964

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



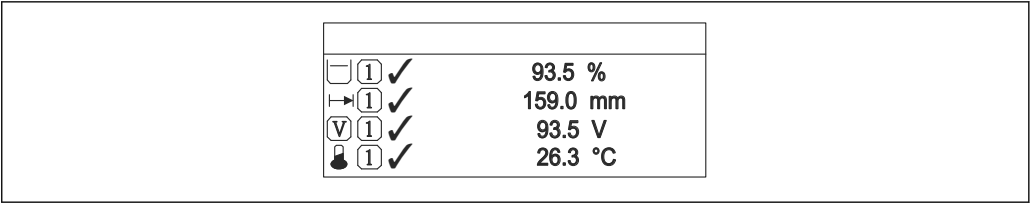
A0019965

 3 "Format display" = "2 values"



A0019966

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



A0019968

5 "Format display" = "4 values"

Read access	Operator
Write access	Operator

- The **Value 1 to 4 display** (→ 31) 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 (→ 34).

Value 1 to 4 display



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

Prerequisite The device has a local display.

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

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

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

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

Factory setting Depending on device version

Additional information

Read access	Operator
Write access	Maintenance

Decimal places 1 to 4

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

Prerequisite The device has a local display.

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

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

Factory setting x.x

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

Read access	Operator
Write access	Maintenance

Separator

Navigation   Expert → System → Display → Separator (0101)

Prerequisite The device has a local display.

Description Select decimal separator for displaying numerical values.

- Selection
- .
 - ,

Factory setting .

Additional information

Read access	Operator
Write access	Maintenance

Number format**Navigation**

Expert → System → Display → Number format (0099)

Prerequisite

The device has a local display.

Description

Choose number format for the display.

Selection

- Decimal
- ft-in-1/16"

Factory setting

Decimal

Additional information

Read access	Operator
Write access	Maintenance



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

Header**Navigation**

Expert → System → Display → Header (0097)

Prerequisite

The device has a local display.

Description

Select header contents on local display.

Selection

- Device tag
- Free text

Factory setting

Device tag

Additional information

Read access	Operator
Write access	Maintenance

Meaning of the options

- **Device tag**

The header contents is defined in the **Device tag** parameter (→ 148).

- **Free text**

The header contents is defined in the **Header text** parameter (→ 34).

Header text

Navigation

Expert → System → Display → Header text (0112)

Prerequisite

Header (→ 33) = Free text

Description

Enter display header text.

User entry

Character string comprising numbers, letters and special characters (11)

Factory setting

TG-Platform

Additional information

Read access	Operator
Write access	Maintenance

Display interval

Navigation

Expert → System → Display → Display interval (0096)

Description

Set time measured values are shown on display if display alternates between values.

User entry

1 to 10 s

Factory setting

5 s

Additional information

This parameter is only relevant if the number of selected measuring values exceeds the number of values the selected display format can display simultaneously.

Read access	Operator
Write access	Operator

Display damping

Navigation

Expert → System → Display → Display damping (0094)

Prerequisite

The device has a local display.

Description

Set display reaction time to fluctuations in the measured value.

User entry

0.0 to 999.9 s

Factory setting

0.0 s

Additional information

Read access	Operator
Write access	Maintenance

Backlight

Navigation   Expert → System → Display → Backlight (0111)

Prerequisite The device has a local display.

Description Switch the local display backlight on and off.

Selection

- Disable
- Enable

Factory setting Enable

Additional information

Read access	Operator
Write access	Operator

Contrast display

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

Prerequisite The device has a local display.

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

User entry 20 to 80 %

Factory setting 30 %

Additional information

Read access	Operator
Write access	Operator

3.1.2 "System units" submenu

Navigation  Expert → System → System units

► System units

Units preset

→  36

Distance unit

→  37

Pressure unit

→  37

Temperature unit

→  37

Density unit

→  38

Decimal places length

→  38

Decimal places pressure

→  39

Decimal places temperature

→  39

Decimal places density

→  39

Units preset

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

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

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

Factory setting mm, bar, °C

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 (→  37)
- Pressure unit (→  37)
- Temperature unit (→  37)

Distance unit

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

Description Select distance unit.

Selection

<i>SI units</i>	<i>US units</i>
■ m	■ ft
■ mm	■ in
■ cm	■ ft-in-16
	■ ft-in-8

Factory setting mm

Additional information	Read access	Operator
	Write access	Maintenance (if Units preset (→  36) = Customer value)

Pressure unit

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

Description Select process pressure unit.

Selection

<i>SI units</i>	<i>US units</i>	<i>Other units</i>
■ bar	psi	■ inH2O
■ Pa		■ inH2O (68°F)
■ kPa		■ ftH2O (68°F)
■ MPa		■ mmH2O
■ mbar a		■ mmHg

Factory setting bar

Additional information	Read access	Operator
	Write access	Maintenance (if Units preset (→  36) = Customer value)

Temperature unit

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

Description Select temperature unit.

Selection

<i>SI units</i>	<i>US units</i>
■ °C	■ °F
■ K	■ °R

Factory setting °C

Additional information	Read access	Operator
	Write access	Maintenance (if Units preset (→ ⓘ 36) = Customer value)

Density unit

ⓘ

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

Description Select density unit.

Selection	<i>SI units</i>	<i>US units</i>	<i>Other units</i>
	■ g/cm³ ■ g/ml ■ g/l ■ kg/l ■ kg/dm³ ■ kg/m³	■ lb/ft³ ■ lb/gal (us) ■ lb/in³ ■ STon/yd³	■ °API ■ SGU

Factory setting kg/m³

Additional information	Read access	Operator
	Write access	Maintenance (if Units preset (→ ⓘ 36) = Customer value)

Decimal places length

ⓘ

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

Description Number of decimal places for length values.

Selection	■ X ■ X.X ■ X.XX ■ X.XXX ■ X.XXXX

Factory setting X.X

Additional information	Read access	Operator
	Write access	Maintenance

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

Decimal places pressure

Navigation

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

Description

Number of decimal places for pressure values.

Selection

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

Factory setting

X.XXX

Additional information

Read access	Operator
Write access	Maintenance

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

Decimal places temperature

Navigation

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

Description

Number of decimal places for temperature values.

Selection

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

Factory setting

X.X

Additional information

Read access	Operator
Write access	Maintenance

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

Decimal places density

Navigation

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

Description

Number of decimal places for density values.

Selection

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

Factory setting

X.X

Additional information

Read access	Operator
Write access	Maintenance

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

3.1.3 "Date / time" submenu

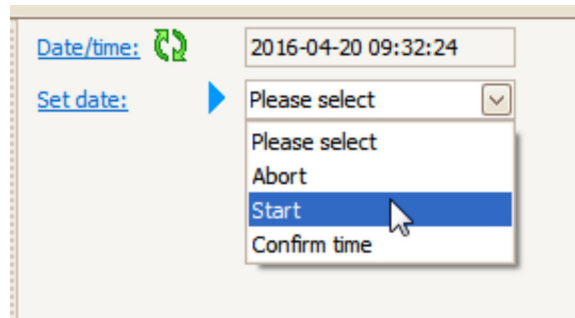
The **Date / time** submenu is used to set the real-time clock of the device.

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

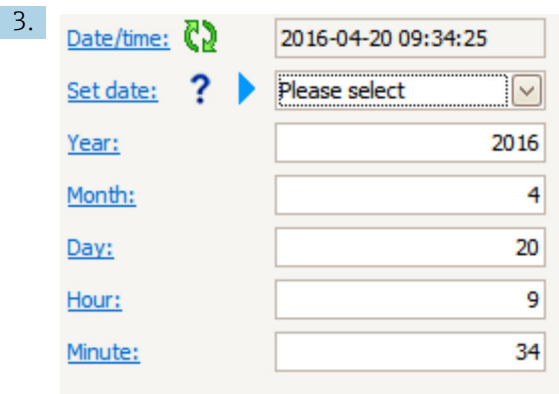
1. Navigate to Expert → System → Date / time → Set date.
 - ↳ The current value of the real-time clock is displayed.
2. If the displayed value is correct: Press  to terminate the wizard.
3. If the displayed value is not correct: Press  to edit it.
 - ↳ The current value of the **Year** parameter is displayed.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

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

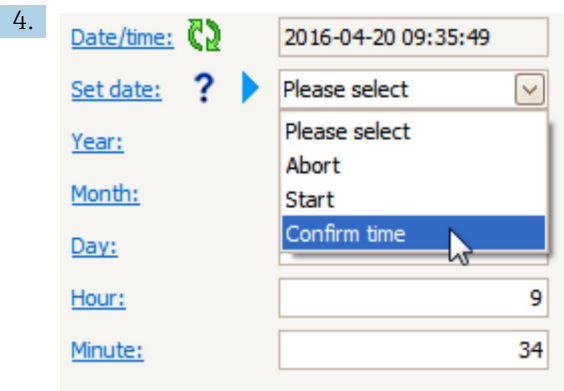
1. Navigate to: Expert → System → Date / time
- 2.



Go to the **Set date** parameter (→ 44) and select the **Start** option.



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



Go to the **Set date** parameter (→ 44) 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

► Date / time		
Date/time	→ 	44
► Set date		
Date/time	→ 	47
Year	→ 	47
Month	→ 	47
Day	→ 	47
Hour	→ 	47
Minute	→ 	48
Set date	→ 	48

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

Navigation  Expert → System → Date / time

► Date / time		
Date/time	→ 	44
Set date	→ 	44
Year	→ 	44
Month	→ 	45
Day	→ 	45
Hour	→ 	45
Minute	→ 	46

Description of parameters

Navigation  Expert → System → Date / time

Date/time

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

Description Displays the device internal real time clock.

Additional information	Read access	Operator
	Write access	-

Set date



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

Description Controls the setting of the real-time clock.

- Selection
- Please select
 - Abort
 - Start
 - Confirm time

Factory setting Please select

Additional information	Read access	Operator
	Write access	Maintenance

Meaning of the options

- **Please select**
Prompts the user to select an action.
- **Abort**
Discards the entered date and time.
- **Start**
Starts the setting of the real time clock.
- **Confirm time**
Sets the real-time clock to the entered date and time.

Year



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

Prerequisite Set date (→  44) = Start

Description Enter the current year.

User entry 2016 to 2079

Factory setting 2016

Additional information

Read access	Operator
Write access	Maintenance

Month



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

Prerequisite Set date (→ 44) = Start

Description Enter the current month.

User entry 1 to 12

Factory setting 1

Additional information

Read access	Operator
Write access	Maintenance

Day



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

Prerequisite Set date (→ 44) = Start

Description Enter the current day.

User entry 1 to 31

Factory setting 1

Additional information

Read access	Operator
Write access	Maintenance

Hour



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

Prerequisite Set date (→ 44) = Start

Description	Enter the current hour.	
User entry	0 to 23	
Factory setting	0	
Additional information	Read access	Operator
	Write access	Maintenance

Minute

Navigation	 Expert → System → Date / time → Minute (0791)	
Prerequisite	Set date (→  44) = Start	
Description	Enter the current minute.	
User entry	0 to 59	
Factory setting	0	
Additional information	Read access	Operator
	Write access	Maintenance

"Set date" wizard

Navigation  Expert → System → Date / time → Set date

Date/time

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

Description →  44

Year

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

Description →  44

Month

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

Description →  45

Day

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

Description →  45

Hour

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

Description →  45

Minute

Navigation

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

Description

→  46

Set date

Navigation

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

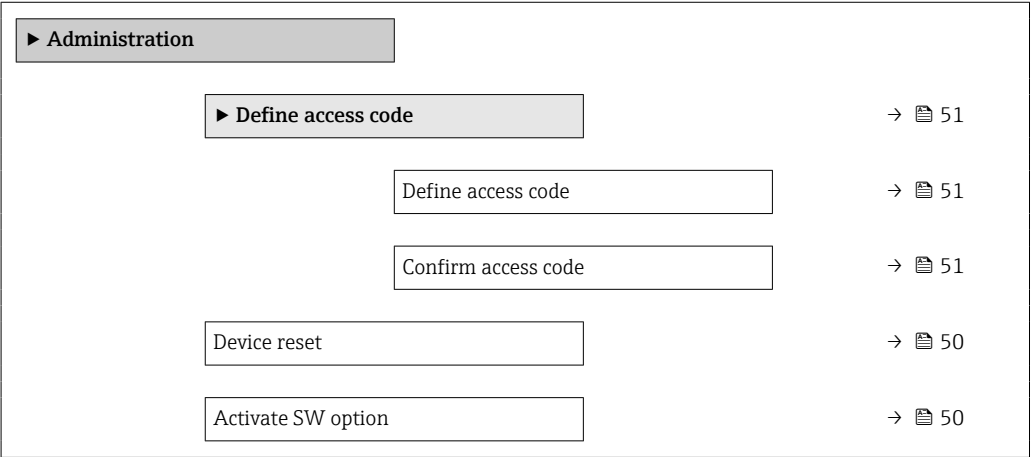
Description

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

3.1.4 "Administration" submenu

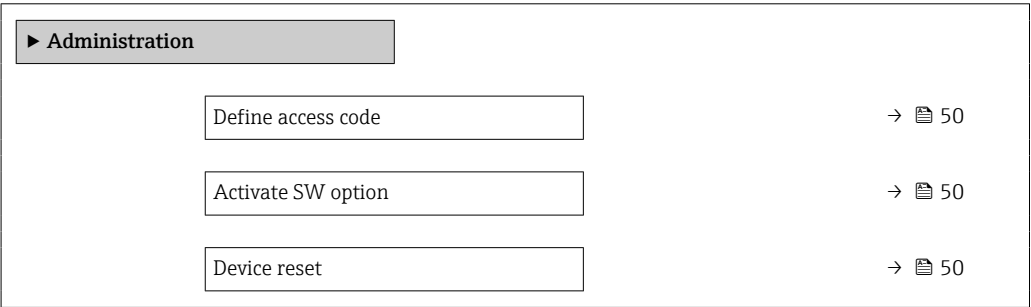
Structure of the submenu on the display and operating module

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 (0093)

Description Define release code for write access to parameters.

User entry 0 to 9 999

Factory setting 0

Additional information	Read access	Operator
	Write access	Maintenance

-  If the factory setting is not changed or 0 is defined as the access code, the parameters are not write-protected and the configuration data of the device can then always be modified. The user is logged on in the *Maintenance* role.
-  The write protection affects all parameters marked with the  symbol in this document.
-  Once the access code has been defined, write-protected parameters can only be modified if the access code is entered in the **Enter access code** parameter (→  27).

Activate SW option

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

Description Activates software options.

User entry Positive integer

Factory setting 0

Additional information	Read access	Operator
	Write access	Maintenance

Device reset

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

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

Selection	■ 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.				
<table><tr><td>Read access</td><td>Operator</td></tr><tr><td>Write access</td><td>Maintenance</td></tr></table>		Read access	Operator	Write access	Maintenance
Read access	Operator				
Write access	Maintenance				

"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	→  50

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	<table><tr><td>Read access</td><td>Operator</td></tr><tr><td>Write access</td><td>Maintenance</td></tr></table>	Read access	Operator	Write access	Maintenance
Read access	Operator				
Write access	Maintenance				

3.2 "Input/output" submenu

Navigation  Expert → Input/output

▶ Input/output		
▶ HART devices	→ 	53
▶ Analog IP	→ 	84
▶ Analog I/O	→ 	93
▶ Digital Xx-x	→ 	106

3.2.1 "HART devices" submenu

Navigation  Expert → Input/output → HART devices

▶ HART devices		
Number of devices	→ 	53
▶ HART Device(s)	→ 	54
▶ Forget device	→ 	82
▶ #blank#	→ 	82

Number of devices

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

Description Shows the number of devices on the HART bus.

Additional information	Read access	Operator
	Write access	-

Scanner status

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

Description Shows the current scanner polling status.

Additional information



 6 Example for scanner polling status display

Read access	Service
Write access	-

"HART Device(s)" submenu

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

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

▶ HART Device(s)		
Device name	→	 55
Polling address	→	 55
Device tag	→	 55
Operating mode	→	 55
Communication status	→	 56
#blank# (PV - designation dependent on device)	→	 56
#blank#(SV - designation dependent on device)	→	 56
#blank#(TV - designation dependent on device)	→	 56
#blank#(QV - designation dependent on device)	→	 56
HART device PV mA	→	 57
HART device PV %	→	 58
Output pressure	→	 58
Output density	→	 58
Output temperature	→	 59
Output vapor temperature	→	 59
Output level	→	 60
▶ HART device information	→	 61
▶ Element values	→	 67
▶ Diagnostics	→	 68

► Diagnostics	→ 69
► NMT device config	→ 71

Device name

Navigation	 Expert → Input/output → HART devices → HART Device(s) → Device name (14722)				
Description	Shows the name of the transmitter.				
Additional information	<table><tr><td>Read access</td><td>Operator</td></tr><tr><td>Write access</td><td>-</td></tr></table>	Read access	Operator	Write access	-
Read access	Operator				
Write access	-				

Polling address

Navigation	 Expert → Input/output → HART devices → HART Device(s) → Polling address (14712)				
Description	Shows the polling address of the transmitter.				
Additional information	<table><tr><td>Read access</td><td>Operator</td></tr><tr><td>Write access</td><td>-</td></tr></table>	Read access	Operator	Write access	-
Read access	Operator				
Write access	-				

Device tag

Navigation	 Expert → Input/output → HART devices → HART Device(s) → Device tag (14713)				
Description	Shows the device tag of the transmitter.				
Additional information	<table><tr><td>Read access</td><td>Operator</td></tr><tr><td>Write access</td><td>-</td></tr></table>	Read access	Operator	Write access	-
Read access	Operator				
Write access	-				

Operating mode

Navigation	 Expert → Input/output → HART devices → HART Device(s) → Operating mode (14745)
Prerequisite	Not available if the HART device is a Prothermo NMT.

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

Selection

- PV only
- PV,SV,TV & QV
- Level ²⁾
- Measured level ²⁾

Factory setting PV,SV,TV & QV

Additional information

Read access	Operator
Write access	Maintenance

Communication status

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

Description Shows the operating status of the transmitter.

User interface

- Operating normally
- Device offline

Additional information

Read access	Operator
Write access	-

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

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

Description Shows the first HART variable (PV).

Additional information

Read access	Operator
Write access	-

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

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

Prerequisite For HART devices other than NMT: **Operating mode** (→  55) = PV,SV,TV & QV

Description Shows the second HART variable (SV).

2) only visible if the connected device is a Micropilot

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)
PrerequisiteFor HART devices other than NMT: **Operating mode** (→  55) = 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)
PrerequisiteFor HART devices other than NMT: **Operating mode** (→  55) = 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 (14708)
Prerequisite

Not available for Micropilot S FMR5xx and Prothermo 53x.

Description

Shows the first HART variable (PV) in mA.

Additional information

Read access	Operator
Write access	-

HART device PV %

Navigation	 Expert → Input/output → HART devices → HART Device(s) → HARTDEV PV % (14709)	
Prerequisite	Not available for Micropilot S FMR5xx and Prothermo 53x.	
Description	Shows the first HART variable (PV) in percentage.	
Additional information	Read access	Operator
	Write access	-

Output pressure



Navigation	 Expert → Input/output → HART devices → HART Device(s) → Output pressure (14719)	
Prerequisite	Not available for Micropilot S FMR5xx, Prothermo NMT53x and Prothermo NMT8x. In these cases the measured variables are allocated automatically.	
Description	Defines which HART variable is the pressure.	
Selection	■ No value ■ Primary variable (PV) ■ Secondary variable (SV) ■ Tertiary variable (TV) ■ Quaternary variable (QV)	
Factory setting	No value	
Additional information	Read access	Operator
	Write access	Maintenance

Output density



Navigation	 Expert → Input/output → HART devices → HART Device(s) → Output density (14720)	
Prerequisite	Not available for Micropilot S FMR5xx, Prothermo NMT53x and Prothermo NMT8x. In these cases the measured variables are allocated automatically.	
Description	Defines which HART variable is the density.	
Selection	■ No value ■ Primary variable (PV) ■ Secondary variable (SV) ■ Tertiary variable (TV) ■ Quaternary variable (QV)	

Factory setting No value

Additional information

Read access	Operator
Write access	Maintenance

Output temperature



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

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

Description Defines which HART variable is the temperature.

Selection

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

Factory setting No value

Additional information

Read access	Operator
Write access	Maintenance

Output vapor temperature



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

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

Description Defines which HART variable is the vapor temperature.

Selection

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

Factory setting No value

Additional information

Read access	Operator
Write access	Maintenance

Output level



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

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

Description Defines which HART variable is the level.

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

Factory setting No value

Additional information

Read access	Operator
Write access	Maintenance

"HART device information" submenu

Navigation

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

► HART device information

Pressure

Density

Temperature

Vapor temperature

Water level

Level source

Tank level to NMT

Manual value

HART bus

Device type

Device ID

Device date

Device description

Device message

Software version

Firmware CRC

Custody transfer

→  61

→  62

→  62

→  62

→  63

→  63

→  63

→  64

→  64

→  64

→  64

→  65

→  65

→  65

→  65

→  66

→  66

Pressure

Navigation

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

Prerequisite

Output pressure (→  58) ≠ No value

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

Additional information	Read access	Operator
	Write access	-

Density

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

Prerequisite **Output density (→  58) ≠ No value**

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

Additional information	Read access	Operator
	Write access	-

Temperature

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

Prerequisite **Output temperature (→  59) ≠ No value**

Description Shows the temperature measured by the connected HART device.

Additional information	Read access	Operator
	Write access	-

Vapor temperature

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

Prerequisite **Output vapor temperature (→  59) ≠ 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 (14717)

Prerequisite **Output level (→  60) ≠ No value**

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

Additional information

Read access	Operator
Write access	-

Level source

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

Prerequisite Prothermo NMT53x

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

Selection

- Manual value
- Tank level

Factory setting Tank level

Additional information

Read access	Maintenance
Write access	Maintenance

Tank level to NMT

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

Prerequisite Prothermo NMT53x with level measurement

Description Shows the level transferred to NMT.

Additional information

Read access	Maintenance
Write access	-

Manual value

Navigation

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

Prerequisite

Prothermo NMT53x with level measurement

Description

Shows the manual set level.

User entry

Signed floating-point number

Factory setting

0 mm

Additional information

Read access	Maintenance
Write access	Maintenance

HART bus

Navigation

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

Description

Information about the used IO-Slot.

Additional information

Read access	Operator
Write access	-

Device type

Navigation

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

Description

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

Additional information

Read access	Operator
Write access	-

Device ID

Navigation

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

Description

Shows the device ID of the connected HART device.

Additional information

Read access	Operator
Write access	-

Device date

Navigation

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

Description

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

Additional information

Read access	Operator
Write access	-

Device description

Navigation

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

Description

Shows a user defined HART descriptor of the connected device.

Additional information

Read access	Operator
Write access	-

Device message

Navigation

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

Description

Shows a user defined HART message of the connected device.

Additional information

Read access	Operator
Write access	-

Software version

Navigation

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

Prerequisite

Prothermo NMT53x

Description

Shows the software version of the NMT device.

Additional information	Read access	Maintenance
	Write access	-

Firmware CRC

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

User interface Positive integer

Factory setting 0

Additional information	Read access	Maintenance
	Write access	-

Custody transfer

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

Prerequisite Prothermo NMT53x with temperature measurement

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

Additional information	Read access	Maintenance
	Write access	-

"Element values" submenu

 This submenu is only available for Prothermo NMT53x.

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

"Element temperature" submenu

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

Element temperature 1 to 24

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

Description Shows the temperature of an element in the NMT.

Additional information	Read access	Operator
	Write access	-

"Element position" submenu

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

Element position 1 to 24

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

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

Additional information	Read access	Operator
	Write access	-

"Diagnostics" submenu

 This submenu is only available for Prothermo NMT53x.

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

► Diagnostics

Diagnostic code

→  68

Last diagnostic

→  68

Reference 0

→  68

Reference 17

→  69

Diagnostic code

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

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

Read access	Operator
Write access	-

Last diagnostic

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

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

Read access	Operator
Write access	-

Reference 0

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

Prerequisite Prothermo NMT53x with temperature measurement.

Description Shows the temperature of internal reference element 0.

Additional information	Read access	Operator
	Write access	-

Reference 17

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

Prerequisite Prothermo NMT53x with temperature measurement.

Description Shows the temperature of internal reference element 17.

Additional information	Read access	Operator
	Write access	-

"Diagnostics" submenu

 This submenu is only available for Prothermo NMT8x.

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

► Diagnostics

Active diagnostics

Previous diagnostics

Test resistance

WB frequency ratio

→  69

→  70

→  70

→  70

Active diagnostics

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

User interface Character string comprising numbers, letters and special characters

Factory setting

Additional information	Read access	Operator
	Write access	-

Previous diagnostics

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

User interface Character string comprising numbers, letters and special characters

Factory setting

Additional information	Read access	Operator
	Write access	-

Test resistance

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

User interface Signed floating-point number

Factory setting 0 Ohm

Additional information	Read access	Operator
	Write access	-

WB frequency ratio

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

User interface Signed floating-point number

Factory setting 0

Additional information	Read access	Operator
	Write access	-

"NMT device config" submenu

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

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

► NMT device config

Configure device?

→  71

Access code

→  72

Total no. element

→  72

Bottom point

→  73

Temperature element short

→  73

Temperature element open

→  73

Output at error

→  74

Gain adjust

→  74

Kind of interval

→  74

Element interval

→  75

Update water level

→  75

► Element setup

→  76

Select element

→  76

Zero adjust

→  76

Element temperature

→  77

Element position

→  77

Configure device? 

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

Description Enable NMT device configuration.

Endress+Hauser

71

Selection	■ No ■ Yes				
Factory setting	No				
Additional information	Meaning of the options ■ No Not configurable ■ Yes Configurable				
	<table><tr><td>Read access</td><td>Operator</td></tr><tr><td>Write access</td><td>Maintenance</td></tr></table>	Read access	Operator	Write access	Maintenance
Read access	Operator				
Write access	Maintenance				

Access code	
-------------	--

Navigation	Expert → Input/output → HART devices → HART Device(s) → NMT dev. config → Access code (14714)				
Prerequisite	Configure device? (→ 71) = Yes				
Description	Shows the access code to configure the NMT device. Code is read from NMT device at start up.				
User entry	0 to 65 535				
Factory setting	0				
Additional information	<table><tr><td>Read access</td><td>Operator</td></tr><tr><td>Write access</td><td>Maintenance</td></tr></table>	Read access	Operator	Write access	Maintenance
Read access	Operator				
Write access	Maintenance				

Total no. element	
-------------------	--

Navigation	Expert → Input/output → HART devices → HART Device(s) → NMT dev. config → Total elements (14730)				
Description	Shows the total amount of configurable temperature elements.				
Additional information	<table><tr><td>Read access</td><td>Operator</td></tr><tr><td>Write access</td><td>-</td></tr></table>	Read access	Operator	Write access	-
Read access	Operator				
Write access	-				

Bottom point

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

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

User entry Signed floating-point number

Factory setting 0 mm

Additional information

Read access	Operator
Write access	Maintenance

Temperature element short

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

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

User entry Signed floating-point number

Factory setting 0 °C

Additional information

Read access	Operator
Write access	Maintenance

Temperature element open

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

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

User entry Signed floating-point number

Factory setting 0 °C

Additional information

Read access	Operator
Write access	Maintenance

Output at error

Navigation

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

Description

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

Selection

■ Off

■ On

Factory setting

Off

Additional information

Read access	Operator
Write access	Maintenance

Gain adjust

Navigation

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

Description

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

User entry

Signed floating-point number

Factory setting

0

Additional information

Read access	Operator
Write access	Maintenance

Kind of interval

Navigation

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

Description

Determines how the element positions are defined.

Selection

■ Even

■ Not even

Factory setting

Even

Additional information**Meaning of the options**■ **Even**

First position bottom point + element interval for every next element.

■ **Not even**

Position of elements can be set manually.

Read access	Operator
Write access	Maintenance

Element interval**Navigation**

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

Prerequisite

Kind of interval (→ 74) = 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. (14751)

Description

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

Selection

- Enabled
- Disabled

Factory setting

Disabled

Additional information

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

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

Read access	Operator
Write access	Maintenance

"Element setup" submenu

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

Select element

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

Description Chooses the temperature element to be configured manually.

User entry 1 to 24

Factory setting 1

Additional information	Read access	Operator
	Write access	Maintenance

Zero adjust

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

Description Adjusts the offset of the selected temperature element.

User interface Signed floating-point number

Factory setting 0 None

Additional information	Read access	Operator
	Write access	Service

Element temperature

Navigation	 Expert → Input/output → HART devices → HART Device(s) → NMT dev. config → Element setup → Element temp. (14737)				
Description	Shows the temperature of the element.				
Additional information	<table><tr><td>Read access</td><td>Operator</td></tr><tr><td>Write access</td><td>-</td></tr></table>	Read access	Operator	Write access	-
Read access	Operator				
Write access	-				

Element position



Navigation	 Expert → Input/output → HART devices → HART Device(s) → NMT dev. config → Element setup → Element position (14738)				
Description	Shows the position of the temperature element.				
User interface	Signed floating-point number				
Factory setting	0 mm				
Additional information	<table><tr><td>Read access</td><td>Operator</td></tr><tr><td>Write access</td><td>Service</td></tr></table>	Read access	Operator	Write access	Service
Read access	Operator				
Write access	Service				

"NMT device config" submenu

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

Navigation	 Expert → Input/output → HART devices → HART Device(s) → NMT dev. config
► NMT device config Configure device? →  78 Total no. element →  78 Bottom point →  79 NMT8NoElementInPhase →  79 Water bottom level offset →  79	

Update water level	→ 80
► Element setup	→ 80
Select element	→ 80
Zero adjust	→ 81
Element temperature	→ 81
Element position	→ 81

Configure device?

Navigation	Expert → Input/output → HART devices → HART Device(s) → NMT dev. config → Config. device? (14728)				
Description	Enable NMT device configuration.				
Selection	No Yes				
Factory setting	No				
Additional information	Meaning of the options No Not configurable Yes Configurable <table><tr><td>Read access</td><td>Operator</td></tr><tr><td>Write access</td><td>Maintenance</td></tr></table>	Read access	Operator	Write access	Maintenance
Read access	Operator				
Write access	Maintenance				

Total no. element

Navigation	Expert → Input/output → HART devices → HART Device(s) → NMT dev. config → Total elements (14730)				
Description	Shows the total amount of configurable temperature elements.				
Additional information	<table><tr><td>Read access</td><td>Operator</td></tr><tr><td>Write access</td><td>-</td></tr></table>	Read access	Operator	Write access	-
Read access	Operator				
Write access	-				

Bottom point

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

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

User entry Signed floating-point number

Factory setting 0 mm

Additional information

Read access	Operator
Write access	Maintenance

NMT8NoElementInPhase

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

Selection

- Alarm
- Warning
- Logbook entry only

Factory setting Alarm

Additional information

Read access	Operator
Write access	Operator

Water bottom level offset

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

User entry Signed floating-point number

Factory setting 0 mm

Additional information

Read access	Operator
Write access	Operator

Update water level



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

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

Selection

- Enabled
- Disabled

Factory setting Disabled

Additional information

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

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

Read access	Operator
Write access	Maintenance

"Element setup" submenu

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

► Element setup

Select element

Zero adjust

Element temperature

Element position

→  80

→  81

→  81

→  81

Select element



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

Description Chooses the temperature element to be configured manually.

User entry 1 to 24

Factory setting 1

Additional information

Read access	Operator
Write access	Maintenance

Zero adjust



Navigation

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

User interface Signed floating-point number

Factory setting 0 °C

Additional information

Read access	Operator
Write access	Maintenance

Element temperature

Navigation

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

Description Shows the temperature of the element.

Additional information

Read access	Operator
Write access	-

Element position



Navigation

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

Description Shows the position of the temperature element.

User interface Signed floating-point number

Factory setting 0 mm

Additional information

Read access	Operator
Write access	Service

"Forget device" wizard

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

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

Forget device

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

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

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

Factory setting None

Additional information	Read access	Operator
	Write access	Maintenance

HART Bus interface

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

▶ #blank#

Operating mode

→  83

Current

→  83

* Visibility depends on order options or device settings

Operating mode

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

Shows the operation mode of this HART bus.

■ None

■ Disable

■ HART master

■ HART slave +4..20mA output

■ HART tunnel

None

Read access	Operator
Write access	-

Current

Navigation

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

Description

Shows the actual current on this HART bus.

User interface

0 to 100 000 mA

Factory setting

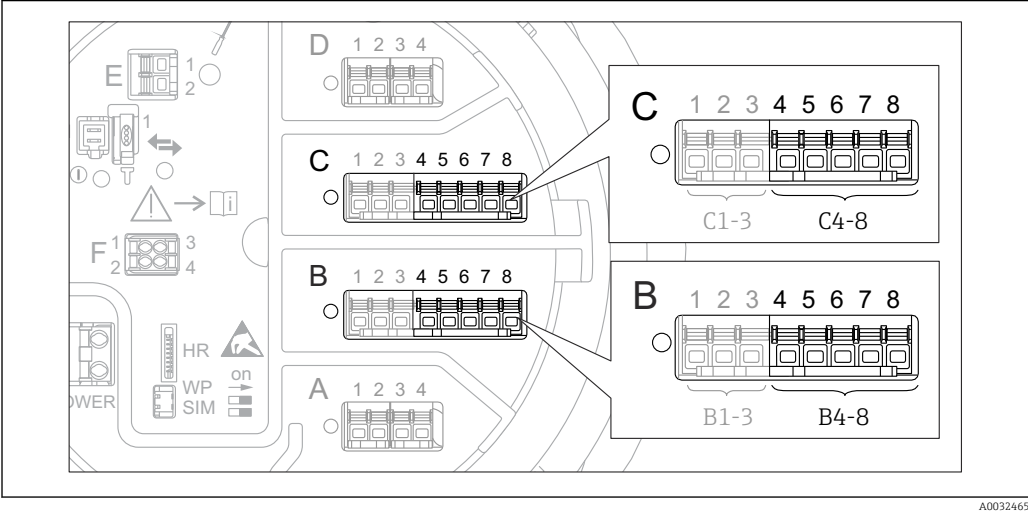
0 mA

Additional information

Read access	Operator
Write access	-

3.2.2 "Analog IP" submenu

i There is an **Analog IP** submenu (→ 84) 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 → 93.



7 Terminals for the "Analog IP" submenu (→ 84) ("B4-8" or "C4-8", respectively)

Navigation Expert → Input/output → Analog IP

▶ Analog IP

Operating mode	→ 85
RTD type	→ 85
Ohms offset	→ 86
Thermocouple type	→ 86
RTD connection type	→ 87
Process value	→ 87
Process variable	→ 87
0 % value	→ 88
100 % value	→ 88
Input value percent	→ 88
Input value	→ 89
Temperature offset after conversion	→ 89

Minimum probe temperature	→ 89
Maximum probe temperature	→ 90
Probe position	→ 90
Calibration type AIP	→ 91
Active calibration	→ 91
Damping factor	→ 91
Gauge current	→ 92

Operating mode

Navigation	Expert → Input/output → Analog IP → Operating mode (14014)	
Description	Defines the operating mode of the analog input.	
Selection	■ Disabled ■ RTD temperature input ■ Gauge power supply	
Factory setting	Disabled	
Additional information	Read access	Operator
	Write access	Maintenance

RTD type

Navigation	Expert → Input/output → Analog IP → RTD type (14021)	
Prerequisite	Operating mode (→ 85) = RTD temperature input	
Description	Defines the type of the connected RTD.	
Selection	■ Cu50 (w=1.428, GOST) ■ Cu53 (w=1.426, GOST) ■ Cu90; 0°C (w=1.4274, GOST) ■ Cu100; 25°C (w=1.4274, GOST) ■ Cu100; 0°C(w=1.4274, GOST) ■ Pt46 (w=1.391, GOST) ■ Pt50 (w=1.391, GOST) ■ Pt100(385) (a=0.00385, IEC751) ■ Pt100(389) (a=0.00389, Canadian) ■ Pt100(391) (a=0.003916, JIS1604)	

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

Factory setting

Pt100(385) (a=0.00385, IEC751)

Additional information

Read access	Operator
Write access	Maintenance

Ohms offset**Navigation**

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

Prerequisite**Operating mode (→ 85) = RTD temperature input****Description**

Defines a offset for the resistance.
 This value is added to the measured resistance before the calculation of the temperature.

User entry

-10.0 to 10.0 Ohm

Factory setting

0 Ohm

Additional information

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

Read access	Operator
Write access	Maintenance

Thermocouple type**Navigation**

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

Description

Defines the type of the connected thermocouple.

Selection

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

Factory setting N type

RTD connection type

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

Prerequisite **Operating mode (→  85) = RTD temperature input**

Description Defines the connection type of the RTD.

Selection

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

Factory setting 4 wire RTD connection

Additional information

Read access	Operator
Write access	Maintenance

Process value

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

Prerequisite **Operating mode (→  85) ≠ Disabled**

Description Shows the measured value received via the analog input.

Additional information

Read access	Operator
Write access	-

Process variable

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

Prerequisite **Operating mode (→  85) ≠ RTD temperature input**

Description Determines type of measured value.

Selection

- Level linearized
- Temperature
- Pressure
- Density

Factory setting Level linearized

Additional information	Read access	Operator
	Write access	Maintenance

0 % value

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

Prerequisite **Operating mode (→  85) = 4..20mA input**

Description Defines the value represented by a current of 4mA.

User entry Signed floating-point number

Factory setting 0 mm

Additional information	Read access	Operator
	Write access	Maintenance

100 % value

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

Prerequisite **Operating mode (→  85) = 4..20mA input**

Description Defines the value represented by a current of 20mA.

User entry Signed floating-point number

Factory setting 0 mm

Additional information	Read access	Operator
	Write access	Maintenance

Input value percent

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

Prerequisite **Operating mode (→  85) = 4..20mA input**

Description Shows the input value in percent.
0% corresponds to 4 mA.
100% corresponds to 20 mA.

Additional information

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

Read access	Operator
Write access	-

Input value**Navigation**
 Expert → Input/output → Analog IP → Input value (14015)
Prerequisite**Operating mode (→  85) ≠ Disabled****Description**

Shows the value received via the analog input.

Additional information

Read access	Operator
Write access	-

Temperature offset after conversion**Navigation**
 Expert → Input/output → Analog IP → Temp. offset (14025)
Prerequisite**Operating mode (→  85) = RTD temperature input****Description**

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

User entry

-20 to 20 °C

Factory setting

0 °C

Additional information

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

Read access	Operator
Write access	Maintenance

Minimum probe temperature**Navigation**
 Expert → Input/output → Analog IP → Min. probe temp (14010)
Prerequisite**Operating mode (→  85) = RTD temperature input****Description**

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

User entry -213 to 927 °C

Factory setting -100 °C

Additional information

Read access	Operator
Write access	Maintenance

Maximum probe temperature



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

Prerequisite **Operating mode (→  85) = RTD temperature input**

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

User entry -213 to 927 °C

Factory setting 250 °C

Additional information

Read access	Operator
Write access	Maintenance

Probe position



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

Prerequisite **Operating mode (→  85) = RTD temperature input**

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

User entry -5 000 to 30 000 mm

Factory setting 5 000 mm

Additional information

Read access	Operator
Write access	Maintenance

Calibration type AIP


Navigation Expert → Input/output → Analog IP → Cal type AIP (14018)

Prerequisite **Operating mode (→ 85) ≠ Disabled**

Description Select calibration state of the analog input or output.

Selection

- User calibration
- Factory calibration

Factory setting Factory calibration

Additional information **Meaning of the options**

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

Read access	Operator
Write access	Maintenance

Active calibration

Navigation Expert → Input/output → Analog IP → Act. calibration (14012)

Prerequisite **Operating mode (→ 85) ≠ Disabled**

Description Shows calibration state of the analog input.

Additional information

Read access	Operator
Write access	-

Damping factor


Navigation Expert → Input/output → Analog IP → Damping factor (14004)

Prerequisite **Operating mode (→ 85) ≠ Disabled**

Description Defines the damping constant (in seconds).

User entry 0 to 999.9 s

Factory setting 0 s

Additional information

Read access	Operator
Write access	Maintenance

Gauge current

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

Prerequisite **Operating mode (→  85) = Gauge power supply**

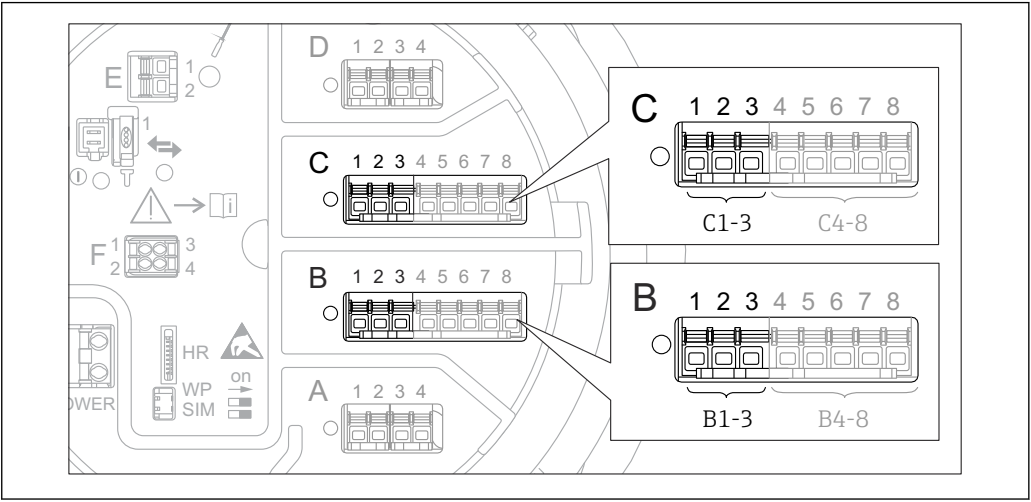
Description Shows the current on the power supply line for the connected device.

Additional information

Read access	Operator
Write access	-

3.2.3 "Analog I/O" submenu

i There is a **Analog I/O** submenu (→ 93) 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 → 84.



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8 Terminals for the "Analog I/O" submenu (→ 93) ("B1-3" or "C1-3", respectively)

Navigation Expert → Input/output → Analog I/O

► Analog I/O

Operating mode	→ 94
Current span	→ 95
Fixed current	→ 96
Analog input source	→ 96
Failure mode	→ 97
Error value	→ 98
Output out of range	→ 98
Error on event	→ 98
Input value	→ 99
0 % value	→ 99
100 % value	→ 99
Input value %	→ 100

Output value	→ 100
Readback value	→ 100
Feedback threshold	→ 101
Process variable	→ 101
Analog input 0% value	→ 101
Analog input 100% value	→ 102
Error event type	→ 102
Process value	→ 102
Input value in mA	→ 103
Input value percent	→ 103
Damping factor	→ 103
Calibration	→ 104
Active calibration	→ 104
Used for SIL/WHG	→ 104

Operating mode

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

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

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

Factory setting Disabled

Read access	Operator
Write access	Maintenance

Meaning of the options

Operating mode (→  94)	Direction of signal	Type of signal
Disabled	-	-
4...20mA input	Input from 1 external device	Analog (4...20mA)
HART master+4...20mA input	Input from 1 external device	■ Analog (4...20mA) ■ HART
HART master	Input from up to 6 external devices	HART
4...20mA output	Output to higher-level unit	Analog (4...20mA)
HART slave +4...20mA output	Output to higher-level unit	■ Analog (4...20mA) ■ HART

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

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



In the active mode the following conditions must be met:

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

Current span**Navigation**

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

Prerequisite

Operating mode parameter (→  94) ≠ **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 (→ 96).				

 In the case of an error, the output current assumes the value defined in the **Failure mode** parameter (→ 97).

Fixed current**Navigation**

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

Prerequisite

Current span (→ 95) = Fixed current

Description

Defines the fixed output current.

User entry

4 to 22.5 mA

Factory setting

4 mA

Additional information

Read access	Operator
Write access	Maintenance

Analog input source**Navigation**

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

Prerequisite

- **Operating mode (→ 94) = 4..20mA output or HART slave +4..20mA output**
- **Current span (→ 95) ≠ 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 ³⁾
- Upper density
- Middle density
- Lower density
- P1 (bottom)
- P2 (middle)
- P3 (top)
- GP 1 ... 4 value
- AIO B1-3 value ³⁾
- AIO B1-3 value mA ³⁾
- AIO C1-3 value ³⁾
- AIO C1-3 value mA ³⁾
- AIP B4-8 value ³⁾
- AIP C4-8 value ³⁾
- Element temperature 1 ... 24 ³⁾
- HART device 1...15 PV ³⁾
- HART device 1 ... 15 PV mA ³⁾
- HART device 1 ... 15 PV % ³⁾
- HART device 1 ... 15 SV ³⁾
- HART device 1 ... 15 TV ³⁾
- HART device 1 ... 15 QV ³⁾

Factory setting

Tank level

Additional information

Read access	Operator
Write access	Maintenance

Failure mode



Navigation

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

Prerequisite

Operating mode (→ 94) = 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.

3) Visibility depends on order options or device settings

Additional information	Read access	Operator
	Write access	Maintenance

Error value

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

Prerequisite **Failure mode (→  97) = Defined value**

Description Defines the output value in case of an error.

User entry 3.4 to 22.6 mA

Factory setting 22 mA

Additional information	Read access	Operator
	Write access	Maintenance

Output out of range

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

Prerequisite **Operating mode (→  94) = 4..20mA output or HART slave +4..20mA output**

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

Selection

- Last valid value
- Alarm
- None

Factory setting Alarm

Additional information	Read access	Operator
	Write access	Maintenance

Error on event

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

Prerequisite **Operating mode (→  94) = 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 (13979)

- Prerequisite**
- Operating mode (→  94) = 4..20mA output or HART slave +4..20mA output
 - Current span (→  95) ≠ 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 (13954)

- Prerequisite**
- Operating mode (→  94) = 4..20mA output or HART slave +4..20mA output
 - Current span (→  95) ≠ 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 (13968)

- Prerequisite**
- Operating mode (→  94) = 4..20mA output or HART slave +4..20mA output
 - Current span (→  95) ≠ Fixed current

Description	Value corresponding to an output current of 100% (20mA).	
User entry	Signed floating-point number	
Factory setting	0 Unitless	
Additional information	Read access	Operator
	Write access	Maintenance

Input value %

Navigation	 Expert → Input/output → Analog I/O → Input value % (13955)	
Prerequisite	▪ Operating mode (→  94) = 4..20mA output or HART slave +4..20mA output ▪ Current span (→  95) ≠ Fixed current	
Description	Shows the output value as a percentage of the complete 4...20mA range.	
Additional information	Read access	Operator
	Write access	-

Output value

Navigation	 Expert → Input/output → Analog I/O → Output value (13969)	
Prerequisite	Operating mode (→  94) = 4..20mA output or HART slave +4..20mA output	
Description	Shows the output value in mA.	
Additional information	Read access	Operator
	Write access	-

Readback value

Navigation	 Expert → Input/output → Analog I/O → Readback value (13957)	
Prerequisite	Operating mode (→  94) = 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. (13956)
Prerequisite**Operating mode (→  94) = 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 (13964)
Prerequisite**Operating mode (→  94) = 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 (13977)
Prerequisite**Operating mode (→  94) = 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 (13965)**Prerequisite****Operating mode (→  94) = 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 (13953)**Prerequisite****Operating mode (→  94) ≠ 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 (13963)**Prerequisite****Operating mode (→  94) = 4..20mA input or HART master+4..20mA input****Description**

Shows the input value scaled to customer units.

Additional information

Read access	Operator
Write access	-

Input value in mA**Navigation**
 Expert → Input/output → Analog I/O → Input val. in mA (13970)
Prerequisite**Operating mode (→  94) = 4..20mA input or HART master+4..20mA input****Description**

Shows the input value in mA.

Additional information

Read access	Operator
Write access	-

Input value percent**Navigation**
 Expert → Input/output → Analog I/O → Input value [%] (13978)
Prerequisite**Operating mode (→  94) = 4..20mA input or HART master+4..20mA input****Description**

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

Additional information

Read access	Operator
Write access	-

Damping factor**Navigation**
 Expert → Input/output → Analog I/O → Damping factor (13951)
Prerequisite**Operating mode (→  94) ≠ Disabled or HART master****Description**

Defines the damping constant (in seconds).

User entry

0 to 999.9 s

Factory setting

0 s

Additional information

Read access	Operator
Write access	Maintenance

Calibration

Navigation

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

Prerequisite

Operating mode (→  94) ≠ Disabled or HART master

Description

Select calibration state of the analog input or output.

- Selection
- User calibration
 - Factory calibration

Factory setting

Factory calibration

Additional information

Read access	Operator
Write access	Maintenance

Active calibration

Navigation

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

Prerequisite

Operating mode (→  94) ≠ Disabled or HART master

Description

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

Additional information

Meaning of the options

- **User calibration**

The calibration entered by the user is active.
- **Factory calibration**

The calibration stored permanently in the device is active.

Read access	Operator
Write access	-

Used for SIL/WHG

Navigation

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

- Prerequisite
- Operating mode (→  94) = 4..20mA output or HART slave +4..20mA output
 - The device has a SIL approval.

Description

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

- Selection
- Enabled
 - Disabled

Factory setting

Disabled

Additional information

Read access	Operator
Write access	Maintenance

Expected SIL/WHG chain

Navigation

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

Prerequisite

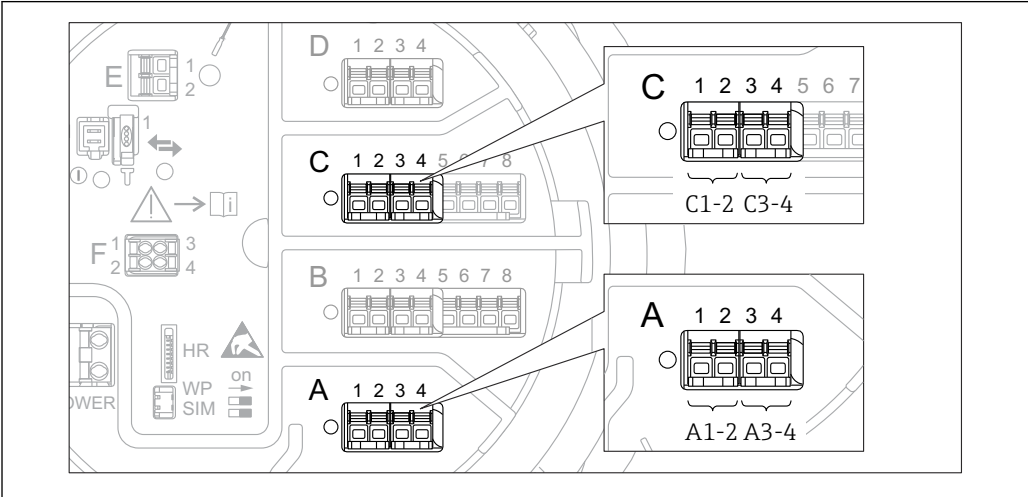
- Operating mode (→  94) = 4..20mA output or HART slave +4..20mA output
- The device has a SIL approval.

Additional information

Read access	Operator
Write access	-

3.2.4 "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.



9 Designation of the digital inputs or outputs (examples)

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

► Digital Xx-x

Operating mode

Digital input source

Input value

Contact type

Output simulation

Output value

Readback value

Error on event

Damping factor

Used for SIL/WHG

→  107

→  107

→  108

→  108

→  109

→  110

→  110

→  110

→  111

→  111

Operating mode



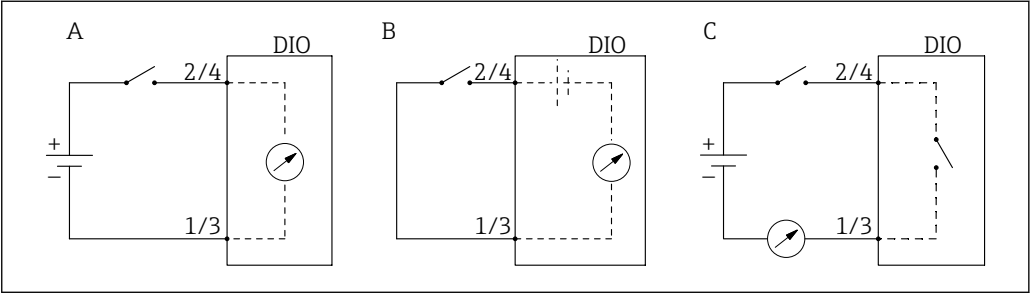
Navigation Expert → Input/output → Digital Xx-x → Operating mode (13911)

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

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

Factory setting Disabled

Additional information



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10 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 (→ 107) = 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**⁴⁾

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** parameter⁵⁾ 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 (→  107) = "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 (→  107) ≠ 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

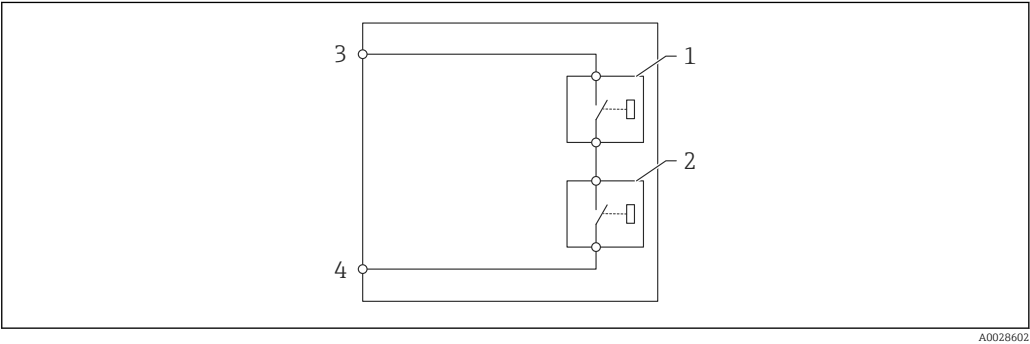
4) Only present if "Operating mode (→  107)" = "Input passive" or "Input active" for the respective Digital I/O module.

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

Output simulation

Navigation	Expert → Input/output → Digital Xx-x → Output sim (13909)				
Prerequisite	Operating mode (→ 107) = 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	<table><tr><td>Read access</td><td>Operator</td></tr><tr><td>Write access</td><td>Maintenance</td></tr></table>	Read access	Operator	Write access	Maintenance
Read access	Operator				
Write access	Maintenance				

The digital output consists of two relays connected in series:



11 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 (→ 📄 107) = 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 (→ 📄 107) = 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 (→ 📄 107) = 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

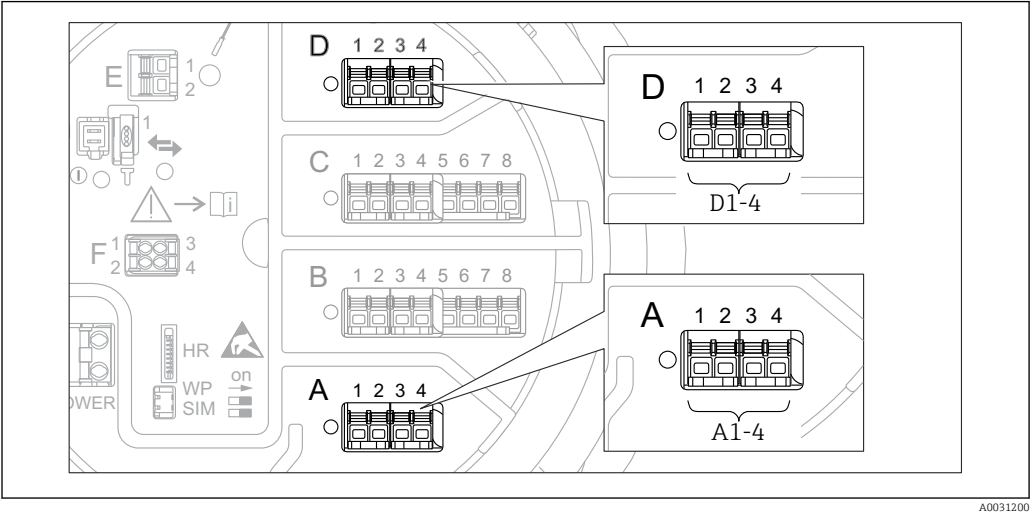
Read access	Operator
Write access	Maintenance

Damping factor		
Navigation	Expert → Input/output → Digital Xx-x → Damping factor (13904)	
Prerequisite	Operating mode (→ 107) ≠ 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 (→ 107) = 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

3.3 "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.



12 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

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

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

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

► Modbus Xx-x

Communication interface protocol

→  113

Modbus value 1 to 4

→  114

Modbus discrete 1 to 4

→  114

► Configuration

→  115

► Integer conversion

→  119

► User value source

→  124

► GP values

→  125

► Discrete selector

→  128

► V1 Xx-x

Communication interface protocol

→  113

► Configuration

→  129

► V1 input selector

→  132

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 (→  113) = 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 (→  113) = MODBUS**

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

Additional information

Read access	Operator
Write access	-

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

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

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

"Configuration" submenu (Modbus)

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

Navigation   Expert → Communication → Modbus Xx-x → Configuration

► Configuration

Baudrate

→  115

Parity

→  116

Modbus address

→  116

Float swap mode

→  116

Invalid data

→  117

Word type

→  117

CRC seed

→  117

Old TSM mode

→  118

Bus termination

→  118

Baudrate

Navigation	  Expert → Communication → Modbus X1-4 → Configuration → Baudrate (13203)	
Prerequisite	Communication interface protocol (→  113) = 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 (→ 113) = 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 (→ 113) = 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 (→ 113) = MODBUS
- Description

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

■ Normal 3-2-1-0

■ Swap 0-1-2-3

■ WW Swap 1-0-3-2

Factory setting Swap 0-1-2-3

Additional information

Read access	Operator
Write access	Maintenance

Invalid data



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

Prerequisite **Communication interface protocol (→ 113) = 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 (→ 113) = 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 (→ 113) = 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 (→  113) = 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 (→  113) = 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

► Integer conversion

Level 0%

→  119

Level 100%

→  120

Temperature 0%

→  120

Temperature 100%

→  120

Pressure 0%

→  121

Pressure 100%

→  121

Density 0%

→  121

Density 100%

→  122

User 0%

→  122

User 100%

→  122

Percent 0%

→  123

Percent 100%

→  123

Level 0%

Navigation	  Expert → Communication → Modbus Xx-x → Integer convers → Level 0% (13214)	
Description	Defines the level that represents 0% on the integer value scale.	
User entry	Signed floating-point number	
Factory setting	0.00 mm	
Additional information	Read access	Operator
	Write access	Maintenance

Level 100%

Navigation

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

Description

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

User entry

Signed floating-point number

Factory setting

30.0 mm

Additional information

Read access	Operator
Write access	Maintenance

Temperature 0%

Navigation

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

Description

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

User entry

Signed floating-point number

Factory setting

273.15 °C

Additional information

Read access	Operator
Write access	Maintenance

Temperature 100%

Navigation

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

Description

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

User entry

Signed floating-point number

Factory setting

273.15 °C

Additional information

Read access	Operator
Write access	Maintenance

Pressure 0%

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

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

User entry Signed floating-point number

Factory setting 0 bar

Additional information

Read access	Operator
Write access	Maintenance

Pressure 100%

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

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

User entry Signed floating-point number

Factory setting 25 000 bar

Additional information

Read access	Operator
Write access	Maintenance

Density 0%

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

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

User entry Signed floating-point number

Factory setting 0 kg/m³

Additional information

Read access	Operator
Write access	Maintenance

Density 100%

Navigation

 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 ⁶⁾
 - 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

6) Visibility depends on order options or device settings

"GP values" submenu

Navigation

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

▶ GP values

GP 1 value 0%

GP 1 value 100%

GP 2 value 0%

GP 2 value 100%

GP 3 value 0%

GP 3 value 100%

GP 4 value 0%

GP 4 value 100%

→ 125

→ 125

→ 126

→ 126

→ 126

→ 127

→ 127

→ 127

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 selector

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

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

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

Factory setting None

Additional information	Read access	Operator
	Write access	Maintenance

"Configuration" submenu (V1)

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

Navigation   Expert → Communication → V1 Xx-x → Configuration

► Configuration

Communication interface protocol variant

→  129

V1 addressV1/MDP

→  129

V1 addressBBB/MIC+232

→  130

Level mapping

→  130

Line impedance

→  131

Compatibility mode

→  131

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 (→  129) = 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 (→  129)

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 (→

113

) = 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 (→ 113) = V1

Description Adjusts the impedance of the communication line.

User entry 0 to 15

Factory setting 15

Additional information

Read access	Operator
Write access	Maintenance

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

Compatibility mode



Navigation Expert → Communication → Modbus Xx-x / V1 Xx-x → Configuration → Comp. mode (13281)

Description Defines the compatibility mode.

Selection

- Nxx5xx
- Nxx8x

Factory setting Nxx8x

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

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

Read access	Operator
Write access	Maintenance

"V1 input selector" submenu (V1)

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

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

► V1 input selector

User value 1 to 8 source

→  132

Alarm 1 input source

→  133

Alarm 2 input source

→  133

Alarm 3 input source

→  134

Alarm 4 input source

→  134

SP 1 value selector

→  135

SP 2 value selector

→  135

SP 3 value selector

→  136

SP 4 value selector

→  136

Value percent selector

→  137

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 density⁷⁾
 - Vapor density
 - Manual density
 - P1 position
 - P3 position
 - GP 1...4 value

7) Visibility depends on order options or device settings

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

Factory setting

None

Additional information

Read access	Operator
Write access	Maintenance

Alarm 1 input source**Navigation**

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

Description

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

Selection

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

Factory setting

None

Additional information

Read access	Operator
Write access	Maintenance

Alarm 2 input source**Navigation**

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

Description

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

Selection

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

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

Factory setting None

Additional information	Read access	Operator
	Write access	Maintenance

Alarm 3 input source

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

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

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

Factory setting None

Additional information	Read access	Operator
	Write access	Maintenance

Alarm 4 input source

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

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

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

Factory setting None

Additional information

Read access	Operator
Write access	Maintenance

SP 1 value selector**Navigation**

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

Description

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

Selection

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

Factory setting

None

Additional information

Read access	Operator
Write access	Maintenance

SP 2 value selector**Navigation**

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

Description

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

Selection

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

Factory setting

None

Additional information

Read access	Operator
Write access	Maintenance

* Visibility depends on order options or device settings

SP 3 value selector



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

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

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

Factory setting None

Additional information

Read access	Operator
Write access	Maintenance

SP 4 value selector



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

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

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

Factory setting None

Additional information

Read access	Operator
Write access	Maintenance

* Visibility depends on order options or device settings

Value percent selector



Navigation	Expert → Communication → V1 → V1 input select. → Value % select (13282)	
Description	Selects which value shall be transmitted as a 0..100% value in the V1 Z0/Z1 message.	
Selection	■ None ■ Tank level % ■ Tank ullage % ■ AIO B1-3 value % * ■ AIO C1-3 value % *	
Factory setting	None	
Additional information	Read access	Operator
	Write access	Maintenance

* Visibility depends on order options or device settings

3.3.2 "HART output" submenu

Navigation  Expert → Communication → HART output

▶ HART output	
▶ HART configuration	→  139
▶ Information	→  147

"HART configuration" submenu

Navigation

 Expert → Communication → HART output → HART config.

► HART configuration

System polling address

→  139

No. of preambles

→  140

PV source

→  140

Assign PV

→  140

0 % value

→  141

100 % value

→  142

PV mA selector

→  142

Primary variable (PV)

→  142

Percent of range

→  143

Assign SV

→  143

Secondary variable (SV)

→  144

Assign TV

→  144

Tertiary variable (TV)

→  145

Assign QV

→  145

Quaternary variable (QV)

→  146

System polling address

Navigation	  Expert → Communication → HART output → HART config. → Polling address (0219)
Description	Device address for HART communication.
User entry	0 to 63
Factory setting	15

Additional information	Read access	Operator
	Write access	Maintenance

No. of preambles

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

Description Defines the number of preambles in the HART telegram.

User entry 5 to 20

Factory setting 5

Additional information	Read access	Operator
	Write access	Maintenance

PV source

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

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

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

Factory setting Custom

Additional information	Read access	Maintenance
	Write access	Maintenance

Assign PV

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

Prerequisite PV source (→  140) = Custom

Description Assign a measured variable to the primary dynamic variable (PV).
Additional information:
The assigned measured variable is also used by the current output.

* Visibility depends on order options or device settings

Selection

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

Factory setting

Tank level

Additional information

Read access	Operator
Write access	Maintenance

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

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

0% value of the primary variable (PV).

User entry

Signed floating-point number

Factory setting

0 mm

Additional information

Read access	Operator
Write access	Maintenance

100 % value



Navigation	Expert → Communication → HART output → HART config. → 100 % value (11633)	
Prerequisite	PV source = Custom	
Description	100% value of the primary variable (PV).	
User entry	Signed floating-point number	
Factory setting	0 mm	
Additional information	Read access	Operator
	Write access	Maintenance

PV mA selector



Navigation	Expert → Communication → HART output → HART config. → PV mA selector (11631)	
Prerequisite	PV source = Custom	
Description	Assigns a current to the primary HART variable (PV).	
Selection	■ None ■ AIO B1-3 value mA * ■ AIO C1-3 value mA *	
Factory setting	None	
Additional information	Read access	Operator
	Write access	Maintenance

Primary variable (PV)

Navigation	Expert → Communication → HART output → HART config. → Primary var (PV) (0201)	
Description	Shows the value of the primary HART variable (PV).	
Additional information	Read access	Operator
	Write access	-

* Visibility depends on order options or device settings

Percent of range

Navigation

 Expert → Communication → HART output → HART config. → Percent of range (0274)

Description

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

Additional information

Read access	Operator
Write access	-

Assign SV

**Navigation**

 Expert → Communication → HART output → HART config. → Assign SV (0235)

Description

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

Selection

- 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) (0226)

Prerequisite

Assign SV (→ 143) ≠ None

Description

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

Additional information

Read access	Operator
Write access	-

Assign TV

Navigation

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

Description

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

Selection

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

Factory setting

Water level

Additional information

Read access	Operator
Write access	Maintenance

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

Tertiary variable (TV)

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

Prerequisite **Assign TV (→  144) ≠ None**

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

Additional information

Read access	Operator
Write access	-

Assign QV



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

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

Selection

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

Factory setting Observed density value

Additional information

Read access	Operator
Write access	Maintenance

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

Quaternary variable (QV)

Navigation

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

Prerequisite

Assign QV (→  145) ≠ None

Description

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

Additional information

Read access	Operator
Write access	-

"Information" submenu

Navigation

 Expert → Communication → HART output → Information

► Information

HART short tag

→  147

Device tag

→  148

Device revision

→  148

Device ID

→  148

Device type

→  149

Manufacturer ID

→  149

HART revision

→  149

HART descriptor

→  150

HART message

→  150

Hardware revision

→  150

Software revision

→  151

HART date code

→  151

HART short tag

Navigation

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

Description

Defines the short tag for the measuring point.

Maximum length: 8 characters
Allowed characters: A-Z, 0-9, certain special characters

User entry

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

Factory setting

NRF8x

Additional information

Read access	Operator
Write access	Maintenance

Device tag

Navigation

 Expert → Communication → HART output → Information → Device tag (0215)

Description

Enter a unique name for the measuring point to identify the device quickly within the plant.

User entry

Character string comprising numbers, letters and special characters (32)

Factory setting

NRF8x

Additional information

Read access	Operator
Write access	Maintenance

Device revision

Navigation

 Expert → Communication → HART output → Information → Device revision (0204)

Description

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

User interface

0 to 255

Factory setting

5

Additional information

Read access	Operator
Write access	-

Device ID

Navigation

 Expert → Communication → HART output → Information → Device ID (0221)

Description

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

User interface

Positive integer

Factory setting

123 456

Additional information

Read access	Operator
Write access	-

Device type

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

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

User interface 0 to 65 535

Factory setting 4 399

Additional information

Read access	Operator
Write access	-

Manufacturer ID

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

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

User interface 0 to 65 535

Factory setting 17

Additional information

Read access	Operator
Write access	-

HART revision

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

Description HART revision used by the device.

User interface 5 to 7

Factory setting 7

Additional information

Read access	Operator
Write access	-

HART descriptor

NavigationExpert → Communication → HART output → Information → HART descriptor (0212)

DescriptionEnter description for the measuring point

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

Factory settingNRF8x

Additional information

Read access	Operator
Write access	Maintenance

HART message

NavigationExpert → Communication → HART output → Information → HART message (0216)

Description

Use this function to define a HART message which is sent via the HART protocol when requested by the master.

Maximum length: 32 characters

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

User entryCharacter string comprising numbers, letters and special characters (32)

Factory settingNRF8x

Additional information

Read access	Operator
Write access	Maintenance

Hardware revision

NavigationExpert → Communication → HART output → Information → Hardware rev. (0206)

DescriptionHardware revision of the device.

User interface0 to 30

Factory setting1

Additional information

Read access	Operator
Write access	-

Software revision

Navigation	 Expert → Communication → HART output → Information → Software rev. (0224)	
Description	Software revision of the device.	
User interface	0 to 255	
Factory setting	5	
Additional information	Read access	Operator
	Write access	-

HART date code



Navigation	 Expert → Communication → HART output → Information → HART date code (0202)	
Description	Enter date of the last configuration change. Use this format yyyy-mm-dd	
User entry	Character string comprising numbers, letters and special characters (10)	
Factory setting	2009-07-20	
Additional information	Read access	Operator
	Write access	Maintenance

3.4 "Application" submenu

Navigation  Expert → Application

▶ Application		
▶ Tank configuration	→ 	152
▶ Tank calculation	→ 	175
▶ Alarm	→ 	202

3.4.1 "Tank configuration" submenu

Navigation  Expert → Application → Tank config

Tank configuration		
▶ Level	→ 	153
▶ Temperature	→ 	157
▶ Density	→ 	161
▶ Pressure	→ 	165
▶ GP values	→ 	173

"Level" submenu

Navigation   Expert → Application → Tank config → Level

► Level		
Level source	→ 	153
Operation mode	→ 	154
Tank reference height	→ 	154
Tank level	→ 	154
Upper interface level	→ 	155
Lower interface level	→ 	155
Water level source	→ 	155
Water level	→ 	155
Manual water level	→ 	156

Level source



Navigation   Expert → Application → Tank config → Level → Level source (14601)

Description Defines the source of the level value.

- Selection
- No input value
 - HART device 1 ... 15 level
 - Level SR *
 - Level *
 - Displacer position *
 - AIO B1-3 value *
 - AIO C1-3 value *
 - AIP B4-8 value *
 - AIP C4-8 value *

Factory setting Dependent on the device version

Additional information

Read access	Operator
Write access	Maintenance

* Visibility depends on order options or device settings

Operation mode

Navigation

 Expert → Application → Tank config → Level → Operation mode (14656)

Description

Selection of normal or HTG mode for level measurement . In the HTG mode, the level is calculated using a pressure device.

Selection

■ Normal

■ HTG *

Factory setting

Normal

Additional information

Read access	Operator
Write access	Maintenance

Tank reference height

Navigation

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

Description

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

User entry

0 to 10 000.00 mm

Factory setting

Dependent on the device version

Additional information

Read access	Operator
Write access	Maintenance

Tank level

Navigation

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

Description

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

Additional information

Read access	Operator
Write access	-

* Visibility depends on order options or device settings

Upper interface level

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

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

Additional information

Read access	Maintenance
Write access	-

Lower interface level

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

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

Additional information

Read access	Maintenance
Write access	-

Water level source



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

Description Defines the source of the bottom water level.

Selection

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

Factory setting Manual value

Additional information

Read access	Operator
Write access	Maintenance

Water level

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

Description Shows the bottom water level.

Additional information	Read access	Operator
	Write access	-

Manual water level

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

Prerequisite **Water level source (→  155) = 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

"Temperature" submenu

Navigation  Expert → Application → Tank config → Temperature

► Temperature		
Liquid temp source	→ 	157
Manual liquid temperature	→ 	158
Liquid temperature	→ 	158
Air temperature source	→ 	158
Manual air temperature	→ 	159
Air temperature	→ 	159
Vapor temp source	→ 	159
Manual vapor temperature	→ 	160
Vapor temperature	→ 	160

Liquid temp source



Navigation	 Expert → Application → Tank config → Temperature → Liq temp source (14972)	
Description	Defines source from which the liquid temperature is obtained.	
Selection	■ Manual value ■ HART device 1 ... 15 temperature ■ AIO B1-3 value ■ AIO C1-3 value ■ AIP B4-8 value ■ AIP C4-8 value	
Factory setting	Manual value	
Additional information	Read access	Operator
	Write access	Maintenance

Manual liquid temperature



- Navigation**  Expert → Application → Tank config → Temperature → Man. liquid temp (15015)
- Prerequisite** **Liquid temp source (→  157) = 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. (14978)
- 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 (14993)
- 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. (14961)

Prerequisite **Air temperature source (→ 158) = 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. (14986)

Description Shows the air temperature.

Additional information

Read access	Operator
Write access	-

Vapor temp source



Navigation Expert → Application → Tank config → Temperature → Vapor temp src (14973)

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

Selection

- 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. (14960)
- Prerequisite** Vapor temp source (→  159) = Manual value
- Description** Defines the manual value of the vapor temperature.
- User entry** -50 to 300 °C
- Factory setting** 25 °C

Additional information

Read access	Operator
Write access	Maintenance

Vapor temperature

- Navigation**  Expert → Application → Tank config → Temperature → Vapor temp. (14985)
- Description** Shows the measured vapor temperature.

Additional information

Read access	Operator
Write access	-

"Density" submenu

Navigation   Expert → Application → Tank config → Density

► Density		
Observed density source	→	 161
Observed density	→	 162
Air density	→	 162
Vapor density	→	 162
Upper density input source	→	 162
Manual upper density	→	 163
Measured upper density	→	 164
Measured middle density	→	 164
Measured lower density	→	 164
Water density	→	 164

Observed density source

Navigation   Expert → Application → Tank config → Density → Density source (13454)

Description Determines how the density is obtained.

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

Factory setting Dependent on the device version

Additional information

Read access	Operator
Write access	Maintenance

* Visibility depends on order options or device settings

Observed density

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

Description Shows the measured or calculated density.

Additional information

Read access	Operator
Write access	-

Air density



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

Description Defines the density of the air surrounding the tank.

User 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 (14981)

Description Defines the density of the gas phase in the tank.

User entry 0.0 to 500.0 kg/m³

Factory setting 1.2 kg/m³

Additional information

Read access	Operator
Write access	Maintenance

Upper density input source



Navigation  Expert → Application → Tank config → Density → UpDensity source (15006)

Description Defines the input source for the upper density value.

Selection

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

Factory setting

Manual value

Additional information

Read access	Operator
Write access	Maintenance

Manual upper density**Navigation**

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

Prerequisite**Upper density input source (→ 162) = Manual value****Description**

Defines the manual upper density of the medium.

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

Read access	Operator
Write access	Maintenance

* Visibility depends on order options or device settings

Measured upper density

Navigation	 Expert → Application → Tank config → Density → Meas upper dens. (15001)	
Description	Shows the density of the upper phase.	
Additional information	Read access	Operator
	Write access	-

Measured middle density

Navigation	 Expert → Application → Tank config → Density → Meas middle dens (14997)	
Description	Density of the middle phase.	
Additional information	Read access	Operator
	Write access	-

Measured lower density

Navigation	 Expert → Application → Tank config → Density → Meas lower dens. (15002)	
Description	Density of the lower phase.	
Additional information	Read access	Maintenance
	Write access	-

Water density

Navigation	 Expert → Application → Tank config → Density → Water density (13757)	
Description	Density of the water in the tank.	
User entry	Signed floating-point number	
Factory setting	1 000 kg/m³	
Additional information	Read access	Operator
	Write access	Maintenance

"Pressure" submenu

Navigation   Expert → Application → Tank config → Pressure

► Pressure		
P1 (bottom) source	→	 166
P1 (bottom)	→	 166
P1 (bottom) manual pressure	→	 166
P1 position	→	 167
P1 offset	→	 167
P1 absolute / gauge	→	 167
P2 (middle) source	→	 168
P2 (middle)	→	 168
P2 (middle) manual pressure	→	 168
P2 offset	→	 169
P1-2 distance	→	 169
P2 absolute / gauge	→	 169
P3 (top) source	→	 170
P3 (top)	→	 170
P3 (top) manual pressure	→	 170
P3 position	→	 171
P3 offset	→	 171
P3 absolute / gauge	→	 171
Ambient pressure	→	 172

P1 (bottom) source



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

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

Selection

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

Factory setting Manual value

Additional information

Read access	Operator
Write access	Maintenance

P1 (bottom)

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

Description Shows the pressure at the tank bottom.

Additional information

Read access	Operator
Write access	-

P1 (bottom) manual pressure



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

Prerequisite **P1 (bottom) source** (→  166) = **Manual value**

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

User entry -25 to 25 bar

Factory setting 0 bar

Additional information

Read access	Operator
Write access	Maintenance

P1 position**Navigation** Expert → Application → Tank config → Pressure → P1 position (14952)**Description**

Defines the position of the bottom pressure transmitter (P1), measured from zero position (tank bottom or datum plate).

User entry

-10 000 to 100 000 mm

Factory setting

5 000 mm

Additional information

Read access	Operator
Write access	Maintenance

P1 offset**Navigation** Expert → Application → Tank config → Pressure → P1 offset (14953)**Description**

Offset for the bottom pressure (P1).

The offset is added to the measured pressure prior to any tank calculation.

User entry

-25 to 25 bar

Factory setting

0 bar

Additional information

Read access	Operator
Write access	Maintenance

P1 absolute / gauge**Navigation** Expert → Application → Tank config → Pressure → P1 absolut/gauge (14954)**Description**

Defines whether the connected pressure transmitter measures an absolute or a gauge pressure.

Selection

- Absolute
- Gauge

Factory setting

Gauge

Additional information

Read access	Operator
Write access	Maintenance

P2 (middle) source



Navigation  Expert → Application → Tank config → Pressure → P2 (mid) source (14995)

Description Defines the source of the middle pressure (P2).

Selection

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

Factory setting Manual value

Additional information

Read access	Operator
Write access	Maintenance

P2 (middle)

Navigation  Expert → Application → Tank config → Pressure → P2 (middle) (14987)

Description Shows the pressure (P2) at the middle transmitter.

Additional information

Read access	Operator
Write access	-

P2 (middle) manual pressure



Navigation  Expert → Application → Tank config → Pressure → P2 (mid) manual (14955)

Prerequisite **P2 (middle) source (→  168) = Manual value**

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

User entry -25 to 25 bar

Factory setting 0 bar

Additional information

Read access	Operator
Write access	Maintenance

P2 offset

Navigation  Expert → Application → Tank config → Pressure → P2 offset (14975)

Description Defines the offset for the middle pressure (P2).
The offset is added to the measured pressure prior to any tank calculation.

User entry -25 to 2.5 bar

Factory setting 0 bar

Additional information

Read access	Operator
Write access	Maintenance

P1-2 distance

Navigation  Expert → Application → Tank config → Pressure → P1-2 distance (14974)

Description Defines the distance between the bottom and the middle pressure transmitter.

User entry 0 to 100 000 mm

Factory setting 2 000 mm

Additional information

Read access	Operator
Write access	Maintenance

P2 absolute / gauge

Navigation  Expert → Application → Tank config → Pressure → P2 absolut/gauge (14976)

Description Defines whether the connected pressure transmitter measures an absolute or a gauge pressure.

Selection

- Absolute
- Gauge

Factory setting Gauge

Additional information

Read access	Operator
Write access	Maintenance

P3 (top) source



Navigation  Expert → Application → Tank config → Pressure → P3 (top) source (14996)

Description Defines the source of the top pressure (P3).

Selection

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

Factory setting Manual value

Additional information

Read access	Operator
Write access	Maintenance

P3 (top)

Navigation  Expert → Application → Tank config → Pressure → P3 (top) (14988)

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

Additional information

Read access	Operator
Write access	-

P3 (top) manual pressure



Navigation  Expert → Application → Tank config → Pressure → P3 (top) manual (14977)

Prerequisite **P3 (top) source (→  170) = Manual value**

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

User entry -2.5 to 2.5 bar

Factory setting 0 bar

Additional information

Read access	Operator
Write access	Maintenance

P3 position

Navigation	  Expert → Application → Tank config → Pressure → P3 position (14956)
Description	Defines the position of the top pressure transmitter (P3), measured from zero position (tank bottom or datum plate).
User entry	0 to 100 000 mm
Factory setting	20 000 mm

Additional information

Read access	Operator
Write access	Maintenance

P3 offset

Navigation	  Expert → Application → Tank config → Pressure → P3 offset (14957)
Description	Offset for the top pressure (P3). The offset is added to the measured pressure prior to any tank calculation.
User entry	-2.5 to 2.5 bar
Factory setting	0 bar

Additional information

Read access	Operator
Write access	Maintenance

P3 absolute / gauge

Navigation	  Expert → Application → Tank config → Pressure → P3 absolut/gauge (14958)
Description	Defines whether the connected pressure transmitter measures an absolute or a gauge pressure.
Selection	■ Absolute ■ Gauge
Factory setting	Gauge

Additional information

Read access	Operator
Write access	Maintenance

Ambient pressure



Navigation Expert → Application → Tank config → Pressure → Ambient pressure (14962)

Description Defines the manual value of the ambient pressure.

User entry 0 to 2.5 bar

Factory setting 1 bar

Additional information

Read access	Operator
Write access	Maintenance

"GP values" submenu

Navigation  Expert → Application → Tank config → GP values

▶ GP values

GP 1 to 4 source

GP 1 to 4 name

GP Value 1

GP Value 2

GP Value 3

GP Value 4

→  173

→  174

→  174

→  174

→  174

→  175

GP 1 to 4 source

Navigation  Expert → Application → Tank config → GP values → GP 1 to 4 source (14989–1 to 4)

Description Source of the general purpose value 1 GP1.

- Selection
- No input value
 - SM R distance
 - Average profile density
 - Net weight
 - AIO B1-3 value
 - AIO C1-3 value
 - AIP B4-8 value
 - AIP C4-8 value
 - HART device 1...15 PV
 - HART device 1...15 SV
 - HART device 1...15 TV
 - HART device 1...15 QV
 - Modbus A1-4 Value 1...4
 - Modbus B1-4 Value 1...4
 - Modbus C1-4 Value 1...4
 - Modbus D1-4 Value 1...4

Factory setting No input value

Additional information	Read access	Operator
	Write access	Maintenance

GP 1 to 4 name

Navigation  Expert → Application → Tank config → GP values → GP 1 name (14963)

Description Defines the label associated with the respective GP value.

User entry Character string comprising numbers, letters and special characters (15)

Factory setting GP Value 1

Additional information	Read access	Operator
	Write access	Maintenance

GP Value 1

Navigation  Expert → Application → Tank config → GP values → GP Value 1 (14966)

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

Additional information	Read access	Operator
	Write access	-

GP Value 2

Navigation  Expert → Application → Tank config → GP values → GP Value 2 (14967)

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

Additional information	Read access	Operator
	Write access	-

GP Value 3

Navigation  Expert → Application → Tank config → GP values → GP Value 3 (14968)

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

Additional information	Read access	Operator
	Write access	-

GP Value 4

Navigation	  Expert → Application → Tank config → GP values → GP Value 4 (14969)				
Description	Displays the value that will be used as general purpose value.				
Additional information	<table><tr><td>Read access</td><td>Operator</td></tr><tr><td>Write access</td><td>-</td></tr></table>	Read access	Operator	Write access	-
Read access	Operator				
Write access	-				

3.4.2 "Tank calculation" submenu

Navigation   Expert → Application → Tank calculation

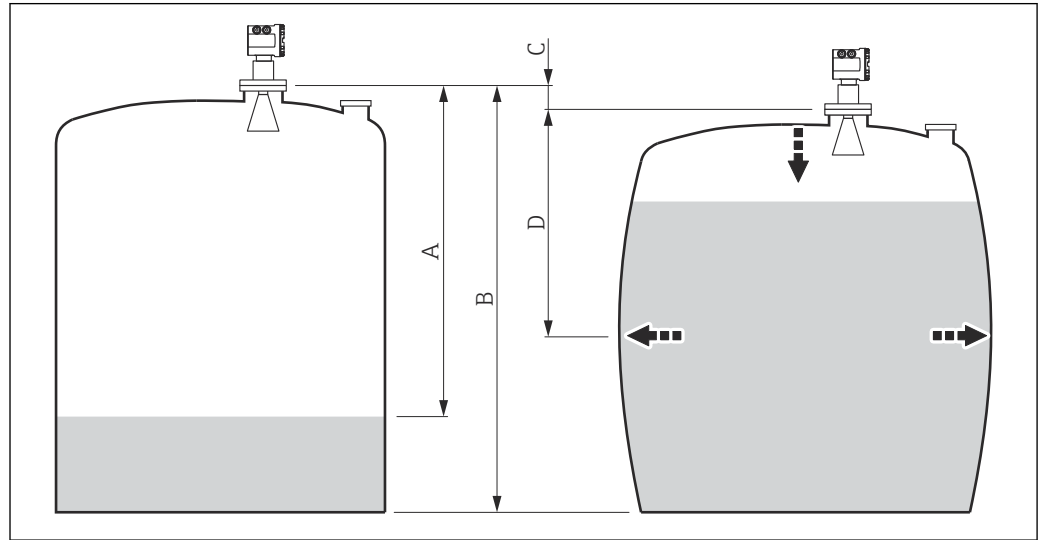
▶ Tank calculation		
Local gravity	→ 	175
▶ HyTD	→ 	178
▶ CTSh	→ 	183
▶ HTG	→ 	192
▶ HTMS	→ 	198

Local gravity

Navigation	  Expert → Application → Tank calculation → Local gravity (14979)
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.



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 13 Correction of the hydrostatic tank deformation (HyTD)

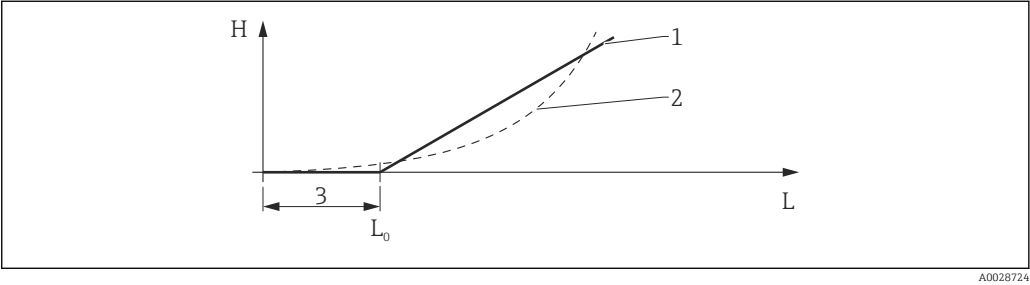
- A "Distance" (level below $L_0 \rightarrow$ "HyTD correction value" = 0)
- B Gauge Reference Height (GRH)
- C HyTD correction value
- D "Distance" (level above $L_0 \rightarrow$ "HyTD correction value" > 0)



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

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.



14 Calculation of the HyTD correction

- 1 Linear correction according to "Deformation factor (→ 179)"
- 2 Real correction
- 3 Starting level (→ 178)
- L Measured level
- H HyTD correction value (→ 178)

Calculation of the HyTD correction

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

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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

HyTD correction value

→  178

HyTD mode

→  178

Starting level

→  178

Deformation factor

→  179

HyTD correction value

Navigation  Expert → Application → Tank calculation → HyTD → HyTD corr. value (13603)

Description Shows the correction value from the Hydrostatic Tank Deformation.

Additional information

Read access	Operator
Write access	-

HyTD mode

Navigation  Expert → Application → Tank calculation → HyTD → HyTD mode (14652)

Description Activates or deactivates the calculation of the Hydrostatic Tank Deformation.

Selection

- No
- Yes

Factory setting No

Additional information

Read access	Operator
Write access	Maintenance

Starting level

Navigation  Expert → Application → Tank calculation → HyTD → Starting level (13601)

Description Defines the starting level for the Hydrostatic Tank Deformation. Levels below this value are not corrected.

User entry 0 to 5 000 mm

Factory setting 500 mm

Additional information	Read access	Operator
	Write access	Maintenance

Deformation factor	
---------------------------	---

Navigation	  Expert → Application → Tank calculation → HyTD → Deform factor (13602)
Description	Defines the deformation factor for the HyTD (change of device position per change of level).
User entry	-1.0 to 1.0 %
Factory setting	0.2 %
Additional information	Read access Operator
	Write access Maintenance

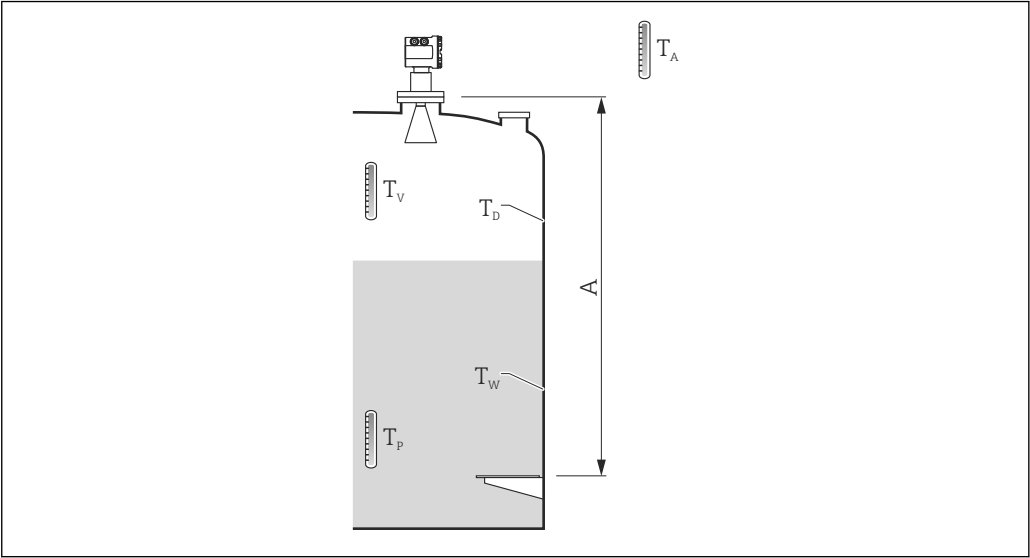
"CTSh" submenu

Overview

CTSh (correction for the thermal expansion of the tank shell) compensates for effects on the Gauge Reference Height (GRH) and on the expansion or contraction of the measuring wire due to temperature effects on the tank shell or stilling well. The temperature effects are separated into two parts, respectively affecting the 'dry' and 'wetted' part of the tank shell or stilling well. The correction function is based on thermal expansion coefficients of steel and insulation factors for both the 'dry' and 'wet' parts of the wire and the tank shell. The temperatures used for the correction can be selected from on manual or measured values.

-  This correction is recommended for the following situations:
 - if the operating temperature deviates considerably from the temperature during calibration ($\Delta T > 10\text{ °C}$ (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



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15 Parameters for the CTSh calculation

A Gauge Reference Height (GRH)

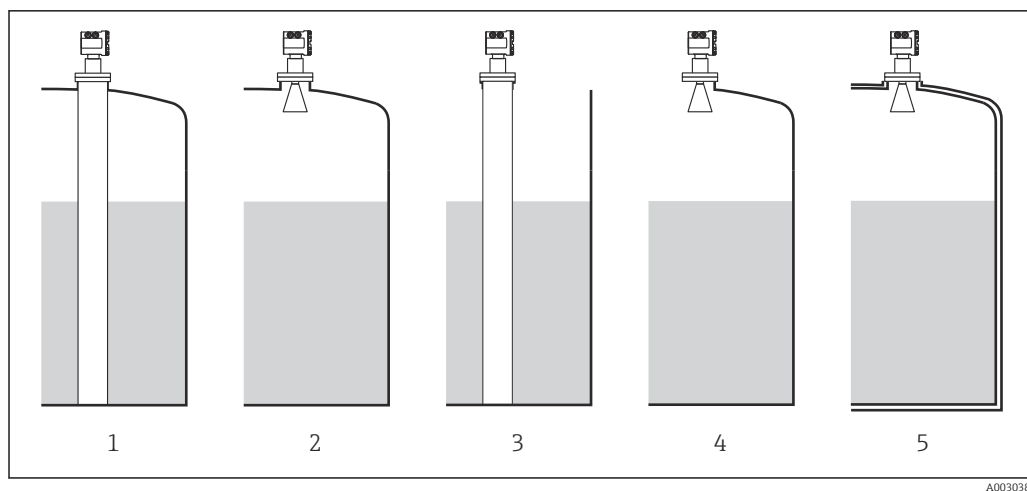
T _W	Temperature of the wetted part of the tank shell
T _D	Temperature of the dry part of the tank shell
T _P	Product temperature
T _V	Vapor temperature (in the tank)
T _A	Ambient temperature (atmosphere surrounding the tank)

CTSh: Calculation of the wall temperature

Depending on the parameters **Covered tank** (→ 184) and **Stilling well** (→ 184), the temperatures T_W of the wetted and T_D of the dry part of the tank wall are calculated as follows:

Covered tank (→ 184)	Stilling well (→ 184)	T _W	T _D
Covered	Yes ¹⁾	T _P	T _V
	No	(7/8) T _P + (1/8) T _A	(1/2) T _V + (1/2) T _A
Open top	Yes	T _P	T _A
	No	(7/8) T _P + (1/8) T _A	T _A

1) This option is also valid for insulated tanks without a stilling well. This is due to the temperature inside and outside of the tank shell being the same due to the insulation of the tank.



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- 1 Covered tank (→ 184) = Covered; Stilling well (→ 184) = Yes
- 2 Covered tank (→ 184) = Covered; Stilling well (→ 184) = No
- 3 Covered tank (→ 184) = Open top; Stilling well (→ 184) = Yes
- 4 Covered tank (→ 184) = Open top; Stilling well (→ 184) = No
- 5 Insulated tank: Covered tank (→ 184) = Open top; Stilling well (→ 184) = 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	→	 183
CTSh mode	→	 184
Covered tank	→	 184
Stilling well	→	 184
Calibration temperature	→	 185
Linear expansion coefficient	→	 185

CTSh correction value

Navigation	 Expert → Application → Tank calculation → CTSh → CTSh corr value (13651)	
Description	Shows the CTSh correction value.	
Additional information	Read access	Operator
	Write access	-

CTSh mode

Navigation

 Expert → Application → Tank calculation → CTSh → CTSh mode (14651)

Description

Activates or deactivates the CTSh.

- Selection
- No
 - Yes
 - With wire *
 - Only wire *

Factory setting

No

Additional information

Read access	Operator
Write access	Maintenance

Covered tank

Navigation

 Expert → Application → Tank calculation → CTSh → Covered tank (13654)

Description

Determines whether the tank is covered.

- Selection
- Open top
 - Covered

Factory setting

Open top

Additional information

Read access	Operator
Write access	Maintenance

 The **Covered** option is only valid for fixed tank roofs. For a floating roof select **Open top**.

Stilling well

Navigation

 Expert → Application → Tank calculation → CTSh → Stilling well (13653)

Description

Determines whether the device is mounted on a stilling well.

- Selection
- No
 - Yes

Factory setting

No

* Visibility depends on order options or device settings

Additional information

Read access	Operator
Write access	Maintenance

Calibration temperature**Navigation**

Expert → Application → Tank calculation → CTSh → Calibration temp (13652)

Description

Specify temperature at which the measurement has been calibrated.

User entry

–50 to 250 °C

Factory setting

25 °C

Additional information

Read access	Operator
Write access	Maintenance

Linear expansion coefficient**Navigation**

Expert → Application → Tank calculation → CTSh → Linear exp coeff (13655)

Description

Defines the linear expansion coefficient of the tank shell material.

User entry

0 to 100 ppm

Factory setting

15 ppm

Additional information

Read access	Operator
Write access	Maintenance

Wire expansion coefficient**Navigation**

Expert → Application → Tank calculation → CTSh → Wire exp coeff (13656)

Description

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

User entry

0 to 100 ppm

Factory setting

15 ppm

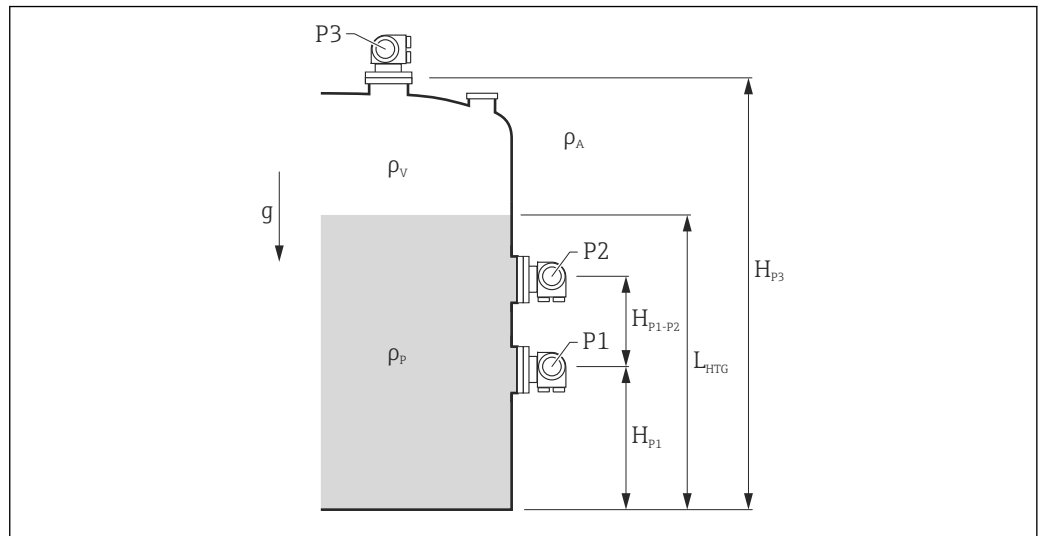
"HTG" submenu*Overview*

Hydrostatic Tank Gauging (HTG) is a method to calculate the level and the density of the product inside a tank using pressure measurements only. The pressure is measured at different heights of the tank using one, two or three pressure sensors. With these data either the density or the level of the product (or both) can be calculated.

HTG modes

Four HTG modes can be selected in the **HTG mode** parameter (→  193). They determine which variables are measured and which are calculated. Depending on the selected mode a number of additional parameters are required for the calculation.

HTG mode (→  193)	Measured variables	Required additional parameters	Calculated variables
P1 only	P1	■ ρ_P ■ g ■ H_{P1}	L_{HTG}
P1 + P3	■ P1 ■ P3	■ ρ_P ■ ρ_V ■ ρ_A ■ g ■ H_{P1} ■ H_{P3}	L_{HTG} (more precise calculation for pressurized tanks)
P1 + P2	■ P1 ■ P2	■ ρ_A ■ g ■ H_{P1} ■ H_{P1-P2}	■ ρ_P ■ L_{HTG}
P1 + P2 + P3	■ P1 ■ P2 ■ P3	■ ρ_V ■ ρ_A ■ g ■ H_{P1} ■ H_{P1-P2} ■ H_{P3}	■ ρ_P ■ L_{HTG} (more precise calculation for pressurized tanks)

HTG parameters

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16 HTG parameters

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
P2 (Middle pressure)	Setup → Advanced setup → Tank configuration → Pressure → P2 (middle)
H _{p1-p2} (Distance between P1 and P2 transmitters)	Setup → Advanced setup → Tank configuration → Pressure → P1-2 distance
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⁾)	■ Read-only: Setup → Advanced setup → Calculation → HTG → Density value ■ Writable: Setup → Advanced setup → Calculation → HTG → Manual upper density
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 _{HTG} (Calculated level)	Setup → Advanced setup → Calculation → HTG → Tank level

1) Depending on the **HTG mode** parameter (→ 193) this is a writable or a read-only parameter.

HTG evaluation: dependence on measured level

To calculate the level or density by HTG with the required accuracy, P1 and P2 have to be covered by a certain product level. To avoid a measurement with an insufficient accuracy, the calculation will stop before the level reaches the position of the pressure sensor.

Two parameters are defined for this purpose:

■ **Minimum level**

This parameter defines the position below which no level is accepted. If the calculation leads to **Tank level** < **Minimum level**, the value of **Minimum level** will be displayed instead of the calculated value.

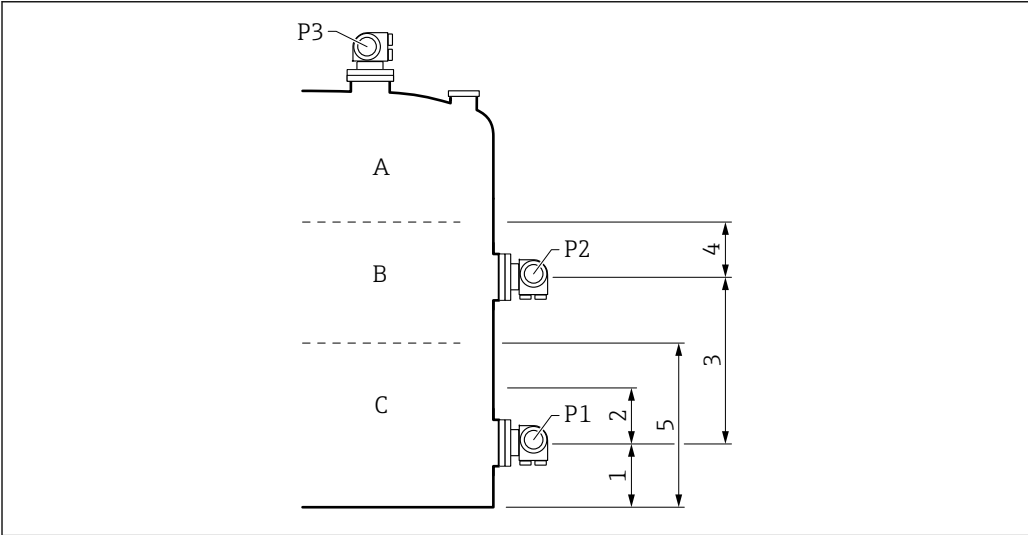
■ **Safety distance**

This parameter defines the minimum amount of product which must be present above the pressure sensor P1 or P2 for the level or density calculation to take place.



- The device always uses the bigger of these two values as the switch-over point for the level calculation.
- If **HTG mode** (→ ⓘ 193) is set to **P1 only** or **P1 + P3**, the density is not calculated and the **Manual upper density** parameter (→ ⓘ 163) is used instead.

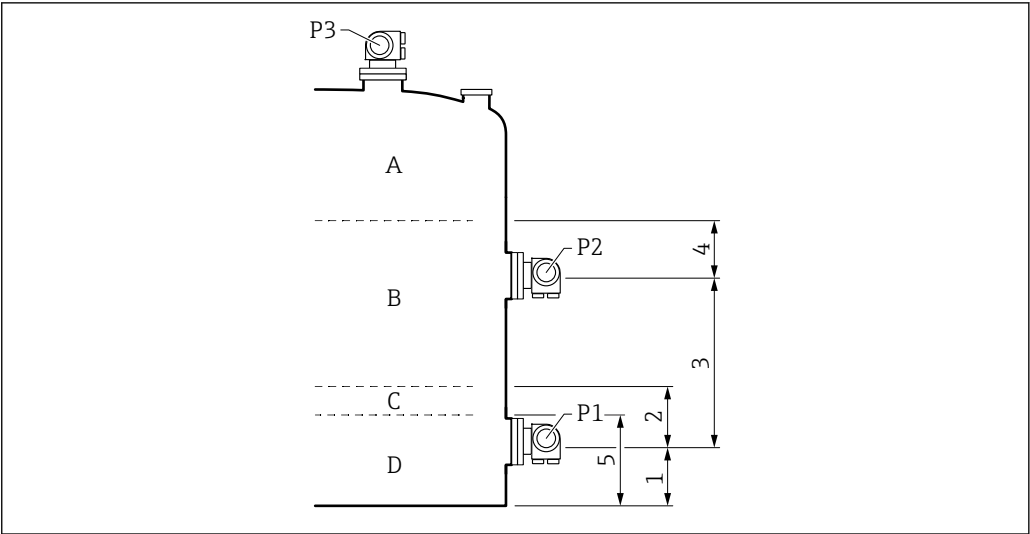
Case 1: $H_{P1} < \text{Minimum level} < H_{P2}$



- 1 P1 position (→ ⓘ 167)
- 2 Safety distance (→ ⓘ 194)
- 3 P1-2 distance (→ ⓘ 169)
- 4 Safety distance (→ ⓘ 194)
- 5 Minimum level (→ ⓘ 194)

Level L is in area	Calculation method for ρ_p	Calculation method for L
A	calculated from pressure	calculated from pressure
B	ρ_p held	calculated from pressure
C	ρ_p held	L = Minimum level

Case 2: Minimum level < H_{P1}

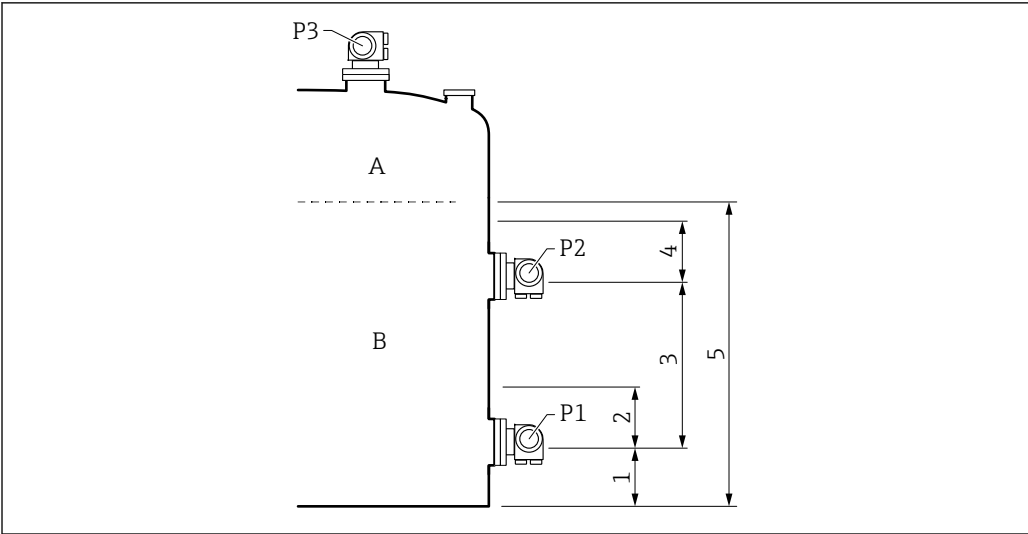


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- 1 P1 position (→ 167)
- 2 Safety distance (→ 194)
- 3 P1-2 distance (→ 169)
- 4 Safety distance (→ 194)
- 5 Minimum level (→ 194)

Level L is in area	Calculation method for ρ_P	Calculation method for L
A	calculated from pressure	calculated from pressure
B	ρ_P held	calculated from pressure
C/D	ρ_P held	L = Minimum level

Case 3: Minimum level > H_{P2}



- 1 P1 position (→ 167)
- 2 Safety distance (→ 194)
- 3 P1-2 distance (→ 169)
- 4 Safety distance (→ 194)
- 5 Minimum level (→ 194)

Level L is in area	Calculation method for p_p	Calculation method for L
A	calculated from pressure	calculated from pressure
B	p_p held	L = Minimum level

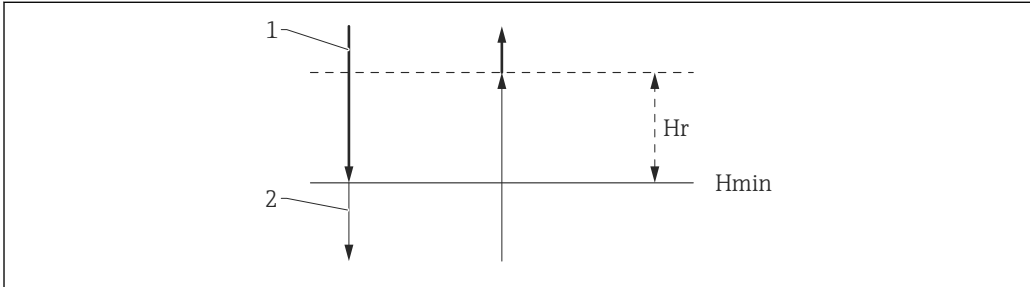
HTG evaluation: dependence on measured pressure

If the level of the product approaches the the P1 or P2 pressure sensor, the measured pressure becomes very small and the measurement might be too inaccurate for the Tank Gauging application. To solve this problem, a minimum pressure $P_{\min}$ is defined in the **Minimum pressure** parameter (→  194). If the pressure measured by the sensor P1 or P2, respectively, the software stops calculating the density and either holds the last calculated value (for the density) or returns the HTMinLevel (for HTGLevel).

- If P2 is smaller than $P_{\min}$, the software stops calculating the density and uses the last density value.
- If P1 is smaller than $P_{\min}$, the software stops calculating the level and uses the value of **Minimum level** (→  194), instead.

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**), 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.



17 HTG hysteresis
1 Value calculated
2 Value held/manual
 H_{min} Minimum level
 H_r Hysteresis (→ 195)

Description of parameters

Navigation Expert → Application → Tank calculation → HTG

► HTG		
Density value		→ 192
Tank level		→ 193
HTG mode		→ 193
Manual density		→ 193
Minimum level		→ 194
Minimum pressure		→ 194
Safety distance		→ 194
Hysteresis		→ 195

Density value

Navigation Expert → Application → Tank calculation → HTG → Density value (13706)

Description Shows the density calculated by HTG.

Additional information

Read access	Operator
Write access	-

Tank level**Navigation**
 Expert → Application → Tank calculation → HTG → Tank level (13707)
Description

Shows the level calculated by HTG.

User interface

Signed floating-point number

Factory setting

0 mm

Additional information

Read access	Operator
Write access	-

HTG mode**Navigation**
 Expert → Application → Tank calculation → HTG → HTG mode (13701)
Description

Defines the HTG mode.

Selection

- P1 only
- P1 + P3
- P1 + P2
- P1 + P2 + P3

Factory setting

P1 only

Additional information

Read access	Operator
Write access	Maintenance

Manual density**Navigation**
 Expert → Application → Tank calculation → HTG → Manual density (15009)
Description

Defines the manual density.

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

Read access	Maintenance
Write access	Maintenance

Minimum level

Navigation

 Expert → Application → Tank calculation → HTG → Min. level (13702)

Description

Defines the minimum level below which no HTG calculation will take place.

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 → HTG → Min. pressure (13703)

Description

Defines the minimum pressure below which no HTG calculation takes place.

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 → HTG → Safety distance (13705)

Description

Defines the minimum level which must be present above the bottom and middle pressure sensor before their 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

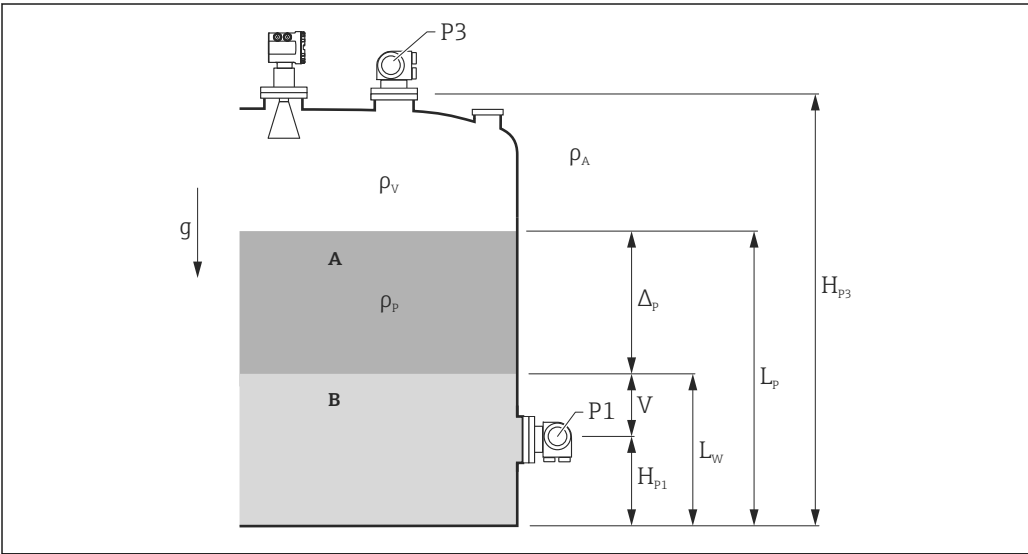
Navigation	 Expert → Application → Tank calculation → HTG → Hysteresis (13704)	
Description	Defines the hysteresis for the HTG calculation. Prevents constant switching if the level is near the switch-over point.	
User entry	0 to 2 000 mm	
Factory setting	50 mm	
Additional information	Read access	Operator
	Write access	Maintenance

"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)
Hp1 (Position of P1 transmitter)	Setup → Advanced setup → Tank configuration → Pressure → P1 position
P3 (Top pressure)	Setup → Advanced setup → Tank configuration → Pressure → P3 (top)
Hp3 (Position of P3 transmitter)	Setup → Advanced setup → Tank configuration → Pressure → P3 position
ρp (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)
ρv (Vapor density)	Expert → Application → Tank configuration → Density → Vapor density
ρA (Ambient air temperature)	Setup → Advanced setup → Tank configuration → Density → Air density
g (Local gravity)	Expert → Application → Tank Calculation → Local gravity
Lp (Level of the product)	Operation → Tank level (14655)
Lw (Bottom water level)	Operation → Water level (14970)
V = Lw - Hp1	
Δp = Lp - Lw = Lp - V - Hp1	

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 (→  198). 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 (→  198)	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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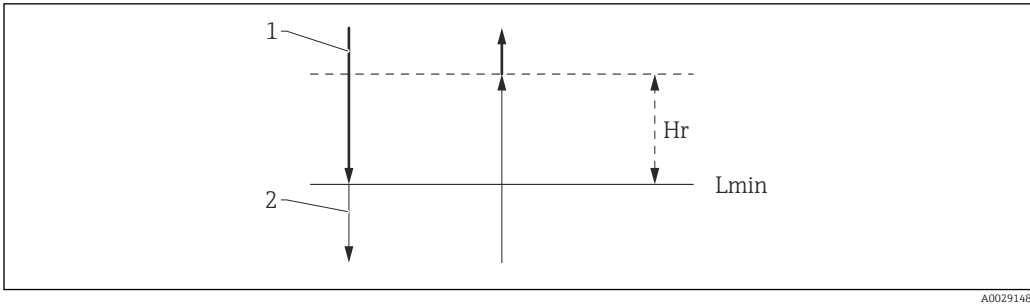
$L_{\min}$ is defined in the **Minimum level** parameter (→  199). As can be seen from the formula it always must be bigger than H_{p1} .

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 (→  163)) 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** (→  199)), 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.



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19 HTMS hysteresis

- 1 Value calculated
- 2 Value held/manual
- L_{min} Minimum level ($\rightarrow$ 199)
- H_r Hysteresis ($\rightarrow$ 200)

Description of parameters

Navigation Expert $\rightarrow$ Application $\rightarrow$ Tank calculation $\rightarrow$ HTMS

► HTMS

HTMS mode

$\rightarrow$ 198

Manual density

$\rightarrow$ 199

Density value

$\rightarrow$ 199

Minimum level

$\rightarrow$ 199

Minimum pressure

$\rightarrow$ 200

Safety distance

$\rightarrow$ 200

Hysteresis

$\rightarrow$ 200

Water density

$\rightarrow$ 201

HTMS mode



Navigation Expert $\rightarrow$ Application $\rightarrow$ Tank calculation $\rightarrow$ HTMS $\rightarrow$ HTMS mode (13751)

Description Defines the HTMS mode. Depending on the mode one or two pressure transmitters are used.

- Selection
- HTMS P1
 - HTMS P1+P3

Factory setting HTMS P1

Additional information

Read access	Operator
Write access	Maintenance

Meaning of the options

- HTMS P1
Only a bottom pressure transmitter (P1) is used.
- HTMS P1+P3
A bottom (P1) and top (P3) pressure transmitter are used. This option should be selected for pressurized tanks.

Manual density**Navigation**

Expert → Application → Tank calculation → HTMS → Manual density (15009)

Description

Defines the manual density.

User 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 (13753)

Description

Shows the calculated product density.

Additional information

Read access	Operator
Write access	-

Minimum level**Navigation**

Expert → Application → Tank calculation → HTMS → Min. level (13752)

Description

Defines the minimum product level for a HTMS calculation.

If Lp - V falls below the limit defined in this parameter, the density retains its last value or the manual value is used instead.

User entry

0 to 20 000 mm

Factory setting

7 000 mm

Additional information	Read access	Operator
	Write access	Maintenance

Minimum pressure

Navigation  Expert → Application → Tank calculation → HTMS → Min. pressure (13754)

Description Defines the minimum pressure for a HTMS calculation.
If the pressure P1 (or the difference P1 - P3) falls below the limit defined in this parameter, the density retains its last value or the manual value is used instead.

User entry 0 to 100 bar

Factory setting 0.1 bar

Additional information	Read access	Operator
	Write access	Maintenance

Safety distance

Navigation  Expert → Application → Tank calculation → HTMS → Safety distance (13756)

Description Defines the minimum level which must be present above the bottom pressure sensor before its signal is used for the calculation.

User entry 0 to 10 000 mm

Factory setting 2 000 mm

Additional information	Read access	Operator
	Write access	Maintenance

Hysteresis

Navigation  Expert → Application → Tank calculation → HTMS → Hysteresis (13755)

Description Defines the hysteresis for the HTMS calculation. Prevents constant switching if the level is near the switch-over point.

User entry 0 to 2 000 mm

Factory setting 50 mm

Additional information

Read access	Operator
Write access	Maintenance

Water density



Navigation

Expert → Application → Tank calculation → HTMS → Water density (13757)

Description

Density of the water in the tank.

User entry

Signed floating-point number

Factory setting

1 000 kg/m³

Additional information

Read access	Operator
Write access	Maintenance

3.4.3 "Alarm" submenu

Navigation  Expert → Application → Alarm

"Alarm" submenu

Navigation  Expert → Application → Alarm → Alarm

▶ Alarm		
Alarm mode	→	 203
Error value	→	 204
Alarm value source	→	 205
Alarm value	→	 206
HH alarm value	→	 206
H alarm value	→	 206
L alarm value	→	 207
LL alarm value	→	 207
HH alarm	→	 207
H alarm	→	 208
HH+H alarm	→	 208
L alarm	→	 208
LL alarm	→	 208
LL+L alarm	→	 209
Any error	→	 209
Clear alarm	→	 209
Alarm hysteresis	→	 210
Damping factor	→	 210

Alarm mode

Navigation

 Expert → Application → Alarm → Alarm → Alarm mode (13864)

Description

Defines the alarm mode of the selected alarm.

- Selection
- Off
 - On
 - Latching

Factory setting

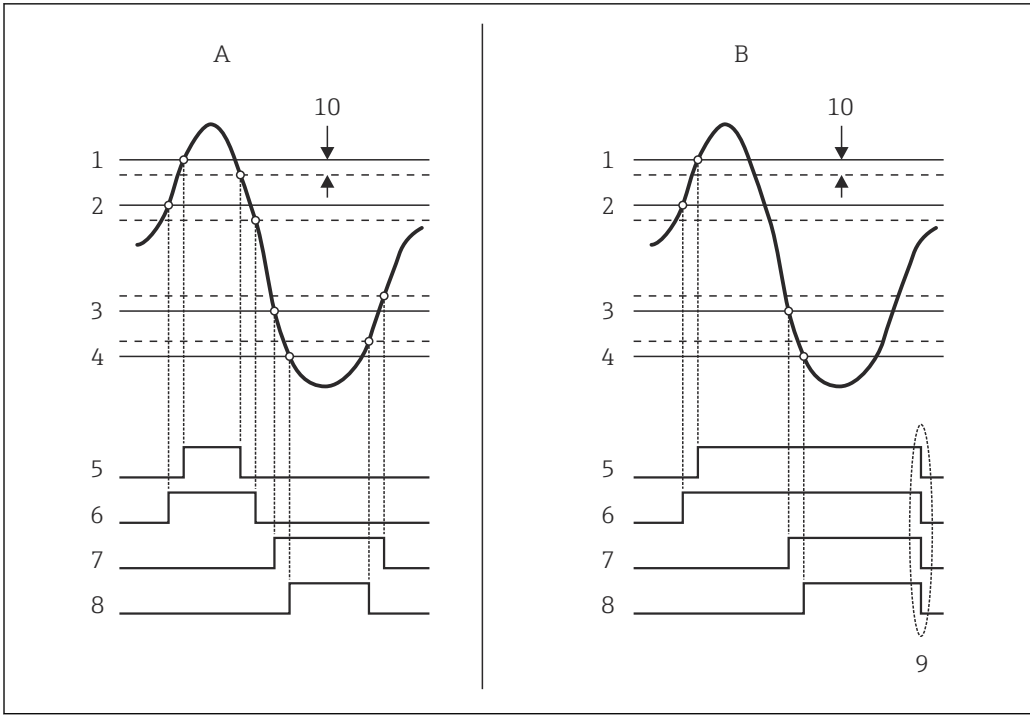
Off

Additional information

Read access	Operator
Write access	Maintenance

Meaning of the options

- **Off**
No alarms are generated.
- **On**
An alarm disappears if the alarm condition is no longer present (taking into consideration the hysteresis).
- **Latching**
All alarms remain active until the user selects **Clear alarm** (→  209) = **Yes** or the power is switched off and on.



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- 20 Principle of the limit evaluation
- A Alarm mode (→ 203) = On
- B Alarm mode (→ 203) = Latching
- 1 HH alarm value (→ 206)
- 2 H alarm value (→ 206)
- 3 L alarm value (→ 207)
- 4 LL alarm value (→ 207)
- 5 HH alarm (→ 207)
- 6 H alarm (→ 208)
- 7 L alarm (→ 208)
- 8 LL alarm (→ 208)
- 9 "Clear alarm (→ 209)" = "Yes" or power off-on
- 10 Hysteresis (→ 210)

Error value

Navigation Expert → Application → Alarm → Alarm → Error value (13851)

Prerequisite Alarm mode (→ 203) ≠ 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

Read access	Operator
Write access	Maintenance

Alarm value source 					
Navigation	  Expert → Application → Alarm → Alarm → Alarm source (13866)				
Prerequisite	Alarm mode (→  203) ≠ 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	<table border="1"> <tr> <td>Read access</td><td>Operator</td></tr> <tr> <td>Write access</td><td>Maintenance</td></tr> </table>	Read access	Operator	Write access	Maintenance
Read access	Operator				
Write access	Maintenance				

Alarm value

Navigation	 Expert → Application → Alarm → Alarm → Alarm value (13863)	
Prerequisite	Alarm mode (→  203) ≠ 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 (13855)	
Prerequisite	Alarm mode (→  203) ≠ 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 (13854)	
Prerequisite	Alarm mode (→  203) ≠ Off	
Description	Defines the high(H) limit value.	
User entry	Signed floating-point number	
Factory setting	0 None	
Additional information	Read access	Operator
	Write access	Maintenance

L alarm value



Navigation Expert → Application → Alarm → Alarm → L alarm value (13853)

Prerequisite **Alarm mode (→ 203) ≠ Off**

Description Defines the low limit value.

User entry Signed floating-point number

Factory setting 0 None

Additional information

Read access	Operator
Write access	Maintenance

LL alarm value



Navigation Expert → Application → Alarm → Alarm → LL alarm value (13852)

Prerequisite **Alarm mode (→ 203) ≠ Off**

Description Defines the low-low(LL) limit value.

User entry Signed floating-point number

Factory setting 0 None

Additional information

Read access	Operator
Write access	Maintenance

HH alarm

Navigation Expert → Application → Alarm → Alarm → HH alarm (13857)

Prerequisite **Alarm mode (→ 203) ≠ Off**

Description Shows whether an HH alarm is currently active.

Additional information

Read access	Operator
Write access	-

H alarm

- Navigation

 Expert → Application → Alarm → Alarm → H alarm (13856)
- Prerequisite

Alarm mode (→  203) ≠ Off
- Description

Shows whether an H alarm is currently active.

Additional information

Read access	Operator
Write access	-

HH+H alarm

- Navigation

 Expert → Application → Alarm → Alarm → HH+H alarm (13858)
- Prerequisite

Alarm mode (→  203) ≠ Off
- Description

Shows whether an HH or H alarm is currently active.

Additional information

Read access	Operator
Write access	-

L alarm

- Navigation

 Expert → Application → Alarm → Alarm → L alarm (13859)
- Prerequisite

Alarm mode (→  203) ≠ Off
- Description

Shows whether an L alarm is currently active.

Additional information

Read access	Operator
Write access	-

LL alarm

- Navigation

 Expert → Application → Alarm → Alarm → LL alarm (13868)
- Prerequisite

Alarm mode (→  203) ≠ 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 (13869)**Prerequisite****Alarm mode (→  203) ≠ 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 (13867)**Prerequisite****Alarm mode (→  203) ≠ 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 (13861)**Prerequisite****Alarm mode (→  203) = 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 (13862)	
Prerequisite	Alarm mode (→  203) ≠ 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 (13860)	
Description	Defines the damping constant (in seconds).	
User entry	0 to 999.9 s	
Factory setting	0 s	
Additional information	Read access	Operator
	Write access	Maintenance

3.5 "Tank values" submenu

Navigation  Expert → Tank values

▶ Tank values		
▶ Level		→  211
▶ Temperature		→  214
▶ Density		→  217
▶ Pressure		→  219
▶ GP values		→  220

3.5.1 "Level" submenu

Navigation  Expert → Tank values → Level

▶ Level		
Tank level		→  211
Tank Level %		→  212
Tank ullage		→  212
Tank ullage %		→  212
Upper interface level		→  212
Lower interface level		→  213
Bottom level		→  213
Water level		→  213
Measured level		→  213

Tank level

Navigation  Expert → Tank values → Level → Tank level (14655)

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

Additional information	Read access	Operator
	Write access	-

Tank Level %

Navigation  Expert → Tank values → Level → Tank Level % (14654)

Description Shows the level as a percentage of the full measuring range.

Additional information	Read access	Operator
	Write access	-

Tank ullage

Navigation  Expert → Tank values → Level → Tank ullage (14657)

Description Shows the remaining empty space in the tank.

Additional information	Read access	Operator
	Write access	-

Tank ullage %

Navigation  Expert → Tank values → Level → Tank ullage % (14658)

Description Shows the remaining empty space in percentage related to parameter tank reference height.

Additional information	Read access	Operator
	Write access	-

Upper interface level

Navigation  Expert → Tank values → Level → Upper I/F level (15003)

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

Additional information	Read access	Maintenance
	Write access	-

Lower interface level

Navigation   Expert → Tank values → Level → Lower I/F level (15004)

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

Additional information

Read access	Maintenance
Write access	-

Bottom level

Navigation   Expert → Tank values → Level → Bottom level (15018)

Description Shows the bottom level.

Additional information

Read access	Operator
Write access	-

Water level

Navigation   Expert → Tank values → Level → Water level (14970)

Description Shows the bottom water level.

Additional information

Read access	Operator
Write access	-

Measured level

Navigation   Expert → Tank values → Level → Measured level (14653)

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

Additional information

Read access	Operator
Write access	-

3.5.2 "Temperature" submenu

Navigation  Expert → Tank values → Temperature

► Temperature

Liquid temperature

Vapor temperature

Air temperature

► NMT element values

► Element temperature

Element temperature 0 to 23

► Element position

Element position 0 to 23

→  214

→  214

→  215

→  215

→  215

→  215

→  215

→  215

Liquid temperature

Navigation  Expert → Tank values → Temperature → Liquid temp. (14978)

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

Additional information	Read access	Operator
	Write access	-

Vapor temperature

Navigation  Expert → Tank values → Temperature → Vapor temp. (14985)

Description Shows the measured vapor temperature.

Additional information	Read access	Operator
	Write access	-

Air temperature

Navigation  Expert → Tank values → Temperature → Air temp. (14986)

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	-

3.5.3 "Density" submenu

Navigation  Expert → Tank values → Density

► Density		
Observed density	→ 	217
Vapor density	→ 	217
Air density	→ 	218
Measured upper density	→ 	218
Measured middle density	→ 	218
Measured lower density	→ 	218

Observed density

Navigation  Expert → Tank values → Density → Observed density (13451)

Description Calculated density of the product.

Additional information	Read access	Operator
	Write access	-

 This value is calculated from different measured variables depending on the selected calculation method.

Vapor density

Navigation  Expert → Tank values → Density → Vapor density (14981)

Description Defines the density of the gas phase in the tank.

User entry 0.0 to 500.0 kg/m³

Factory setting 1.2 kg/m³

Additional information	Read access	Operator
	Write access	Maintenance

Air density

Navigation

 Expert → Tank values → Density → Air density (14980)

Description

Defines the density of the air surrounding the tank.

User entry

0.0 to 500.0 kg/m³

Factory setting

1.2 kg/m³

Additional information

Read access	Operator
Write access	Maintenance

Measured upper density

Navigation

 Expert → Tank values → Density → Meas upper dens. (15001)

Description

Shows the density of the upper phase.

Additional information

Read access	Operator
Write access	-

Measured middle density

Navigation

 Expert → Tank values → Density → Meas middle dens (14997)

Description

Density of the middle phase.

Additional information

Read access	Operator
Write access	-

Measured lower density

Navigation

 Expert → Tank values → Density → Meas lower dens. (15002)

Description

Density of the lower phase.

Additional information

Read access	Maintenance
Write access	-

3.5.4 "Pressure" submenu

Navigation  Expert → Tank values → Pressure

► Pressure		
P1 (bottom)	→	 219
P2 (middle)	→	 219
P3 (top)	→	 219

P1 (bottom)

Navigation  Expert → Tank values → Pressure → P1 (bottom) (14983)

Description Shows the pressure at the tank bottom.

Additional information

Read access	Operator
Write access	-

P2 (middle)

Navigation  Expert → Tank values → Pressure → P2 (middle) (14987)

Description Shows the pressure (P2) at the middle transmitter.

Additional information

Read access	Operator
Write access	-

P3 (top)

Navigation  Expert → Tank values → Pressure → P3 (top) (14988)

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

Additional information

Read access	Operator
Write access	-

3.5.5 "GP values" submenu

Navigation  Expert → Tank values → GP values

▶ GP values

GP 1 to 4 name

GP Value 1

GP Value 2

GP Value 3

GP Value 4

→  220

→  220

→  220

→  221

→  221

GP 1 to 4 name 

Navigation  Expert → Tank values → GP values → GP 1 name (14963)

Description Defines the label associated with the respective GP value.

User entry Character string comprising numbers, letters and special characters (15)

Factory setting GP Value 1

Additional information

Read access	Operator
Write access	Maintenance

GP Value 1

Navigation  Expert → Tank values → GP values → GP Value 1 (14966)

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

Additional information

Read access	Operator
Write access	-

GP Value 2

Navigation  Expert → Tank values → GP values → GP Value 2 (14967)

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

Additional information

Read access	Operator
Write access	-

GP Value 3

Navigation

 Expert → Tank values → GP values → GP Value 3 (14968)

Description

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

Additional information

Read access	Operator
Write access	-

GP Value 4

Navigation

 Expert → Tank values → GP values → GP Value 4 (14969)

Description

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

Additional information

Read access	Operator
Write access	-

3.6 "Diagnostics" submenu

Navigation  Expert → Diagnostics

► Diagnostics		
Actual diagnostics	→ 	223
Timestamp	→ 	224
Previous diagnostics	→ 	224
Timestamp	→ 	224
Operating time from restart	→ 	225
Operating time	→ 	225
Date/time	→ 	225
► Diagnostic list		
Diagnostics 1 to 5	→ 	226
Timestamp 1 to 5	→ 	226
► Event logbook		
Filter options	→ 	227
► Simulation		
Device alarm simulation	→ 	229
Diagnostic event simulation	→ 	229
Current output 1 to 2 simulation	→ 	230
Simulation value	→ 	230
► Device information		
Device tag	→ 	231
Serial number	→ 	232
Firmware version	→ 	232
Firmware CRC	→ 	232

Weight and measures configuration CRC	→ ⓘ 232
Device name	→ ⓘ 233
Order code	→ ⓘ 233
Extended order code 1 to 3	→ ⓘ 233
ENP version	→ ⓘ 233
Device type	→ ⓘ 234
Module type	→ ⓘ 234
Communication Slot	→ ⓘ 234
▶ Board info	→ ⓘ 235
Date/time	→ ⓘ 225
System temperature	→ ⓘ 235
W&M lock switch	→ ⓘ 235
▶ Data logging	→ ⓘ 237
Assign channel 1 to 4	→ ⓘ 238
Logging interval	→ ⓘ 239
Clear logging data	→ ⓘ 240

Actual diagnostics

Navigation	🔍 ⓘ Expert → Diagnostics → Actual diagnos. (0691)	
Description	Shows the current occurred diagnostic event along with its diagnostic information.	
Additional information	Read access	Operator
	Write access	-

The display consists of:

- Symbol for event behavior
- Code for diagnostic behavior
- Operating time of occurrence
- Event text

 If several messages are active at the same time, the messages with the highest priority is displayed.

 Information on what is causing the message, and remedy measures, can be viewed via the ⓘ symbol on the display.

Timestamp

Navigation  Expert → Diagnostics → Timestamp (0667)

Description Displays the timestamp for the currently active diagnostic message.

Additional information	Read access	Operator
	Write access	-

Previous diagnostics

Navigation   Expert → Diagnostics → Prev.diagnostics (0690)

Description Shows the diagnostic event that occurred prior to the current diagnostic event along with its diagnostic information.

Additional information	Read access	Operator
	Write access	-

The display consists of:

- Symbol for event behavior
- Code for diagnostic behavior
- Operating time of occurrence
- Event text

 If several messages are active at the same time, the messages with the highest priority is displayed.

 Information on what is causing the message, and remedy measures, can be viewed via the ⓘ symbol on the display.

Timestamp

Navigation  Expert → Diagnostics → Timestamp (0672)

Description Shows the timestamp of the previous diagnostic message.

Additional information

Read access	Operator
Write access	-

Operating time from restart

Navigation  Expert → Diagnostics → Time fr. restart (0653)**Description**

Shows the time the device has been in operation since the last device restart.

Additional information

Read access	Operator
Write access	-

Operating time

Navigation  Expert → Diagnostics → Operating time (0652)**Description**

Indicates how long the device has been in operation.

Additional information

Read access	Operator
Write access	-

Date/time

Navigation  Expert → Diagnostics → Date/time (0790)**Description**

Displays the device internal real time clock.

Additional information

Read access	Operator
Write access	-

3.6.1 "Diagnostic list" submenu

Navigation  Expert → Diagnostics → Diagnostic list

► Diagnostic list

Diagnostics 1 to 5

→  226

Timestamp 1 to 5

→  226

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

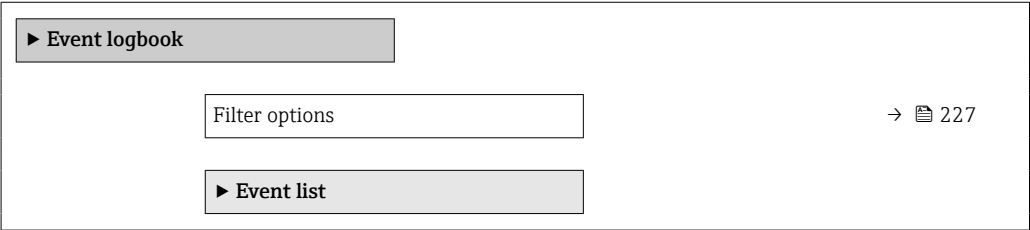
Timestamp of the diagnostic message.
- Additional information

Read access	Operator
Write access	-

3.6.2 "Event logbook" submenu

Structure of the submenu on the local display

Navigation  Expert → Diagnostics → Event logbook



Description of parameters

Navigation   Expert → Diagnostics → Event logbook

Filter options

Navigation  Expert → Diagnostics → Event logbook → Filter options (0705)

Description Define which category of event messages is shown in the Events list submenu.

- Selection
- All
 - Failure (F)
 - Function check (C)
 - Out of specification (S)
 - Maintenance required (M)
 - Information (I)
 - Not categorized

Factory setting All

- Additional information 
- This parameter is only used for operation via the local display.
 - The status signals are categorized according to NAMUR NE 107.

Read access	Operator
Write access	Maintenance

"Event list" submenu

 The **Event list** submenu (→  227) 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

3.6.3 "Simulation" submenu

Navigation  Expert → Diagnostics → Simulation

► Simulation		
Device alarm simulation	→ 	229
Diagnostic event simulation	→ 	229
Current output 1 to 2 simulation	→ 	230
Simulation value	→ 	230

Device alarm simulation

Navigation  Expert → Diagnostics → Simulation → Dev. alarm sim. (0654)

Description Switch the device alarm on and off.

Selection

- Off
- On

Factory setting Off

Additional information	Read access	Operator
	Write access	Maintenance

Diagnostic event simulation

Navigation  Expert → Diagnostics → Simulation → Diag. event sim. (0737)

Description Select a diagnostic event to simulate this event.

Selection The diagnostic events of the device

Factory setting Off

Additional information	Read access	Operator
	Write access	Maintenance

 To terminate the simulation, select **Off**.

Current output N simulation



Navigation

Expert → Diagnostics → Simulation → Curr.outp N sim. (13985)

Prerequisite

- The device has an Anlog I/O module.
- **Operating mode (→ 94) = 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 (→ 230) = 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

3.6.4 "Device information" submenu

Navigation   Expert → Diagnostics → Device info

► Device information		
Device tag	→ 	231
Serial number	→ 	232
Firmware version	→ 	232
Firmware CRC	→ 	232
Weight and measures configuration CRC	→ 	232
Device name	→ 	233
Order code	→ 	233
Extended order code 1 to 3	→ 	233
ENP version	→ 	233
Device type	→ 	234
Module type	→ 	234
Communication Slot	→ 	234
► Board info	→ 	235

Device tag

Navigation   Expert → Diagnostics → Device info → Device tag (0011)

Description Shows the device tag.

User interface Character string comprising numbers, letters and special characters

Factory setting - none -

Additional information

Read access	Operator
Write access	-

Serial number

Navigation

 Expert → Diagnostics → Device info → Serial number (0009)

Description

The serial number is a unique alphanumeric code identifying the device.
It is printed on the nameplate.
In combination with the Operations app it allows to access all device related documentation.

Additional information

Read access	Operator
Write access	-

Firmware version

Navigation

 Expert → Diagnostics → Device info → Firmware version (0010)

Description

Displays the device firmware version installed.

Additional information

Read access	Operator
Write access	-

Firmware CRC

Navigation

 Expert → Diagnostics → Device info → Firmware CRC (8563)

Description

Result of the cyclic redundancy check of the firmware.

Additional information

Read access	Operator
Write access	-

Weight and measures configuration CRC

Navigation

 Expert → Diagnostics → Device info → W&M config CRC (8564)

Description

Result of the cyclic redundancy check of the weights and measure relevant parameters.

Additional information

Read access	Operator
Write access	-

Device name

Navigation   Expert → Diagnostics → Device info → Device name (0013)

Description Use this function to display the device name. It can also be found on the nameplate.

Additional information

Read access	Operator
Write access	-

Order code



Navigation   Expert → Diagnostics → Device info → Order code (0008)

Description Shows the device order code.

Additional information

Read access	Operator
Write access	Service

Extended order code 1 to 3



Navigation   Expert → Diagnostics → Device info → Ext. order cd. 1 (0023)

Description Display the three parts of the extended order code.

User interface Character string comprising numbers, letters and special characters

Additional information

Read access	Operator
Write access	Service

The extended order code indicates the selected option of all ordering features and thus uniquely identifies the device.

ENP version

Navigation   Expert → Diagnostics → Device info → ENP version (0012)

Description Shows the version of the electronic nameplate (ENP).

Additional information

Read access	Operator
Write access	-

Device type

Navigation

 Expert → Diagnostics → Device info → Device type (8561)

Description

Displays the device type.

Additional information

Read access	Operator
Write access	-

Module type

Navigation

 Expert → Diagnostics → Device info → Module type (8526)

Description

Shows the type of installed IO module.

Additional information

Read access	Operator
Write access	-

Communication Slot

Navigation

 Expert → Diagnostics → Device info → Comm. Slot (13285)

Description

Indicates which IOM slot contains the communication protocol interface board.

Additional information

Read access	Operator
Write access	-

"Board info" submenu

Navigation   Expert → Diagnostics → Device info → Board info

► Board info

Date/time

→  235

System temperature

→  235

W&M lock switch

→  235

Date/time

Navigation   Expert → Diagnostics → Device info → Board info → Date/time (0790)

Description Displays the device internal real time clock.

Additional information	Read access	Operator
	Write access	-

System temperature

Navigation   Expert → Diagnostics → Device info → Board info → System temp. (8553)

Description Shows the electronic temperature of the main board.

User interface Signed floating-point number

Factory setting 0 °C

Additional information	Read access	Operator
	Write access	-

W&M lock switch

Navigation   Expert → Diagnostics → Device info → Board info → W&M lock switch (8558)

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

User interface

- Enabled
- Disabled

Factory setting Enabled

Additional information

Read access	Operator
Write access	-

3.6.5 "Data logging" submenu

Structure of the submenu on the local display

Navigation   Expert → Diagnostics → Data logging

► Data logging

Assign channel 1 to 4

Logging interval

Clear logging data

► Display channel 1 to 4

→  238

→  239

→  240

Structure of the submenu in an operating tool

Navigation   Expert → Diagnostics → Data logging

► Data logging

Assign channel 1 to 4

Logging interval

Clear logging data

→  238

→  239

→  240

Description of parameters

Navigation  Expert → Diagnostics → Data logging

Assign channel 1 to 4

Navigation  Expert → Diagnostics → Data logging → Assign chan. 1 (0851)

Description Assign a process variable to logging channel.

Selection

- Off
- Tank level
- Measured level
- Tank level %
- Distance
- Water level
- Upper interface level
- Lower interface level
- Displacer position *
- Upper density
- Middle density
- Lower density
- Bottom level
- Average profile density *
- Liquid temperature
- Vapor temperature
- Air temperature
- Tank ullage
- Tank ullage %
- Observed density value
- P1 (bottom)
- P2 (middle)
- P3 (top)
- GP 1 value
- GP 2 value
- GP 3 value
- GP 4 value
- AIO B1-3 value *
- AIO B1-3 value mA *
- AIO B1-3 value % *
- AIO C1-3 value *
- AIO C1-3 value mA *
- AIO C1-3 value % *
- AIP B4-8 value *
- AIP C4-8 value *
- Absolute echo amplitude *
- Amplitude eval distance *
- DiffPhase *

Factory setting Off

* Visibility depends on order options or device settings

Additional information

A total of 1000 measured values can be logged. This means:

- 1000 data points if 1 logging channel is used
- 500 data points if 2 logging channels are used
- 333 data points if 3 logging channels are used
- 250 data points if 4 logging channels are used

If the maximum number of data points is reached, the oldest data points in the data log are cyclically overwritten in such a way that the last 1000, 500, 333 or 250 measured values are always in the log (ring memory principle).

 The logged data are deleted if a new option is selected in this parameter.

Read access	Operator
Write access	Maintenance

Logging interval**Navigation**

-  Expert → Diagnostics → Data logging → Logging interval (0856)
-  Expert → Diagnostics → Data logging → Logging interval (0856)

Description

Define the logging interval $t_{\log}$ for data logging. This value defines the time interval between the individual data points in the memory.

User entry

1.0 to 3 600.0 s

Factory setting

10.0 s

Additional information

This parameter defines the interval between the individual data points in the data log, and thus the maximum loggable process time $T_{\log}$:

- If 1 logging channel is used: $T_{\log} = 1000 \cdot t_{\log}$
- If 2 logging channels are used: $T_{\log} = 500 \cdot t_{\log}$
- If 3 logging channels are used: $T_{\log} = 333 \cdot t_{\log}$
- If 4 logging channels are used: $T_{\log} = 250 \cdot t_{\log}$

Once this time elapses, the oldest data points in the data log are cyclically overwritten such that a time of $T_{\log}$ always remains in the memory (ring memory principle).

 The logged data are deleted if this parameter is changed.

*Example***When using 1 logging channel**

- $T_{\log} = 1000 \cdot 1 \text{ s} = 1000 \text{ s} \approx 16.5 \text{ min}$
- $T_{\log} = 1000 \cdot 10 \text{ s} = 1000 \text{ s} \approx 2.75 \text{ h}$
- $T_{\log} = 1000 \cdot 80 \text{ s} = 80000 \text{ s} \approx 22 \text{ h}$
- $T_{\log} = 1000 \cdot 3600 \text{ s} = 3600000 \text{ s} \approx 41 \text{ d}$

Read access	Operator
Write access	Maintenance

Clear logging data



- Navigation

Expert → Diagnostics → Data logging → Clear logging (0855)

Expert → Diagnostics → Data logging → Clear logging (0855)

Description

Clear the entire logging data.

- Selection

■ Cancel

■ Clear data

Factory setting

Cancel

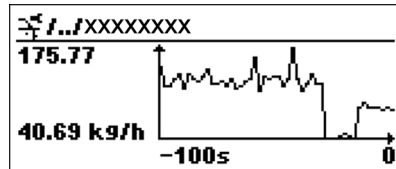
Additional information

Read access	Operator
Write access	Maintenance

"Display channel 1 to 4" submenu

 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

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