



Level



Pressure



Flow



Temperature



Liquid
Analysis



Registration



Systems
Components



Services



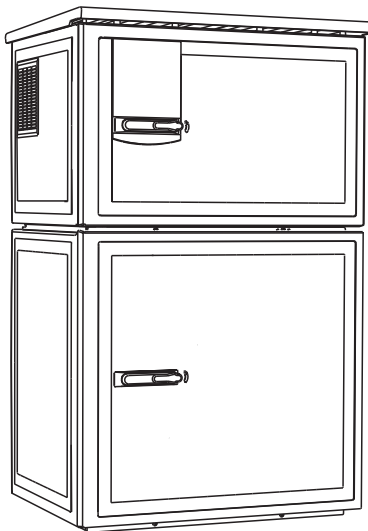
Solutions

Operating Instructions

Liquistation CSF48

Automatic sampler for liquid media

Operation & settings



Liquistation CSF48
BA464C/07/EN/14.11
71129802

Valid as of:
Software version 01.02.00

Endress+Hauser 

People for Process Automation

Operation concept

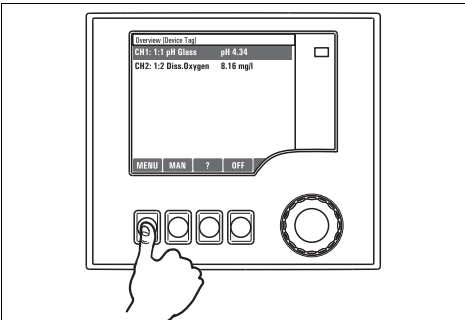


Fig. 1: Pressing the soft key: selecting the menu directly

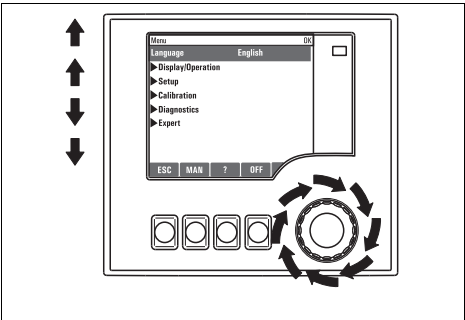


Fig. 2: Turning the navigator: moving the cursor in the menu

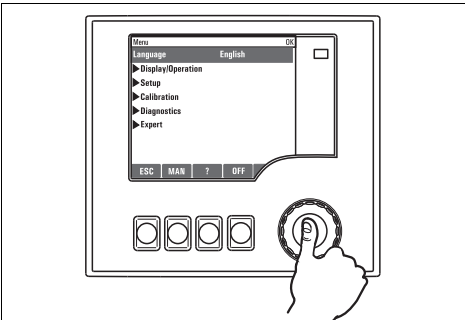


Fig. 3: Pressing the navigator: launching a function

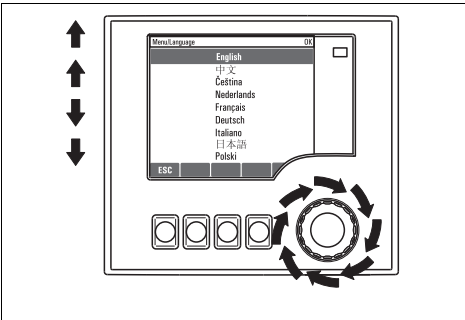


Fig. 4: Turning the navigator: selecting a value (e.g. from a list)

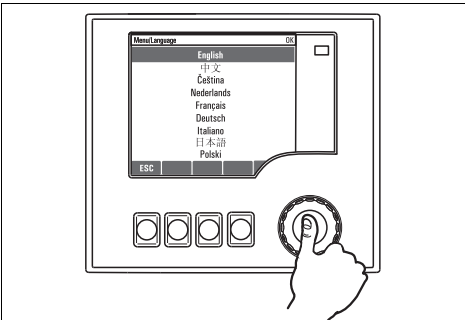


Fig. 5: Pressing the navigator: accepting the new value

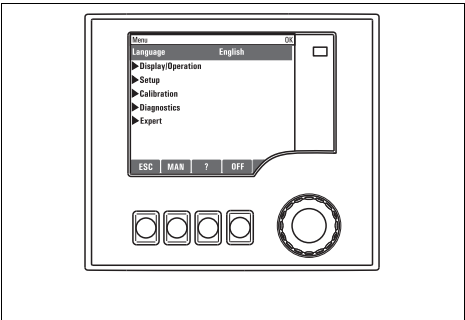


Fig. 6: Result: new setting is accepted

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1 About this manual

This manual gives a detailed account of all the configuration options **in the "Setup" menu**.

A description of the following menus is provided here:

- Inputs
 - Input configuration
 - Split into separate sections based on the different types of sensor that can be connected
 -  Some submenus are identical for all sensor types.
These submenus are repeated in each input-specific section to make sure you can find the information you need quickly and easily.
- Outputs
 - Output configuration
 - Split into separate sections based on the different output types
- Sampling programs
 - Creating sampling programs
 - Configuring different types of programs
- Additional functions
 - Settings for the alarm sensor
 - Cleaning program configuration
- Data management
 - Firmware updates
 - Saving and loading configurations

This manual does not include the following:

- Setup/General settings
 - Operating Instructions BA443C "Commissioning"
- Display/Operation
 - Operating Instructions BA443C "Commissioning"
- Calibration
 - Operating Instructions BA467C "Calibration"
- Diagnostics
 - Operating Instructions BA463C "Maintenance & diagnostics"
- Expert
 - Internal Service Manual

2 General settings

2.1 Basic settings

Path: Menu/Setup/General settings

Function	Options	Info
Device tag	Customized text, 20 characters	Select any name for your controller. Use the TAG name for example.
Temperature unit	Options ■ °C ■ °F ■ K Factory setting °C	
Alarm delay	0 to 9999 s Factory setting 0 s	The system only displays the errors that are present longer than the set delay time. This makes it possible to suppress error messages that only occur briefly and are caused by normal process-specific fluctuations.

2.2 Date and time

Path: Menu/Setup/General settings/Date/Time

Function	Options	Info
Set date	Depends on the format	Editing mode: DD (day): 01 to 31 MM (month): 01 to 12 YYYY (year): 2005 to 2100
Set time	Depends on the format	Editing mode: hh (hour): 00 to 23 / 0 am to 12 pm mm (minutes): 00 to 59 ss (seconds): 00 to 59
► Extended setup		
Date format	Options ■ DD.MM.YYYY ■ YYYY-MM-DD ■ MM-DD-YYYY Factory setting DD.MM.YYYY	Decide which date format you want to use.
Time format	Options ■ HH:MM am (12h) ■ HH:MM (24h) ■ HH:MM:SS (24h) Factory setting HH:MM:SS (24h)	Decide whether you want to use the 12-hour or 24-hour clock. Seconds can also be displayed with the latter version.

Path: Menu/Setup/General settings/Date/Time

Function	Options	Info
Time zone	Options - None - Choice of 35 time zones Factory setting None	If no time is selected, then Greenwich Mean Time is used (London).
DST	Options - Off - Europe - USA - Manual Factory setting Off	The controller adapts the summertime/normal time changeover automatically if you choose European or American daylight saving time. Manual means that you can specify the start and end of daylight saving time yourself. Here, two additional submenus are displayed in which you specify the changeover date and time.

2.3 Automatic hold (optional)

Path: Menu/Setup/General settings/Automatic hold

Function	Options	Info
► Device specific hold		
Setup menu	Options - Disabled - Enabled Factory setting Disabled	Decide whether a hold should be output at the current output when the particular menu is opened.
Diagnostics menu		
Calibration menu		
Hold delay	0 to 600 s Factory setting 0 s	The hold is maintained for the duration of the delay time when you switch to the measuring mode.

2.4 Logbooks

Logbooks record the following events:

- Calibration/adjustment events
- Operator events
- Diagnostic events
- Programming events

Here you define how the logbooks should store the data.

In addition, you are also able to define individual data logbooks. Assign the logbook name and select the measured value to be recorded. The data recording rate (Sample Time) is then the same for all data logbooks.

Path: Menu/Setup/General settings/Logbooks

Function	Options	Info
Logbook ident	Customized text	Part of the file name when exporting a logbook.
Event logbook	Options ■ Off ■ Ring buffer ■ Fill up buffer Factory setting Ring buffer	All diagnostic messages are recorded Ring buffer If the memory is full, the latest entry automatically overwrites the oldest entry. Fill up buffer If the memory is full, there is an overflow, i.e. no new values can be saved. The controller displays a corresponding diagnostic message. The memory then has to be cleared manually.
Program logbook	Options ■ Off ■ Ring buffer ■ Fill up buffer Factory setting Ring buffer	All diagnostic messages are recorded Ring buffer If the memory is full, the latest entry automatically overwrites the oldest entry. Fill up buffer If the memory is full, there is an overflow, i.e. no new values can be saved. The controller displays a corresponding diagnostic message. The memory then has to be cleared manually.
► Overflow warnings <i>Data logbook= "Fill up buffer"</i>		
Calibration logbook	Options ■ Off ■ On Factory setting Off	Decide whether you want to receive a diagnostic message from the controller in the event of memory overrun of the logbook in question.
Diagnostic logbook		
Configuration logbook		
► Data logbooks		
Scan time	00:00:01 to 01:00:00 Factory setting 00:01:00	Minimum interval between two entries Format: HH:MM:SS
► New		You can create a maximum of 8 data logbooks.
Logbook name	Customized text, 20 characters	
Source of data	Options ■ None ■ Binary input 1 ■ Binary input 2 ■ Current input 1 ■ Current input 2 ■ Temperature 1 Factory setting None	Select the input that should be the data source of the logbook entries.
Measured value	Options Depends on data source	The measured value to be recorded depends on the selected data source and thus also on the sensor connected.

Path: Menu/Setup/General settings/Logbooks

Function	Options	Info
▶ Add new logbook	Action	<i>Only if you want to create another data logbook immediately.</i> You add a new data logbook at a later data using ▶ New.
▶ Ready	Action	This allows you to exit the menu ▶ New.
▶ "Logbook name"		The menu only appears if you have created a new data logbook.
Source of data	Read only	This is for information purposes only. If you want to record another value, delete this logbook and create a new data logbook.
Measured value		
Log time left <i>Data logbook= "Fill up buffer"</i>	Read only	Displays the days, hours and minutes remaining until the logbook is full.
Log size <i>Data logbook= "Ring buffer"</i>	Read only	Displays the number of entries remaining until the logbook is full.
Logbook name	Customized text, 20 characters	You can change the name here.
Data logbook	Options ■ Off ■ Ring buffer ■ Fill up buffer Factory setting Off	Ring buffer If the memory is full, the latest entry automatically overwrites the oldest entry. Fill up buffer If the memory is full, there is an overflow, i.e. no new values can be saved. The controller displays a corresponding diagnostic message. The memory then has to be cleared manually.
Overflow warnings <i>Data logbook= "Fill up buffer"</i>	Options ■ Off ■ On Factory setting Off	Decide whether you want to receive a diagnostic message from the controller in the event of memory overrun of the logbook in question.
▶ Line plotter		Menu to define the graphic display
Axes	Options ■ Off ■ On Factory setting On	Should the axes (x, y) be displayed (On) or not (Off)?
Orientation	Options ■ Horizontal ■ Vertical Factory setting Horizontal	

Path: Menu/Setup/General settings/Logbooks

Function	Options	Info
X-Description	Options ■ Off ■ On Factory setting On	Decide whether a description should be displayed for the axes and whether grids should be shown. In addition, you can also decide whether a pitch should be displayed.
Y-Description		
Grids		
Pitches		
X Pitch/Grid distance	10 ... 50%	Specify the pitch.
Y Pitch/Grid distance	Factory setting 10 %	

Example for setting up a new data logbook

1. Menu/Setup/General settings/Logbooks/Data logbooks/Scan time: Specify the interval between two logbook entries.
2. .../New:
 - a. Logbook name: Assign a name, e.g. "01".
 - b. Source of data: Select a data source, e.g. the sensor connected to binary input 1.
 - c. Measured value: From the sensor signals, select the signal that you want to record.
3. .../Ready: Execute this action.
—> Your new logbook now appears in the list of data logbooks.
4. Select the data logbook with the name "01".
5. Activate the logbook by going to "Data logbook" and specifying Ring buffer or Fill up buffer as the type of memory.
6. If you selected "Fill up buffer", you can also decide whether you want to receive a diagnostic message in the event of memory overrun.
7. Depending on the type of memory selected, you receive information about the memory space (for "Ring buffer") or the time remaining until memory overrun (for "Fill up buffer").
8. Define the graphic display mode in the "Line plotter" submenu.

2.5 Configuring the sampling depending on the device version

 The list of functions displayed depends on the device version selected. Functions marked ¹⁾ are available in device versions with a vacuum pump. Functions marked ²⁾ are available in device versions with a peristaltic pump. Functions marked ³⁾ are available in device versions with a distributor plate.

Path: Menu/Setup/General settings

Function	Options	Info
► Sampling		
Number of bottles	Choice of all possible bottle combinations	The bottle configuration you ordered is preset in the device.
Bottle volume	0 to 100000 ml Factory setting 1000 ml	Set the bottle volume.
Distribution reference ³⁾	Options ■ Pre sampling ■ Pre bottle change ■ Pre program start Factory setting Pre sampling	The distributor arm goes through a reference point depending on the option selected.
Power failure	Options ■ Resume program ■ Stop program Factory setting Stop program	Decide how the sampler should react when it is energized after a power failure.
Sample retries	0 to 3 Factory setting 0	If sampling is started and no sample is drawn in, sampling can be repeated up to 3 times.
Sampling delay	0 to 99 s Factory setting 0 s	The start of the sampling cycle can be delayed by up to 99 s. The binary output is switched without any delay.
Liquid detection ¹⁾	Options ■ Automatic ■ Semiautomatic Factory setting Automatic	If "Semiautomatic" is selected, the purge times and intake times can be defined separately.
Dosing volume ¹⁾	20 to 350 ml Factory setting 200 ml	Adjust the dosing tube in the dosing chamber to change the dosing volume. The level in the bottle is calculated using the set dosing volume.
Dosing chamber ¹⁾	Options ■ Dose without pressure (A) ■ Dose with pressure (B) Factory setting Dose without pressure (A)	Dosing with pressure e.g. in conditions with low suction heights and slight counterpressure or low volumes.

Path: Menu/Setup/General settings

Function	Options	Info
Liquid detection ²⁾	Options ■ Automatic ■ Semiautomatic ■ Off Factory setting Automatic	If "Semiautomatic" is selected, the purge times and intake times can be defined separately.
Rinse cycles ²⁾	0 ... 3 Factory setting 0	The suction line is rinsed with the sample up to 3 times.
Safety interlock ²⁾ (optional)	Options ■ Off ■ On Factory setting Off	If the peristaltic pump is opened, the safety interlock stops all the functions.
► Diagnostics settings		
► Sensor fouling ¹⁾		
Warning	0 ... 10 Factory setting 7	Indicates maintenance work must be performed on the conductivity sensors.
Alarm	0 ... 10 Factory setting 10	
► Pump tube life ²⁾		
Control	Options ■ Off ■ On Factory setting Off	Indicates the pump hose has to be exchanged.
Warning	10 to 50 h Factory setting 30 h	
Alarm	30 to 200 h Factory setting 50 h	
Totalizer	00-00:00 ... 49710-06:28 Factory setting 00-00:00	Operating time of the pump in days, hours and minutes
▷ Reset	Action	

Path: Menu/Setup/General settings

Function	Options	Info
► Sample temperature (optional)		
Temp. control	Options ■ Off ■ On Factory setting On	On: Temperature control of the sample compartment
Economy operation	Options ■ Off ■ On Factory setting Off	On: Temperature control only activated when the program is running
Sample temperature	2 to 20 °C Factory setting 4 °C	Set the sample compartment temperature.
Cooling control	Options ■ Standard operation ■ Quick cool down Factory setting Standard operation	The temperature regulator is switched off for a certain time if quick cool-down is selected.
► Defrosting		
 The automatic defrosting function is preset at the factory. The following changes may only be made by experts.		
Mode	Options ■ Off ■ On Factory setting On	Configuration of the automatic defrosting function
Interval	Options ■ Hourly ■ Daily ■ Weekly ■ Monthly Factory setting Hourly	Select the defrosting interval
Time	00-01:00 ... 00-23:59 Factory setting 00-04:00	
Duration	00:01 ... 02:00 Factory setting 00:05	

2.6 Extended setup

2.6.1 Diagnostics settings



This branch, along with the same functions, can be found in different "Extended setup" menus. The list of diagnostic messages displayed depends on the path selected. There are device-specific messages, and messages that depend on what sensor is connected.

Path: ... /Extended setup/Diagnostics settings/Diag. behavior

Function	Options	Info
List of diagnostic messages		Select the message to be changed. Only then you can make the settings for this message.
Diag. code	Read only	
Diagnostic message	Options ■ On ■ Off Factory setting Depends on the message	You can deactivate or reactivate a diagnostic message here. Deactivating means: ■ No error message in the measuring mode ■ No error current at the current output
Error current	Options ■ On ■ Off Factory setting Depends on the message	Decide whether an error current should be output at the current output if the diagnostic message display is activated.
Status signal	Options ■ Maintenance (M) ■ Out of specification (S) ■ Function check (C) ■ Failure (F) Factory setting Depends on the message	The messages are divided into different error categories in accordance with NAMUR NE 107. → BA463C "Maintenance & diagnostics"
Diag. output	Options ■ None ■ Alarm relay ■ Relay 1 to n (depends on the device version) Factory setting None	You can use this function to select a relay output and/or binary output to which the diagnostic message should be assigned. For sensors with the Memosens protocol: You first have to configure a relay output before being able to assign the message to an output (Menu/Setup/Outputs, assign "Diagnostics" function and set Operating mode to "Normal"). → BA464C "Operation & configuration"
Cleaning program (optional)	Options ■ None ■ Cleaning 1 ■ Cleaning 2 ■ Cleaning 3 ■ Cleaning 4 Factory setting None	Decide whether the diagnostic message should trigger a cleaning program. You can define the cleaning programs under: Menu/Setup/Additional functions/Cleaning.

Path: ... /Extended setup/Diagnostics settings/Diag. behavior

Function	Options	Info
Detail Information	Read only	Here you can find more information on the diagnostic message and instructions on how to resolve the problem.

2.6.2 HART bus address

If Multidrop is active (Bus address > 0), the current at current output 1 is always set to 4 mA. Here, it does not matter what function has been assigned to the output (measured value/controller etc.). Current simulation is no longer possible.

Path: Menu/Setup/General settings/Extended setup/HART

Function	Options	Info
Bus address	0 ... 63 Factory setting 0	You can change the device address to integrate several HART devices in a network (Multidrop mode).

 If you reset the device to the factory settings (Diagnostics/Systemtest/Reset/Factory default), the bus address is not reset. Your setting is retained.

2.6.3 Data management

Firmware update

Please contact your local sales office for information on firmware updates available for your controller and its compatibility with earlier versions.
Your **current firmware version** can be found at: Menu/Diagnostics/System information/Software version.

 First save your current setup on an SD card since a firmware update overwrites your settings with the factory settings. After updating the firmware, you can restore your setup by uploading it from the SD card.

- To install a firmware update, you must have the update available on an SD card.
1. Insert the SD card into the controller card reader.
 2. Go to: Menu/Setup/General settings/Extended setup/Data management/Firmware update.
→ The update files on the SD card are displayed.
 3. Select the desired update and select yes when the following question is displayed: The current firmware will be overwritten. After this the device will reboot. Do you want to proceed?
→ The firmware is loaded and the device is then started with the new firmware.

Saving the setup

Saving the setup gives you the following advantages:

- Quick and easy to restore a setup following a firmware update
- Copying settings for other devices
- Quick and easy switching between various setups, e.g. for different user groups or for recurring sensor type change
- Restoring a tried-and-tested setup, e.g. if you have changed a lot of settings and no longer know what the original settings were

1. Insert the SD card into the controller card reader.
2. Go to: Menu/Setup/General settings/Extended setup/Data management/Save setup.
3. Assign a file name (Name).
4. Then select "Save".
5. If you have already assigned the file name, you will be asked whether you want to overwrite the existing setup.
Select "OK" to confirm, or cancel the action and give the file a new name.

—> Your setup is stored on the SD card and you can upload it quickly to the device at a later date.

Loading the setup

You can load a setup you have saved quickly and easily:

1. Insert the SD card into the controller card reader.
2. Go to: Menu/Setup/Data management/Load setup.
—> A list of all the setups on the SD card is displayed.
3. Select the desired setup.
The device then displays the following message: The current parameters will be overwritten and the device will reboot. Do you want to proceed?
4. Select "OK" to confirm or cancel the action.

—> The desired setup is restored after restarting the device.

Exporting the setup

Exporting the setup gives you the following advantages:

- Export in xml format
- Import the data e.g. into MS Excel (drag&drop the xml file in an open Excel window)

1. Insert the SD card into the controller card reader.
2. Go to: Menu/Setup/General settings/Extended setup/Data management/Export setup.
3. Assign a file name (Name).
4. Then select "Export".
5. If you have already assigned the file name, you will be asked whether you want to overwrite the existing setup.
Select "OK" to confirm, or cancel the action and give the file a new name.

—> Your setup is saved on the SD card.

Activation code

You require activation codes for:

- Additional functions, e.g. other inputs
- Software upgrades

1. Install the hardware or load the new software.
2. Go to: Menu/Setup/General settings/Extended setup/Data management/Activation code.
3. Enter the activation code which you received with the hardware or software.
4. Then select "Confirm".

—> Your new hardware or software is now activated and can now be configured.

3 Inputs

The CSF48 sampler has 2 binary inputs and 2 current inputs as standard. All inputs are galvanically isolated from one another.

3.1 Binary inputs

The binary inputs are used to control the sampler using external signals.

With the CSF48, the auxiliary voltage of 24 V DC from the terminal block in the connection compartment of the sampler can be used for floating contacts (see BA443C "Commissioning").

Path: Menu/Setup/Inputs

Function	Options	Info
► Binary input S:x		
Mode	Options ■ Off ■ On Factory setting Off	Switches the function on or off
Input mode	Options ■ Flow rate ■ Rainfall ■ External event Factory setting Flow rate	■ Pulse input for connected flowmeters or rain gages ■ Control of sampling functions via external signals
If the Input mode Flow rate is selected:		
Signal slope	Options ■ Low-High ■ High-Low Factory setting Low-High	Preselect the level change of the signal.
Unit	Options ■ m³ ■ l ■ cf ■ gal Factory setting m ³	Select the unit.
Meas. value format	Factory setting #.#	Specify the number of decimal places for the flow.
1 Impulse =	0 to 1000 m ³ Factory setting 10 m ³	Definition of the pulse value, limits are calculated depending on the unit

Path: Menu/Setup/Inputs

Function	Options	Info
▶ Totalized flow		
Current totalized flow	---	The totalized flow values are displayed.
Reset totalizer	Options - Manual - Automatic - At program start Factory setting Manual	Manual: Reset the counter manually. Automatic: The counter is reset automatically at intervals. At program start: The counter is reset at program start.
If Manual is selected for the counter reset:		
▷ Reset totalized flow	Action	The totalized flow currently calculated is set to zero when the counter is reset.
If Automatic is selected for the counter reset:		
Interval	Options - Daily - Weekly - Monthly Factory setting Daily	Daily: If a daily interval is selected, set the Time in the menu item that follows. Weekly: If a weekly interval is selected, set the Day of week and the Time in the menu items that follow. Monthly: If a monthly interval is selected, set the Day of month and the Time in the menu items that follow.
If the Input mode Rainfall is selected:		
Signal slope	Options - Low-High - High-Low Factory setting Low-High	Preselect the level change of the signal.
Unit	Options - mm - inch Factory setting mm	Select the unit.
Meas. value format	Factory setting #.#	Specify the number of decimal places.
1 Impulse =	0.00 to 5.00 mm Factory setting 1.0 mm	Definition of the pulse value, limits are calculated depending on the unit. The correct switch value is provided in the Operating Instructions of your rain gage.

Path: Menu/Setup/Inputs

Function	Options	Info
Intensity	Options ■ mm/min ■ mm/h ■ mm/d Factory setting mm/min	Select the intensity per minute, hour or day according to your requirements.
▶ Totalized rainfall		
Totalized rainfall	---	The totalized rainfall is displayed.
Reset totalizer	Options ■ Manual ■ Automatic ■ At program start Factory setting Manual	Manual: Reset the counter manually. Automatic: The counter is reset automatically at intervals. At program start: The counter is reset at program start.
If Manual is selected for the counter reset:		
▶ Reset totalized rainfall	Action	The totalized rainfall currently calculated is set to zero when the meter is reset manually.
If Automatic is selected for the counter reset:		
Interval	Options ■ Daily ■ Weekly ■ Monthly Factory setting Daily	Daily: If a daily interval is selected, set the Time in the menu item that follows. Weekly: If a weekly interval is selected, set the Day of week and the Time in the menu items that follow. Monthly: If a monthly interval is selected, set the Day of month and the Time in the menu items that follow.
If Input mode External event is selected:		

Path: Menu/Setup/Inputs

Function	Options	Info
Operation	Options - No operation - Start sampling - Program start - Program stop - Program duration - Program pause - Partprogram activation - Change bottle - Bottle synchronization - External hold Factory setting No operation	No operation: No action is executed. Start sampling: A pulse triggers sampling. Program start: A pulse starts a program. Program stop: A pulse stops all programs running. Program duration: A program is active as long as the input signal is present. The signal is a level signal, i.e. the action takes effect as long as the level is present. The level that triggers the action is configured in the Signal slope menu item that follows. Program pause: The input signal stops all programs running. The programs continue running when the signal disappears. The signal is a level signal, i.e. the action takes effect as long as the level is present. The level that triggers the action is configured in the Signal slope menu item that follows. Partprogram activation: A pulse triggers a subprogram. Change bottle: A pulse triggers a changeover to the next bottle. Bottle synchronization: A pulse triggers a changeover to the set bottle position. —> Select the bottle position in the menu item that follows. External hold: The input signal triggers an external hold. The signal is a level signal, i.e. the action takes effect as long as the level is present. The level that triggers the action is configured in the Signal slope menu item that follows.
Signal slope	Options - Low-High - High-Low Factory setting Low-High	Preselect the level change of the signal. —> If Low-High is selected, the high level brings about the corresponding setting.

3.2 Current inputs

The current input must be assigned an analog signal for the functions described. Active and passive current inputs are available to connect 2-wire or 4-wire devices.

For the correct wiring of the current inputs, see:
BA443C "Commissioning" for CSF48

Path: Menu/Setup/Inputs

Function	Options	Info
► Current input S:x		
Mode	Options - Off 0..20 mA 4..20 mA Factory setting Off	Enter the output signal of the connected device: 0 to 20 mA or 4 to 20 mA.
Input mode	Options - Flow rate - Parameter - Current Factory setting Current	Select the input variable. Flow rate: The input can be used as the source for time/flow-paced or flow-paced sampling programs. Parameter: The input can be used as the source for limit switches, logbooks and enabling and disabling events for sampling programs. Current: The input can be used as the source for limit switches, logbooks and enabling and disabling events for sampling programs. A unit name cannot be specified.
If Input mode Flow rate is selected:		
Unit of flow	Options - l/s - m³/s - m³/h - m³/d - cfs - cfm - gpm - gph - mgd Factory setting l/s	Select the unit.
Unit of totalized flow	Options - l - m³ - cf - gal Factory setting m ³	Select the unit for the totalized flow.

Path: Menu/Setup/Inputs

Function	Options	Info
Meas. value format	Factory setting #.#	Specify the number of decimal places for the flow.
Low flow limit	0 to 10000 l/s Factory setting 0 l/s	The set limit value prevents sampling if the flow falls below this value (only for time/flow-paced sampling).
Lower range value	0 to 10000 l/s Factory setting 0 l/s	Enter a value for the start of the measuring range. 0/4 mA is assigned to this value as per your specifications.
Upper range value	0 to 10000 l/s Factory setting 100000 l/s	Enter a value for the end of the measuring range. 20 mA is assigned to this value as per your specifications.
Damping	0 to 60 s Factory setting 0 s	The damping causes a floating average curve of the measured values over the time specified.
► Totalized flow  The totalized flow is calculated when the program is started if you use a sampling program with volume, flow-paced sampling or time/flow-paced sampling as the start condition. The samples are taken based on this value. The current totalizer is used for calculating purposes if the totalized flow is used as the measured value for an enabling or disabling event.		
Current totalized flow	---	The totalized flow values are displayed.
Flow rate	---	The current flow rate is displayed.
Reset totalizer	Options ■ Manual ■ Automatic ■ At program start Factory setting Manual	Manual: Reset the counter manually. Automatic: The counter is reset automatically at intervals. At program start: The counter is reset at program start.
If Manual is selected for the counter reset:		
► Reset totalized flow	Action	The totalized flow currently calculated is set to zero when the counter is reset.
If Automatic is selected for the counter reset:		
Interval	Options ■ Daily ■ Weekly ■ Monthly Factory setting Daily	Daily: If a daily interval is selected, set the Time in the menu item that follows. Weekly: If a weekly interval is selected, set the Day of week and the Time in the menu items that follow. Monthly: If a monthly interval is selected, set the Day of month and the Time in the menu items that follow.

Path: Menu/Setup/Inputs

Function	Options	Info
If the Input mode Parameter is selected:		
Meas. value format	Factory setting #.#	Specify the number of decimal places.
Parameter name	Customized text	Assign a name.
Unit of measure	Customized text	Enter the engineering unit.
Lower range value	-20 to 10000 Factory setting 0	Enter a value for the start of the measuring range. 0/4 mA is assigned to this value as per your specifications.
Upper range value	-20 to 10000 Factory setting 10	Enter a value for the end of the measuring range. 20 mA is assigned to this value as per your specifications.
Damping	0 to 60 s Factory setting 0 s	The damping causes a floating average curve of the measured values over the time specified.
If the Input mode Current is selected:		
Meas. value format	Factory setting #.#	Specify the number of decimal places.
Damping	0 to 60 s Factory setting 0 s	The damping causes a floating average curve of the measured values over the time specified.

4 Programming

The CSF48 sampler offers users a wide range of options for configuring individual sampling programs. The 3 different program types (Basic, Standard and Advanced) make it easy for you to find the right program for your application.

4.1 Overview of the possible program types

Sampler version	Basic program type	Standard program type	Advanced program type
Vacuum/peristaltic pump	Time-paced	Time-paced	Time-paced
	Flow-paced	Flow-paced	Flow-paced
			Single sample
			Sampling table
			External signal
Peristaltic pump	Time/flow-paced	Time/flow-paced	Time/flow-paced

The graphic below explains the various ways sampling can be controlled on the basis of a flow curve:

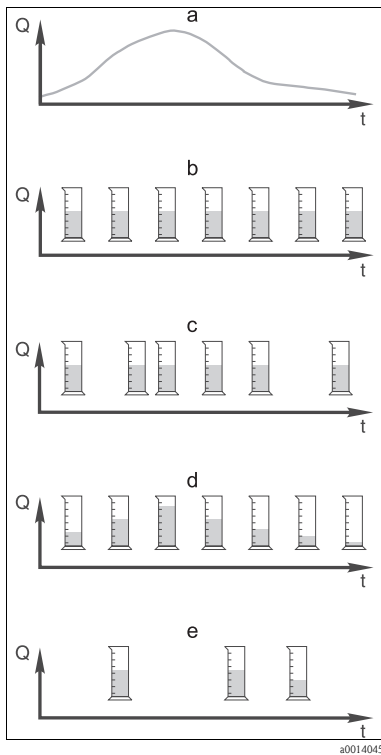


Fig. 7: Sampling control

- a. Flow curve
- b. **Time-paced sampling**
A constant sampling volume (e.g. 50 ml) is taken at steady intervals (e.g. every 5 min).
- c. **Flow-paced sampling**
A constant sampling volume is taken at variable intervals (depending on the inflow volume).
- d. **Time/flow-paced sampling**
A variable sampling volume (the sampling volume depends on the inflow) is taken at steady time intervals (e.g. every 10 min).
- e. **Event-controlled sampling**
Sampling is triggered by an event (e.g. pH limit value). Sampling can be time-paced, flow-paced, or time/flow-paced, or single samples can be taken.

The following table explains the various types of sampling using specific examples.

Type of sampling	Example	Info
Time-paced	■ Sampling interval: 5 min ■ Sampling volume: 50 ml ■ Bottle change mode: 2 h With this setting, a 50 ml sample is taken every 5 minutes. 12 samples are thus taken every hour. Each bottle is filled over a period of 2 hours. This results in a total sampling volume of 24 samples per bottles x 50 ml = 1200 ml.	This type of sampling remains constant over time and does not take changes in flow or polluting load into account. It is possible to take a representative sample if the intervals are brief (e.g. 5 min).
Flow-paced	Controlled via current input ■ Signal: 0 to 20 mA = 0 to 600 m³/h ■ Sampling volume: 50 ml ■ Sampling interval: 20 m³ ■ Bottle change mode: 2 h If 20 mA = 600 m³/h, a sample is taken every 2 minutes (smallest sampling interval with maximum flow). The total number of samples amounts to 60 samples per bottle. With a flow of 300 m³/h, a sample is taken every 4 minutes. Controlled via binary input ■ Signal pulse: 5 m³ ■ Sampling volume: 50 ml ■ Sampling interval: 20 m³ ■ Bottle change mode: 2 h The pulses are scaled at the flowmeter. By multiplying the pulses at the sampling interval, the shortest sampling interval at the maximum pulse frequency can be set. Example: Given a maximum flow of 600 m³/h, the pulse frequency at 5 m³ is 120 pulses/h or 2 pulses/min. With a sampling interval of 20 m³, sampling takes place after 4 pulses = 2 minutes.	■ The current inputs can be configured for the current range of 0 to 20 mA or 4 to 20 mA. ■ The binary inputs require power (24 V DC) for floating contacts. In the case of flow-paced sampling, the sampling interval is calculated on the basis of the volume flow. The same sampling volume is take at variable intervals. Advantage: Good, representative results in the event of minor fluctuations in flow. Disadvantage: Longer intervals when the level of water is low mean that malfunctions cannot be detected.

Type of sampling	Example	Info
Time/flow-paced (only possible with peristaltic pump)	Controlled via current input ■ Signal: 0 to 20 mA ■ Sampling interval: 10 min ■ Sampling volume: variable The maximum sampling volume is defined at the maximum flow rate. Example: The maximum flow rate at 20 mA at the current input is 160 l/s, and the maximum sampling volume is 200 ml. When transferring samples into a 30l mixed sample container, 144 samples are taken per day with a maximum sampling volume of 28.8 l. With a flow rate of 80 l/s, a sampling volume of only 100 ml would be grabbed, and a sampling volume of 50 ml would be grabbed at a flow rate of 40 l/s. The sampling volume is always calculated based on the flow. Controlled via binary input ■ Binary input (pulse per flow unit) ■ Sampling interval: 10 min ■ Sampling volume: variable The sampling volume is defined for a flow pulse, e.g.: 1 pulse is 20 ml. For instance, if 5 flow pulses are counted between the sampling intervals, this results in a sampling volume of $5 \times 20 = 100$ ml, and a volume of $8 \times 20 = 160$ ml for 8 pulses. If a binary input is used for time/flow-paced sampling, the sampling volume is calculated per sample as a percentage of the specified sampling volume.	Samples are taken at set intervals with a variable sampling volume. The sampling volume is calculated from the flow rate. More volume is grabbed when the flow is high than when it is low. Since the flow normally fluctuates and the maximum flow is only rarely a constant variable, the sampling volume transferred to the container will depend on the daily average. Advantage: Very good, representative sampling given large fluctuations in the flow and constant time intervals. Disadvantage: Too little sampling volume is made available for analysis when the flow is low. Advantage with current input: For the sampling interval, either the current flow rate or the average value between the last and current flow rate is used to calculate the exact sampling volume (depending on the presetting). Disadvantage with binary input: For the sampling interval, the pulses counted since the last sampling are multiplied by a volume. If this is too high - e.g. 100 ml - the composition of the sample is not representative for analysis.
Event	Event-based sampling is controlled via the current input, binary input and/or sensor input. The subprogram created waits to be activated by an event that can consist of up to 3 individual events. Every possible condition can be created using logical "and" / "or" links. For example, the information from a flowmeter connected to the current input can be linked to a rain gage and a pH sensor signal connected to the binary input. An event is defined as limit value violation (exceeded or undershot), range monitoring within or outside a range, or a rate of change. Users can decide whether additional sampling is started when the event starts and/or ends. For the duration of the event, users can choose from time-paced, flow-paced or time/flow-paced sampling, or can take single samples, use a sampling table or the external control system.	The sampler waits for an event. This event takes place via internal sensor signal processing or via devices connected externally. As bottle assignment is possible when using several bottles, events can be assigned to individual bottles. A maximum of 24 subprograms can be started simultaneously and assigned to individual bottles.

4.1.1 Bottle synchronization

The bottle synchronization setting is possible with all types of program. In addition, bottle synchronization can be switched via an external signal.

Bottle synchronization is only possible with a bottle change after a specific time and not with a bottle change after a number of samples.

Specific bottles can be assigned specific filling times with the bottle synchronization function. For example, bottle 1 is to be filled from midnight to 2 a.m., bottle 2 from 2 a.m. to 4 a.m. etc.. The following options are available for this:

- None: The time of sampling and bottle change are not synchronized.
- 1. bottle change time: Sampling starts with the first bottle. The changeover to the next bottles is synchronized. For example, a time of 2 hours was set for bottle changeover, and 00:00 was set for the synchronization. If the program is started at 5:23 a.m., for example, bottle 1 is initially filled. The system switches to bottle 2 at 6 a.m. and bottle 3 at 8 a.m. etc.
- 1. Time of change + bottle number: A specific filling time is assigned to every bottle. For example, midnight to 2 a.m. for bottle 1; 2 a.m. to 4 a.m. for bottle 2; 4 a.m. to 6 a.m. for bottle 3 etc. If the program is started at 10 a.m., for example, the device starts filling bottle 6.
- External signal: The system changes to the next bottle when an external signal is received. The external signal first has to be configured via the binary input. The binary input can then be selected as the source.

4.2 Program type: Basic

With the Basic program type, you can create simple sampling programs quickly based on time, volume and flow. In the case of volume- and flow-controlled sampling, the inputs have to be configured appropriately beforehand. If you want to create a program and use it immediately, you have to check the configuration of the sampler before programming. You can make the settings under "Menu/Setup/General settings/Sampling": e.g. the bottle configuration, and the bottle volume, as well as the correct dosing volume for the device version with a vacuum pump. The dosing volume setting makes it possible to correctly calculate the level in the bottle and is a reliable way of preventing the bottles from being overfilled.



You can go to the Setup program either via the overview under "Select sampling program" or via the path "Menu/Setup/Sampling programs".

Path: Menu/Setup/Sampling programs

Function	Options	Info
Current program:	Read only	The last sampling program to be created or used is displayed.
Status:	Read only	Display "Active": The sampling program has been started and the device takes a sample as per the set parameters. Display "Inactive": No sampling program has been started, or a program that was running has been paused.
► Setup program		
New		A list of all the programs created is displayed. For this reason, it is often helpful to add a "B" for Basic in the program name.
 Program 1, which is supplied with the device, is displayed, as is a list of all the programs already created (Basic, Standard or Advanced programs). You can either create a new program or select an existing one. You can edit, delete, start or duplicate an existing program. If you are creating a new program, select the Basic, Standard or Advanced program type.		
► Basic		
Program name	Customized text	Use a distinct name for your sampling program. The program name can be up to 16 characters long.
Bottle configuration	Choice of all possible bottle combinations Options for CSF48: - 1x - PE direct distribution - 2x - PE direct distribution - 4x - PE direct distribution - 4x - glass direct distribution - 12x - PE direct distribution - 12x - PE/glass distributor plate - 24x - PE direct distribution - 24x - PE/glass distributor plate - 6x+1x - PE/glass distributor plate - 6x+2x - PE+PE distributor plate - 6x+2x - PE+glass distributor plate - 12x+1x - PE/glass distributor plate - 12x+2x - PE+PE distributor plate - 12x+2x - PE+glass distributor plate - 12x+6x PE direct distribution - 12x+6x PE/glass distributor plate	The ordered bottle configuration is preset or the configuration selected in the setup is displayed.
Bottle volume	0 to 100000 ml Factory setting 30000 ml	Set the bottle volume. The preset value depends on the bottle configuration configured. The bottle volume is always 30 l for individual containers.  In the case of asymmetric distribution, e.g. 6 x 3 l + 2 x 13 l, you can set the bottle volume on the left and right in the menu items that follow.

Path: Menu/Setup/Sampling programs

Function	Options	Info
Sampling mode	Options ■ Time paced CTCV ■ Flow paced VTCV ■ Time/flow paced CTVV Factory setting Time paced CTCV	The following functions depend on the option selected. These versions are illustrated individually in the following section to provide a clearer understanding of the options. Time paced CTCV: A constant sampling volume is taken at steady intervals. Flow paced VTCV: A constant sampling volume is taken at variable intervals. Time/flow paced CTVV (only for version with peristaltic pump): A variable sampling volume is taken at steady intervals.

4.2.1 Settings with a time-paced Basic program

Settings with the Basic program type with 1 bottle

Sampling mode = "Time paced CTCV"

Path: Menu/Setup/General settings

Function	Options	Info
Sampling interval	1 to 5999 min Factory setting 10 min	Set the sampling interval.
Dosing volume (for version with vacuum pump) Sampling volume (for version with peristaltic pump)	Vacuum pump: 20 to 350 ml Peristaltic pump: 10 to 10000 ml or maximum bottle volume Factory setting Vacuum pump: 200 ml Peristaltic pump: 100 ml	Set the dosing volume or the sampling volume.  The volume is taken from the setup in the version with a vacuum pump.
Multiplier (only for version with vacuum pump)	1 to 10 Factory setting 1	You can change the sampling volume using the multiplier. For example, if the dosing volume is set to 200 ml, set the multiplier to 2 for a sampling volume of 400 ml. 2 samples are taken in succession when sampling.
Samples per bottle	1 to 9999 Factory setting 1	Set the number of samples.

Path: Menu/Setup/General settings

Function	Options	Info
Start condition	Options ■ Immediate ■ Date/time Factory setting Immediate	The sampling program can be started either immediately or at a specific, configurable time.
If Start condition Date/time is selected:		
Start date	01.01.2000 to 31.12.2099 Factory setting DD.MM.YYYY	Set the start date for the sampling program. The format depends on the option configured under general settings.
Start time	00:00:00 to 23:59:59 Factory setting HH:MM:SS (24h)	Set the time when the sampling program is started. The format depends on the option configured under general settings.
Stop condition	Options ■ Program end ■ Continuous Factory setting Program end	Program end: The device stops sampling automatically once it has run through the set program. Continuous: The device runs through the set program continuously in an infinite loop. Do not forget to empty the bottles.

Settings with the Basic program type with multiple bottles

Sampling mode = "Time paced CTCV"

Path: Menu/Setup/General settings

Function	Options	Info
Sampling interval	1 to 5999 min Factory setting 10 min	Set the sampling interval.
Dosing volume (for version with vacuum pump) Sampling volume (for version with peristaltic pump)	Vacuum pump: 20 to 350 ml Peristaltic pump: 10 to 10000 ml or maximum bottle volume Factory setting Vacuum pump: 200 ml Peristaltic pump: 100 ml	Set the dosing volume or the sampling volume.  The volume is taken from the setup in the version with a vacuum pump.
Multiplier (only for version with vacuum pump)	1 to 10 Factory setting 1	You can change the sampling volume using the multiplier. For example, if the dosing volume is set to 200 ml, set the multiplier to 2 for a sampling volume of 400 ml. 2 samples are taken in succession when sampling.

Path: Menu/Setup/General settings

Function	Options	Info
Bottle change mode	Options ■ Number of samples ■ Time Factory setting Number of samples	The bottle is changed either after a specific number of samples or after a time.
If Bottle change mode Number of samples is selected:		
Samples per bottle	1 to 9999 Factory setting 1	Set the number of samples.  If the bottle is full beforehand based on the calculated level, the system prevents more samples being added to the bottle. Such samples are logged as failed samples in the program logbook.
If Bottle change mode Time is selected:		
Time interval	00:02 to 99:59 HH:MM Factory setting 01:00 HH:MM	Set the time (in hours and minutes) after which the system should change to the next bottle.
Multiple bottles	0 to 23  The configuration options depend on the current number of bottles Factory setting 0	Multiple bottles: "Simultaneous" transfer of two samples to separate bottles.
Bottle synchronization	Options ■ None ■ 1. bottle change time ■ 1. Time of change + bottle number Factory setting 1. bottle change time	None: The time of sampling and bottle change are not synchronized. 1. bottle change time: Sampling starts with the first bottle. 1. Time of change + bottle number: A specific filling time is assigned to every bottle.
Start condition	Options ■ Immediate ■ Date/time Factory setting Immediate	The sampling program can be started either immediately or at a specific, configurable time.
If Start condition Date/time is selected:		
Start date	01.01.2000 to 31.12.2099 Factory setting DD.MM.YYYY	Set the start date for the sampling program. The format depends on the option configured under general settings.

Path: Menu/Setup/General settings

Function	Options	Info
Start time	00:00:00 to 23:59:59 Factory setting HH:MM:SS (24h)	Set the time when the sampling program is started. The format depends on the option configured under general settings.
Stop condition	Options ■ Program end ■ Continuous Factory setting Program end	Program end: The device stops sampling automatically once it has run through the set program. Continuous: The device runs through the set program continuously in an infinite loop. Do not forget to empty the bottles. The bottle level is reset once a program loop has been run through.

4.2.2 Settings with a flow-paced Basic program**Settings with the Basic program type with 1 bottle**

Sampling mode = "Flow paced VTCV"

Path: Menu/Setup/General settings

Function	Options	Info
Flowmeter input	Options ■ No flow input configured ■ Binary input S:x ■ Current input S:x Factory setting No flow input configured	Select the flow input. The binary input or the current input must be configured for this function. Only the inputs configured as a flow input are displayed.
Sampling interval	1.000 to 9999.000 m ³ Factory setting 10.000 m ³	Set the sampling interval. The unit and the number of decimal places are displayed as configured under Setup/Inputs.
Dosing volume (for version with vacuum pump) Sampling volume (for version with peristaltic pump)	Vacuum pump: 20 to 350 ml Peristaltic pump: 10 to 10000 ml Factory setting Vacuum pump: 200 ml Peristaltic pump: 100 ml	Set the dosing volume or the sampling volume.  In the version with a vacuum pump, the volume is taken from the setup and cannot be edited.
Multiplier (only for version with vacuum pump)	1 to 10 Factory setting 1	You can change the sampling volume using the multiplier. For example, if the dosing volume is set to 200 ml, set the multiplier to 2 for a sampling volume of 400 ml. 2 samples are taken in succession when sampling.

Path: Menu/Setup/General settings

Function	Options	Info
Samples per bottle	1 to 9999 Factory setting 1	Set the number of samples.
Start condition	Options ■ Immediate ■ Date/time Factory setting Immediate	The sampling program can be started either immediately or at a specific, configurable time.
If Start condition Date/time is selected:		
Start date	01.01.2000 to 31.12.2099 Factory setting DD.MM.YYYY	Set the start date for the sampling program. The format depends on the option configured under general settings.
Start time	00:00:00 to 23:59:59 Factory setting HH:MM:SS (24h)	Set the time when the sampling program is started. The format depends on the option configured under general settings.
Stop condition	Options ■ Program end ■ Continuous Factory setting Program end	Program end: The device stops sampling automatically once it has run through the set program. Continuous: The device runs through the set program continuously in an infinite loop. Do not forget to empty the bottles.

Settings with the Basic program type with multiple bottles

Sampling mode = "Flow paced VTCV"

Path: Menu/Setup/General settings

Function	Options	Info
Flowmeter input	Options ■ No flow input configured ■ Binary input S:x ■ Current input S:x Factory setting No flow input configured	Select the flow input. The binary input or the current input must be configured for this function. Only the inputs configured as a flow input are displayed.
Sampling interval	1.000 to 9999.000 m ³ Factory setting 10.000 m ³	Set the sampling interval. The unit and the number of decimal places are displayed as configured under Setup/Inputs.

Path: Menu/Setup/General settings

Function	Options	Info
Dosing volume (for version with vacuum pump) Sampling volume (for version with peristaltic pump)	Vacuum pump: 20 to 350 ml Peristaltic pump: 10 to 10000 ml Factory setting Vacuum pump: 200 ml Peristaltic pump: 100 ml	Set the dosing volume or the sampling volume.  In the version with a vacuum pump, the volume is taken from the setup and cannot be edited.
Multiplier (only for version with vacuum pump)	1 to 10 Factory setting 1	You can change the sampling volume using the multiplier. For example, if the dosing volume is set to 200 ml, set the multiplier to 2 for a sampling volume of 400 ml. 2 samples are taken in succession when sampling.
Bottle change mode	Options ■ Number of samples ■ Time Factory setting Number of samples	The bottle is changed either after a specific number of samples or after a time.
If Bottle change mode Number of samples is selected:		
Samples per bottle	1 to 9999 Factory setting 1	Set the number of samples.
If Bottle change mode Time is selected:		
Time interval	00:02 to 99:59 HH:MM Factory setting 01:00 HH:MM	Set the time (in hours and minutes) after which the system should change to the next bottle.
Multiple bottles	0 to 23  The configuration options depend on the current number of bottles. Factory setting 0	Multiple bottles: "Simultaneous" transfer of two samples to separate bottles.
Bottle synchronization	Options ■ None ■ 1. bottle change time ■ 1. Time of change + bottle number Factory setting 1. bottle change time	None: The time of sampling and bottle change are not synchronized. 1. bottle change time: Sampling starts with the first bottle. 1. Time of change + bottle number: A specific filling time is assigned to every bottle.

Path: Menu/Setup/General settings

Function	Options	Info
Start condition	Options ■ Immediate ■ Date/time Factory setting Immediate	The sampling program can be started either immediately or at a specific, configurable time.
If Start condition Date/time is selected:		
Start date	01.01.2000 to 31.12.2099 Factory setting DD.MM.YYYY	Set the start date for the sampling program. The format depends on the option configured under general settings.
Start time	00:00:00 to 23:59:59 Factory setting HH:MM:SS (24h)	Set the time when the sampling program is started. The format depends on the option configured under general settings.
Stop condition	Options ■ Program end ■ Continuous Factory setting Program end	Program end: The device stops sampling automatically once it has run through the set program. Continuous: The device runs through the set program continuously in an infinite loop. Do not forget to empty the bottles.

4.2.3 Settings for the time/flow-paced Basic program (only for version with peristaltic pump)

Settings with the Basic program type with 1 bottle

Sampling mode = "Time/flow paced CTVV"

Path: Menu/Setup/General settings

Function	Options	Info
Sampling volume input	Options ■ No flow input configured ■ Binary input S:x ■ Current input S:x Factory setting No flow input configured	Select the sampling volume input. The binary input or the current input must be configured for this function. Only the inputs configured as a sampling volume input are displayed.
Sampling interval	1 to 5999 min Factory setting 10 min	Set the sampling interval in minutes.

Path: Menu/Setup/General settings

Function	Options	Info
If Binary input is selected for the sampling volume input:		
Sampling volume / pulse	10 to 1000 ml or maximum bottle volume (depending on what is smaller) Factory setting 20 ml	Set what sampling volume should be grabbed per pulse.
If Current input is selected for the sampling volume input:		
Sampling volume 20mA	10 to 10000 ml or maximum bottle volume (depending on what is smaller) Factory setting 100 ml	Set what sampling volume should be grabbed at 20 mA.
Flow calculation	Options ■ Current ■ Average flow Factory setting Current	Current: The current flow is converted to the sampling volume at the time of sampling. Average flow: The system calculates the mean between the last and the current sample and sets the sampling volume accordingly.
Samples per bottle	1 to 9999 Factory setting 1	Set the number of samples.
Start condition	Options ■ Immediate ■ Date/time Factory setting Immediate	The sampling program can be started either immediately or at a specific, configurable time.
If Start condition Date/time is selected:		
Start date	01.01.2000 to 31.12.2099 Factory setting DD.MM.YYYY	Set the start date for the sampling program. The format depends on the option configured under general settings.
Start time	00:00:00 to 23:59:59 Factory setting HH:MM:SS (24h)	Set the time when the sampling program is started. The format depends on the option configured under general settings.
Stop condition	Options ■ Program end ■ Continuous Factory setting Program end	Program end: The device stops sampling automatically once it has run through the set program. Continuous: The device runs through the set program continuously in an infinite loop. Do not forget to empty the bottles.

Settings with the Basic program type with multiple bottles

Sampling mode = "Time/flow paced CTVV"

Path: Menu/Setup/General settings

Function	Options	Info
Sampling volume input	Options ■ No flow input configured ■ Binary input S:x ■ Current input S:x Factory setting No flow input configured	Select the sampling volume input. The binary input or the current input must be configured for this function. Only the inputs configured as a sampling volume input are displayed.
Sampling interval	1 to 5999 min Factory setting 10 min	Set the sampling interval in minutes.
If Binary input is selected for the sampling volume input:		
Sampling volume / pulse	10 to 1000 ml or maximum bottle volume (depending on what is smaller) Factory setting 20 ml	Set what sampling volume should be grabbed per pulse.
If Current input is selected for the sampling volume input:		
Sampling volume 20mA	10 to 10000 ml or maximum bottle volume (depending on what is smaller) Factory setting 100 ml	Set what sampling volume should be grabbed at 20 mA.
Flow calculation	Options ■ Current ■ Average flow Factory setting Current	Current: The current flow is converted to the sampling volume at the time of sampling. Average flow: The system calculates the mean between the last and the current sample and sets the sampling volume accordingly.
Bottle change mode	Options ■ Number of samples ■ Time Factory setting Number of samples	The bottle is changed either after a specific number of samples or after a time.
If Bottle change mode Number of samples is selected:		
Samples per bottle	1 to 9999 Factory setting 1	Set the number of samples.

Path: Menu/Setup/General settings

Function	Options	Info
If Bottle change mode Time is selected:		
Time interval	00:02 to 99:59 HH:MM Factory setting 01:00 HH:MM	Set the time (in hours and minutes) after which the system should change to the next bottle.
Multiple bottles	0 to 23  The configuration options depend on the current number of bottles Factory setting 0	Multiple bottles: "Simultaneous" transfer of two samples to separate bottles.
Start condition	Options ■ Immediate ■ Date/time Factory setting Immediate	The sampling program can be started either immediately or at a specific, configurable time.
If Start condition Date/time is selected:		
Start date	01.01.2000 to 31.12.2099 Factory setting DD.MM.YYYY	Set the start date for the sampling program. The format depends on the option configured under general settings.
Start time	00:00:00 to 23:59:59 Factory setting HH:MM:SS (24h)	Set the time when the sampling program is started. The format depends on the option configured under general settings.
Stop condition	Options ■ Program end ■ Continuous Factory setting Program end	Program end: The device stops sampling automatically once it has run through the set program. Continuous: The device runs through the set program continuously in an infinite loop. Do not forget to empty the bottles.

4.3 Program types: Standard and Advanced

A Standard program can comprise a maximum of 5 subprograms. An Advanced program can comprise a maximum of 24 subprograms. These subprograms can be run simultaneously or consecutively.

Each event subprogram can consist of up to 3 conditions.

As the device contains dual bottle trays, you can assign a program easily, and easily detect a change in the program.

4.3.1 Settings for the Standard program

Path: Menu/Setup/Sampling programs

Function	Options	Info
► Setup program		
New		A list of all the programs created is displayed. For this reason, it is often helpful to add an "S" for Standard in the program name.
► Standard		
Program name	Customized text	Use a distinct name for your sampling program. The program name can be up to 16 characters long.
Bottle configuration	Choice of all possible bottle combinations	The ordered bottle configuration is preset or the configuration selected in the setup is displayed.
Bottle volume	0 to 100000 ml Factory setting 30000 ml	Set the bottle volume. The preset value depends on the bottle configuration configured. The bottle volume is always 30 l for individual containers.  In the case of asymmetric distribution, e.g. 6 x 3 l + 2 x 13 l, you can set the bottle volume on the left and right in the menu items that follow.
Start condition	Options ■ Immediate ■ Date/time ■ Volume Factory setting Immediate	The sampling program can be started either immediately, at a specific, configurable time, or when a certain totalized flow is reached.
If Start condition Date/time is selected:		
Start date	01.01.2000 to 31.12.2099 Factory setting DD.MM.YYYY	Set the start date for the sampling program. The format depends on the option configured under general settings.
Start time	00:00:00 to 23:59:59 Factory setting HH:MM:SS (24h)	Set the time when the sampling program is started. The format depends on the option configured under general settings.

Path: Menu/Setup/Sampling programs

Function	Options	Info
If Start condition Volume is selected:		
Start volume input	Options ■ No flow input configured ■ Binary input S:x ■ Current input S:x Factory setting No flow input configured	Select the start volume input. The binary input or the current input must be configured for this function. Only the inputs configured as a start volume input are displayed.
Start flow sum	1.000 to 9999.000 m ³ Factory setting 10.000 m ³	Set the start volume.
Stop condition	Options ■ Program end ■ Continuous ■ Date/time Factory setting Program end	Program end: The device stops sampling automatically once it has run through the set program. Continuous: The device runs through the set program continuously in an infinite loop. Do not forget to empty the bottles. Date/time: The device stops the set program at a specific time.
If Stop condition Date/time is selected:		
Stop date	01.01.2000 to 31.12.2099 Factory setting DD.MM.YYYY	Set the stop date for the sampling program. The format depends on the option configured under general settings.
Stop time	00:00:00 to 23:59:59 Factory setting HH:MM:SS (24h)	Set the time when the sampling program is stopped. The format depends on the option configured under general settings.
► Setup subprogram		
New		
Programpart		Use a distinct name for your subprogram. The program name can be up to 16 characters long.
Sampling mode	Options ■ Time paced CTCV ■ Flow paced VTCV ■ Time/flow paced CTVV Factory setting Time paced CTCV	Time paced CTCV: A constant sampling volume is taken at steady intervals. Flow paced VTCV: A constant sampling volume is taken at variable intervals. Time/flow paced CTVV (only for version with peristaltic pump): A variable sampling volume is taken at steady intervals.
 The settings that depend on the sampling mode are listed in the "Program type: Basic" section.		

Path: Menu/Setup/Sampling programs

Function	Options	Info
Enable subprogram	Options ■ Immediate ■ Individual dates ■ Multiple date ■ Interval Factory setting Immediate	Immediate: The subprogram is enabled immediately. Individual dates: Set the start and stop dates for enabling the subprogram. Multiple date: Set the start time, activity time and repeat interval for the subprogram. Interval: Set the start time, activity time and inactivity time for the subprogram.
If Individual dates is selected for "Enable subprogram":		
► Individual dates Set the start and stop times for the subprogram. Enter a new date via "INSERT". Delete a date via "DELETE". You can assign a maximum of 25 start and stop dates.		
If Multiple date is selected for "Enable subprogram":		
Start time	Options ■ No delay ■ Date/Time Factory setting No delay	No delay: The subprogram is started when the program is enabled. Date/Time: Set the start date and start time for enabling the subprogram.
Activity time	00:01 to 99:59 HH:MM Factory setting 00:01 HH:MM	Specify how long the subprogram should be active in hours and minutes.
► Multiple date		
Repetition mode	Options ■ Daily interval ■ Weekly interval ■ Days of week Factory setting Daily interval	Daily interval: Specify whether the subprogram should be repeated every day. Weekly interval: Specify whether the subprogram should be repeated every week. Days of week: Specify whether the subprogram should be repeated on certain days of the week. —> Select the days of the week in the subsequent menu item.
Repetition interval (only for Daily interval and Weekly interval)	1 to 999 Factory setting 1	Specify for how many days or weeks the subprogram should be active. Example: Repetition type: daily interval Repetition interval = 2 From the "start at a particular time" on the subprogram will be activated every second day.

Path: Menu/Setup/Sampling programs

Function	Options	Info
If Interval is selected for "Enable subprogram":		
Start time	Options ■ No delay ■ Date/Time Factory setting Date/Time	No delay: The subprogram is started when the program is enabled. Date/Time: Set the start date and start time for enabling the subprogram.
Start date	01.01.2000 to 31.12.2099 Factory setting DD.MM.YYYY	Set the start date for the 1st interval. The format depends on the option configured under general settings.
Start time	00:00:00 to 23:59:59 Factory setting HH:MM:SS (24h)	Set the time for the 1st interval. The format depends on the option configured under general settings.
Activity time	00:01 to 99:59 HH:MM Factory setting 00:01 HH:MM	Specify how long the subprogram should be active in hours and minutes. The subprogram always begins with an activation.
Inactivity time	00:01 to 99:59 HH:MM Factory setting 00:01 HH:MM	Specify how long the subprogram should be inactive in hours and minutes.
Sample at enable	Options ■ No ■ Yes Factory setting Yes	Specify whether the first sample should be taken directly when the subprogram is enabled. For example, with intervals, a sample is taken at the start of every activation interval.
Sample at disable	Options ■ No ■ Yes Factory setting No	Specify whether a sample should be taken when the subprogram is disabled. For example, with intervals, a sample is taken at the end of every activation interval.
Use "SAVE" to save the subprogram setup. Then press "ESC" to return to the main program. A prompt to save the program appears if you have not yet saved the subprogram. You can avoid saving the program by pressing "ESC".		
Bottle assignment (only possible with multiple bottles)  This menu item appears when more than one bottle is available.	Options ■ No bottle assignment ■ Dynamical bottle assignment ■ Statical bottle assignment Factory setting Dynamical bottle assignment	No bottle assignment: Each subprogram fills the same bottle until the bottle is full. All the subprograms then change to the next bottle. Dynamical bottle assignment: When the subprogram changes, the system switches to the next bottle. Statical bottle assignment: A table can be used to assign a subprogram to each bottle.
 Via the "Bottle change" menu item, the bottle change can be configured after a certain time or number of samples if more than 1 bottle is available and either dynamic or static bottle assignment has been selected.		

Path: Menu/Setup/Sampling programs

Function	Options	Info
If Bottle assignment Statical bottle assignment is selected:		
▶ Bottle assignment table		
Select a bottle and assign it a subprogram.		

4.3.2 Programming example: Program switchover

The following example explains how to program a program change with flow-paced sampling as the daily average sample from Monday to Friday and time-paced sampling to a composite container on Saturday and Sunday.

Path: Menu/Setup/Sampling programs/Setup program/New

Function	Entry for sample program
▶ Standard	
Program name	TDVT 6+20
Bottle configuration	6x + 1x
Bottle volume left	3000 ml
Bottle volume right	20000 ml
Start condition	Date/time
Start date	DD.MM.YYYY e.g. 03.06.2010
Start time	HH:MM:SS e.g. 12:00:00
Stop condition	Continuous
▶ Setup subprogram	
Programpart	MO - FR
"SAVE" - saves the "MO - FR" subprogram	
▶ Setup subprogram	
Programpart	SAT - SUN
"SAVE" - saves the "SAT - SUN" subprogram	
"ESC" - the main program is displayed	
Bottle assignment	Statical bottle assignment
▶ Setup subprogram: MO - FR	
▶ Edit	
Sampling mode	Flow paced VTCV

Path: Menu/Setup/Sampling programs/Setup program/New

Function	Entry for sample program
Flowmeter input	Current input S:1
Sampling interval	1000 m ³
Sampling volume	80 ml
Bottle change mode	Time
Time interval	04:00
Multiple bottles	0
Enable subprogram	Multiple date
Start time	No delay
Activity time	24:00
► Multiple date	
Repetition mode	Days of week
Monday	Yes
Tuesday	Yes
Wednesday	Yes
Thursday	Yes
Friday	Yes
Saturday	No
Sunday	No
Sample at enable	Yes
Sample at disable	No
"SAVE" - saves the "MO - FR" subprogram	
"ESC" - "ESC"	
► Setup subprogram: SAT - SUN	
► Edit	
Sampling mode	Time paced CTCV
Sampling interval	15 min
Sampling volume	100 ml
Bottle change mode	Time
Time interval	48:00
Multiple bottles	0
Enable subprogram	Multiple date

Path: Menu/Setup/Sampling programs/Setup program/New

Function	Entry for sample program
Start time	No delay
Activity time	24:00
► Multiple date	
Repetition mode	Days of week
Monday	No
Tuesday	No
Wednesday	No
Thursday	No
Friday	No
Saturday	Yes
Sunday	Yes
Sample at enable	Yes
Sample at disable	No
"SAVE" - saves the "SAT - SUN" subprogram	
"ESC" - "ESC"	
► Bottle assignment table	
Bottle 1 ... Bottle 6	MO - FR
Bottle 7	SAT - SUN

Press the "SAVE" soft key to save the program. In the overview, you can start the program created under "Select sampling program".

4.3.3 Settings for the Advanced program

Path: Menu/Setup/Sampling programs

Function	Options	Info
► Setup program		
New		A list of all the programs created is displayed. For this reason, it is often helpful to add an "A" for Advanced in the program name.
► Advanced		

Path: Menu/Setup/Sampling programs

Function	Options	Info
Program name	Customized text	Use a distinct name for your sampling program. The program name can be up to 16 characters long.
Bottle configuration	Choice of all possible bottle combinations	The ordered bottle configuration is preset or the configuration selected in the setup is displayed.
Bottle volume	0 to 100000 ml Factory setting 30000 ml	Set the bottle volume. The preset value depends on the bottle configuration configured. The bottle volume is always 30 l for individual containers.  In the case of asymmetric distribution, e.g. 6 x 3 l + 2 x 13 l, you can set the bottle volume on the left and right in the menu items that follow.
Start condition	Options ■ Immediate ■ Date/time ■ Volume ■ External start ■ External duration Factory setting Immediate	Immediate The sampling program is started immediately. Date/time The sampling program is started at a specific time that can be configured. Volume The sampling program is started when a certain totalized flow is reached. External start The sampling program is active as long as the configured input has the corresponding level. External duration The sampling program is started by a pulse at the configured binary input.
If Start condition Date/time is selected:		
Start date	01.01.2000 to 31.12.2099 Factory setting DD.MM.YYYY	Set the start date for the sampling program. The format depends on the option configured under general settings.
Start time	00:00:00 to 23:59:59 Factory setting HH:MM:SS (24h)	Set the time when the sampling program is started. The format depends on the option configured under general settings.
If Start condition Volume is selected:		
Start volume input	Options ■ No flow input configured ■ Binary input S:x ■ Current input S:x Factory setting No flow input configured	Select the start volume input. The binary input or the current input must be configured for this function. Only the inputs configured as a start volume input are displayed.
Start flow sum	1.000 to 9999.000 m ³ Factory setting 10.000 m ³	Set the starting volume.

Path: Menu/Setup/Sampling programs

Function	Options	Info
If the Start condition selected is External start :		
Start signal input	Options - No program start input configured - Binary input S:x Factory setting No program start input configured	Select the program start input. The binary input must be configured for this function. Only the inputs configured as a program start input are displayed.
If the Start condition selected is External duration :		
Start signal input	Options - No program duration input configured - Binary input S:x Factory setting No program duration input configured	Select the program duration input. The binary input must be configured for this function. Only the inputs configured as a program duration input are displayed.
Stop condition (not for External start)	Options - Program end - Continuous - Date/time - External signal Factory setting Program end	Program end: The device stops sampling automatically once it has run through the set program. Continuous: The device runs through the set program continuously in an infinite loop. Do not forget to empty the bottles. Date/time: The device stops the set program at a specific time. External signal: The device stops the set program if a pulse is sent to a binary input configured accordingly.
If Stop condition Date/time is selected:		
Stop date	01.01.2000 to 31.12.2099 Factory setting DD.MM.YYYY	Set the stop date for the sampling program. The format depends on the option configured under general settings.
Stop time	00:00:00 to 23:59:59 Factory setting HH:MM:SS (24h)	Set the time when the sampling program is stopped. The format depends on the option configured under general settings.
If Stop condition External signal is selected:		
Stop signal input	Options - No program stop input configured - Binary input S:x Factory setting No program stop input configured	Select the program stop input. The binary input must be configured for this function. Only the inputs configured as a program stop input are displayed.
► Setup subprogram		

Path: Menu/Setup/Sampling programs

Function	Options	Info
New		
Programpart		Use a distinct name for your subprogram. The program name can be up to 16 characters long.
Sampling mode	Options ■ Time paced CTCV ■ Flow paced VTCV ■ Time/flow paced CTVV ■ Single sample ■ Sampling table ■ External signal Factory setting Time paced CTCV	Time paced CTCV: A constant sampling volume is taken at steady intervals. Flow paced VTCV: A constant sampling volume is taken at variable intervals. Time/flow paced CTVV (only for version with peristaltic pump): A variable sampling volume is taken at steady intervals. Single sample: The device takes a single sample with a specific volume. Sampling table: The time and the sampling volume is assigned to a certain bottle in the sampling table. External signal: A sample is taken when an external signal is received.
 The settings that depend on the sampling mode (time-paced, flow-paced and time/flow-paced sampling) are listed in the "Program type: Basic" section.		
If Sampling mode Single sample is selected:		
Dosing volume (for version with vacuum pump) Sampling volume (for version with peristaltic pump)	Vacuum pump: 20 to 350 ml Peristaltic pump: 10 to 10000 ml or maximum bottle volume Factory setting Vacuum pump: 200 ml Peristaltic pump: 100 ml	Set the dosing volume or the sampling volume.  The volume is taken from the setup in the version with a vacuum pump.
If Sampling mode Sampling table is selected:		
► Sampling table Assign the time and sampling volume to a certain bottle. Add a new entry via "INSERT". Delete an entry via "DELETE". You can make a maximum of 24 entries.		
Example: - Bottle: 1 - Bottle: 2 ...	- Delta (=waiting time): 01:00:00 - Delta (=waiting time): 00:10:00	- Volume: 100 ml - Volume: 100 ml

Path: Menu/Setup/Sampling programs

Function	Options	Info
1. Sampling one hour after program start: 100 ml in bottle 1 2. Sampling 10 minutes later: 100 ml in bottle 2 The sampling table indicates: After the defined "Delta time" (column 2) the volume of column 3 will be dosed into the bottle of column 1.		
If Sampling mode External signal is selected:		
Sampling signal input	Options —> Binary input 1 or 2	Select the input for the sampling signal. The binary input must be configured for this function. Only the configured inputs are displayed.
Enable subprogram	Options ■ Immediate ■ Individual dates ■ Multiple date ■ Interval ■ Event ■ External start Factory setting Immediate	Immediate: The subprogram is enabled immediately. Individual dates: Set the start and stop dates for enabling the subprogram. Multiple date: Set the start time, activity time and repeat interval for the subprogram. Interval: Set the start time, activity time and inactivity time for the subprogram. Event: The subprogram is enabled by an event. Up to 3 measuring signals are linked to form a start signal using And./Or logic. External start: The subprogram is enabled by a pulse at a binary input configured accordingly.
 The settings (Immediate, Individual dates, Multiple date and Interval) that depend on the activation of the subprogram are listed in the "Program type: Standard" section.		
If Event is selected for "Enable subprogram":		
Start time	Options ■ No delay ■ Date/Time Factory setting No delay	No delay: The subprogram is started when the program is enabled. Date/Time: Set the start date and start time for enabling the subprogram.
► Activation event		
Number of events	Options ■ 1 ■ 2 ■ 3 Factory setting 1	Specify how many measuring inputs (1-3) you want to link to generate an activation signal.

Path: Menu/Setup/Sampling programs

Function	Options	Info
► Event Editor 1  If you have more than one event editor, the "Event editor" menu item appears often. Use the "Link" menu item to configure the logical link between the signals.		
Source of data	Options ■ None ■ Binary input S:x ■ Current input S:x ■ Temperature input (depending on the version and sensor) Factory setting None	Select the input via which the activation event is to be output. The inputs are configured in the "Setup/Inputs" menu. The binary inputs are only visible if they have been configured accordingly (rainfall or flow).
Measured value	Options (depends on sensor/data source) ■ None ■ Totalized flow Factory setting None	
Operating mode	Options ■ Upper limit ■ Lower limit ■ Within range ■ Out of range ■ Rate of change Factory setting Upper limit	Type of limit value monitoring: ■ Limit value overshoot or undershoot ■ Measured value within or outside a range ■ Rate of change
Limit value	Range of adjustment and factory setting Depends on the measured value	<i>Operating mode="Above limit check" or "Below limit check"</i>
■ The event is triggered if the limit value + hysteresis is exceeded for the switch-on duration. ■ The event is reset again if the limit value - hysteresis is undershot for the duration of the switch-off delay at least.		
Range lower value	Range of adjustment and factory setting Depends on the measured value	<i>Operating mode="In range check" or "Out of range check"</i>
Range upper value		
■ The event is triggered if the range lower value + hysteresis is exceeded for the switch-on duration. ■ The event is reset again if the range upper value - hysteresis is undershot for the duration of the switch-off delay at least.		
Hysteresis	Range of adjustment and factory setting Depends on the measured value	The hysteresis is the difference between the switch-on point and the switch-off point if values, which cause the limit switch to pick up, become closer or move further apart. It is needed to ensure a stable switching behavior.
Start delay	0 to 9999 s	Synonyms: pick-up and drop-out delay
Release delay	Factory setting 0 s	

Path: Menu/Setup/Sampling programs

Function	Options	Info
Delta value	Range of adjustment and factory setting Depends on the measured value	<i>Operating mode= "Change rate"</i> The event is triggered if the measured value changes by at least the delta value (both positive and negative) within the set delta time. The event is deleted as soon as the rate of change is lower than the set value and the auto confirmation time has elapsed.
Delta time	00:01 to 23:59 Factory setting 01:00	
Auto Confirm	00:01 to 23:59 Factory setting 00:01	
If External start is selected for "Enable subprogram":		
Activation input	Options ■ No subprogram start input configured ■ Binary input S:x Factory setting No subprogram start input configured	Select the input for start of the subprogram. The binary input must be configured for this function. Only the configured inputs are displayed.
Sample at enable (not for single sample and sampling table)	Options ■ No ■ Yes Factory setting Yes	Specify whether the first sample should be taken directly when the subprogram is enabled.
Sample at disable (not for single sample and sampling table also not for "Immediate" and event)	Options ■ No ■ Yes Factory setting No	Specify whether a sample should be taken when the subprogram is disabled.
Synchronize samplings	Options ■ To subprogram start ■ To clock Factory setting To subprogram start	To subprogram start The intervals defined in the sampling mode are enabled when the subprogram is started. To clock The intervals defined in the sampling mode are enabled after a specific time. For example, if 30 min is entered this means that the interval is only activated at a time of xx:30. —> You configure this time in the "Offset synchronisation" menu item.
Use "SAVE" to save the subprogram setup. Then press "ESC" to return to the main program.		

Path: Menu/Setup/Sampling programs

Function	Options	Info
Bottle assignment (only possible with multiple bottles)  This menu item appears when more than one bottle is available.	Options ■ No bottle assignment ■ Dynamical bottle assignment ■ Statical bottle assignment Factory setting No bottle assignment	No bottle assignment: Each subprogram fills the same bottle until the bottle is full. All the subprograms then change to the next bottle. Dynamical bottle assignment: When the subprogram changes, the system switches to the next bottle. Statical bottle assignment: A table can be used to assign a subprogram to each bottle.
 Via the "Bottle change" menu item, the bottle change can be configured after a certain time or number of samples if more than 1 subprogram is available and either dynamic or static bottle assignment has been selected.		
If Bottle assignment Statical bottle assignment is selected:		
► Bottle assignment table Select a bottle and assign it a subprogram.		

4.3.4 Programming example: Event program

Event-controlled sampling is only possible for the version with digital sensors with Memosens technology. The following example explains how to program an event program with time-paced sampling into a composite container and time-paced sampling into individual bottles. The composite container is emptied daily.

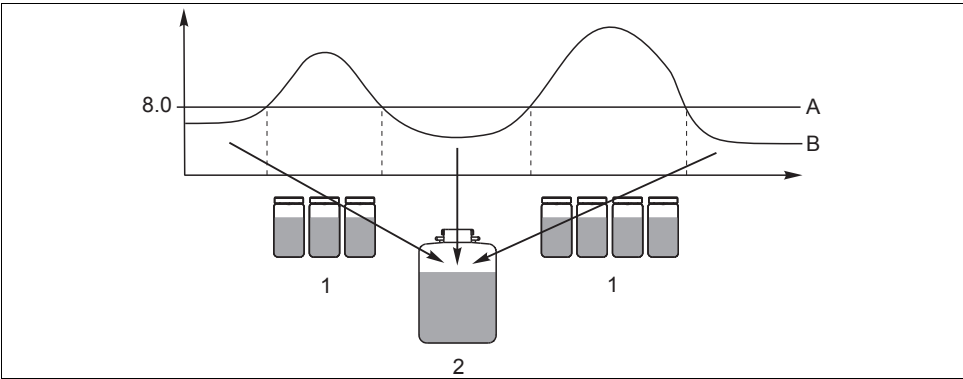


Fig. 8: Event-controlled sampling

- A pH value: 8.0
- B pH value
- 1 Sampling into individual bottles when pH value > 8.0
- 2 Sampling into composite container when pH value < 8.0

Path: Menu/Setup/Sampling programs/Setup program/New

Function	Entry for sample program
► Advanced	
Program name	TDTE 12+20
Bottle configuration	12x + 1x
Bottle volume left	1000 ml
Bottle volume right	2000 ml
Start condition	Immediate
Stop condition	Continuous
Bottle assignment	Statical bottle assignment
► Setup subprogram: New	
Programpart	TD1
Sampling mode	Time paced CTCV
Sampling interval	15 min
Sampling volume	100 ml
Multiple bottles	1
Enable subprogram	Immediate
Sample at enable	Yes
Synchronize samplings	To subprogram start
-> "SAVE" -> "ESC"	
► Setup subprogram: New	
Programpart	EE1
Sampling mode	Time paced CTCV
Sampling interval	6 min
Sampling volume	100 ml
Bottle change mode <i>Only if Bottle assignment = "Statical bottle assignment" is selected in the main program</i>	Number of samples
Samples per bottle	10
Multiple bottles	0
Enable subprogram	Event
Start time	No delay
► Activation event	

Path: Menu/Setup/Sampling programs/Setup program/New

Function	Entry for sample program
Number of events	1
► Event Editor 1	
Source of data	CH1: 1:1 pH glass
Measured value	pH
Operating mode	Upper limit
Limit value	pH 8.00
Hysteresis	pH 0.20
Start delay	0 s
Release delay	0 s
Sample at enable	Yes
Sample at disable	No
Deactivation	Enable invalid
Synchronize samplings	To subprogram start
-> "SAVE" -> "ESC" -> "ESC"	
Bottle assignment	Statical bottle assignment
► Bottle assignment table	
Bottle 1	EE1
...	
Bottle 12	EE1
Bottle 13	TD1
-> "ESC"	

Press the "SAVE" soft key to save the program. In the overview, you can start the program created under "Select sampling program".

4.3.5 Programming example: Limit value-controlled program

The following example explains how to program a limit value-controlled sampling program with flow-paced sampling into individual bottles above the limit value and time-paced sampling into individual bottles below the limit value. When the subprogram changes, the system switches to the next bottle.

Path: Menu/Setup/Sampling programs/Setup program/New

Function	Entry for sample program
► Advanced	
Program name	UVT 12x3
Bottle configuration	12x
Bottle volume	3000 ml
Start condition	Date/time
Start date	DD.MM.YYYY e.g. 03.06.2010
Start time	HH:MM:SS e.g. 12:00:00
Stop condition	Continuous
► Setup subprogram: New	
Programpart	VD1
"SAVE" - saves the "VD1" subprogram	
► Setup subprogram: New	
Programpart	ZD1
"SAVE" - saves the "ZD1" subprogram	
"ESC" - the main program is displayed	
Bottle assignment	Dynamical bottle assignment
► Setup subprogram: VD1	
► Edit	
Sampling mode	Flow paced VTCV
Flowmeter input	Current input S:1 (max. 15 samples/h = 4 min)
Sampling interval	50 m³
Sampling volume	100 ml
Bottle change mode	Time
Time interval	06:00
Multiple bottles	0
Enable subprogram	Event

Path: Menu/Setup/Sampling programs/Setup program/New

Function	Entry for sample program
Start time	No delay
▶ Activation event	
Number of events	1
▶ Event Editor 1	
Source of data	Current input S:1
Measured value	Flow rate
Operating mode	Upper limit
Limit value	155 l/s
Hysteresis	5 l/s
Start delay	0 s
Release delay	0 s
"ESC" - "ESC"	
Sample at enable	Yes
Sample at disable	No
Stop condition	enable invalid
Synchronize samplings	To subprogram start
"SAVE" - "ESC"	
▶ Setup subprogram: ZD 1	
▶ Edit	
Sampling mode	Time paced CTCV
Sampling interval	15 min
Sampling volume	100 ml
Bottle change mode	Time
Time interval	06:00
Multiple bottles	0
Enable subprogram	Event
Start time	No delay
▶ Activation event	
Number of events	1
▶ Event Editor 1	
Source of data	Current input S:1

Path: Menu/Setup/Sampling programs/Setup program/New

Function	Entry for sample program
Measured value	Flow rate
Operating mode	Lower limit
Limit value	150 l/s
Hysteresis	5 l/s
Start delay	0 s
Release delay	0 s
"ESC" - "ESC"	
Sample at enable	Yes
Sample at disable	No
Stop condition	enable invalid
Synchronize samplings	To subprogram start
"SAVE" - "ESC"	

Press the "SAVE" soft key to save the program. In the overview, you can start the program created under "Select sampling program".

5 Information on sensors with the Memosens protocol

The following options are only available for versions with at least one digital sensor with Memosens technology.

Sensors with the Memosens protocol have integrated electronics that save calibration data and other information. The sensor data are automatically communicated to the transmitter when the sensor is connected and are used to calculate the measured value.

Data digital sensors save include:

- Manufacturer data
 - Serial number
 - Order code
 - Date of manufacture
- Calibration data
 - Date of calibration
 - Calibration values
 - Number of calibrations
 - Serial number of the transmitter used to perform the last calibration
- Operating data
 - Date of initial commissioning
 - Hours of operation under extreme operating conditions
 - Sensor monitoring data



The specific data that are recorded and communicated to the transmitter depend on the sensor used. Differences can also occur within a sensor type.

In the case of the CM44x controller, this causes different menu items to be displayed or hidden depending on the sensor connected.

Pay attention to specific information in this manual.

Example:

The amperometric oxygen sensor COS51D cannot be sterilized. For this reason, you will not be able to define limit values for sterilization in the diagnostics settings for this sensor. On the other hand, these menu items are displayed for a sterilizable amperometric sensor, such as COS22D.

6 Inputs: General

An input can be configured in one of two ways:

1. Configuration where a sensor is not connected
 - ▶ Select the appropriate channel.
 - ▶ From the list of sensor types, select the sensor which you want to configure.
 - ▶ Configure the channel as explained in following sections.
 - ▶ Connect the selected sensor type later on.
2. Configuration where a sensor is connected
 - ▶ Configure the channel as explained in following sections.

The following applies when configuring with a sensor:

- Some settings require sensor communication.
You cannot make these settings if a sensor is not connected.
- It is also possible to save a setup and transfer it to another device (see "Data management" in the "General settings" section). This function might be a better option than performing a configuration when a sensor is not connected.

7 Inputs: pH/ORP

7.1 Basic settings

7.1.1 Sensor identification

Path: Menu/Setup/Inputs/<Sensor type>

Function	Options	Info
Channel	Options ■ On ■ Off Factory setting On	On The channel display is switched on in the measuring mode Off The channel is not displayed in the measuring mode, regardless of whether a sensor is connected or not.
Sensor type	Read only (Only available if a sensor is connected)	Connected sensor type
Order code		Order code of the connected sensor

7.1.2 Main value

Path: Menu/Setup/Inputs/pH or ORP

Function	Options	Info
Main value	Options ■ pH (only pH sensor) ■ mV ■ % (only ORP sensor) Factory setting pH (pH sensor) mV (ORP sensor)	Select how the main measured value should be displayed. You can display the main measured value of a pH sensor as a pH value or as a raw value in mV. If using an ORP sensor, here you decide which ORP mode to use: mV or %. Subsequent configuration options depend on the option selected here.

7.1.3 Damping

The damping causes a floating average curve of the measured values over the time specified.

Path: Menu/Setup/Inputs/<Sensor type>

Function	Options	Info
Damping <Sensor type>	0 to 300 s	You specify the damping of the main measured value of the connected sensor and that of the integrated temperature sensor.
Damping temp.	Factory setting 0 s	

7.1.4 Manual hold

Path: Menu/Setup/Inputs/<Sensor type>

Function	Options	Info
Manual hold	Options - On - Off Factory setting Off	On You can use this function to set the channel manually to "Hold". Off No hold

7.2 Extended setup

7.2.1 Temperature and medium compensation (only pH)

Path: Menu/Setup/Inputs/pH/Extended setup

Function	Options	Info
Temp. compensation	Options - Off - Automatic - Manual Factory setting Automatic	Decide how you want to compensate the medium temperature: - Automatically using the temperature sensor of your sensor (ATC) - Manually by entering the medium temperature - Not at all
 This setting only refers to compensation during measurement. You enter the compensation for calibration in the calibration settings.		
Medium comp.	Options - Off 2-point - Table Factory setting Off	Take a sample from the medium and determine its pH value at different temperatures in the lab. Decide whether you want to compensate using two points or several points in a table.
 The dissociation of water changes with increasing temperature. The balance shifts towards the protons; the pH value drops. You can balance out this effect with the "Medium compensation" function.		
Internal buffer <i>(only pH glass)</i>	pH 0 to 14 Factory setting pH 7.00	Only change the value if you are using a sensor with an internal buffer other than pH 7.

7.2.2 Measured value formats

Path: Menu/Setup/Inputs/pH or ORP/Extended setup

Function	Options	Info
Main value format <i>(only pH)</i>	Options ■ #.# ■ #.## Factory setting #.#	Specify the number of decimal places for displaying the main measured value.
Temperature format	Options ■ #.# ■ #.## Factory setting #.#	Select how many decimal places should be used to display the temperature.

7.2.3 Cleaning

Path: Menu/Setup/Inputs/<Sensor type>/Extended setup

Function	Options	Info
Cleaning	Options ■ None ■ Cleaning 1 ■ Cleaning 2 ■ Cleaning 3 ■ Cleaning 4 Factory setting None	Select a cleaning program. This program is executed if: ■ A diagnostics message is present at the channel and ■ A cleaning process has been specified for this message (→ "Inputs/Diagnostics settings/Diag. behavior").

 You define the cleaning programs in the "Setup/Additional functions/Cleaning" menu.

7.2.4 Calibration settings

Stability criteria

You define the permitted measured value fluctuation which must not be exceeded in a certain timeframe during calibration.
If the permitted difference is exceeded, calibration is not permitted and is aborted automatically.

Path: Menu/Setup/Inputs/<Sensor type>/Extended setupCalib. settings

Function	Options	Info
► Stability criteria		
Delta mV	1 to 10 mV Factory setting 1 mV	Permitted measured value fluctuation during calibration
Duration	10 to 60 s Factory setting 20 s	Timeframe within which the permitted range for measured value fluctuation should not be exceeded

Buffer recognition (only pH)

Automatic buffer recognition

To ensure a buffer is detected correctly, the measuring signal may deviate by a maximum of 30 mV from the value stored in the buffer table. This is approx. 0.5 pH at a temperature of 25°C. If both buffers - 9.00 and 9.20 - were used, this would cause the signal intervals to overlap and buffer recognition would not work. For this reason, the device would recognize a buffer with a pH of 9.00 as a pH of 9.20. → Do not use the buffer with a pH of 9.00 for automatic buffer recognition.

Path: Menu/Setup/Inputs/pH/Extended setup/Calib. settings

Function	Options	Info
Temp. compensation	Options ■ Off ■ Automatic ■ Manual Factory setting Automatic	Decide how you want to compensate the buffer temperature: ■ Automatically using the temperature sensor of your sensor (ATC) ■ Manually by entering the buffer temperature ■ Not at all
Temperature <i>Temp. compensation="Manual"</i>	-50 to 250 °C (-58 to 482 °F) Factory setting 25 °C (77 °F)	Specify the buffer temperature.
 This setting only refers to compensation during calibration, not in measuring mode. You perform the compensation in the measuring mode further down in the menu.		
Buffer recognition	Options ■ Fixed ■ Automatic (<i>only pH glass</i>) ■ Manual Factory setting Fixed	Fixed You choose values from a list. This list depends on the setting for "Buffer manufacturer". Automatic (<i>only pH glass</i>) The device recognizes the buffer automatically. The recognition depends on the setting for "Buffer manufacturer". Manual You enter any two buffer values. These must differ in terms of their pH value.

Path: Menu/Setup/Inputs/pH/Extended setup/Calib. settings

Function	Options	Info
Buffer manufacturer	Options ■ Endress+Hauser ■ Ingold/Mettler ■ DIN 19266 ■ DIN 19267 ■ Merck/Riedel ■ Hamilton ■ Special buffer Factory setting Endress+Hauser	Temperature tables are stored internally in the unit for the following pH values: ■ Endress+Hauser 2,00 / 4,00 / 7,00 / (9,00) / 9,20 / 10,00 / 12,00 ■ Ingold/Mettler 2,00 / 4,01 / 7,00 / 9,21 ■ DIN 19266 1,68 / 4,01 / 6,86 / 9,18 ■ DIN 19267 1,09 / 4,65 / 6,79 / 9,23 / 12,75 ■ Merck/Riedel 2,00 / 4,01 / 6,98 / 8,95 / 12,00 ■ Hamilton 1,09 / 1,68 / 2,00 / 3,06 / 4,01 / 5,00 / 6,00 7,00 / 8,00 / 9,21 / 10,01 / 11,00 / 12,00
 You have the possibility of defining two buffers of your own with the "Special buffer" option. For this purpose, two tables are displayed in which you can enter value pH value/temperature value pairs.		

Calibration timer and calibration expiration date

You can specify the calibration interval for the sensor here.

Once the time configured elapses, the "Calibration timer" diagnostics message appears on the display.

 The timer is reset automatically if you recalibrate the sensor.

Path: Menu/Setup/Inputs/<Sensor type>/Extended setup/Calib. settings

Function	Options	Info
Calibration timer	Options ■ Off ■ On Factory setting Off	Switches the function on or off
Calibration timer <i>Calibration timer= "On"</i>	1 to 10000 h Factory setting 1000 h	Specify the time after which the timer should have timed out. Once this time has elapsed, the "Calib. Timer" diagnostics message, along with the code 102, appears on the display.
Calib. expiration date	Options ■ Off ■ On Factory setting Off	The function checks whether the calibration of a sensor is still valid. Example: You install a precalibrated sensor. The function checks how much time has elapsed since the sensor was last calibrated. A diagnostics message is displayed if the time since the last calibration is longer than the predefined warning and alarm limit.
▶ Calib. expiration date		
Warning limit	Factory setting 11 months	Diagnostics message: 105 "Calib. validity" Warning and alarm limits mutually affect each other's possible ranges for adjustment.

Path: Menu/Setup/Inputs/ <Sensor type>/Extended setupCalib. settings

Function	Options	Info
Alarm limit	Factory setting 12 months	Diagnostics message: 104 "Calib. validity" General rule: Alarm limit > warning limit

7.2.5 Diagnostics settings

This menu branch is used for specifying warning limits, and for defining whether and how diagnostics tools should be used.

The associated diagnostics code is displayed for every setting.

Sensor check system (only pH glass)

The sensor check system (SCS) monitors the high impedance of the pH glass.
An alarm is issued if a minimum impedance value is undershot or a maximum impedance is exceeded.

- Glass breakage is the main reason for a drop in high impedance values.
- The reasons for increasing impedance values include:
 - Dry sensor
 - Worn pH glass membrane

Path: Menu/Setup/Inputs/pH/Extended setup/Diagnostics settings

Function	Options	Info
► Glass impedance (SCS)	0 to 10000 MΩ	Specify your limit values for monitoring the impedance of the pH glass.
Function	Options ■ On ■ Off Factory setting On	On SCS operates with the following settings for the warning and alarm limits. Off SCS is switched off.
Upper alarm limit	Factory setting 2000 MΩ	Diagnostics code and associated message text: 124 "Sensor glass"
Upper warning limit	Factory setting 1600 MΩ	Diagnostics code and associated message text: 125 "Sensor glass"
Lower warning limit	Factory setting 1 MΩ	Diagnostics code and associated message text: 123 "Sensor glass"
Lower alarm limit	Factory setting 0 MΩ	Diagnostics code and associated message text: 122 "Sensor glass"

Slope (only pH)

The slope characterizes the sensor condition. The bigger the deviation from the ideal value (59 mV/pH) the poorer the condition of the sensor.

Path: Menu/Setup/Inputs/pH/Extended setup/Diagnostics settings

Function	Options	Info
► Slope	5.00 to 99.00 mV/pH	Specify your limit values for slope monitoring.
Warning limit	Factory setting 55.00 mV/pH	Associated diagnostics code and message text: 509 "Sensor calib."

Zero point (only pH glass) or Operating point (only pH-ISFET)

pH glass sensors

The zero point characterizes the condition of the sensor reference. The bigger the deviation from the ideal value (pH 7.00) the poorer the condition. This can be caused by KCl dissolving away or reference contamination.

Path: Menu/Setup/Inputs/pH/Extended setup/Diagnostics settings

Function	Options	Info
► Zero point (<i>pH glass</i>) Operating point (<i>pH ISFET</i>)	pH glass -2,00 ... 16,00 pH ISFET -950 mV to 950 mV	Specify your limit values for zero point or operating point monitoring.
Upper warning limit	Factory setting pH 8.00 / 300 mV	Associated diagnostics code and message text: 505 "Sensor calib." (pH glass) 515 "Sensor calib." (pH ISFET)
Lower warning limit	Factory setting pH 6.00 / -300 mV	Associated diagnostics code and message text: 507 "Sensor calib." (pH glass) 517 "Sensor calib." (pH ISFET)

Sensor condition check (only pH glass)

Sensor condition check (SCC) monitors the electrode status and the degree of electrode aging. The electrode status is updated after every calibration.

The main reasons for a deteriorating electrode status are:

- Glass membrane blocked or dry
- Diaphragm (reference) blocked

Remedial action

- Clean or regenerate the sensor.
- Replace the sensor if this does not have the desired effect.

Path: Menu/Setup/Inputs/pH/Extended setup/Diagnostics settings

Function	Options	Info
► Sensor Condition Check		The function can only be switched on or off. It uses internal limit values
Function	Options ■ On ■ Off Factory setting On	Diagnostics code and associated message text: 127 "SCC sufficient" 126 "SCC bad"

ORP-Meas value (only ORP)

You can specify limit values in order to monitor your process. A diagnostics message is displayed if the limits are exceeded or undershot.

Path: Menu/Setup/Inputs/ORP/Extended setup/Diagnostics settings

Function	Options	Info
► ORP-Meas value		Specify your limit values for monitoring the measured value.
Upper warning limit	Factory setting 900 mV	Diagnostics code and associated message text: 942 "Process value"
Lower warning limit	Factory setting -900 mV	Diagnostics code and associated message text: 943 "Process value"

Process check system

The process check system (PCS) checks the measuring signal for stagnation. An alarm is triggered if the measuring signal does not change over a certain period (several measured values).

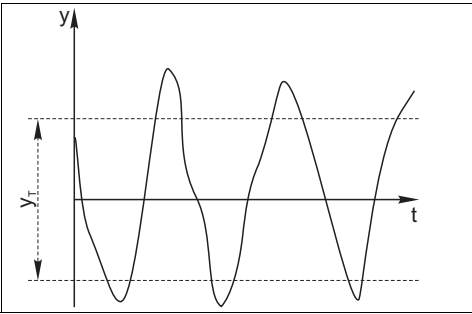


Fig. 9: Normal measuring signal, no alarm

y Measuring signal
 y_T Set value for "Tolerancewidth"

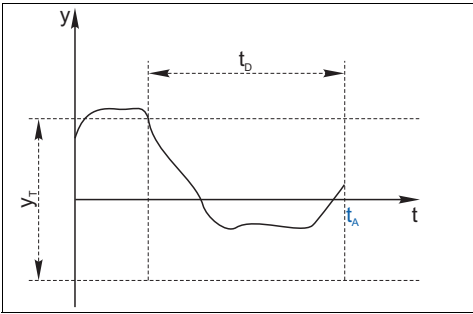


Fig. 10: Stagnating signal, alarm is triggered

t_D Set value for "Duration"
 t_A Time when the alarm is triggered

The main causes of stagnating measured values are:

- Contaminated sensor, or sensor in air
- Sensor failure
- Process error (e.g. through control system)

Remedial action

- Clean the sensor.
- Check the measuring chain.
- Switch off the controller and switch it back on again.

Path: Menu/Setup/Inputs/<Sensor type>/Extended setup/Diagnostics settings

Function	Options	Info
► Process Check System		Diagnostics code and associated message text: 904 "Process check"
Function	Options ■ On ■ Off Factory setting Off	
Duration	1 to 240 min Factory setting 60 min	The measured value must change during this time. Otherwise the error message is triggered.

Path: Menu/Setup/Inputs/<Sensor type>/Extended setup/Diagnostics settings

Function	Options	Info
Tolerancewidth <i>Not available for pH/ORP</i>	The range depends on the sensor Factory setting Depends on the sensor	Interval around the measuring signal (raw value) for detecting stagnation. Measured values within the set interval are regarded as stagnating.

Limits operating hours

The total operating time of the sensor and its use under extreme conditions is monitored. If the operating time exceeds the defined threshold values, the device issues a corresponding diagnostics message.

 Each sensor has a limited life expectancy which heavily depends on the operating conditions. If you specify warning limits for operating times under extreme conditions, you can guarantee the operation of your measuring point without any downtime by performing maintenance tasks in time.

Path: Menu/Setup/Inputs/pH or ORP/Extended setup/Diagnostics settings

Function	Options	Info
▶ Limits operating hours		Specify your limit values for monitoring the number of operating hours under extreme conditions.
 The range of adjustment for the operating hours alarm and warning limits is generally 1 to 50000 h.		
Function	Options ■ On ■ Off Factory setting On	On The operation of the sensor under extreme conditions is monitored, recorded in the sensor and diagnostics messages are displayed on the controller. Off No diagnostics messages. However, the time the sensor operates under extreme conditions is recorded in the sensor and can be read in the sensor information in the diagnostics menu.
▶ Operating time		Total operating time of the sensor
Warning limit	Factory setting 10000 h	Diagnostics code and associated message text: 199 "Operating time"
▶ Operation > 80°C		
Warning limit	Factory setting 10000 h	Diagnostics code and associated message text: 193 "Operating time"
▶ Operation > 100°C		
Warning limit	Factory setting 10000 h	Diagnostics code and associated message text: 194 "Operating time"

Path: Menu/Setup/Inputs/pH or ORP/Extended setup/Diagnostics settings

Function	Options	Info
► Operation < -300 mV		<i>only pH</i>
Warning limit	Factory setting 10000 h	Diagnostics code and associated message text: 180 "Operating time"
► Operation > 300 mV		<i>only pH</i>
Warning limit	Factory setting 10000 h	Diagnostics code and associated message text: 179 "Operating time"

Delta slope (only pH)

The device determines the difference in slope between the last calibration and the penultimate calibration, and issues a warning or an alarm depending on the setting configured. The difference is an indicator for the condition of the sensor. The greater the change, the greater the wear experienced by the pH-sensitive glass membrane as a result of chemical corrosion or abrasion.

Path: Menu/Setup/Inputs/pH/Extended setup/Diagnostics settings

Function	Options	Info
► Delta slope	0,10 ... 10,00	Specify your limit values for monitoring the slope differential.
Function	Options ■ On ■ Off Factory setting Off	
Warning limit	Factory setting 5.00 mV/pH	Diagnostics code and associated message text: 518 "Sensor calib."

Delta zero point (only pH glass) or Delta operating point (only pH-ISFET)

The device determines the difference between the last calibration and the penultimate calibration, and issues a warning or an alarm depending on the setting configured. The difference is an indicator for the condition of the sensor. The following applies to pH glass electrodes: The greater the change, the greater the wear experienced by the reference as a result of contaminating ions or KCl dissolving away.

Path: Menu/Setup/Inputs/pH/Extended setup/Diagnostics settings

Function	Options	Info
► Delta zero point (<i>pH glass</i>) Delta operating point (<i>pH ISFET</i>)	pH glass pH 0.00 to 2.00 pH ISFET 0 to 950 mV	Specify your limit values for monitoring the zero point or operating point differential.

Path: Menu/Setup/Inputs/pH/Extended setup/Diagnostics settings

Function	Options	Info
Function	Options ■ On ■ Off Factory setting Off	
Warning limit	Factory setting pH 0.50 / 25 mV	Diagnostics code and associated message text: 520 "Sensor calib." (pH glass) 522 "Sensor calib." (pH ISFET)

Sterilizations

The system counts the number of operating hours in which the sensor is exposed to a temperature that is typical for a sterilization. This temperature depends on the sensor.

Path: Menu/Setup/Inputs/<Sensor type>/Extended setup/Diagnostics settings

Function	Options	Info
► Sterilizations	0 ... 99	Specify the limit values for the number of sensor sterilizations.
Function	Options ■ On ■ Off Factory setting Off	
Warning limit	Factory setting 30	Diagnostics code and associated message text: 108 "Sterilization"

Diagnostic behavior

 This branch, along with the same functions, can be found in different "Extended setup" menus. The list of diagnostic messages displayed depends on the path selected. There are device-specific messages, and messages that depend on what sensor is connected.

Path: ... /Extended setup/Diagnostics settings/Diag. behavior

Function	Options	Info
List of diagnostic messages		Select the message to be changed. Only then can you make the settings for this message.
Diag. code	Read only	

Path: ... /Extended setup/Diagnostics settings/Diag. behavior

Function	Options	Info
Diagnostic message	Options ■ On ■ Off Factory setting Depends on the message	You can deactivate or reactivate a diagnostic message here. Deactivating means: ■ No error message in the measuring mode ■ No error current at the current output
Error current	Options ■ On ■ Off Factory setting Depends on the message	Decide whether an error current should be output at the current output if the diagnostic message display is activated.
Status signal	Options ■ Maintenance (M) ■ Out of specification (S) ■ Function check (C) ■ Failure (F) Factory setting Depends on the message	The messages are divided into different error classes in accordance with NAMUR NE 107. —> BA463C "Maintenance&diagnostics"
Diag. output	Options ■ None ■ Alarm relay ■ Relay 1 to n (depends on the device version) Factory setting None	You can use this function to select an output to which the diagnostic message should be assigned. You first have to configure a relay output before being able to assign the message to an output (Menu/Setup/Outputs, assign "Diagnostics" function and set Operating mode to "as assigned").
 One alarm relay is always available, regardless of the device version. Other relays are optional.		
Cleaning program	Options ■ None ■ Cleaning 1 ■ Cleaning 2 ■ Cleaning 3 ■ Cleaning 4 Factory setting None	Decide whether the diagnostic message should trigger a cleaning program. You can define the cleaning programs under: Menu/Setup/Additional functions/Cleaning.
Detail information	Read only	Here you can find more information on the diagnostic message and instructions on how to resolve the problem.

7.2.6 Tag control

With this function, you specify which sensors are accepted at your device

Path: Menu/Setup/Inputs/<Sensor type>/Extended setup

Function	Options	Info
► Tag control		Additional information on the display: tag control currently used
Operating mode	Options ■ Off ■ Tag ■ Group Factory setting Off	Off No tag control, all sensors are accepted. Tag Only sensors with the same tag are accepted. Group Only sensors in the same tag group are accepted.
Tag	Customized text Factory setting EH_CM44_	Enter the tag name. The controller checks every sensor to be connected as to whether this sensor belongs to the measuring point, and only accepts the sensors that have the same tag.
Group	Numerical Factory setting 0	

 "Tag" stands for the name of a measuring point, and is used in many areas of process measuring technology.

7.2.7 Data processing factory setting

Here you can restore the factory settings for the sensor input. For this purpose, simply press the navigator button and select "OK" when the prompt for the device software appears. Only the factory settings for this particular input are restored. All other settings remain unchanged.

8 Inputs: Conductivity

8.1 Basic settings

8.1.1 Sensor identification

Path: Menu/Setup/Inputs/<Sensor type>

Function	Options	Info
Channel	Options ■ On ■ Off Factory setting On	On The channel display is switched on in the measuring mode Off The channel is not displayed in the measuring mode, regardless of whether a sensor is connected or not.
Sensor type	Read only (Only available if a sensor is connected)	Connected sensor type
Order code		Order code of the connected sensor

8.1.2 Damping

The damping causes a floating average curve of the measured values over the time specified.

Path: Menu/Setup/Inputs/<Sensor type>

Function	Options	Info
Damping <Sensor type>	0 to 300 s	You specify the damping of the main measured value of the connected sensor and that of the integrated temperature sensor.
Damping temp.	Factory setting 0 s	

8.1.3 Manual hold

Path: Menu/Setup/Inputs/<Sensor type>

Function	Options	Info
Manual hold	Options ■ On ■ Off Factory setting Off	On You can use this function to set the channel manually to "Hold". Off No hold

8.1.4 Operating mode and cell constant

Path: Menu/Setup/Inputs/Conductivity

Function	Options	Info
Operating mode	Options ■ Conductivity ■ Resistance <i>(only Cond c)</i> ■ Concentration <i>(only Cond i)</i> Factory setting Conductivity	Alternatively to the conductivity, you can also measure the resistivity with a conductive conductivity sensor . Alternatively to the conductivity, you can determine the concentration of the medium with an inductive conductivity sensor .
Cell constant	Read only (Only available if a sensor is connected)	The cell constant of the connected sensor is displayed (→ sensor certificate)

8.1.5 Installation factor (only inductive sensors)

Path: Menu/Setup/Inputs/Conductivity

Function	Options	Info
Inst. factor	Read only (Only available if a sensor is connected)	Displays the current value. Only changes with a calibration.

In confined installation conditions, the wall affects conductivity measurement in the liquid. The installation factor compensates for this effect. The transmitter corrects the cell constant by multiplying by the installation factor.

The size of the installation factor depends on the diameter and the conductivity of the pipe nozzle, as well as the distance between the sensor and the wall.

If there is a sufficient distance between the wall and the sensor ($a > 15\text{ mm}$ (0.59"), from DN 80), the installation factor f does not have to be taken into consideration ($f = 1.00$).

If distances from the wall are smaller, the installation factor is bigger for electrically insulating pipes ($f > 1$), and smaller for electrically conductive pipes ($f < 1$).

It can be measured using calibration solutions, or a close approximation determined from the following diagram.

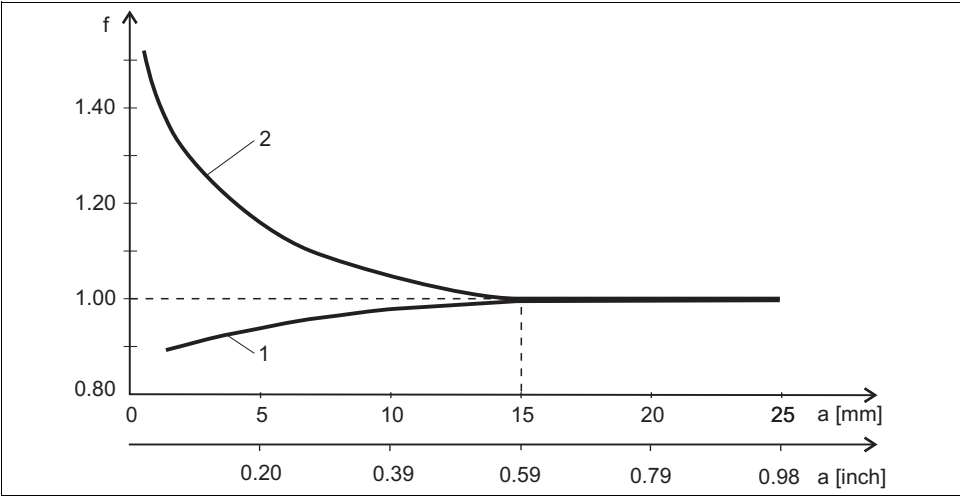


Fig. 11: Relation between the installation factor f and the wall distance

- 1 Electrically conductive pipe wall
- 2 Electrically insulating pipe wall

8.1.6 Concentration table (only inductive sensors)

Path: Menu/Setup/Inputs/Conductivity

Function	Options	Info
Conc. Table (Operating mode=Concentration)	Options - NaOH 0..15% - NaOH 18..50% - HCl - HNO3 - H2SO4 0..30% - H2SO4 32..84% - H3PO4 - User table 1 - User table 2 - User table 3 - User table 4 Factory setting - NaOH 0..15%	Concentration tables saved at the factory: NaOH: 0 to 15%, 0 to 100 °C NaOH: 18 to 50%, 0 to 100 °C HCl: 0 to 20%, 0 to 80 °C HNO ₃ : 0 to 25%, 0 to 90 °C H ₂ SO ₄ : 0 to 30%, 0 to 100 °C H ₂ SO ₄ : 32 to 84%, 0 to 100 °C H ₃ PO ₄ : 0 to 15%, 0 to 90 °C
Temp. comp. mode (Operating mode=Concentration)	Options - with temp. comp - without temp. comp Factory setting - with temp. comp	Only select "without temp. comp" in very small temperature ranges. In all other cases, select "with temp. comp".

Path: Menu/Setup/Inputs/Conductivity

Function	Options	Info
Table name (Conc. Table=one of the user tables)	Customized text, 16 characters	Assign a meaningful name to the selected table.
► (Conc. Table=one of the user tables)	3-column table	Assign conductivity and concentration value pairs for a specific temperature.
Conc. unit (Operating mode=Concentration)	Read only %	This is for information purposes only. No options are available.

Example of a concentration table:

Conductivity (uncompensated)	Concentration	Temperature
1.000 mS/cm	0.000 mg/l	0.00 °C
2.000 mS/cm	0.000 mg/l	100.00 °C
100.0 mS/cm	3.000 mg/l	0.00 °C
300.0 mS/cm	3.000 mg/l	100.00 °C

8.1.7 Unit and format

Path: Menu/Setup/Inputs/Conductivity

Function	Options	Info
Main value format	Options ■ Auto ■ # ■ #.# ■ #.## ■ #.### Factory setting Auto	Specify the number of decimal places.
Cond. unit (Operating mode=Conductivity) Unit (Operating mode=Resistance)	Options Conductivity/resistance ■ Auto / Auto ■ µS/cm / MΩm ■ mS/cm / MΩcm ■ S/cm / kΩcm ■ µS/m / kΩm ■ mS/m / Ωm ■ S/m / Ωcm Factory setting Auto / Auto	The picklist depends on the operating mode. You can either choose from units for conductivity or units for resistivity. Since there are no options for concentration measurement, this function is not displayed for such measurements.

8.1.8 Temperature compensation

Temperature coefficient α = change in the conductivity per degree of temperature change:

$$\kappa(T) = \kappa(T_0)(1 + \alpha(T - T_0))$$

$\kappa(T)$... conductivity at process temperature T

$\kappa(T_0)$... conductivity at reference temperature T_0

The temperature coefficient depends both on the chemical composition of the solution and the temperature itself.

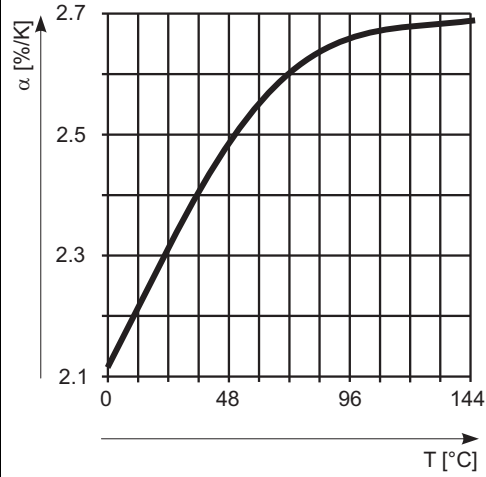
Path: Menu/Setup/Inputs/Conductivity

Function	Options	Info
Alpha ref. temp.	-5.0 to 100.0 °C (23.0 to 212.0 °F) Factory setting 25.0 °C (77.0 °F)	Reference temperature for calculating the temperature-compensated conductivity The alpha coefficients and alpha reference temperatures of Endress+Hauser calibration solutions can be found in the documentation enclosed.
Temp. source	Options ■ Sensor ■ Manual Factory setting Sensor	Decide how you want to compensate the medium temperature: ■ Automatically using the temperature sensor of your sensor ■ Manually by entering the medium temperature
Medium temperature (Temp. source=Manual)	-50.0 to 250.0 °C (-58.0 to 482.0 °F) Factory setting 25.0 °C (77 °F)	Enter the temperature of your medium.
Compensation (Operating mode=Conductivity)	Options ■ None ■ Linear ■ NaCl (IEC 746-3) ■ Water ISO7888 ■ UPW NaCl ■ UPW HCl ■ User table 1 ■ User table 2 ■ User table 3 ■ User table 4 Factory setting Linear	Various methods are available to compensate for the temperature dependency. Depending on your process, decide which type of compensation you want to use. Alternatively, you can also select "None" and thus measure uncompensated conductivity.

Linear temperature compensation

The change between two temperature points is taken to be constant, i.e. $\alpha = \text{const}$. The value for alpha is stored in the sensor and is recalculated for each calibration. You already specified the related reference temperature in this menu.

Path: Menu/Setup/Inputs/Conductivity

Function	Options	Info																
NaCl compensation In the case of NaCl compensation (as per IEC 60746), a fixed non-linear curve specifying the relationship between the temperature coefficient and temperature is saved in the device. This curve applies to low concentrations of up to approx. 5 % NaCl. <table><caption>Data points for NaCl compensation curve (approximate)</caption><tr><th>T [°C]</th><th>α [%/K]</th></tr><tr><td>0</td><td>2.10</td></tr><tr><td>24</td><td>2.30</td></tr><tr><td>48</td><td>2.48</td></tr><tr><td>72</td><td>2.60</td></tr><tr><td>96</td><td>2.65</td></tr><tr><td>120</td><td>2.67</td></tr><tr><td>144</td><td>2.68</td></tr></table>			T [°C]	α [%/K]	0	2.10	24	2.30	48	2.48	72	2.60	96	2.65	120	2.67	144	2.68
T [°C]	α [%/K]																	
0	2.10																	
24	2.30																	
48	2.48																	
72	2.60																	
96	2.65																	
120	2.67																	
144	2.68																	
Compensation for natural water A non-linear in accordance with ISO 7888 is saved in the device for temperature compensation in natural water. Ultrapure water compensation (for conductive sensors) Algorithms for pure and ultrapure water are stored in the device. These algorithms take the dissociation of the water and its temperature dependency into account. They are used for conductivity values up to approx. 100 µS/cm. ■ UPW NaCl: Optimized for pH-neutral contamination. ■ UPW HCl: Optimized for measuring the acid conductivity downstream of a cation exchanger. Also suitable for ammonia (NH3) and caustic soda (NaOH).																		
User-defined tables You can save a function that takes the properties of your specific process into account. To do so, determine the value pairs made up of the temperature T and conductivity κ with: ■ κ(T0) for the reference temperature T0 ■ κ(T) for the temperatures that occur in the process Use the following formula to calculate the α values for the temperatures that are relevant in your process: $\alpha = \frac{100\%}{\kappa(T_0)} \cdot \frac{\kappa(T) - \kappa(T_0)}{T - T_0} ; T \neq T_0$																		
Temp. comp. mode (Operating mode=Conductivity)	Options ■ Conductivity ■ Coeff. Alpha Factory setting Conductivity	Conductivity You specify the temperature, conductivity and uncompensated conductivity. Recommended for large measuring ranges and small measured values. Coeff. Alpha As the value pairs, you specify an alpha value and the related temperature.																

Path: Menu/Setup/Inputs/Conductivity

Function	Options	Info
Table name (Compensation=one of the user tables)	Customized text, 16 characters	Assign a meaningful name to the selected table.
► (Compensation=one of the user tables)	■ Temperature ■ Conductivity ■ Temperature comp. cond. or ■ Temperature ■ Coefficient alpha	Maximum number of rows: 25 The type of table depends on the option under "Temp. comp. mode".

8.2 Extended setup

8.2.1 Temperature format

Path: Menu/Setup/Inputs/<Sensor type>/Extended setup

Function	Options	Info
Temperature format	Options ■ #.# ■ #.## Factory setting #.#	Select how many decimal places should be used to display the temperature.

8.2.2 Cleaning

Path: Menu/Setup/Inputs/<Sensor type>/Extended setup

Function	Options	Info
Cleaning	Options ■ None ■ Cleaning 1 ■ Cleaning 2 ■ Cleaning 3 ■ Cleaning 4 Factory setting None	Select a cleaning program. This program is executed if: ■ A diagnostics message is present at the channel and ■ A cleaning process has been specified for this message (→ "Inputs/Diagnostics settings/Diag. behavior").



You define the cleaning programs in the "Setup/Additional functions/Cleaning" menu.

8.2.3 Diagnostics settings

This menu branch is used for specifying warning limits, and for defining whether and how diagnostics tools should be used.
The associated diagnostics code is displayed for every setting.

Process check system

The process check system (PCS) checks the measuring signal for stagnation. An alarm is triggered if the measuring signal does not change over a certain period (several measured values).

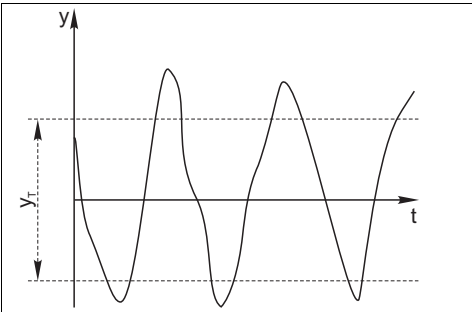


Fig. 12: Normal measuring signal, no alarm a0013107

y Measuring signal
 y_T Set value for "Tolerancewidth"

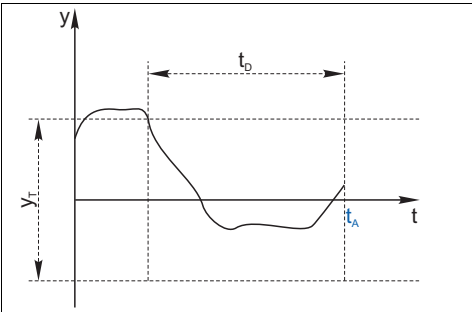


Fig. 13: Stagnating signal, alarm is triggered a0013106

t_D Set value for "Duration"
 t_A Time when the alarm is triggered

The main causes of stagnating measured values are:

- Contaminated sensor, or sensor in air
- Sensor failure
- Process error (e.g. through control system)

Remedial action

- ▶ Clean the sensor.
- ▶ Check the measuring chain.
- ▶ Switch off the controller and switch it back on again.

Path: Menu/Setup/Inputs/<Sensor type>/Extended setup/Diagnostics settings

Function	Options	Info
▶ Process Check System		Diagnostics code and associated message text: 904 "Process check"
Function	Options ■ On ■ Off Factory setting Off	

Path: Menu/Setup/Inputs/<Sensor type>/Extended setup/Diagnostics settings

Function	Options	Info
Duration	1 to 240 min Factory setting 60 min	The measured value must change during this time. Otherwise the error message is triggered.
Tolerancewidth <i>Not available for pH/ORP</i>	The range depends on the sensor Factory setting Depends on the sensor	Interval around the measuring signal (raw value) for detecting stagnation. Measured values within the set interval are regarded as stagnating.

Limits operating hours

The total operating time of the sensor and its use under extreme conditions is monitored. If the operating time exceeds the defined threshold values, the device issues a corresponding diagnostics message.



Each sensor has a limited life expectancy which heavily depends on the operating conditions. If you specify warning limits for operating times under extreme conditions, you can guarantee the operation of your measuring point without any downtime by performing maintenance tasks in time.

Path: Menu/Setup/Inputs/Conductivity/Extended setup/Diagnostics settings

Function	Options	Info
▶ Limits operating hours		
The range of adjustment for the operating hours alarm and warning limits is generally 1 to 50000 h.		
Function	Options ■ On ■ Off Factory setting Off	On The operation of the sensor under extreme conditions is monitored, recorded in the sensor and diagnostics messages are displayed on the controller. Off No diagnostics messages. However, the time the sensor operates under extreme conditions is recorded in the sensor and can be read in the sensor information in the diagnostics menu.
▶ Operating time		Total operating time of the sensor
Warning limit	Factory setting 10000 h	Diagnostics code and associated message text: 199 "Operating time"
▶ Operation > 80°C		
Warning limit	Factory setting 10000 h	Diagnostics code and associated message text: 193 "Operating time"
▶ Operation > 120°C		<i>Only conductive sensors</i>
Warning limit	Factory setting 10000 h	Diagnostics code and associated message text: 195 "Operating time"

Path: Menu/Setup/Inputs/Conductivity/Extended setup/Diagnostics settings

Function	Options	Info
► Operation > 125°C		Only inductive sensors
Warning limit	Factory setting 10000 h	Diagnostics code and associated message text: 196 "Operating time"
► Operation > 140°C		Only conductive sensors
Warning limit	Factory setting 10000 h	Diagnostics code and associated message text: 197 "Operating time"
► Operation > 150°C		Only inductive sensors
Warning limit	Factory setting 10000 h	Diagnostics code and associated message text: 198 "Operating time"
► Operation > 80°C < 100nS/cm		Only conductive sensors
Warning limit	Factory setting 10000 h	Diagnostics code and associated message text: 187 "Operating time"
► Operation < 5°C		Only inductive sensors
Warning limit	Factory setting 10000 h	Diagnostics code and associated message text: 188 "Operating time"

Sterilizations

The system counts the number of operating hours in which the sensor is exposed to a temperature that is typical for a sterilization. This temperature depends on the sensor.

Path: Menu/Setup/Inputs/<Sensor type>/Extended setup/Diagnostics settings

Function	Options	Info
► Sterilizations	0 ... 99	Specify the limit values for the number of sensor sterilizations.
Function	Options ■ On ■ Off Factory setting Off	
Warning limit	Factory setting 30	Diagnostics code and associated message text: 108 "Sterilization"

Diagnostic behavior

-  This branch, along with the same functions, can be found in different "Extended setup" menus. The list of diagnostic messages displayed depends on the path selected. There are device-specific messages, and messages that depend on what sensor is connected.

Path: ... /Extended setup/Diagnostics settings/Diag. behavior

Function	Options	Info
List of diagnostic messages		Select the message to be changed. Only then can you make the settings for this message.
Diag. code	Read only	
Diagnostic message	Options ■ On ■ Off Factory setting Depends on the message	You can deactivate or reactivate a diagnostic message here. Deactivating means: ■ No error message in the measuring mode ■ No error current at the current output
Error current	Options ■ On ■ Off Factory setting Depends on the message	Decide whether an error current should be output at the current output if the diagnostic message display is activated.
Status signal	Options ■ Maintenance (M) ■ Out of specification (S) ■ Function check (C) ■ Failure (F) Factory setting Depends on the message	The messages are divided into different error classes in accordance with NAMUR NE 107. —> BA463C "Maintenance&diagnostics"
Diag. output	Options ■ None ■ Alarm relay ■ Relay 1 to n (depends on the device version) Factory setting None	You can use this function to select an output to which the diagnostic message should be assigned. You first have to configure a relay output before being able to assign the message to an output (Menu/Setup/Outputs, assign "Diagnostics" function and set Operating mode to "as assigned").
 One alarm relay is always available, regardless of the device version. Other relays are optional.		
Cleaning program	Options ■ None ■ Cleaning 1 ■ Cleaning 2 ■ Cleaning 3 ■ Cleaning 4 Factory setting None	Decide whether the diagnostic message should trigger a cleaning program. You can define the cleaning programs under: Menu/Setup/Additional functions/Cleaning.
Detail information	Read only	Here you can find more information on the diagnostic message and instructions on how to resolve the problem.

Polarization detection (only conductive sensors)

As a result of flow through the electrolyte/electrode interface, reactions take place here which result in additional voltage. These polarization effects limit the measuring range of conductive sensors. Sensor-specific compensation increases the level of accuracy at the measuring range limits.

 The controller recognizes the Memosens sensor and automatically uses suitable compensation. You can view the measuring range limits of the sensor under Diagnostics/Sensor information/Sensor specifications.

Path: Menu/Setup/Inputs/Conductivity/Extended setup/Polarization detected

Function	Options	Info
Polarization detected	Options ■ On ■ Off Factory setting Off	Diagnostics code and associated message text: 168 "Polarization"

8.2.4 Tag control

With this function, you specify which sensors are accepted at your device

Path: Menu/Setup/Inputs/<Sensor type>/Extended setup

Function	Options	Info
► Tag control		Additional information on the display: tag control currently used
Operating mode	Options ■ Off ■ Tag ■ Group Factory setting Off	Off No tag control, all sensors are accepted. Tag Only sensors with the same tag are accepted. Group Only sensors in the same tag group are accepted.
Tag	Customized text Factory setting EH_CM44_	Enter the tag name. The controller checks every sensor to be connected as to whether this sensor belongs to the measuring point, and only accepts the sensors that have the same tag.
Group	Numerical Factory setting 0	

 "Tag" stands for the name of a measuring point, and is used in many areas of process measuring technology.

8.2.5 Data processing factory setting

Here you can restore the factory settings for the sensor input. For this purpose, simply press the navigator button and select "OK" when the prompt for the device software appears. Only the factory settings for this particular input are restored. All other settings remain unchanged.

8.2.6 Sensor factory setting (only CLS50D)

Here you can restore the sensor factory settings. For this purpose, simply press the navigator button and select "OK" when the prompt for the device software appears. Only the factory settings for the sensor are restored. The settings for the input remain unchanged.

9 Inputs: Oxygen

9.1 Basic settings

9.1.1 Sensor identification

Path: Menu/Setup/Inputs/<Sensor type>

Function	Options	Info
Channel	Options ■ On ■ Off Factory setting On	On The channel display is switched on in the measuring mode Off The channel is not displayed in the measuring mode, regardless of whether a sensor is connected or not.
Sensor type	Read only (Only available if a sensor is connected)	Connected sensor type
Order code		Order code of the connected sensor

9.1.2 Main value

Path: Menu/Setup/Inputs/DO

Function	Options	Info
Main value	Options ■ Concentration liquid ■ Concentration gaseous ■ Saturation ■ Partial pressure ■ Raw value nA (only Oxygen (amp.)) ■ Raw value µs (only Oxygen (opt.)) Factory setting Concentration liquid	Decide how you want to display the main value. Other functions, such as the setting for the unit, depends on this setting.

9.1.3 Damping

The damping causes a floating average curve of the measured values over the time specified.

Path: Menu/Setup/Inputs/<Sensor type>

Function	Options	Info
Damping <Sensor type>	0 to 300 s	You specify the damping of the main measured value of the connected sensor and that of the integrated temperature sensor.
Damping temp.	Factory setting 0 s	

9.1.4 Unit

Path: Menu/Setup/Inputs/DO

Function	Options	Info
Unit <i>Main value="Concentration liquid" or "Concentration gaseous"</i>	Options <i>(Main value="Concentration liquid")</i> ■ mg/l ■ µg/l ■ ppm ■ ppb Options <i>(Main value="Concentration gaseous")</i> ■ %Vol ■ ppmVol <i>(Main value="Concentration gaseous"</i> Factory setting mg/l %Vol	

9.1.5 Manual hold

Path: Menu/Setup/Inputs/<Sensor type>

Function	Options	Info
Manual hold	Options ■ On ■ Off Factory setting Off	On You can use this function to set the channel manually to "Hold". Off No hold

9.2 Extended setup

9.2.1 Temperature compensation

Path: Menu/Setup/Inputs/DO/Extended setup

Function	Options	Info
Temp. compensation	Options ■ Automatic ■ Manual Factory setting Automatic	Decide how you want to compensate the medium temperature: ■ Automatically using the temperature sensor of your sensor ■ Manually by entering the medium temperature

Path: Menu/Setup/Inputs/DO/Extended setup

Function	Options	Info
Temperature <i>(Temp. compensation=Manual)</i>	0.0 to 80.0 °C (32.0 to 176.0 °F) Factory setting 20,0 °C (68 °F)	Enter the temperature of your medium.

9.2.2 Measured value formats

Path: Menu/Setup/Inputs/DO or Chlorine/Extended setup

Function	Options	Info
Temperature format	Options ■ #.# ■ #.## Factory setting #.#	Select how many decimal places should be used to display the temperature.
Main value format	Options ■ #.# ■ #.## ■ #.### ■ # Factory setting #.#	Specify the number of decimal places for displaying the main measured value.

9.2.3 Medium compensation (in the process)

Path: Menu/Setup/Inputs/DO/Extended setup

Function	Options	Info
Medium pressure	Options ■ Process pressure ■ Air pressure Factory setting Air pressure	

Path: Menu/Setup/Inputs/DO/Extended setup

Function	Options	Info
Altitude <i>Medium pressure="Air pressure"</i>	-300 to 4000 m Factory setting 0 m	Enter the altitude or the average air pressure (mutually dependent values). If you specify the altitude, the average air pressure is calculated from the barometric altitude formula and vice versa.
Air pressure or Medium pressure	<i>Medium pressure="Air pressure"</i> 500 to 1200 hPa <i>Medium pressure="Process pressure"</i> 500 to 9999 hPa Factory setting 1013 hPa	If you are compensating using the process pressure, enter the pressure in your process here. The pressure is then independent of the altitude.
Salinity	0 to 100 g/kg Factory setting 0 g/kg	The influence of salt content on oxygen measurement is compensated with this function. Example: sea water measurement as per Copenhagen Standard (30 g/kg).

9.2.4 Cleaning

Path: Menu/Setup/Inputs/<Sensor type>/Extended setup

Function	Options	Info
Cleaning	Options ■ None ■ Cleaning 1 ■ Cleaning 2 ■ Cleaning 3 ■ Cleaning 4 Factory setting None	Select a cleaning program. This program is executed if: ■ A diagnostics message is present at the channel and ■ A cleaning process has been specified for this message (→ "Inputs/Diagnostics settings/Diag. behavior").

 You define the cleaning programs in the "Setup/Additional functions/Cleaning" menu.

9.2.5 Calibration settings

Stability criteria

You define the permitted measured value fluctuation which must not be exceeded in a certain timeframe during calibration.
If the permitted difference is exceeded, calibration is not permitted and is aborted automatically.

Path: Menu/Setup/Inputs/DO or Chlorine/Extended setup/Calib. settings

Function	Options	Info
► Stability criteria		
Delta signal	0,1 ... 2,0 % Factory setting 0,2 %	Permitted measured value fluctuation during calibration. Referenced to the raw value in nA in the case of amperometric sensors, and referenced to the partial pressure in the case of optical sensors.
Delta temperature	0.10 to 2.00 °C 0.18 to 3.60 °F Factory setting 0.50 °C 0.90 °F	Permitted temperature fluctuation during calibration
Duration	10 to 60 s Factory setting 20 s	Timeframe within which the permitted range for measured value fluctuation should not be exceeded

Medium compensation (during calibration)

Path: Menu/Setup/Inputs/DO/Extended setup/Calib. settings

Function	Options	Info
Medium pressure	Options ■ Process pressure ■ Air pressure Factory setting Air pressure	
Altitude <i>Medium pressure="Air pressure"</i>	-300 to 4000 m Factory setting 0 m	Enter the altitude or the average air pressure (mutually dependent values). If you specify the altitude, the average air pressure is calculated from the barometric altitude formula and vice versa. If you are compensating using the process pressure, enter the pressure in your process here. The pressure is then independent of the altitude.
Air pressure or Medium pressure	<i>Medium pressure="Air pressure"</i> 500 to 1200 hPa <i>Medium pressure="Process pressure"</i> 500 to 9999 hPa Factory setting 1013 hPa	

Path: Menu/Setup/Inputs/DO/Extended setup/Calib. settings

Function	Options	Info
Rel. hum. (air variable)	0 ... 100 % Factory setting 100 %	

Calibration timer and calibration expiration date

You can specify the calibration interval for the sensor here.

Once the time configured elapses, the "Calibration timer" diagnostics message appears on the display.



The timer is reset automatically if you recalibrate the sensor.

Path: Menu/Setup/Inputs/<Sensor type>/Extended setup/Calib. settings

Function	Options	Info
Calibration timer	Options ■ Off ■ On Factory setting Off	Switches the function on or off
Calibration timer <i>Calibration timer="On"</i>	1 to 10000 h Factory setting 1000 h	Specify the time after which the timer should have timed out. Once this time has elapsed, the "Calib. Timer" diagnostics message, along with the code 102, appears on the display.
Calib. expiration date	Options ■ Off ■ On Factory setting Off	The function checks whether the calibration of a sensor is still valid. Example: You install a precalibrated sensor. The function checks how much time has elapsed since the sensor was last calibrated. A diagnostics message is displayed if the time since the last calibration is longer than the predefined warning and alarm limit.
► Calib. expiration date		
Warning limit	Factory setting 11 months	Diagnostics message: 105 "Calib. validity" Warning and alarm limits mutually affect each other's possible ranges for adjustment.
Alarm limit	Factory setting 12 months	Diagnostics message: 104 "Calib. validity" General rule: Alarm limit > warning limit

9.2.6 Diagnostics settings

This menu branch is used for specifying warning limits, and for defining whether and how diagnostics tools should be used.
The associated diagnostics code is displayed for every setting.

Slope

The (relative) slope characterizes the sensor condition. Decreasing values indicate electrolyte exhaustion. You can control when the electrolyte should be replaced by specifying limit values and the diagnostics messages these limit values trigger.

Path: Menu/Setup/Inputs/DO/Extended setup/Diagnostics settings

Function	Options	Info
► Slope	0,0 ... 200,0 %	Specify the limit values for slope monitoring in your sensor.
Upper warning limit	Factory setting 140,0 %	Diagnostics code and associated message text: 511 "Sensor calib."
Lower warning limit	Factory setting 60,0 %	Diagnostics code and associated message text: 509 "Sensor calib."

Delta slope (only amperometric sensors)

The device determines the difference in slope between the last calibration and the penultimate calibration, and issues a warning or an alarm depending on the setting configured. The difference is an indicator for the condition of the sensor. An increasing change indicates the formation of buildup on the sensor diaphragm or electrolyte contamination. Replace the diaphragm and electrolyte as specified in the instructions in the sensor operating manual.

Path: Menu/Setup/Inputs/DO/Extended setup/Diagnostics settings

Function	Options	Info
► Delta slope	0,0 ... 50,0 %	Specify the limit values for monitoring the slope differential.
Function	Options ■ On ■ Off Factory setting On	
Warning limit	Factory setting 5,0 %	Diagnostics code and associated message text: 518 "Sensor calib."

Zero point (only amperometric sensors)

 The zero point corresponds to the sensor signal that is measured in a medium in the absence of oxygen. You can calibrate the zero point in water that is free from oxygen or in high-purity nitrogen. This improves accuracy in the trace range.

Path: Menu/Setup/Inputs/DO/Extended setup/Diagnostics settings

Function	Options	Info
 Zero point	0.0 to 10.0 nA	Specify the limit values for zero point monitoring in your sensor.
Warning limit	Factory setting 3.0 nA	Diagnostics code and associated message text: 513 "Zero Warn"

Delta zero point (only amperometric sensors)

The device determines the difference between the last calibration and the penultimate calibration, and issues a warning or an alarm depending on the setting configured. The difference is an indicator for the condition of the sensor. Increasing differences indicate the formation of buildup on the cathode. Clean the cathode as specified in the instructions in the sensor operating manual.

Path: Menu/Setup/Inputs/DO/Extended setup/Diagnostics settings

Function	Options	Info
 Delta zero point	0.0 to 10 nA	Specify your limit values for monitoring the zero point differential.
Function	Options ■ On ■ Off Factory setting On	
Warning limit	Factory setting 2.0 nA	Diagnostics code and associated message text: 520 "Sensor calib."

Sterilizations (only sterilizable sensors)

The system counts the number of operating hours in which the sensor is exposed to a temperature that is typical for a sterilization. This temperature depends on the sensor.

Path: Menu/Setup/Inputs/<Sensor type>/Extended setup/Diagnostics settings

Function	Options	Info
► Sterilizations	0 ... 99	Specify the limit values for the number of sensor sterilizations.
Function	Options ■ On ■ Off Factory setting Off	
Warning limit	Factory setting 30	Diagnostics code and associated message text: 108 "Sterilization"

Calibrations, cap (only amperometric sensors)



The calibration counters in the sensor make a distinction between sensor calibrations and calibrations with the membrane cap currently used. If this cap is replaced, only the (cap) counter is reset.

Path: Menu/Setup/Inputs/DO/Extended setup/Diagnostics settings

Function	Options	Info
► Number of cap calibrations		Specify how many calibrations may be performed with a membrane cap before the cap has to be replaced. The number depends heavily on the process and must be determined individually.
Function	Options ■ On ■ Off Factory setting On	
Warning limit	Factory setting 6	Diagnostics code and associated message text: 529 "Sensor check"

Sterilizations, cap (only sterilizable, amperometric sensors)

 The sterilization counters in the sensor make a distinction between the sensor and the membrane cap currently used. If this cap is replaced, only the (cap) counter is reset.

Path: Menu/Setup/Inputs/DO/Extended setup/Diagnostics settings

Function	Options	Info
► Number of cap sterilisations		Specify how many sterilizations may be performed with a membrane cap before the cap has to be replaced. The number depends heavily on the process and must be determined individually.
Function	Options ■ On ■ Off Factory setting On	
Warning limit	Factory setting 6	Diagnostics code and associated message text: 109 "Sterilizat. cap"

Process check system

The process check system (PCS) checks the measuring signal for stagnation. An alarm is triggered if the measuring signal does not change over a certain period (several measured values).

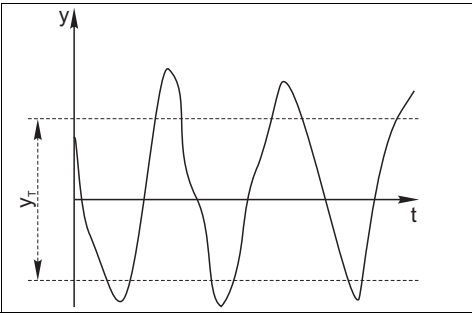


Fig. 14: Normal measuring signal, no alarm

a0013107

y Measuring signal
 y_T Set value for "Tolerancewidth"

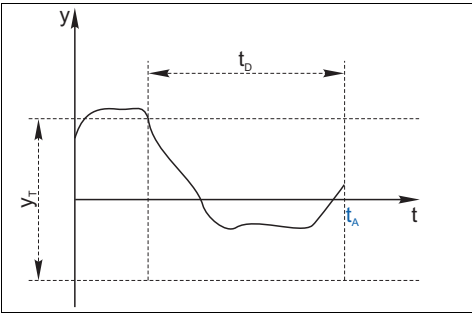


Fig. 15: Stagnating signal, alarm is triggered

a0013106

t_D Set value for "Duration"
 t_A Time when the alarm is triggered

The main causes of stagnating measured values are:

- Contaminated sensor, or sensor in air
- Sensor failure
- Process error (e.g. through control system)

Remedial action

- ▶ Clean the sensor.
- ▶ Check the measuring chain.
- ▶ Switch off the controller and switch it back on again.

Path: Menu/Setup/Inputs/<Sensor type>/Extended setup/Diagnostics settings

Function	Options	Info
▶ Process Check System		Diagnostics code and associated message text: 904 "Process check"
Function	Options ■ On ■ Off Factory setting Off	
Duration	1 to 240 min Factory setting 60 min	The measured value must change during this time. Otherwise the error message is triggered.

Path: Menu/Setup/Inputs/<Sensor type>/Extended setup/Diagnostics settings

Function	Options	Info
Tolerancewidth <i>Not available for pH/ORP</i>	The range depends on the sensor Factory setting Depends on the sensor	Interval around the measuring signal (raw value) for detecting stagnation. Measured values within the set interval are regarded as stagnating.

Limits operating hours

The total operating time of the sensor and its use under extreme conditions is monitored. If the operating time exceeds the defined threshold values, the device issues a corresponding diagnostics message.



Each sensor has a limited life expectancy which heavily depends on the operating conditions. If you specify warning limits for operating times under extreme conditions, you can guarantee the operation of your measuring point without any downtime by performing maintenance tasks in time.

Path: Menu/Setup/Inputs/DO/Extended setup/Diagnostics settings

Function	Options	Info
► Limits operating hours		
The range of adjustment for the operating hours alarm and warning limits is generally 1 to 50000 h.		
Function	Options ■ On ■ Off Factory setting On	On The operation of the sensor under extreme conditions is monitored, recorded in the sensor and diagnostics messages are displayed on the controller. Off No diagnostics messages. However, the time the sensor operates under extreme conditions is recorded in the sensor and can be read in the sensor information in the diagnostics menu.
► Operating time		Total operating time of the sensor
Warning limit	Factory setting 10000 h	Diagnostics code and associated message text: 199 "Operating time"
► Operation < 5°C		<i>Only optical sensors</i>
Warning limit	Factory setting 10000 h	Diagnostics code and associated message text: 188 "Operating time"
► Operation > 25°C		<i>Only optical sensors</i>
Warning limit	Factory setting 10000 h	Diagnostics code and associated message text: 190 "Operating time"
► Operation > 40°C		
Warning limit	Factory setting 10000 h	Diagnostics code and associated message text: 192 "Operating time"

Path: Menu/Setup/Inputs/DO/Extended setup/Diagnostics settings

Function	Options	Info
▶ Operation > 80°C		
Warning limit	Factory setting 10000 h	Diagnostics code and associated message text: 193 "Operating time"
▶ (Operation above first specified nA value)		<i>Only amperometric sensors, sensor-specific limit</i>
Warning limit	Factory setting 10000 h	Diagnostics code and associated message text: 183 "Operating time" (COS51D) 184 "Operating time" (COS22D)
▶ (Operation above second specified nA value)		<i>Only amperometric sensors, sensor-specific limit</i>
Warning limit	Factory setting 10000 h	Diagnostics code and associated message text: 185 "Operating time" (COS51D) 186 "Operating time" (COS22D)
▶ Operation < 25 µs		<i>Only optical sensors (µs = fluorescence decay time, raw value of optical measurement)</i>
Warning limit	Factory setting 10000 h	Diagnostics code and associated message text: 181 "Operating time"
▶ Operation > 40 µs		<i>Only optical sensors</i>
Warning limit	Factory setting 10000 h	Diagnostics code and associated message text: 182 "Operating time"

Diagnostic behavior

 This branch, along with the same functions, can be found in different "Extended setup" menus. The list of diagnostic messages displayed depends on the path selected. There are device-specific messages, and messages that depend on what sensor is connected.

Path: ... /Extended setup/Diagnostics settings/Diag. behavior

Function	Options	Info
List of diagnostic messages		Select the message to be changed. Only then can you make the settings for this message.
Diag. code	Read only	
Diagnostic message	Options ■ On ■ Off Factory setting Depends on the message	You can deactivate or reactivate a diagnostic message here. Deactivating means: ■ No error message in the measuring mode ■ No error current at the current output

Path: ... /Extended setup/Diagnostics settings/Diag. behavior

Function	Options	Info
Error current	Options ■ On ■ Off Factory setting Depends on the message	Decide whether an error current should be output at the current output if the diagnostic message display is activated.
Status signal	Options ■ Maintenance (M) ■ Out of specification (S) ■ Function check (C) ■ Failure (F) Factory setting Depends on the message	The messages are divided into different error classes in accordance with NAMUR NE 107. → BA463C "Maintenance&diagnostics"
Diag. output	Options ■ None ■ Alarm relay ■ Relay 1 to n (depends on the device version) Factory setting None	You can use this function to select an output to which the diagnostic message should be assigned. You first have to configure a relay output before being able to assign the message to an output (Menu/Setup/Outputs, assign "Diagnostics" function and set Operating mode to "as assigned").
 One alarm relay is always available, regardless of the device version. Other relays are optional.		
Cleaning program	Options ■ None ■ Cleaning 1 ■ Cleaning 2 ■ Cleaning 3 ■ Cleaning 4 Factory setting None	Decide whether the diagnostic message should trigger a cleaning program. You can define the cleaning programs under: Menu/Setup/Additional functions/Cleaning.
Detail information	Read only	Here you can find more information on the diagnostic message and instructions on how to resolve the problem.

9.2.7 Tag control

With this function, you specify which sensors are accepted at your device

Path: Menu/Setup/Inputs/<Sensor type>/Extended setup

Function	Options	Info
► Tag control		Additional information on the display: tag control currently used

Path: Menu/Setup/Inputs/<Sensor type>/Extended setup

Function	Options	Info
Operating mode	Options ■ Off ■ Tag ■ Group Factory setting Off	Off No tag control, all sensors are accepted. Tag Only sensors with the same tag are accepted. Group Only sensors in the same tag group are accepted.
Tag	Customized text Factory setting EH_CM44_	Enter the tag name. The controller checks every sensor to be connected as to whether this sensor belongs to the measuring point, and only accepts the sensors that have the same tag.
Group	Numerical Factory setting 0	

 "Tag" stands for the name of a measuring point, and is used in many areas of process measuring technology.

9.2.8 Data processing factory setting

Here you can restore the factory settings for the sensor input. For this purpose, simply press the navigator button and select "OK" when the prompt for the device software appears. Only the factory settings for this particular input are restored. All other settings remain unchanged.

9.2.9 Sensor factory setting (only COS61D)

Here you can restore the sensor factory settings. For this purpose, simply press the navigator button and select "OK" when the prompt for the device software appears. Only the factory settings for the sensor are restored. The settings for the input remain unchanged.

10 Inputs: Chlorine

10.1 Basic settings

10.1.1 Sensor identification

Path: Menu/Setup/Inputs/ <Sensor type>

Function	Options	Info
Channel	Options ■ On ■ Off Factory setting On	On The channel display is switched on in the measuring mode Off The channel is not displayed in the measuring mode, regardless of whether a sensor is connected or not.
Sensor type	Read only (Only available if a sensor is connected)	Connected sensor type
Order code		Order code of the connected sensor

10.1.2 Main value

Path: Menu/Setup/Inputs/Chlorine

Function	Options	Info
Main value	Options ■ Concentration liquid ■ Sensor current (nA) Factory setting Concentration liquid	Decide how you want to display the main value.

10.1.3 Damping

The damping causes a floating average curve of the measured values over the time specified.

Path: Menu/Setup/Inputs/ <Sensor type>

Function	Options	Info
Damping <Sensor type>	0 to 300 s	You specify the damping of the main measured value of the connected sensor and that of the integrated temperature sensor.
Damping temp.	Factory setting 0 s	

10.1.4 Manual hold

Path: Menu/Setup/Inputs/<Sensor type>

Function	Options	Info
Manual hold	Options ■ On ■ Off Factory setting Off	On You can use this function to set the channel manually to "Hold". Off No hold

10.1.5 Unit

Path: Menu/Setup/Inputs/Chlorine

Function	Options	Info
Unit <i>Main value="Concentration liquid"</i>	Options ■ mg/l ■ µg/l ■ ppm ■ ppb Factory setting mg/l	

10.2 Extended setup

10.2.1 Measured value formats

Path: Menu/Setup/Inputs/DO or Chlorine/Extended setup

Function	Options	Info
Temperature format	Options ■ ## ■ ### Factory setting ##	Select how many decimal places should be used to display the temperature.
Main value format	Options ■ ## ■ ### ■ #### ■ # Factory setting ##	Specify the number of decimal places for displaying the main measured value.

10.2.2 Medium compensation (in the process)

Path: Menu/Setup/Inputs/Chlorine/Extended setup

Function	Options	Info
Medium comp. (pH)	Options ■ Off ■ On Factory setting Off	Off The concentration measured value is calculated as HClO (=free available chlorine). On The pH value is used to calculate a cumulative concentration value from HClO and ClO ⁻ (=total chlorine).
Mode <i>Medium comp. (pH) = "On"</i>	Options ■ Fixed value ■ Measured value Factory setting Fixed value	Decide whether you want to specify a fixed pH value for calculating the total chlorine or whether the measured value of a pH sensor attached to another input should be used.
Fixed pH <i>Mode = "Fixed value"</i>	4.00 to 9.00 pH Factory setting 7,20 pH	Useful for media with constant pH values Enter the pH value of your medium which you determined with a reference measurement.
Associated pH-sensor <i>Mode = "Measured value"</i>	Select the pH sensor Factory setting None	Preferred method for media with varying pH values Select the sensor input with the connected pH sensor. The measured value of the sensor is then continuously used to calculate the total chlorine.
Temp. compensation	Options ■ Off ■ Automatic ■ Manual Factory setting Automatic	Decide whether and how you want to compensate the medium temperature: ■ No compensation ■ Automatically using the temperature sensor of your sensor ■ Manually by entering the medium temperature
Medium temperature <i>(Temp. compensation = Manual)</i>	-5.0 to 50.0 °C (23.0 to 122.0 °F) Factory setting 20,0 °C (68 °F)	Enter the temperature of your medium.

10.2.3 Cleaning

Path: Menu/Setup/Inputs/<Sensor type>/Extended setup

Function	Options	Info
Cleaning	Options ■ None ■ Cleaning 1 ■ Cleaning 2 ■ Cleaning 3 ■ Cleaning 4 Factory setting None	Select a cleaning program. This program is executed if: ■ A diagnostics message is present at the channel and ■ A cleaning process has been specified for this message (→ "Inputs/Diagnostics settings/Diag. behavior").

 You define the cleaning programs in the "Setup/Additional functions/Cleaning" menu.

10.2.4 Calibration settings

Calibration timer and calibration expiration date

You can specify the calibration interval for the sensor here.
Once the time configured elapses, the "Calibration timer" diagnostics message appears on the display.

 The timer is reset automatically if you recalibrate the sensor.

Path: Menu/Setup/Inputs/<Sensor type>/Extended setupCalib. settings

Function	Options	Info
Calibration timer	Options ■ Off ■ On Factory setting Off	Switches the function on or off
Calibration timer <i>Calibration timer= "On"</i>	1 to 10000 h Factory setting 1000 h	Specify the time after which the timer should have timed out. Once this time has elapsed, the "Calib. Timer" diagnostics message, along with the code 102, appears on the display.
Calib. expiration date	Options ■ Off ■ On Factory setting Off	The function checks whether the calibration of a sensor is still valid. Example: You install a precalibrated sensor. The function checks how much time has elapsed since the sensor was last calibrated. A diagnostics message is displayed if the time since the last calibration is longer than the predefined warning and alarm limit.
► Calib. expiration date		
Warning limit	Factory setting 11 months	Diagnostics message: 105 "Calib. validity" Warning and alarm limits mutually affect each other's possible ranges for adjustment.

Path: Menu/Setup/Inputs/<Sensor type>/Extended setupCalib. settings

Function	Options	Info
Alarm limit	Factory setting 12 months	Diagnostics message: 104 "Calib. validity" General rule: Alarm limit > warning limit

Stability criteria

You define the permitted measured value fluctuation which must not be exceeded in a certain timeframe during calibration.
If the permitted difference is exceeded, calibration is not permitted and is aborted automatically.

Path: Menu/Setup/Inputs/DO or Chlorine/Extended setup/Calib. settings

Function	Options	Info
► Stability criteria		
Delta signal	0,1 ... 2,0 % Factory setting 0,2 %	Permitted measured value fluctuation during calibration. Referenced to the raw value in nA in the case of amperometric sensors, and referenced to the partial pressure in the case of optical sensors.
Delta temperature	0.10 to 2.00 °C 0.18 to 3.60 °F Factory setting 0.50 °C 0.90 °F	Permitted temperature fluctuation during calibration
Duration	10 to 60 s Factory setting 20 s	Timeframe within which the permitted range for measured value fluctuation should not be exceeded

10.2.5 Diagnostics settings

This menu branch is used for specifying warning limits, and for defining whether and how diagnostics tools should be used.
The associated diagnostics code is displayed for every setting.

Slope

The (relative) slope characterizes the sensor condition. Decreasing values indicate electrolyte exhaustion. You can control when the electrolyte should be replaced by specifying limit values and the diagnostics messages these limit values trigger.

Path: Menu/Setup/Inputs/Chlorine/Extended setup/Diagnostics settings

Function	Options	Info
► Slope	3,0 ... 500,0 %	Specify the limit values for slope monitoring in your sensor.
Upper warning limit	Factory setting 200,0 %	Diagnostics code and associated message text: 511 "Sensor calib."
Lower warning limit	Factory setting 25,0 %	Diagnostics code and associated message text: 509 "Sensor calib."

Delta slope

The device determines the difference in slope between the last calibration and the penultimate calibration, and issues a warning or an alarm depending on the setting configured. The difference is an indicator for the condition of the sensor. An increasing change indicates the formation of buildup on the sensor diaphragm or electrolyte contamination. Replace the diaphragm and electrolyte as specified in the instructions in the sensor operating manual.

Path: Menu/Setup/Inputs/Chlorine/Extended setup/Diagnostics settings

Function	Options	Info
► Delta slope	1 ... 15 %	Specify the limit values for monitoring the slope differential.
Function	Options ■ On ■ Off Factory setting On	
Warning limit	Factory setting 5 %	Diagnostics code and associated message text: 518 "Sensor calib."

Zero point

The zero point corresponds to the sensor signal that is measured in a medium in the absence of chlorine. You can calibrate the zero point in water that is free from chlorine. This improves accuracy in the trace range.

Path: Menu/Setup/Inputs/Chlorine/Extended setup/Diagnostics settings

Function	Options	Info
► Zero point	0.0 to 3.2 nA	Specify the limit values for zero point monitoring in your sensor.
Warning limit	Factory setting 2.0 nA	Diagnostics code and associated message text: 513 "Zero Warn"

Delta zero point

The device determines the difference between the last calibration and the penultimate calibration, and issues a warning or an alarm depending on the setting configured. The difference is an indicator for the condition of the sensor. Increasing differences indicate the formation of buildup on the cathode. Clean the cathode as specified in the instructions in the sensor operating manual.

Path: Menu/Setup/Inputs/Chlorine/Extended setup/Diagnostics settings

Function	Options	Info
▶ Delta zero point	0.0 to 3.2 nA	Specify your limit values for monitoring the zero point differential.
Function	Options ☐ On ☐ Off Factory setting On	
Warning limit	Factory setting 1.0 nA	Diagnostics code and associated message text: 520 "Sensor calib."

Number of cap calibrations

The calibration counters in the sensor make a distinction between sensor calibrations and calibrations with the membrane cap currently used. If this cap is replaced, only the (cap) counter is reset.

Path: Menu/Setup/Inputs/Chlorine/Extended setup/Diagnostics settings

Function	Options	Info
▶ Number of cap calibrations		Specify how many calibrations may be performed with a membrane cap before the cap has to be replaced.
Function	Options ☐ On ☐ Off Factory setting On	The number depends heavily on the process and must be determined individually.
Warning limit	Factory setting 6	Diagnostics code and associated message text: 535 "Sensor check"

Number of sensor calibrations

The calibration counters in the sensor make a distinction between sensor calibrations and calibrations with the membrane cap currently used.

Path: Menu/Setup/Inputs/Chlorine/Extended setup/Diagnostics settings

Function	Options	Info
► Number of sensor calibrations		Specify how many calibrations may be performed with a sensor before the sensor has to be replaced.
Function	Options ■ On ■ Off Factory setting On	The number depends heavily on the process and must be determined individually.
Warning limit	Factory setting 6	Diagnostics code and associated message text: 533 "Sensor calib."

Process check system

The process check system (PCS) checks the measuring signal for stagnation. An alarm is triggered if the measuring signal does not change over a certain period (several measured values).

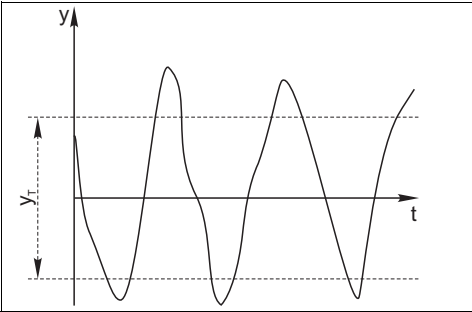


Fig. 16: Normal measuring signal, no alarm

y Measuring signal
y_T Set value for "Tolerancewidth"

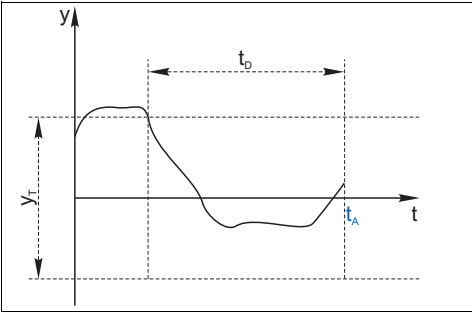


Fig. 17: Stagnating signal, alarm is triggered

t_D Set value for "Duration"
t_A Time when the alarm is triggered

The main causes of stagnating measured values are:

- Contaminated sensor, or sensor in air
- Sensor failure
- Process error (e.g. through control system)

Remedial action

- Clean the sensor.
- Check the measuring chain.

- Switch off the controller and switch it back on again.

Path: Menu/Setup/Inputs/<Sensor type>/Extended setup/Diagnostics settings

Function	Options	Info
► Process Check System		Diagnostics code and associated message text: 904 "Process check"
Function	Options ■ On ■ Off Factory setting Off	
Duration	1 to 240 min Factory setting 60 min	The measured value must change during this time. Otherwise the error message is triggered.
Tolerancewidth <i>Not available for pH/ORP</i>	The range depends on the sensor Factory setting Depends on the sensor	Interval around the measuring signal (raw value) for detecting stagnation. Measured values within the set interval are regarded as stagnating.

Limits operating hours

The total operating time of the sensor and its use under extreme conditions is monitored. If the operating time exceeds the defined threshold values, the device issues a corresponding diagnostics message.

-  Each sensor has a limited life expectancy which heavily depends on the operating conditions. If you specify warning limits for operating times under extreme conditions, you can guarantee the operation of your measuring point without any downtime by performing maintenance tasks in time.

Path: Menu/Setup/Inputs/Chlorine/Extended setup/Diagnostics settings

Function	Options	Info
► Limits operating hours		
 The range of adjustment for the operating hours alarm and warning limits is generally 1 to 50000 h.		
Function	Options ■ On ■ Off Factory setting On	On The operation of the sensor under extreme conditions is monitored, recorded in the sensor and diagnostics messages are displayed on the controller. Off No diagnostics messages. However, the time the sensor operates under extreme conditions is recorded in the sensor and can be read in the sensor information in the diagnostics menu.

Path: Menu/Setup/Inputs/Chlorine/Extended setup/Diagnostics settings

Function	Options	Info
► Operating time		Total operating time of the sensor
Warning limit	Factory setting 10000 h	Diagnostics code and associated message text: 199 "Operating time"
► Operation > 15°C		
Warning limit	Factory setting 10000 h	Diagnostics code and associated message text: 178 "Operating time"
► Operation > 30°C		
Warning limit	Factory setting 10000 h	Diagnostics code and associated message text: 191 "Operating time"
► Operation < -20 nA		
Warning limit	Factory setting 10000 h	Diagnostics code and associated message text: 177 "Operating time"
► Operation < -100 nA		
Warning limit	Factory setting 10000 h	Diagnostics code and associated message text: 176 "Operating time"

Electrolyte counter

The electrolyte consumption is calculated on the basis of the load volume entered by the sensor diaphragm.

The following applies for the sensor CCS142D:

Half the chloride would be consumed and the entire dihydrogen phosphate would be converted to monohydrogen phosphate in an electrolyte filling (4 ml) at 20 000 000 µAs (=20 As). This would render the electrolyte and the sensor unusable.

In the interests of predictive maintenance, you should replace the electrolyte at 10 000 000 µAs, and preferably at 5 000 000 µAs. 25%-50% of the dihydrogen phosphate is then consumed. The calculation presumes that the buffer of the electrolyte is only changed by the electrochemical conversion of hypochlorous acid. It does not take the penetration of acids and bases into the sensor into account. Depending on the application it can be necessary to change the electrolyte before a load of 5 As is reached.

Path: Menu/Setup/Inputs/Chlorine/Extended setup/Diagnostics settings

Function	Options	Info
▶ Electrolyte counter	100000 to 2000000 µAs	
Function	Options ■ On ■ Off Factory setting On	
Warning limit	Factory setting 1000000 µAs	Diagnostics code and associated message text: 534 "Sensor calib."

Diagnostic behavior

-  This branch, along with the same functions, can be found in different "Extended setup" menus. The list of diagnostic messages displayed depends on the path selected. There are device-specific messages, and messages that depend on what sensor is connected.

Path: ... /Extended setup/Diagnostics settings/Diag. behavior

Function	Options	Info
List of diagnostic messages		Select the message to be changed. Only then can you make the settings for this message.
Diag. code	Read only	
Diagnostic message	Options ■ On ■ Off Factory setting Depends on the message	You can deactivate or reactivate a diagnostic message here. Deactivating means: ■ No error message in the measuring mode ■ No error current at the current output
Error current	Options ■ On ■ Off Factory setting Depends on the message	Decide whether an error current should be output at the current output if the diagnostic message display is activated.
Status signal	Options ■ Maintenance (M) ■ Out of specification (S) ■ Function check (C) ■ Failure (F) Factory setting Depends on the message	The messages are divided into different error classes in accordance with NAMUR NE 107. → BA463C "Maintenance&diagnostics"

Path: ... /Extended setup/Diagnostics settings/Diag. behavior

Function	Options	Info
Diag. output	Options - None - Alarm relay - Relay 1 to n (depends on the device version) Factory setting None	You can use this function to select an output to which the diagnostic message should be assigned. You first have to configure a relay output before being able to assign the message to an output (Menu/Setup/Outputs, assign "Diagnostics" function and set Operating mode to "as assigned").
 One alarm relay is always available, regardless of the device version. Other relays are optional.		
Cleaning program	Options - None - Cleaning 1 - Cleaning 2 - Cleaning 3 - Cleaning 4 Factory setting None	Decide whether the diagnostic message should trigger a cleaning program. You can define the cleaning programs under: Menu/Setup/Additional functions/Cleaning.
Detail information	Read only	Here you can find more information on the diagnostic message and instructions on how to resolve the problem.

10.2.6 Tag control

With this function, you specify which sensors are accepted at your device

Path: Menu/Setup/Inputs/<Sensor type>/Extended setup

Function	Options	Info
► Tag control		Additional information on the display: tag control currently used
Operating mode	Options - Off - Tag - Group Factory setting Off	Off No tag control, all sensors are accepted. Tag Only sensors with the same tag are accepted. Group Only sensors in the same tag group are accepted.
Tag	Customized text Factory setting EH_CM44_	Enter the tag name. The controller checks every sensor to be connected as to whether this sensor belongs to the measuring point, and only accepts the sensors that have the same tag.
Group	Numerical Factory setting 0	

 "Tag" stands for the name of a measuring point, and is used in many areas of process measuring technology.

10.2.7 Data processing factory setting

Here you can restore the factory settings for the sensor input. For this purpose, simply press the navigator button and select "OK" when the prompt for the device software appears. Only the factory settings for this particular input are restored. All other settings remain unchanged.

11 Inputs: Turbidity and solids

11.1 Basic settings

11.1.1 Sensor identification

Path: Menu/Setup/Inputs/<Sensor type>

Function	Options	Info
Channel	Options ■ On ■ Off Factory setting On	On The channel display is switched on in the measuring mode Off The channel is not displayed in the measuring mode, regardless of whether a sensor is connected or not.
Sensor type	Read only (Only available if a sensor is connected)	Connected sensor type
Order code		Order code of the connected sensor

11.1.2 Application

 Calibration data records are saved under an individual name in the turbidity sensor. A new sensor is calibrated at the factory and thus already has appropriate data records. You can add your own data records during each calibration. These are then available for selection under "Application".

Path: Menu/Setup/Inputs/Turbidity

Function	Options	Info
Application type	Options ■ Clear water ■ Solid Factory setting Clear water	Preselection for saved calibration data records
Application	Options ■ Formazin ■ Kaolin ■ SiO2 ■ TiO2 ■ Excess sludge ■ Digested sludge ■ Activated sludge Factory setting Formazin or Excess sludge	Select a saved calibration data record The options and the factory setting depend on the setting in "Application type".

11.1.3 Damping

The damping causes a floating average curve of the measured values over the time specified.

Path: Menu/Setup/Inputs/<Sensor type>

Function	Options	Info
Damping <Sensor type>	0 to 300 s	You specify the damping of the main measured value of the connected sensor and that of the integrated temperature sensor.
Damping temp.	Factory setting 0 s	

11.1.4 Manual hold

Path: Menu/Setup/Inputs/<Sensor type>

Function	Options	Info
Manual hold	Options ■ On ■ Off Factory setting Off	On You can use this function to set the channel manually to "Hold". Off No hold

11.2 Extended setup

11.2.1 Measured value formats

Path: Menu/Setup/Inputs/Turbidity/Extended setup

Function	Options	Info
Temperature format	Options ■ #.# ■ #.## Factory setting #.#	Select how many decimal places should be used to display the temperature.

Path: Menu/Setup/Inputs/Turbidity/Extended setup

Function	Options	Info
Main value format	Options ■ #.# ■ #.## ■ #.### ■ # Factory setting #.#	Specify the number of decimal places for the main value.
Unit	Options Application="Formazin" ■ FNU ■ NTU Options All apart from "Formazin" ■ g/l ■ ppm ■ %TS Factory setting FNU g/l	Select the unit for the main measured value.

11.2.2 Cleaning

Path: Menu/Setup/Inputs/<Sensor type>/Extended setup

Function	Options	Info
Cleaning	Options ■ None ■ Cleaning 1 ■ Cleaning 2 ■ Cleaning 3 ■ Cleaning 4 Factory setting None	Select a cleaning program. This program is executed if: ■ A diagnostics message is present at the channel and ■ A cleaning process has been specified for this message (→ "Inputs/Diagnostics settings/Diag. behavior").

 You define the cleaning programs in the "Setup/Additional functions/Cleaning" menu.

11.2.3 Calibration settings

Calibration timer and calibration expiration date

You can specify the calibration interval for the sensor here.
Once the time configured elapses, the "Calibration timer" diagnostics message appears on the display.

 The timer is reset automatically if you recalibrate the sensor.

Path: Menu/Setup/Inputs/<Sensor type>/Extended setup/Calib. settings

Function	Options	Info
Calibration timer	Options ☐ Off ☐ On Factory setting Off	Switches the function on or off
Calibration timer <i>Calibration timer="On"</i>	1 to 10000 h Factory setting 1000 h	Specify the time after which the timer should have timed out. Once this time has elapsed, the "Calib. Timer" diagnostics message, along with the code 102, appears on the display.
Calib. expiration date	Options ☐ Off ☐ On Factory setting Off	The function checks whether the calibration of a sensor is still valid. Example: You install a precalibrated sensor. The function checks how much time has elapsed since the sensor was last calibrated. A diagnostics message is displayed if the time since the last calibration is longer than the predefined warning and alarm limit.
► Calib. expiration date		
Warning limit	Factory setting 11 months	Diagnostics message: 105 "Calib. validity" Warning and alarm limits mutually affect each other's possible ranges for adjustment.
Alarm limit	Factory setting 12 months	Diagnostics message: 104 "Calib. validity" General rule: Alarm limit > warning limit

Stability criteria

You define the permitted measured value fluctuation which must not be exceeded in a certain timeframe during calibration.

If the permitted difference is exceeded, calibration is not permitted and is aborted automatically.

Path: Menu/Setup/Inputs/Turbidity or SAC/Extended setup/Calib. settings

Function	Options	Info
► Stability criteria		
Delta turbidity or Delta SAC	0,1 ... 5,0 % Factory setting 2,0 %	Permitted measured value fluctuation during calibration
Delta temperature	0.10 to 2.00 °C 0.18 to 3.60 °F Factory setting 0.50 °C 0.90 °F	Permitted temperature fluctuation during calibration

Path: Menu/Setup/Inputs/Turbidity or SAC/Extended setup/Calib. settings

Function	Options	Info
Duration	0 to 100 s Factory setting 10 s	Timeframe within which the permitted range for measured value fluctuation should not be exceeded

11.2.4 Diagnostics settings

This menu branch is used for specifying warning limits, and for defining whether and how diagnostics tools should be used.
The associated diagnostics code is displayed for every setting.

Limits operating hours

The total operating time of the sensor and its use under extreme conditions is monitored. If the operating time exceeds the defined threshold values, the device issues a corresponding diagnostics message.

 Each sensor has a limited life expectancy which heavily depends on the operating conditions. If you specify warning limits for operating times under extreme conditions, you can guarantee the operation of your measuring point without any downtime by performing maintenance tasks in time.

Path: Menu/Setup/Inputs/<Sensor type>/Extended setup/Diagnostics settings

Function	Options	Info
▶ Limits operating hours		Specify your limit values for monitoring the number of operating hours under extreme conditions.
 The range of adjustment for the operating hours alarm and warning limits is generally 1 to 50000 h.		
Function	Options ■ On ■ Off Factory setting Off	On The operation of the sensor under extreme conditions is monitored, recorded in the sensor and diagnostics messages are displayed on the controller. Off No diagnostics messages. However, the time the sensor operates under extreme conditions is recorded in the sensor and can be read in the sensor information in the diagnostics menu.
▶ Operating time		Total operating time of the sensor
Warning limit	Factory setting 10000 h	Diagnostics code and associated message text: 199 "Operating time"
▶ (Operation below specified temperature limit)		

Path: Menu/Setup/Inputs/<Sensor type>/Extended setup/Diagnostics settings

Function	Options	Info
 The names of the menu functions in brackets depend on the sensor specification. For this reason, they cannot be specified here.		
Warning limit	Factory setting 10000 h	Diagnostics code and associated message text: 935 "Process temp."
▶ (Operation above specified temperature limit)		
Warning limit	Factory setting 10000 h	Diagnostics code and associated message text: 934 "Process temp."
▶ (Operation below specified turbidity limit)		
Warning limit	Factory setting 10000 h	Diagnostics code and associated message text: 943 "Process value"
▶ (Operation above specified turbidity limit)		
Warning limit	Factory setting 10000 h	Diagnostics code and associated message text: 942 "Process value"
▶ Filter change		<i>Only CAS51D</i>
Warning limit	Factory setting 10000 h	Diagnostics code and associated message text: 157 "Filter change"
▶ Lamp life		<i>Only CAS51D-SAC</i>
Warning limit	Factory setting 35040 h	Diagnostics code and associated message text: 171 "Lamp change"

Process check system

The process check system (PCS) checks the measuring signal for stagnation. An alarm is triggered if the measuring signal does not change over a certain period (several measured values).

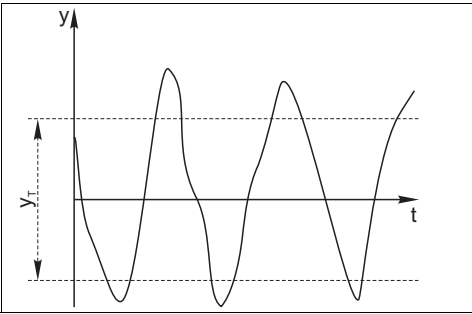


Fig. 18: Normal measuring signal, no alarm

y Measuring signal
 y_T Set value for "Tolerancewidth"

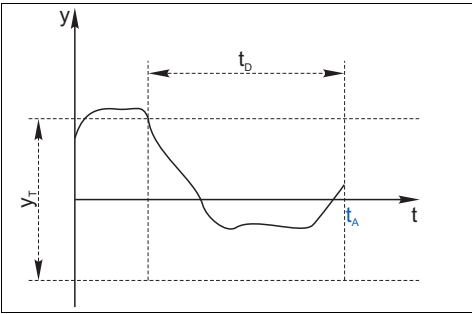


Fig. 19: Stagnating signal, alarm is triggered

t_D Set value for "Duration"
 t_A Time when the alarm is triggered

The main causes of stagnating measured values are:

- Contaminated sensor, or sensor in air
- Sensor failure
- Process error (e.g. through control system)

Remedial action

- ▶ Clean the sensor.
- ▶ Check the measuring chain.
- ▶ Switch off the controller and switch it back on again.

Path: Menu/Setup/Inputs/<Sensor type>/Extended setup/Diagnostics settings

Function	Options	Info
▶ Process Check System		Diagnostics code and associated message text: 904 "Process check"
Function	Options ■ On ■ Off Factory setting Off	
Duration	1 to 240 min Factory setting 60 min	The measured value must change during this time. Otherwise the error message is triggered.

Path: Menu/Setup/Inputs/<Sensor type>/Extended setup/Diagnostics settings

Function	Options	Info
Tolerancewidth <i>Not available for pH/ORP</i>	The range depends on the sensor Factory setting Depends on the sensor	Interval around the measuring signal (raw value) for detecting stagnation. Measured values within the set interval are regarded as stagnating.

Sensor operating hours

The data displayed here are the current hours the device has been in operation under extreme conditions. You cannot make any changes. You can only read the values.
The same data can be found in the Diagnostics menu.

Diagnostic behavior

 This branch, along with the same functions, can be found in different "Extended setup" menus. The list of diagnostic messages displayed depends on the path selected. There are device-specific messages, and messages that depend on what sensor is connected.

Path: ... /Extended setup/Diagnostics settings/Diag. behavior

Function	Options	Info
List of diagnostic messages		Select the message to be changed. Only then can you make the settings for this message.
Diag. code	Read only	
Diagnostic message	Options ■ On ■ Off Factory setting Depends on the message	You can deactivate or reactivate a diagnostic message here. Deactivating means: ■ No error message in the measuring mode ■ No error current at the current output
Error current	Options ■ On ■ Off Factory setting Depends on the message	Decide whether an error current should be output at the current output if the diagnostic message display is activated.
Status signal	Options ■ Maintenance (M) ■ Out of specification (S) ■ Function check (C) ■ Failure (F) Factory setting Depends on the message	The messages are divided into different error classes in accordance with NAMUR NE 107. —> BA463C "Maintenance&diagnostics"

Path: ... /Extended setup/Diagnostics settings/Diag. behavior

Function	Options	Info
Diag. output	Options - None - Alarm relay - Relay 1 to n (depends on the device version) Factory setting None	You can use this function to select an output to which the diagnostic message should be assigned. You first have to configure a relay output before being able to assign the message to an output (Menu/Setup/Outputs, assign "Diagnostics" function and set Operating mode to "as assigned").
 One alarm relay is always available, regardless of the device version. Other relays are optional.		
Cleaning program	Options - None - Cleaning 1 - Cleaning 2 - Cleaning 3 - Cleaning 4 Factory setting None	Decide whether the diagnostic message should trigger a cleaning program. You can define the cleaning programs under: Menu/Setup/Additional functions/Cleaning.
Detail information	Read only	Here you can find more information on the diagnostic message and instructions on how to resolve the problem.

11.2.5 Tag control

With this function, you specify which sensors are accepted at your device

Path: Menu/Setup/Inputs/<Sensor type>/Extended setup

Function	Options	Info
► Tag control		Additional information on the display: tag control currently used
Operating mode	Options - Off - Tag - Group Factory setting Off	Off No tag control, all sensors are accepted. Tag Only sensors with the same tag are accepted. Group Only sensors in the same tag group are accepted.
Tag	Customized text Factory setting EH_CM44_	Enter the tag name. The controller checks every sensor to be connected as to whether this sensor belongs to the measuring point, and only accepts the sensors that have the same tag.
Group	Numerical Factory setting 0	

 "Tag" stands for the name of a measuring point, and is used in many areas of process measuring technology.

11.2.6 Data processing factory setting

Here you can restore the factory settings for the sensor input. For this purpose, simply press the navigator button and select "OK" when the prompt for the device software appears. Only the factory settings for this particular input are restored. All other settings remain unchanged.

11.2.7 Sensor factory setting

Here you can restore the sensor factory settings. For this purpose, simply press the navigator button and select "OK" when the prompt for the device software appears. Only the factory settings for the sensor are restored. The settings for the input remain unchanged.

12 Inputs: SAC

12.1 Basic settings

12.1.1 Sensor identification

Path: Menu/Setup/Inputs/<Sensor type>

Function	Options	Info
Channel	Options ■ On ■ Off Factory setting On	On The channel display is switched on in the measuring mode Off The channel is not displayed in the measuring mode, regardless of whether a sensor is connected or not.
Sensor type	Read only (Only available if a sensor is connected)	Connected sensor type
Order code		Order code of the connected sensor

12.1.2 Application

 Calibration data records are saved under an individual name in the sensor. A new sensor is calibrated at the factory and thus already has appropriate data records. You can add your own data records during each calibration. These are then available for selection under "Application".

Path: Menu/Setup/Inputs/SAC

Function	Options	Info
Basic application	Options ■ SAC ■ Transm. ■ Absorption ■ COD ■ TOC ■ DOC ■ BOD Factory setting SAC	Preselection for saved calibration data records
Application	Options ■ Factory calib. ■ 6 other data records Factory setting Factory calib.	Select a saved calibration data record

12.1.3 Damping

The damping causes a floating average curve of the measured values over the time specified.

Path: Menu/Setup/Inputs/<Sensor type>

Function	Options	Info
Damping <Sensor type>	0 to 300 s	You specify the damping of the main measured value of the connected sensor and that of the integrated temperature sensor.
Damping temp.	Factory setting 0 s	

12.1.4 Manual hold

Path: Menu/Setup/Inputs/<Sensor type>

Function	Options	Info
Manual hold	Options ■ On ■ Off Factory setting Off	On You can use this function to set the channel manually to "Hold". Off No hold

12.2 Extended setup

12.2.1 Measured value formats

Path: Menu/Setup/Inputs/SAC/Extended setup

Function	Options	Info
Temperature format	Options ■ #.# ■ #.## Factory setting #.#	Select how many decimal places should be used to display the temperature.

Path: Menu/Setup/Inputs/SAC/Extended setup

Function	Options	Info
Main value format	Options ■ #.# ■ #.## ■ #.### ■ # Factory setting #.#	Specify the number of decimal places for the main value.
Unit	Options ■ None ■ % ■ mg/l ■ ppm ■ 1/m Factory setting depends on "Basic application"	The unit of the main value depends on the basic application selected. Depending on this setting only certain units are available for selection.

12.2.2 Cleaning

Path: Menu/Setup/Inputs/<Sensor type>/Extended setup

Function	Options	Info
Cleaning	Options ■ None ■ Cleaning 1 ■ Cleaning 2 ■ Cleaning 3 ■ Cleaning 4 Factory setting None	Select a cleaning program. This program is executed if: ■ A diagnostics message is present at the channel and ■ A cleaning process has been specified for this message (→ "Inputs/Diagnostics settings/Diag. behavior").

 You define the cleaning programs in the "Setup/Additional functions/Cleaning" menu.

12.2.3 Calibration settings

Calibration timer and calibration expiration date

You can specify the calibration interval for the sensor here.
Once the time configured elapses, the "Calibration timer" diagnostics message appears on the display.

 The timer is reset automatically if you recalibrate the sensor.

Path: Menu/Setup/Inputs/<Sensor type>/Extended setup/Calib. settings

Function	Options	Info
Calibration timer	Options ☐ Off ☐ On Factory setting Off	Switches the function on or off
Calibration timer <i>Calibration timer="On"</i>	1 to 10000 h Factory setting 1000 h	Specify the time after which the timer should have timed out. Once this time has elapsed, the "Calib. Timer" diagnostics message, along with the code 102, appears on the display.
Calib. expiration date	Options ☐ Off ☐ On Factory setting Off	The function checks whether the calibration of a sensor is still valid. Example: You install a precalibrated sensor. The function checks how much time has elapsed since the sensor was last calibrated. A diagnostics message is displayed if the time since the last calibration is longer than the predefined warning and alarm limit.
► Calib. expiration date		
Warning limit	Factory setting 11 months	Diagnostics message: 105 "Calib. validity" Warning and alarm limits mutually affect each other's possible ranges for adjustment.
Alarm limit	Factory setting 12 months	Diagnostics message: 104 "Calib. validity" General rule: Alarm limit > warning limit

Stability criteria

You define the permitted measured value fluctuation which must not be exceeded in a certain timeframe during calibration.

If the permitted difference is exceeded, calibration is not permitted and is aborted automatically.

Path: Menu/Setup/Inputs/Turbidity or SAC/Extended setup/Calib. settings

Function	Options	Info
► Stability criteria		
Delta turbidity or Delta SAC	0,1 ... 5,0 % Factory setting 2,0 %	Permitted measured value fluctuation during calibration
Delta temperature	0.10 to 2.00 °C 0.18 to 3.60 °F Factory setting 0.50 °C 0.90 °F	Permitted temperature fluctuation during calibration

Path: Menu/Setup/Inputs/Turbidity or SAC/Extended setup/Calib. settings

Function	Options	Info
Duration	0 to 100 s Factory setting 10 s	Timeframe within which the permitted range for measured value fluctuation should not be exceeded

12.2.4 Diagnostics settings

This menu branch is used for specifying warning limits, and for defining whether and how diagnostics tools should be used.
The associated diagnostics code is displayed for every setting.

Limits operating hours

The total operating time of the sensor and its use under extreme conditions is monitored. If the operating time exceeds the defined threshold values, the device issues a corresponding diagnostics message.

 Each sensor has a limited life expectancy which heavily depends on the operating conditions. If you specify warning limits for operating times under extreme conditions, you can guarantee the operation of your measuring point without any downtime by performing maintenance tasks in time.

Path: Menu/Setup/Inputs/<Sensor type>/Extended setup/Diagnostics settings

Function	Options	Info
▶ Limits operating hours		Specify your limit values for monitoring the number of operating hours under extreme conditions.
 The range of adjustment for the operating hours alarm and warning limits is generally 1 to 50000 h.		
Function	Options ■ On ■ Off Factory setting Off	On The operation of the sensor under extreme conditions is monitored, recorded in the sensor and diagnostics messages are displayed on the controller. Off No diagnostics messages. However, the time the sensor operates under extreme conditions is recorded in the sensor and can be read in the sensor information in the diagnostics menu.
▶ Operating time		Total operating time of the sensor
Warning limit	Factory setting 10000 h	Diagnostics code and associated message text: 199 "Operating time"
▶ (Operation below specified temperature limit)		

Path: Menu/Setup/Inputs/<Sensor type>/Extended setup/Diagnostics settings

Function	Options	Info
 The names of the menu functions in brackets depend on the sensor specification. For this reason, they cannot be specified here.		
Warning limit	Factory setting 10000 h	Diagnostics code and associated message text: 935 "Process temp."
▶ (Operation above specified temperature limit)		
Warning limit	Factory setting 10000 h	Diagnostics code and associated message text: 934 "Process temp."
▶ (Operation below specified turbidity limit)		
Warning limit	Factory setting 10000 h	Diagnostics code and associated message text: 943 "Process value"
▶ (Operation above specified turbidity limit)		
Warning limit	Factory setting 10000 h	Diagnostics code and associated message text: 942 "Process value"
▶ Filter change		<i>Only CAS51D</i>
Warning limit	Factory setting 10000 h	Diagnostics code and associated message text: 157 "Filter change"
▶ Lamp life		<i>Only CAS51D-SAC</i>
Warning limit	Factory setting 35040 h	Diagnostics code and associated message text: 171 "Lamp change"

Process check system

The process check system (PCS) checks the measuring signal for stagnation. An alarm is triggered if the measuring signal does not change over a certain period (several measured values).

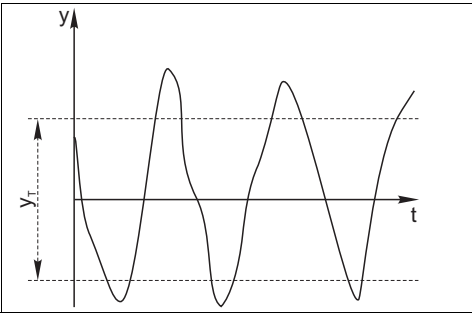


Fig. 20: Normal measuring signal, no alarm

y Measuring signal
 y_T Set value for "Tolerancewidth"

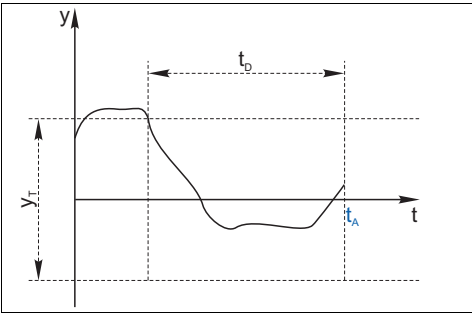


Fig. 21: Stagnating signal, alarm is triggered

t_D Set value for "Duration"
 t_A Time when the alarm is triggered

The main causes of stagnating measured values are:

- Contaminated sensor, or sensor in air
- Sensor failure
- Process error (e.g. through control system)

Remedial action

- ▶ Clean the sensor.
- ▶ Check the measuring chain.
- ▶ Switch off the controller and switch it back on again.

Path: Menu/Setup/Inputs/<Sensor type>/Extended setup/Diagnostics settings

Function	Options	Info
▶ Process Check System		Diagnostics code and associated message text: 904 "Process check"
Function	Options ■ On ■ Off Factory setting Off	
Duration	1 to 240 min Factory setting 60 min	The measured value must change during this time. Otherwise the error message is triggered.

Path: Menu/Setup/Inputs/<Sensor type>/Extended setup/Diagnostics settings

Function	Options	Info
Tolerancewidth <i>Not available for pH/ORP</i>	The range depends on the sensor Factory setting Depends on the sensor	Interval around the measuring signal (raw value) for detecting stagnation. Measured values within the set interval are regarded as stagnating.

Sensor operating hours

The data displayed here are the current hours the device has been in operation under extreme conditions. You cannot make any changes. You can only read the values.

The same data can be found in the Diagnostics menu.

Diagnostic behavior

This branch, along with the same functions, can be found in different "Extended setup" menus. The list of diagnostic messages displayed depends on the path selected. There are device-specific messages, and messages that depend on what sensor is connected.

Path: ... /Extended setup/Diagnostics settings/Diag. behavior

Function	Options	Info
List of diagnostic messages		Select the message to be changed. Only then can you make the settings for this message.
Diag. code	Read only	
Diagnostic message	Options ■ On ■ Off Factory setting Depends on the message	You can deactivate or reactivate a diagnostic message here. Deactivating means: ■ No error message in the measuring mode ■ No error current at the current output
Error current	Options ■ On ■ Off Factory setting Depends on the message	Decide whether an error current should be output at the current output if the diagnostic message display is activated.
Status signal	Options ■ Maintenance (M) ■ Out of specification (S) ■ Function check (C) ■ Failure (F) Factory setting Depends on the message	The messages are divided into different error classes in accordance with NAMUR NE 107. → BA463C "Maintenance&diagnostics"

Path: ... /Extended setup/Diagnostics settings/Diag. behavior

Function	Options	Info
Diag. output	Options - None - Alarm relay - Relay 1 to n (depends on the device version) Factory setting None	You can use this function to select an output to which the diagnostic message should be assigned. You first have to configure a relay output before being able to assign the message to an output (Menu/Setup/Outputs, assign "Diagnostics" function and set Operating mode to "as assigned").
 One alarm relay is always available, regardless of the device version. Other relays are optional.		
Cleaning program	Options - None - Cleaning 1 - Cleaning 2 - Cleaning 3 - Cleaning 4 Factory setting None	Decide whether the diagnostic message should trigger a cleaning program. You can define the cleaning programs under: Menu/Setup/Additional functions/Cleaning.
Detail information	Read only	Here you can find more information on the diagnostic message and instructions on how to resolve the problem.

12.2.5 Tag control

With this function, you specify which sensors are accepted at your device

Path: Menu/Setup/Inputs/<Sensor type>/Extended setup

Function	Options	Info
► Tag control		Additional information on the display: tag control currently used
Operating mode	Options - Off - Tag - Group Factory setting Off	Off No tag control, all sensors are accepted. Tag Only sensors with the same tag are accepted. Group Only sensors in the same tag group are accepted.
Tag	Customized text Factory setting EH_CM44_	Enter the tag name. The controller checks every sensor to be connected as to whether this sensor belongs to the measuring point, and only accepts the sensors that have the same tag.
Group	Numerical Factory setting 0	

 "Tag" stands for the name of a measuring point, and is used in many areas of process measuring technology.

12.2.6 Data processing factory setting

Here you can restore the factory settings for the sensor input. For this purpose, simply press the navigator button and select "OK" when the prompt for the device software appears. Only the factory settings for this particular input are restored. All other settings remain unchanged.

12.2.7 Sensor factory setting

Here you can restore the sensor factory settings. For this purpose, simply press the navigator button and select "OK" when the prompt for the device software appears. Only the factory settings for the sensor are restored. The settings for the input remain unchanged.

13 Inputs: Nitrate

13.1 Basic settings

13.1.1 Sensor identification

Path: Menu/Setup/Inputs/<Sensor type>

Function	Options	Info
Channel	Options ■ On ■ Off Factory setting On	On The channel display is switched on in the measuring mode Off The channel is not displayed in the measuring mode, regardless of whether a sensor is connected or not.
Sensor type	Read only (Only available if a sensor is connected)	Connected sensor type
Order code		Order code of the connected sensor

13.1.2 Application

 Calibration data records are saved under an individual name in the nitrate sensor. A new sensor is calibrated at the factory and always has a corresponding data record. You can add additional data records during each calibration. These are then available for selection under "Application".

Path: Menu/Setup/Inputs/Nitrate

Function	Options	Info
Application	Depends on the sensor	Select a saved calibration data record

13.1.3 Damping

The damping causes a floating average curve of the measured values over the time specified.

Path: Menu/Setup/Inputs/<Sensor type>

Function	Options	Info
Damping <Sensor type>	0 to 300 s	You specify the damping of the main measured value of the connected sensor and that of the integrated temperature sensor.
Damping temp.	Factory setting 0 s	

13.1.4 Manual hold

Path: Menu/Setup/Inputs/<Sensor type>

Function	Options	Info
Manual hold	Options ■ On ■ Off Factory setting Off	On You can use this function to set the channel manually to "Hold". Off No hold

13.2 Extended setup

13.2.1 Measured value formats

Path: Menu/Setup/Inputs/Nitrate/Extended setup

Function	Options	Info
Temperature format	Options ■ #.# ■ #.## Factory setting #.#	Select how many decimal places should be used to display the temperature.
Main value format	Options ■ #.# ■ #.## ■ #.### ■ # Factory setting #.#	Specify the number of decimal places.
Unit	Options ■ mg/l NO3-N ■ mg/l NO3 ■ ppm NO3-N ■ ppm NO3 Factory setting mg/l NO3-N	Select the unit for the main measured value.

13.2.2 Cleaning

Path: Menu/Setup/Inputs/<Sensor type>/Extended setup

Function	Options	Info
Cleaning	Options - None - Cleaning 1 - Cleaning 2 - Cleaning 3 - Cleaning 4 Factory setting None	Select a cleaning program. This program is executed if: - A diagnostics message is present at the channel and - A cleaning process has been specified for this message (→ "Inputs/Diagnostics settings/Diag. behavior").

 You define the cleaning programs in the "Setup/Additional functions/Cleaning" menu.

13.2.3 Calibration settings

Calibration timer and calibration expiration date

You can specify the calibration interval for the sensor here.
Once the time configured elapses, the "Calibration timer" diagnostics message appears on the display.

 The timer is reset automatically if you recalibrate the sensor.

Path: Menu/Setup/Inputs/<Sensor type>/Extended setupCalib. settings

Function	Options	Info
Calibration timer	Options - Off - On Factory setting Off	Switches the function on or off
Calibration timer <i>Calibration timer= "On"</i>	1 to 10000 h Factory setting 1000 h	Specify the time after which the timer should have timed out. Once this time has elapsed, the "Calib. Timer" diagnostics message, along with the code 102, appears on the display.
Calib. expiration date	Options - Off - On Factory setting Off	The function checks whether the calibration of a sensor is still valid. Example: You install a precalibrated sensor. The function checks how much time has elapsed since the sensor was last calibrated. A diagnostics message is displayed if the time since the last calibration is longer than the predefined warning and alarm limit.
▶ Calib. expiration date		
Warning limit	Factory setting 11 months	Diagnostics message: 105 "Calib. validity" Warning and alarm limits mutually affect each other's possible ranges for adjustment.

Path: Menu/Setup/Inputs/<Sensor type>/Extended setupCalib. settings

Function	Options	Info
Alarm limit	Factory setting 12 months	Diagnostics message: 104 "Calib. validity" General rule: Alarm limit > warning limit

Stability criteria

You define the permitted measured value fluctuation which must not be exceeded in a certain timeframe during calibration.
If the permitted difference is exceeded, calibration is not permitted and is aborted automatically.

Path: Menu/Setup/Inputs/Nitrate/Extended setup/Calib. settings

Function	Options	Info
► Stability criteria		
Delta nitrate	0,1 ... 5,0 % Factory setting 2,0 %	Permitted measured value fluctuation during calibration
Delta temperature	0.10 to 2.00 °C 0.18 to 3.60 °F Factory setting 0.50 °C 0.90 °F	Permitted temperature fluctuation during calibration
Duration	0 to 100 s Factory setting 10 s	Timeframe within which the permitted range for measured value fluctuation should not be exceeded

13.2.4 Diagnostics settings

This menu branch is used for specifying warning limits, and for defining whether and how diagnostics tools should be used.
The associated diagnostics code is displayed for every setting.

Limits operating hours

The total operating time of the sensor and its use under extreme conditions is monitored. If the operating time exceeds the defined threshold values, the device issues a corresponding diagnostics message.

 Each sensor has a limited life expectancy which heavily depends on the operating conditions. If you specify warning limits for operating times under extreme conditions, you can guarantee the operation of your measuring point without any downtime by performing maintenance tasks in time.

Path: Menu/Setup/Inputs/<Sensor type>/Extended setup/Diagnostics settings

Function	Options	Info
► Limits operating hours  The range of adjustment for the operating hours alarm and warning limits is generally 1 to 50000 h.		
Function	Options ■ On ■ Off Factory setting Off	On The operation of the sensor under extreme conditions is monitored, recorded in the sensor and diagnostics messages are displayed on the controller. Off No diagnostics messages. However, the time the sensor operates under extreme conditions is recorded in the sensor and can be read in the sensor information in the diagnostics menu.
► Operating time		Total operating time of the sensor
Warning limit	Factory setting 10000 h	Diagnostics code and associated message text: 199 "Operating time"
► (Operation below specified temperature limit)  The names of the menu functions in brackets depend on the sensor specification. For this reason, they cannot be specified here.		
Warning limit	Factory setting 10000 h	Diagnostics code and associated message text: 935 "Process temp."
► (Operation above specified temperature limit)		
Warning limit	Factory setting 10000 h	Diagnostics code and associated message text: 934 "Process temp."
► (Operation below specified turbidity limit)		
Warning limit	Factory setting 10000 h	Diagnostics code and associated message text: 943 "Process value"
► (Operation above specified turbidity limit)		
Warning limit	Factory setting 10000 h	Diagnostics code and associated message text: 942 "Process value"
► Filter change		
Warning limit	Factory setting 10000 h	Diagnostics code and associated message text: 157 "Filter change"
► Lamp life		
Warning limit	Factory setting 35040 h	Diagnostics code and associated message text: 171 "Lamp change"

Process check system

The process check system (PCS) checks the measuring signal for stagnation. An alarm is triggered if the measuring signal does not change over a certain period (several measured values).

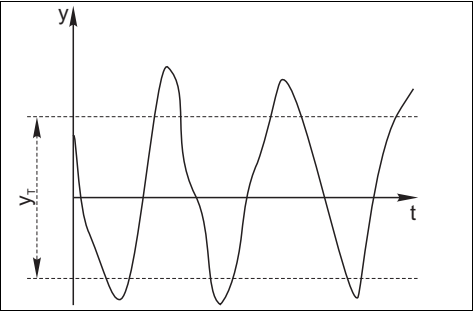


Fig. 22: Normal measuring signal, no alarm

y Measuring signal
 y_T Set value for "Tolerancewidth"

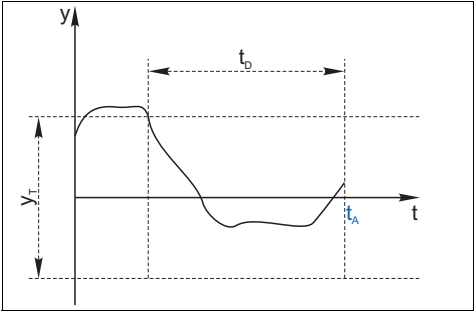


Fig. 23: Stagnating signal, alarm is triggered

t_D Set value for "Duration"
 t_A Time when the alarm is triggered

The main causes of stagnating measured values are:

- Contaminated sensor, or sensor in air
- Sensor failure
- Process error (e.g. through control system)

Remedial action

- Clean the sensor.
- Check the measuring chain.
- Switch off the controller and switch it back on again.

Path: Menu/Setup/Inputs/<Sensor type>/Extended setup/Diagnostics settings

Function	Options	Info
► Process Check System		Diagnostics code and associated message text: 904 "Process check"
Function	Options ■ On ■ Off Factory setting Off	
Duration	1 to 240 min Factory setting 60 min	The measured value must change during this time. Otherwise the error message is triggered.

Path: Menu/Setup/Inputs/<Sensor type>/Extended setup/Diagnostics settings

Function	Options	Info
Tolerancewidth <i>Not available for pH/ORP</i>	The range depends on the sensor Factory setting Depends on the sensor	Interval around the measuring signal (raw value) for detecting stagnation. Measured values within the set interval are regarded as stagnating.

Sensor operating hours

The data displayed here are the current hours the device has been in operation under extreme conditions. You cannot make any changes. You can only read the values.
The same data can be found in the Diagnostics menu.

Diagnostic behavior

 This branch, along with the same functions, can be found in different "Extended setup" menus. The list of diagnostic messages displayed depends on the path selected. There are device-specific messages, and messages that depend on what sensor is connected.

Path: ... /Extended setup/Diagnostics settings/Diag. behavior

Function	Options	Info
List of diagnostic messages		Select the message to be changed. Only then can you make the settings for this message.
Diag. code	Read only	
Diagnostic message	Options ■ On ■ Off Factory setting Depends on the message	You can deactivate or reactivate a diagnostic message here. Deactivating means: ■ No error message in the measuring mode ■ No error current at the current output
Error current	Options ■ On ■ Off Factory setting Depends on the message	Decide whether an error current should be output at the current output if the diagnostic message display is activated.
Status signal	Options ■ Maintenance (M) ■ Out of specification (S) ■ Function check (C) ■ Failure (F) Factory setting Depends on the message	The messages are divided into different error classes in accordance with NAMUR NE 107. —> BA463C "Maintenance&diagnostics"

Path: ... /Extended setup/Diagnostics settings/Diag. behavior

Function	Options	Info
Diag. output	Options ■ None ■ Alarm relay ■ Relay 1 to n (depends on the device version) Factory setting None	You can use this function to select an output to which the diagnostic message should be assigned. You first have to configure a relay output before being able to assign the message to an output (Menu/Setup/Outputs, assign "Diagnostics" function and set Operating mode to "as assigned").
 One alarm relay is always available, regardless of the device version. Other relays are optional.		
Cleaning program	Options ■ None ■ Cleaning 1 ■ Cleaning 2 ■ Cleaning 3 ■ Cleaning 4 Factory setting None	Decide whether the diagnostic message should trigger a cleaning program. You can define the cleaning programs under: Menu/Setup/Additional functions/Cleaning.
Detail information	Read only	Here you can find more information on the diagnostic message and instructions on how to resolve the problem.

13.2.5 Tag control

With this function, you specify which sensors are accepted at your device

Path: Menu/Setup/Inputs/<Sensor type>/Extended setup

Function	Options	Info
► Tag control		Additional information on the display: tag control currently used
Operating mode	Options ■ Off ■ Tag ■ Group Factory setting Off	Off No tag control, all sensors are accepted. Tag Only sensors with the same tag are accepted. Group Only sensors in the same tag group are accepted.
Tag	Customized text Factory setting EH_CM44_	Enter the tag name. The controller checks every sensor to be connected as to whether this sensor belongs to the measuring point, and only accepts the sensors that have the same tag.
Group	Numerical Factory setting 0	



"Tag" stands for the name of a measuring point, and is used in many areas of process measuring technology.

13.2.6 Data processing factory setting

Here you can restore the factory settings for the sensor input. For this purpose, simply press the navigator button and select "OK" when the prompt for the device software appears. Only the factory settings for this particular input are restored. All other settings remain unchanged.

13.2.7 Sensor factory setting

Here you can restore the sensor factory settings. For this purpose, simply press the navigator button and select "OK" when the prompt for the device software appears. Only the factory settings for the sensor are restored. The settings for the input remain unchanged.

14 Inputs: ISE

14.1 Basic settings

14.1.1 Sensor identification

Path: Menu/Setup/Inputs/<Sensor type>

Function	Options	Info
Channel	Options ■ On ■ Off Factory setting On	On The channel display is switched on in the measuring mode Off The channel is not displayed in the measuring mode, regardless of whether a sensor is connected or not.
Sensor type	Read only (Only available if a sensor is connected)	Connected sensor type
Order code		Order code of the connected sensor

14.1.2 Main value

The main value can be any parameter which is returned by one of the electrodes in the ISE-sensor.

Path: Menu/Setup/Inputs/ISE

Function	Options	Info
Main value	Options ■ Ammonium ■ Nitrate ■ Potassium ■ Chloride ■ pH ■ ORP Factory setting pH	Decide which parameter you want to display as the main value for the ISE channel. Here, you can only choose from the electrodes which you configured via the electrode slot menus. At the factory, this is equivalent to the types of electrode that are actually installed in the ISE sensor.

14.1.3 Damping of the temperature value

The damping causes a floating average curve of the measured values over the time specified.

Path: Menu/Setup/Inputs/ISE

Function	Options	Info
Damping temp.	0 to 300 s Factory setting 0 s	Specify the damping for the temperature measurement.

14.1.4 Manual hold

Path: Menu/Setup/Inputs/<Sensor type>

Function	Options	Info
Manual hold	Options ■ On ■ Off Factory setting Off	On You can use this function to set the channel manually to "Hold". Off No hold

14.2 Extended setup

14.2.1 Temperature format

Path: Menu/Setup/Inputs/<Sensor type>/Extended setup

Function	Options	Info
Temperature format	Options ■ #.# ■ #.## Factory setting #.#	Select how many decimal places should be used to display the temperature.

14.2.2 Cleaning

Path: Menu/Setup/Inputs/<Sensor type>/Extended setup

Function	Options	Info
Cleaning	Options ■ None ■ Cleaning 1 ■ Cleaning 2 ■ Cleaning 3 ■ Cleaning 4 Factory setting None	Select a cleaning program. This program is executed if: ■ A diagnostics message is present at the channel and ■ A cleaning process has been specified for this message (→ "Inputs/Diagnostics settings/Diag. behavior").

 You define the cleaning programs in the "Setup/Additional functions/Cleaning" menu.

14.2.3 Diagnostic behavior



This branch, along with the same functions, can be found in different "Extended setup" menus. The list of diagnostic messages displayed depends on the path selected. There are device-specific messages, and messages that depend on what sensor is connected.

Path: ... /Extended setup/Diagnostics settings/Diag. behavior

Function	Options	Info
List of diagnostic messages		Select the message to be changed. Only then can you make the settings for this message.
Diag. code	Read only	
Diagnostic message	Options ■ On ■ Off Factory setting Depends on the message	You can deactivate or reactivate a diagnostic message here. Deactivating means: ■ No error message in the measuring mode ■ No error current at the current output
Error current	Options ■ On ■ Off Factory setting Depends on the message	Decide whether an error current should be output at the current output if the diagnostic message display is activated.
Status signal	Options ■ Maintenance (M) ■ Out of specification (S) ■ Function check (C) ■ Failure (F) Factory setting Depends on the message	The messages are divided into different error classes in accordance with NAMUR NE 107. —> BA463C "Maintenance&diagnostics"
Diag. output	Options ■ None ■ Alarm relay ■ Relay 1 to n (depends on the device version) Factory setting None	You can use this function to select an output to which the diagnostic message should be assigned. You first have to configure a relay output before being able to assign the message to an output (Menu/Setup/Outputs, assign "Diagnostics" function and set Operating mode to "as assigned").
One alarm relay is always available, regardless of the device version. Other relays are optional.		
Cleaning program	Options ■ None ■ Cleaning 1 ■ Cleaning 2 ■ Cleaning 3 ■ Cleaning 4 Factory setting None	Decide whether the diagnostic message should trigger a cleaning program. You can define the cleaning programs under: Menu/Setup/Additional functions/Cleaning.
Detail information	Read only	Here you can find more information on the diagnostic message and instructions on how to resolve the problem.

14.2.4 Tag control

With this function, you specify which sensors are accepted at your device

Path: Menu/Setup/Inputs/<Sensor type>/Extended setup

Function	Options	Info
► Tag control		Additional information on the display: tag control currently used
Operating mode	Options ■ Off ■ Tag ■ Group Factory setting Off	Off No tag control, all sensors are accepted. Tag Only sensors with the same tag are accepted. Group Only sensors in the same tag group are accepted.
Tag	Customized text Factory setting EH_CM44_	Enter the tag name. The controller checks every sensor to be connected as to whether this sensor belongs to the measuring point, and only accepts the sensors that have the same tag.
Group	Numerical Factory setting 0	

 "Tag" stands for the name of a measuring point, and is used in many areas of process measuring technology.

14.2.5 Data processing factory setting

Here you can restore the factory settings for the sensor input. For this purpose, simply press the navigator button and select "OK" when the prompt for the device software appears. Only the factory settings for this particular input are restored. All other settings remain unchanged.

14.3 Electrode slot menus

14.3.1 Electrode slot

A CAS40D sensor has 4 electrode slots in total. Consequently, each of these slots has its own menu.

Make settings:

- Define the parameter for the slot (only slots 2-4).
The 1st slot is always designated to the pH electrode. There is no way you can select another parameter for this slot.
- You can complete and assign the other 3 slots as you prefer.
- Specify the measured variable that should be output. No options can be selected for pH which is why the "Measured variable" function is not available for this parameter.

Options displayed for "Measured variable" with the following parameters:				
pH	Ammonium	Nitrate	Potassium	Chloride
-	■ NH4-N ■ NH4	■ NO3-N ■ NO3	■ K	■ Cl

NOTICE

Electrode (hardware) incorrectly assigned to the software menu

Unreliable measured values and malfunctions in the measuring point could result

- When assigning the slot in the software, make sure it matches the assignment in the CAS40D sensor.
- Example: You have connected the ammonium electrode to cable No. 2 in the CAS40D. In the "2. Electrode slot" software menu then configure the ammonium parameter.

14.3.2 Damping

The damping causes a floating average curve of the measured values over the time specified.

Path: Menu/Setup/Inputs/ISE/Electrode slot

Function	Options	Info
Damping	0 to 300 s Factory setting 0 s	Specify the damping of the main value of the electrode assigned to the slot.

14.3.3 Extended setup

Main value format

If the measured variable of the electrode slot is not your main value for the ISE input, it will be displayed with all the measured values in the measuring mode.

Path: Menu/Setup/Inputs/ISE/Extended setup

Function	Options	Info
Main value format	Options ■ # ■ ## ■ ### Factory setting ###	Specify the number of decimal places for the measured variable of the electrode slot.

Compensation (only ammonium and nitrate)

Depending on the selectivity of the ion-selective electrode vis-à-vis other ions (interference ions), and the concentration of these ions, such ions could also be interpreted as part of the measuring signal and thus cause measuring errors.

When measuring in wastewater, the potassium ion which is chemically similar to the ammonium ion can cause higher measured values.

The measured values for nitrate can be too high due to high concentrations of chloride.

To reduce measuring errors resulting from such cross-interference, the concentration of the potassium or chloride interference ion can be measured and compensated for with a suitable additional electrode.

Path: Menu/Setup/Inputs/ISE/Extended setup

Function	Options	Info
Compensation	Options - Off - On Factory setting Off	If you want to use the compensation function, you must have installed a compensation electrode (potassium or chloride) in another electrode slot and have configured it in the software.
Offset	-14.00 to 14.00 pH -100 to 100 mg/l Factory setting 0.00 pH 0.00 mg/l	The offset compensates for a difference between a laboratory measurement and an online measurement which is caused by interference ions. Enter this value manually. If you are using a compensation electrode, keep the offset at zero.
Compensation type	Options - Chloride - pH - Potassium - pH and potassium Factory setting Chloride Potassium	The options depends on the parameter to be compensated. You compensate for chloride when using a nitrate electrode, while you can compensate for potassium and pH when using the ammonium electrode. The factory setting depends on the electrode used.
Comp. electrode	Select the slot	If you have installed and configured several compensation electrodes of the same type in the CAS40D sensor, you have to define which electrode is used for compensation here. Generally, you have a potassium or chloride electrode and Liquiline recognizes the right slot.
Selectivity coefficient	-10,00 ... 10,00 Factory setting -2.00 (chloride) -0.85 (potassium)	The coefficients are empirical values.
Mode	Options + - Factory setting -	The standard setting (-) corrects a measured value that is too high as a result of the effect of interference ions.

Calibration settings

Stability criteria

Path: Menu/Setup/Inputs/ISE/<Electrode slot>Extended setup/Calib. settings

Function	Options	Info
Stability criteria	Options - Off - Weak - Medium - Hard Factory setting Off	The stability criteria are usually switched off. However, in the event of standard addition it is advisable to select "Medium" in order to achieve the stable measured values required for this type of calibration.

Buffer recognition (only pH)

Path: Menu/Setup/Inputs/ISE/<Electrode slot>Extended setup/Calib. settings

Function	Options	Info
Buffer recognition	Options - Fixed - Manual Factory setting Fixed	Fixed You choose values from a list. This list depends on the setting for "Buffer manufacturer". Manual You enter any two buffer values. These must differ in terms of their pH value.
Buffer manufacturer	Options - Endress+Hauser - Ingold/Mettler - DIN 19266 - DIN 19267 - Merck/Riedel - Hamilton - Special buffer Factory setting Endress+Hauser	Temperature tables are stored internally in the unit for the following pH values: - Endress+Hauser 2,00 / 4,00 / 7,00 / (9,00) / 9,20 / 10,00 / 12,00 - Ingold/Mettler 2,00 / 4,01 / 7,00 / 9,21 - DIN 19266 1,68 / 4,01 / 6,86 / 9,18 - DIN 19267 1,09 / 4,65 / 6,79 / 9,23 / 12,75 - Merck/Riedel 2,00 / 4,01 / 6,98 / 8,95 / 12,00 - Hamilton 1,09 / 1,68 / 2,00 / 3,06 / 4,01 / 5,00 / 6,00 / 7,00 / 8,00 / 9,21 / 10,01 / 11,00 / 12,00



You have the possibility of defining two buffers of your own with the "Special buffer" option. For this purpose, two tables are displayed in which you can enter value pH value/temperature value pairs.

Standard addition (all except for pH)

Different types of calibration are available to calibrate an ion-selective electrode. Initial settings only have to be made for the standard addition method.

Path: Menu/Setup/Inputs/ISE/<Electrode slot>Extended setup/Calib. settings

Function	Options	Info
► Standard addition		
Sampling volume	0.00 to 5000.00 ml Factory setting 1000.00 ml	Here, specify the sample volume which you use during the calibration.
Standard volume	0.00 to 100.00 ml Factory setting 1.00 ml	Volume of the added standard solution per addition step
Standard concentration	0.00 to 10.00 mol/l Factory setting 1.00 mol/l	Concentration of the standard solution
No. of steps	1 ... 4 Factory setting 3	Number of addition steps (=measuring points of the calibration function)

Calibration timer

You can specify the calibration interval for the sensor here.
Once the time configured elapses, the "Calibration timer" diagnostics message appears on the display.

 The timer is reset automatically if you recalibrate the sensor.

Path: Menu/Setup/Inputs/ISE/<Slot>/Extended setup/Calib. settings

Function	Options	Info
Calibration timer	Options ■ Off ■ On Factory setting Off	Switches the function on or off
Calibration timer <i>Calibration timer="On"</i>	1 to 10000 h Factory setting 1000 h	Specify the time after which the timer should have timed out. Once this time has elapsed, the "Calib. Timer" diagnostics message, along with the code 102, appears on the display.

Diagnostics settings

This menu branch is used for specifying warning limits, and for defining whether and how diagnostics tools should be used.
The associated diagnostics code is displayed for every setting.

Process check system

The process check system (PCS) checks the measuring signal for stagnation. An alarm is triggered if the measuring signal does not change over a certain period (several measured values).

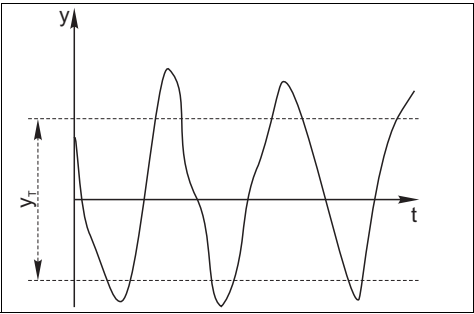


Fig. 24: Normal measuring signal, no alarm

y Measuring signal
 y_T Set value for "Tolerancewidth"

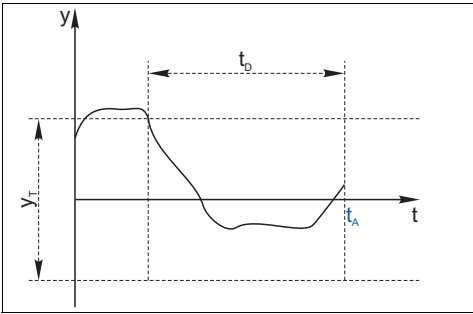


Fig. 25: Stagnating signal, alarm is triggered

t_D Set value for "Duration"
 t_A Time when the alarm is triggered

The main causes of stagnating measured values are:

- Contaminated sensor, or sensor in air
- Sensor failure
- Process error (e.g. through control system)

Remedial action

- ▶ Clean the sensor.
- ▶ Check the measuring chain.
- ▶ Switch off the controller and switch it back on again.

Path: Menu/Setup/Inputs/<Sensor type>/Extended setup/Diagnostics settings

Function	Options	Info
▶ Process Check System		Diagnostics code and associated message text: 904 "Process check"
Function	Options ■ On ■ Off Factory setting Off	
Duration	1 to 240 min Factory setting 60 min	The measured value must change during this time. Otherwise the error message is triggered.

Path: Menu/Setup/Inputs/<Sensor type>/Extended setup/Diagnostics settings

Function	Options	Info
Tolerancewidth <i>Not available for pH/ORP</i>	The range depends on the sensor Factory setting Depends on the sensor	Interval around the measuring signal (raw value) for detecting stagnation. Measured values within the set interval are regarded as stagnating.

Slope (only pH)

The slope characterizes the sensor condition. The bigger the deviation from the ideal value (100%, corresponds to -59 mV/pH) the poorer the condition of the sensor.

Path: Menu/Setup/Inputs/ISE/Extended setup/Diagnostics settings

Function	Options	Info
► Slope	80,00 ... 100,00 %	Specify your limit values for slope monitoring.
Warning limit	Factory setting 90,00 %	Associated diagnostics code and message text: 509 "Sensor calib."

Zero point (only pH)

The zero point characterizes the condition of the sensor reference. The bigger the deviation from the ideal value (pH 7.00) the poorer the condition. This can be caused by KCl dissolving away or reference contamination.

Path: Menu/Setup/Inputs/ISE/Extended setup/Diagnostics settings

Function	Options	Info
► Zero point (<i>pH glass</i>)	-10,00 ... 10,00	Specify your limit values for zero point or operating point monitoring.
Upper warning limit	Factory setting 2,50	Associated diagnostics code and message text: 505 "Sensor calib."
Lower warning limit	Factory setting -2,50	Associated diagnostics code and message text: 507 "Sensor calib."

Delta slope (only pH)

The device determines the difference in slope between the last calibration and the penultimate calibration, and issues a warning or an alarm depending on the setting configured. The difference is an indicator for the condition of the sensor. The greater the change, the greater the wear experienced by the pH-sensitive glass membrane as a result of chemical corrosion or abrasion.

Path: Menu/Setup/Inputs/ISE/Extended setup/Diagnostics settings

Function	Options	Info
► Delta slope	0,50 ... 10,00 %	Specify your limit values for monitoring the slope differential.
Function	Options ■ On ■ Off Factory setting Off	
Warning limit	Factory setting 2,5 %	Diagnostics code and associated message text: 518 "Sensor calib."

Delta zero point (only pH)

The device determines the difference between the last calibration and the penultimate calibration, and issues a warning or an alarm depending on the setting configured. The difference is an indicator for the condition of the sensor. The following applies to pH glass electrodes: The greater the change, the greater the wear experienced by the reference as a result of contaminating ions or KCl dissolving away.

Path: Menu/Setup/Inputs/ISE/Extended setup/Diagnostics settings

Function	Options	Info
► Delta zero point	0,00 ... 5,00	Specify your limit values for monitoring the zero point or operating point differential.
Function	Options ■ On ■ Off Factory setting Off	
Warning limit	Factory setting 1,00	Diagnostics code and associated message text: 520 "Sensor calib."

14.4 Limits operating hours

The total operating time of the sensor and its use under extreme conditions is monitored. If the operating time exceeds the defined threshold values, the device issues a corresponding diagnostics message.

 Each sensor has a limited life expectancy which heavily depends on the operating conditions. If you specify warning limits for operating times under extreme conditions, you can guarantee the operation of your measuring point without any downtime by performing maintenance tasks in time.

Path: Menu/Setup/Inputs/ISE

Function	Options	Info
► Limits operating hours		Specify your limit values for monitoring the number of operating hours under extreme conditions.
 The range of adjustment for the operating hours alarm and warning limits is generally 1 to 50000 h.		
Function	Options ■ On ■ Off Factory setting On	On The operation of the sensor under extreme conditions is monitored, recorded in the sensor and diagnostics messages are displayed on the controller. Off No diagnostics messages. However, the time the sensor operates under extreme conditions is recorded in the sensor and can be read in the sensor information in the diagnostics menu.
► Operating time		Total operating time of the sensor
Warning limit	Factory setting 36000 h	Diagnostics code and associated message text: 199 "Operating time"
► Operation > 30°C		
Warning limit	Factory setting 36000 h	Diagnostics code and associated message text: 191 "Operating time"
► Operation > 40°C		
Warning limit	Factory setting 36000 h	Diagnostics code and associated message text: 192 "Operating time"

15 Inputs: Interface

15.1 Basic settings

Path: Menu/Setup/Inputs/UIS

Function	Options	Info
Sensor operation	Options ■ Scan for memosens sensor ■ Current sensor Factory setting Current sensor	Scan for memosens sensor Searches for Memosens sensors Current sensor Connected sensor is used
Turbidity measurement	Options ■ Off ■ On Factory setting On	Only for sensor version with integrated turbidity measurement and wiper function
Turbidity unit	Options ■ FNU ■ NTU Factory setting FNU	Only for sensor version with integrated turbidity measurement and wiper function

15.2 Manual hold

Path: Menu/Setup/Inputs/<Sensor type>

Function	Options	Info
Manual hold	Options ■ On ■ Off Factory setting Off	On You can use this function to set the channel manually to "Hold". Off No hold

15.3 Tank configuration

Path: Menu/Setup/Inputs/UIS/Tank configuration

Function	Options	Info
Blanket definition	Options ■ Interface level ■ Interface range Factory setting Interface level	Type of measurement that should be displayed and calculated: Interface level Distance from the basin floor to the boundary area Interface range Distance from the water line to the boundary area

Path: Menu/Setup/Inputs/UIS/Tank configuration

Function	Options	Info
Unit of measure	Options ■ m ■ cm ■ ft ■ inch Factory setting m	Any change to the unit is automatically accepted in all the displays.
Tank depth	0.4 to 10.0 m (1.4 to 32.8 ft) Factory setting 8.0 m (26.2 ft)	Distance from the water level to the basin floor
Zero adjust	0.4 to 10.0 m (1.4 to 32.8 ft) Factory setting 0.4 m (1.3 ft)	Distance from the water level to the sensor diaphragm
Blanking zone	Options ■ Off ■ On Factory setting Off	Permanent echo signals above and below a search window are blanked as interference signals.
Upper window limit	0.0 m ... Lower window limit (1.4 ft ...) Factory setting 0.3 m (1.0 ft)	Distance from the selected reference point from which the system should search for a separation zone. Permanent echo signals above the search window are blanked.
Lower window limit	Upper window limit ... 11.0 m (... 32.8 ft) Factory setting 3.3 m (10.8 ft)	Distance from the selected reference point from which the system blanks out permanent echo signals below the search window.

15.4 Sensor signal

Path: Menu/Setup/Inputs/UIS/Sensor signal

Function	Options	Info
Acoustic control	Options ■ Manual ■ Automatic Factory setting Automatic	Controls the graphic display of the echo signal Automatic The transmitter uses the gain value determined in the self-test (initialization). In the measuring mode, this value is automatically adapted to the current process conditions. Manual You can enter a fixed gain value for diagnostics or test purposes.



Common gain values for applications involving relatively clear water and a "hard" separation zone are between 25 and 35. The values can be as high as 60 if the sludge/water transition is relatively "soft". If you require significantly higher gain values, this is an indication of overranging. It is then difficult or impossible to reliably evaluate the echo signal.

Path: Menu/Setup/Inputs/UIS/Sensor signal

Function	Options	Info
Current gain	0 ... 100 Factory setting 30	You can only configure the value for manual signal adjustment. The value is read-only for automatic signal adjustment.
Gain control set point <i>Acoustic control="Automatic"</i>	1 ... 50 Factory setting 20	Horizontal position of the intersection of the separation zone line with the echo peak. The factory setting "20" corresponds to 20 % of the maximum display height.
Refresh rate	■ 2 s ■ 4 s ■ 6 s ■ 8 s ■ 10 s Factory setting 4 s	The sensor signal is measured and integrated during this time.
Damping	5 ... 255 Factory setting 130	This parameter is used to attenuate the movement of the indicator arrow. Select a low attenuation value if you can change the height of the separation zone very quickly. Higher attenuation prevents the system for following echo signals that occur briefly and quickly (e.g. caused by a scraper) and the indicator arrow from jumping around the screen.

15.5 Extended setup

15.5.1 Sensor signal

Path: Menu/Setup/Inputs/UIS/Extended setup/Sensor signal

Function	Options	Info
Sound speed	300 to 2000 m/s (985 to 6561 ft/s) Factory setting 1482 m/s (4862 ft/s)	The sound speed depends on the medium temperature and the medium density. Since the temperature and density only fluctuate slightly in most water and wastewater applications, the factory setting of 1482 m/s proves to be a suitable value.
▶ Tank zone		
Gain band	5 ... 30 Factory setting 20	Restricts the gain in automatic mode in order to prevent system overload.
Gain increment	0,1 ... 0,5 Factory setting 0,1	Defines how quickly the gain can adapt to changing process conditions in the automatic mode.
▶ Bottom definition		

Path: Menu/Setup/Inputs/UIS/Extended setup/Sensor signal

Function	Options	Info
Range above bottom	0.0 to 1.0 m (0.0 to 3.2 ft) Factory setting 0.1 m (0.3 ft)	Blanketing zone in the area of the basin bottom This is needed for very low sludge levels or basins free from sludge.
Bottom signal set point	0 ... 100 Factory setting 60	Restricts the gain in automatic mode in order to prevent system overload when the basin is empty or does not have an interface.

15.5.2 Calculation

Path: Menu/Setup/Inputs/UIS/Extended setup/Calculation

Function	Options	Info
Interface	Options ■ Top layer ■ Lower layer Factory setting Top layer	Defines which signal the system should track and display when several separation zones are calculated. Top layer Separation zone closest to the sensor Lower layer Separation zone farthest from the sensor
Interface window	Options ■ Off ■ On Factory setting Off	Interface window around the separation zone currently being tracked New echo signals occurring outside this area are initially not tracked. The signals first have to meet the search criteria for a separation zone for a prolonged period before the window opens and the indicator arrow tracks the new separation zone.
Above interface <i>Interface window="On"</i>	0.0 to 10.0 m (0.0 to 32.8 ft) Factory setting 0.6 m (2.0 ft)	The interface window is indicated by broken lines in the graphic mode. The window is 1.2 m wide in the factory setting for both parameters.
Below interface <i>Interface window="On"</i>		
Gate response rate	0 ... 255 Factory setting 1	Speed at which the interface window opens

15.5.3 Diagnostics settings

This menu branch is used for specifying warning limits, and for defining whether and how diagnostics tools should be used.
The associated diagnostics code is displayed for every setting.

Alarm delay

Path: Menu/Setup/Inputs/UIS/Extended setup/Diagnostics settings

Function	Options	Info
Alarm delay	0 to 255 min Factory setting 10 min	

Diagnostic behavior

 This branch, along with the same functions, can be found in different "Extended setup" menus. The list of diagnostic messages displayed depends on the path selected. There are device-specific messages, and messages that depend on what sensor is connected.

Path: ... /Extended setup/Diagnostics settings/Diag. behavior

Function	Options	Info
List of diagnostic messages		Select the message to be changed. Only then can you make the settings for this message.
Diag. code	Read only	
Diagnostic message	Options ■ On ■ Off Factory setting Depends on the message	You can deactivate or reactivate a diagnostic message here. Deactivating means: ■ No error message in the measuring mode ■ No error current at the current output
Error current	Options ■ On ■ Off Factory setting Depends on the message	Decide whether an error current should be output at the current output if the diagnostic message display is activated.
Status signal	Options ■ Maintenance (M) ■ Out of specification (S) ■ Function check (C) ■ Failure (F) Factory setting Depends on the message	The messages are divided into different error classes in accordance with NAMUR NE 107. → BA463C "Maintenance&diagnostics"
Diag. output	Options ■ None ■ Alarm relay ■ Relay 1 to n (depends on the device version) Factory setting None	You can use this function to select an output to which the diagnostic message should be assigned. You first have to configure a relay output before being able to assign the message to an output (Menu/Setup/Outputs, assign "Diagnostics" function and set Operating mode to "as assigned").

 One alarm relay is always available, regardless of the device version. Other relays are optional.

Path: ... /Extended setup/Diagnostics settings/Diag. behavior

Function	Options	Info
Cleaning program	Options ■ None ■ Cleaning 1 ■ Cleaning 2 ■ Cleaning 3 ■ Cleaning 4 Factory setting None	Decide whether the diagnostic message should trigger a cleaning program. You can define the cleaning programs under: Menu/Setup/Additional functions/Cleaning.
Detail information	Read only	Here you can find more information on the diagnostic message and instructions on how to resolve the problem.

15.5.4 Data processing factory setting

Here you can restore the factory settings for the sensor input. For this purpose, simply press the navigator button and select "OK" when the prompt for the device software appears.
Only the factory settings for this particular input are restored. All other settings remain unchanged.

16 Outputs

16.1 Binary outputs

The basic version of the device always has two binary outputs.

Possible application

→ For outputting a manipulated variable to connected actuators

Path: Menu/Setup/Outputs

Function	Options	Info
► OutputBinary		
	Options ■ Off ■ Event ■ Limit value ■ Diagnostics message ■ Cleaning (only for version with sensors with the Memosens protocol) Factory setting Off	The following functions depend on the option selected. Function = "Off" switches off the function of the binary output and means no further settings are required.
If Event is selected:		
Signal slope	Options ■ Low-High ■ High-Low Factory setting Low-High	Select the level change of the signal

Path: Menu/Setup/Outputs

Function	Options	Info
Event	Options ■ Program enabled ■ End of program ■ Sampling start ■ End of sampling ■ Dosing ■ Sampling cycle ■ Bottle change ■ External stop ■ No sample Factory setting - Sampling cycle	Program enabled: A pulse is switched when the sampling program starts. End of program: A pulse is switched when the sampling program ends. Sampling start: A pulse is switched when a sample is taken. End of sampling: A pulse is switched when sampling has ended. Dosing: The output signal is switched while the device doses a sample. Sampling cycle: The output signal is switched for the duration of the sampling cycle. Bottle change: A pulse is switched when a bottle is changed. External stop: The output signal is switched when an external stop is performed. No sample: The output signal is switched if no sample was taken.
If Limit value is selected:		
Signal slope	Options ■ Low-High ■ High-Low Factory setting - Low-High	Select the level change of the signal
Source of data	Options ■ None ■ Limit switch 1-8 Factory setting - None	Select the limit switch via which the status of the relay is to be output. The limit switches are configured in the "Setup/Additional functions/LimitSwitch" menu.
If Diagnostics message is selected:		
Signal slope	Options ■ Low-High ■ High-Low Factory setting - Low-High	Select the level change of the signal

Path: Menu/Setup/Outputs

Function	Options	Info
Operating mode	Options ■ as assigned ■ Namur M ■ Namur S ■ Namur C ■ Namur F Factory setting as assigned	As assigned: If this option is selected, the diagnostics messages which you have individually assigned to the binary output are output via the binary output. Namur M - F: If you decided to use one of the Namur classes, all the messages that are assigned to the individual class are output via the binary output. You can also change the Namur class assignment for every diagnostics message. (Menu/Setup/General settings/Diagnostics/Device behavior or Menu/Setup/Inputs/ ../Diag. settings/Diag. behavior)
 Attributed diagnostic messages	Read only List of diagnostic messages	All the messages assigned to the relay output appear on the display. You do not have the option of editing the information here.
If Cleaning is selected: (only for version with sensors with the Memosens protocol)		
Signal slope	Options ■ Low-High ■ High-Low Factory setting Low-High	Select the level change of the signal
Assignment	Options ■ None ■ Cleaning 1-4 Factory setting None	Use this function to choose the cleaning instance which should be started when the binary output is active.

16.2 Current outputs (optional)

Two optional current outputs are available on Basic module L.
Set the current range from 0 to 20 mA or 4 to 20 mA under Menu/Setup/General settings.

Possible applications

- For outputting a measured value to a process control system or an external recorder
- For outputting a manipulated variable to connected actuators

 The current output curve is always linear.

Path: Menu/Setup/Outputs

Function	Options	Info
► Current output		
Current output	Options ■ On ■ Off Factory setting Off	Use this function to activate and deactivate a variable being output at the current output.
Source of data	Options ■ None ■ Connected inputs ■ Temperature sensors Factory setting None	The sources of data on offer depend on your device version. All the sensors and controllers connected to inputs are available for selection.
Measured value	Options ■ None ■ Depends on the Source of data Factory setting None	The measured value you can select depends on the option selected under "Source of data".
 The table on the next page lists the measured values available depending on the data source. In the "Additional functions" menu, you can also select and configure the current output for outputting the controlled variable.		
Range lower value	Selection range and factory settings depend on: "Measured value"	You can output the entire measuring range of the "Measured value" or just some of it at the current output. For this purpose, specify the start and end of the range in accordance with your requirements.
Range upper value		
Hold behavior	Options ■ Freeze ■ Fixed value ■ None Factory setting Depends on the channel:output	Freeze The device freezes the last current value. Fixed value You define a fixed current value that is output at the output. None A hold does not affect this current output.
Hold current <i>Hold behavior= "Fixed value"</i>	0.0 to 23.0 mA Factory setting 22.0 mA	Specify which current should be output at this current output in the event of a hold.

Measured value depending on the Source of data

Source of data	Measured value
pH Glass	Options ■ Raw value mV ■ pH ■ Temperature
pH ISFET	
ORP	Options ■ Temperature ■ ORP mV ■ ORP %
Oxygen (amp.)	Options ■ Temperature ■ Partial pressure ■ Concentration liquid ■ Saturation ■ Raw value nA (only Oxygen (amp.)) ■ Raw value µs (only Oxygen (opt.))
Oxygen (opt.)	
Cond i	Options ■ Temperature ■ Conductivity ■ Resistance
Cond c	
Chlorine	Options ■ Temperature ■ Current ■ Concentration
ISE	Options ■ Temperature ■ pH ■ Ammonium ■ Nitrate ■ Potassium ■ Chloride
TU/TS	Options ■ Temperature ■ Turbidity g/l ■ Turbidity FNU
Nitrate	Options ■ Temperature ■ NO3 ■ NO3-N
UIS (interface measurement)	Options ■ Interface ■ Turbidity
SAC	Options ■ Temperature ■ SAC ■ Transm. ■ Absorption ■ COD ■ BOD

Measured value depending on the Source of data

Source of data	Measured value
Current input 1-3	Options depend on the configuration
Temperature 1-3	

16.3 Alarm relay and optional relays

 The alarm relay is not available in devices with a battery backup system. The alarm relay is required to switch off the device completely when operating with the storage battery.

The following functions can be output via a relay

- Limit switch status
- Diagnostics messages
- Status of a cleaning function in order to control a pump or a valve

 You can assign a relay to multiple inputs in order to clean several sensors with just one cleaning unit, for example.

Path: Menu/Setup/Outputs/Alarm relay or relay at channel no.

Function	Options	Info
Function	Options ■ Off ■ LimitSwitch ■ Diagnostics ■ Cleaning Factory setting Off	The following functions depend on the option selected. These versions are illustrated individually in the following section to provide a clearer understanding of the options. Function="Off" switches off the relay function and means no further settings are required.

16.3.1 Outputting the status of a limit switch

Function="LimitSwitch"

Function	Options	Info
Source of data	Options ■ None ■ Limit switch 1 ■ Limit switch 2 ■ Limit switch 3 ■ Limit switch 4 ■ Limit switch 5 ■ Limit switch 6 ■ Limit switch 7 ■ Limit switch 8 Factory setting None	Select the limit switch via which the status of the relay is to be output. The limit switches are configured in the "Setup/Additional functions/Limit switches" menu.

16.3.2 Outputting diagnostics messages via the relay

You can output two categories of diagnostics messages via the relay:

1. Diagnostics messages from one of the 4 Namur classes
(→ BA463C "Maintenance&Diagnostics" for more information on the Namur classes)
2. Diagnostics messages which you have individually assigned to the relay output

A message is individually assigned to the relay output at 2 specific points in the menu:

- Menu/Setup/General settings/Diagnostics/Device behavior
(device-specific messages)
- Menu/Setup/Inputs/.../Diagnostics settings/Diag. behavior
(sensor-specific messages)

 Before being able to assign a special message to the relay output "Device behavior", you must first configure Outputs/relay x:y or /Alarm relay/Function="Diagnostics".

Function="Diagnostics"

Function	Options	Info
Operating mode	Options ■ as assigned ■ Namur M ■ Namur S ■ Namur C ■ Namur F Factory setting as assigned	as assigned If this option is selected, the diagnostics messages which you have individually assigned to the relay are output via the relay. Namur M ... F If you decided to use one of the Namur classes, all the messages that are assigned to the individual class are output via the relay. You can also change the Namur class assignment for every diagnostics message. (Menu/Setup/General settings/Diagnostics/Device behavior or Menu/Setup/Inputs/.../Diagnostics settings/Diag. behavior)
Attributed diagnostic messages <i>Operating mode="as assigned"</i>	Read only List of diagnostic messages	All the messages assigned to the relay output appear on the display. You do not have the option of editing the information here.

16.3.3 Outputting the status of a cleaning function

Function="Cleaning"

Function	Options	Info
Assignment	Options ■ None ■ Cleaning 1 - Water ■ Cleaning 1 - Cleaner ■ Cleaning 2 - Water ■ Cleaning 2 - Cleaner ■ Cleaning 3 - Water ■ Cleaning 3 - Cleaner ■ Cleaning 4 - Water ■ Cleaning 4 - Cleaner Factory setting None	Here you can specify how a cleaning function should be displayed for the alarm relay. You can define the cleaning programs under: Menu/Setup/Additional functions/Cleaning.

17 Additional functions

17.1 Limit switch

There are different ways of configuring a limit switch:

- Assigning a switch-on and switch-off point
- Assigning a switch-on and switch-off delay for a relay
- Setting an alarm threshold and also outputting an error message
- Starting a cleaning function

Path: Menu/Setup/Additional functions/Limit switches/Limit switches 1 ... 8

Function	Options	Info
Source of data	Options ■ None ■ Connected sensors ■ Connected inputs ■ Temperature sensors Factory setting None	Specify the input or output which should be the source of data for the limit switch. The sources of data on offer depend on your device version. All the sensors and controllers connected to inputs are available for selection.
Measured value	Options ■ None ■ Depends on the Source of data Factory setting None	The measured value you can select depends on the option selected under "Source of data".

Measured value depending on the Source of data

Source of data	Measured value
pH Glass	Options ■ Raw value mV ■ pH ■ Temperature
pH ISFET	
ORP	Options ■ Temperature ■ ORP mV ■ ORP %
Oxygen (amp.)	Options ■ Temperature ■ Partial pressure ■ Concentration liquid ■ Saturation ■ Raw value nA (only Oxygen (amp.)) ■ Raw value µs (only Oxygen (opt.))
Oxygen (opt.)	

Measured value depending on the Source of data

Source of data	Measured value
Cond i	Options ■ Temperature ■ Conductivity ■ Resistance
Cond c	
Chlorine	Options ■ Temperature ■ Current ■ Concentration
ISE	Options ■ Temperature ■ pH ■ Ammonium ■ Nitrate ■ Potassium ■ Chloride
TU/TS	Options ■ Temperature ■ Turbidity g/l ■ Turbidity FNU
Nitrate	Options ■ Temperature ■ NO3 ■ NO3-N
UIS (interface measurement)	Options ■ Interface ■ Turbidity
SAC	Options ■ Temperature ■ SAC ■ Transm. ■ Absorption ■ COD ■ BOD
Current input 1- 3	Options depend on the configuration
Temperature 1 - 3	
Mathematical functions	All the mathematic functions can also be used as a data source and the calculated value can be used as the measured value.



You can monitor the manipulated variable by assigning the controller manipulated variable to a limit switch (e.g. configure a dosing time alarm).

17.2 Cleaning programs (only for version with sensors with the Memosens protocol)

Path: Menu/Setup/Additional functions/Cleaning/Cleaning 1 ... 4

Function	Options	Info
Cleaning type	Options ■ Standard clean ■ Chemoclean Factory setting Standard clean	
Cleaning time	5 to 600 s Factory setting 10 s	Cleaning time ... Cleaning duration The cleaning duration and interval depend on the process and sensor. Determine the variables empirically or based on experience.
Cleaning interval	00-00:01 to 07-00:00 (DD-hh:mm) Factory setting 01-00:00	The interval value can be between 1 minute and 7 days. Example: You have set the value "01-00:00". Each day, the cleaning cycle starts at the same time you started the first cleaning cycle.
Hold behavior	Options ■ On ■ Off Factory setting Off	Decide whether there should be a hold for the assigned sensor during the cleaning process.
► Output selection		Goes to the "Outputs" menu You can assign the cleaning program directly to one or more outputs. → "Outputs" section
▷ Start cycle	Action	Start the cyclical cleaning process with the settings above
▷ Start manually	Action	Start an individual cleaning process If cyclical cleaning is enabled, there are times in which it is not possible to manually start the process.
▷ Stop	Action	End the cleaning process (cyclically or manually)
State of cleaning	Read only	Indicates whether cleaning is currently taking place or not
Time to next clean	Read only	Countdown to the next cleaning process (only if cyclical cleaning has been started)

18 Data administration

18.1 Firmware update

Please contact your local sales office for information on firmware updates available for your controller and its compatibility with earlier versions.

Your **current firmware version** can be found at: Menu/Diagnostics/System information/Software version.



First save your current setup on an SD card since a firmware update overwrites your settings with the factory settings. After updating the firmware, you can restore your setup by uploading it from the SD card.

To install a firmware update, you must have the update available on an SD card.

1. Insert the SD card into the controller card reader.
2. Go to: Menu/Setup/Data management/Firmware update.
—> The update files on the SD card are displayed.
3. Select the desired update and select yes when the following question is displayed: The current firmware will be overwritten. After this the device will reboot. Do you want to proceed?
—> The firmware is loaded and the device is then started with the new firmware.

18.2 Saving the setup

Saving the setup gives you the following advantages:

- Quick and easy to restore a setup following a firmware update
- Copying settings for other devices
- Quick and easy switching between various setups, e.g. for different user groups or for recurring sensor type change
- Restoring a tried-and-tested setup, e.g. if you have changed a lot of settings and no longer know what the original settings were

1. Insert the SD card into the controller card reader.
2. Go to: Menu/Setup/Data management/Save setup.
3. Assign a file name (Name).
4. Then select "Save".
5. If you have already assigned the file name, you will be asked whether you want to overwrite the existing setup.
Select "OK" to confirm, or cancel the action and give the file a new name.

—> Your setup is stored on the SD card and you can upload it quickly to the device at a later date.

18.3 Loading the setup

You can load a setup you have saved quickly and easily:

1. Insert the SD card into the controller card reader.
2. Go to: Menu/Setup/Data management/Load setup.
—> A list of all the setups on the SD card is displayed.
3. Select the desired setup.

The device then displays the following message: The current parameters will be overwritten and the device will reboot. Do you want to proceed?

4. Select "OK" to confirm or cancel the action.

—> The desired setup is restored after restarting the device.

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