BA00479C/07/EN/23.21
71520583
2021-03-17

Valid as of version
01.09.00

Operating Instructions
Liquistation CSF33

Automatic sampler for liquid media

Endress+Hauser
People for Process Automation

Table of contents

1 About this document

1.1 Warnings

Structure of information	Meaning
DANGER **Causes (/consequences)** If necessary, Consequences of non-compliance (if applicable) ▶ Corrective action	This symbol alerts you to a dangerous situation. Failure to avoid the dangerous situation **will** result in a fatal or serious injury.
WARNING **Causes (/consequences)** If necessary, Consequences of non-compliance (if applicable) ▶ Corrective action	This symbol alerts you to a dangerous situation. Failure to avoid the dangerous situation **can** result in a fatal or serious injury.
CAUTION **Causes (/consequences)** If necessary, Consequences of non-compliance (if applicable) ▶ Corrective action	This symbol alerts you to a dangerous situation. Failure to avoid this situation can result in minor or more serious injuries.
NOTICE **Cause/situation** If necessary, Consequences of non-compliance (if applicable) ▶ Action/note	This symbol alerts you to situations which may result in damage to property.

1.2 Symbols

- Additional information, tips
- Permitted or recommended
- Not permitted or not recommended
- Reference to device documentation
- Reference to page
- Reference to graphic
- Result of a step

1.3 Symbols on the device

- Reference to device documentation
- Do not dispose of products bearing this marking as unsorted municipal waste. Instead, return them to the manufacturer for disposal under the applicable conditions.

1.4 Documentation

The following manuals which are available on the complement these Brief Operating Instructions Operating Instructions:

- Brief Operating Instructions for Liquistation CSF33, BA00479C
- Guidelines for communication via fieldbus and web server
- Special Documentation: Sampler application manual SD01068C
- Documentation on other devices in the Liquiline platform:
  - Liquiline CM44xR (DIN rail device)
  - Liquiline System CA80 (analyzer)
  - Liquiline System CAT8x0 (sample preparation)
  - Liquistation CSFxx (sampler)
  - Liquiport CSP44 (sampler)

2 Basic safety instructions

2.1 Requirements for personnel

- Installation, commissioning, operation and maintenance of the measuring system may be carried out only by specially trained technical personnel.
- The technical personnel must be authorized by the plant operator to carry out the specified activities.
- The electrical connection may be performed only by an electrical technician.
- The technical personnel must have read and understood these Operating Instructions and must follow the instructions contained therein.
- Faults at the measuring point may only be rectified by authorized and specially trained personnel.

Repairs not described in the Operating Instructions provided must be carried out only directly at the manufacturer's site or by the service organization.

2.2 Designated use

Liquistation CSF33 is a stationary sampler for liquid media. The samples are taken discontinuously using a vacuum pump or peristaltic pump and are then distributed into sampling containers and refrigerated.

The sampler is designed for use in the following applications:
- Communal and industrial wastewater treatment plants
- Laboratories and water management offices
- Monitoring of liquid media in industrial processes

Use of the device for any purpose other than that described, poses a threat to the safety of people and of the entire measuring system and is therefore not permitted. The manufacturer is not liable for damage caused by improper or non-designated use.

2.3 Workplace safety

As the user, you are responsible for complying with the following safety conditions:
- Installation guidelines
- Local standards and regulations
- Regulations for explosion protection

Electromagnetic compatibility
- The product has been tested for electromagnetic compatibility in accordance with the applicable international standards for industrial applications.
- The electromagnetic compatibility indicated applies only to a product that has been connected in accordance with these Operating Instructions.

2.4 Operational safety

Before commissioning the entire measuring point:

1. Verify that all connections are correct.
2. Ensure that electrical cables and hose connections are undamaged.
3. Do not operate damaged products, and protect them against unintentional operation.
4. Label damaged products as defective.

During operation:

- If faults cannot be rectified:
  products must be taken out of service and protected against unintentional operation.

2.5 Product safety

2.5.1 State-of-the-art technology

The product is designed to meet state-of-the-art safety requirements, has been tested, and left the factory in a condition in which it is safe to operate. The relevant regulations and international standards have been observed.

Devices connected to the sampler must comply with the applicable safety standards.

2.5.2 IT security

We only provide a warranty if the device is installed and used as described in the Operating Instructions. The device is equipped with security mechanisms to protect it against any inadvertent changes to the device settings.

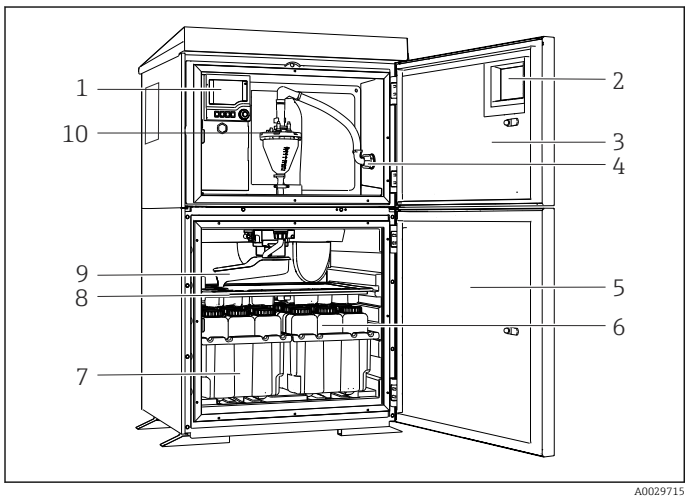
IT security measures in line with operators' security standards and designed to provide additional protection for the device and device data transfer must be implemented by the operators themselves.

3 Product description

3.1 Device design

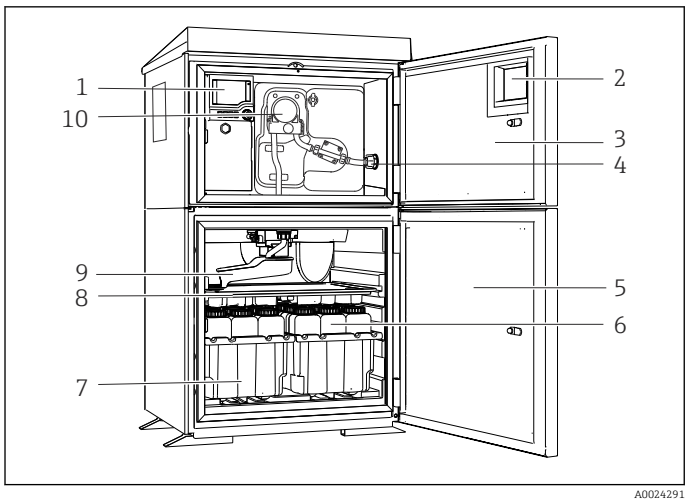
A complete sampling unit comprises:

- Controller with display, soft keys and navigator
- Vacuum or peristaltic pump for sampling
- PE or glass sample bottles for sample preservation
- Sampling chamber temperature regulator (optional) for safe sample storage
- Suction line with suction head



1 Controller
2 Window (optional)
3 Dosing chamber door
4 Suction line connection
5 Sampling chamber door
6 Sample bottles, e.g. 2 x 12 bottles, PE, 1 liter
7 Bottle trays (depending on sample bottles selected)
8 Distribution plate (depending on sample bottles selected)
9 Distribution arm
10 Vacuum system, e.g. Dosing system with conductive sample sensor

1 Example of a Liquistation, version with vacuum pump



1 Controller
2 Window (optional)
3 Dosing chamber door
4 Suction line connection
5 Sampling chamber door
6 Sample bottles, e.g. 2 x 12 bottles, PE, 1 liter
7 Bottle trays (depending on sample bottles selected)
8 Distribution plate (depending on sample bottles selected)
9 Distribution arm
10 Peristaltic pump

2 Example of a Liquistation, version with peristaltic pump

WARNING

Risk of injury

Danger of injury due to rotating parts

► Secure the sampler against unintentional start-up whilst you work on the opened hose pump.

3.2 Equipment architecture

3.2.1 Slot and port assignment

The electronics configuration follows a modular concept:

- There are several slots for electronics modules.
- These slots are numbered consecutively in the housing. Slots 0 and 1 are always reserved for the basic module.
- In addition there are also inputs and outputs for the control module. These slots are labeled "S".
- Each electronics module has one or more inputs and outputs or relays. Here they are all collectively known as "ports".
- Ports are consecutively numbered per electronics module and are recognized automatically by the software.
- Outputs and relays are named according to their function, e.g. "current output", and are displayed in ascending order with the slot and port numbers.
  Example:
  "Current output 2:1" shown on the display means: slot 2 (e.g. AOR module) : port 1 (current output 1 of the AOR module)
- Inputs are assigned to measuring channels in the ascending order of "slot:port number"
  Example:

3.3 Terminal diagram

The unique terminal name is derived from:

Slot no. : Port no. : Terminal

Example, NO contact of a relay

Device with inputs for digital sensors, 4 current outputs and 4 relays

- Base module BASE2-E (contains 2 sensor inputs, 2 current outputs)
- 2AO module (2 current outputs)
- 4R module (4 relays)

4 Incoming acceptance and product identification

4.1 Incoming acceptance

1. Verify that the packaging is undamaged.
   ↳ Notify the supplier of any damage to the packaging.
   Keep the damaged packaging until the issue has been resolved.
2. Verify that the contents are undamaged.
   ↳ Notify the supplier of any damage to the delivery contents.
   Keep the damaged goods until the issue has been resolved.
3. Check that the delivery is complete and nothing is missing.
   ↳ Compare the shipping documents with your order.
4. Pack the product for storage and transportation in such a way that it is protected against impact and moisture.
   ↳ The original packaging offers the best protection.
   Make sure to comply with the permitted ambient conditions.

If you have any questions, please contact your supplier or your local Sales Center.

NOTICE

Damage to the sampler

If transported incorrectly, the roof may become damaged or tear off.

- ▶ Transport the sampler using a forklift truck. Never lift the sampler by the top. Lift it in the middle between the upper and lower sections.

4.2 Product identification

Nameplates can be found:
- On the inside of the door
- On the packaging (adhesive label, portrait format)

4.2.1 Nameplate

The nameplate provides you with the following information on your device:
- Manufacturer identification
- Order code
- Extended order code
- Serial number
- Firmware version
- Ambient and process conditions
- Input and output values
- Activation codes
- Safety information and warnings
- Certificate information

- ▶ Compare the information on the nameplate with the order.

4.3 Scope of delivery

The scope of delivery comprises:
- 1 Liquistation CSF33 with:
  - The ordered bottle configuration
  - Optional hardware
- Accessories kit
  -
  - Connection nipple for suction line with various angles (straight, 90°), Allen key (for version with vacuum pump only)
- Suction line:
  - Suction line ID 13 mm (1/2"), PVC, reinforced spiral wire, length 10 m (33 ft), suction head V4A for vacuum version
  - Suction line ID 10 mm (1/2"), PVC, reinforced spiral wire, length 10 m (33 ft), suction head V4A for peristaltic version
- 1 print version of Brief Operating Instructions in the language ordered
- Optional accessories

▶ If you have any queries:
Please contact your supplier or local sales center.

4.4 Certificates and approvals

4.4.1 CE mark

Declaration of Conformity

The product meets the requirements of the harmonized European standards. As such, it complies with the legal specifications of the EU directives. The manufacturer confirms successful testing of the product by affixing to it the CE mark.

4.4.2 Additional certification

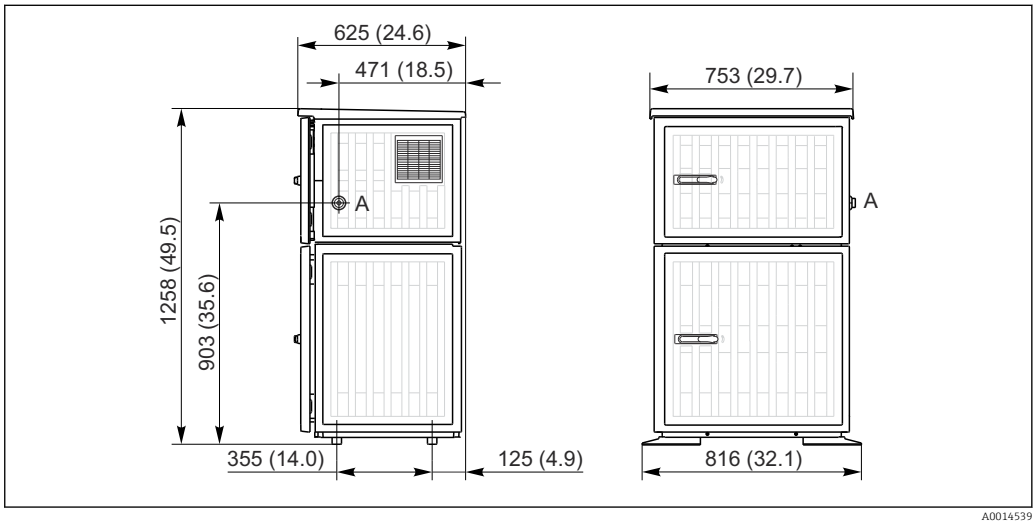
EAC

The product has been certified according to guidelines TP TC 004/2011 and TP TC 020/2011 which apply in the European Economic Area (EEA). The EAC conformity mark is affixed to the product.

5 Installation

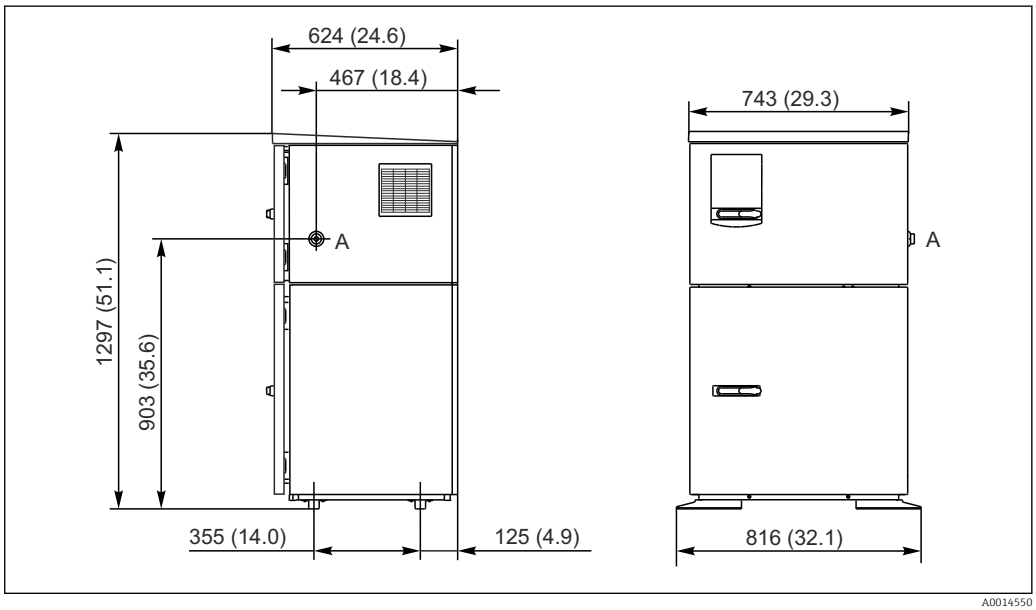
5.1 Installation conditions

5.1.1 Dimensions



3 *Dimensions of Liquistation CSF33 plastic version, dimensions in mm (in)*

A Suction line connection

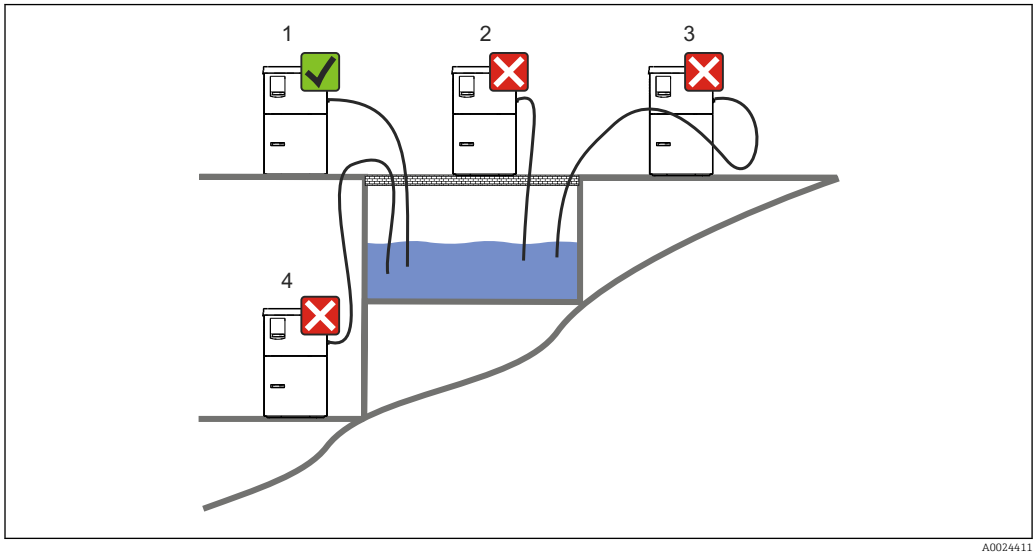


4 *Dimensions of Liquistation CSF33CSF33 stainless steel version, dimensions in mm (in)*

A Suction line connection

5.1.2 Installation site

For version with sample pump



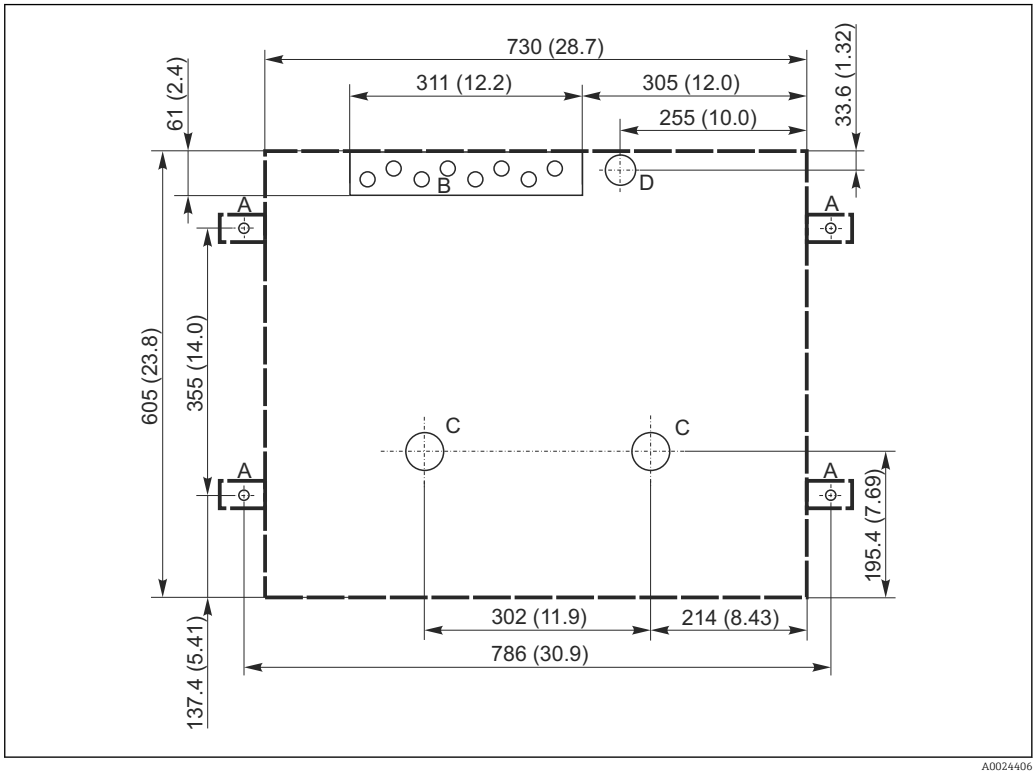
5 *Liquistation mounting conditions*

1. Correct
   ↳ The suction line must be routed with a downward slope to the sampling point.
2. Incorrect
   ↳ The sampler should never be mounted in a place where it is exposed to aggressive gases.
3. Incorrect
   ↳ Avoid siphoning effects in the suction line.
4. Incorrect
   ↳ The suction pipe should never be routed with an upward gradient to the sampling point.

Note the following when erecting the device:
- Erect the device on a level surface.
- Securely connect the device at the fastening points to the surface underneath.
- Protect the device against additional heating (e.g. heater or direct sunlight in the case of PS housing).
- Protect the device against mechanical vibrations.
- Protect the device against strong magnetic fields.
- Make sure air can circulate freely at the side panels of the cabinet. Do not mount the device directly against a wall. Allow at least 150 mm (5.9") from the wall to the left and right.
- Do not erect the device directly above the inlet channel of a wastewater treatment plant.

5.1.3 Mechanical connection

Foundation plan



6 *Foundation plan*

A Fasteners (4 x M10)
B Cable inlet
C Outlet for condensate and overflow > DN 50
D Sample supply from below > DN 80
--- Dimensions of Liquistation

5.1.4 Connection for suctioning samples

- Maximum suction height:
  - Vacuum pump: Standard 6 m (20 ft)
  - Peristaltic pump: standard 8 m (26 ft)
- Maximum hose length: 30 m (98 ft)
- Hose connection diameter
  - Vacuum pump: 13 mm (1/2")
  - Peristaltic pump: internal diameter of 10 mm (3/8")
- Intake speed:
  > 0.6 m/s (> 1.9 ft/s) for 10 mm (3/8") ID, as per Ö 5893, US EPA
  > 0.5 m/s (> 1.6 ft/s) for ≤ 13 mm (1/2") ID, in accordance with EN 25667, ISO 5667

Note the following when erecting the device:
- Always route the suction line so that it slopes upwards from the sampling point to the sampler.
- The sampler must be located above the sampling point.
- Avoid siphoning effects in the suction line.

Requirements for the sampling point:
- Do not connect the suction line to pressurized systems.
- Use the suction filter to impede coarse and abrasive solids and solids which can cause clogging.
- Immerse the suction line in the direction of flow.
- Take the sample at a representative point (turbulent flow, not directly at the bottom of the channel).

Useful sampling accessories
Suction filter:
Impedes coarser solids and solids which can cause clogging.

5.1.5 Connection for sample intake on version with sample pump

- Maximum suction height:
  - Vacuum pump: Standard 6 m (20 ft)
  - Peristaltic pump: standard 8 m (26 ft)
- Maximum hose length: 30 m (98 ft)
- Hose connection diameter
  - Vacuum pump: 13 mm (1/2")
  - Peristaltic pump: internal diameter of 10 mm (3/8")
- Intake speed:
  > 0.6 m/s (> 1.9 ft/s) for 10 mm (3/8") ID, as per Ö 5893, US EPA
  > 0.5 m/s (> 1.6 ft/s) for ≤ 13 mm (1/2") ID, in accordance with EN 25667, ISO 5667

Note the following when erecting the device:
- Always route the suction line so that it slopes upwards from the sampling point to the sampler.
- The sampler must be located above the sampling point.
- Avoid siphoning effects in the suction line.

Requirements for the sampling point:
- Do not connect the suction line to pressurized systems.
- Use the suction filter to impede coarse and abrasive solids and solids which can cause clogging.
- Immerse the suction line in the direction of flow.
- Take the sample at a representative point (turbulent flow, not directly at the bottom of the channel).

Useful sampling accessories
Suction filter:
Impedes coarser solids and solids which can cause clogging.

5.2 Installation

5.2.1 Connecting the suction line at the side on version with pump

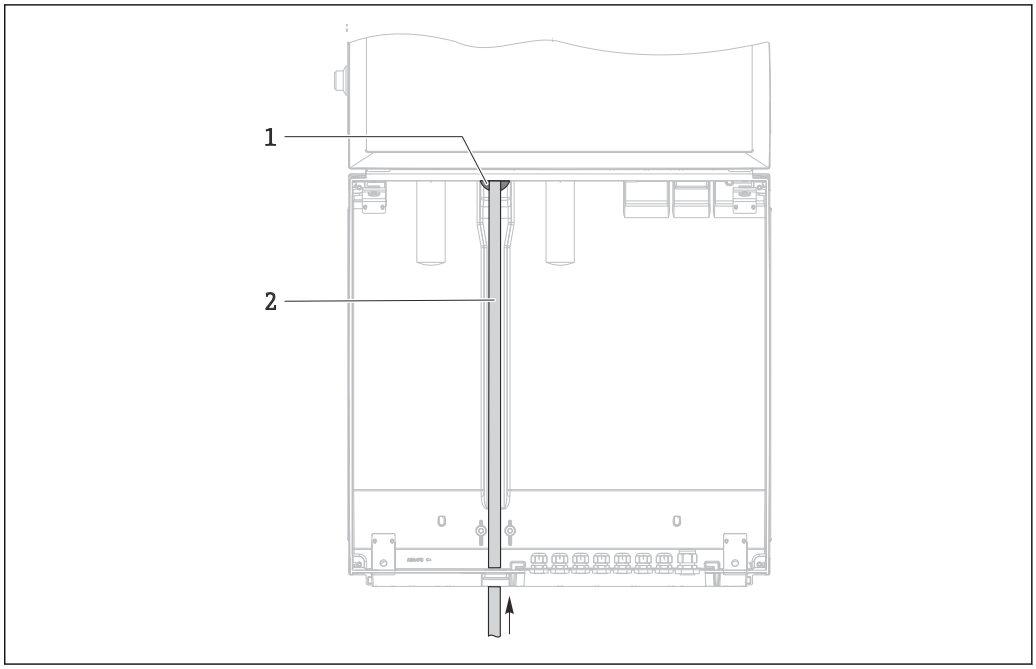
1. When installing the device, take the installation conditions into account.
2. Route the suction line from the sampling point to the device.
3. Screw the suction line onto the device's hose connection.

5.2.2 Connecting the suction line from the bottom on version with pump

If the suction line is connected from below, the suction line is routed upwards behind the rear panel of the sample compartment. First remove the rear panel of the dosing compartment and sample compartment as described in the "Electrical connection" section.

1. Remove the drain plug from the hose gland located at the back of the device base.

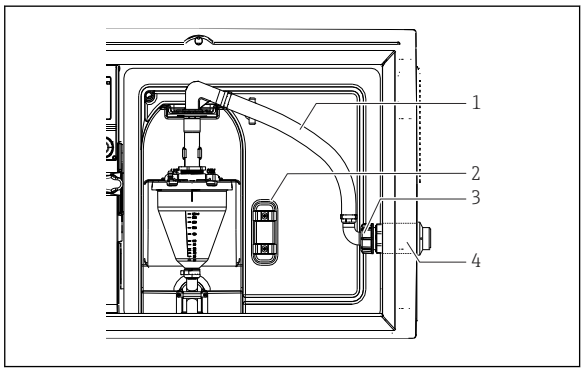
2. As illustrated, guide the suction line upwards and through the opening towards the front.



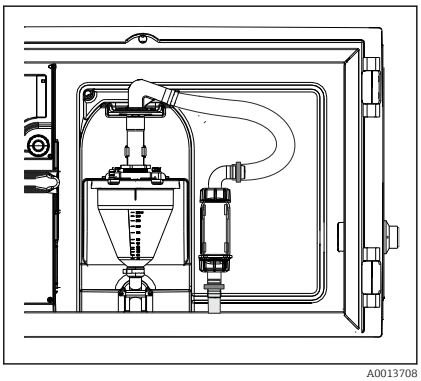
7 *Sample supply from below*

1 Gland for the suction line
2 Suction line

Connecting the suction line on version with vacuum pump



8 *Connecting the suction line from the side (as-delivered state)*

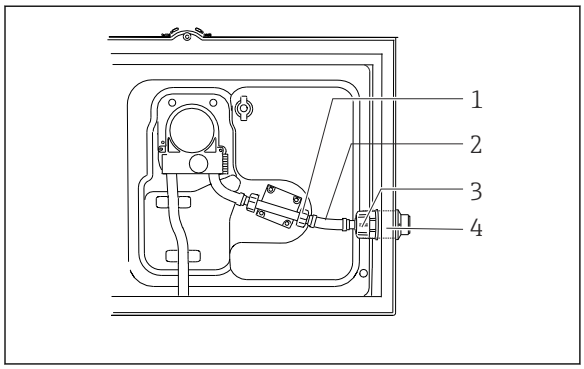


9 *Suction line connected from below*

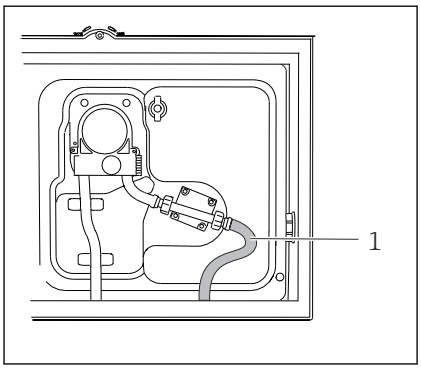
1 Hose
2 Fixing clip for hose gland
3 Thread adapter nut
4 Hose gland

1. Unscrew the thread adapter nut (item 3).
2. Unscrew the hose gland (item 4) from the side panel.
3. Fit the hose gland in the fixing clamp (item 2) as illustrated.
4. Screw the hose tight from above.
5. Attach the hose adapter supplied to the suction line and screw it onto the hose gland from below.
6. Insert the dummy plugs supplied.

Connecting the suction line on version with peristaltic pump



10 *Connecting the suction line from the side (as-delivered state)*



11 *Suction line*

1 Small thread adapter nut
2 Hose
3 Thread adapter nut
4 Hose gland

1. Unscrew the thread adapter nut (item 3) and the hose fitting (item 4) from the side panel.
2. Unscrew the small thread adapter nut (item 1) and remove the hose.
3. Connect the suction line from below as illustrated.
4. Insert the dummy plugs supplied.

5.3 Post-installation check

1. Verify that the suction line is securely connected to the device.
2. Visually check that the suction line is installed correctly from the sampling point to the device.
3. Verify that the rotating arm is correctly engaged.
4. Allow the sampler to rest for a minimum of 12 hours following installation and before switch-on. Otherwise you may cause damage to the climate control module.

6 Electrical connection

6.1 Connecting the sampler

⚠ WARNING

Device is live!

Incorrect connection may result in injury or death!

- The electrical connection may be performed only by an electrical technician.
- The electrical technician must have read and understood these Operating Instructions and must follow the instructions contained therein.
- **Prior** to commencing connection work, ensure that no voltage is present on any cable.

NOTICE

The device does not have a power switch

- A fuse with a maximum rating of 10 A must be provided by the customer. Observe the local regulations for installation.
- Use a HBC fuse with 10 A, 250 V AC for samplers with CSA approval.
- The circuit breaker must be a switch or power switch, and you must label it as the circuit breaker for the device.
- The ground connection must be made before all other connections. Danger may arise if the protective ground is disconnected.
- A circuit breaker must be located near the device.
- For 24V versions, the power supply at the voltage source must be isolated from cables carrying low voltage (110/230V AC) by double or reinforced insulation.

Operation with non-stationary power cable connection to sampler (optional)

6.1.1 Laying the cable

- Lay the cables so that they are protected behind the rear panel of the device.
- Cable glands (up to 8 depending on the version) are available for the cable entry.
- The cable length from the foundation to the terminal connection is approx. 1.7 m (5.6 ft).
-

6.1.2 Cable types

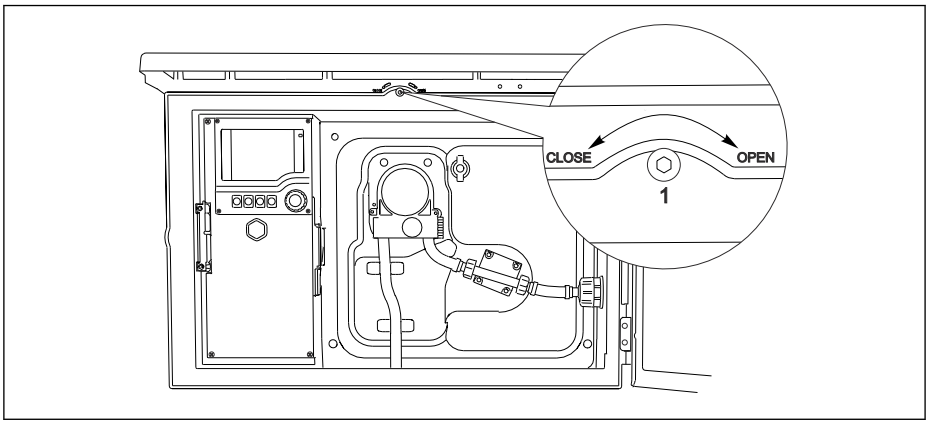
- Power supply: e.g. NYY-J; 3-wire; min. 2.5 mm^2
- Analog, signal and transmission cables: e.g. LiYY 10 x 0.34 mm^2

The terminal connection is located under an additional protective cover in the upper rear section of the device. Prior to commissioning, therefore, remove the rear panel of the device to connect the power supply. The terminal cross-section must be at least 2.5 mm^2 for devices with 24V power supply. With 24V power supply, a current of up to 10A can flow. For this reason pay attention to the voltage drop on the supply line. The voltage at the device terminals must be within the specified range (→ 29).

6.1.3 Removing the rear panel of the dosing compartment

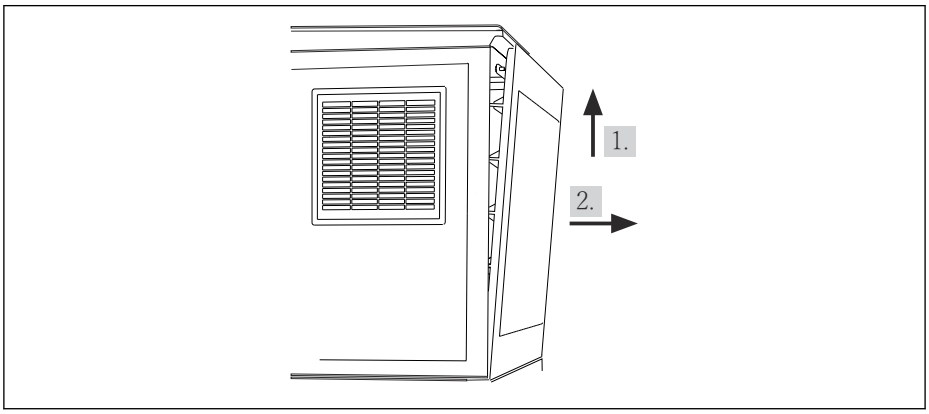
1. Open the door of the dosing compartment.

2. Using an 5mm Allen key, release the rear panel by turning the lock clockwise.



A0012803

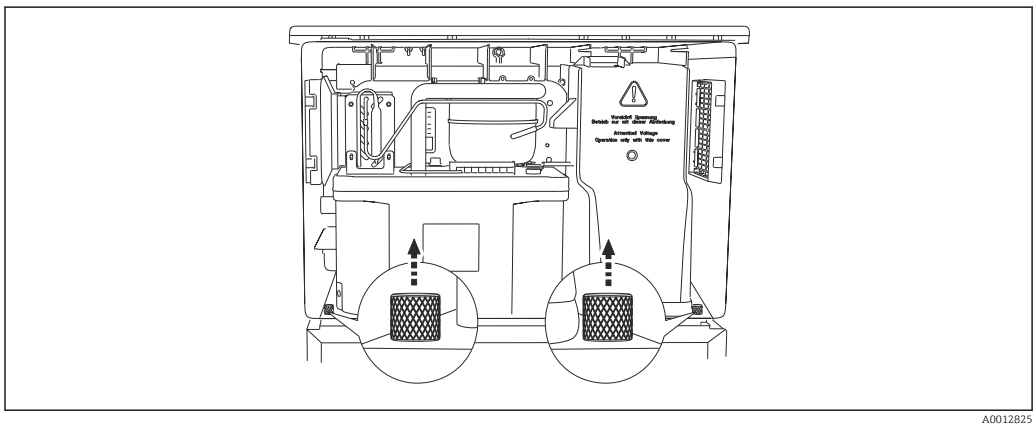
3. Lift up the rear upper panel and pull it off towards the back.



A0012826

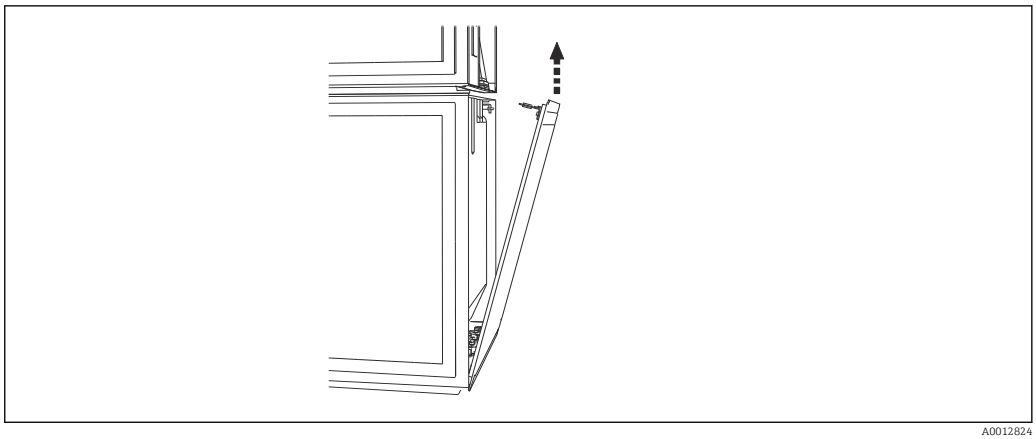
12 Remove the rear panel.

6.1.4 Removing the rear panel of the sampling compartment



A0012825

▶ Remove the bolt on the rear of the dosing compartment.



A0012824

▶ Remove the bolt on the rear panel.

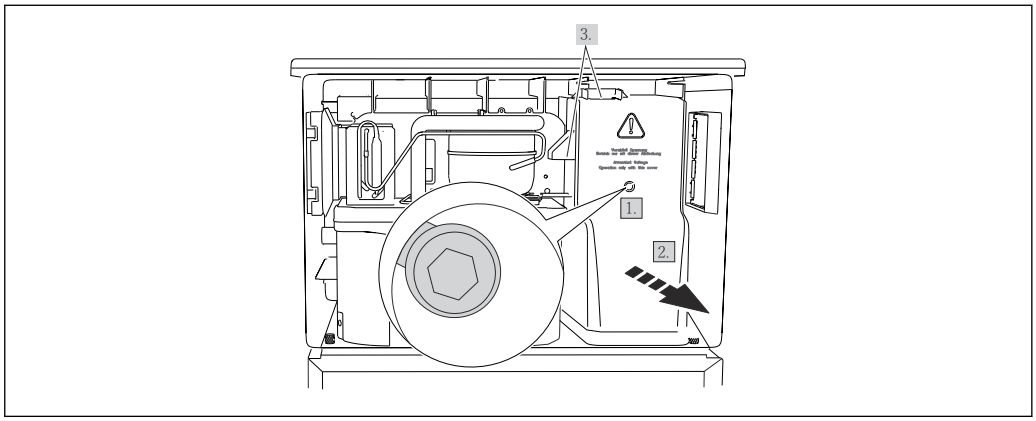
6.1.5 Removing the cover

⚠ WARNING

Device is live

Incorrect connection may result in injury or death

▶ Make sure the device is disconnected from the power source before you remove the cover of the power unit.



A0012831

1. Release the screw with an Allen key (5 mm).
2. Remove the cover of the power unit from the front.
3. When reassembling make sure that the seals are seated correctly.

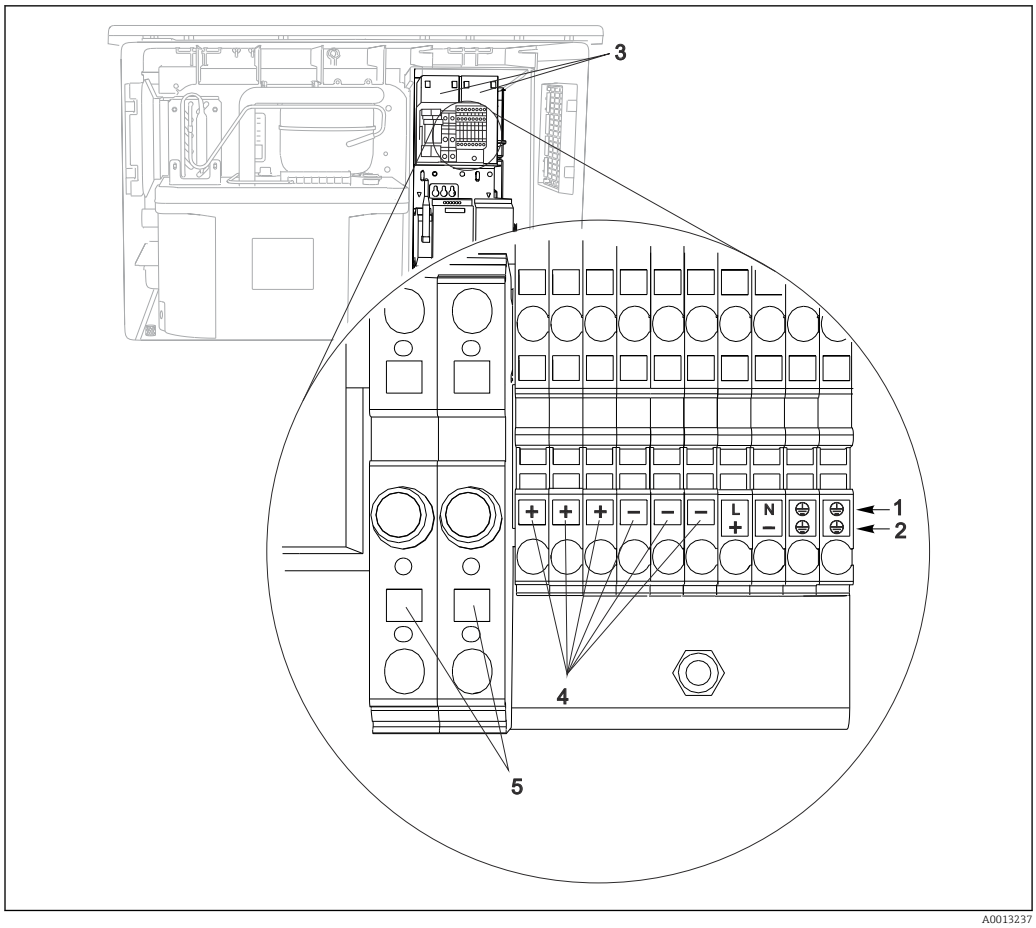
6.1.6 Power supply terminal assignment

The power supply is connected via plug-in terminals.

▶ Connect the ground to one of the ground connections.

Batteries and fuses are available as an optional extra. → 172

Use rechargeable batteries only.→ 172

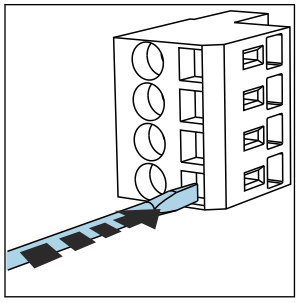


13 *Terminal assignment*

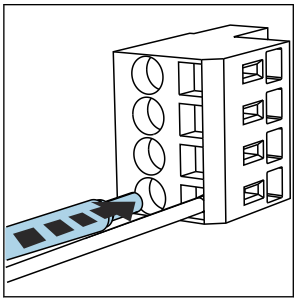
1 *Assignment: 100 to 120 V/200 to 240 V AC ±10 %*
2 *Assignment: 24 V DC +15/-9 %*
3 *Rechargeable batteries (optional)*
4 *Internal 24 V voltage*
5 *Fuses (only for batteries)*

6.1.7 Cable terminals

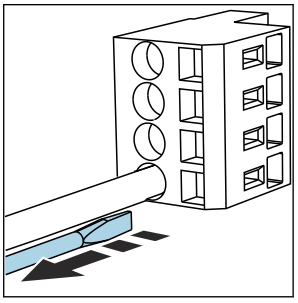
After connection, make sure that every cable end is securely in place. Terminated cable ends, in particular, tend to come loose easily if they have not been correctly inserted as far as the limit stop.



14 *Press the screwdriver against the clip (opens the terminal)*



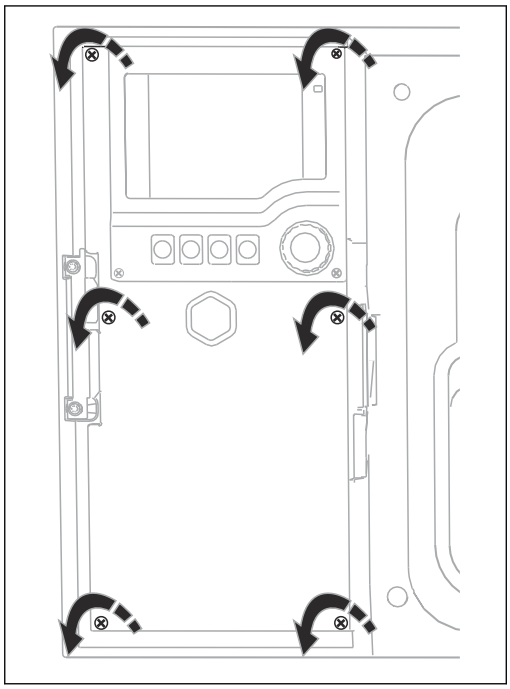
15 *Insert the cable until the limit stop*



16 *Remove the screwdriver (closes the terminal)*

6.2 Connecting modules and sensors

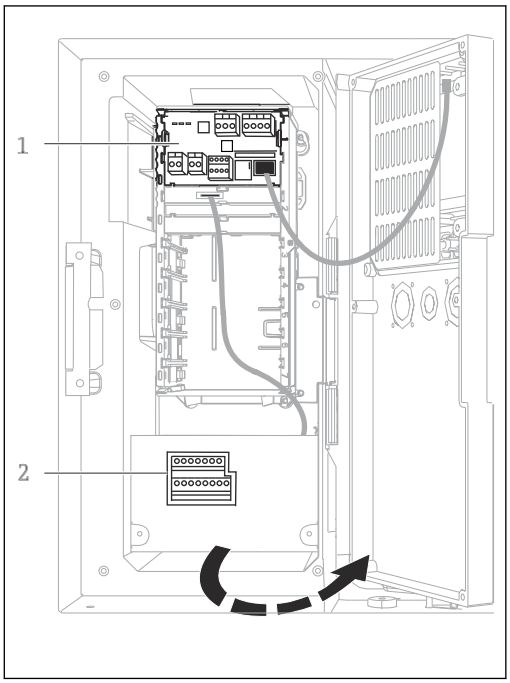
6.2.1 Connection compartment in the controller housing



A0012843

The controller housing has a separate connection compartment. Release the six cover screws to open the connection compartment:

- Release 6 cover screws with a Phillips screwdriver to open the display cover.

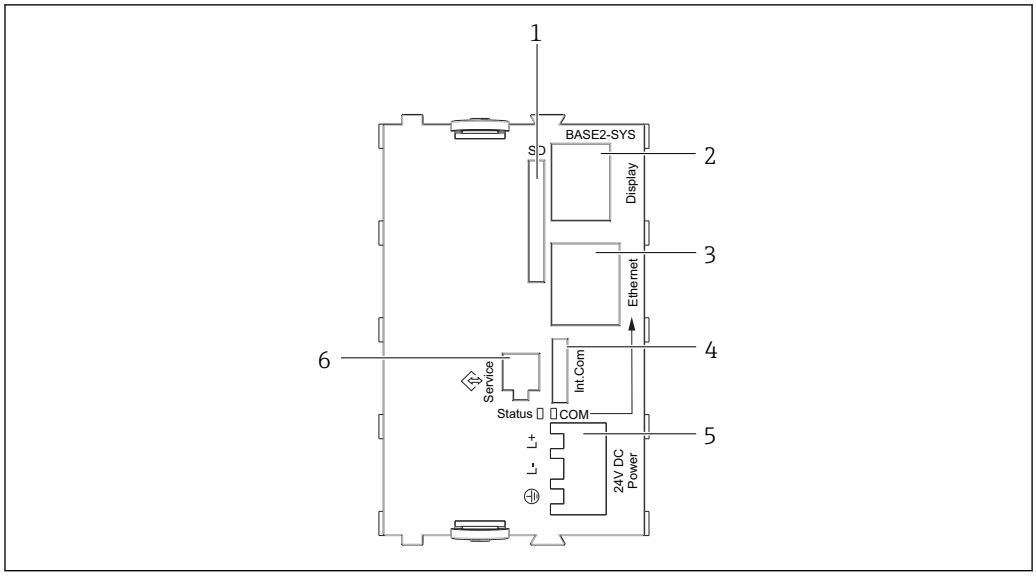


A0042244

1 1 E base module
2 Sampler controller

Display cover open, version with base module E

6.2.2 Base module SYS



17 *Base module SYS (BASE2-SYS)*

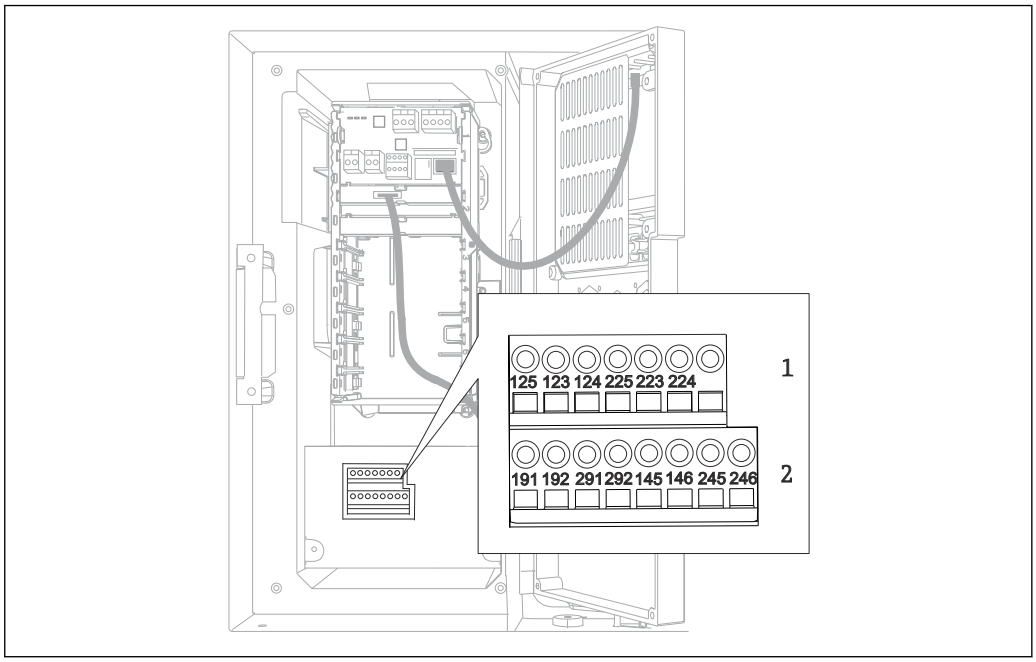
1 *SD card slot*
2 *Slot for display cable*[1)]
3 *Ethernet interface*
4 *Connecting cable to sampler controller*[1)]
5 *Voltage connection*[1)]
6 *Service interface*[1)]

[1)]Internal device connection, do not disconnect the plug.

6.2.3 Sampler controller

The connections for the sampler controller are located in the controller housing (→ 25).

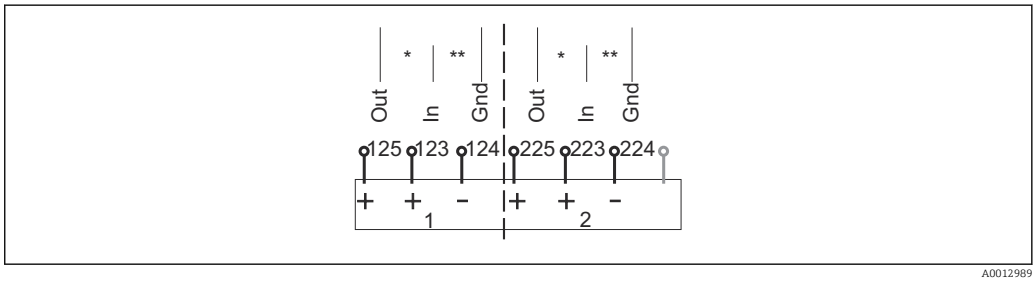
Analog inputs and binary inputs/outputs



18 *Position of the terminals*

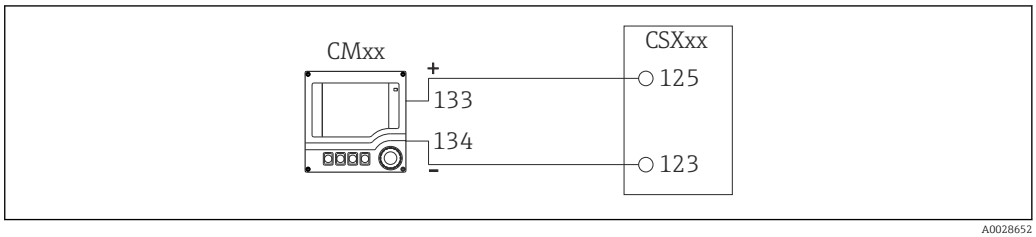
1 Analog inputs 1 and 2
2 Binary inputs/outputs

Analog inputs

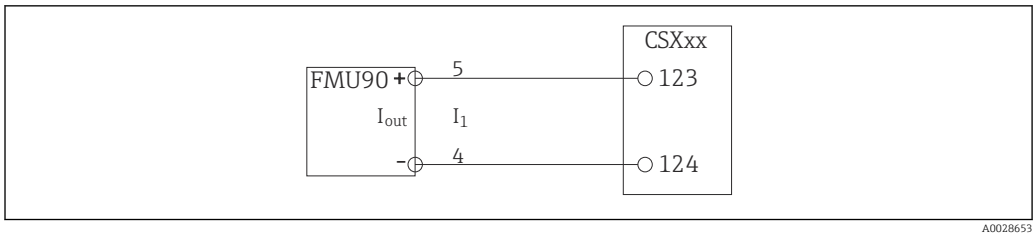


19 *Assignment of analog inputs 1 and 2*

* *Analog input for passive devices (two-wire transmitter), Out + In terminals (125/123 or 225/223)*
** *Analog input for active devices (four-wire transmitter), In + Gnd terminals (123/124 or 223/224)*

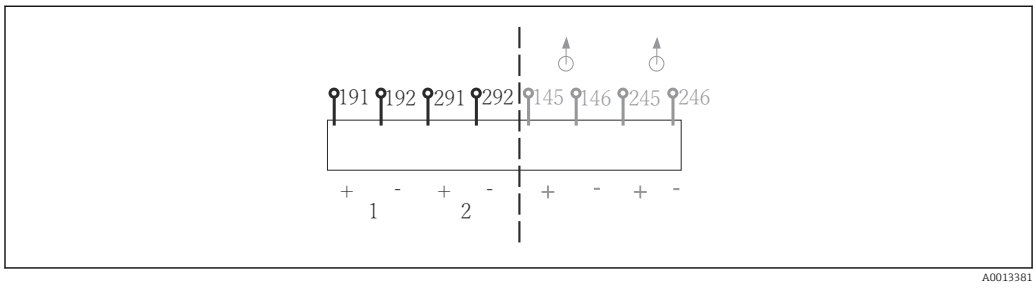


20 *With two-wire transmitter, e.g. Liquiline M CM42*



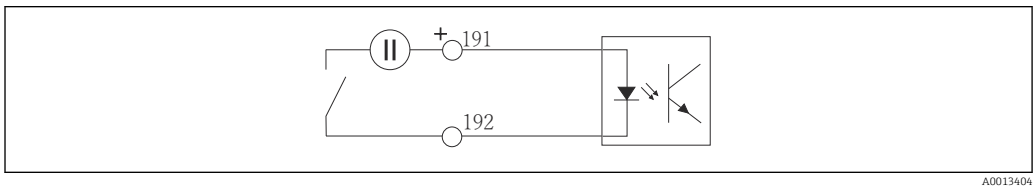
21 With four-wire transmitter, e.g. Prosonic S FMU90

Binary inputs



22 Assignment of binary inputs 1 and 2

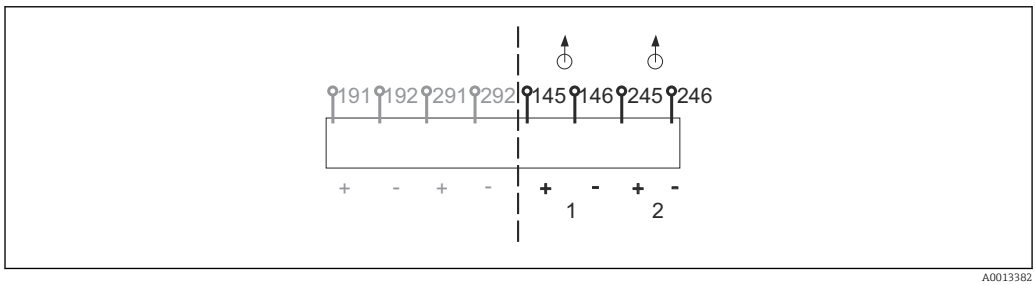
1 Binary input 1 (191/192)
2 Binary input 2 (291/292)



23 Binary input with external voltage source

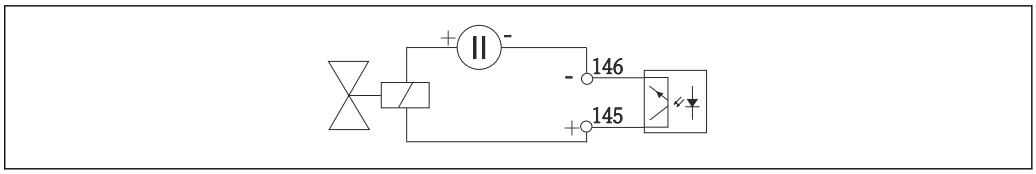
When connecting to an internal voltage source, use the terminal connection on the rear of the dosing compartment. The connection is located on the lower terminal strip (on the far left, + and -), (→ 23)

Binary outputs



24 Assignment of binary outputs 1 and 2

1 Binary output 1 (145/146)
1 Binary output 2 (245/246)



25 Binary output with external voltage source

When connecting to an internal voltage source, use the terminal connection on the rear of the dosing compartment. The connection is located on the lower terminal strip (on the far left, + and -) (→ 23)

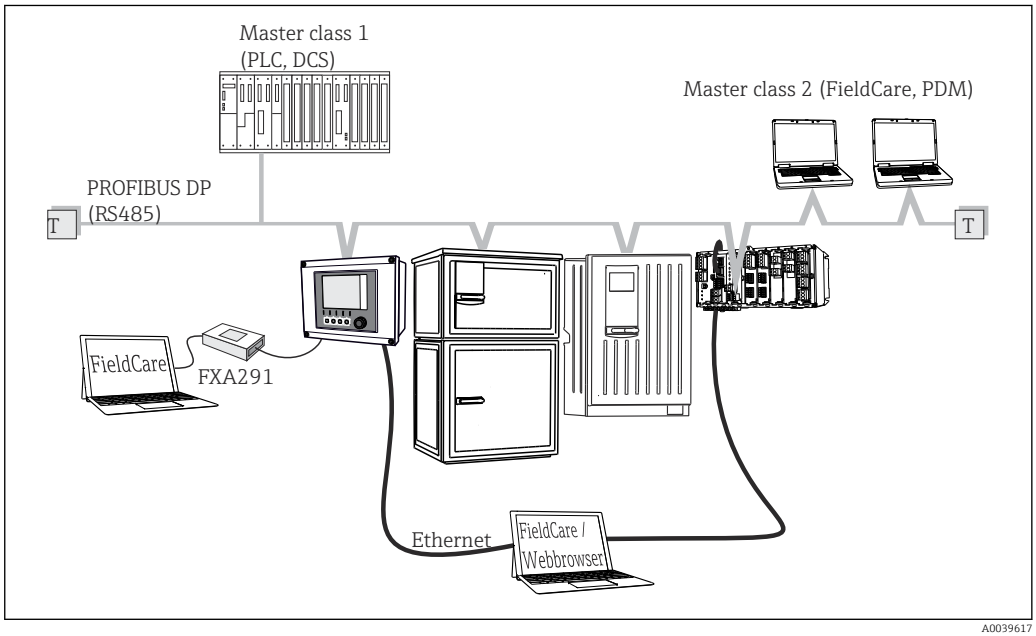
6.3 Terminal assignment for input/output signals

Input signals
- 2 analog signals 0/4 to 20 mA
- 2 binary signals > 100 ms pulse width or edge

Output signals
2 binary signals > 1 s pulse width or edge

6.4 Connection conditions

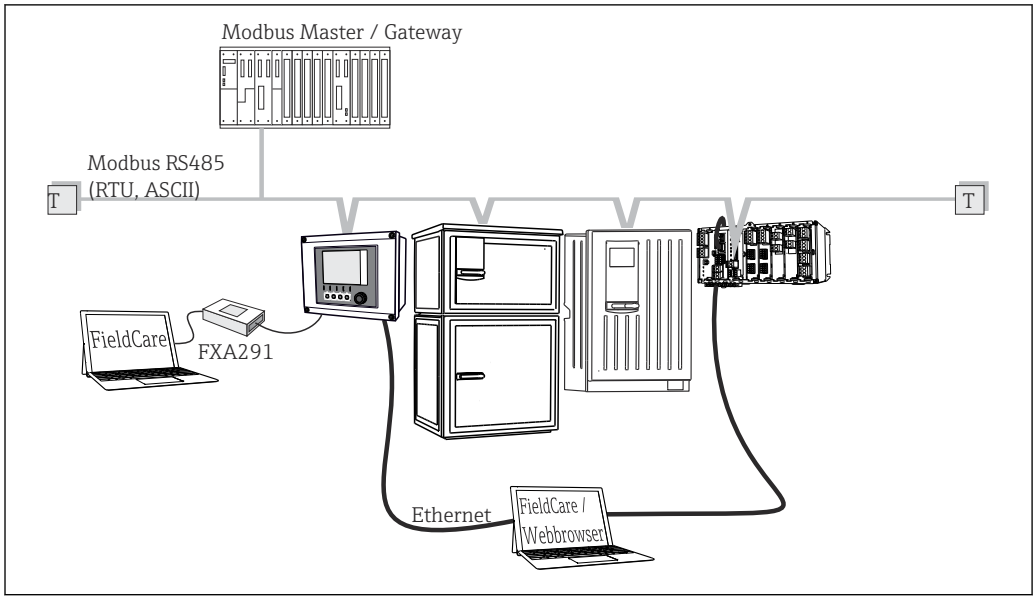
6.4.1 Via PROFIBUS DP



26 PROFIBUS DP

T Terminating resistor

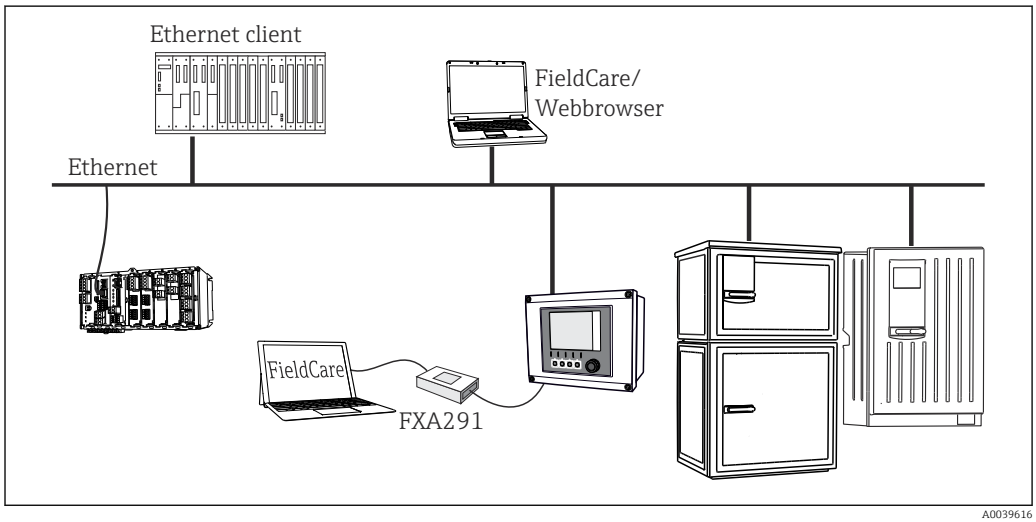
6.4.2 Via Modbus RS485



27 *Modbus RS485*

T Terminating resistor

6.4.3 Via Ethernet: web server/Modbus TCP/PROFINET/ EtherNet/IP



28 *Modbus TCP or EtherNet/IP or PROFINET*

6.5 Ensuring the degree of protection

Only the mechanical and electrical connections which are described in these instructions and which are necessary for the required, designated use, may be carried out on the device delivered.

- ▶ Exercise care when carrying out the work.

Individual types of protection permitted for this product (impermeability (IP), electrical safety, EMC interference immunity, Ex protection) can no longer be guaranteed if, for example :

- Covers are left off
- Different power units to the ones supplied are used
- Cable glands are not sufficiently tightened (must be tightened with 2 Nm (1.5 lbf ft) for the permitted level of IP protection)
- Unsuitable cable diameters are used for the cable glands
- Modules are not fully secured
- The display is not fully secured (risk of moisture entering due to inadequate sealing)
- Loose or insufficiently tightened cables/cable ends
- Conductive cable strands are left in the device

6.6 Post-connection check

⚠ WARNING

Connection errors

The safety of people and of the measuring point is at risk! The manufacturer does not accept any responsibility for errors that result from failure to comply with the instructions in this manual.

- Put the device into operation only if you can answer **yes** to **all** the following questions.

Device condition and specifications

- Are the device and all the cables free from damage on the outside?

Electrical connection

- Are the mounted cables strain relieved?
- Are the cables routed without loops and cross-overs?
- Are the signal cables correctly connected as per the wiring diagram?
- Are all plug-in terminals securely engaged?
- Are all the connection wires securely positioned in the cable terminals?

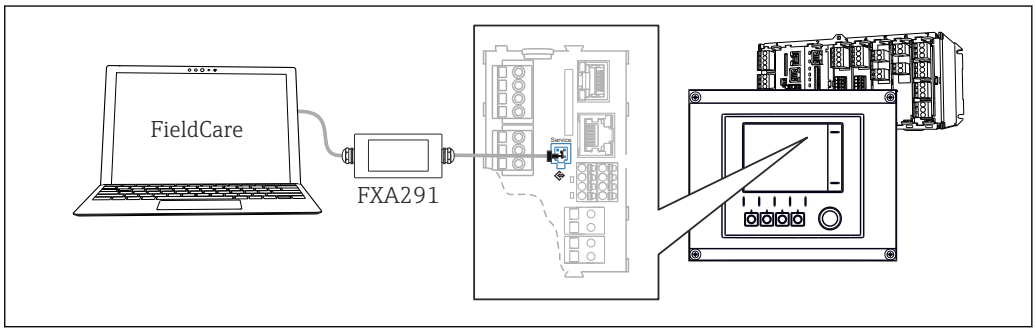
7 System integration

7.1 Service interface

You can connect the device to a computer via the service interface and configure it using "FieldCare" . Furthermore, configurations can also be saved, transferred and documented.

7.1.1 Connection

1. Connect the service connector to the interface on the Liquiline base module and connect it to the Commubox.
2. Connect the Commubox via the USB connection to the computer on which FieldCare is installed.



29 *Connection overview*

7.1.2 Establishing the data connection

1. Start FieldCare.
2. Establish a connection to the Commubox. To do so, select the "CDI Communication FXA291" ComDTM.
3. Then select the "Liquiline CM44x" DTM and start configuration.

You can now start online configuration via the DTM.

Online configuration competes with onsite operation, i.e. each of the two options blocks the other one. On both sides it is possible to take away access from the other side.

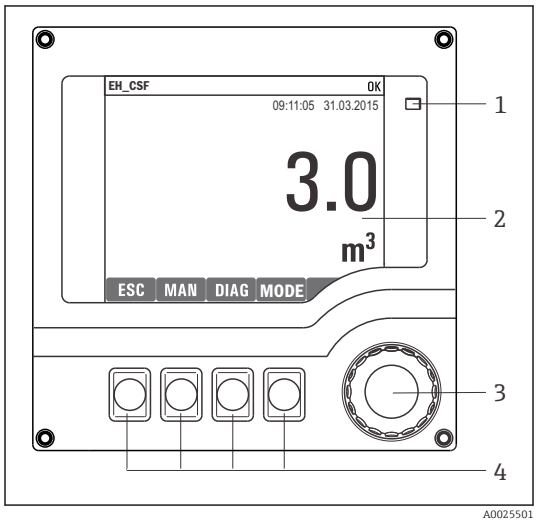
7.1.3 Operation

- In the DTM the menu structure corresponds to the onsite operation. The functions of the Liquiline soft keys are found in the main window on the left.
- Clicking a menu name or a function corresponds to pressing the navigator.
- You can make your settings conveniently via the computer keyboard.
- You can use FieldCare to save logbooks, make backups of configurations and transfer configurations to other devices.
- You can also print out configurations or save them as PDFs.

8 Operation options

8.1 Overview

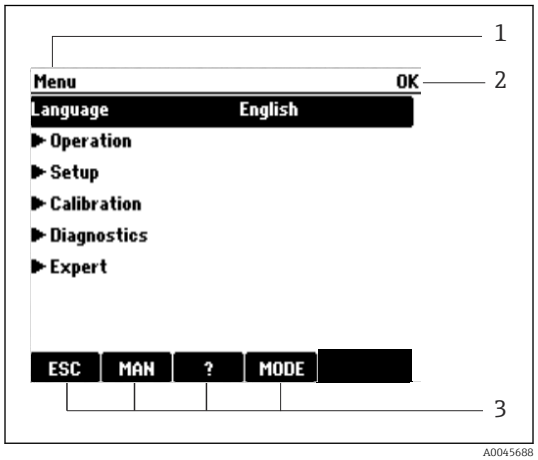
8.1.1 Display and operating elements



1 *LED*
2 *Display (with red display background in alarm condition)*
3 *Navigator (jog/shuttle and press/hold function)*
4 *Soft keys (function depends on menu)*

30 Overview of operation

8.1.2 Display

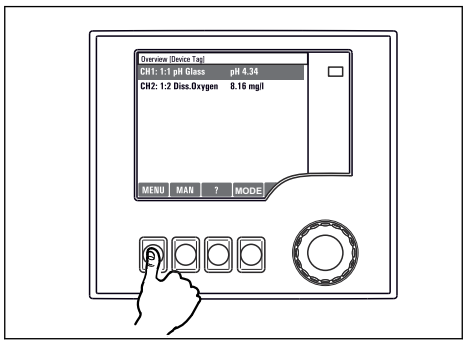


1 *Menu path and/or device designation*
2 *Status display*
3 *Assignment of soft keys, e.g.:*
ESC: escape or abortion of a sampling process
MAN: manual sample
?: Help, if available
MODE: switch the device to standby or cancel the program

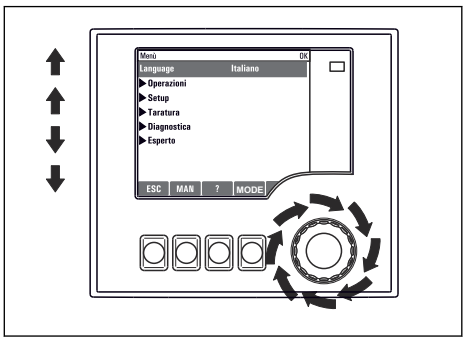
31 Display (example)

8.2 Access to the operating menu via the local display

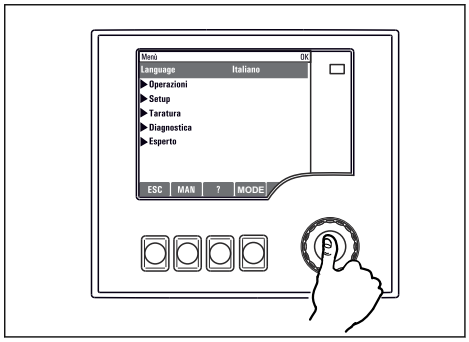
8.2.1 Operating concept



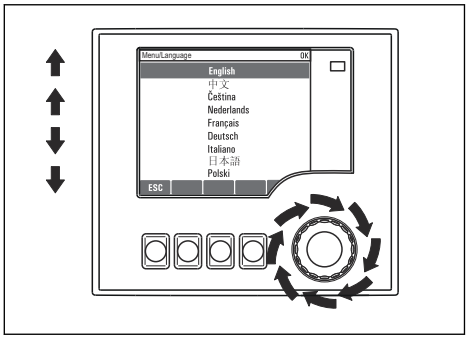
Pressingthe soft key: selecting the menu directly



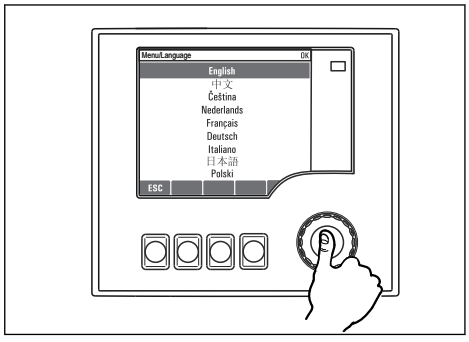
Turningthe navigator: moving the cursor in the menu



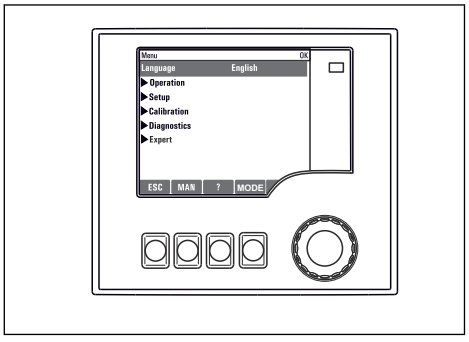
Pressingthe navigator: launching a function



Turningthe navigator: selecting a value (e.g. from a list)



Pressingthe navigator: accepting the new value



↳ *New setting is accepted*

8.2.2 Locking or unlocking operating keys

Locking operating keys

- ▶ Press the navigator for longer than 2 s.
  - ↳ A context menu for locking the operating keys is displayed.

You have the choice of locking the keys with or without password protection. "With password" means that you can only unlock the keys again by entering the correct

password. This password is set here: **MenuSetupGeneral settingsExtended setupData managementChange key lock password**

- Choose whether you want to lock without or without a password.
  - The keys are locked. No more entries can be made. In the soft key bar, you will see the symbol.

The password is 0000 when the device is delivered from the factory. **Make sure to note down any changes to the password**, as otherwise you will not be able to unlock the keypad yourself.

Unlocking operating keys

1. Press the navigator for longer than 2 s.
   - A context menu for unlocking the operating keys is displayed.
2. Select **Key unlock**
   - The keys are unlocked immediately if you did not choose to lock with a password. Otherwise you are asked to enter your password.
3. Only if keypad is password-protected: enter the right password.
   - The keys are unlocked. It is possible to access the entire onsite operation again. The symbol is no longer visible on the display.

The password is 0000 when the device is delivered from the factory. **Make sure to note down any changes to the password**, as otherwise you will not be able to unlock the keypad yourself.

8.3 Configuration options

8.3.1 Display only

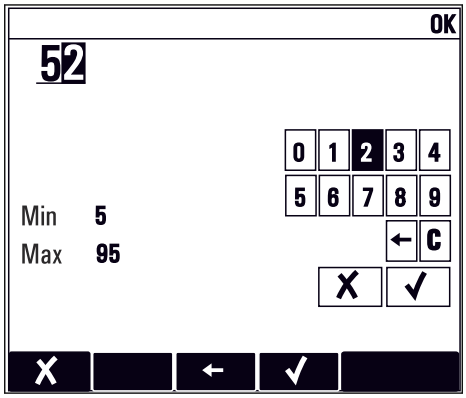
- You can only read the values but cannot change them.
- Typical read-only values are: sensor data and system information
- Example: **Menu/Setup/Inputs/../Sensor type**

8.3.2 Picklists

- You receive a list of options. In a few cases, these also appear in the form of multiple choice boxes.
- Usually you just select one option; in rare instances you select one or more options.
- Example: **Menu/Setup/General settings/Temperature unit**

8.3.3 Numerical values

- You are changing a variable.
- The maximum and minimum values for this variable are shown on the display.
- Configure a value within these limits.
- Example: **Menu/Operation/Display/Contrast**

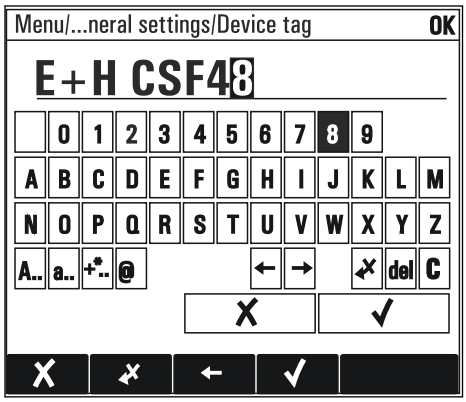


8.3.4 Actions

- You trigger an action with the appropriate function.
- You know that the item in question is an action if it is preceded by the following symbol: ▷
- Examples of typical actions include:
  - Deleting log entries
  - Saving or loading configurations
  - Triggering cleaning programs
- Examples of typical actions include:
  - Start a sampling program
  - Start manual sampling
  - Saving or loading configurations
- Example: **Menu/Manual sampling/Start sampling**

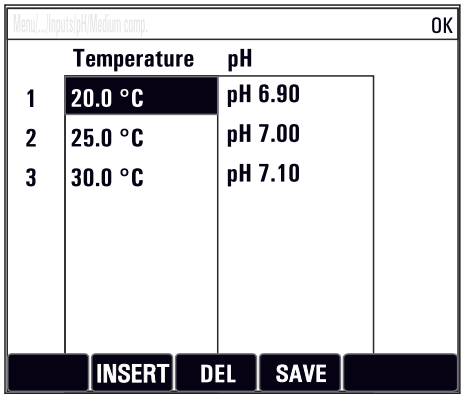
8.3.5 User-defined text

- You are assigning an individual designation.
- Enter a text. You can use the characters in the editor for this purpose (upper-case and lower-case letters, numbers and special characters).
- Using the soft keys, you can:
  - Cancel your entries without saving the data (✗)
  - Delete the character in front of the cursor (✗)
  - Move the cursor back one position (←)
  - Finish your entries and save (✓)
- Example: **Menu/Setup/General settings/Device tag**



8.3.6 Tables

- Tables are needed to map mathematical functions or to enter irregular interval samples.
- You edit a table by navigating through rows and columns with the navigator and changing the values of the cells.
- You only edit the numerical values. The controller automatically takes care of the engineering units.
- You can add rows to the table (**INSERT** soft key) or delete them (**DEL** soft key).
- Afterwards, you save the table (**SAVE** soft key).
- You can also cancel your entries any time using the ✗ soft key.
- Example: **Menu/Setup/Inputs/**pH/**Medium comp.**



9 Commissioning

9.1 Function check

⚠ WARNING

Incorrect connection, incorrect supply voltage

Safety risks for staff and device malfunctions!

- ▶ Check that all connections have been established correctly in accordance with the wiring diagram.
- ▶ Ensure that the supply voltage matches the voltage indicated on the nameplate.

Saving displays as a screenshot

Via the local display, you can take screenshots at any time and save them to an SD card.

1. Insert an SD card into the SD card slot in the basic module.
2. Press the navigator button for at least 3 seconds.
3. In the context menu select the "Screenshot" item.
   ↳ The current screen is saved as a bitmap file to the SD card in the "Screenshots" folder.

9.2 Setting the operating language

Configuring the language

If you have not already done so, close the housing cover and screw the device closed.

1. Switch on the supply voltage.
   ↳ Wait for the initialization to finish.
2. Press the soft key: **MENU**.
3. Set your language in the top menu item.
   ↳ The device can now be operated in your chosen language.

9.3 Configuring the measuring device

9.3.1 Start screen

You can find the following menu items and soft keys on the initial screen:

- **Select sampling program**
- **Edit program %0V** [1)]
- **Start program %0V**[1)]
- **MENU**
- **MAN**
- **MEAS**
- **MODE**

1) "%0V" here stands for text that depends on the context. This text is generated automatically by the software and inserted in place of %0V.

9.3.2 Display behavior

Menu/Operation/Display		
Function	**Options**	**Info**
Contrast	5 to 95 % **Factory setting** 50 %	Adjust the screen settings to suit your working environment. **Backlight** = **Automatic** The backlighting is switched off automatically after a short time if a button is not pressed. It switches back on again as soon as you press the navigator button. **Backlight** = **On** The backlighting does not switch off automatically.
Backlight	**Selection** ▪ On ▪ Off ▪ Automatic **Factory setting** Automatic	
Screen rotation	**Selection** ▪ Manual ▪ Automatic **Factory setting** Manual	If **Automatic** is selected, the single-channel measured value display switches from one channel to the next every second.
Current program:	Read only	The name of the sampling program currently selected is displayed.
Status	Read only	Active The sampling program has been started and the device takes a sample as per the set parameters. Inactive No sampling program has been started, or a program that was running has been stopped.
▷ Start	Action	The selected sampling program is started.
▶ Measurement		Current measured values at the inputs are displayed. Analog and binary inputs cannot be modified here.
▶ Show summary of current program		The bottle statistics for the sampler are displayed. The statistics appear for each individual bottle after the start of the program. You can find more information in the Chap. "Bottle statistics".
▶ Show summary of inputs		The configured counters of the analog and binary input are displayed. Max. 8 lines

9.3.3 User definable screens

Menu/Operation/User definable screens		
Function	**Options**	**Info**
▶ Meas. screen 1 … 6		You can create 6 measuring screens of your own and give them a name. The functions are identical for all 6 measuring screens.
Meas. screen	**Selection** ▪ On ▪ Off **Factory setting** Off	Once you have defined your own measuring screen, you can switch it on here. You can find the new screen under **User definable screens**.
Label	Customized text, 20 characters	Name of the measuring screen Appears in the status bar of the display.
Number of lines	1 to 8 **Factory setting** 8	Specify the number of measured values displayed.

Menu/Operation/User definable screens		
Function	**Options**	**Info**
▶ Line 1 ... 8	**User interface** Label	Specify the content of **Label** in the submenu of each line.
Source of data	**Selection** ▪ None ▪ See list in "Info" column **Factory setting** None	▸ Select a source of data. You can choose from the following: ▪ Sensor inputs ▪ Binary inputs ▪ Current inputs ▪ Temperature ▪ Memosens sensor input (optional) ▪ Fieldbus signals ▪ Mathematical functions ▪ Binary inputs and outputs ▪ Current outputs ▪ Relay ▪ Measuring range switching
Measured value **Source of data** *is an input*	**Selection** Depends on the input **Factory setting** None	You can display different main, secondary and raw measured values depending on the type of input. No options can be selected for outputs here.
Label	Customized text, 20 characters	User-defined name for the parameter to be displayed
▷ Set label to "%0V" [1]	Action	If you perform this action you accept the parameter name that is automatically suggested. Your own parameter name (**Label**) is lost!

1) "%0V" here stands for text that depends on the context. This text is generated automatically by the software and inserted in place of %0V. In the simplest situations, the generated text could be the name of the measuring channel, for example.

9.3.4 Basic setup

Making basic settings

1. Switch to the **Setup/Basic setup** menu.
   ↳ Make the following settings.
2. **Device tag**: Give your device any name of your choice (max. 32 characters).
3. **Set date**: Correct the set date if necessary.
4. **Set time**: Correct the set time if necessary.
5. **Number of bottles**: Correct the set number of bottles if necessary.
6. **Bottle volume**: Correct the set bottle volume if necessary.
   ↳ For quick commissioning, you can ignore the additional settings for outputs etc. You can make these settings later in the specific menus.
7. To return to the display overview: press the soft key for **ESC** for at least one second.
   ↳ Your sampler now works with your basic settings. The sensors connected use the factory settings of the sensor type in question and the individual calibration settings that were last saved.

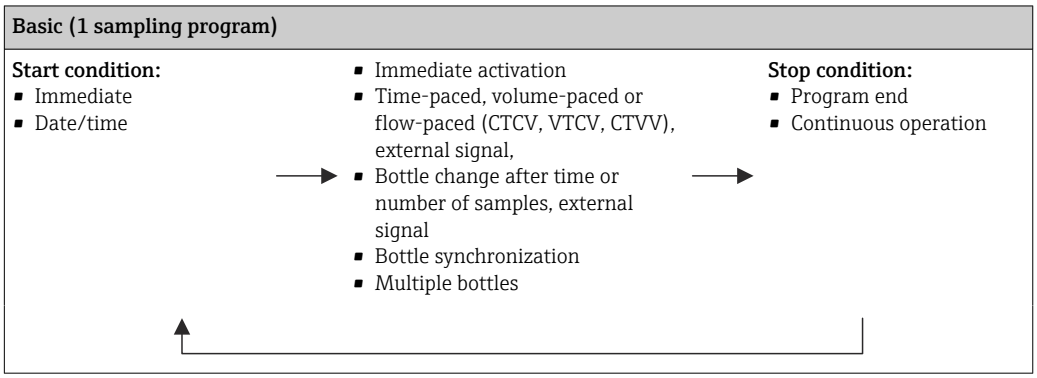
If you wish to configure your most important input and output parameters in the **Basic setup** :

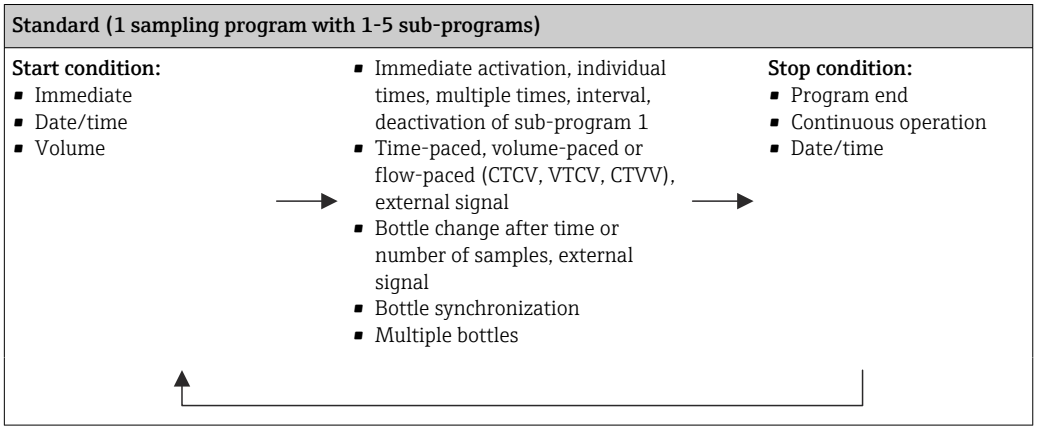
▸ Configure the current inputs, relays, limit switches, cleaning cycles and device diagnostics with the following submenus.

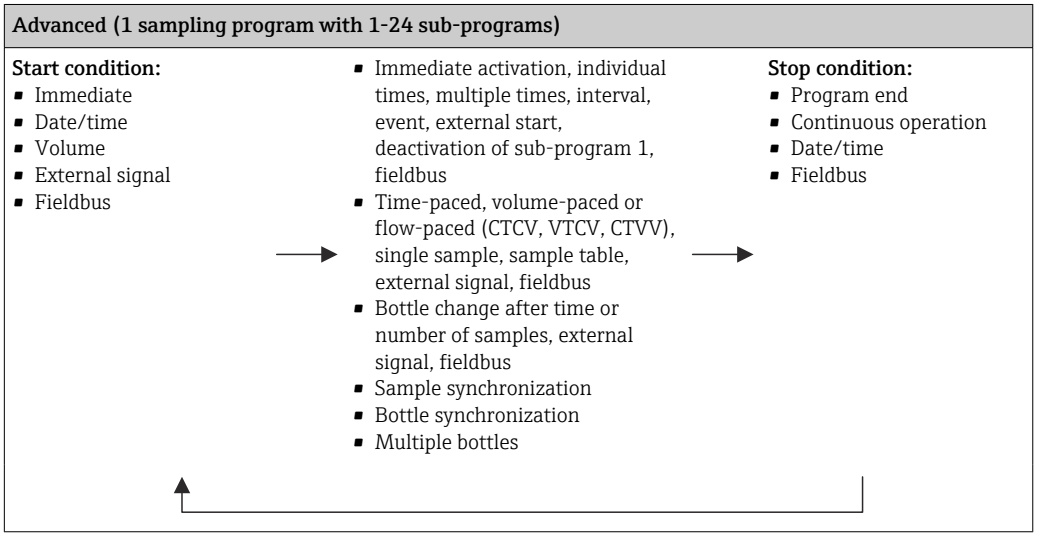
9.3.5 Sampling programs

Difference between program types

The following box provides an overview of the differences between the Basic, Standard and Advanced program types.







Manual sampling

1. Manual sampling is triggered by the **MAN** soft key. This pauses any program currently running.
   ↳ The current bottle configuration and the current sample volume are displayed. You can select the distributor position. In peristaltic systems, you can also change the sample volume.
   In vacuum systems, a multiple of a single manual sample can be taken under **Multiplier**. Specify the **Multiplier** range of adjustment 1 to 50.
2. Select **Start sampling**
   ↳ A new screen is displayed indicating the progress of the sampling process.
3. After manual sampling, a running program can be displayed again and continued with **ESC**.
   ↳ The sample volume for "Manual sampling" is not taken into account in the calculated bottle volumes.

Programming for automatic sampling

In the overview screen, create a simple sampling program under **Select sampling program/New/Basic** or under **Menu/Setup/Sampling programs/Setup program/New/Basic**:

1. Enter the "Program name".
2. The settings from the **Basic setup** for the bottle configuration and bottle volume are displayed.
3. **Sampling mode**=**Time paced CTCV** is preset.
4. Enter the **Sampling interval**.
5. Enter the **Sampling volume** per sample. (For version with vacuum pump, configure under **Menu/Setup/General settings/Sampling**.)
6. Select the **Bottle change mode** after number of samples or time for average samples.

With the option "Bottle change after a time", you can enter the change time and bottle synchronization (None, 1st bottle change time, 1st time of change + bottle number). The description for this can be found in the "Bottle synchronization" section.

With the option "Bottle change after a time", you can choose the bottle synchronization before the start condition (None, 1st bottle change time, 1st time of change + bottle number). The description for this can be found in the "Bottle synchronization" section.

1. For **Multiple bottles** enter the number of bottles the sample should be distributed over.
2. **Start condition**: immediately or after date/time
3. **Stop condition**: after program end or continuous operation.
4. Pressing **SAVE** saves the program and ends data entry.

10 Operation

10.1 Display

10.1.1 Measuring mode

▶ To display the measured values, press the soft key **MEAS** in the start screen, or during operation press **STAT** under **Measurement**.

Press the navigator button to change the mode

There are various display modes:

- *Channel overview*
  The names of all the channels, the sensor type connected and the current main value are displayed.
- *Main value of the selected channel*
  The name of the channel, the sensor type connected and the current main value are displayed.
- *Main value and secondary value of the selected channel*
  The name of the channel, the connected sensor type and the current main value and secondary value are displayed.
  Temperature sensor 1 has a special function. The states of the compressor, ventilator and heater are displayed (on/off).
- *All the measured values of all the inputs and outputs*
  The current main value and secondary value as well as all the raw values are displayed.
- *User-defined measuring screens*
  You configure what values you want to display. You can choose from all the measured values of physical and "virtual" sensors (calculated using mathematical functions) and output parameters.

In the first 3 modes, you can switch between channels by turning the navigator. In addition to having an overview of all the channels, in the 4th mode you can also select a value and press the navigator to see more details for the value. You can also find your user-defined screens in this mode.

10.1.2 Device status

Icons on the display alert you to special device states.

Icon	Location	Description
F	Header bar	Diagnostic message "Failure"
M	Header bar	Diagnostic message "Maintenance request"
C	Header bar	Diagnostic message "Check"
S	Header bar	Diagnostic message "Out of specification"
⇆	Header bar	Fieldbus or TCP/IP communication active
⧗	Header bar	Hold active (for sensors)
⧗	At measured value	Hold for the actuator (current output, limit switch etc.) is active
⤒	At measured value [1]	An offset has been added to the measured value
⊗	At measured value	Measured value in "Bad" or "Alarm" state
ATC	At measured value	Automatic temperature compensation active (for sensors)
MTC	At measured value	Manual temperature compensation active (for sensors)
SIM	Header bar	Simulation mode active or Memocheck SIM connected
SIM	At measured value	The measured value is influenced by a simulated value

Icon	Location	Description
SIM	At measured value	The displayed measured value is simulated (for sensors)
⍰	Header bar	Controller is active

1) Only pH or ORP measurement

If two or more diagnostic messages occur simultaneously, only the icon for the message with the highest priority is shown on the display (for the order of priority according to NAMUR, → 130).

10.1.3 Assignment views

Assignment views, e.g. **Channel assignment view**, appear as the last function in many sections of the menu. You can use this function to see which actuators or functions are connected to an input or output. The assignments appear in hierarchical order.

10.2 General settings

10.2.1 Basic settings

Some settings are visible with optional hardware only.

Menu/Setup/General settings		
Function	**Options**	**Info**
Device tag	Customized text, 32 characters	▶ Select any name for your controller, e.g. use the TAG name.
Temperature unit	**Selection** ▪ °C ▪ °F ▪ K **Factory setting** °C	
Current output range	**Selection** ▪ 0..20 mA ▪ 4..20 mA **Factory setting** 4..20 mA	In accordance with Namur NE43, the linear range is from 3.8 to 20.5 mA (**4..20 mA**) or from 0 to 20.5 mA (**0..20 mA**). If the range is exceeded or undershot, the current value stops at the range limit and a diagnostic message (460 or 461) is output.
Failure current	0.0 to 23.0 mA **Factory setting** 22.5 mA	The function meets NAMUR NE43. ▶ Set the current value that should be output at the current outputs in the event of an error.
The value for **Failure current** should be outside the measuring range. If you decided that your **Current output range** = **0..20 mA** you should set an error current between 20.1 and 23 mA. If the **Current output range** = **4..20 mA** you could also define a value < 4 mA as the error current. The device allows an error current within the measuring range. In such instances pay attention to any effects this may have on your process.		

Menu/Setup/General settings		
Function	**Options**	**Info**
Alarm delay	0 to 9999 s **Factory setting** 0 s	The software displays only the errors that are present longer than the set delay time. This makes it possible to suppress messages that only occur briefly and are caused by normal process-specific fluctuations.
Device hold	**Selection** ▪ Disabled ▪ Enabled **Factory setting** Disabled	You can enable an immediate, general hold (for sensors) here. The function acts in the same way as the **HOLD** soft key in the screens.

10.2.2 Date and time

Menu/Setup/General settings/Date/Time		
Function	**Options**	**Info**
Set date	Depends on the format	Editing mode: Day (two-digit): 01 to 31 Month (two-digit): 01 to 12 Year (four-digit): 1970 to 2106
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	**Selection** ▪ DD.MM.YYYY ▪ YYYY-MM-DD ▪ MM-DD-YYYY **Factory setting** DD.MM.YYYY	▶ Select a date format.
Time format	**Selection** ▪ hh:mm am (12h) ▪ hh:mm (24h) ▪ hh:mm:ss (24h) **Factory setting** hh:mm:ss (24h)	▶ Choose between 12-hour display or 24-hour display. Seconds can also be displayed with the latter version.
Time zone	**Selection** ▪ None ▪ Choice of 35 time zones **Factory setting** None	**None** = Greenwich Mean Time (London).
DST	**Selection** ▪ 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.

10.2.3 Hold settings

Menu/Setup/General settings/Hold settings		
Function	**Options**	**Info**
▶Settings automatic Hold		
Hold release time	0...600 s **Factory setting** 0 s	The hold is maintained for the duration of the delay time when you switch to the measuring mode.
Setup menu	**Selection** ▪ 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 active	**Factory setting** Enabled	

If a device-specific hold is enabled, any cleaning that was previously started is stopped. You can only start a manual cleaning if a hold is active. The hold has no influence on the sampling.

10.2.4 Logbooks

Logbooks record the following events:
- Calibration/adjustment events
- Operator events
- Diagnostic events
- Programming events

You define how the logbooks should store the data.

In addition, you can also define individual data logbooks .

1. Assign the logbook name.
2. Select the measured value to be recorded.
3. Set the scan time (**Scan time**).
   ↳ You can set the scan time individually for every data logbook.

Further information on the logbooks: .

Menu/Setup/General settings/Logbooks		
Function	**Options**	**Info**
Logbook ident	Customized text, 16 characters	Part of the file name when exporting a logbook
Event logbook	**Selection** ▪ Off ▪ Ring buffer ▪ Fill up buffer **Factory setting** Ring buffer	All diagnostic messages are recorded **Ring buffer** If the memory is full, the most recent entry automatically overwrites the oldest entry. **Fill up buffer** If the memory is full, there is an overflow,i. e. you cannot store any new values. The controller displays a corresponding diagnostic message. The memory then has to be cleared manually.

Menu/Setup/General settings/Logbooks		
Function	**Options**	**Info**
Logbook program	**Selection** ▪ Off ▪ Ring buffer ▪ Fill up buffer **Factory setting** Ring buffer	All program cycles are recorded **Ring buffer** If the memory is full, the most recent entry automatically overwrites the oldest entry. **Fill up buffer** If the memory is 80 % full, the device displays a diagnostic message. 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 **Event logbook** = **Fill up buffer**		
Calibration logbook Diagnostic logbook Configuration logbook	**Selection** ▪ Off ▪ On **Factory setting** Off	▸ Decide whether you want to receive a diagnostic message if the fill buffer of the relevant logbook overflows.
▶ Data logbooks		
▶ New		You can create a maximum of 8 data logbooks.
Logbook name	Customized text, 20 characters	
Source of data	**Selection** ▪ Sensor inputs ▪ Controller ▪ Current inputs ▪ Temperature ▪ Fieldbus signals ▪ Binary inputs ▪ Mathematical functions **Factory setting** None	▸ Select a data source for the logbook entries. You can choose from the following: ▪ Connected sensors ▪ Available controllers ▪ Current inputs ▪ Fieldbus signals ▪ Binary input signals ▪ Mathematical functions
Measured value	**Selection** Depends on **Source of data** **Factory setting** None	You can record different measured values depending on the data source.
Scan time	0:00:01 to 1:00:00 **Factory setting** 0:01:00	Minimum time interval between two entries Format: H:MM:SS
Data logbook	**Selection** ▪ Ring buffer ▪ Fill up buffer **Factory setting** Ring buffer	**Ring buffer** If the memory is full, the most recent 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 **Event logbook** = **Fill up buffer**	**Selection** ▪ Off ▪ On **Factory setting** Off	▸ Decide whether you want to receive a diagnostic message if the fill buffer of the relevant logbook overflows.
▷ Add another logbook	Action	Only if you want to create another data logbook immediately. You add a new data logbook at a later date using **New**.
▷ Finished	Action	This allows you to exit the **New** menu.

Menu/Setup/General settings/Logbooks		
Function	**Options**	**Info**
▷ Start/stop simultaneously	Action	Appears if you have created more than one data logbook. With one mouse click, you can start or stop recording all the data logbooks.
▶ Logbook name		The name of this submenu is based on the name of the logbook and only appears once you have created a logbook.
This menu appears several times if you have several data logbooks.		
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 **Event logbook** = **Fill up buffer**	Read only	Displays the days, hours and minutes remaining until the logbook is full.
Log size **Event logbook** = **Fill up buffer**	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 again.
Scan time	0:00:01 to 1:00:00 **Factory setting** 0:01:00	As above Minimum time interval between two entries Format: H:MM:SS
Data logbook	**Selection** ▪ Ring buffer ▪ Fill up buffer **Factory setting** Ring buffer	**Ring buffer** If the memory is full, the most recent 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 **Event logbook** = **Fill up buffer**	**Selection** ▪ Off ▪ On **Factory setting** Off	▶ Decide whether you want to receive a diagnostic message if the fill buffer of the relevant logbook overflows.

Menu/Setup/General settings/Logbooks		
Function	**Options**	**Info**
▶ Line plotter		Menu to define the graphic display
Axes	**Selection** ▪ Off ▪ On **Factory setting** On	Should the axes (x, y) be displayed (**On**) or not (**Off**)?
Orientation	**Selection** ▪ Horizontal ▪ Vertical **Factory setting** Horizontal	You can choose whether the value curves should be displayed from left to right (**Horizontal**) or from top to bottom (**Vertical**). If you want to display two data logbooks simultaneously, make sure that both logbooks have the same settings here.
X-Description Y-Description Grids Pitches	**Selection** ▪ Off ▪ On **Factory setting** On	▶ Decide whether a description should be displayed for the axes and whether gridlines should be shown. In addition, you can also decide whether pitches should be displayed.
X Pitch/Grid distance Y Pitch/Grid distance	10 to 50% **Factory setting** 10 %	▶ Determine the pitch.
▷ Remove	Action	This action removes the data logbook. Any data that have not been saved are lost.

Example: New data logbook (Setup/General settings/Logbooks/Data logbooks/New)

1. Make the settings:

- Logbook name
  Assign a name. Example: "01".
- Source of data
  Select a data source. Example: Sensor connected to channel 1 (CH1).
- Measured value
  Select the measured value to be recorded. Example: pH value.
- Scan time
  Specify the time interval between two logbook entries.
- Data logbook
  Activate the logbook: specify the data storage method.

2. ../**Finished**: Perform the action.
   ↳ The device shows the new logbook in the list of data logbooks.
3. Select data logbook "01".
   ↳ Additional display: **Log time left**.
4. Only in the case of **Fill up buffer**:
   Decide to set **Overflow warning**: **On** or **Off**.
   ↳ **On**: The device displays a diagnostic message in the event of memory overflow.
5. **Line plotter** submenu: Specify the type of graphic representation.

10.2.5 Configuring the sampling depending on the device version

The list of functions displayed depends on the device version selected with:
- Vacuum pump[1)]
- Peristaltic pump[2)]
- Distribution drive[3)]
- Sampling assembly:[4)]

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** Depends on the bottle configuration	If continuous operation is selected for a sampling program, there is the danger of overfilling the bottles. Do not forget to empty the bottles!
Distribution parking[3)]	**Selection** ▪ Back ▪ None **Factory setting** Back	Causes the distribution arm to go to the center at the back or remain parked in the current position when the device is started or the program is ended.
Distribution reference	**Selection** ▪ Pre sampling ▪ Pre bottle change ▪ Pre program start **Factory setting** Pre sampling	The distribution arm goes through a reference point depending on the option selected. **Pre sampling:** This means that the distribution arm performs a reference test before each individual sampling. **Pre bottle change:** This means that the distribution arm performs a reference test in every subprogram. **Pre program start:** This means that a single reference test is performed before the program starts.
Power failure	**Selection** ▪ Resume program ▪ Stop program **Factory setting** Resume program	Decide how the sampler should react when it is energized after a power failure. **Resume program:** ▪ Time and flow-paced The program calculates the omitted samples and enters them in the logbook as failed. When the program is restarted, it continues where it was interrupted. ▪ Flow-paced No samples are entered in the logbook during the power failure. When the program is restarted, it continues where it was interrupted.
Sample retries[1), 2), 3)]	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.

Menu/Setup/General settings/			
Function		**Options**	**Info**
	Liquid detection	**Selection** ▪ Automatic ▪ Semi automatic ▪ Manual **Factory setting** Automatic	**Automatic** The last intake time determined is the new purge time. **Semi automatic** In **Semi automatic** purge times and intake times can be defined separately. **Manual** In **Manual** the dosing time can also be set.
	Dosing volume [1), 4)]	[1)] 20 to 350 ml **Factory setting** 200 ml [4)] 10 to 1000 ml **Factory setting** 200 ml	[1)]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. [4)]If the sampling assembly CSA420 is used, 10, 30 or 50 ml are the only values that are permitted.
	Conductive sensor [1)]	**Selection** ▪ Low sensitivity ▪ Medium sensitivity ▪ High sensitivity **Factory setting** Medium sensitivity	The switching behavior can be set with the liquid detection function. Use the high sensitivity setting if the sample has a low conductivity, for example.
	Dosing chamber [1)]	**Selection** ▪ 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.
	Ext. Program Pause	**Selection** ▪ None ▪ Binary input 1 ▪ Binary input 2 **Factory setting** None	**Binary input 1-2** Available only if the input is configured as an external signal. If activated via an external input: ▪ no samples are taken ▪ sample requests are recorded in the program logbook and logged as "nOK" ▪ bottle levels are changed virtually ▪ bottle changes are recorded virtually and performed after the break.
	Ext. Sampling Hold	**Selection** ▪ None ▪ Binary input 1 ▪ Binary input 2 **Factory setting** None	**Binary input 1-2** Available only if the input is configured as an external signal. If activated via an external input: ▪ no samples are taken ▪ no sample requests are recorded in the program logbook ▪ no bottle levels are changed ▪ no bottle changes are recorded or performed

Menu/Setup/General settings/		
Function	**Options**	**Info**
Liquid detection [2]	**Selection** ▪ Automatic ▪ Semi automatic ▪ Off **Factory setting** Automatic	If "Semiautomatic" is selected, the purge times and intake times can be defined separately. **Off:** The definition of the purge times and intake times is completely time-controlled. **Automatic:** The last intake time determined is the new purge time. **Semi automatic:** If the suction heights tend to vary greatly.
Rinse cycles [2]	0 to 3 **Factory setting** 0	The suction line is rinsed with the sample up to 3 times.
▶ Diagnostics settings		
▶ **Sensor fouling**[1]		
Warning	0 to 10 **Factory setting** 7	Indicates maintenance work must be performed on the conductivity sensors. If there is conductive fouling between the conductivity 1 and conductivity 2 electrode, a diagnostic message is displayed when this level of fouling is reached.
Alarm	0 to 10 **Factory setting** 7	If there is conductive fouling between the conductivity 1 and conductivity 2 electrode, a diagnostic message is displayed when this level of fouling is reached.
▶ **Pump tube life**[2]		
Control	**Selection** ▪ Off ▪ On **Factory setting** On	Indicates the pump hose has to be exchanged.
Warning	10 to 50 h **Factory setting** 30 h	When the tube has been in operation for this length of time, a diagnostic message is displayed to indicate that the tube should be replaced in time.
Alarm	10 to 50 h **Factory setting** 30 h	
Totalizer	00-00:00 to 49710-06:28 **Factory setting** 00-00:00	Operating time of the current pump hose in days, hours and minutes
▷ Reset	Action	The tube life counter is reset to 0:00 h.
▶ **Sample temperature** (optional)		
Temp. control	**Selection** ▪ Off ▪ On **Factory setting** On	Switch the temperature control of the sample compartment on or off here.

Menu/Setup/General settings/		
Function	**Options**	**Info**
Sample temperature	2 to 20 °C **Factory setting** 4 °C	Set the sample compartment temperature.
Cooling control	**Selection** ▪ 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 system is preset at the factory. The following menu items can only be viewed and changed in the Expert mode.		
Mode	**Selection** ▪ Off ▪ On **Factory setting** On	Configuration of the automatic defrosting function
Interval	**Selection** ▪ Hourly ▪ Daily ▪ Weekly ▪ Monthly **Factory setting** Hourly	Select the defrosting interval
Time	00-01:00 to 00-23:59 **Factory setting** 00-04:00	
Duration	00:01 to 02:00 **Factory setting** 00:05	

10.2.6 Extended setup

Diagnostics settings

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.

Menu/Setup/(General settings or Inputs<sensor channel>)/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	**Selection** ▪ 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 failure current at the current output
Failure current	**Selection** ▪ On ▪ Off **Factory setting** Depends on the message	▶ Decide whether an failure current should be output at the current output if the diagnostic message display is activated. In the event of general device errors, the failure current is output at all the current outputs. In the event of channel-specific errors, the failure current is only output at the assigned current output.
Status signal	**Selection** ▪ 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. ▶ Decide whether you want to change a status signal assignment for your application.
Diag. output	**Selection** ▪ None ▪ Alarm relay ▪ Binary output ▪ 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: Before being able to assign the message to an output you must first configure a relay output to **Diagnostics**. (**Menu**/**Setup**/**Outputs**: assign **Diagnostics** function and set **Operating mode** to **as assigned**.)
Alarm relays are available, depending on the device version.		
Cleaning program	**Selection** ▪ 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.

Modbus

Menu/Setup/General settings/Extended setup/Modbus		
Function	**Options**	**Info**
Enable	**Selection** ▪ Off ▪ On **Factory setting** On	You can switch off communication at this point. The software can then only be accessed via local operation.
Termination	Read only	If the device is the last in the bus, you can terminate via the hardware.
Settings		
Transmission Mode	**Selection** ▪ TCP ▪ RTU ▪ ASCII **Factory setting** (Modbus-RS485 only) RTU	The transmission mode is displayed depending on the version ordered. In the case of RS485 transmission, you can choose between **RTU** and **ASCII** . There are no choices for Modbus-TCP.
Parity *Modbus-RS485 only*	**Selection** ▪ Even (1 Stopbit) ▪ Odd (1 Stopbit) ▪ None (2 Stopbit) **Factory setting** Even (1 Stopbit)	
Byte order	**Selection** ▪ 1-0-3-2 ▪ 0-1-2-3 ▪ 2-3-0-1 ▪ 3-2-1-0 **Factory setting** 1-0-3-2	
Watchdog	0 to 999 s **Factory setting** 5 s	If no data transmission takes place for longer than the time set, this is an indicator that communication has been interrupted. After this time, input values received via the Modbus are considered to be invalid.

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.

Current firmware version : **Menu/Diagnostics/System information**.

► Back up your current setup and your logbooks to an 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 asked the following:

   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 a setup offers the following advantages, among others :
- Copying settings for other devices
- Quick and easy switching between various setups, e. g. for different user groups or for recurring sensor type changes
- 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. **Name**: Assign a file name.
4. Then select **Save** .
   ↳ If you have already assigned the file name, you will be asked whether you want to overwrite the existing setup.
5. Use **OK** to confirm or cancel and assign a new file 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

When you load a setup, the current configuration is overwritten.

1. Insert the SD card into the controller card reader. A setup must have been saved to the SD card.
2. Go to **Menu/Setup/General settings/Extended setup/Data management/Load setup** .
   ↳ A list of all the setups on the SD card is displayed.
   An error message is displayed if there is no valid setup on the card.
3. Select the desired setup.
   ↳ A warning is displayed:

   The current parameters will be overwritten and the device will reboot.
   Warning: Please note that cleaning and controller programs can be active.
   Do you want to proceed?
4. Use **OK** to confirm or cancel.
   ↳ If you select **OK** to confirm, the device restarts with the desired setup.

Exporting the setup

Exporting a setup offers the following advantages, among others:
- Export in XML format with a stylesheet for formatted display in an XML-compatible application, such as . Microsoft Internet Explorer
- Importing the data (drag and drop the XML file into a browser 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. **Name**: Assign a file name.

4. Then select **Export** .
   ↳ If you have already assigned the file name, you will be asked whether you want to overwrite the existing setup.
5. Use **OK** to confirm or cancel and assign a new file name.
   ↳ Your setup is saved on the SD card in the "Device" folder.

You cannot upload the exported setup to the device again. You must use the **Save setup** . This is the only way you can save a setup to an SD card and reload it later on or upload it to other devices.

Activation code

You require activation codes for:
- Additional functions
- Firmware upgrades

If your original device has activation codes, these can be found on . The corresponding device functions are activated at the factory. You only require the codes if servicing the device or deactivating fieldbus protocols.

1. Enter the activation code: **Menu/Setup/General settings/Extended setup/Data management/Activation code**.
2. Confirm your entry.
   ↳ The new hardware or software function is activated and can be configured.

Functions that are enabled by an activation code:

Function	Activation code beginning with
Two current outputs (BASE2-E module only)	081...
Web server [1)]	351...
HART	0B1...
PROFIBUS DP	0B3...
Modbus TCP	0B8...
Modbus RS485	0B5...
EtherNet/IP	0B9...
PROFINET	0B7...
Feedforward control	220...
Chemoclean Plus	25...
Formula [2)]	321...

1) Via Ethernet socket of the Base2 module, for versions without an Ethernet fieldbus
2) Mathematical function

10.3 Programming

The following box provides an overview of the differences between the Basic, Standard and Advanced program types.

Basic (1 sampling program)

Start condition:
- Immediate
- Date/time

→

- Immediate activation
- Time-paced, volume-paced or flow-paced (CTCV, VTCV, CTVV), external signal,
- Bottle change after time or number of samples, external signal
- Bottle synchronization
- Multiple bottles

→

Stop condition:
- Program end
- Continuous operation

Standard (1 sampling program with 1-5 sub-programs)

Start condition:
- Immediate
- Date/time
- Volume

→

- Immediate activation, individual times, multiple times, interval, deactivation of sub-program 1
- Time-paced, volume-paced or flow-paced (CTCV, VTCV, CTVV), external signal
- Bottle change after time or number of samples, external signal
- Bottle synchronization
- Multiple bottles

→

Stop condition:
- Program end
- Continuous operation
- Date/time

Advanced (1 sampling program with 1-24 sub-programs)

Start condition:
- Immediate
- Date/time
- Volume
- External signal
- Fieldbus

→

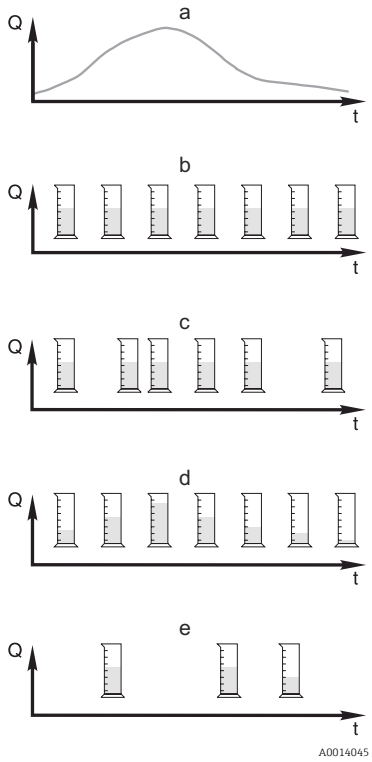
- Immediate activation, individual times, multiple times, interval, event, external start, deactivation of sub-program 1, fieldbus
- Time-paced, volume-paced or flow-paced (CTCV, VTCV, CTVV), single sample, sample table, external signal, fieldbus
- Bottle change after time or number of samples, external signal, fieldbus
- Sample synchronization
- Bottle synchronization
- Multiple bottles

→

Stop condition:
- Program end
- Continuous operation
- Date/time
- Fieldbus

10.3.1 Overview of the possible program types

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



32 Sampling control

Q Flow
t Time

a. Flow curve

b. **Time-proportional sampling (CTCV)**
A constant sample volume (e.g. 50 ml) is taken at regular intervals (e.g. every 5 min).

c. **Volume-proportional sampling (VTCV)**
A constant sample volume is taken at variable intervals (depending on the inflow volume).

d. **Flow-proportional sampling (CTVV)**
A variable sample volume (the sample volume depends on the flow rate) is taken at regular 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, volume-paced or 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 bottle 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 interval**: 5 min ▪ **Sampling volume**: 50 ml ▪ **Bottle change mode**: 2 h If 20 mA = 600 m3/h, a sample is taken every two minutes (smallest sampling interval with maximum flow rate). The total number of samples amounts to 60 samples per bottle. With a flow rate of 300 m3/h, a sample is taken every four minutes. **Controlled via binary input** ▪ Signal pulse: 5 m ▪ **Sampling interval**: 5 min ▪ **Sampling volume**: 50 ml ▪ **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: With a maximum flow rate 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, a sample is taken 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) Time/flow-paced	**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 x 20 = 100 ml, and a volume of 8 x 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.

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 sampling and bottle change times are not synchronized.
- **1. bottle change time**:
  Sampling starts with the first bottle. The change to the next bottle 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 for the first time to bottle 2 at midnight (00:00), to bottle 3 at 2 a.m. etc.
- **Time of change + bottle number**: A specific filling time is assigned to every bottle.
  E.g.: 00:00 to 02:00: bottle 1;
  02:00 to 04:00: bottle 2;
  04:00 to 06:00: bottle 3, etc.
  If the program is started at 10:00, for example, the device starts by filling bottle 6.
  It is also possible to start synchronization on a specific day of the week. For example, a time of 24 hours was set for bottle changeover, Monday 00:00 was the time set for synchronization, and Tuesday 8 a.m. was set for starting the program. The system fills bottle 2 until 00:00 on Wednesday and then switches to bottle 3.
- **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.

In the Standard and Advanced program, the bottle position is not currently restored following a power failure.

10.3.2 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 must be configured appropriately beforehand. If you want to create a program and use it immediately, you must check the configuration of the sampler before programming.

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.

Here you can adjust the bottle configuration, the bottle volume and, in the case of the device version with vacuum pump, the correct dosing volume:

▶ **Menu /Setup/General settings/Sampling**

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

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	User interface **Active**: The sampling program has been started and the device takes a sample as per the set parameters. User interface **Inactive**: No sampling program has been started, or a program that was running has been paused. User interface **Pause**: Sampling program paused.

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 a "B" for Basic in the program name.
Program1, 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. If you select an existing program, you can edit, delete, start or duplicate it. Furthermore, you can also see whether this program is a Basic, Standard or Advanced program. If you are creating a new program, select the Basic, Standard or Advanced program type.		
▶ Basic		
Program name	Free 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:** ▪ 1 x PE direct distribution ▪ 2 x PE direct distribution ▪ 4 x PE direct distribution ▪ 4 x glass, Schott GLS80 Direct distribution ▪ 12 x PE direct distribution ▪ 12 x PE/glass distributor plate ▪ 24 x PE direct distribution ▪ 24 x PE/glass distributor plate ▪ 6 x + 1 x PE/glass distributor plate ▪ 6 x + 2 x PE+PE distributor plate ▪ 6 x + 2 x PE+glass Distribution plate 12 x + 1 x PE/glass Distribution plate ▪ 12 x + 2 x PE+PE distributor plate ▪ 12 x + 2 x PE+glass Distribution plate ▪ 12 x + 6 x PE direct distribution ▪ 12 x + 6 x PE/glass	The ordered bottle configuration is preset or the configuration selected in the setup is displayed.

Menu/Setup/Sampling programs		
Function	**Options**	**Info**
Bottle volume	0 to 100000 ml **Factory setting** ▪ 30000 ml ▪ 20000 ml	Set the bottle volume. The preset value depends on the bottle configuration configured. The bottle volume is always 30 l for individual containers. The preset value depends on the bottle configuration. The bottle volume is always 20 l for individual containers. In the case of asymmetric distribution, e.g. 6 x 3 l + 2 x 13 l or 12 x 1 l + 6 x 2 l, you can set the bottle volume on the left and right in the menu items that follow.
Sampling mode	**Selection** ▪ Time paced CTCV ▪ Flow paced VTCV ▪ Time/flow paced CTVV ▪ External signal **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. In "Advanced" only: Time monitoring (min: 00:01:00; max: 99:59:00) **Flow paced VTCV** A constant sampling volume is taken at variable intervals. **Time/flow paced CTVV** A sampling volume adjusted to the flow rate is taken at steady intervals. The sampling volume is calculated based on the current flow rate or the average value between two samples. **External signal** Controlled via binary input.

Settings with a time-paced Basic program

Settings with the Basic program type with 1 bottle

Sampling mode = Time paced CTCV

Menu/Setup/Sampling programs/Setup program/New/Basic		
Function	**Options**	**Info**
Sampling interval (for version with vacuum pump or peristaltic pump)	00:01:00 ... 99:59:00 HH:MM:SS **Factory setting** 00:10:00 HH:MM:SS 00:10:00 HH:MM:SS HH:MM:SS **Factory setting** 00:10:00 HH:MM:SS	Set the sampling interval.
Dosing volume (for version with vacuum pump or sampling assembly) Sampling volume (for version with peristaltic pump) Sampling volume	**Factory setting** Vacuum pump: 200 ml Peristaltic pump: 100 ml Sampling assembly: 200 ml	Set the dosing volume or the sampling volume. Set the sampling volume. In the version with a vacuum pump or sampling assembly, the volume is taken from the setup and can only be modified there. The volume accuracy and the repeatability of a sampling volume < 20 ml may vary with the peristaltic pump depending on the specific application.
Multiplier (for version with vacuum pump or sampling assembly)	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	**Selection** ▪ Number of samples ▪ Time ▪ External signal **Factory setting** External signal	The bottle can be changed after a specific number of samples, after a time or by an external signal.
If is selected: **Bottle change mode Number of samples**:		
Samples per bottle	1 ... 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. At the same time, the diagnostics message "Overfill check" (F353) is also triggered. Set the number of samples.
Having selected **Bottle change mode Time**:		
Time interval	00-00:02 ... 31-00:00 DD-HH:MM **Factory setting** 00-01:00 DD-HH:MM	Set the time (days, hours and minutes) after which the system should change to the next bottle.

Menu/Setup/Sampling programs/Setup program/New/Basic		
Function	**Options**	**Info**
Bottle synchronization	**Selection** ▪ None ▪ 1. bottle change time ▪ 1. Time of change + bottle number **Factory setting** None	**None** The sampling and bottle change times are not synchronized. **1. bottle change time** Sampling starts with the first bottle. Set the synchronization time. **1. Time of change + bottle number** Each bottle is assigned to a specific fill time. Set the synchronization time and the weekday.
Having selected **Bottle change mode Bottle change external signal**:		
External event	**Selection** ▪ No bottle change input configured ▪ **Binary input** Sx **Factory setting** No bottle change input configured	A binary input must be configured for this function. The sampling input can be configured under "Inputs".
Multiple bottles	0 … 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	**Selection** ▪ Immediate ▪ Date/time **Factory setting** Immediate	The sampling program can be started either immediately or at a specific, configurable time.
Having selected **Start condition Immediate**:		
Sample at start	**Selection** ▪ Yes ▪ No **Factory setting** Yes	**Yes** The first sample is taken when the program is started. **No** The system waits for the interval to elapse before the first sample is taken.
Having selected **Start condition Date/time**:		
Start date	01.01.2000 … 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 … 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	**Selection** ▪ 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.

Menu/Setup/Sampling programs/Setup program/New/Basic		
Function	**Options**	**Info**
Assignment bin. output	**Selection** ▪ No binary output configured ▪ **Binary output** Sx **Factory setting** No binary output configured	Assignment of the binary output to the program cycle.
▶ Inputs		Settings for the inputs can be made as described in the "Inputs" section.

Settings with the Basic program type with multiple bottles

Sampling mode = Time paced CTCV

Menu/Setup/Sampling programs/Setup program/New/Basic		
Function	**Options**	**Info**
Sampling interval (for version with vacuum pump or peristaltic pump)	00:01:00 ... 99:59:00 HH:MM:SS **Factory setting** 00:10:00 HH:MM:SS 00:10:00 HH:MM:SS HH:MM:SS **Factory setting** 00:10:00 HH:MM:SS	Set the sampling interval.
Dosing volume (for version with vacuum pump or sampling assembly) **Sampling volume** (for version with peristaltic pump) Sampling volume	**Factory setting** Vacuum pump: 20 to 350 ml Peristaltic pump: 10 to 10000 ml Sampling assembly: 10 to 1000 ml **Factory setting** Vacuum pump: 200 ml Peristaltic pump: 100 ml Sampling assembly: 200 ml	Set the dosing volume or the sampling volume. Set the sampling volume. In the version with a vacuum pump or sampling assembly, the volume is taken from the setup and can only be modified there. The dosing accuracy and the repeatability of a sample volume < 20 ml can vary, depending on the specific application.
Multiplier (for version with vacuum pump or sampling assembly)	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	**Selection** ▪ Number of samples ▪ Time ▪ External signal **Factory setting** External signal	The bottle can be changed after a specific number of samples, after a time or by an external signal.
If is selected: **Bottle change mode Number of samples**		

Menu/Setup/Sampling programs/Setup program/New/Basic		
Function	**Options**	**Info**
Samples per bottle	1 … 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. At the same time, the diagnostics message "Overfill check" (F353) is also triggered. Set the number of samples.
Having selected **Bottle change mode Time**		
External event	**Selection** ▪ No bottle change input configured ▪ **Binary input** Sx **Factory setting** No bottle change input configured	A binary input must be configured for this function. The sampling input can be configured under "Inputs".
Time interval	00-00:02 … 31-00:00 DD-HH:MM **Factory setting** 00-01:00 DD-HH:MM	Set the time (days, hours and minutes) after which the system should change to the next bottle.
Multiple bottles	0 … 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	**Selection** ▪ None ▪ 1. bottle change time ▪ 1. Time of change + bottle number **Factory setting** None	**None** The sampling and bottle change times are not synchronized. **1. bottle change time** Sampling starts with the first bottle. Set the synchronization time. **1. Time of change + bottle number** Each bottle is assigned to a specific fill time. Set the synchronization time and the weekday.
Having selected **Bottle change mode External signal**		
Bottle chg. sig. input	**Selection** ▪ No bottle change input configured ▪ **Binary input** Sx **Factory setting** No bottle change input configured	A binary input must be configured for this function. The sampling input can be configured under "Inputs".
Multiple bottles	0 … 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	**Selection** ▪ Immediate ▪ Date/time **Factory setting** Immediate	The sampling program can be started either immediately or at a specific, configurable time.
Having selected **Start condition Immediate**		

Menu/Setup/Sampling programs/Setup program/New/Basic		
Function	**Options**	**Info**
Sample at start	**Selection** ▪ Yes ▪ No **Factory setting** Yes	**Yes** The first sample is taken when the program is started. **No** The system waits for the interval to elapse before the first sample is taken.
Start date	01.01.2000 ... 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 ... 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	**Selection** ▪ 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.
Assignment bin. output	**Selection** ▪ No binary output configured ▪ **Binary output** Sx **Factory setting** No binary output configured	Assignment of the binary output to the program cycle.
▶ Inputs		Settings for the inputs can be made as described in the "Inputs" section.

Settings with a flow-paced Basic program

Settings with the Basic program type with 1 bottle

Sampling mode = Flow paced VTCV

Menu/Setup/Sampling programs/Setup program/New/Basic		
Function	**Options**	**Info**
Flowmeter input	**Selection** ▪ 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 (for version with vacuum pump or peristaltic pump) Sampling interval	1000 to 9,999,000 m^{3}3 **Factory setting** 10,000 m^{3}3	Set the sampling interval. The unit and the number of decimal places are displayed as configured under **Setup**/ **Inputs**.

Menu/Setup/Sampling programs/Setup program/New/Basic		
Function	**Options**	**Info**
Dosing volume (for version with vacuum pump or sampling assembly) **Sampling volume** (for version with peristaltic pump)	**Factory setting** Vacuum pump: 20 to 350 ml Peristaltic pump: 10 to 10000 ml Sampling assembly: 10 to 1000 ml **Factory setting** ▪ Vacuum pump: 200 ml ▪ Peristaltic pump: 100 ml ▪ Sampling assembly: 200 ml	Set the dosing volume or the sampling volume. In the version with a vacuum pump or sampling assembly, the volume is taken from the setup and can only be modified there. The dosing accuracy and the repeatability of a sample volume < 20 ml can vary, depending on the specific application.
Multiplier (for version with vacuum pump or sampling assembly)	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	**Selection** ▪ Number of samples ▪ Time ▪ External signal **Factory setting** External signal	The bottle can be changed after a specific number of samples, after a time or by an external signal.
If is selected: **Bottle change mode Number of samples**		
Samples per bottle	1 ... 9999 **Factory setting** 1	Set the number of samples.
Having selected **Bottle change mode Time**		
Time interval	00-00:02 ... 31-00:00 DD-HH:MM **Factory setting** 00-01:00 DD-HH:MM	Set the time (days, hours and minutes) after which the system should change to the next bottle.
Bottle synchronization	**Selection** ▪ None ▪ 1. bottle change time ▪ 1. Time of change + bottle number **Factory setting** None	**None** The sampling and bottle change times are not synchronized. **1. bottle change time** Sampling starts with the first bottle. Set the synchronization time. **1. Time of change + bottle number** Each bottle is assigned to a specific fill time. Set the synchronization time and the weekday.
Start condition	**Selection** ▪ Immediate ▪ Date/time **Factory setting** Immediate	The sampling program can be started either immediately or at a specific, configurable time.
Having selected **Start condition Immediate**		
Sample at start	**Selection** ▪ Yes ▪ No **Factory setting** Yes	**Yes** The first sample is taken when the program is started. **No** The system waits for the interval to elapse before the first sample is taken.
Having selected **Start condition Date/time**		

Menu/Setup/Sampling programs/Setup program/New/Basic		
Function	**Options**	**Info**
Start date	01.01.2000 ... 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 ... 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	**Selection** ▪ 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.
Assignment bin. output	**Selection** ▪ No binary output configured ▪ **Binary output** Sx **Factory setting** No binary output configured	Assignment of the binary output to the program cycle.
▶ Inputs		Settings for the inputs can be made as described in the "Inputs" section.

Settings with the Basic program type with multiple bottles

Sampling mode = Flow paced VTCV

Menu/Setup/Sampling programs/Setup program/New/Basic		
Function	**Options**	**Info**
Flowmeter input	**Selection** ▪ 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 (for version with vacuum pump or peristaltic pump) Sampling interval	1000 to 9,999,000 m^33 **Factory setting** 10,000 m^33	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 or sampling assembly) **Sampling volume** (for version with peristaltic pump) Sampling volume	**Factory setting** Vacuum pump: 20 to 350 ml Peristaltic pump: 10 to 10000 ml Sampling assembly: 10 to 1000 ml **Factory setting** Vacuum pump: 200 ml Peristaltic pump: 100 ml Sampling assembly: 200 ml	Set the dosing volume or the sampling volume. Set the sampling volume. In the version with a vacuum pump or sampling assembly, the volume is taken from the setup and can only be modified there. The dosing accuracy and the repeatability of a sample volume < 20 ml can vary, depending on the specific application.

Menu/Setup/Sampling programs/Setup program/New/Basic		
Function	**Options**	**Info**
Multiplier (for version with vacuum pump or sampling assembly)	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	**Selection** ▪ Number of samples ▪ Time ▪ External signal **Factory setting** External signal	The bottle can be changed after a specific number of samples, after a time or by an external signal.
If is selected: **Bottle change mode Number of samples**		
Samples per bottle	1 ... 9999 **Factory setting** 1	Set the number of samples.
Having selected **Bottle change mode Time**		
Time interval	00-00:02 ... 31-00:00 DD-HH:MM **Factory setting** 00-01:00 DD-HH:MM	Set the time (days, hours and minutes) after which the system should change to the next bottle.
Multiple bottles	0 ... 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	**Selection** ▪ None ▪ 1. bottle change time ▪ 1. Time of change + bottle number **Factory setting** None	**None** The sampling and bottle change times are not synchronized. **1. bottle change time** Sampling starts with the first bottle. Set the synchronization time. **1. Time of change + bottle number** Each bottle is assigned to a specific fill time. Set the synchronization time and the weekday.
Having selected **Bottle change mode External signal**		
Bottle chg. sig. input	**Selection** ▪ No bottle change input configured ▪ **Binary input** Sx **Factory setting** No bottle change input configured	The bottle change input can be configured under▶ **Inputs** . A binary input must be configured for this function. The sampling input can be configured under "Inputs".
Multiple bottles	0 ... 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	**Selection** ▪ Immediate ▪ Date/time **Factory setting** Immediate	The sampling program can be started either immediately or at a specific, configurable time.

Menu/Setup/Sampling programs/Setup program/New/Basic		
Function	**Options**	**Info**
Having selected **Start condition Immediate**		
Sample at start	**Selection** ▪ Yes ▪ No **Factory setting** Yes	**Yes** The first sample is taken when the program is started. **No** The system waits for the interval to elapse before the first sample is taken.
Having selected **Start condition Date/time**		
Start date	01.01.2000 ... 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 ... 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	**Selection** ▪ 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.
Assignment bin. output	**Selection** ▪ No binary output configured ▪ **Binary output** Sx **Factory setting** No binary output configured	Assignment of the binary output to the program cycle.
▶ Inputs		Settings for the inputs can be made as described in the "Inputs" section.

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

Menu/Setup/Sampling programs/Setup program/New/Basic		
Function	**Options**	**Info**
Sampling volume input	**Selection** ▪ 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	00:01:00 ... 99:59:00 HH:MM:SS **Factory setting** 00:10:00 HH:MM:SS 00:10:00 HH:MM:SS HH:MM:SS **Factory setting** 00:10:00 HH:MM:SS	Set the sampling interval.

Menu/Setup/Sampling programs/Setup program/New/Basic		
Function	**Options**	**Info**
If is selected: **Sampling volume input Binary input**		
Sampling volume	10 to 10000 ml **Factory setting** 20 ml	Set the sampling volume. The dosing accuracy and the repeatability of a sample volume < 20 ml can vary, depending on the specific application.
If is selected: **Sampling volume input Current input**		
Sampling volume 20mA	10 to 10000 ml **Factory setting** 100 ml	Set what sampling volume should be grabbed at 20 mA. The dosing accuracy and the repeatability of a sample volume < 20 ml can vary, depending on the specific application.
Flow calculation	**Selection** ▪ 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	**Selection** ▪ Number of samples ▪ Time ▪ External signal **Factory setting** External signal	The bottle can be changed after a specific number of samples, after a time or by an external signal.
Having selected **Bottle change mode Number of samples**		
Samples per bottle	1 ... 9999 **Factory setting** 1	Set the number of samples.
Having selected **Bottle change mode Time**		
Time interval	00-00:02 ... 31-00:00 DD-HH:MM **Factory setting** 00-01:00 DD-HH:MM	Set the time (days, hours and minutes) after which the system should change to the next bottle.
Bottle synchronization	**Selection** ▪ None ▪ 1. bottle change time ▪ 1. Time of change + bottle number **Factory setting** None	**None** The sampling and bottle change times are not synchronized. **1. bottle change time** Sampling starts with the first bottle. Set the synchronization time. **1. Time of change + bottle number** Each bottle is assigned to a specific fill time. Set the synchronization time and the weekday.
Start condition	**Selection** ▪ Immediate ▪ Date/time **Factory setting** Immediate	The sampling program can be started either immediately or at a specific, configurable time.
Having selected **Start condition Date/time**		
Start date	01.01.2000 ... 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 ... 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.

Menu/Setup/Sampling programs/Setup program/New/Basic		
Function	**Options**	**Info**
Stop condition	**Selection** ▪ 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.
Assignment bin. output	**Selection** ▪ No binary output configured ▪ **Binary output** Sx **Factory setting** No binary output configured	Assignment of the binary output to the program cycle.
▶ Inputs		Settings for the inputs can be made as described in the "Inputs" section.

Settings with the Basic program type with multiple bottles

Sampling mode = Time/flow paced CTVV

Menu/Setup/Sampling programs/Setup program/New/Basic		
Function	**Options**	**Info**
Sampling volume input	**Selection** ▪ 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	00:01:00 ... 99:59:00 HH:MM:SS **Factory setting** 00:10:00 HH:MM:SS 00:10:00 HH:MM:SS HH:MM:SS **Factory setting** 00:10:00 HH:MM:SS	Set the sampling interval.
If is selected: **Sampling volume input Binary input**		
Sampling volume	10 to 10000 ml **Factory setting** 20 ml	Set the sampling volume. The dosing accuracy and the repeatability of a sample volume < 20 ml can vary, depending on the specific application.
If is selected: **Sampling volume input Current input**		
Sampling volume 20mA	10 to 10000 ml **Factory setting** 100 ml	Set what sampling volume should be grabbed at 20 mA. The dosing accuracy and the repeatability of a sample volume < 20 ml can vary, depending on the specific application.
Flow calculation	**Selection** ▪ 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.

Menu/Setup/Sampling programs/Setup program/New/Basic		
Function	**Options**	**Info**
Bottle change mode	**Selection** ▪ Number of samples ▪ Time ▪ External signal **Factory setting** External signal	The bottle can be changed after a specific number of samples, after a time or by an external signal.
Having selected **Bottle change mode Number of samples**		
Samples per bottle	1 ... 9999 **Factory setting** 1	Set the number of samples.
Having selected **Bottle change mode Time**		
Time interval	00-00:02 ... 31-00:00 DD-HH:MM **Factory setting** 00-01:00 DD-HH:MM	Set the time (days, hours and minutes) after which the system should change to the next bottle.
Multiple bottles	0 ... 23 The configuration options depend on the current number of bottles **Factory setting** 0	**Multiple bottles:** "Simultaneous" transfer of two samples to separate bottles.
Having selected **Bottle change mode External signal**		
Bottle chg. sig. input	**Selection** ▪ No bottle change input configured ▪ **Binary input** Sx **Factory setting** No bottle change input configured	The bottle change input can be configured under▶**Inputs** . A binary input must be configured for this function. The sampling input can be configured under "Inputs".
Multiple bottles	0 ... 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	**Selection** ▪ Immediate ▪ Date/time **Factory setting** Immediate	The sampling program can be started either immediately or at a specific, configurable time.
Having selected **Start condition Date/time**		
Start date	01.01.2000 ... 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 ... 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	**Selection** ▪ 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.

Menu/Setup/Sampling programs/Setup program/New/Basic		
Function	**Options**	**Info**
Assignment bin. output	**Selection** ▪ No binary output configured ▪ **Binary output** Sx **Factory setting** No binary output configured	Assignment of the binary output to the program cycle.
▶ Inputs		Settings for the inputs can be made as described in the "Inputs" section.

Settings with a Basic program and external signal

Settings with the Basic program type via an external signal with 1 bottle

Sampling mode = External signal

Menu/Setup/Sampling programs/Setup program/New/Basic		
Function	**Options**	**Info**
Sampling volume input	10 to 1000 ml **Factory setting** 100 ml	Enter the sample volume.
Sampling signal input	**Selection** No sampling input configured **Factory setting** No sampling input configured	Select the input for the sampling signal. The fieldbus must be configured for this function. The sampling input can be configured under ▶**Inputs** .
Bottle change mode	**Selection** ▪ Number of samples ▪ Time ▪ Number of samples **Factory setting** Number of samples	The bottle can be changed after a specific number of samples, after a time or by an external signal.
Having selected **Bottle change mode Number of samples**		
Samples per bottle	1 ... 9999 **Factory setting** 1	Set the number of samples.
Having selected **Bottle change mode Time**		
Time interval	00-00:02 ... 31-00:00 DD-HH:MM **Factory setting** 00-01:00 DD-HH:MM	Set the time (days, hours and minutes) after which the system should change to the next bottle.
Bottle synchronization	**Selection** ▪ None ▪ 1. bottle change time ▪ 1. Time of change + bottle number **Factory setting** None	**None** The sampling and bottle change times are not synchronized. **1. bottle change time** Sampling starts with the first bottle. Set the synchronization time. **1. Time of change + bottle number** Each bottle is assigned to a specific fill time. Set the synchronization time and the weekday.

Menu/Setup/Sampling programs/Setup program/New/Basic		
Function	**Options**	**Info**
Start condition	**Selection** ▪ Immediate ▪ Date/time **Factory setting** Immediate	The sampling program can be started either immediately or at a specific, configurable time.
Having selected **Start condition Immediate**		
Sample at start	**Selection** ▪ Yes ▪ No **Factory setting** Yes	**Yes** The first sample is taken when the program is started. **No** The system waits for the interval to elapse before the first sample is taken.
Having selected **Start condition Date/time**		
Start date	01.01.2000 ... 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 ... 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	**Selection** ▪ 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.
Assignment bin. output	**Selection** ▪ No binary output configured ▪ **Binary output** Sx **Factory setting** No binary output configured	Assignment of the binary output to the program cycle.
▶ Inputs		Settings for the inputs can be made as described in the "Inputs" section.

Settings with the Basic program type via an external signal with multiple bottles

Sampling mode = **External signal**

Menu/Setup/Sampling programs/Setup program/New/Basic		
Function	**Options**	**Info**
Sampling volume input	10 to 1000 ml **Factory setting** 100 ml	Enter the sample volume.
Sampling signal input	**Selection** No sampling input configured **Factory setting** No sampling input configured	Select the input for the sampling signal. The fieldbus must be configured for this function. The sampling input can be configured under ▶**Inputs** .

Menu/Setup/Sampling programs/Setup program/New/Basic		
Function	**Options**	**Info**
Bottle change mode	**Selection** ▪ Number of samples ▪ Time ▪ Number of samples **Factory setting** Number of samples	The bottle can be changed after a specific number of samples, after a time or by an external signal.
Having selected **Bottle change mode Number of samples**		
Samples per bottle	1 ... 9999 **Factory setting** 1	Set the number of samples.
Having selected **Bottle change mode Time**		
Time interval	00-00:02 ... 31-00:00 DD-HH:MM **Factory setting** 00-01:00 DD-HH:MM	Set the time (days, hours and minutes) after which the system should change to the next bottle.
Having selected **Bottle change mode External signal**		
Bottle chg. sig. input	**Selection** ▪ No bottle change input configured ▪ **Binary input** Sx **Factory setting** No bottle change input configured	The bottle change input can be configured under▶**Inputs** . A binary input must be configured for this function. The sampling input can be configured under "Inputs".
Multiple bottles	0 ... 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	**Selection** ▪ Immediate ▪ Date/time **Factory setting** Immediate	The sampling program can be started either immediately or at a specific, configurable time.
Having selected **Start condition Immediate**		
Sample at start	**Selection** ▪ Yes ▪ No **Factory setting** Yes	**Yes** The first sample is taken when the program is started. **No** The system waits for the interval to elapse before the first sample is taken.
Having selected **Start condition Date/time**		
Start date	01.01.2000 ... 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 ... 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.

Menu/Setup/Sampling programs/Setup program/New/Basic		
Function	**Options**	**Info**
Stop condition	**Selection** ▪ 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.
Assignment bin. output	**Selection** ▪ No binary output configured ▪ **Binary output** Sx **Factory setting** No binary output configured	Assignment of the binary output to the program cycle.
▶ Inputs		Settings for the inputs can be made as described in the "Inputs" section.

10.3.3 Program types: Standard and Advanced

Standard program:
Comprises a maximum of five subprograms

Advanced program:
- Comprises 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.

Settings for the Standard program

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	Free text	Use a distinct name for your sampling program. The program name can be up to 16 characters long.
Bottle volume	0 to 100000 ml 0 to 20000 ml **Factory setting** ▪ 30000 ml ▪ 20000 ml	Set the bottle volume. The preset value depends on the bottle configuration configured. The bottle volume is always 30 l for individual containers. The preset value depends on the bottle configuration. The bottle volume is always 20 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.
Bottle configuration	Choice of all possible bottle combinations	The ordered bottle configuration is preset or the configuration selected in the setup is displayed.

Menu/Setup/Sampling programs		
Function	**Options**	**Info**
Start condition	**Selection** ▪ 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.
Having selected **Start condition Date/time**		
Start time	00:00:00 ... 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.
Start date	01.01.2000 ... 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.
Having selected **Start condition Volume**		
Start volume input	**Selection** ▪ 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 for flow measurement are displayed.
Start flow sum	1000 to 9,999,000 m^3 **Factory setting** 10,000 m^3	Set the start volume.
Stop condition	**Selection** ▪ 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.
Having selected **Start condition Date/time**		
Stop date	01.01.2000 ... 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 ... 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.

Menu/Setup/Sampling programs		
Function	**Options**	**Info**
Sampling mode	**Selection** ▪ Time paced CTCV ▪ Flow paced VTCV ▪ Time/flow paced CTVV ▪ External signal **Factory setting**	**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 override can be enabled in an advanced program. With time monitoring, it is possible to interrupt long, flow-controlled sampling intervals caused by a low flow rate. A sample which is also time-controlled is taken. **Time/flow paced CTVV** ▪ (only for version with peristaltic pump) ▪ A variable sampling volume is taken at steady intervals. **External signal** A pulse at the binary input starts a sampling cycle.
The settings that depend on the sampling mode are listed in the "Program type: Basic" section.		
Enable subprogram	**Selection** ▪ Immediate ▪ Individual dates ▪ Repeating date ▪ Interval ▪ Deactivation **Factory setting** Immediate	**Immediate** The subprogram is enabled immediately. **Individual dates** Set the start and stop dates for enabling the subprogram. **Repeating date** Set the start condition, activity time and repetition interval for the subprogram. **Interval** Set the start condition, activity time and inactivity time for the subprogram. **Deactivation** Subprogram 2 or 2+n is started as soon as subprogram 1 is disabled. Only possible with multiple subprograms.
Having selected **Enable subprogram Individual dates**		
▶ 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.		
Having selected **Enable subprogram Repeating date**		
Start condition	**Selection** ▪ No delay ▪ Date/Time ▪ Time ▪ No delay (sync) **Factory setting** No delay (sync)	**No delay** The subprogram is started when the program is enabled. **Date/Time** Set the start date and start time for enabling the subprogram. **Time** Set the start time for enabling the subprogram. **No delay (sync)** Only possible on program start **Immediate** and with bottle assignment "Dynamic or Static".
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 time to be selected depends on the setting for the repetition mode.
▶ Multiple date		

Menu/Setup/Sampling programs		
Function	**Options**	**Info**
Repetition mode	**Selection** ▪ 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 with **Daily interval** and **Weekly interval**)	1 … 999 **Factory setting** 1	Specify for how many days or weeks the subprogram should be active. Example: Repetition mode = daily interval Repetition interval = 2 The subprogram is enabled every second day from the start condition.
Having selected **Enable subprogram Interval**		
Ensure activation	**Selection** ▪ No ▪ Daily ▪ Weekly **Factory setting** No	Ensures that the subprogram is activated at the specified intervals. If necessary, the inactivity time is shortened by one day or one week.
Start condition	**Selection** ▪ No delay ▪ Date/Time ▪ Time ▪ No delay (sync) **Factory setting** No delay (sync)	The subprogram is started when the program is enabled. **Date/Time** Set the start date and start time for enabling the subprogram. **Time** Set the start time for enabling the subprogram. **No delay (sync)** Only possible on program start **Immediate** and with bottle assignment "Dynamic or Static".
Start date	01.01.2000 … 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 … 23:59:59 **Factory setting** 00-00:01 DD-HH:MM	Set the time for the 1st interval. The format depends on the option configured under general settings.
Activity time	00-00:01 … 31-00:00 DD-HH:MM **Factory setting** 00-00:01 DD-HH:MM	Specify how long the subprogram should be active in days, hours and minutes. The subprogram always begins with an activation.
Inactivity time	00-00:01 … 31-00:00 DD-HH:MM **Factory setting** 00-00:01 DD-HH:MM	Specify how long the subprogram should be inactive in days, hours and minutes.
Sample at enable	**Selection** ▪ Yes ▪ No **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.

Menu/Setup/Sampling programs		
Function	**Options**	**Info**
Sample at disable	**Selection** ▪ Yes ▪ No **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.
New bottle at disable	**Selection** ▪ Yes ▪ No **Factory setting** Yes	
Bottle synchronization	**Selection** ▪ None ▪ 1. bottle change time ▪ 1. Time of change + bottle number ▪ External BC sync input **Factory setting** None	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.. **None** The sampling and bottle change times are not synchronized. **1. bottle change time** Sampling starts with the first bottle. The change to the next bottle is synchronized. **1. Time of change + bottle number** Each bottle is allocated a specific filling time. **External BC sync input** 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.
Assignment bin. output	**Selection** ▪ No binary output configured ▪ **Binary output** S:x **Factory setting** No binary output configured	Assignment of the binary output to the program cycle.
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".		
▶Inputs		Settings for the inputs can be made as described in the "Inputs" section.
Bottle assignment(only possible with multiple bottles) This menu item appears when more than one bottle is available, regardless of the number of subprograms.	**Selection** ▪ 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. Only visible if there is more than one subprogram. **Dynamical bottle assignment:** When the subprogram changes, the system switches to the next empty 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 bottle distribution with more than one bottle has been selected and either dynamic or static bottle assignment has been selected.		
Having selected **Bottle assignmentStatical bottle assignment**:		
▶Bottle assignment table Select a bottle and assign it a subprogram.		

Programming example: Program switchover

The following example explains how to program a program change in the Standard program.

Flow-paced sampling
- Daily average sample
- From Monday to Friday

Time-paced sampling
- In a composite container
- On Saturday and Sunday

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 date	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
▶ **Programpart**: MO - FR	
▶ Edit	
Sampling mode	Flow paced VTCV
Flow measurement	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 condition	No delay
Activity time	24:00
▶ Repeating date	
Repetition mode	Days of week
Monday	Yes
Tuesday	Yes

Menu/Setup/Sampling programs/Setup program/New	
Function	**Entry for sample program**
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
Start condition	No delay
Activity time	24:00
▶ Repeating 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	MO - FR
Bottle 6	
Bottle 7	SAT - SUN
▶ Inputs	
Press the "SAVE" soft key to save the program. In the overview, you can start the program created under "Select sampling program".	

Settings for the Advanced program

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.
▶ Advanced		
Program name	Free 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 ▪ 20000 ml	Set the bottle volume. The preset value depends on the bottle configuration configured. The bottle volume is always 30 l for individual containers. The preset value depends on the bottle configuration. The bottle volume is always 20 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	**Selection** ▪ 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 started by a pulse at the configured binary input. **External duration** The sampling program is active as long as the configured input has the corresponding level
Having selected **Start condition Date/time**		
Start date	01.01.2000 ... 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 ... 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.
Having selected **Start condition Volume**		
Start volume input	**Selection** ▪ 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 for flow measurement are displayed.

Menu/Setup/Sampling programs		
Function	**Options**	**Info**
Start flow sum	1000 to 9,999,000 m^3 **Factory setting** 10,000 m^3	Set the start volume.
Having selected **Start condition External start**		
Start signal input	**Selection** ▪ 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.
Having selected **Start condition External duration**		
Start signal input	**Selection** ▪ No program start input configured ▪ **Binary input** S:x ▪ **Factory setting** No program start input configured	Select the program duration input. The binary input must be configured for this function. Only the inputs configured as a program start input are displayed.
Having selected **Start condition PROFIBUS DP**or **Modbus**		
Start signal input	**Selection** ▪ None ▪ %0V DO 01 ▪ %0V DO 02 ▪ %0V DO 03 ▪ %0V DO 04 ▪ %0V DO 05 ▪ %0V DO 06 ▪ %0V DO 07 ▪ %0V DO 08 **Factory setting** None	Select the program start input.
Stop condition (not for external start)	**Selection** ▪ Program end ▪ Continuous ▪ Date/time ▪ External duration **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. **External duration** The device stops the set program if a pulse is sent to a binary input configured accordingly.
Having selected **Stop condition Date/time**		
Stop date	01.01.2000 ... 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 ... 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.
Having selected **Stop condition External signal**		

Menu/Setup/Sampling programs		
Function	**Options**	**Info**
Stop signal input	**Selection** ▪ No program start input configured ▪ **Binary input** S:x ▪ **Factory setting** No program start 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.
Having selected **Stop conditionPROFIBUS DP**or **Modbus**		
Stop signal input	**Selection** ▪ None ▪ %0V DO 01 ▪ %0V DO 02 ▪ %0V DO 03 ▪ %0V DO 04 ▪ %0V DO 05 ▪ %0V DO 06 ▪ %0V DO 07 ▪ %0V DO 08 **Factory setting** None	Select the program stop input.
▶ Setup subprogram		
New		
Programpart		Use a distinct name for your subprogram. The program name can be up to 16 characters long.
Sampling mode	**Selection** ▪ Time paced CTCV ▪ Flow paced VTCV ▪ Time/flow paced CTVV ▪ Single sample ▪ Sampling table ▪ External signal ▪ **Factory setting** Flow paced VTCV	**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.		
Having selected **Sampling modeSingle sample**		
Dosing volume (for version with vacuum pump or sampling assembly) Sampling volume (for version with peristaltic pump)	Vacuum pump: 20 to 350 ml Peristaltic pump: 10 to 10000 ml Sampling assembly: 10 to 1000 ml **Factory setting** Vacuum pump: 200 ml Peristaltic pump: 100 ml Sampling assembly: 200 ml	Depending on the version, set the dosing volume or the sampling volume The volume is taken from the setup in the version with a vacuum pump or sampling assembly. The dosing accuracy and the repeatability of a sample volume < 20 ml may vary depending on the specific application

Menu/Setup/Sampling programs		
Function	**Options**	**Info**
Sampling volume	10 to 10000 ml **Factory setting** 100 ml	Set the sampling volume. The dosing accuracy and the repeatability of a sample volume < 20 ml may vary depending on the specific application
Having selected **Sampling mode Sampling table**		
▶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	**Example:** ▪ Delta (=waiting time): 01:00:00 ▪ Delta (=waiting time): 00:10:00	▪ Volume: 100 ml ▪ Volume: 100 ml
1st sampling one hour after program start: 100 ml in bottle 1 2nd 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.		
Enable subprogram	**Selection** ▪ Immediate ▪ Individual dates ▪ Repeating date ▪ Interval ▪ Event ▪ External start ▪ Deactivation **Factory setting** Immediate	**Immediate** The subprogram is enabled immediately. **Individual dates** Set the start and stop dates for enabling the subprogram. **Repeating date** Set the start condition, activity time and repetition interval for the subprogram. **Interval** Set the start condition, activity time and inactivity time for the subprogram. **Event** The subprogram is enabled by an event. Up to three measuring signals are linked to form a start signal using "and"/"or" links. **External start** The subprogram is enabled by a pulse at a binary input configured accordingly. **Deactivation** Subprogram 2 or 2+n is started as soon as subprogram 1 is disabled. Only possible with multiple subprograms.
Having selected **Enable subprogram Event**		
Start condition	**Selection** ▪ No delay ▪ Date/Time ▪ 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. **Time** Set the start time for enabling the subprogram.
▶ Activation event		
Number of events	**Selection** ▪ 1 ▪ 2 ▪ 3 **Factory setting** 1	Specify how many measuring inputs (1-3) you want to link to generate an activation signal.

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	**Selection** ▪ None ▪ **Binary input** S:x ▪ **Current input** S:x ▪ Temperature Input **Factory setting** None	Select the input via which the activation event is to be output. The inputs are configured in the menu **Setup Inputs**. 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 ▪ Current ▪ Temperature ▪ **PROFIBUS** AO 0x **Factory setting** None	
Operating mode	**Selection** ▪ 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	**Operating mode = Above limit check or Below limit check** ▪ 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 upper value	**Range of adjustment and factory setting** Depends on the measured value	**Operating mode = In range check or Out of range check** ▪ 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 Switch off delay	0 to 9999 s **Factory setting** 0 s	Synonyms: pick-up and drop-out delay
Delta value	**Range of adjustment and factory setting** Depends on the measured value	**Operating mode = Change rate** 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 ... 23:59 **Factory setting** 01:00	

Menu/Setup/Sampling programs		
Function	**Options**	**Info**
Auto Confirm	00:01 ... 23:59 **Factory setting** 01:00	
Having selected **Activation input External start**		
Activation input	**Selection** ▪ No program part start input configured ▪ **Binary input** S:x **Factory setting** No program part 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 and also not for "Immediate" and event)	**Selection** ▪ Yes ▪ No **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	**Selection** ▪ Yes ▪ No **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.
Deactivation	**Selection** ▪ Bottles full ▪ Enable invalid ▪ Deactivation with event **Factory setting** Enable invalid	Select the disable function of the subprogram: **Bottles full** The subprogram is disabled once all the assigned bottles have been filled. **Enable invalid** Disable via limit value **Deactivation with event** New parameter can be defined
Bottle change mode	**Selection** ▪ No ▪ Yes **Factory setting** Yes	**No** The bottle is changed following a disable/ enable **Yes** When the cycle is finished, the system continues filling the last bottle.
Synchronize samplings	**Selection** ▪ To subprogram start ▪ To clock **Factory setting**	**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 synchronization** menu item.

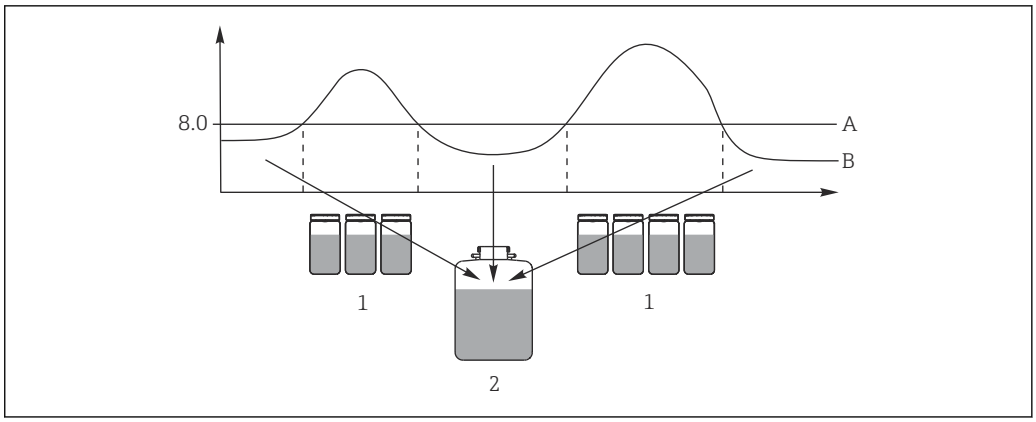
Menu/Setup/Sampling programs		
Function	**Options**	**Info**
Bottle synchronization	**Selection** ▪ None ▪ 1. bottle change time ▪ 1. Time of change + bottle number ▪ External BC sync input **Factory setting** None	Specific bottles can be assigned specific filling times with the bottle synchronization 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.. **None** The sampling and bottle change times are not synchronized. **1. bottle change time** Sampling starts with the first bottle. The change to the next bottle is synchronized. **1. Time of change + bottle number** Each bottle is allocated a specific filling time. **External BC sync input** 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.
Assignment bin. output	**Selection** ▪ No binary output configured ▪ **Binary output** S:x **Factory setting** No binary output configured	Assignment of the binary output to the program cycle.
Use "SAVE" to save the subprogram setup. Then press "ESC" to return to the main program.		
▶ Inputs		Settings for the inputs can be made as described in the "Inputs" section.
Bottle assignment (only possible with multiple bottles) This menu item appears when more than one bottle is available, regardless of the number of subprograms.	**Selection** ▪ No bottle assignment ▪ Dynamical bottle assignment ▪ Statical 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. Only visible if there is more than one subprogram. **Dynamical bottle assignment:** When the subprogram changes, the system switches to the next empty 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 bottle distribution with more than one bottle has been selected and either dynamic or static bottle assignment has been selected.		
Having selected **Bottle assignmentStatical bottle assignment**:		
▶ Bottle assignment table Select a bottle and assign it a subprogram.		

Programming example: Event program

The following example explains how to program a program change in the Event program.

Time-paced sampling
- In a composite container
- Daily emptying

Time-paced sampling
- In a composite container
- In individual bottles



33 *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

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
Multiple bottles Only if **Bottle assignment** = **Statical bottle assignment** is selected in the main program	Number of samples
Samples per bottle	10

Menu/Setup/Sampling programs/Setup program/New	
Function	**Entry for sample program**
Multiple bottles	0
Enable subprogram	Event
Start condition	No delay
▶ Activation event	
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
Switch off delay	0 s
Sample at enable	Yes
Sample at disable	No
Deactivation	Enable invalid
Synchronize samplings	To subprogram start
-> "SAVE" -> "ESC" -> "ESC"	
Bottle assignment	
▶ Bottle assignment table	
Bottle 1 ... Bottle 12 Bottle 13	EE1 EE1 TD1
-> "ESC"	
Press the "SAVE" soft key to save the program. In the overview, you can start the program created under "Select sampling program".	

10.3.4 Selecting and executing the program

In the overview, under **Select sampling program** you can see all the programs created. Here you can also use **New** to create a new program.

Using the navigator, you can select the program you want to execute here and then choose from the following menu items:

- Edit
- Start
- Duplicate
- Cancel

Setup program	
Function	**Info**
▶ Edit	The selected program is displayed and can be edited. Press the "**SAVE**" button to save the changes.
▶ Delete	The selected program is deleted following a confirmation prompt.

Setup program	
Function	**Info**
▶ Start	The selected program is started immediately. The program can be canceled or paused by pressing the **OFF**button. If there are differences between the setup and the selected program, the **Program configuration contains errors**message appears, e.g. the bottle configuration in the program does not match the configuration in the setup. The program is not started. In this example, the actual bottle configuration must be checked against the configuration in the setup and the program and changed accordingly. Only the bottle configuration entered in the setup is valid for the program to be executed.
▶ Duplicate	The selected program is duplicated and saved with an ID.
▶ Cancel	Back to the overview.

The **Setup program**display features the **ESC**, **MAN**, **?** and **MODE** softkeys.

The **Program enabled**display features the **ESC**, **STAT** and **MODE** softkeys.

Setup program	
Function	**Info**
▶ ESC	Back to the overview. Any program currently running is canceled.
▶ MAN	Manual sampling can be configured and started here. Any program currently running is paused. -> See "Sampling program/Manual sampling" section
▶ ?	A help text is displayed for the item.
▶ STAT	For selecting statistics about measured values, sampling and inputs, see the "Display behavior" section.
▶ MODE	If no program is enabled, the device can be switched off here. If a program is enabled, the following options appear: **Power down sampler:** Following a confirmation prompt, the device is set to the standby mode. Power continues to be supplied to the device and the LED flashes green. The display goes dark. **Stop program %0V:** [1)] Stops a program currently running following a confirmation prompt. The overview display appears. **Pause program %0V:** Is selected if maintenance work is pending. The program is paused and the pause time is entered in the logbook. After pressing the **Resume program** button, the current program is continued.

1) "%0V" here stands for text that depends on the context. This text is generated automatically by the software and inserted in place of %0V. In the simplest scenario, this could be the name of the measuring channel, for example.

10.4 Inputs

As standard, Liquistation CSF33 has:
- Two binary inputs
- Two current inputs
- Galvanically isolated from one another

10.4.1 Binary inputs

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

With the CSF33, the power supply of 24 V DC from the terminal block in the connection compartment of the sampler can be used for floating contacts (see the "Electrical connection" section).

Menu/Setup/Inputs		
Function	**Options**	**Info**
▶ **Binary input** S:x		
Mode	**Selection** ▪ Off ▪ On **Factory setting** Off	Switches the function on or off
Input variable	**Selection** ▪ Flow rate ▪ Rainfall ▪ External event ▪ Armature end position detection (only for version with sampling assembly) **Factory setting** Flow rate	▪ Pulse input for connected flowmeters or rain gages ▪ Control of sampling functions via external signals
Having selected **Input variable Flow rate**		
Signal slope	**Selection** ▪ Low-High ▪ High-Low **Factory setting** Low-High	Preselect the level change of the signal.
Unit	**Selection** ▪ m^3 ▪ 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
▶ Unit of totalized flow		
Current totalized flow	- - -	The totalized flow values are displayed.
Reset totalizer	**Selection** ▪ 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.
Having selected **Reset totalizer Manual**		
▷ Reset totalized flow	Action	The totalized flow currently calculated is set to zero when the counter is reset.
Having selected **Reset totalizer Automatic**		

Menu/Setup/Inputs		
Function	**Options**	**Info**
Interval	**Selection** ▪ Daily ▪ Weekly ▪ Monthly **Factory setting** Daily	**Daily** If a daily interval is selected, set the **Time** in the following menu item. **Weekly** If a weekly interval is selected, set the **Day of week** and the **Time** in the following menu items. **Monthly** If a monthly interval is selected, set the **Day of month** and the **Time** in the following menu items.
Time	00:00:00 ... 23:59:59 HH:MM:SS **Factory setting** 12:00:00 HH:MM:SS	
Having selected **Input variable Rainfall**		
Signal slope	**Selection** ▪ Low-High ▪ High-Low **Factory setting** Low-High	Preselect the level change of the signal.
Unit	**Selection** ▪ 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.
Intensity	**Selection** ▪ 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	**Selection** ▪ 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.
Having selected **Reset totalizer Manual**		
▷ Reset totalized rainfall	Action	The totalized rainfall currently calculated is set to zero when the meter is reset manually.
Having selected **Reset totalizer Automatic**		

Menu/Setup/Inputs		
Function	**Options**	**Info**
Interval	**Selection** ▪ Daily ▪ Weekly ▪ Monthly **Factory setting** Daily	**Daily** If a daily interval is selected, set the **Time** in the following menu item. **Weekly** If a weekly interval is selected, set the **Day of week** and the **Time** in the following menu items. **Monthly** If a monthly interval is selected, set the **Day of month** and the **Time** in the following menu items.
Time	00:00:00 ... 23:59:59 HH:MM:SS **Factory setting** 12:00:00 HH:MM:SS	
Input variable External event		
Signal slope	**Selection** ▪ Low-High; High ▪ High-Low; Low **Factory setting** Low-High; High	A signal slope or a signal state triggers the function assigned to the binary input. The choice between signal slope and signal state is performed automatically by the function assigned to the binary input.
If **Input variable Armature end position detection** is selected (only for version with sampling assembly)		
Position	**Selection** ▪ Off ▪ Front (sampling) ▪ Back (dosing) **Factory setting** Off	Setting specifying the assembly position (front or back) to which the end position sensor is connected.
▷ Binary input assignment view		Overview of the outputs to which this binary input is linked.

10.4.2 Current inputs

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

For the correct wiring of the current inputs see the "Electrical connection" section → 📄 21

Menu/Setup/Inputs		
Function	**Options**	**Info**
▶**Current input** S:x		
Mode	**Selection** ▪ 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.

Menu/Setup/Inputs		
Function	**Options**	**Info**
Input variable	**Selection** ▪ 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.
Having selected **Input variable Flow rate**		
Unit of flow	**Selection** ▪ l/s ▪ m^3/s ▪ m^3/h ▪ m^3/d ▪ cfs ▪ gpm ▪ gph ▪ mgd **Factory setting** l/s	Select the unit.
Unit of totalized flow	**Selection** ▪ l ▪ m^3 ▪ cf ▪ gal **Factory setting** m^3	Select the unit for the totalized flow.
Meas. value format	**Factory setting** #.#	Specify the number of decimal places for the flow.
Minimum flow	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 ... 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.

Menu/Setup/Inputs		
Function	**Options**	**Info**
Reset totalizer	**Selection** ▪ 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.
Flow rate	- - -	The current flow rate is displayed.
Having selected **Reset totalizer Manual**		
▷ Reset totalized flow	Action	The totalized flow currently calculated is set to zero when the counter is reset.
Having selected **Reset totalizer Automatic**		
Interval	**Selection** ▪ Daily ▪ Weekly ▪ Monthly **Factory setting** Daily	**Daily** If a daily interval is selected, set the **Time** menu item. **Weekly** If a weekly interval is selected, set the **Day of week** and the **Time** menu item. **Monthly** If a monthly interval is selected, set the **Day of month** and the**Time** menu item.
Having selected **Input variable Parameter**		
Meas. value format	**Factory setting** #.#	Specify the number of decimal places.
Parameter name	Free text	Assign a name.
Unit of measure	Free text	Enter the engineering unit.
Lower range value	-20 ... 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.
	-20 ... 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.
Upper range value	0 ... 60 s **Factory setting** 0 s	The damping causes a floating average curve of the measured values over the time specified.
Having selected **Input variable Current**		
Meas. value format	**Factory setting** #.#	Specify the number of decimal places.
Damping	0 ... 60 s **Factory setting** 0 s	The damping causes a floating average curve of the measured values over the time specified.

10.5 Outputs

10.5.1 Binary outputs

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

Possible application --> For outputting a manipulated variable to connected actuators

The binary output must be assigned in the program or subprogram before it can be activated.

Menu/Setup/Outputs		
Function	**Options**	**Info**
▶ OutputBinary		
Function	**Selection** ▪ 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. In **Cleaning**: The outputs can only switch 100mA. A relay must be added to control valves or motors.
Having selected **Function Event**		
Signal slope	**Selection** ▪ Low-High ▪ High-Low **Factory setting** Low-High	Select the level change of the signal
Event	**Selection** ▪ Program enabled ▪ End of program ▪ Sampling start ▪ End of sampling ▪ End of mult. samp. ▪ Dosing ▪ Sampling cycle ▪ Bottle change ▪ External stop ▪ No sample ▪ Sub program enabled ▪ Sub prog. activ. ▪ Sub prog. deactiv. **Factory setting** Sampling cycle	**Program enabled** A permanent signal is switched when the sampling program starts. **End of program** A pulse or permanent signal 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. **End of mult. samp.** A pulse is switched when sampling of the last multiple bottle has ended. **Dosing** A pulse is switched at the start of dosing. **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** A pulse is switched when an external stop is performed. **No sample** The output signal is switched if no sample was taken. **Sub program enabled** The output signal is switched if this subprogram is active. **Sub prog. activ.** The output signal is switched when the subprogram starts. **Sub prog. deactiv.** The output signal is switched when the subprogram ends.
Having selected **Function Limit value**		

Menu/Setup/Outputs		
Function	**Options**	**Info**
Signal slope	**Selection** ▪ Low-High ▪ High-Low **Factory setting** Low-High	Preselect the level change of the signal.
Source of data	**Selection** ▪ 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 menu "**Setup/Additional functions/Limit switch**".
Having selected **Function Diagnostics message**		
Signal slope	**Selection** ▪ Low-High ▪ High-Low **Factory setting** Low-High	Preselect the level change of the signal.
Operating mode	**Selection** ▪ 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 to 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/../Diagnostics 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.
Having selected **Function Cleaning**(only for version with sensors with the Memosens protocol)		
Signal slope	**Selection** ▪ Low-High ▪ High-Low **Factory setting** Low-High	Preselect the level change of the signal.
Assignment	**Selection** ▪ 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.

10.5.2 Current outputs

Setting the current output range

► **Menu/Setup/General settings**: **0..20 mA** or **4..20 mA**.

Menu/Setup/Outputs/Current output x:y [1]		
Function	**Options**	**Info**
Current output	**Selection** ▪ Off ▪ On **Factory setting** Off	Use this function to activate or deactivate a variable being output at the current output
Source of data	**Selection** ▪ None ▪ Connected inputs **Factory setting** None	The sources of data on offer depend on your device version.
Measured value	**Selection** ▪ 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 list of dependent measured values is provided in the **Measured value** *table, subject to the* **Source of data**→ 105.		
Range lower value Range upper value	Range of adjustment and factory settings depend on the **Measured value**	You can output the entire measuring range or just some of it at the current output. To do so, specify the upper and lower range values in accordance with your requirements.
Hold behavior	**Selection** ▪ Freeze last value ▪ Fixed value ▪ Ignore **Factory setting** Depends on the channel:output	**Freeze last value** The device freezes the last current value. **Fixed value** You define a fixed current value that is output at the output. **Ignore** A hold does not affect this current output.
Hold current **Hold behavior** = **Fixed value**	0.0 to 23.0 mA **Factory setting** 22.0 mA	▶ Specify which current should be output at this current output in the hold state.

1) x:y = slot:output number

Measured value *depending on the* Source of data

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

Source of data	Measured value
Cond i	**Selection** ▪ Temperature ▪ Conductivity ▪ Resistance *(only* **Cond c***)* ▪ Concentration *(only* **Cond i** *and* **Cond c 4-pol***)*
Cond c	
Cond c 4-pol	
Disinfection	**Selection** ▪ Temperature ▪ Sensor current ▪ Concentration
ISE	**Selection** ▪ Temperature ▪ pH ▪ Ammonium ▪ Nitrate ▪ Potassium ▪ Chloride
TU/TS	**Selection** ▪ Temperature ▪ Turbidity g/l *(only* **TU/TS***)* ▪ Turbidity FNU *(only* **TU/TS***)* ▪ Turbidity Formazine *(only* **TU***)* ▪ Turbidity solid *(only* **TU***)*
TU	
Nitrate	**Selection** ▪ Temperature ▪ NO3 ▪ NO3-N
Ultrasonic interface	**Selection** Interface
SAC	**Selection** ▪ Temperature ▪ SAC ▪ Transm. ▪ Absorption ▪ COD ▪ BOD
	Selection ▪ Bipolar *(only for current outputs)* ▪ Unipolar+ ▪ Unipolar-
Mathematical functions	All the mathematical functions can also be used as a data source and the calculated value can be used as the measured value.

10.5.3 Alarm relays and optional relays, functions of the optional binary outputs

The basic version of the device always has one alarm relay. Additional relays are also available depending on the version of the device.

The following functions can be output via a relay:
- Limit switch status
- Controller manipulated variable for controlling an actuator
- Diagnostic 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.

Menu/Setup/Outputs/Alarm relay or relay at channel no.		
Function	**Options**	**Info**
Function	**Selection** ▪ Off ▪ Limit switch ▪ Controller ▪ Diagnostics ▪ Cleaning (sensor) ▪ Formula (sensor) **Factory setting** ▪ Alarm relays: Diagnostics ▪ Other relays: Off	The following functions depend on the option selected. These versions are illustrated individually in the following sections to provide a clearer understanding of the options. **Function** = **Off** Switches off the relay function and means no further settings are required.

Outputting the status of a limit switch

Function = Limit switch		
Function	**Options**	**Info**
Source of data	**Selection** 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 menu: **Setup/Additional functions/Limit switches**. Use the **ALL** and **NONE** soft keys to select or deselect all the limit switches in one go.
Hold behavior	**Selection** ▪ Freeze last value ▪ Fixed value ▪ Ignore **Factory setting** Ignore	

Outputting diagnostics messages via the relay

If a relay is defined as a diagnostic relay (**Function** = **Diagnostics**), it works in the **"fail-safe mode"**.
This means that the relay is always energized ("normally closed", n.c.) in the basic state if an error is not present. In this way it can also indicate a drop in voltage, for example.
The alarm relay always works in the failsafe mode.

You can output two categories of diagnostic messages via the relay:
- Diagnostic messages from one of the 4 Namur classes
- Diagnostic 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/Extended setup/Diagnostics settings/Diag. behavior** (device-specific messages)
- **Menu/Setup/Inputs/**<Sensor>**/Extended setup/Diagnostics settings/Diag. behavior** (sensor-specific messages)

Before being able to assign the relay output to a special message in **Diag. behavior** you must first configure **Outputs**/Relay x:y or **/Alarm relay/Function** = **Diagnostics** .

Function = Diagnostics		
Function	**Options**	**Info**
Operating mode	**Selection** ▪ as assigned ▪ Namur M ▪ Namur S ▪ Namur C ▪ Namur F **Factory setting** ▪ Relay: as assigned ▪ Alarm relays: Namur F	**as assigned** If this option is selected, the diagnostic messages which you have individually assigned to the relay are output via the relay. **Namur M** ... **Namur 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 diagnostic message. (**Menu/Setup/General settings/Extended setup/Diagnostics settings/Diag. behavior** or **Menu/Setup/Inputs/**<Sensor>**/Extended setup/Diagnostics settings/Diag. behavior**)
Attributed diagnostic messages **Operating mode** = **as assigned**	Read only	All the messages assigned to the relay output appear on the display. You do not have the option of editing the information here.

Outputting the status of a cleaning function

Function = Cleaning		
Function	**Options**	**Info**
Assignments	**Selection** ▪ None ▪ Depends on the type of cleaning **Factory setting** None	Here you can specify how a cleaning function should be displayed for the relay. You have the following options depending on the cleaning program that is selected (**Menu/Setup/Additional functions/Cleaning**: ▪ **Cleaning type** = **Standard clean** **Cleaning 1 - Water**, **Cleaning 2 - Water**, **Cleaning 3 - Water**, **Cleaning 4 - Water** ▪ **Cleaning type** = **Chemoclean** **Cleaning 1 - Water**, **Cleaning 1 - Cleaner**, **Cleaning 2 - Water**, **Cleaning 2 - Cleaner**, **Cleaning 3 - Water**, **Cleaning 3 - Cleaner**, **Cleaning 4 - Water**, **Cleaning 4 - Cleaner** ▪ **Cleaning type** = **Chemoclean Plus** 4x **Cleaning 1 - %0V**, 4x **Cleaning 2 - %0V** [1]
Hold behavior	**Selection** ▪ Freeze last value ▪ Fixed value ▪ Ignore **Factory setting** Ignore	**Freeze last value** The device freezes the last measured value. **Fixed value** You define a fixed measured value that is output at the output. **Ignore** A hold has no effect.

1) %0V is variable text which you can assign in **Menu/Setup/Additional functions/Cleaning/Chemoclean Plus/Output label 1 ... 4**.

10.5.4 HART

Specify which device variables should be output via HART communication.

You can define a maximum of 16 device variables.

1. Specify the data source.
   ↳ You can choose from sensor inputs and controllers.
2. Select the measured value to be output.
3. Specify the behavior in "Hold" status. (Configuration options of **Source of data**, **Measured value** and **Hold behavior**) → 105

Please note that if you select **Hold behavior** = **Freeze** , the system not only flags the status but also actually "freezes" the measured value.

More information is provided in:

Operating Instructions "HART Communication", BA00486C

10.5.5 Modbus RS485 and Modbus TCP

Specify which process values should be output via Modbus RS485 Communication or via Modbus TCP.

In the case of Modbus RS485, you can switch between the RTU and the ASCII protocol.

You can define a maximum of 16 device variables.

1. Define the data source.
   ↳ You can choose from sensor inputs and controllers.
2. Select the measured value to be output.
3. Define how the device should behave in the hold state. (Configuration options of **Source of data**, **Measured value** and **Hold behavior**) → 105

Please note that if you select **Hold behavior** = **Freeze** , the system not only flags the status but also actually "freezes" the measured value.

Further information on "Modbus" can be found in the Guideline for Communication via Modbus, SD01189C

10.6 Additional functions

10.6.1 Limit switches

There are different ways to configure 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

Menu/Setup/Additional functions/Limit switches/Limit switch 1 … 8		
Function	**Options**	**Info**
Source of data	**Selection** ▪ None ▪ Sensor inputs ▪ Binary inputs ▪ Controller ▪ Fieldbus signals ▪ Mathematical functions ▪ MRS set 1 … 2 **Factory setting** None	▶ Specify the input or output which is to be the data source for the limit switch. The sources of data on offer depend on your device version. You can choose from connected sensors, binary inputs, fieldbus signals, mathematical functions, controllers and sets for measuring range switching.
Measuring value	**Selection** Depends on: Source of data	▶ Select the measured value, see the following table.

Measured value *depending on the* Source of data

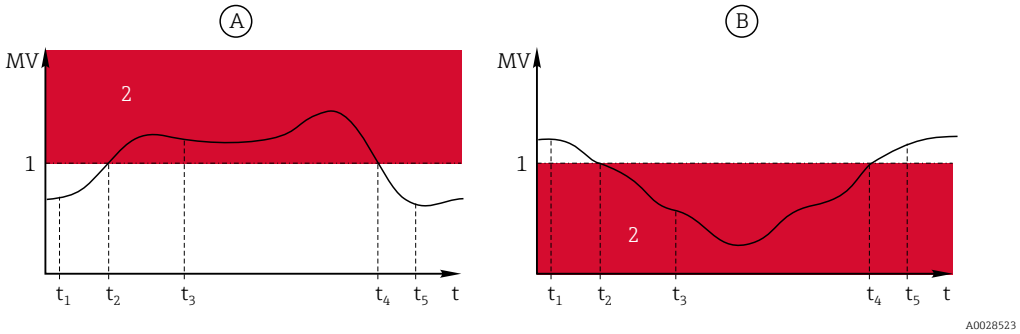
Source of data	Measured value
pH Glass pH ISFET	**Selection** ▪ Raw value mV ▪ pH ▪ Temperature
ORP	**Selection** ▪ Temperature ▪ ORP mV ▪ ORP %
Oxygen (amp.) Oxygen (opt.)	**Selection** ▪ Temperature ▪ Partial pressure ▪ Concentration liquid ▪ Saturation ▪ Raw value nA *(only* **Oxygen (amp.)***)* ▪ Raw value µs *(only* **Oxygen (opt.)***)*
Cond i Cond c Cond c 4-pol	**Selection** ▪ Temperature ▪ Conductivity ▪ Resistance *(only* **Cond c***)* ▪ Concentration *(only* **Cond i** *and* **Cond c 4-pol***)*
Disinfection	**Selection** ▪ Temperature ▪ Sensor current ▪ Concentration
ISE	**Selection** ▪ Temperature ▪ pH ▪ Ammonium ▪ Nitrate ▪ Potassium ▪ Chloride

Source of data	Measured value
TU/TS TU	**Selection** ▪ Temperature ▪ Turbidity g/l *(only* **TU/TS***)* ▪ Turbidity FNU *(only* **TU/TS***)* ▪ Turbidity Formazine *(only* **TU***)* ▪ Turbidity solid *(only* **TU***)*
Nitrate	**Selection** ▪ Temperature ▪ NO3 ▪ NO3-N
Ultrasonic interface	**Selection** Interface
SAC	**Selection** ▪ Temperature ▪ SAC ▪ Transm. ▪ Absorption ▪ COD ▪ BOD
	Selection ▪ Bipolar *(only for current outputs)* ▪ Unipolar+ ▪ Unipolar-
Mathematical functions	All the mathematical 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).

Menu/Setup/Additional functions/Limit switches/Limit switch 1 … 8		
Function	**Options**	**Info**
Cleaning program	**Selection** ▪ None ▪ Cleaning 1 … 4 **Factory setting** None	Use this function to choose which cleaning instance should start when the limit switch is active.
Function	**Selection** ▪ Off ▪ On **Factory setting** Off	Activating/deactivating the limit switch
Operating mode	**Selection** ▪ Above limit check ▪ Below limit check ▪ In range check ▪ Out of range check ▪ Change rate **Factory setting** Above limit check	Type of limit value monitoring: ▪ Limit value overshoot or undershoot→ 34 ▪ Measured value within or outside a range → 35 ▪ Rate of change → 37

Menu/Setup/Additional functions/Limit switches/Limit switch 1 ... 8		
Function	**Options**	**Info**
Limit value	Settings depend on the measured value	**Operating mode** = **Above limit check** *or* **Below limit check**

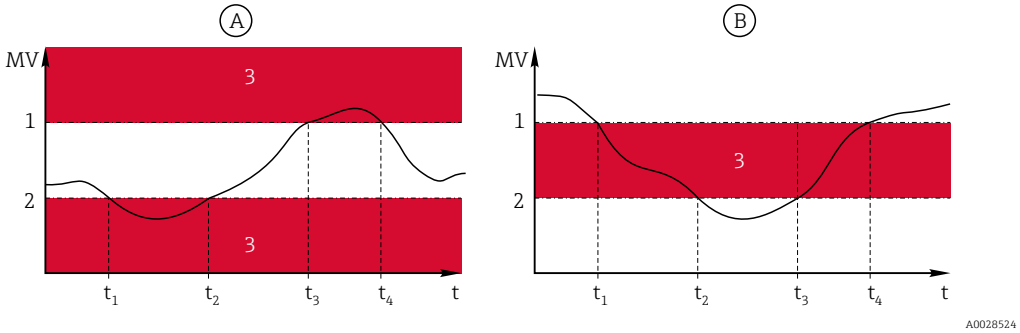


34 *Exceeding (A) and undershooting (B) a limit value (without hysteresis and switch-on delay)*

1 *Limit value*
2 *Alarm range*
$t_{1,3,5}$ *No action*
$t_{2,4}$ *An event is generated*

- If measured values (MV) are increasing, the relay contact is closed when the switch-on point is exceeded (**Limit value** + **Hysteresis**) and the start delay (**Start delay**) has elapsed.
- If measured values are decreasing, the relay contact is reset when the switch-off point is undershot (**Limit value** - **Hysteresis**) and after the drop-out delay (**Switch off delay**).

Range lower value Range upper value	Settings depend on the measured value	**Operating mode** = **Out of range check** *or* **In range check**

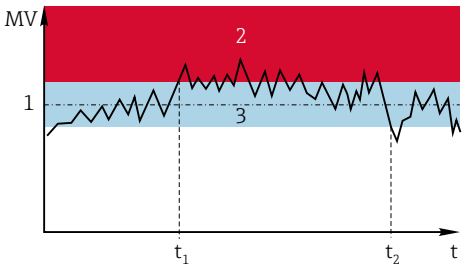


35 *Range monitoring outside (A) and within (B) a range (without hysteresis and switch-on delay)*

1 *End of range*
2 *Start of range*
3 *Alarm range*
t_{1-4} *An event is generated*

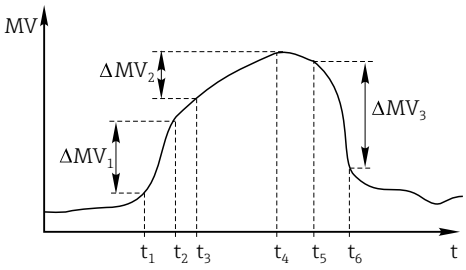
- If measured values (MV) are increasing, the relay contact is closed when the switch-on point is exceeded (**Range lower value** + **Hysteresis**) and the start delay (**Start delay**) has elapsed.
- If measured values are decreasing, the relay contact is reset when the switch-off point is undershot (**Range upper value** - **Hysteresis**) and after the drop-out delay (**Switch off delay**).

Menu/Setup/Additional functions/Limit switches/Limit switch 1 … 8		
Function	**Options**	**Info**
Hysteresis	Settings depend on the measured value	**Operating mode ≠ Change rate** The hysteresis is needed to ensure a stable switching behavior. The device software adds or subtracts the value set here to/from the limit value (**Limit value**, **Range lower value** or **Range upper value**). This results in double the **Hysteresis** value for the hysteresis range around the limit value. An event is then only generated if the measured value (MV) completely passes through the hysteresis range.
Start delay **Operating mode ≠ Change rate**	0 to 9999 s **Factory setting** 0 s	Synonyms: pick-up and drop-out delay
Switch off delay **Operating mode ≠ Change rate**		
Delta value	Settings depend on the measured value	**Operating mode = Change rate** The slope of the measured value (MV) is monitored in this mode. If, in the specified time frame (**Delta time**), the measured value increases or decreases by more than the specified value (**Delta value**), an event is generated. No further event is generated if the value continues to experience such a steep increase or decrease. If the slope is back below the limit value, the alarm status is reset after a preset time (**Auto Confirm**). Events are triggered by the following conditions in the example given: $t_2 - t_1$ < **Delta time** and ΔMV1 > **Delta value** $t_4 - t_3$ >**Auto Confirm** and ΔMV2 < **Delta value** $t_6 - t_5$ < **Delta time** and ΔMV3 > **Delta value**
Delta time	00:00:01 … 23:59:00 **Factory setting** 01:00:00	
Auto Confirm	00:01 to 23:59 **Factory setting** 00:01	



36 *Hysteresis taking the example of limit value overshoot*

1 Limit value
2 Alarm range
3 Hysteresis range
$t_{1,2}$ An event is generated



37 *Rate of change*

10.6.2 Sensor cleaning programs

⚠ CAUTION

Cleaning not switched off during calibration or maintenance activities

Risk of injury due to medium or cleaning agent!

- If a cleaning system is connected, switch it off before removing a sensor from the medium.
- If you need to test the cleaning function while cleaning is in progress, wear protective clothing, goggles and gloves or take other suitable measures to protect yourself.

Selecting the type of cleaning

The user can choose from the following cleaning types:
- Standard clean
- Chemoclean
- Chemoclean Plus

State of cleaning: Indicates whether the cleaning program is active or not. This is for information purposes only.

Selecting the cleaning type

1. **Menu/Setup/Additional functions/Cleaning**: Select a cleaning program.
   ↳ You can configure 4 different types of cleaning which you can assign individually to the inputs.
2. **Cleaning type**: For each cleaning program decide which type of cleaning should be performed.

Standard cleaning

Standard cleaning involves cleaning a sensor with compressed air, for instance, as performed with the ion-selective sensor CAS40D (connection of cleaning unit for CAS40D)

Menu/Setup/Additional functions/Cleaning/Cleaning 1 ... 4/Standard clean		
Function	**Options**	**Info**
Cleaning time	5 to 600 s **Factory setting** 10 s	Cleaning duration The cleaning duration and interval depend on the process and sensor. ▶ Determine the variables empirically or based on experience.

▶ Define the cleaning cycle→ 116.

Chemoclean

An example is the use of the CYR10 injector unit to clean pH glass sensors. (CYR10 connection)

Menu/Setup/Additional functions/Cleaning/Cleaning 1 ... 4/Chemoclean		
Function	**Options**	**Info**
Cleaning time	0 to 900 s **Factory setting** 5 s	Cleaning duration
Prerinse time	0 to 900 s **Factory setting** 0 s	The cleaning duration, pre-rinse and post-rinse times and the interval depend on the process and sensor. Determine the variables empirically or based on experience.
Postrinse time		

Chemoclean Plus

An example is the use of the CYR10 injector unit to clean pH glass sensors. (CYR10 connection)

Menu/Setup/Additional functions/Cleaning/Cleaning 1 ... 4/Chemoclean Plus/ChemoCleanPlus setup		
Function	**Options**	**Info**
Cleaning steps setup	Table to create a time program	You define a maximum of 30 program steps which should be performed one after the other. For each step enter the duration [s] and the state (0 = "off", 1 = "on") of each relay or output. You can specify the number and name of the outputs further down in the menu. See below for an example of programming.
Failsafe step setup	Table view	▶ In the table specify the states that the relays or outputs should assume in the event of an error.
Limit contacts	0 to 2	▶ Select the number of digital input signals (e. g. from limit position switches of the retractable assembly).
Limit contact 1 ... 2	**Selection** ▪ Binary inputs ▪ Fieldbus signals	▶ Define the signal source for each limit position switch.
Outputs	0 to 4	▶ Select the number of outputs that actuators, such as valves or pumps, should activate.
Output label 1 ... 4	Free text	You can assign a meaningful name to each output, e. g. "assembly", "cleaner 1", "cleaner 2", etc.

Programming example: regular cleaning with water and 2 cleaning agents

Limit switch	Duration [s]	Assembly CPA87x	Water	Cleaner 1	Cleaner 2
ES1 1	5	1	1	0	0
ES2 1	5	1	1	0	0
0	30	1	1	0	0
0	5	1	1	1	0
0	60	1	0	0	0
0	30	1	1	0	0
0	5	1	1	0	1
0	60	1	0	0	0
0	30	1	1	0	0
ES1 0	5	0	1	0	0
ES2 0	5	0	1	0	0
0	5	0	0	0	0

The pneumatic retractable assembly, e.g. CPA87x, is activated by compressed air via a two-way valve. As a result, the assembly assumes either the "Measure" position (sensor in medium) or the "Service" position (sensor in rinse chamber). Media such as water or cleaning agents are supplied via valves or pumps. Here there are two states: 0 (= "off" or "closed") and 1 (= "on" or "open").

The hardware required for "Chemoclean Plus", such as control valves, pumps, compressed air supply, media supply etc., must be provided by the customer.

Defining the cleaning cycle

Menu/Setup/Additional functions/Cleaning/Cleaning 1 ... 4		
Function	**Options**	**Info**
Cleaning cycle	**Selection** ▪ Off ▪ Interval ▪ Weekly program **Factory setting** Weekly program	▶ Choose from a cleaning routine that is restarted at set intervals and a user-definable weekly program.
Cleaning interval **Cleaning cycle** = **Interval**	0-00:01 to 07-00:00 (D-hh:mm) **Factory setting** 1-00:00	The interval value can be between 1 minute and 7 days. Example: You have set the value "1-00:00". Each day, the cleaning cycle starts at the same time you started the first cleaning cycle.
Daily event times **Cleaning cycle** = **Weekly program**	00:00 to 23:59 (HH:MM)	1. Define up to 6 times (**Event time 1 ... 6**). ↳ You can then choose from these for each day of the week.
Weekdays **Cleaning cycle** = **Weekly program**	**Selection** **Monday** ... **Sunday**	2. Choose individually for each day of the week which of the 6 times should be used for a cleaning routine on this particular day. This allows you to create weekly programs that are perfectly adapted to suit your process.

Other settings and manual cleaning

Menu/Setup/Additional functions/Cleaning/Cleaning 1 ... 4		
Function	**Options**	**Info**
Start signal	**Selection** ▪ None ▪ Fieldbus signals ▪ Signals of digital or analog inputs **Factory setting** None	In addition to cyclic cleaning, you can also use an input signal to start event-controlled cleaning. ▶ Choose the trigger for such a cleaning process here. Interval and weekly programs are executed as normal, i. e. conflicts can occur. Priority is given to the cleaning program that was the first to be started.
Hold	**Selection** ▪ Off ▪ On **Factory setting** On	▶ Decide whether there should be a hold during the cleaning process. This hold affects the inputs to which this cleaning process is assigned.
▷ Start single	Action	Start an individual cleaning process with the selected parameters. If cyclical cleaning is enabled, there are times in which it is not possible to manually start the process.
▷ **Stop** or **Stop Failsafe**	Action	End the cleaning process (cyclically or manually)
▶ Outputs		Goes to the menu **Outputs**
▶ Cleaning program assignment view		Shows an overview of the cleaning processes

10.6.3 Cleaning programs, sampling technology

CAUTION

Risk of injury due to medium or cleaning agent

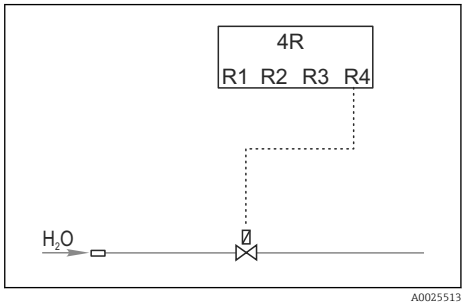
Cleaning not switched off during calibration or maintenance activities

- If a cleaning system is connected, switch if off before removing a sensor from the medium.
- If you wish to check the cleaning function and have therefore not switched off the cleaning system, please wear protective clothing, goggles and gloves or take other appropriate measures.

Dosing chamber rinsing

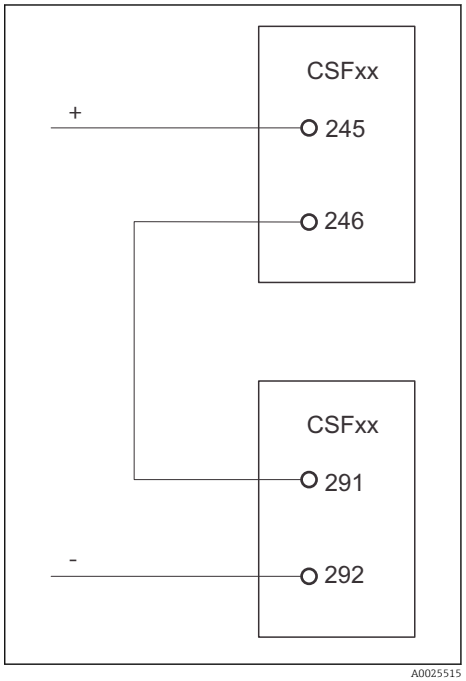
The sampler must be ordered with TSP modification 71265624 to commission this function.

The following hardware changes have already been made:



38 *Cleaning valve*

Control of cleaning valve via relay R4 for dosing chamber rinsing.



39 *Cleaning valve*

Binary output S:2 is configured for "End of sampling". or "Bottle change" and is connected to binary input S:2 which starts the Chemoclean Plus function.

Cleaning/rinsing the dosing chamber

1. Select **Menu/Setup/Inputs/Binary input** and configure binary input S:2.

MenuSetup/Inputs/Binary input	
Function	**Entry for sample program**
MODE	On
Input variable	External signal -> Control of sampling functions via external signals
Having selected input variable **External signal**:	
Operation	Start cleaning -> A pulse triggers the cleaning.
Signal slope	Low-High Factory setting: Low-High.

2. Select **Menu/Setup/Additional functions** and configure the binary output:

MenuSetup/Inputs/Outputs	
Function	**Entry for sample program**
Having selected input variable **Binary output**	
Mode	Event Factory setting: Off
Having selected input variable **Event**:	
Slope of signal	Low-High Factory setting: Low-High.
Event	End of sampling A pulse is switched when sampling has ended. Bottle change A pulse is switched when a bottle is changed.

3. Select **Menu/Setup/Additional functions** and configure the binary output:

MenuSetup/Inputs/Additional functions/Cleaning/Cleaning 1	
Function	**Entry for sample program**
Cleaning type	Chemoclean Plus Dosing chamber rising is only enabled in this way
Cleaning steps setup	Table to create a time program: You define a maximum of 30 program steps which should be performed one after the other. For each step, enter the duration [s] and the state (0="off", 1="on") for each relay or output. You can specify the number and name of the outputs further down in the menu. See below for program examples.
Failsafe step setup	Table view: In the table specify the states that the relays or outputs should assume in the event of an error.
Outputs	1 Select the number of outputs that the actuators, such as valves or pumps, should activate. 0....4
Output label 1	Test (out 1) You can assign a meaningful name to each output, e.g.: "assembly", "acid", "base" etc.

Example of a cleaning phase table

#	Duration (s)	Water	Info
1	5	0	Arm at tundish
2	5	1	Water valve
3	5	0	Drip time

The distribution arm only goes to the bottle at the next sampling.

MenuSetup/Inputs/Additional functions/Cleaning/Cleaning 1/Chemoclean Plus/ChemoCleanPlus setup	
Function	**Entry for sample program**
Cleaning cycle	Off Only active via external controller.
Start signal	Binary input Select the sensors and their measured variables that should be used as the minuend (**Y1**) or subtrahend (**Y2**).
Start signal	Binary input The input must be selected beforehand.
▶ Outputs	
▶ OutputRelay	Cleaning
▶ Assignment	Cleaning 1 - Out 1 Press the navigator to confirm.

4. Please check the function in **Menu/Setup/Output/Relay %0V** .

10.6.4 Other settings and manual cleaning

Menu/Setup/Additional functions/Cleaning/Cleaning 1 ... 4		
Function	**Options**	**Info**
Start signal	**Selection** ▪ None ▪ Fieldbus signals ▪ Signals of digital or analog inputs **Factory setting** None	In addition to cyclic cleaning, you can also use an input signal to start event-controlled cleaning. ▶ Choose the trigger for such a cleaning process here. Interval and weekly programs are executed as normal, i. e. conflicts can occur. Priority is given to the cleaning program that was the first to be started.
Hold	**Selection** ▪ Off ▪ On **Factory setting** On	▶ Decide whether there should be a hold during the cleaning process. This hold affects the inputs to which this cleaning process is assigned.
▷ Start single	Action	Start an individual cleaning process with the selected parameters. If cyclical cleaning is enabled, there are times in which it is not possible to manually start the process.
▷ **Stop** or **Stop Failsafe**	Action	End the cleaning process (cyclically or manually)
▶ Outputs		Goes to the menu **Outputs**
▶ Cleaning program assignment view		Shows an overview of the cleaning processes

10.6.5 Mathematical functions

In addition to "real" process values, which are provided by connected physical sensors or analog inputs, mathematical functions can be used to calculate a maximum of 8 "virtual" process values.

The "virtual" process values can be:
- Output via a current output or a fieldbus
- Used as a controlled variable
- Assigned as a measured variable to a limit switch
- Used as a measured variable to trigger cleaning
- Displayed in user-defined measuring menus

Difference

You can subtract the measured values of two sensors and use the result to detect incorrect measurements, for example.

To calculate a difference, you must use two measured values with the same engineering unit.

Menu/Setup/Additional functions/Mathematical functions/MF1 to 8/Mode = Difference		
Function	**Options**	**Info**
Calculation	**Selection** ▪ Off ▪ On **Factory setting** Off	On/off switch for the function
Y1	The options depend on the sensors connected	Select the sensors and measured variables that should function as the minuend (**Y1**) or subtrahend (**Y2**).
Measured value		
Y2		
Measured value		
Difference value	Read only	View this value in a user-defined measuring screen or output the value via the current output.
▶ Mathematical function assignment view		Overview of the configured functions

Redundancy

Use this function to monitor two or three sensors with redundant measurements. The arithmetic average of the two closest measured values is calculated and output as the redundancy value.

Menu/Setup/Additional functions/Mathematical functions/MF1 to 8/Mode = Redundancy		
Function	**Options**	**Info**
Calculation	**Selection** ▪ Off ▪ On **Factory setting** Off	On/off switch for the function
Y1	The options depend on the sensors connected	You can select a maximum of 3 different types of sensor that output the same measured value. **Example for temperature redundancy** You have a pH sensor and an oxygen sensor at inputs 1 and 2. Select the pH sensor as **Y1** and the oxygen sensor as **Y2**. **Measured value**: Select **Temperature** in each case.
Measured value		
Y2		
Measured value		
Y3 (optional)		
Measured value		

Menu/Setup/Additional functions/Mathematical functions/MF1 to 8/Mode = Redundancy		
Function	**Options**	**Info**
Deviation control	**Selection** ▪ Off ▪ On **Factory setting** Off	You can monitor the redundancy. Specify an absolute limit value that must not be exceeded.
Deviation limit	Depends on the selected measured value	
Redundancy	Read only	View this value in a user-defined measuring screen or output the value via the current output.
▶ Mathematical function assignment view		Overview of the configured functions

rH value

To calculate the rH value, a pH sensor and an ORP sensor must be connected. It is irrelevant whether you are using a pH glass sensor, an ISFET sensor or the pH electrode of an ISE sensor.

Instead of the mathematical functions, you can also connect a combined pH/ORP sensor.

▶ Set the main measured value simply to rH.

Menu/Setup/Additional functions/Mathematical functions/MF1 to 8/Mode = rH calculation		
Function	**Options**	**Info**
Calculation	**Selection** ▪ Off ▪ On **Factory setting** Off	On/off switch for the function
pH source	Connected pH sensor	Set the input for the pH sensor and the input for the ORP sensor. Measured value interrogation is obsolete as you must select pH or ORP mV.
ORP source	Connected ORP sensor	
Calculated rH	Read only	View this value in a user-defined measuring screen or output the value via the current output.
▶ Mathematical function assignment view		Overview of the configured functions

Degassed conductivity

Carbon dioxide from the air can be a contributing factor to the conductivity of a medium. The degassed conductivity is the conductivity of the medium excluding the conductivity caused by carbon dioxide.

Advantages of using degassed conductivity taking the example of a power station:
- The conductivity caused by corrosion products or contamination in the feed water is determined as soon as the turbines are started. The system excludes the initially high conductivity values resulting from the ingress of air.
- If carbon dioxide is regarded as non-corrosive, the live steam can be directed to the turbine far earlier during startup.
- If the conductivity value increases during normal operation, it is possible to immediately determine an ingress of coolant or air by calculating the degassed conductivity.

Menu/Setup/Additional functions/Mathematical functions/MF1 to 8/Mode = Degassed conductivity		
Function	**Options**	**Info**
Calculation	**Selection** ▪ Off ▪ On **Factory setting** Off	On/off switch for the function
Cation conductivity	Connected conductivity sensor	**Cation conductivity** represents the sensor downstream from the cation exchanger and upstream from the "degassing module", **Degassed conductivity** represents the sensor at the outlet of the degassing module. Measured value interrogation is obsolete as you can only choose conductivity.
Degassed conductivity	Connected conductivity sensor	
CO2 concentration	Read only	View this value in a user-defined measuring screen or output the value via the current output.
▶ Mathematical function assignment view		Overview of the configured functions

Dual conductivity

You can subtract two conductivity values and use the result to monitor the efficiency of an ion exchanger, for example.

Menu/Setup/Additional functions/Mathematical functions/MF1 to 8/Mode = Dual conductivity		
Function	**Options**	**Info**
Calculation	**Selection** ▪ Off ▪ On **Factory setting** Off	On/off switch for the function
Inlet	The options depend on the sensors connected	Select the sensors that should function as the minuend (**Inlet**, e.g. sensor upstream from the ion exchanger) or subtrahend (**Outlet**, e.g. sensor downstream from the ion exchanger).
Measured value		
Outlet		
Measured value		
Main value format	**Selection** ▪ Auto ▪ # ▪ #.# ▪ #.## ▪ #.### **Factory setting** Auto	Specify the number of decimal places.
Cond. unit	**Selection** ▪ Auto ▪ µS/cm ▪ mS/cm ▪ S/cm ▪ µS/m ▪ mS/m ▪ S/m **Factory setting** Auto	
Dual conductivity	Read only	View this value in a user-defined measuring screen or output the value via the current output.
▶ Mathematical function assignment view		Overview of the configured functions

Calculated pH value

The pH value can be calculated from the measured values of two conductivity sensors under certain conditions. Areas of application include power stations, steam generators and boiler feedwater.

Menu/Setup/Additional functions/Mathematical functions/MF1 to 8/Mode = pH calculation from conductivity		
Function	**Options**	**Info**
Calculation	**Selection** ▪ Off ▪ On **Factory setting** Off	On/off switch for the function
Method	**Selection** ▪ NaOH ▪ NH3 ▪ LiOH **Factory setting** NaOH	The calculation is performed on the basis of Guideline VGB-R-450L of the Technical Association of Large Power Plant Operators (Verband der Großkesselbetreiber, (VGB)). **NaOH** $pH = 11 + \log \{(\kappa_v - 1/3\ \kappa_h)/273\}$ **NH3** $pH = 11 + \log \{(\kappa_v - 1/3\ \kappa_h)/243\}$ **LiOH** $pH = 11 + \log \{(\kappa_v - 1/3\ \kappa_h)/228\}$ κ_v ... **Inlet** ... direct conductivity κ_h ... **Outlet** ... acid conductivity
Inlet Measured value Outlet Measured value	The options depend on the sensors connected	**Inlet** Sensor upstream from the cation exchanger, "direct conductivity" **Outlet** Sensor downstream from the cation exchanger, "acid conductivity" Selection of the measured value is obsolete as it must always be **Conductivity**.
Calculated pH	Read only	View this value in a user-defined measuring screen or output the value via the current output.
▶ Mathematical function assignment view		Overview of the configured functions

Formula (optional, with activation code)

With the formula editor, it is possible to calculate a new value from a maximum of 3 measured values. A wide range of mathematical and logical (Boolean) operations are available for this purpose.

The Liquiline firmware offers you a powerful mathematics tool with the formula editor. You are responsible for the feasibility of your formula, and therefore for the feasibility of the result.

Symbol	Operation	Type of operands	Type of result	Example
+	Addition	Numerical	Numerical	A+2
-	Subtraction	Numerical	Numerical	100-B
*	Multiplication	Numerical	Numerical	A*C
/	Division	Numerical	Numerical	B/100
^	Power	Numerical	Numerical	A^5
²	Square	Numerical	Numerical	A^2
³	Cube	Numerical	Numerical	B^3

Symbol	Operation	Type of operands	Type of result	Example
SIN	Sine	Numerical	Numerical	SIN(A)
COS	Cosine	Numerical	Numerical	COS(B)
EXP	Exponential function e^x	Numerical	Numerical	EXP(A)
LN	Natural logarithm	Numerical	Numerical	LN(B)
LOG	Decadic logarithm	Numerical	Numerical	LOG(A)
MAX	Maximum of two values	Numerical	Numerical	MAX(A,B)
MIN	Minimum of two values	Numerical	Numerical	MIN(20,B)
MOD	Division with remainder	Numerical	Numerical	MOD (10.3)
ABS	Absolute value	Numerical	Numerical	ABS(C)
NUM	Boolean → numerical conversion	Boolean	Numerical	NUM(A)
=	Equals	Boolean	Boolean	A=B
<>	Not equal to	Boolean	Boolean	A<>B
>	Greater than	Numerical	Boolean	B>5.6
<	Less than	Numerical	Boolean	A<C
OR	Disjunction	Boolean	Boolean	B OR C
AND	Conjunction	Boolean	Boolean	A AND B
XOR	Exclusive disjunction	Boolean	Boolean	B XOR C
NOT	Negation	Boolean	Boolean	NOT A

Menu/Setup/Additional functions/Mathematical functions/MF1 to 8/Mode = Formula

Function	Options	Info
Calculation	**Selection** ▪ Off ▪ On **Factory setting** Off	On/off switch for the function
Source A … C	**Selection** Select source **Factory setting** None	You can use all the sensor inputs, binary and analog inputs, mathematical functions, limit switches, time switches, fieldbus signals, controllers and datasets for measuring range switching as the source for measured values. 1. Choose a maximum of three sources (A, B and C) for measured values. 2. For each source, choose the measured value to be calculated. ↳ All available signals - depending on the selected source - are possible measured values. 3. Enter the formula. 4. Switch on the calculation. ↳ The current measured values A, B and C as well as the result of the calculation using the formula are displayed.
Measured value	**Selection** Depends on the source	
A … C	The current measured value is displayed	

Menu/Setup/Additional functions/Mathematical functions/MF1 to 8/Mode = Formula		
Function	**Options**	**Info**
Formula	User-defined text	Table → 123 Make sure the exact notation is used (upper case). Blank spaces before and after mathematical characters are irrelevant. Note the operator precedence, i.e. multiplication and division take precedence over addition and subtraction. Use parentheses if necessary.
Result unit	User-defined text	You may enter a unit for the calculated value if desired.
Result format	**Selection** ▪ # ▪ #.# ▪ #.## ▪ #.### ▪ #.#### **Factory setting** #.##	Select the number of decimal places.
Result numeric	Read only	Current, calculated value
▶ Mathematical function assignment view		Overview of the configured functions

Example: 2-point chlorine regulator with volume flow monitoring

A relay output activates a dosing pump. The pump should switch on when the following 3 conditions are met:
- (1) There is flow
- (2) The volume flow is above a defined value
- (3) The concentration of chlorine drops below a defined value

1. Connect a binary input signal from an "INS" point level switch of the CCA250 assembly to the DIO module.
2. Connect an analog input signal of a volume flow meter to the AI module.
3. Connect the chlorine sensor.
4. Configure the **Formula** mathematical function: **Source A** = binary input DIO, **Source B** = current input AI, **Source C** = input **Disinfection**.
   ↳ Formula:
   A AND (B > 3) AND (C < 0.9)
   (where 3 is the lower limit value of the volume flow and 0.9 is the lower limit value of the chlorine concentration)
5. Configure the relay output with the **Formula** mathematical function and connect the dosing pump to the corresponding relay.

The pump is switched on if all 3 conditions are met. If one of the conditions is no longer met, the pump is switched off again.

Instead of outputting the result of the formula directly to a relay, you can also connect a limit switch in between in order to attenuate the output signal via a switch-on and switch-off delay.

Example: Load-based control

The load - i.e. the product of the concentration and volume flow - is needed for the dosage of precipitants, for instance.

1. Connect the input signal of a phosphate analyzer to the AI module.
2. Connect an analog input signal of a volume flow meter to the AI module.

3. Configure the **Formula** mathematical function: **Source A** = input signal phosphate and **Source B** = input signal volume flow.
   ↳ Formula:
   A*B*x
   (where x is an application-specific proportionality factor)
4. Select this formula as the source e.g. of the current output or of a modulated binary output.
5. Connect the valve or pump.

10.6.6 Measuring range switching

A measuring range switching (MRS) configuration includes the following options for each of the four binary input states:
- Operating mode (conductivity or concentration)
- Concentration table
- Temperature compensation
- Current output turndown
- Limit switch range

An MRS set is assigned to a channel and switched on. The measuring range configuration selected via the binary inputs is now applied instead of the normal configuration of the linked sensor channel. For current outputs and limit switches to be controlled by the MRS, they must be linked to the MRS set, not to the measuring channel.
Current outputs and limit switches can be linked to an MRS set. This MRS set gives you the measured value and the associated turn down (current outputs) or the range for limit value monitoring (limit switches).
A limit switch connected to an MRS set always uses the **Out of range check**mode. Consequently, it switches when the value is outside the configured range.
If a current output or limit switch is connected to an MRS set, the turndown, monitoring range and limit switch mode can no longer be configured manually. Therefore, these options are hidden in the menus (current outputs and limit switch).

Programming example: CIP cleaning in a brewery

	Beer	**Water**	**Alkali**	**Acid**
Binary input 1	0	0	1	1
Binary input 1	0	1	0	1
	Measuring range 00	Measuring range 01	Measuring range 10	Measuring range 11
Operating mode	Conductivity	Conductivity	Concentration	Concentration
Conc. Table	-	-	NaOH 0..15%	User table 1
Compensation	User table 1	Linear	-	-
Current output				
Range lower value	1.00 mS/cm	0.1 mS/cm	0.50 %	0.50 %
Range upper value	3.00 mS/cm	0.8 mS/cm	5.00 %	1.50 %
Limit switches				
Range lower value	2.3 mS/cm	0.5 mS/cm	2.00 %	1.30 %
Range upper value	2.5 mS/cm	0.7 mS/cm	2.10 %	1.40 %

Menu/Setup/Additional functions/Measuring range switch		
Function	**Options**	**Info**
▶ MRS set 1 … 2		If you enter both activation codes, you have two independent parameter sets available for measuring range switching. The submenus are the same for both sets.
MRS	**Selection** ▪ Off ▪ On **Factory setting** Off	Switches the function on or off
Sensor	**Selection** ▪ None ▪ Connected conductivity sensors **Factory setting** None	This function can be used on conductivity sensors only.
Binary input 1 … 2	**Selection** ▪ None ▪ Binary inputs ▪ Fieldbus signals ▪ Limit switches **Factory setting** None	Source of the switching signal, can be selected for input 1 and 2 in each case
▶ Measuring range 00 … 11		Select the MRSs; a maximum of 4 are possible. The submenus are identical for each and thus are displayed only once.

Operating mode	**Selection**
	▪ Conductivity
	▪ Concentration
	▪ TDS
	▪ Resistance
	Factory setting
	Conductivity
		Selection depends on the sensor used:
		▪ Inductive sensor and conductive four-pin sensor
		  ▪ Conductivity
		  ▪ Concentration
		  ▪ TDS
		▪ Conductive sensor
		  ▪ Conductivity
		  ▪ Resistance
		  ▪ TDS

Conc. Table **Operating mode** = **Concentration**	**Selection** ▪ NaOH 0..15% ▪ NaOH 25..50% ▪ HCl 0..20% ▪ HNO3 0..24% ▪ HNO3 24..30% ▪ H2SO4 0.5..27% ▪ H2SO4 93..99% ▪ H3PO4 0..40% ▪ NaCl 0..26% ▪ User table 1 … 4 **Factory setting** NaOH 0..15%	Concentration tables saved at the factory: ▪ NaOH: 0 to 15%, 0 to 100 °C (32 to 212 °F) ▪ NaOH: 25 to 50%, 2 to 80 °C (36 to 176 °F) ▪ HCl: 0 to 20%, 0 to 65 °C (32 to 149 °F) ▪ HNO3: 0 to 25%, 2 to 80 °C (36 to 176 °F) ▪ H2SO4: 0 to 28%, 0 to 100 °C (32 to 212 °F) ▪ H2SO4: 40 to 80%, 0 to 100 °C (32 to 212 °F) ▪ H2SO4: 93 to 100%, 0 to 100 °C (32 to 212 °F) ▪ H3PO4: 0 to 40%, 2 to 80 °C (36 to 176 °F) ▪ NaCl: 0 to 26%, 2 to 80 °C (36 to 176 °F)
Compensation **Operating mode** = **Conductivity**	**Selection** ▪ None ▪ Linear ▪ NaCl (IEC 746-3) ▪ Water ISO7888 (20°C) ▪ Water ISO7888 (25°C) ▪ UPW NaCl ▪ UPW HCl ▪ User table 1 … 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.

Menu/Setup/Additional functions/Measuring range switch		
Function	**Options**	**Info**
▶ Current output		
Range lower unit	Depends on the **Operating mode**	Units are only queried for **Operating mode** = **Conductivity** . The other units are pre-defined and cannot be modified. ▪ Conductivity **S/m**, **mS/cm**, **µS/cm**, **S/cm**, **µS/m**, **mS/m** ▪ Concentration % ▪ TDS ppm ▪ Resistance Ωcm
Range lower value		
Range upper unit		
Range upper value		
▶ Limit switches		
Range lower unit	Depends on the **Operating mode**	Units are only queried for **Operating mode** = **Conductivity** . The other units are pre-defined and cannot be modified. ▪ Conductivity **S/m**, **mS/cm**, **µS/cm**, **S/cm**, **µS/m**, **mS/m** ▪ Concentration % ▪ TDS ppm ▪ Resistance Ωcm
Range lower value		
Range upper unit		
Range upper value		

11 Diagnostics and troubleshooting

11.1 General troubleshooting

The sampler continuously monitors its functions itself.

The color of the display background changes to red if a diagnostic message for error category "F" occurs.

The LED beside the display flashes red if a diagnostic message for error category "M" occurs.

11.1.1 Troubleshooting

A diagnostic message appears on the display , measured values are not plausible, or you identify a fault.

1. See the Diagnostics menu for details on the diagnostic message.
   ↳ Follow the instructions to rectify the problem.
2. If this does not help, search for the diagnostic message under "Overview of diagnostic information" in these Operating Instructions. Use the message number as a search criterion. Ignore the letters indicating the Namur error category.
   ↳ Follow the troubleshooting instructions provided in the last column of the error tables.
3. If the measured values are implausible, the local display is faulty or you encounter other problems, search for the faults under "Process errors without messages" (→ Operating Instructions Memosens, BA01245C) or "Device-specific errors" (→ 🖹 132).
   ↳ Follow the recommended measures.
4. Contact the Service Department if you cannot rectify the error yourself. citing only the error number.

11.1.2 Device-specific errors

Problem	Possible cause	Tests and/or remedial measures
Dark display	No supply voltage	▶ Check if supply voltage applied.
	Base module defective	▶ Replace base module
Values appear on display but: ▪ Display does not change and/or ▪ Device cannot be operated	Module not wired correctly	▶ Check modules and wiring.
	Impermissible operating system condition	▶ Switch off device and switch it on again.
Implausible measured values	Inputs defective	▶ First perform tests and take measures as outlined in "Process-specific errors" section. Measuring input test: ▶ Connect the Memocheck Sim CYP03D to the input and use it to check the function of the input.
Controller signals not accepted or outputs do not switch	Incorrect program setting	▶ Check program setting
	Incorrect wiring	▶ Check wiring
	Electronics failure	▶ Replace base module
Sample not representative	Siphon in sampling hose	▶ Check the sampling hose
	Connection not tight/ sampling hose drawing in air	1. Check hoses/connections 2. Check routing of the sampling hose

Problem	Possible cause	Tests and/or remedial measures
	Bottles not filling correctly	Incorrect distribution selected in operation ▶ Calibrate the distribution arm
	Distribution arm stops	Incorrect distribution selected in operation 1. Check the distribution arm connection 2. Distributor is defective, replace distributor or arrange for repair by E+H Service
	Incorrect bottle filled	Incorrect distribution selected in operation
	No sample cooling	▶ Check the setting for the sample compartment temperature at the console Refrigeration system defective --> have repaired by E+H Service
	Incorrect pump tubing	▶ Only use the original pump tubing
	Sensory mechanism is faulty	▶ Replace the sensory mechanism (contact E+H Service)
No sampling	Connection not tight	▶ Check tightness of hoses/connections
	Sampling hose drawing in air	▶ Check routing of the sampling hose
	Air manager defective	Have repaired by E+H Service
	Membrane pump defective	Have repaired by E+H Service
	Incorrect pump tubing	▶ Only use the original pump tubing
	Sensory mechanism is faulty	▶ Replace the sensory mechanism (contact E+H Service)
Current output, incorrect current value	Incorrect adjustment	▶ Check with integrated current simulation, connect mA meter directly to current output.
	Load too large	
	Shunt/short to ground in current loop	
No current output signal	Base module defective	▶ Check with integrated current simulation, connect mA meter directly to current output.

11.2 Diagnostic information on local display

Up-to-date diagnostic events are displayed along with their status category, diagnostic code and short text. Clicking on the navigator lets you retrieve more information and tips on remedial measures.

11.3 Adapting the diagnostic information

11.3.1 Classification of diagnostics messages

In the **DIAG/Diagnostics list** menu you can find more detailed information on the current diagnostic messages displayed.

In accordance with Namur specification NE 107, the diagnostic messages are characterized by:
- Message number
- Error category (letter in front of the message number)
  - **F** = (Failure) a malfunction has been detected
    The cause of the malfunction is to be found in the sampling point/measuring point. Any control system connected should be set to manual mode.
  - **C** = (Function check), (no error)
    Maintenance work is being performed on the device. Wait until the work has been completed.
  - **S** = (Out of specification), the measuring point is being operated outside its specification
    Operation is still possible. However, you run the risk of increased wear, shorter operating life or lower measurement accuracy. The cause of the problem is to be found outside the measuring point.
  - **M** = (Maintenance required), action should be taken as soon as possible
    The device still measures/takes samples correctly. Immediate measures are not necessary. However, proper maintenance efforts would prevent a possible malfunction in the future.
- Message text

If you contact the Service Department, please cite the message number only. Since you can individually change the assignment of an error to an error category, the Service Department cannot use this information.

11.3.2 Adapting the diagnostic behavior

All the diagnostic messages are assigned to specific error categories at the factory. Since other settings might be preferred depending on the application, error categories and the effect errors have on the measuring point can be configured individually. Furthermore, every diagnostic message can be disabled.

Example

Diagnostic message 531 **Logbook full**appears on the display. You want to change this message so that an error is not shown on the display for example.

1. Select the diagnostics message and press the navigator button.
2. Decide: (a) Should the message be deactivated? (**Diagnostics message** = **Off**)
   (b) Do you want to change the error category?(**Status signal**)
   (c) Should an error current be output? (**Failure current** = **On**)
   (d) Do you want to trigger a cleaning program? (**Cleaning program**)
3. Example: You deactivate the message.
   ↳ The message is no longer displayed. In the **DIAG** menu, the message appears as **Past message**.

Possible settings

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.

Menu/Setup/Run the ../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	

Menu/Setup/Run the ../Extended setup/Diagnostics settings/Diag. behavior		
Function	**Options**	**Info**
Diagnostic message	**Selection** ▪ Off ▪ On **Factory setting** Depends on the Diag. code	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
Failure current	**Selection** ▪ Off ▪ On **Factory setting** Depends on the Diag. code	Decide whether an error current should be output at the current output if the diagnostic message display is activated. In the event of general device errors, the error current is switched to all the current outputs. In the event of channel-specific errors, the error current is only switched to the current output in question.
Status signal	**Selection** ▪ Maintenance (M) ▪ Out of specification (S) ▪ Function check (C) ▪ Failure (F) **Factory setting** Depends on the Diag. code	The messages are divided into different error categories in accordance with NAMUR NE 107. Decide whether you want to change a status signal assignment for your application.
Diag. output	**Selection** ▪ None ▪ Binary outputs ▪ Alarm relay ▪ Relay **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. An alarm relay is always available, regardless of the device version. Other relays are optional. Before you can assign the message to an output: Configure one of the output types mentioned as follows: **Menu**/**Setup**/**Outputs**/(**Alarm relay** or **Binary output** or **relay**)/**Function** = **Diagnostics** and **Operating mode** = **as assigned**.
Cleaning program	**Selection** ▪ None ▪ Cleaning 1 ... 4 **Factory setting** None	Decide whether the diagnostic message should trigger a cleaning program. You can define 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.

11.4 Overview of diagnostic information

11.4.1 Device-specific, general diagnostic messages

No.	Message	Factory settings			Tests or remedial action
		S [1]	D [2]	F [3]	
202	Selftest active	F	On	Off	Wait for self-test to be finished
216	Hold active	C	On	Off	Output values and status of the channel are on hold

No.	Message	Factory settings			Tests or remedial action
		S [1]	D [2]	F [3]	
241	Firmware failure	F	On	On	Internal device error 1. Update the software. 2. Contact the Service Department. 3. Replace the backplane (Service).
242	Firmware incomp.	F	On	On	
243	Firmware failure	F	On	On	
261	Electronics module	F	On	On	Electronics module defective 1. Replace the module. 2. Contact the Service Department.
262	Module connection	F	On	On	Electronics module not communicating 1. Check the cable connection , replace it if necessary. 2. Check the power supply of the sampling control module. 3. Contact the Service Department.
263	Incomp. detected	F	On	On	Wrong kind of electronics module 1. Replace the module. 2. Contact the Service Department.
284	Firmware update	M	On	Off	Update completed successfully
285	Update error	F	On	On	Firmware update failed 1. Repeat. 2. SD card error → use another card. 3. Incorrect firmware → repeat with suitable firmware. 4. Contact the Service Department.
302	Battery low	M	On	Off	Buffer battery of real time clock is low The date and time are lost if the power is interrupted. ▶ Contact the Service Department (battery replacement).
304	Module data	F	On	On	At least 1 module has incorrect configuration data 1. Check the system information. 2. Contact the Service Department.
305	Power consumption	F	On	On	Total power consumption too high 1. Check installation. 2. Remove sensors/modules.
306	Software error	F	On	On	Internal firmware error ▶ Contact the Service Department.
310	Temperature sensor	F	On	On	Temperature sensor PT1 in the climate control module for sample compartment measurement is defective ▪ No temperature regulation possible for the sample compartment ▪ Unable to cancel the sampling program ▶ Contact the Service Department.
311	Temperature sensor	F	On	On	Temperature sensor PT2 in the sample compartment is defective ▪ No sample temperature measurement possible ▪ An in-progress sampling program cannot be canceled ▶ Replace the sensor.

No.	Message	Factory settings			Tests or remedial action
		S [1]	D [2]	F [3]	
312	Temperature sensor	F	On	On	Temperature sensor PT3 for ambient temperature measurement is defective ▪ Winter operation regulation not possible ▪ Sampling and distribution arm blocked to protect against freezing 1. Deactivate winter operation under **Setup**/**Inputs**/**Temperature** S:3/**Winter operation**. 2. Replace the sensor.
313	Safety sensor	M	On	On	Safety switch LF2 for sample sensor active ▪ Contact electrodes for sample detection are fouled ▪ The sample continues to be taken 1. Clean sample detection sensor LF1 in the dosing glass. 2. Contact the Service Department.
314	No sample flow	F	On	On	A vacuum cannot be generated in the peristaltic pump. 1. Check the pump hose for leaks. 2. Immerse the suction line in the medium.
315	Refrigeration	F	On	On	▪ Sample compartment target temperature not reached ▪ Cooling regulation not possible 1. Check the sample compartment door. 2. Perform the module test under **Menu**/**Diagnostics**/**System test**/**Cooling system**/**Check cooling**. 3. Contact the Service Department.
316	Heating	F	On	On	▪ Sample compartment target temperature not reached ▪ Heating regulation not possible 1. Check the sample compartment door. 2. Perform the module test under **Menu**/**Diagnostics**/**System test**/**Cooling system**/**Check heating**. 3. Contact the Service Department.
317	Liquidsensor	M	On	On	▪ Sensor LF1 for sample detection fouled ▪ Five samples still possible ▶ Clean sensor LF1 in the dosing glass.
318	Liquidsensor	F	On	On	▪ Sensor LF1 for sample detection defective ▪ No sampling possible ▶ Contact the Service Department.
319	Safety sensor	M	On	On	▪ Safety switch LF2 fouled ▪ Five samples still possible ▶ Clean sensor LF2 in the dosing glass.
320	Safety sensor	F	On	On	▪ Safety switch LF2 defective ▪ No sampling possible ▶ Contact the Service Department.

No.	Message	Factory settings			Tests or remedial action
		S [1]	D [2]	F [3]	
321	Liquid sensor	F	On	On	Capacitance sensor adjusted incorrectly or defective ▪ No medium detection possible in the dosing glass ▪ No sampling possible 1. Clean sensor. 2. Contact the Service Department.
322	Read sub-program	F	On	On	Selected subprogram cannot be read from the program memory ▶ Create a new subprogram.
323	Write sub-program	F	On	On	Subprogram created cannot be saved 1. Hardware error 2. Contact the Service Department.
324	Delete sub-program	F	On	On	Selected subprogram cannot be deleted from the program memory ▶ Perform a software reset.
325	Read subprogram list	F	On	On	Subprogram list cannot be read from the program memory ▶ Perform a software reset.
326	Membrane pump	F	On	On	▪ Membrane pump defective ▪ Motor cable broken ▶ Contact the Service Department.
327	Air-Manager	F	On	On	▪ Air manager for compressed air distribution defective ▪ Photoelectric barrier defective ▪ Cable defective ▶ Contact the Service Department.
328	Distribution arm	F	On	On	Distribution arm zero point not found during reference run 1. Perform the distribution arm test under **Menu/Diagnostics/System test/ Distribution arm**. 2. Contact the Service Department.
329	Pump failure	F	On	On	Pump motor is drawing excess current ▶ Contact the Service Department.
330	Membrane pump	F	On	On	Membrane pump control defective ▶ Contact the Service Department.
331	Peristaltic pump	F	On	On	▪ Peristaltic pump defective ▪ Motor cable broken ▶ Contact the Service Department.
332	Peristaltic pump	F	On	On	Control of peristaltic pump defective ▶ Contact the Service Department.
333	Pressure sensor	F	On	On	Medium detection not possible, sampling not possible ▪ Suction line not drained before sampling ▪ Pressure sensor defective 1. Check the suction line, if necessary use the pump test under **Menu/Diagnostics/ System test/Pump purge**. 2. Contact the Service Department.

No.	Message	Factory settings			Tests or remedial action
		S [1]	D [2]	F [3]	
334	Cooling system	F	On	On	Climate control module defective 1. Replace the climate control module. 2. Contact the Service Department.
335	Fan defective	F	On	On	Fan defective 1. Replace the fan. 2. Contact the Service Department.
337	Pump hose warning	M	On	Off	End of pump hose service life will be reached shortly Display under **Menu/Diagnostics/Operating time information/Pump tube life** 1. Schedule replacement. 2. After replacing, reset the operating time under **Menu/Diagnostics/Operating time information**.
338	Pump hose alarm	M	On	Off	End of pump hose service life reached Display under **Menu/Diagnostics/Operating time information/Pump tube life**. 1. Replace the pump hose. 2. After replacing, reset the operating time under **Menu/Diagnostics/Operating time information**.
339	Liquidsensor	M	On	Off	Sensor LF1 fouled 1. Clean the sensor soon. 2. Set the sensitivity under: **Setup/General settings/Sampling/Conductive sensor**.
340	Liquidsensor	M	On	Off	Sensor LF1 fouled 1. Clean sensor. 2. Set the sensitivity under: **Setup/General settings/Sampling/Conductive sensor**.
343	Power supply	M	On	Off	Power supply failure
344	Program pause	C	On	Off	Sampling program paused
345	Time changeover	M	On	Off	Daylight saving time/winter time setting Normal time (winter time) active
346	Time changeover	M	On	Off	Daylight saving time/winter time setting Daylight saving time active
347	No sample confirm.	F	On	On	Sampling command has not been processed 1. Check the internal cable to 1IF. 2. Perform a software reset.
348	Read program	F	On	On	Selected program cannot be read from the program memory ► Create a new program.
349	Read program	F	On	On	Program created cannot be saved Hardware error has occurred ► Contact the Service Department.
351	Delete program	F	On	On	Selected program cannot be deleted from the program memory ► Perform a software reset.
352	Read Programlist	F	On	On	Program list cannot be read from the program memory ► Reset the device: **Menu/Diagnostics/Device restart**

No.	Message	Factory settings			Tests or remedial action
		S [1]	D [2]	F [3]	
353	Overfill check	F	On	Off	Total capacity of bottle reached No further sampling to current bottle is triggered ▶ If desired: Make changes to the sampling program under **Select sampling program**.
354	Bottle check	F	On	Off	No empty bottles available for current program No further sampling ▶ Check program settings under **Select sampling program**.
355	Start time over	M	On	Off	Start time entered is in the past ▶ Enter a new start time.
356	Overfill check	F	On	Off	The total sample volume does not fit in the sample bottle ▶ Change the sample volume.
357	Sampling faulted	M	On	Off	▪ Sample discarded ▪ There are too many sampling requests pending ▶ Make changes to the sampling program under: **Select sampling program**.
358	Configuration	F	On	On	Program configuration does not match the current device configuration ▶ Adjust the configuration.
359	Emptying error	F	On	On	▪ Error during emptying ▪ Emptying and sampling program is canceled 1. Check the connection to the FMSY1 module. 2. Check the 4R module, replace it if necessary. 3. Reset the device: **Menu**/**Diagnostics**/**Device restart**
366	Module connection	F	On	On	No communication with the actuator module ▶ Check the internal connecting cable to the 1IF module.
370	Internal voltage	F	On	On	Internal voltage outside the valid range 1. Check supply voltage. 2. Check inputs and outputs for short-circuiting.
373	Electronictemp. high	M	On	Off	High electronics temperature ▶ Check ambient temperature and energy consumption.
374	Sensor check	F	On	Off	No measurement signal from sensor 1. Check sensor connection. 2. Check the sensor, replace it if necessary.
375	No 4R module	F	On	On	No connection to the 4R module 1. Check the 4R module, replace it if necessary. 2. Restart the software under: **Menu**/**Diagnostics**/**Device restart**.
401	Factory reset	F	On	On	Factory reset is performed
403	Device verification	M	Off	Off	Device verification active, please wait

No.	Message	Factory settings			Tests or remedial action
		S [1]	D [2]	F [3]	
405	Service IP active	C	Off	Off	Service switch is switched on The device can be addressed at 192.168.1.212. ► Switch off the service switch to change to the saved IP settings.
412	Writing backup	F	On	Off	► Wait for the write process to be finished
413	Reading backup	F	On	Off	► Wait.
436	**SD card** (80%)	M	On	Off	SD card 80% full 1. Replace SD card with empty card. 2. Clear SD card. 3. Set logbook properties to ring buffer (**Setup/General settings/Logbooks**).
437	**SD card** (100%)	M	On	Off	SD card 100% full. No longer possible to write to the card. 1. Replace SD card with empty card. 2. Clear SD card. 3. Set logbook properties to ring buffer (**Setup/General settings/Logbooks**).
438	SD card removed	M	On	Off	SD card not plugged in 1. Check SD card. 2. Replace SD card. 3. Disable logging.
455	Mathemat. function	F	On	On	Mathematical function: fault condition 1. Check mathematical function. 2. Check assigned input variables.
460	Output below limit	S	On	Off	Reasons ▪ Sensor in air ▪ Air pockets in assembly ▪ Sensor fouled ▪ Incorrect flow to sensor 1. Check sensor installation. 2. Clean sensor. 3. Change assignment of current outputs.
461	Output above limit	S	On	Off	
502	No text catalog	F	On	On	► Contact the Service Department.
503	Language change	M	On	Off	Language change failed ► Contact the Service Department.
529	Diag. setup active	C	Off	Off	► Wait for maintenance to be finished.
530	Logbook at 80%	M	On	Off	1. Save the logbook to the SD card and then delete the logbook in the device. 2. Set memory to circular buffer. 3. Deactivate logbook.
531	Logbook full	M	On	Off	
532	License error	M	On	Off	► Contact the Service Department.
540	Parameter save fail	M	On	Off	Storage of configuration has failed ► Repeat.
541	Parameter load ok	M	On	Off	Configuration successfully loaded
542	Parameter load fail	M	On	Off	Loading of configuration has failed ► Repeat.
543	Parameter load abort	M	On	Off	Configuration loading aborted

No.	Message	Factory settings			Tests or remedial action
		S [1]	D [2]	F [3]	
544	Parameter reset ok	M	On	Off	Factory default successful
545	Parameter reset fail	M	On	Off	Setting of device configuration to factory setting has failed
903	Minimum flow	F	On	On	The flow is too low for flow-proportional sampling 1. Check the medium flow. 2. Check the flowmeter. 3. Check the configuration under **Setup/ Inputs/Current input** S:x.
910	Limit switch	S	On	Off	Limit switch activated
920	No sample	F	On	On	No inflow during dosing process ▪ Suction line blocked or leaking ▪ No inflow of sample 1. Check suction line and suction strainer 2. Check inflow of sample.
921	Pump bracket open	F	On	On	The pump bracket is detected as open ▪ Pump bracket open ▪ Reed contact defective 1. Close the pump bracket. 2. Contact the Service Department.
922	Armature cycle	M	On	Off	O-ring seals on sampling assembly approaching end of operating life Display under **Diagnostics/Operating time information/Inline armature** 1. Replace the seals. 2. Switch off monitoring under **Setup/ General settings/Sampling/Diagnostics settings/Process sealing**. 3. Contact the Service Department
923	Armature cycle	M	On	On	O-ring seals on sampling assembly have reached end of operating life Display under **Diagnostics/Operating time information/Inline armature** 1. Replace the seals. 2. Switch off monitoring under **Setup/ General settings/Sampling/Diagnostics settings/Process sealing**. 3. Contact the Service Department.
924	Inline armature	F	On	On	Final sampling position (in the process) of sampling assembly not reached or detected ▪ Final position switch is damaged ▪ Supply cables are damaged 1. Check the final position switches. 2. Check the supply cables to the final position switches. 3. Contact the Service Department.

No.	Message	Factory settings			Tests or remedial action
		S [1]	D [2]	F [3]	
925	Inline armature	F	On	On	Final sampling position (in the process) of sampling assembly not reached or detected ▪ Assembly blocked ▪ Final position switch is damaged ▪ Supply cables are damaged 1. Check the assembly. 2. Check the final position switches. 3. Check the supply cables to the final position switches. 4. Contact the Service Department.
926	Inline armature	F	On	On	Final dosing position (outside the process) of sampling assembly not reached or detected ▪ Assembly blocked ▪ Final position switch is damaged ▪ Supply cables are damaged 1. Check the assembly 2. Check the final position switches. 3. Check the supply cables to the final position switches. 4. Contact the Service Department.
927	Winter operation	S	On	Off	1. Winter operation active 2. Outside temperature too low 3. No sampling
928	No sample	F	On	On	Sample intake not possible ▪ Suction line clogged ▪ Suction height too high 1. Check the suction line and suction strainer. 2. Ensure suitable suction height (< 8 m).
929	Input signal	F	On	On	▪ Sensors reversed ▪ Sensor not present ► Check measuring inputs.
930	No sample	F	On	On	Sample flow interrupted during intake ▪ Suction line blocked or leaking ▪ No inflow of sample 1. Check the suction line and suction strainer. 2. Check inflow of sample.
937	Controlled variable	S	On	Off	Controller input warning Status of the controller variable is not OK ► Check application.
938	Controller setpoint	S	On	Off	Controller input warning Status of set point is not OK ► Check application.
939	Control. disturbance	S	On	Off	Controller input warning Status of disturbance variable is not OK ► Check application.
951 - 958	Hold active CH1 ..	C	On	Off	Output values and status of the channels are on hold. ► Wait until the hold is deactivated again.

No.	Message	Factory settings			Tests or remedial action
		S [1]	D [2]	F [3]	
961 - 968	Diagnostic module 1 (961) ... Diagnostic module 8 (968)	S	Off	Off	Diagnostic module is enabled
969	Modbus Watchdog	S	Off	Off	The device did not receive a Modbus telegram from the master within the specified time. The status of Modbus process values received is set to invalid
970	Curr. input overload	S	On	On	Current input overloaded The current input is switched off from 23 mA due to overload and reactivated automatically when a normal load is present.
971	Current Input low	S	On	On	Current input too low At 4 to 20 mA, the input current is less than the lower failure current. ▶ Check the input for short-circuiting.
972	Curr. input > 20 mA	S	On	On	Current output range exceeded
973	Current Input < 4 mA	S	On	On	Current output range undershot
974	Diagnostics confirm.	C	Off	Off	User has acknowledged the message displayed in the measuring menu.
975	Device restart	C	Off	Off	Device reset
978	ChemoClean Failsafe	S	On	On	No feedback signal detected within the configured period. 1. Check application. 2. Check wiring. 3. Extend the duration.
990	Deviation limit	F	On	On	Redundancy: limit value of percentage deviation exceeded
991	CO2 conc. range	F	On	On	CO_2 concentration (degassed conductivity) outside the measuring range
992	pH calculation range	F	On	On	pH calculation outside the measuring range
993	rH calculation range	F	On	On	rH calculation outside the measuring range
994	Difference conduct.	F	On	On	Dual conductivity outside the measuring range

1) **Status signal**
2) **Diagnostic message**
3) **Failure current**

11.5 Pending diagnostics messages

The Diagnostics menu contains all the information on the device status.

Furthermore, various service functions are available.

The following messages are directly displayed every time you enter the menu:
- **Most important message**
  Diagnostic message recorded with the highest criticality level
- **Past message**
  Diagnostic message whose cause is no longer present.

All the other functions in the Diagnostics menu are described in the following chapters.

Diagnostic messages associated with sampling are deleted under the following conditions:
- Diagnostic messages caused by sampling are deleted automatically with the next successful sampling.
- Diagnostic messages caused by the level of medium in the bottle are deleted the next time the bottle is changed.

If the diagnostic message "M313 liquid sensor" appears 5 times in succession when executing a program, the active program is aborted for reasons of safety. This behavior on the part of the device cannot be altered by deactivating the diagnostic message under **Menu/Setup/General settings/Extended setup/Diagnostics settings** .

11.6 Diagnostics list

All the current diagnostic messages are listed here.

A time stamp is available for each message. Furthermore, the user also sees the configuration and description of the message as saved in **Menu/Setup/General settings/Extended setup/Diagnostics settings/Diag. behavior** .

11.7 Logbooks

11.7.1 Available logbooks

Types of logbooks
- Logbooks physically available (all apart from the overall logbook)
- Database view of all logbooks (=overall logbook)

Logbook	Visible in	Max. entries	Can be disabled [1])	Logbook can be deleted	Entries can be deleted	Can be exported
Overall logbook	All events	20000	Yes	No	Yes	No
Calibration logbook	Calibration events	75	(Yes)	No	Yes	Yes
Operation logbook	Configuration events	250	(Yes)	No	Yes	Yes
Diagnostics logbook	Diagnostic events	250	(Yes)	No	Yes	Yes
Program log	Program logbook	5000	Yes	No	Yes	Yes
Version logbook	All events	50	No	No	No	Yes
Hardware version logbook	All events	125	No	No	No	Yes
Data logbook for sensors (optional)	Data logbooks	150 000	Yes	Yes	Yes	Yes
Debugging logbook	Debug events (only accessible by entering the special service activation code)	1000	Yes	No	Yes	Yes

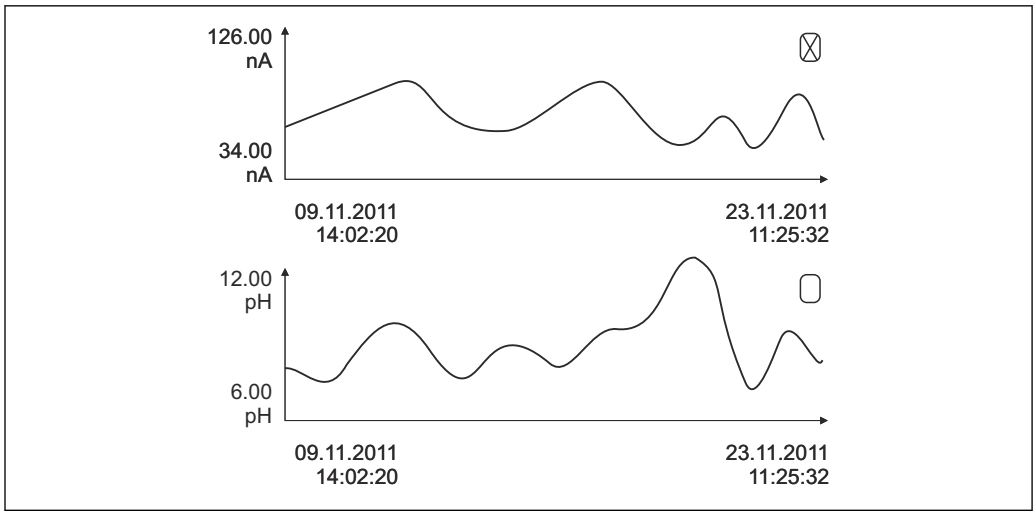
1) Data in brackets means this depends on the overall logbook

11.7.2 Logbooks menu

DIAG/Logbooks		
Function	**Options**	**Info**
▶ All events		Chronological list of all the logbook entries, with information on the type of event
▶ Show	Events are displayed	Select a particular event to display more detailed information.
▶ Go to date	**User entry** ▪ Go to date ▪ Time	Use this function to go directly to a specific time in the list. In this way, you avoid having to scroll through all the information. The complete list is always visible, however.
▶ Calibration events		Chronological list of the calibration events
▶ Show	Events are displayed	Select a particular event to display more detailed information.
▶ Go to date	**User entry** ▪ Go to date ▪ Time	Use this function to go directly to a specific time in the list. In this way, you avoid having to scroll through all the information. The complete list is always visible, however.
▷ Delete all entries	Action	You can delete all the calibration logbook entries here.
▶ Configuration events		Chronological list of the configuration events
▶ Show	Events are displayed	Select a particular event to display more detailed information.
▶ Go to date	**User entry** ▪ Go to date ▪ Time	Use this function to go directly to a specific time in the list. In this way, you avoid having to scroll through all the information. The complete list is always visible, however.
▷ Delete all entries	Action	You can use this to delete all the operation logbook entries.
▶ Diagnostic events		Chronological list of the diagnostics events
▶ Show	Events are displayed	Select a particular event to display more detailed information.
▶ Go to date	**User entry** ▪ Go to date ▪ Time	Use this function to go directly to a specific time in the list. In this way, you avoid having to scroll through all the information. The complete list is always visible, however.
▷ Delete all entries	Action	You can use this to delete all the diagnostics logbook entries.

You can also view your data logbook entries graphically on the display (**Show plot**).

You can also adapt the display to suit your individual requirements:
- Press the navigator button in the graphic display: you are given additional options such as the zoom function and x/y movement of the graph.
- Define the cursor: if you select this option, you can move along the graph with the navigator and view the logbook entry (data stamp/measured value) in text form for every point in the graph.
- Simultaneous display of two logbooks: **Select 2nd plot** and **Show plot**
  - A small cross marks the currently selected graph for which the zoom can be changed or a cursor used, for example.
  - In the context menu (press the navigator button), you can select the other graph. You can then apply the zoom function, a movement or a cursor to this graph.
  - Using the context menu, you can also select both graphs simultaneously. This enables you to use the zoom function on both graphs simultaneously, for example.



40 Simultaneous display of two graphs, the top one is selected

DIAG/Logbooks		
Function	**Options**	**Info**
▶ Data logbooks		Chronological list of the data logbook entries for sensors
Data logbook 1 ... 8 <Logbook name>		This submenu is available for each data logbook that you have set up and activated.
Source of data	Read only	Input or mathematical function is displayed
Measured value	Read only	Measured value being recorded is displayed
Log time left	Read only	Display of days, hours and minutes until logbook is full. ▸ Pay attention to the information on selecting the memory type in the menu **General settings/Logbooks**.
▶ Show	Events are displayed	Select a particular event to display more detailed information.
▶ Go to date	**User entry** ▪ Go to date ▪ Time	Use this function to go directly to a specific time in the list. In this way, you avoid having to scroll through all the information. The complete list is always visible, however.
▶ Show plot	Graphic display of the logbook entries	The display is according to your settings in the menu **General settings/Logbooks**.
Select 2nd plot	Select another data logbook	You can view a second logbook at the same time as the current one.
▷ Delete all entries	Action	You can use this to delete all data logbook entries.
▶ Save logbooks		
File format	**Selection** ▪ CSV ▪ FDM	▸ Save the logbook in the preferred file format. You can then open the saved CSV file on the PC in MS Excel, for example, and make further edits here. [1]. You can import the FDM files into FieldCare and archive them so that they are tamper-proof.

DIAG/Logbooks		
Function	**Options**	**Info**
▷ Program logbook ▷ All data logbooks ▷ Data logbook 1 … 8 ▷ All event logbooks ▷ Calibration logbook ▷ Diagnostic logbook ▷ Configuration logbook ▷ HW version logbook ▷ Version logbook	Action, commences as soon as the option is selected	Use this function to save the logbook to an SD card. ▶ Insert the SD card into the device card reader and select the logbook to be saved. ▶ Save the logbook in the preferred file format. You can then open the saved CSV file on the PC in MS-Excel, for example, and edit it. You can import the FDM files into Fieldcare and archive them so they are tamper-proof.
The file name is made up of the **Logbook ident** (**Menu**/**Setup**/**General settings**/**Logbooks**), an abbreviation for the particular logbook and a time stamp.		

1) CSV files use international number formats and separators. Therefore they must be imported into MS Excel as external data with the correct format settings. If you double-click the file to open it, the data are only displayed correctly if MS Excel is installed with the US country setting.

11.7.3 Program logbook

Entry	Example	Info
Timestamp	05.05.2010 12:40	Time stamp - the start time in the case of sampling
Event	BasicPrgStart	**Power on** --> Time the device is started **Power failure** --> Time the power failed (to the minute) **BasicPrgStart, StdPrgStart** --> Time the program was started **BasicSampling, StdSampling** --> Entry made during sampling **PrgPartStart, PrgPartStop** --> Time a subprogram is enabled and disabled **PrgStop** --> Time the program was ended
Name	Program1	**In the case of BasicPrgStart, StdPrgStart, BasicSampling or PrgStop** --> The name of the program appears **In the case of StdSampling, PrgPartStart or PrgPartStop** --> The name of the subprogram appears
Bottle configuration	12x+6x - PE/glass plate distribution	The selected bottle configuration is displayed
Left bottle volume	1000	The bottle volume is displayed --> "Right bottle volume" remains empty for bottle configurations with different volumes
Right bottle volume	3000	

Entry	Example	Info
Sampling mode	Time-paced CTCV	**Time-paced CTCV** Time-paced **Flow-paced VTCV** Flow-paced **Time/flow-paced CTVV** Time/flow-paced **Single sample** Single sample **Sample table** Single sample **Sampling mode** Display of the sampling mode
Sampling interval/unit	10 min	Display of the interval and the unit
Samples/bottle	4	**With bottle change** Number of samples per bottle .
Bottles/sample	0	Multiple bottles,
Sampling volume/unit	100 ml	Sample volume when sampling
Start mode	Immediate	Field only populated for **PrgPartStart, BasicPrgStart** and **StdPrgStart**: --> The program start setting is displayed ▪ **Immediate** --> immediately ▪ **Date/time** --> after date/time ▪ **Volume** --> with a volume ▪ **Event** --> when an event occurs ▪ **Interval** --> after an interval ▪ **Individual dates** --> individual timetable ▪ **Multiple date** --> multiple dates
Start date	05.05.2010	Field only populated if **Start mode = Date/ Time**: --> The start date is displayed
Stop mode	Program end	The program stop setting is displayed: ▪ **Program end** --> when the program ends ▪ **Continuous** --> continuous operation ▪ **Bottles full** --> when bottles are full ▪ **Date/time** --> after date/time ▪ **Event** --> when an event occurs
Stop date	06.05.2010	Field only populated if **Program end** = **Date/Time**: --> The date the program was stopped is displayed
Start flow sum/unit	100 m^3	Field only populated if **Start mode** = **Volume**: --> The starting volume is displayed
Bottle number	1	Field only populated for **BasicSampling** or **StdSampling**: --> The bottle which was filled with the sample is displayed
Sample nbr	2	Number of samples transferred to the current bottle
Sampling result	Sampling Ok	**Sampling Ok** --> sampling ok **Sampling nOk** --> sampling failed --> For detailed diagnostics messages, see the diagnostics logbook

Entry	Example	Info
Running sample number	1	Running sample number in the current program
Flow sum since last sampling	1	For **flow-paced** and **time/flow-paced** sampling: --> Flow since the last sampling For all other types of sampling: --> Display: 0

11.7.4 Bottle statistics

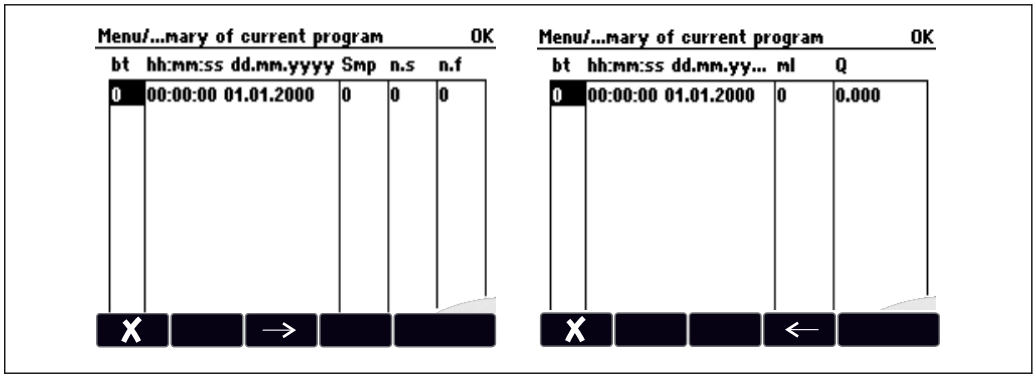
The bottle statistics of the sampler are displayed:

- In **Menu/Diagnostics/Logbooks/Logbook program** select the **Show summary of current program** menu item or simply select the STAT soft key during an active sampling program
  - The statistics are displayed for each individual bottle when the program is started. This gives you detailed feedback on the last sampling operations.

The statistics are deleted when the following event occurs:
Program is started

The statistics are selectively overwritten when the following event occurs:
When the first bottle is reached in situations where "Continuous operation" is configured as the end of the program in the program settings

The statistics are displayed as follows:



A0045690

Display	Info
bt	The bottle number is displayed.
hh:mm	The time the first sample was transferred to the bottle is displayed.
DD-hh:mm	The time the first sample was transferred to the bottle is displayed.
Smp	Displays how often sampling was triggered per bottle.
n.s	Indicates the number of times a sample was not taken even though sampling was triggered. This can occur if the maximum permissible fill volume for the bottle has been reached but the system is still supposed to transfer samples to the bottle. The "Overfill sensor" message is displayed while the program is active.
n.f	The value indicates how often sampling was canceled since the system was unable to take in any medium, or enough medium, into the dosing chamber to cover the LF1 probe.
ml	The sampling volume collected per bottle is displayed.
Q	The total flow for every bottle is displayed (if connected).

11.8 Device information

11.8.1 System information

DIAG/System information		
Function	**Options**	**Info**
Device tag	Read only	Individual device tag → **General settings**
Order code	Read only	You can order identical hardware with this code. This code changes on account of changes to the hardware and you can enter the new code you received from the manufacturer here [1].
To establish the version of your device, enter the order code into the search screen at the following address: www.endress.com/order-ident		
Orig. order code ext.	Read only	Complete order code for the original device, resulting from the product structure.
Current order code ext.	Read only	Current code, taking into account changes to the hardware. You must enter this code yourself.
Serial number	Read only	The serial number allows you to access device data and documentation on the Internet: www.endress.com/device-viewer
Software version	Read only	Current version
Sw version FMSY1	Read only	Current version
FMSY1 proj. version	Read only	Current version
▶ SD card	Read only ▪ Total ▪ Free memory	
▶ System modules		
Backplane	Read only ▪ Description ▪ Serial number ▪ Order code ▪ Hardware version ▪ Software version	This information is provided for every electronics module available. Specify the serial numbers and order codes when servicing, for example.
Base		
Display module		
Extension module 1 … 8		
▶ Sensors	Read only ▪ Description ▪ Serial number ▪ Order code ▪ Hardware version ▪ Software version	This information is provided for every sensor available. Specify the serial numbers and order codes when servicing, for example.
▶ Save system information		
▷ Save to SD card	File name assigned automatically (includes a time stamp)	The information is saved on the SD card in a "sysinfo" subfolder. The csv file can be read and edited in MS Excel, for example. This file can be used when servicing the device.

DIAG/System information		
Function	**Options**	**Info**
▶ Heartbeat operation		Heartbeat functions are only available with the appropriate device version or optional access code.

▶ Device	Read only
	▪ Total operating time
	▪ Counters since reset
	  ▪ Availability
	  ▪ Operating time
	  ▪ Time in failure
	  ▪ Number of failures
	  ▪ MTBF
	  ▪ MTTR
	▪ ▷ Reset counters
		Availability
		Percentage of time no error with the status signal F was pending (**Operating time** - **Time in failure**)*100% /**Operating time**
		Time in failure
		Total amount of time an error with the status signal F was pending
		MTBF
		Mean Time Between Failures (**Operating time** - **Time in failure**)/ **Number of failures**
		MTTR
		Mean Time To Repair **Time in failure**/**Number of failures**

1) Provided you give the manufacturer all the information about changes to the hardware.

11.8.2 Sensor information

▶ Select the channel you want from the list of channels.

Information in the following categories is displayed:
- **Extreme values**
  Extreme conditions to which the sensor was previously exposed, e. g. min./max. temperatures [2)]
- **Operating time**
  Operating time of the sensor under defined extreme conditions
- **Calibration information**
  Calibration data of the last calibration
- **Sensor specifications**
  Measuring range limits for main measured value and temperature
- **General information**
  Information on sensor identification

The specific data that are displayed depends on what sensor is connected.

11.9 Simulation

You can simulate values at inputs and outputs for testing purposes:
- Current values at current outputs
- Measured values at inputs
- Relay contact opening or closing

Only current values are simulated. Via the simulation function, it is not possible to calculate the totalized value for the flow or rainfall.

▶ Before simulation: Enable the inputs and outputs in the Setup menu.

2) Not available for all sensor types.

DIAG/Simulation		
Function	**Options**	**Info**
▶ Current output x:y		Simulation of an output current This menu appears once for each current output.
Simulation	**Selection** ▪ Off ▪ On **Factory setting** Off	If you simulate the value at the current output, this is indicated on the display by a simulation icon in front of the current value.
Current	2.4 to 23.0 mA **Factory setting** 4 mA	▶ Set the desired simulation value.
▶ Alarm relay ▶ Relay x:y		Simulation of a relay state This menu appears once for each relay.
Simulation	**Selection** ▪ Off ▪ On **Factory setting** Off	If you simulate the relay state, this is indicated on the display by a simulation icon in front of the relay display.
State	**Selection** ▪ Low ▪ High **Factory setting** Low	▶ Set the desired simulation value. The relay switches in accordance with your setting when you switch on the simulation. On the measured value display, you see **On** (= **Low**) or **Off**(= **High**) for the simulated relay state.
▶ Meas. inputs		Simulation of a measured value (only for sensors) This menu appears once for each measuring input.
Channel : parameter		
Simulation	**Selection** ▪ Off ▪ On **Factory setting** Off	If you simulate the measured value, this is indicated on the display by a simulation icon in front of the measured value.
Main value	Depends on the sensor	▶ Set the desired simulation value.
Sim. temperature	**Selection** ▪ Off ▪ On **Factory setting** Off	If you simulate the temperature measured value, this is indicated on the display by a simulation icon in front of the temperature.
Temperature	-50.0 to +250.0 °C (-58.0 to 482.0 °F) **Factory setting** 20.0 °C (68.0 °F)	▶ Set the desired simulation value.
Binary input x:y Binary output x:y		Simulation of a binary input or output signal The number of submenus available corresponds to the number of binary inputs or outputs.
Simulation	**Selection** ▪ Off ▪ On **Factory setting** Off	
State	**Selection** ▪ Low ▪ High	

11.10 Device test

Menu/Diagnostics/System test		
Function	**Options**	**Info**
▶Power supply	Read only	The current supply voltage is displayed.
▶ **Cooling system** (only for version with sample compartment temperature regulation)		
▶ Check cooling		
Power supply	Read only	The current supply voltage is displayed. With AC power supply: 24 V ±0.5 V With DC power supply: 22 to 28 V
Overcurrent	Read only	No: no error Yes: the fan in the climate control module is defective -> Contact the Service Department
Sample compartment	Read only	The current temperature of the sample compartment is displayed.
Sample compartment	Read only	When you start the cooling test, the temperature at the start time is displayed
Cooling test off or **Cooling test on** -> progress is displayed		
▷ Start Test	Action	Start the cooling test.
▷ Stop test	Action	End the cooling test.
▶ Check heating		
Power supply	Read only	The current supply voltage is displayed. With AC power supply: 24 V ±0.5 V With DC power supply: 22 to 28 V
Overcurrent	Read only	No: no error Yes: the heating is defective -> Contact the Service Department
Overcurrent	Read only	No: no error Yes: the fan is defective -> Contact the Service Department
Sample compartment	Read only	The current temperature of the sample compartment is displayed.
Sample compartment	Read only	When you start the heating test, the temperature at the start time is displayed
Heating test off or **Heating test on** -> progress is displayed		
▷ Start Test	Action	Start the heating test.
▷ Stop test	Action	End the heating test.
▶ Manual sampling		
Bottle configuration	Read only	
Bottle configuration	Read only	
Bottle configuration	**Selection** ▪ Front ▪ Bottle 1 ... ▪ Back	Select which bottle should be filled with the sample.
Sample volume	50 to 2000 ml 10 to 10000 ml **Factory setting** 100 ml	You can change the sample volume in the version with the peristaltic pump. The sample volume can be changed.
Sample volume	**Factory setting** 200 ml	The sample volume is preset at the factory in the version with the vacuum pump.

Menu/Diagnostics/System test		
Function	**Options**	**Info**
▷ Start sampling	Action	
▶ Peristaltic pump		
▷ Pump purge	Action	
Pump purge, to stop press ESC	Read only	
Current pump operating time	Read only	
Power supply	Read only	The current supply voltage is displayed. With AC power supply: 24 V ±0.5 V With DC power supply: 22 to 28 V
Motor current	Read only	The current consumption of the pump is displayed.
Vacuum	Read only	The vacuum is an indicator of the suction height. -> 100 mbar corresponds to approx. 1 m suction height
Medium detected	Read only	Yes: the medium was detected No: no medium was detected
▷ Pump suction	Action	
Pump suction, to stop press ESC	Read only	
Current pump operating time	Read only	
Power supply	Read only	The current supply voltage is displayed. With AC power supply: 24 V ±0.5 V With DC power supply: 22 to 28 V
Motor current	Read only	The current consumption of the pump is displayed.
Vacuum	Read only	The vacuum is an indicator of the suction height. -> 100 mbar corresponds to approx. 1 m suction height
Medium detected	Read only	Yes: the medium was detected No: no medium was detected
▷ Vacuum pump (only for version with vacuum pump)	Action	
Bottle configuration	Read only	
Bottle volume	Read only	
Distributor position	**Selection** ▪ Front ▪ Bottle 1 ... ▪ Back	Select which bottle should be filled with the sample.
Sample volume	**Factory setting** 200 ml	The sample volume is preset at the factory.
▷ Start sampling	Action	Perform sampling manually.
Progress	Read only	The progress of the sampling operation is displayed.
Power supply	Read only	The current supply voltage is displayed. With AC power supply: 24 V ±0.5 V With DC power supply: 22 to 28 V
Motor current	Read only	The current consumption of the pump is displayed.

Menu/Diagnostics/System test		
Function	**Options**	**Info**
Medium LF1	Read only	▪ Medium detection LF1 switchoff ▪ Medium detection LF2 disconnection from protective circuit -> Both "No" at the start -> If "Yes", clean LF2
Medium LF2	Read only	
▷ Inline sampling (only for version with sampling assembly)	Action	
Sampling activated, to stop press ESC	Read only	
Progress	Read only	
▷ Distribution arm	Action	Only for bottle configurations with more than one bottle.
Test distribution arm	Read only	When the menu item is activated, the distribution arm undergoes a test run. Afterwards, the system moves to each position in succession and the position is displayed. In the case of plate distribution, the arm moves left and right to ensure the bottles are numbered consecutively. Calibrate the distribution arm if the arm is not positioned precisely over the bottles.
Position	Read only	
▶ Power supply	Read only ▪ Digital supply 1: 1.2V ▪ Digital supply 2: 3.3V ▪ Analog supply: 12.5V ▪ Sensor supply: 24V ▪ Temperature	Detailed list of power supply to instrument. The actual values can vary without a malfunction having occurred.

11.11 Resetting the measuring device

Menu/Diagnostics		
Function	**Options**	**Info**
▷ Device restart	**Selection** ▪ OK ▪ ESC	Restart and keep all the settings
▷ Factory default	**Selection** ▪ OK ▪ ESC	Restart with factory settings Settings that have not been saved are lost.

11.12 Information on operating times

The following information is displayed:
- **Operating hours device**:
  Displays the total operating hours of the device in days, hours and minutes
- **Operating hours cooling** (only for the version with a climate control module):
  Displays the total operating hours of the compressor in days, hours and minutes
- **Overfill sensor** (for version with vacuum pump):
  Number of times a safety switchoff has been caused by LF2
- **Dosing valve** (for version with vacuum pump):
  Number of times the dosing valve is actuated; -> corresponds to the number of samples taken

- **Vacuum pump** (for version with vacuum pump):
  Displays the pump operating time in hours and minutes
- **Sample totalizer** (for version with peristaltic pump):
  Number of all samples taken and sample errors
- **Pump tube life** (for version with peristaltic pump):
  Displays how old the tube is in days, hours and minutes
- **Peristaltic pump** (for version with peristaltic pump):
  Displays the pump operating time in hours and minutes

This counter must be reset when a tube is replaced.

- **Filter mats**:
  Displays the period of usage in days
- **Operating time photometer**:
  Displays the hours of operation in hours
- **Operating time cooling module**:
  (optional): Displays the period of usage in days.

With **Reset** set the specific counter reading to zero.

11.13 Status of inputs/outputs

Path: **Display/Measurement**

The following measured values are listed (read only):
- Binary inputs
  Current function state: on or off
- Current inputs
  Actual current values of all the current inputs available
- Relay
  Current function state: on or off
- Binary outputs
  Current function state: on or off
- Temperature sensors
  Current value is displayed
- Current outputs
  (for version with sensors with the Memosens protocol) Actual current values of the current outputs

11.14 Firmware history

Date	Version	Changes to firmware	Documentation
04/2021	01.09.00	Improvement ▪ Signal type at binary input to control program events ▪ Possible to reset counters when sampling programs are paused ▪ Simple transmission of bottle position and bottle level via the fieldbus	BA00443C/07/EN/25.21 BA00478C/07/EN/10.21 BA00479C/07/EN/23.21 BA01407C/07/EN/07.21
05/2018	01.06.06	Improvement ▪ New soft keys **ALL** and **NONE** in multiple choice editors ▪ Manual factor for CAS51D nitrate ▪ Calibration timer and validity revised for pH, conductivity, oxygen and disinfection ▪ Clear distinction between offset and 1-point calibration for pH ▪ Heartbeat verification report can now also be downloaded via the web server ▪ Better description of diagnostics code 013	BA00444C/07/EN/22.18

Date	Version	Changes to firmware	Documentation
03/2016	01.06.00	Expansion ▪ "Ensure activation" switch with subprogram activation "Interval" ("Bavarian sampling") ▪ Binary input can switch sampling to the hold state Improvement ▪ Sensors can be calibrated while the program is running ▪ Incremental sampling moved after diagnostics/device test ▪ Dosing time for vacuum sampling can be adjusted ▪ Binary output can be switched after multiple samples have been taken ▪ Improved control over the activation/deactivation of subprograms via binary inputs ▪ Specification of "Volume per bottle" in the run screen ▪ Program can be started at a specific time ▪ Paused program can be restarted with new "Continue program" entry via MODE soft key ▪ Minimum sampling time and dosing time reduced to 1 s for in-line sampling	BA00444C/07/EN/19.16 BA00486C/07/EN/02.13 BA01245C/07/EN/03.16
03/2015	01.05.02	Expansion ▪ Time exceeded with flow proportional sampling ▪ Outputs Improvement ▪ Menu corrections (functions, designations) ▪ Chemoclean Plus for samplers	BA00443C/07/EN/19.15 BA01245C/07/EN/02.15

12/2013	01.05.00	Expansion
		▪ Chemoclean Plus
		▪ Calendar function for cleaning
		▪ Conductivity:
		  ▪ Measuring range switching also for conductive conductivity measurement
		  ▪ External temperature signal via current input
		▪ Oxygen:
		  ▪ External pressure or temperature signals via current input
		  ▪ Connected conductivity sensor can be used to calculate the salinity
		▪ SAC, nitrate, turbidity:
		Calibration settings can be configured via fieldbus
		▪ Channel-specific diagnostics codes for HOLD function.
		Improvement
		▪ Web server login for managing multiple users
		▪ Set point and PID parameters for controllers can be configured via fieldbus
			BA00444C/07/EN/17.13
			BA01225C/07/EN/02.13
			BA00486C/07/EN/02.13
			BA01245C/07/EN/01.13

12/2013	01.05.00	Expansion ▪ Calendar function for cleaning ▪ Channel-specific diagnostics codes for HOLD function.	BA00479C/07/EN/16.13

Date	Version	Changes to firmware	Documentation

04/2013
07/2013
	01.04.00	Expansion
		▪ Conductivity:
		  ▪ Measuring range switching
		  ▪ Temperature compensation ISO 7888 at 20 °C
		▪ Support for DIO module
		  ▪ Triggering of external hold
		  ▪ Triggering a cleaning
		  ▪ Limit switch signals via digital output
		▪ Keylock with password protection
		▪ PID controller: feedforward control is supported
		▪ pH:
		  ▪ Icon for manual and automatic temperature compensation (ATC/MTC+MED)
		  ▪ Monitoring for the upper and lower limits of the glass SCS value can be switched on or off independently of each other
		▪ ISE
		  ▪ Simultaneous calibration of two parameters
		  ▪ User-defined electrode type
		  ▪ Raw measured values can be selected for current output
		  ▪ Timer for membrane replacement
		▪ Logbooks are preserved after the firmware update
		Improvement
		▪ PROFIBUS address range for Siemens-S7 moved to the lower area.
		▪ Offset icon only for pH or ORP
		▪ Turbidity: autoranging can be switched off
		▪ Export Print (xml): Export file revised and style sheet added for better legibility.
		Original firmware
			BA00444C/07/EN/16.13
			BA01225C/07/EN/01.13
			BA00445C/07/EN/16.13
			BA01227C/07/EN/01.13
			BA00450C/07/EN/16.13
			BA00450C/07/EN/17.13
			BA00451C/07/EN/15.13
			BA00451C/07/EN/16.13
			BA00486C/07/EN/01.11
			BA00486C/07/EN/02.13

06/2012	01.03.01	Improvement ▪ Hold via soft key ▪ Global or channel-specific hold stops automatic cleaning. Manual cleaning can be started, however. ▪ Adapted factory settings	BA00444C/07/EN/15.12 BA00445C/07/EN/15.12 BA00450C/07/EN/15.12 BA00451C/07/EN/14.11 BA00486C/07/EN/01.11
12/2011	01.03.00	Expansion ▪ Max. 8 sensor channels supported ▪ Current inputs ▪ PROFIBUS DP supported incl. Profile 3.02 ▪ Modbus RTU (RS485) supported ▪ Modbus TCP supported ▪ Integrated web server supported via TCPIP (RJ45) ▪ USP/EP (United States Pharmacopeia and European Pharmacopeia) and TDS (Total Dissolved Solids) for conductivity ▪ Icon for "controller active" in measuring screen Improvement ▪ Controller hold via analog input ▪ Adapted factory settings ▪ SAC: factory calibration in the field incl. reset filter operation time and lamp change ▪ ISFET leak current visible in measuring screen ▪ Multiselect for limit switch and cleaning cycles	BA00444C/07/EN/14.11 BA00445C/07/EN/14.11 BA00450C/07/EN/14.11 BA00451C/07/EN/14.11 BA00486C/07/EN/01.11

Date	Version	Changes to firmware	Documentation

12/2010	01.02.00	Expansion
		▪ Support for additional sensors:
		  ▪ Chlorine
		  ▪ ISE
		  ▪ SAC
		  ▪ Interface
		▪ HART communication
		▪ Mathematical functions
		Improvement
		▪ Modified software structures
		▪ Adapted factory settings
		▪ User-defined measuring screens
			BA444C/07/EN/13.10
			BA445C/07/EN/13.10
			BA450C/07/EN/13.10
			BA451C/07/EN/13.10
			BA00486C/07/EN/01.11

03/2010	01.00.00	Original software	BA444C/07/EN/03.10 BA445C/07/EN/03.10 BA450C/07/EN/03.10 BA451C/07/EN/03.10
04/2010	01.00	Original software	BA443C/07/EN/04.10 BA463C/07/EN/04.10 BA464C/07/EN/04.10 BA467C/07/EN/04.10

12 Maintenance

Effects on process and process control
- Take all the necessary precautions in time to ensure the operational safety and reliability of the entire measuring point.

⚠ WARNING

Process pressure and temperature, contamination, electrical voltage
Risk of serious or fatal injury
- If a sensor has to be removed during maintenance work, avoid hazards posed by pressure, temperature and contamination.
- Make sure the device is de-energized before you open it.
- Power can be supplied to switching contacts from separate circuits. De-energize these circuits before working on the terminals.

NOTICE

Electrostatic discharge (ESD)
Risk of damaging the electronic components
- Take personal protective measures to avoid ESD, such as discharging beforehand at PE or permanent grounding with a wrist strap.
- For your own safety, use only genuine spare parts. With genuine parts, the function, accuracy and reliability are also ensured after maintenance work.

⚠ CAUTION

Possibility of microbiological contamination of content of sample bottles.
Minor to medium injury possible.
- Wear suitable protective clothing.

12.1 Recommended maintenance

Maintenance work has to be carried out at regular intervals to ensure the efficient operation of the sampler.

The maintenance work comprises:
- Replacing the wear parts
- Cleaning the device

The cleaning intervals depend heavily on:
- The medium
- The ambient conditions of the sampler (dust etc.)
- The programming intervals

For this reason, adapt the cleaning intervals to your specific requirements but always ensure that these cleaning tasks are performed regularly.

Replacing wear parts

Wear parts are replaced by Endress+Hauser Service at one- and two-year intervals. Please contact your local sales center in this regard.

Endress+Hauser offers its customers a maintenance contract. A maintenance contract increases the operational safety of your device and reduces your staff's workload. Ask your Endress+Hauser Service Organization for detailed information on maintenance contracts.

12.2 Calibration

12.2.1 Sensors

All connected sensors can be calibrated while a sampling program is active.

12.2.2 Distribution arm

The position of the distribution arm is set at the factory. It is only possible to calibrate the distribution arm in the version with multiple bottles.

The distribution arm must be calibrated if:
- The distribution arm motor has been replaced
- Error message "F236 Distribution arm" appears on the display

1. In menu "**Setup/Basic setup**" select the number of bottles.
2. Proceed as follows to calibrate the distribution arm:

Menu/Calibration active		
Function	**Options**	**Info**
▶ Distribution arm		
▷ Go to ref. point	Action	The reference run is started. The reference point is in the middle at the front. For versions with a distributor plate, the reference point is at the arrow in the middle of the plate. For versions with a distribution assembly the reference point is between bottle number 1 and the last bottle. Separate the upper compartment from the lower compartment to see the reference point.
With▷ **Adjust**you can correct the distribution arm if the unit does not move to the reference point correctly. Use the two arrow keys to correct the position.		

3. Then, in menu **Diagnostics/System test/Reset/Distribution arm**", carry out the distribution arm test.

12.2.3 Vacuum pump sample volume

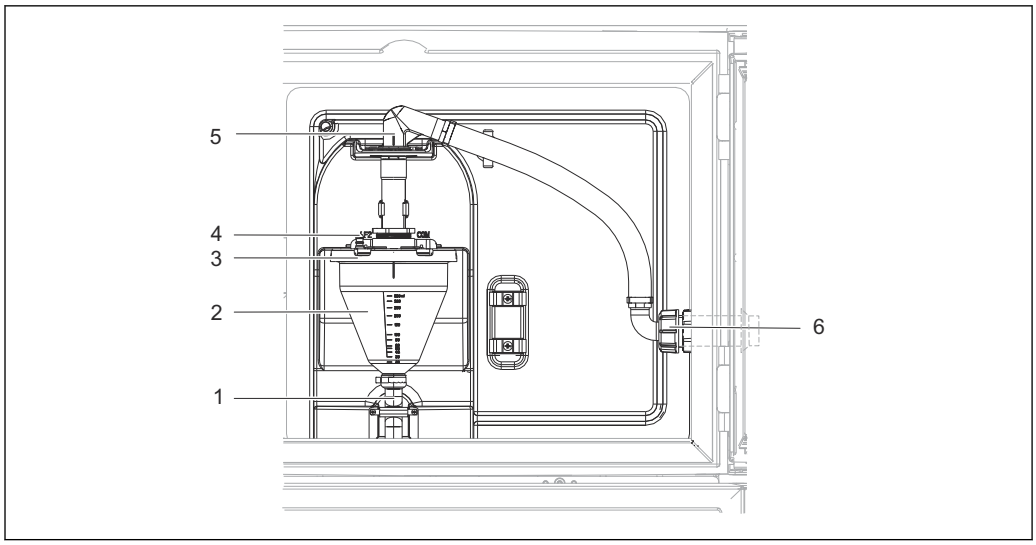
The dosing volume of the vacuum pump is preset to 200 ml at the factory. The required sample volume is set by moving the dosing pipe manually.

NOTICE

Calibration not possible during operation.
The sample volume cannot be determined.
▶ Stop the sampling program before calibrating the sample volume.

Sampling volume calibration

Proceed as follows to calibrate the sample volume:

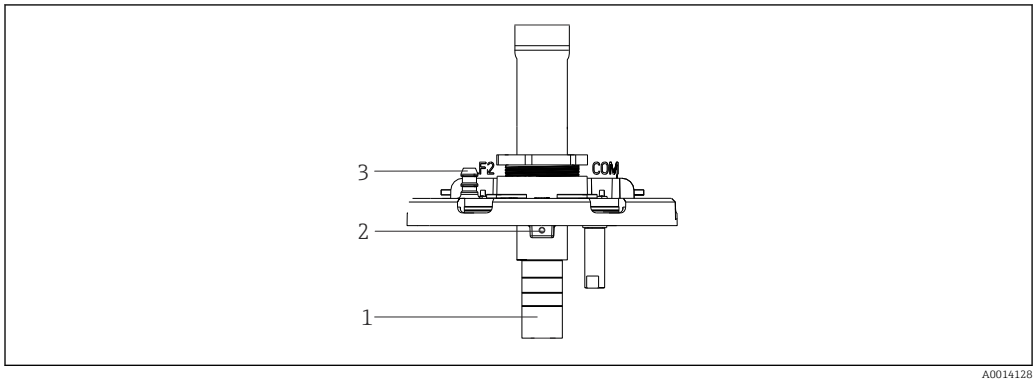


41 *Vacuum pump*

1 *Outflow hose*
2 *Dosing glass*
3 *Dosing chamber cover*
4 *Air hose connection*
5 *Lock for intake hose*
6 *Thread adapter nut for intake hose*

1. Check the sample volume set under Menu/Setup/General settings/Sampling/Dosing volume.
2. Release the thread adapter nut on the intake hose (item 6).
3. Turn the intake hose at the lock (item 5) to the "open" position and pull the hose upwards to disconnect it.
4. Release the air hose (item 4) and remove the dosing chamber (item 2) from the front along with the outflow hose (item 1).
5. Open the bayonet lock (item 3) and open the dosing chamber.

Dosing



42 *Vacuum pump*

1 *Dosing tube*
2 *Allen screw*
3 *Air hose connection*

1. Release the 2mm Allen screw with the key provided.
2. Set the sample volume by adjusting the dosing tube. Secure the dosing tube with the screw.
3. Use the white scale (A) to dose without pressure and the blue scale (B) to dose with pressure.

4. Reinstall the parts in reverse order. Make sure that the contacts of the conductivity sensors are in the correct position.
5. Check that the dosing tube is set correctly by triggering manual sampling.

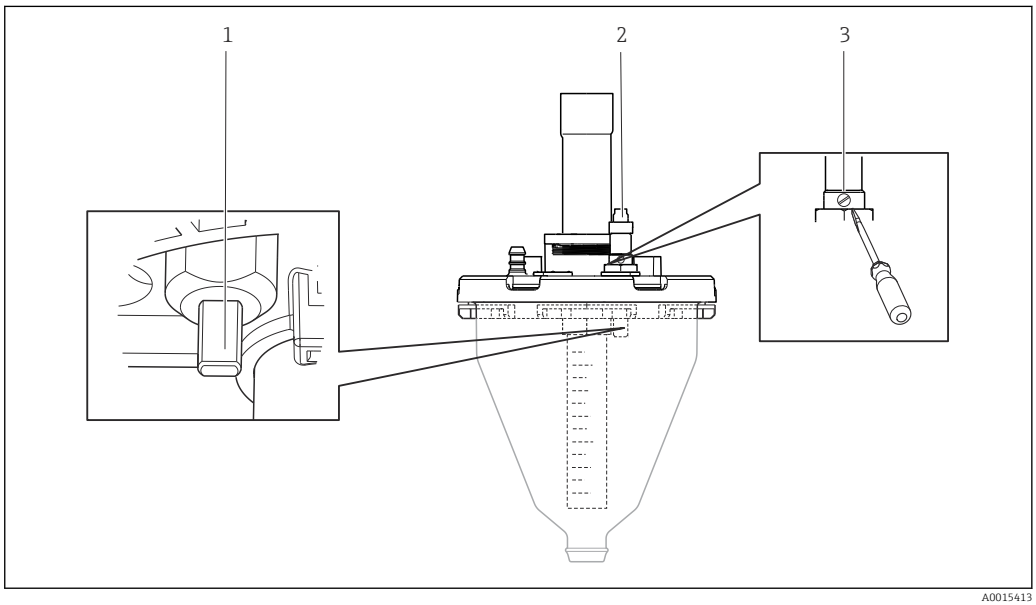
Capacitance sensor

(Only for version with vacuum pump)

The capacitance sensor has already been preset at the factory for water. Only adjust the sensor if the switching sensitivity needs to be changed. This is the case if the sample covers more than 30% of the sensor (item 1). A yellow and green light (item 2) is lit on the capacitance sensor.

Adjustment

Adjust the capacitance sensor as follows:



43 *Capacitance sensor adjustment*

1 Sensor
2 Yellow and green light
3 Adjusting screw

1. Make sure the dosing chamber is empty.
2. Then turn slightly back to the left (counterclockwise) until the yellow light is on again. At this point the sensor is adjusted to the most sensitive setting.
3. In order to verify the settings perform a manual sampling.
4. If this setting is too sensitive (incorrect triggering or the yellow light does not come back on after sampling), adjust the sensor to a more insensitive setting by turning the adjusting screw further to the left.

12.2.4 Peristaltic pump sample volume

The sample volume of the peristaltic pump is calibrated at the factory.

In order to calibrate the sample volume, a measurement beaker with a volume of at least 200 ml is required.

Proceed as follows to calibrate:

Menu/Calibration active		
Function	**Options**	**Info**
▶ Sample volume		
▶ 1-point calibration		
Distributor position	**Selection** ▪ Front ▪ Bottle x ▪ Back	Select the distributor position.
Sample volume	20 to 2000 m **Factory setting** 100 ml	Set the sample volume.
▷ Start sampling	Action	The progress of the sampling operation is displayed.
Check whether the sample volume is correct. Press ▶ No to enter the sample volume actually taken, e.g. 110 ml. Press ▷ Yes to repeat the sampling.		
▶ 2-point calibration Use 2-point calibration for levels that fluctuate greatly. The second sampling point must be either higher or lower (height difference of at least 1 m).		
Distributor position	**Selection** ▪ Front ▪ Bottle x ▪ Back	Select the distributor position.
Sample volume	20 to 2000 ml **Factory setting** 100 ml	Set the sample volume.
▷Start 1. sampling	Action	The progress of the sampling operation is displayed.
Check whether the sample volume is correct. Press ▶ No to enter the sample volume actually taken, e.g. 110 ml. Press ▷ Yes to repeat the sampling.		
▷Start 2. sampling	Action	The progress of the sampling operation is displayed.
Check whether the sample volume is correct. Press ▶ No to enter the sample volume actually taken, e.g. 110 ml. Press ▷ Yes to repeat the sampling.		

12.3 Replacing the pump tube

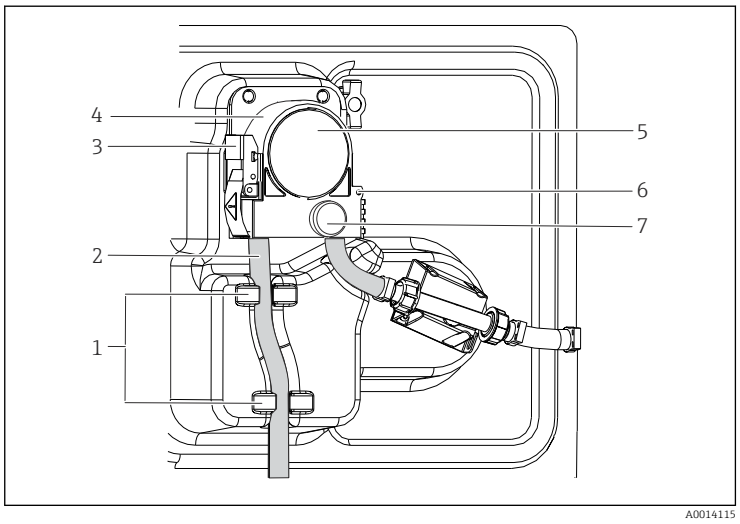
⚠ WARNING

Rotating parts

Minor to medium injury possible.

- ▶ Take the sampler out of service before opening the peristaltic pump.
- ▶ Secure the sampler against unintentional start-up whilst you work on the opened hose pump.

Opening the peristaltic pump

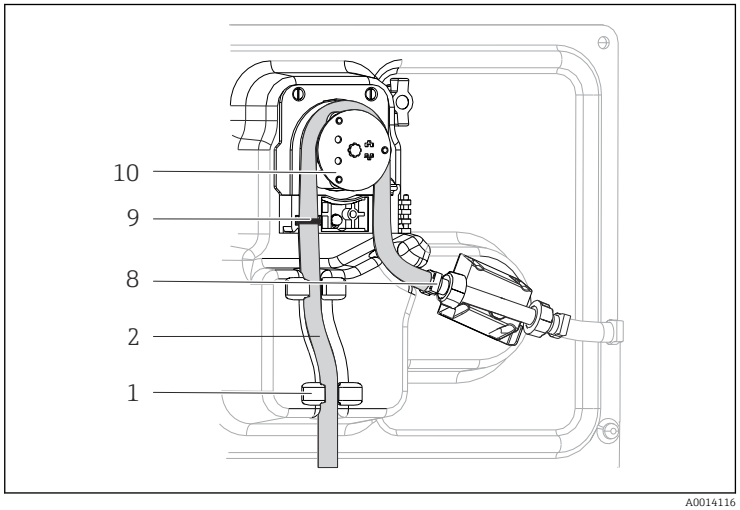


1 *Retainer*
2 *Pump tubing*
3 *Fastening clip*
4 *Pump bracket*
5 *Pump head cover*
6 *Positioning pin*
7 *Knurled head screw*

44 *Opening the peristaltic pump*

1. Take the sampler out of service by pausing a program that is currently running.
2. Open the fastening clip (item 3) and push the pump bracket (item 4) upwards.
3. Remove the knurled head screw (item 7) and open the pump head cover (item 5) to the right.
4. Remove the knurled head screw (item 7) and open the pump head cover (item 5) to the right.

Replacing the pump tube



1 *Retainer*
2 *Pump tubing*
8 *Terminal*
9 *Marking ring*
10 *Roller*

45 *Replacing the pump tube*

1. Remove the clamp (item 8) and remove the pump tube (item 2) from the pump.
2. Remove any silicone deposits on the roller (item 10) and the flexible pump bracket.
3. Make sure the roller and all the rolls turn smoothly and evenly.
4. Apply some lubricant to the roller.
5. Secure the new pump tube to the pressure sensor with the clamp (item 8).
6. Guide the pump tube around the roller and insert the marking ring into the groove (item 9).
7. Close the pump head cover and screw it tight. Close the pump bracket.

8. To avoid incorrect metering, reset the tube life to zero under **Menu**/**Diagnostics**/**Operating time information**/**Pump tube life** using the "**Reset**" function.

Calibrate the sample volume each time you replace a pump tube.

12.4 Cleaning

12.4.1 Housing

▶ Clean the front of the housing using commercially available cleaning agents only.

The front of the housing is resistant to the following in accordance with DIN 42 115:
- Ethanol (for a short time)
- Diluted acids (max. 2% HCl)
- Diluted bases (max. 3% NaOH)
- Soap-based household cleaning agents

NOTICE

Cleaning agents not permitted

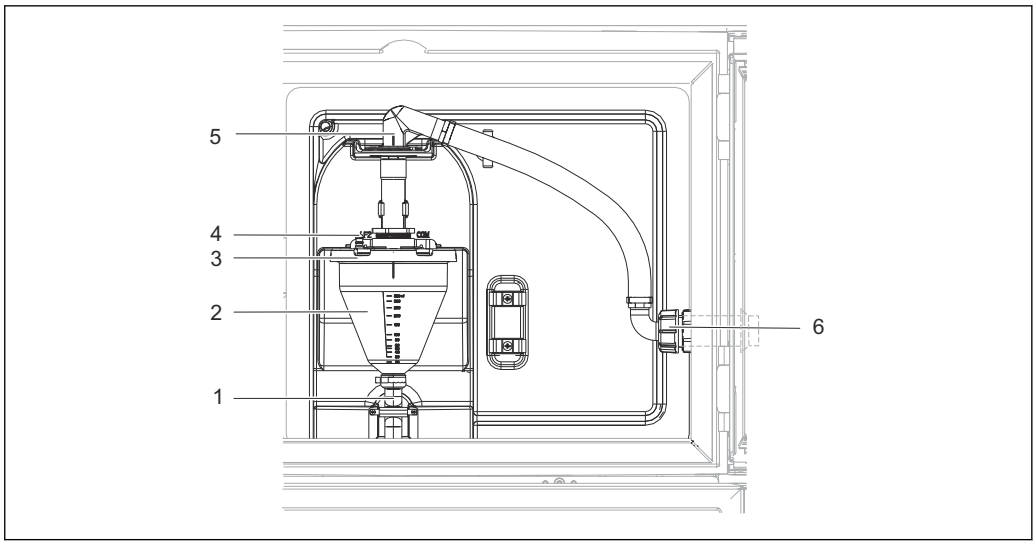
Damage to the housing surface or housing seal
- ▶ Never use concentrated mineral acids or alkaline solutions for cleaning.
- ▶ Never use organic cleaners such as acetone, benzyl alcohol, methanol, methylene chloride, xylene or concentrated glycerol cleaner.
- ▶ Never use high-pressure steam for cleaning.

12.4.2 Wetted parts

▶ After cleaning, rinse all wetted parts thoroughly with clear water to ensure that all cleaning agent residue has been removed so it cannot affect subsequent medium samples.

Version with vacuum pump

Clean the wetted parts as follows:



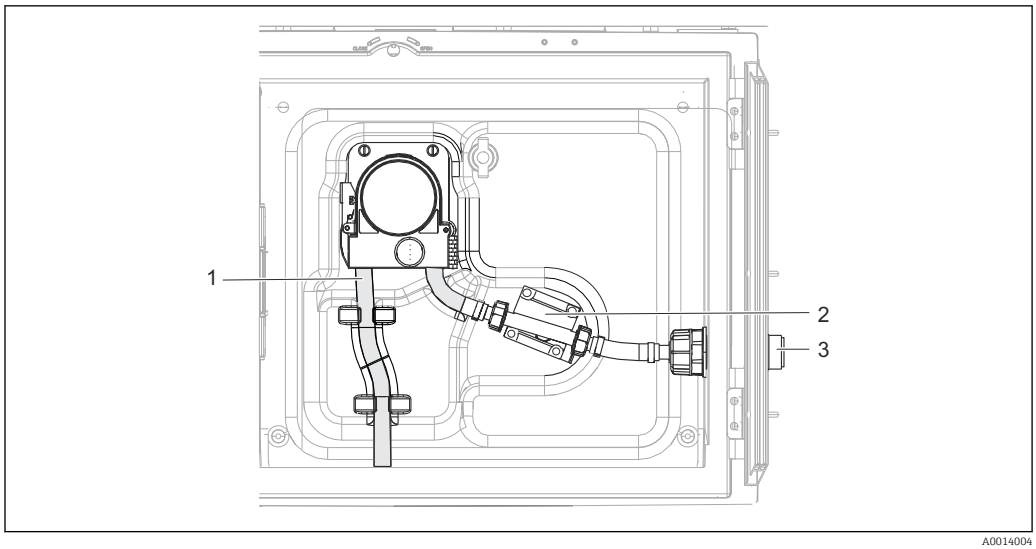
46 *Vacuum pump*

1 Outflow hose
2 Dosing glass
3 Dosing chamber cover
4 Air hose connection
5 Lock for intake hose
6 Thread adapter nut for intake hose

1. Release the thread adapter nut on the intake hose (item 6).
2. Turn the intake hose at the lock (item 5) to the "open" position and pull the hose upwards to disconnect it.
3. Release the air hose (item 4) and remove the dosing chamber (item 2) from the front along with the outflow hose (item 1).
4. Open the bayonet lock (item 3) and open the dosing chamber.
5. Clean these parts (hoses, dosing chamber etc.) with water or soapsuds. Use a bottle brush if necessary.
   ↳ You can wash the dosing chamber and dosing chamber cover in a dishwasher at 60 °C.
6. Make sure the dosing pipe is set correctly and set the old value if necessary.
7. Reinstall the cleaned parts in reverse order.

Version with peristaltic pump

Clean the wetted parts as follows:



47 *Version with peristaltic pump*

1 Pump tubing
2 Pressure sensor
3 Hose connection

1. Release the sample supply at the tube connection (item 3).
2. Connect a container containing clear water to the tube connection.
3. Remove the bottles from the sample compartment.
4. Rinse the wetted parts with clear water by taking a manual sample or by performing a pump test (under **Menu/Diagnostics/System test/** -> **Peristaltic pump/Pump purge/Pump suction**
5. Release the couplings to the left and right of the pressure sensor (item 2). Clean the tube piece carefully with a bottle brush and rinse it with clear water.
6. Reconnect the sample supply to the tube connection and put the bottles back in the sample compartment.

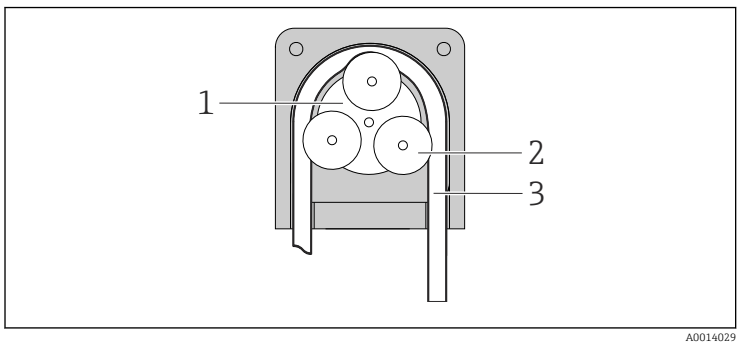
⚠ WARNING

Rotating parts

Minor to medium injury possible.

- ▶ Do not open the cover of the peristaltic pump while the pump is operating.
- ▶ Secure the sampler against unintentional start-up whilst you work on the opened hose pump.

Interior of peristaltic pump



1 Pump rotor
2 Roller
3 Pump tubing

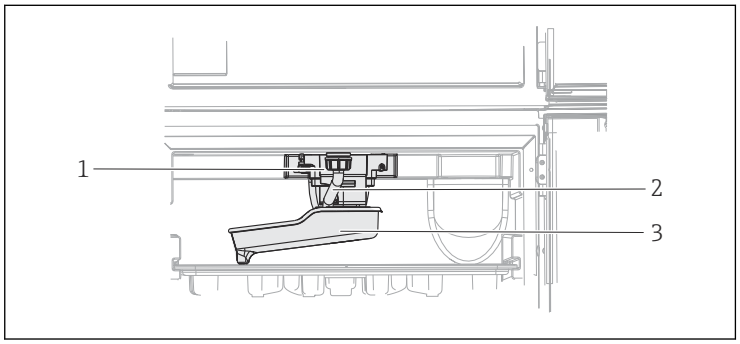
48 *Interior view of the peristaltic pump*

1. Take the sampler out of service by pausing a program that is currently running.
2. Open the peristaltic pump as described in the "Replacing the pump tube" → 162section.

3. Remove the pump tube.
4. Remove any silicone deposits on the roller and the flexible pump bracket.
5. Make sure the roller turns smoothly and evenly

Cleaning the distribution arm

Clean the distribution arm as follows:



1 Distribution arm
2 motor
3 Drain pipe
Distribution arm

49 Sample compartment

1. Release the outlet pipe (item 2).
2. Push up the splash guard.
3. Remove the distribution arm from the front.
4. Remove the cover.
5. Clean these parts with water or soapsuds. Use a bottle brush if necessary.
6. Reinstall the cleaned parts in reverse order.

Make sure the distribution arm is seated correctly! The distribution arm must be locked as otherwise the rotation movement could be blocked or the system might no longer approach the bottles correctly.

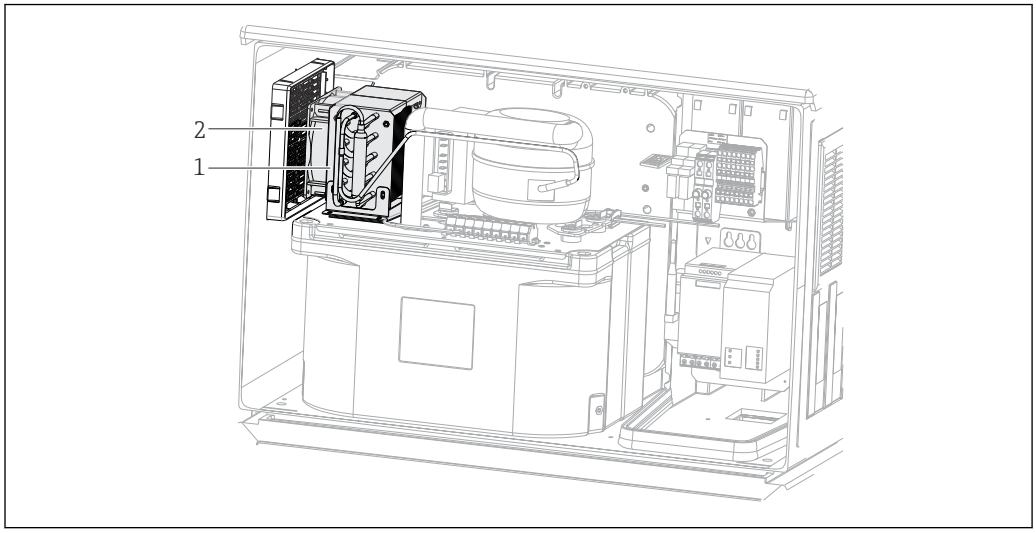
12.4.3 Sample compartment

The sample compartment has a continuous inner plastic lining.

1. Remove the bottle trays and the distribution pan.
2. Remove the bottles.
3. Remove the distribution arm. See also
4. Spray-clean the sample compartment with a water hose.

You can wash the PE and glass bottles in a dishwasher at 60 °C.

12.4.4 Ventilator and liquefier



50 *Cleaning the climate control module*

1 Liquefier
2 Ventilator

- ▶ Clean the liquefier and ventilator with compressed air.

12.4.5 Digital sensors

⚠ CAUTION

Cleaning not switched off during calibration or maintenance activities

Risk of injury due to medium or cleaning agent!

- ▶ If a cleaning system is connected, switch it off before removing a sensor from the medium.
- ▶ If you need to test the cleaning function while cleaning is in progress, wear protective clothing, goggles and gloves or take other suitable measures to protect yourself.

12.5 Technical support

We recommend the purchase and use of an SD card (see accessories). You can save the entire sampler configuration on the SD card (see "Data management" section) and make the data available to the service team should you be in need of technical assistance.

13 Repair

13.1 Spare parts

The repair and conversion concept provides for the following:
- The product has a modular design
- Spare parts are grouped into kits which include the associated kit instructions
- Only use original spare parts from the manufacturer
- Repairs are carried out by the manufacturer's Service Department or by trained users
- Certified devices can only be converted to other certified device versions by the manufacturer's Service Department or at the factory
- Observe applicable standards, national regulations, Ex documentation (XA) and certificates

1. Carry out the repair according to the kit instructions.
2. Document the repair and conversion and enter, or have entered, in the Life Cycle Management tool (W@M).

Device spare parts that are currently available for delivery can be found on the website:

www.endress.com/device-viewer

▶ Quote the serial number of the device when ordering spare parts.

13.2 Return

The product must be returned if repairs or a factory calibration are required, or if the wrong product was ordered or delivered. As an ISO-certified company and also due to legal regulations, Endress+Hauser is obliged to follow certain procedures when handling any returned products that have been in contact with medium.

To ensure the swift, safe and professional return of the device:

▶ Refer to the website www.endress.com/support/return-material for information on the procedure and conditions for returning devices.

13.3 Disposal

If required by the Directive 2012/19/EU on waste electrical and electronic equipment (WEEE), the product is marked with the depicted symbol in order to minimize the disposal of WEEE as unsorted municipal waste. Do not dispose of products bearing this marking as unsorted municipal waste. Instead, return them to Endress+Hauser for disposal under the applicable conditions.

The device contains electronic components. The product must be disposed of as electronic waste.

▶ Observe the local regulations.

Dispose of batteries correctly

▶ Always dispose of batteries in accordance with local regulations on battery disposal.

14 Accessories

The following are the most important accessories available at the time this documentation was issued.

▶ For accessories not listed here, please contact your Service or Sales Center.

Order no.	Bottle tray + bottles + cover
71111152	Bottle tray + 6 x 3 liter (0.79 US gal.) PE+ cover
71111154	Bottle tray + 12 x 1 liter (0.26 US gal.) PE + cover

Order no.	Distributor plate; centering plate
71111158	Distributor plate for 2 x 6 bottles
71111159	Distributor plate for 2 x 12 bottles

Order no.	Bottles + covers
71111164	1 liter (0.26 US gal.) PE + cover, 24 pcs
71111167	3 liter (0.79 US gal.) PE + cover, 12 pcs
71111169	13 liter (3.43 US gal.) PE + cover, 1 pc
71111172	30 liter (7.92 US gal.) PE + cover, 1 pc

Order no.	Complete suction line
71111233	Suction line ID 10 mm (3/8"), PVC clear, reinforced fabric, length 10 m (33 ft), suction head V4A
71111234	Suction line ID 10 mm (3/8"), EPDM black, length 10 m (33 ft), suction head V4A
71111235	Suction line ID 13 mm (1/2"), PVC green, reinforced spiral wire, length 10 m (33 ft), suction head V4A
71111236	Suction line ID 13 mm (1/2"), EPDM black, length 10 m (33 ft), suction head V4A
71111237	Suction line ID 16 mm (5/8"), PVC green, reinforced spiral wire, length 10 m (33 ft), suction head V4A
71111238	Suction line ID 16 mm (5/8"), EPDM black, length 10 m (33 ft), suction head V4A
71111239	Suction line ID 19 mm (3/4"), PVC green, reinforced spiral wire, length 10 m (33 ft), suction head V4A
71111240	Suction line ID 19 mm (3/4"), EPDM black, length 10 m (33 ft), suction head V4A
71111482	... m; suction line coil ID 10 mm (3/8"), PVC
71111485	... m, suction line ID 13 mm (1/2"), PVC green

Order no.	Terminated hose: vacuum pump
71111188	Dosing hose to distributor, 2 pcs, material: silicon
71111189	Dosing hose to distributor, 25 pcs, material: silicon

Order no.	Terminated hose: peristaltic pump
71111191	Pump tubing, 2 pcs; material: silicon
71111192	Pump tubing, 25 pcs; material: silicon

Order no.	Suction head
71111184	Suction head V4A for ID 10 mm (3/8"), 1 pc.
71111185	Suction head V4A for ID 13 mm (1/2"), 1 pc.

Order no.	Communication; software
71239104	Activation code: Chemoclean Plus
71110815	SD card, 1 GB, Industrial Flash Drive
	Activation code for PROFIBUS DP

15 Technical data

15.1 Input

Input types	▪ 2 analog inputs ▪ 2 binary inputs

15.2 Binary input, passive

Span	12 to 30 V, galvanically isolated
Signal characteristics	Minimum pulse width: 100 ms

15.3 Analog input, passive/active

Span	0/4 to 20 mA, galvanically isolated
Accuracy	±0.5 % of measuring range

15.4 Output

Output signal	2 binary outputs Open collector, max. 30 V, 200 mA
Communication	▪ 1 service interface ▪ Commubox FXA291 (accessory) required for communication with the PC

15.5 Power supply

Electrical connection	See the "Electrical connection" section (→ 21)
Supply voltage	Depending on version: 100 to 120/200 to 240 V AC ±10 %, 50/60 Hz The device does not have a power switch. A fuse with a maximum rating of 10 A must be provided by the customer. Observe the local regulations for installation.
Cable entries	Depending on version: ▪ 1 x M25, 7 x M20 cable gland ▪ 1 x M25, 1 x M20 cable gland

Permitted cable diameter:
- M20x1.5 mm: 7 to 13 mm (0.28 to 0.51")
- M25x1.5 mm: 9 to 17 mm (0.20 to 0.67")

Mains fuse

Optional fuses:

T3.15A (for 230V power supply)

Power consumption

- Version with vacuum pump: 290 VA
- Version with peristaltic pump: 290 VA

Power failure

Real-time clock: lithium battery, type CR2032

15.6 Performance characteristics

Sampling methods

Vacuum pump/peristaltic pump/sampling assembly:
- Event sampling
- Single and multiple samples
- Sampling table

Vacuum pump:
- Time-paced
- In proportion to volume

Peristaltic pump:
- Time-paced
- In proportion to volume
- Flow proportional sampling/time override (CTVV)

Dosing volume

Vacuum pump:
20 to 350 ml (0.7 to 12 fl.oz.)

Peristaltic pump:
10 to 10000 ml (0.3 to 340 fl.oz.)

The dosing accuracy and the repeatability of a sample volume < 20 ml can vary, depending on the specific application.

Dosing accuracy

- **Vacuum pump:**
  ± 5 ml (0.17 fl.oz.) or 5 % of the set volume
- **Peristaltic pump:**
  ± 5 ml (0.17 fl.oz.) or 5 % of the set volume

Repeatability

5 %

Intake speed

> 0.5 m/s (> 1.6 ft/s) for ≤ 13 mm (1/2") ID, as per EN 25667, ISO 5667, CEN 16479-1

> 0.6 m/s (> 1.9 ft/s) for 10 mm (3/8") ID, in accordance with Ö 5893; US EPA

Suction height

- **Vacuum pump:**
  Max. 6 m (20 ft) or max. 8 m (26 ft), depending on the version
- **Peristaltic pump:**
  Max. 8 m (26 ft)

Hose length	Max. 30 m (98 ft)
Temperature control	**Temperature sensors:** Sampling compartment temperature **Cooling module:** ▪ Sample temperature range: 2 to 20 °C (36 to 68 °F) Factory setting: 4 °C (39 °F) ▪ Automatic defrost system ▪ Cooling rate in accordance with Ö 5893 (Austrian standard): 4 liters of water at 20 °C cool down to 4 °C in less than 210 minutes ▪ Temperature constancy of sample at 4 °C over the operating temperature range of -15 to 40 °C (5 to 105 °F)

15.7 Environment

Ambient temperature	With ASA+PC or stainless steel housing:	-20 to 40 °C (0 to 104 °F)
	With plastic polystyrene housing:	0 to 40 °C (32 to 104 °F)
Storage temperature	−20 to 60 °C (−4 to 140 °F)	
Electrical safety	In accordance with EN 61010-1, protection class I, environment ≤ 2000 m (6500 ft) above MSL. The device is designed for pollution degree 2.	
Humidity	10 to 95%, not condensing	
Degree of protection	▪ Front dosing compartment: IP 54 ▪ Rear dosing compartment: IP 33 ▪ Front panel with display (internal): IP 65 ▪ Sample compartment: IP 54	
Electromagnetic compatibility	Interference emission and interference immunity as per EN 61326-1:2013, Class A for Industry	

15.8 Process

Medium temperature range	2 to 50 °C (36 to 122 °F)
Process pressure	▪ Unpressurized, open channel (unpressurized sampling) ▪ Max. 1.8 bar (26.11 psi) piping (only with shutoff/inlet valve) **Sampling assembly:** Max. 6 bar

Medium properties

Vacuum pump
Capacitance level measurement used for:
- Sample media has to be free of abrasive substances.
- Media that tend to create a lot of foam or contain fats and grease
- Media with a conductivity < 30 µS/cm

Peristaltic pump
Sample media has to be free of abrasive substances.

Pay attention to the material compatibility of the wetted parts.

Process connection

- **Vacuum pump:**
  Suction line ID 10 mm (3/8"), 13 mm (1/2"), 16 mm (5/8") or 19 mm (3/4")
- **Peristaltic pump:**
  Intake hose ID 10 mm (3/8")

15.9 Mechanical construction

Dimensions

See the "Installation" section → 15

Weight

Sampler version	Weight
Plastic version with refrigeration	101 kg (223 lbs)
Stainless steel version with refrigeration	118 kg (260 lbs)

Materials

Plastic polystyrene V0 can change color when exposed to direct sunlight. For outdoor use without a weather protection cover, the use of Plastic ASA+PC V0 is recommended. The functionality is not affected by the discoloration.

Non-wetted parts	
Cabinet housing	**Plastic polystyrene V0** For standard applications in wastewater treatment plants and environmental monitoring **Stainless steel V2A (1.4301)** For standard applications in wastewater treatment plants and environmental monitoring
Sample compartment inner lining	Plastic PP
Insulation	Plastic EPS "Neopor®"

Wetted parts	Vacuum pump	Peristaltic pump
Dosing tube	Plastic PP	-
Dosing chamber cover	Plastic PP	-
Conductivity sensors	Stainless steel V4A (1.4404)	-
Conductivity sensors	Stainless steel V4A (1.4404)	-
Dosing chamber	PMMA, glass (depending on version)	-
Dosing system outflow hose	Silicone	-
Pump tubing	-	Silicone
Process seal	-	-

Wetted parts	Vacuum pump	Peristaltic pump
Distribution arm	Plastic PP	
Distribution arm cover	Plastic PE	
Distribution plate	Plastic PS	
Composite container/bottles	Plastic PE, glass (depending on version)	
Intake hose	Plastic PVC, EPDM (depending on version)	
Hose connection	Plastic PP	
Rinse connection	-	-

Choose process seal depending on the application. Viton is recommended for standard applications involving watery samples.

Vacuum pump only	
Pneumatic hoses	Silicone
Air Manager housing	PC
Air Manager sealing plate	Silicone
Pump head	Aluminum, anodized
Pump membrane	EPDM

Process connections

- Vacuum pump:
  Suction line ID 10 mm (3/8"), 13 mm (1/2"), 16 mm (5/8") or 19 mm (3/4")
- Peristaltic pump:
  Intake hose ID 10 mm (3/8")

Index

S

T

U

W

www.addresses.endress.com

Endress+Hauser

People for Process Automation