

Operating Instructions

CA76NA

Analyzer for sodium



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1 About this document

1.1 Symbols used

1.1.1 Safety information

Structure of information	Meaning
 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.
 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.
 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.
 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.

1.1.2 Symbols

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

1.1.3 Symbols on the device

-  Caution: Hazardous voltage
-  Fire, open sources of ignition and smoking are forbidden
-  Eating and drinking are forbidden
-  Wear eye protection goggles
-  Wear safety gloves
-  Reference to device documentation

1.2 Documentation

The following instructions complement these Operating Instructions and are available on the product pages on the Internet:

Installation Instructions, EA01214C

2 Basic safety instructions

2.1 Requirements for the 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 Intended use

CA76NA is an analyzer designed for the continuous measurement of the concentration of sodium in aqueous solutions.

The analyzer is designed for use in the following applications:

- Monitoring of the water/steam circuit in power plants, particularly for condenser monitoring
- Quality assurance of demineralization systems and seawater desalination
- Quality assurance of the ultrapure water circuit in the semi-conductor and electronics industry

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

The operator is responsible for ensuring compliance with the following safety regulations:

- Installation guidelines
- Local standards and regulations

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

WARNING

Contact of chemicals with eyes and skin, and inhalation of vapors

Damage to the skin, eyes and respiratory organs

- ▶ Wear protective goggles, protective gloves and a lab coat when working with chemicals.
- ▶ Avoid any skin contact with chemicals.
- ▶ Do not inhale any vapors.
- ▶ Ensure the area is well ventilated.
- ▶ Comply with further instructions in the safety data sheets for the chemicals used.

2.5 Product safety

2.5.1 State of the art

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.

2.6 IT security

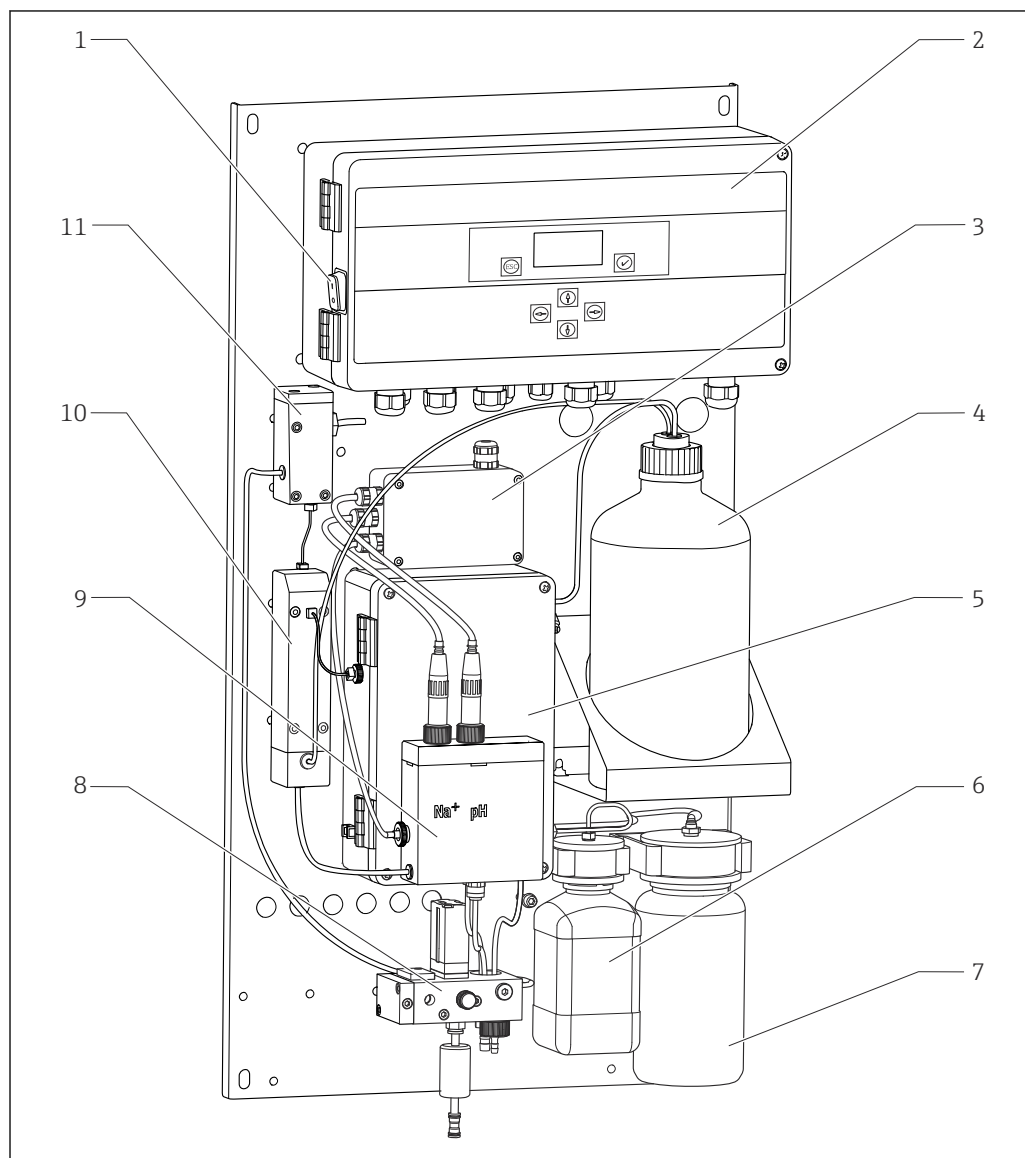
We only provide a warranty if the device is installed and used as described in the Operating Instructions . The device is equipped with security mechanisms to protect it against any inadvertent changes to the device settings.

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 Product design

3.1.1 Main components

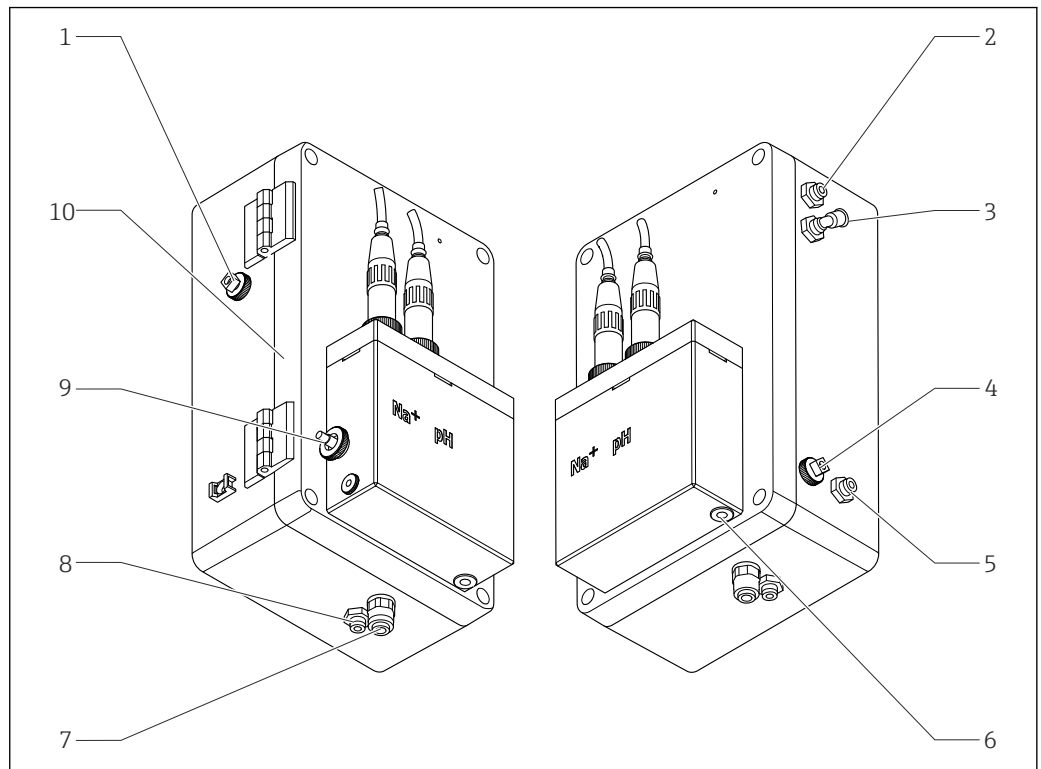


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1 Main components

- | | |
|-------------------------------------|--|
| 1 Power switch | 7 Bottle for lab sample |
| 2 Electronics unit | 8 Sample conditioning unit (controls and filters the flow of sample) |
| 3 Amplifier | 9 Measuring unit with supply vessel |
| 4 Bottle with alkalization reagent | 10 Alkalization unit |
| 5 Liquid control unit | 11 Overflow vessel with level control |
| 6 Bottle with sodium stock solution | |

3.1.2 Liquid control unit

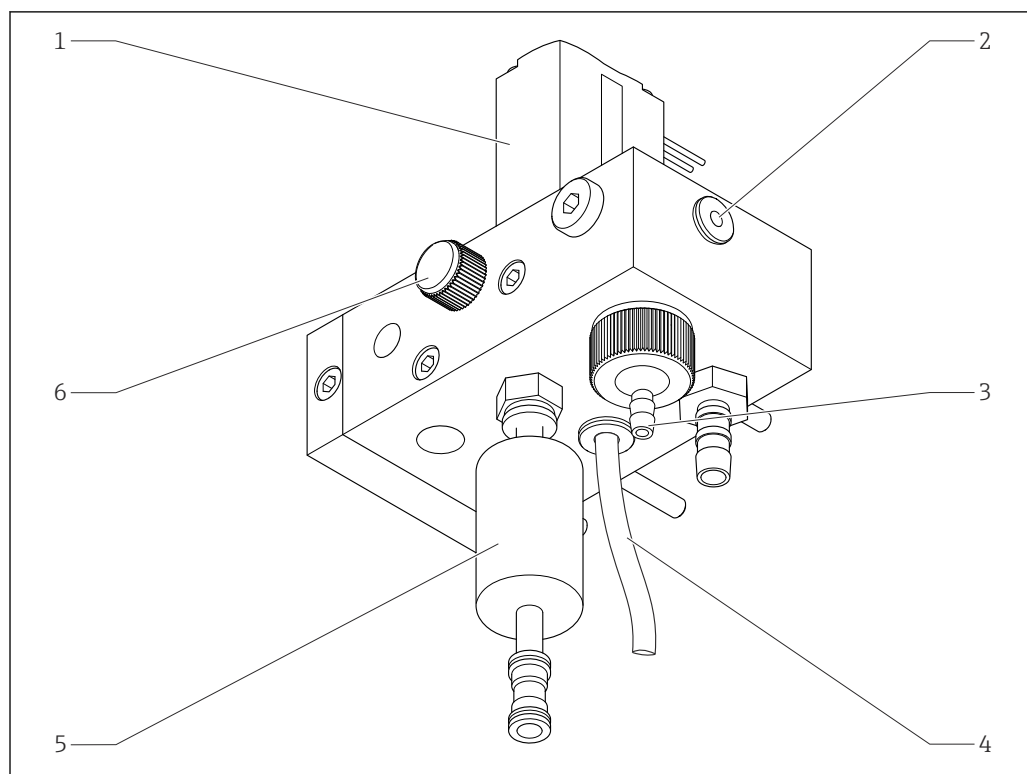


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2 Liquid control unit including measuring unit and supply vessel

- | | | | |
|---|--------------------------------|-----|----------------------------|
| 1 | Sample outlet, circuit | 7 | Housing outlet |
| 2 | Outlet after alkalization pump | 8 | Sample outlet, calibration |
| 3 | Inlet of alkalization pump | 9 | Temperature sensor |
| 4 | Inlet, standard solution | 10 | Fold-out housing |
| 5 | Inlet, laboratory sample | Na+ | Sodium sensor |
| 6 | Sample outlet, measurement | pH | pH sensor |

3.1.3 Sample conditioning unit



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 3 Sample conditioning unit

- 1 Solenoid valve
- 2 Outlet to analyzer
- 3 Overflow valve
- 4 Sample outlet (bypass at solenoid valve)
- 5 Filter
- 6 Control valve (set sampling volume, for even sample overflow)

The sample conditioning unit performs the following tasks:

- Filters the sample
- Controls the flow of sample
- Limits the maximum pressure to 1 bar (14.5 psi)
- Provides fresh sample to every channel

If a channel is being measured, the corresponding solenoid valve (1) for the channel opens. The sample flows to the overflow vessel. The rest of the time the sample drains off via the bypass at the solenoid valve (4).

Each channel needs a minimum overpressure of 0.5 bar (7.3 psi) and a sample flow of 10 l/h (2.64 gal/hr). The maximum permitted supply pressure is 5 bar (72.5 psi).

3.1.4 Measuring system

A complete measuring system comprises:

- Analyzer CA76NA
 - Sodium electrode (not included with the analyzer, can be ordered as an accessory)
 -  64
 - pH electrode (not included with the analyzer, can be ordered as an accessory)
 -  64
- Standard solution and pH buffer solution (not included with the analyzer, can be ordered as an accessory) →  64
- Alkalization reagent (recommended: diisopropylamine (DIPA), to be purchased separately, > 99.0 % (GC), in a bottle made from a solid material, e.g. glass).

The measurement system in the flow direction consists of a sodium electrode (working electrode), a temperature sensor and a pH electrode (reference electrode).

The sodium electrode measures the concentration of sodium ions in the sample. Its ion-selective glass membrane allows Na⁺ ions to pass through.

The pH electrode has 2 specific functions:

- It serves as a reference for the sodium electrode.
- It measures the pH value of the sample.

The sample needs to have a pH value of > 10.8. Otherwise, H⁺ ions in the sample would influence the measurement of the Na⁺ ions. The pH value of the sample is increased to 11.0 by adding an alkalization reagent, e.g. diisopropylamine. The amount of alkalization reagent to be added is regulated by measuring the pH.

The Na measuring chain has the following electrochemical structure:

Ag/AgCl(S) – sodium electrolyte – Na⁺-sensitive glass membrane – alkalized measuring solution – junction – KCl electrolyte gel – AgCl(S)/Ag

The potential of the sodium electrode is measured against the reference of the pH electrode.

3.1.5 Calibration rig

The calibration unit consists of the following main components:

- Supply vessel with standard solution pump
- Manifold with 3 solenoid valves for draining, circuit flow and lab samples
- Circuit pump for draining, circuit and supply of lab samples
- Standard solution (available for order as an accessory →  64)

3.2 Operating principle

3.2.1 Measuring principle

The analyzer measures the concentration of dissolved sodium ions.

Sodium measurement is potentiometric using ion-selective glass electrodes.

An advanced Nernst equation describes in principal the processes at the ion-selective glass membrane:

$$U_i = U_0 + \frac{2.303 RT}{F} \cdot \log (a_{\text{Na}^+} + \sum K_{\text{Na}^+} \cdot a_x^{-1/z_x})$$

A0034599

U_i	Measured value in mV
U_0	Standard potential
R	Relative gas constant (8.3143 J/molK)
T	Temperature [K]
F	Faraday constant (26.803 Ah)
a_{Na^+}	Activity of Na ⁺ ions
K_{Na^+}	Selectivity coefficient
a_x	Activity of interference ion
z_x	Value of interference ion

 The slope of the Nernst equation (2.303RT/F) is known as the **Nernst factor** and has a value of 59.16 mV/px at 25 °C.

The pH electrode has 2 specific functions:

- It serves as the reference point for the sodium electrode.
- It measures the pH value of the sample.

To also be able to measure Na^+ in very low concentrations, the Ag^+ and H^+ activity must be well below the Na^+ concentration to be measured. In this case, the pH value present must be more than 10.8. The device is set to a pH target value of 11.00 as standard to sufficiently safeguard the set pH value.

The pH value of the sample is increased to 11.0 by adding an alkalization reagent, e.g. diisopropylamine.

The sensitivity of the measuring arrangement to interference ions is according to the following rule:

$\text{Ag}^+ \gg \text{H}^+ \gg \text{Na}^+ > \text{Li}^+ > \text{K}^+$

3.2.2 Sample conditioning

Sample conditioning consists of the following main components:

- Alkalization pump
- Bottle with alkalization reagent
- Overflow vessel
- Alkalization vessel

It performs the following tasks:

- Monitors the flow of sample with a level switch in the overflow vessel
- Maintains a constant pressure through the overflow vessel to ensure constant flow
- Alkalizes the sample with pH regulation in the alkalization vessel



Purchase alkalization reagent separately (recommended: diisopropylamine (DIPA), > 99.0 % (GC), in a bottle made from a solid material, e.g. glass).

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.

4.1.1 Scope of delivery

The scope of delivery comprises:

- 1 analyzer
- 1 printed copy of the Brief Operating Instructions in the language ordered

 The sodium electrode, pH electrode, standard solution, pH buffer solutions and alkalization reagent are not included in the delivery for the analyzer.

Before commissioning the analyzer, order the sodium electrode, pH electrode, standard solution and pH buffer solutions as a "starter kit" accessory →  64.

Purchase alkalization reagent separately (recommended: diisopropylamine (DIPA), > 99.0 % (GC), in a bottle made from a solid material, e.g. glass.

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

4.2 Product identification

4.2.1 Nameplate

The nameplate is located on the panel.

The nameplate provides you with the following information on your device:

- Manufacturer identification
 - Order code
 - Serial number
 - Extended order code
 - Input and output values
 - Ambient temperature
 - Safety information and warnings
 - Approvals as per version ordered
- ▶ Compare the data on the nameplate with your order.

4.2.2 Identifying the product

Product page

www.endress.com/ca76na

Interpreting the order code

The order code and serial number of your product can be found in the following locations:

- On the nameplate
- In the delivery papers

Obtaining information on the product

1. Go to www.endress.com.
2. Page search (magnifying glass symbol): Enter valid serial number.
3. Search (magnifying glass).
 - ↳ The product structure is displayed in a popup window.
4. Click the product overview.
 - ↳ A new window opens. Here you will find information pertaining to your device, including the product documentation.

4.3 Storage and transport

1. Store the measuring device in a dry space where it is protected against moisture.
2. At temperatures around or below freezing, ensure there is no water in the device.
3. Store the alkalization reagent and electrodes at temperatures above +5 °C (41 °F).
4. Observe the permitted storage temperatures →  68.

5 Installation

CAUTION

Danger of crushing or entrapment if the analyzer is mounted or disassembled incorrectly

- ▶ Two people are needed to mount and disassemble the analyzer.
- ▶ Wear suitable protective gloves to protect against mechanical risks.
- ▶ Comply with minimum spacing requirements when mounting.
- ▶ Use the spacers provided when mounting.

5.1 Installation requirements

5.1.1 Installation options

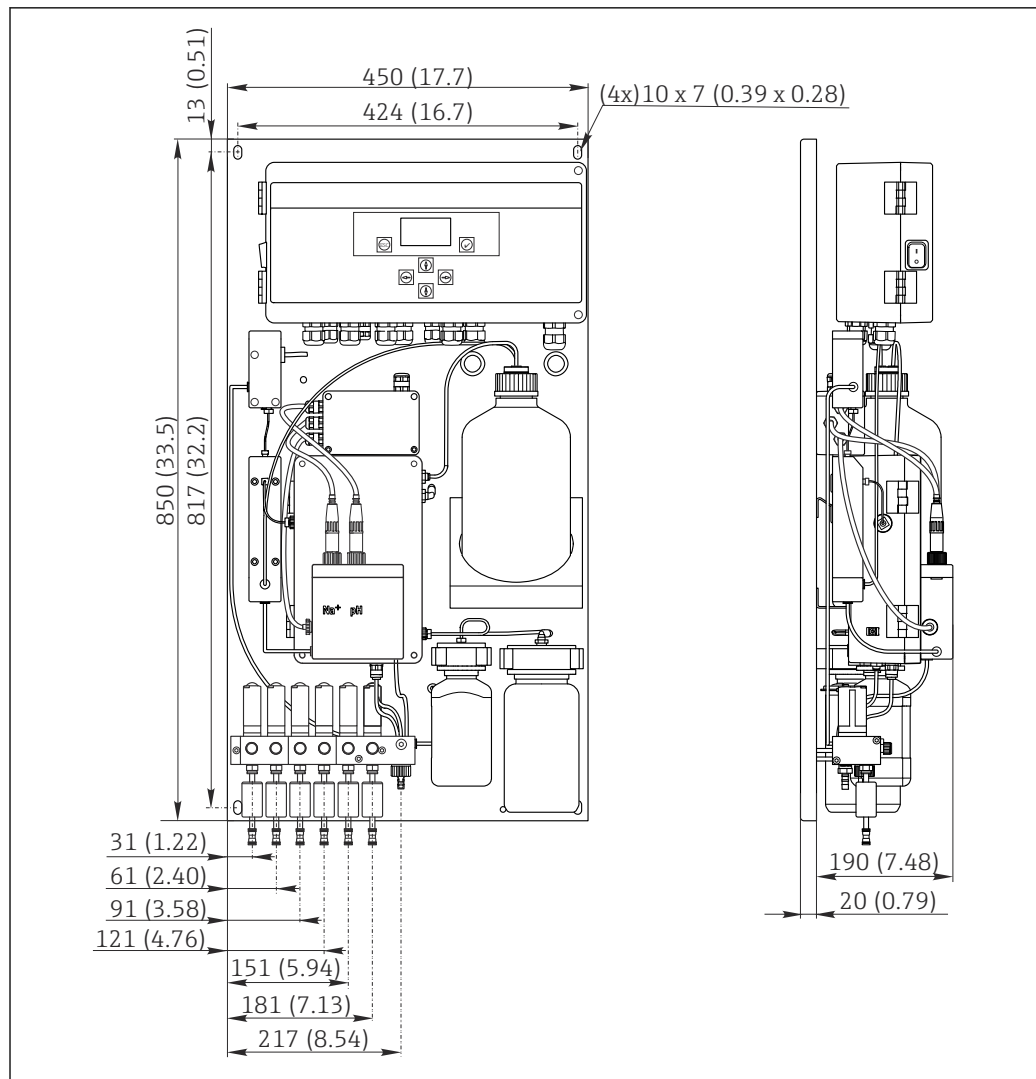
Mounted on a vertical surface:

- Wall
- Mounting plate

5.1.2 Dimensions

The mounting materials required to secure the device to the wall (screws, wall plugs) are not supplied.

- ▶ Provide mounting materials on site.



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4 Analyzer CA76NA. Unit of measurement mm (in)

5.1.3 Installation site

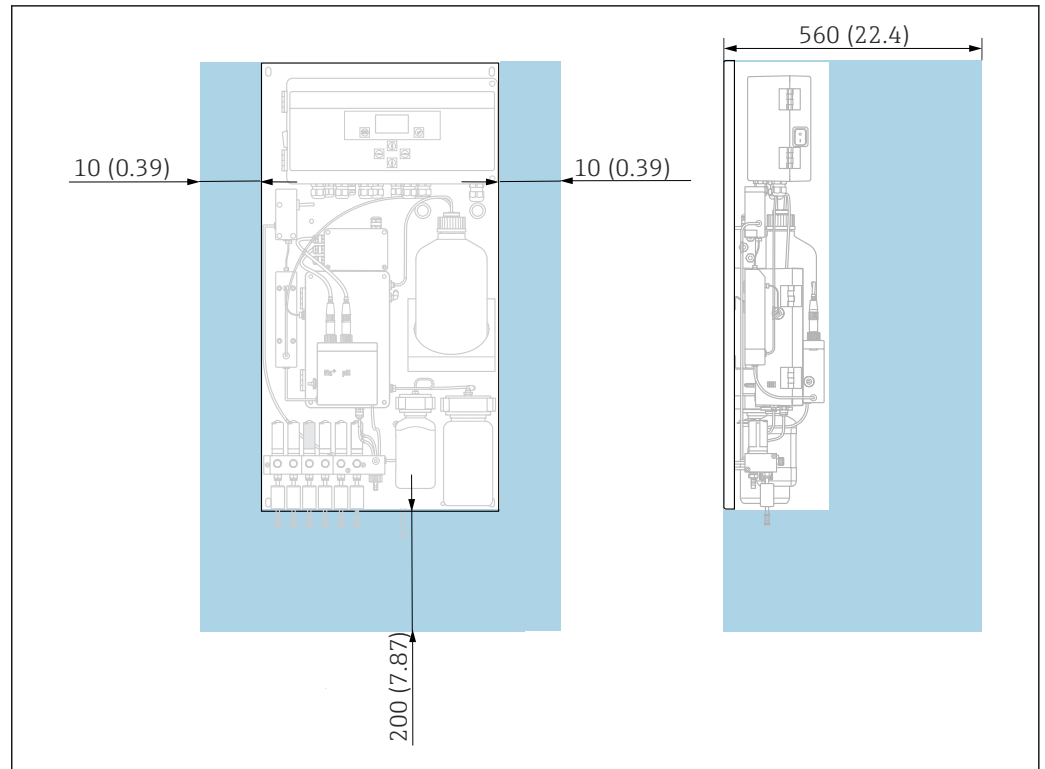
Please note the following:

1. Protect the device against mechanical vibrations.
2. Protect the device against chemical exposure.
3. Do not expose the device to very dusty environments.
4. Install the device in a dry environment.
5. Make sure that the wall has sufficient load-bearing capacity and is fully perpendicular.
6. Make sure that the device is horizontally aligned and is mounted on a vertical surface (mounting plate or wall).
7. Protect the device from additional heating (e.g. from heaters or direct sunlight).

Comply with the following minimum spacing requirements:

- at least 10 mm (0.39 in) at the sides of the analyzer
- at least 550 mm (21.7 in) in front of the analyzer
- at least 200 mm (7.87 in) under the analyzer since cables and water conduits are connected from below

5.2 Installing the analyzer on a vertical surface



5 Analyzer CA76NA, spacing requirements in mm (in)

A0049178

- Observe the required distances when mounting.

5.3 Post-installation check

After mounting, check all the connections to ensure they are secure.

6 Electrical connection

⚠ 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.

6.1 Connecting requirements

1. Route the input and control cables separately from the low-voltage cables.
2. Use shielded cables to connect control cables for analog signals.
3. At the place of installation, connect the shield at one end or both ends in accordance with the shielding concept of the plant and the cable used.
4. Suppress inductive loads such as a relay with a free-wheeling diode or RC module.
5. When connecting the current output, pay attention to the polarity and maximum load (500 Ω).
6. If floating relay outputs are used, provide an appropriate backup fuse for these relays at the installation location.
7. Observe the values for maximum contact load →  66.

NOTICE

The device is only suitable for fixed installation.

- ▶ At the installation location, you must provide an all-pole disconnecting device as per IEC 60947-1 and IEC 60947-3 in the vicinity of the power supply.
- ▶ The disconnecting device may not disconnect a protective conductor.

6.2 Connecting the analyzer

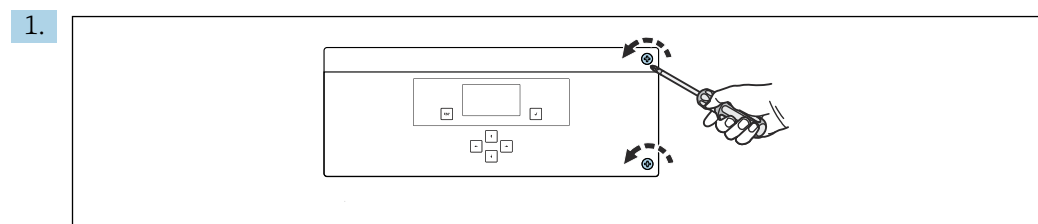
⚠ WARNING

Failure to comply with the instructions for protective grounding can result in injury or death

- ▶ Comply with the instructions for protective grounding when installing the analyzer.
- ▶ The device is Class 1 equipment: use a separate protective ground for the mains connection.
- ▶ It is not permitted to disconnect the protective ground

6.2.1 Opening the housing of the electronics unit

Opening the housing of the electronics unit



A0033421

 6 Electronics unit housing, securing screws on the cover

Loosen the securing screws on the cover with a PH2 Phillips head screwdriver.

2. Open the cover of the electronics unit to the left.

6.2.2 Connecting the analog outputs, digital outputs and power supply

Connecting the signal outputs

The measured value of the particular channel is available as a current signal on the analog or digital output card. The analyzer can have up to 6 current outputs depending on the device version.

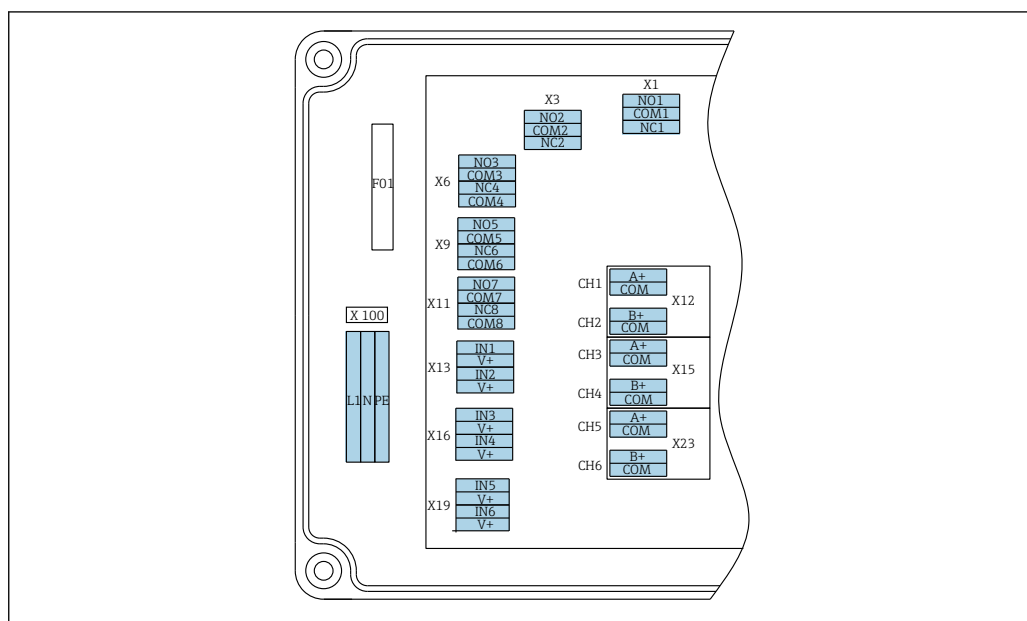
1. Guide the cables through the cable entries at the bottom of the electronics unit.
Position and dimensions of the cable entries →  15.
2. Guide the cables through the cable glands to the electronics unit.
3. Connect the outputs as shown in the terminal connection diagram →  19.

Connecting the power supply

 The analyzer is fitted with a fuse, T 1.25 A, for the 215 to 240 V AC voltage level. If the analyzer is operated with 100 to 130 V AC, replace the fuse with the T 2.5 A fuse supplied. The fuse is located in the cover of the electronics unit.

1. Guide the cables through the cable entries on the back of the electronics unit.
Position and dimensions of the cable entries →  15.
2. Connect with a 3-core cable to terminal strip X100 (L1/N/PE) in the electronics unit according to terminal connection diagram →  19.

Terminal diagram without PROFIBUS



A0033459

L1	N	PE	NO1	COM1	NC1	NO2	COM2	NC2	A	COM	B	COM	A	COM	B	COM	A	COM	B	COM
									+		+		+		+		+		+	
X100 Power supply 100 to 240 V AC, 50/60 Hz			X1 Relay 1 Alarm			X3 Relay 2 Warning			X12A 4 to 20 mA Channel 1		X12B 4 to 20 mA Channel 2		X15A 4 to 20 mA Channel 3		X15B 4 to 20 mA Channel 4		X23A 4 to 20 mA Channel 5		X23B 4 to 20 mA Channel 6	

Mains voltage

Multi-range power unit for 100 to 240 V AC

i The analyzer is fitted with a fuse, T 1.25 A, for the 215 to 240 V AC voltage level. If the analyzer is operated with 100 to 130 V AC, replace the fuse with the T 2.5 A fuse supplied. The fuse is located in the cover of the electronics unit.

Analog outputs

- X12: current output, channels 1 + 2
- X15: current output, channels 3 + 4
- X23: current output, channels 5 + 6

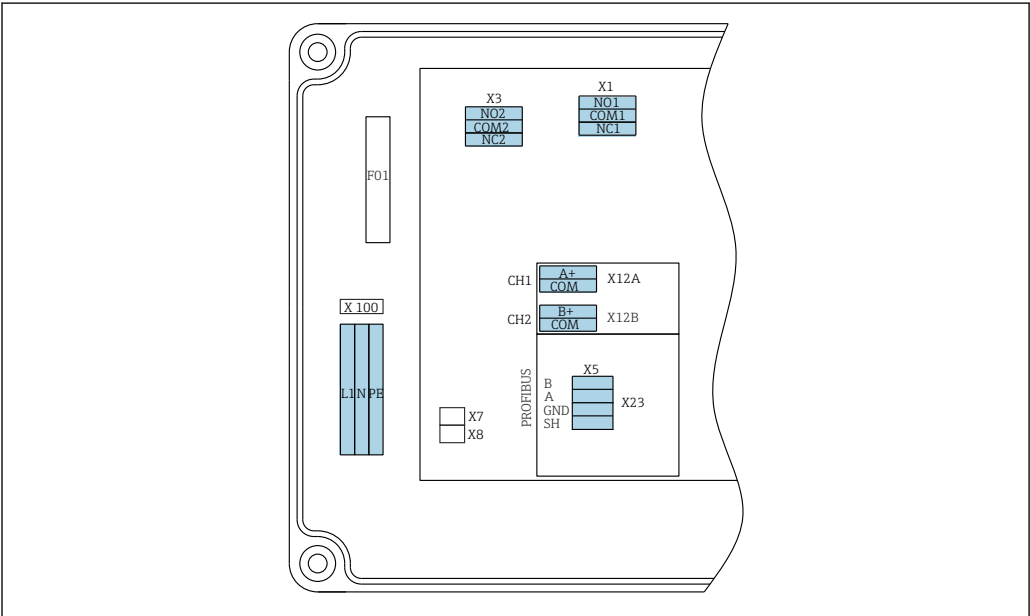
Control inputs (external contact)

- X13: current input, channels 1 + 2
- X16: current input, channels 3 + 4
- X19: current input, channels 5 + 6

Digital outputs

- X1: relay 1, alarm
 - Open contact on error: COM-NO
 - Closed contact on error: COM-NC
- X3: relay 2, warning
 - Open contact on error: COM-NC
 - Closed contact on error: COM-NO
- X6: status, channels 1 + 2
- X9: status, channels 3 + 4
- X11: status, channels 5 + 6

Terminal diagram with PROFIBUS



A0041292

L1	N	PE	NO1	CO M1	NC1	NO2	CO M2	NC2	A+	CO M	B+	CO M	B	A	GND	SH
X100 Power supply 100 to 240 V AC, 50/60 Hz			X1 Relay 1 Alarm			X3 Relay 2 Warning			X12A 4 to 20 mA Channel 1		X12B 4 to 20 mA Channel 2		PROFIBUS cable (internal)			

Mains voltage

Multi-range power unit for 100 to 240 V AC

Analog outputs

X12: current output, channel 1 + 2

Digital outputs

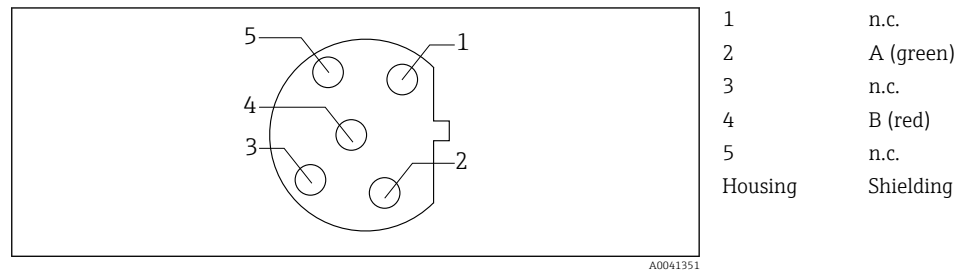
- X1: relay 1, alarms
 - Open contact on error: COM-NO
 - Closed contact on error: COM-NC
- X3: relay 2, warnings
 - Open contact on error: COM-NC
 - Closed contact on error: COM-NO

If the CA76NA is the last device in the bus segment, the two jumpers must be set to X7 and X8 on the PROFIBUS interface card to incorporate the terminating resistors. If the

analyzer is not the last device in the bus segment, the jumpers must be removed from X7 and X8 on the PROFIBUS interface card.

M12 socket

PROFIBUS is connected to an external M12 socket.



7 Pin assignment 5-pin, b-coded

6.3 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 approved for this product (impermeability (IP), electrical safety, EMC interference immunity) 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 for the confirmed level of IP protection).
- Cables/cable ends are loose or insufficiently secured.
- Conductive cable strands are left in the device.

6.4 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

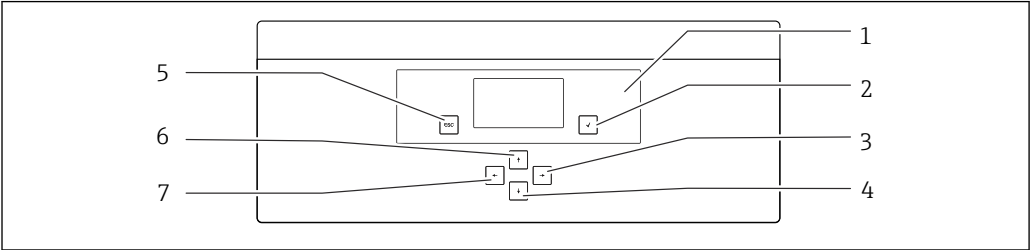
- Are the device and all the cables free from damage on the outside?

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 Operation options

7.1 Structure and function of the operating menu



A0033387

 8 Operating elements of the electronics unit

- | | |
|--|--|
| 1 Display | 5 Key  |
| 2 Key  | 6 Key  |
| 3 Key  | 7 Key  |
| 4 Key  | |

Each main menu contains submenus. Navigate through the menus using the 6 keys on the control panel.

Functions of the keys on the control panel:

Key 	
Measured value display	Main menu
Main menu	Submenu
Submenu	Input menu
Input menu	Entry mode
Entry mode	Input menu, input value is accepted
Key 	
Entry mode	Input menu, input value is not accepted
Input menu	Submenu
Submenu	Main menu
Main menu	Measured value display
Press the  key for 4 s	
Measured value display	Measured value display
Keys  , 	
Measured value display	Measured value display (channel): detailed overview of status and measured values / overview of current outputs
Menus	Select the menu item
Input menu	Select the entry field
Entry mode	Select character/list
Keys  , 	
Measured value display	Change channel
Menus	No function assigned
Input menu	Field selection (if multi-column)
Entry mode	Position selection

8 Commissioning

8.1 Preliminaries

i Due to the necessary calibrations, schedule about 8 hours to commission the device.

The following prerequisites apply for commissioning:

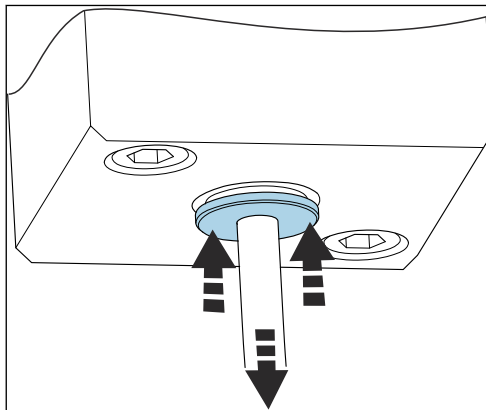
- The analyzer is mounted as described →  15.
- Pipes that carry liquid are mounted as described →  24.
- The electrodes are inserted as described →  26.
- The reagent bottles are connected as described →  27.
- The electrical connection is established as described →  18.
- Power supply and medium supply are available.

Push-in couplings

All hydraulic connections with hoses feature "push-in couplings" by design. Hoses must be cut clean and straight and must not have any damage on the surface.

1. Insert the hose as far as it will go.

2.



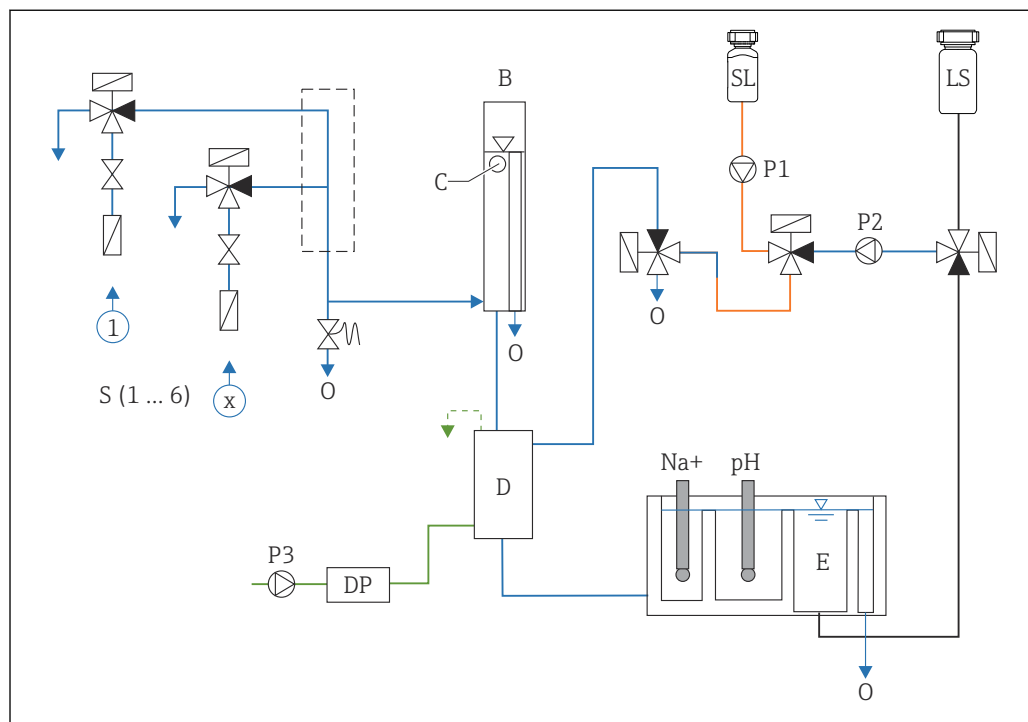
Hoses can only be removed when unpressurized:

Push in the ring with the hose and hold it in place, then remove the hose.

If the hose is removed frequently, indentations appear on the hose in the area around the retaining clips. It is important that the first 5 mm of the hose are smooth.

8.1.1 Connecting pipes that carry liquid

Flow diagram



A0047930

9 Liquid control unit with measuring unit and supply vessel

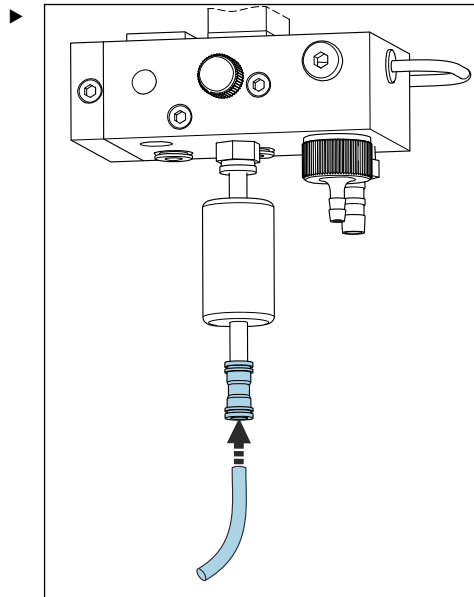
S	Sample inlet, 1 to 6	O	Outlet
B	Overflow vessel for constant primary pressure	SL	Standard solution
C	Overflow level monitor	LS	Laboratory sample
D	Alkalization vessel	P1	Dosing pump
DP	Diisopropylamine (DIPA)	P2	Circuit pump
E	Supply vessel	P3	Alkalization pump

Connecting medium supply points

The analyzer can have up to 6 medium supply points depending on the device version.

Hose specifications (not included in scope of delivery):

- Externally toleranced, flexible PE or PTFE hose with outer diameter of 6 mm (0.24 in)
- Length at least 200 mm (7.87 in)



Connect sample hose using quick-release coupling.

- ↳ The applied pressure is limited to approx. 1 bar (14.5 psi) by the installed overflow valve.

Connecting medium outlet points

There are 3 sample outlet points on the device:

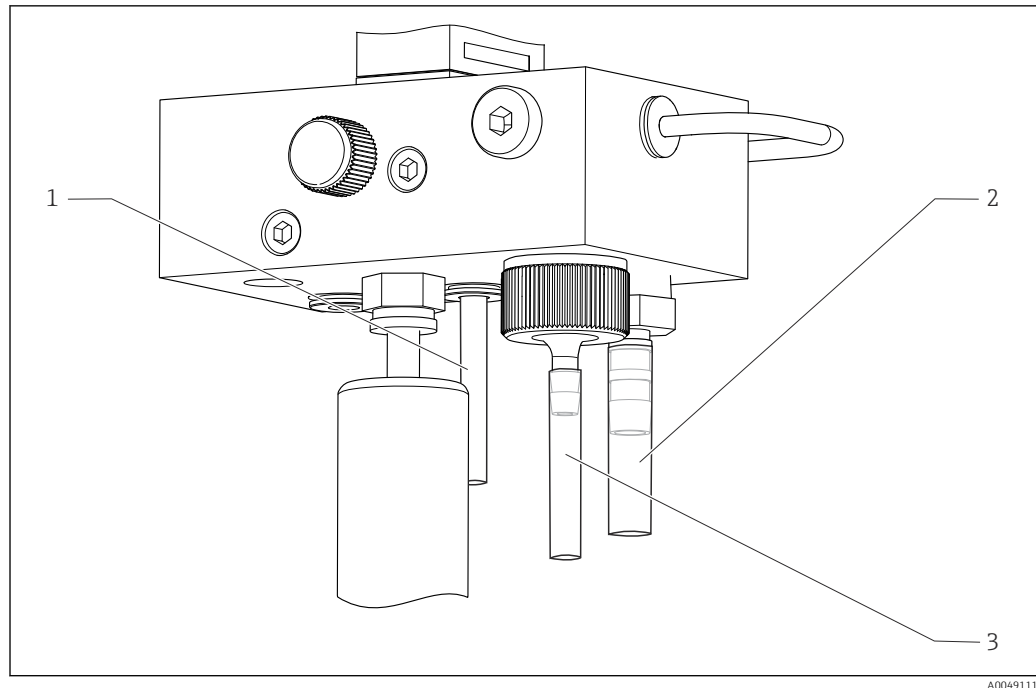
- Individual channel outlet points of the sample conditioning unit, up to 6 pieces of hose measuring 6 x 4 mm
- Overflow valve outlet, hose measuring 8 x 6 mm
- General outlet, hose measuring 11 x 8 mm

The medium discharged from the sample conditioning unit and overflow vessel can be directly re-introduced into the power plant circuit. As alkalization reagent is used, the water discharged at the general outlet is contaminated with these reagent substances. The discharging of wastewater into drains or the disposal of discharged water is governed by the wastewater management concept of the owner/operator.

i Media must be able to drain off freely; do not route hoses upwards or bend hoses.

To avoid any buildup of backwater, use outflow hoses with a maximum length of 1 m (3.28 ft).

- ▶ Route hoses with a constant downward gradient so that water can drain off easily.



A0049111

- 1 Channel outlet
- 2 General outlet
- 3 Overflow valve

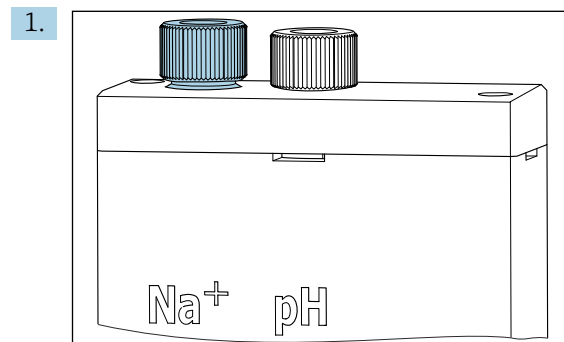
8.1.2 Installing electrodes

Preparing electrodes

1. The analyzer is switched off or the operating mode is **OFF**.
Fill the measuring unit halfway with deionized water so that the electrodes do not dry out after installation.
2. Remove the electrodes from the packaging. The sodium electrode is marked "Na" on the shaft. The pH electrode has no marking.
3. Remove the lower sealing cap with the saline solution. If there are any salt crystals on the electrode, rinse them off carefully with deionized water.

The electrodes are now ready to be installed.

Installing the electrodes

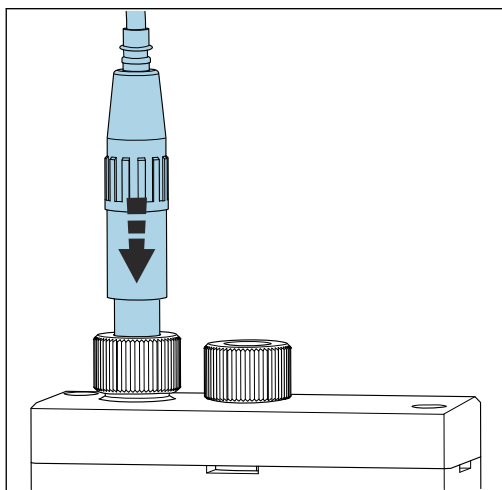


Loosen the screw connection on the measuring unit.

2. Fit the plug of the cable marked "Na+" onto the sodium electrode.
3. Fit the plug of the cable marked "pH" onto the pH electrode.
4. The plugs have a right-hand thread. Tighten the plugs by hand.

5. NOTICE**Risk of damaging the electrodes during the installation and removal procedure**

- ▶ Exercise care when inserting the electrodes into, and removing the electrodes from, the chambers of the flow through cell.
- ▶ Do not touch against the glass bulbs of the electrodes.
- ▶ The electrodes are very fragile. Exercise great care when handling the electrodes.
- ▶ Avoid air bubbles in the glass bulbs. If air bubbles are present, hold the electrode in a vertical position and shake it gently to remove the bubbles.
- ▶ Do not allow the glass bulbs of the electrodes to become dry. Fit the electrodes with the protection caps after removal.
- ▶ Protect the cable connections and plugs against corrosion and moisture.



Carefully insert the electrode as far as it will go into the left-hand chamber (sodium) or right-hand chamber (pH).

6. Tighten the screw connection by hand.

8.1.3 Connecting reagent bottles**⚠ WARNING****Contact of chemicals with eyes and skin, and inhalation of vapors**

Damage to the skin, eyes and respiratory organs

- ▶ Wear protective goggles, protective gloves and a lab coat when working with chemicals.
- ▶ Avoid any skin contact with chemicals.
- ▶ Do not inhale any vapors.
- ▶ Ensure the area is well ventilated.
- ▶ Comply with further instructions in the safety data sheets for the chemicals used.

⚠ CAUTION**Fire hazard**

- ▶ Make sure there are no sources of ignition, e.g. hot surfaces, in the vicinity
- ▶ Do not smoke

NOTICE**Escaping chemicals can contaminate the device**

Incorrect measurements

- ▶ When changing the hoses, do not contaminate the hose ends with chemicals.
- ▶ Allow the ends of the hoses to drain fully.
- ▶ Do not touch the hoses when changing the standard solution.
- ▶ Ensure the area is well ventilated.

Connecting the bottle with alkalization reagent

i Bottles with alkalization reagent with GL45 thread

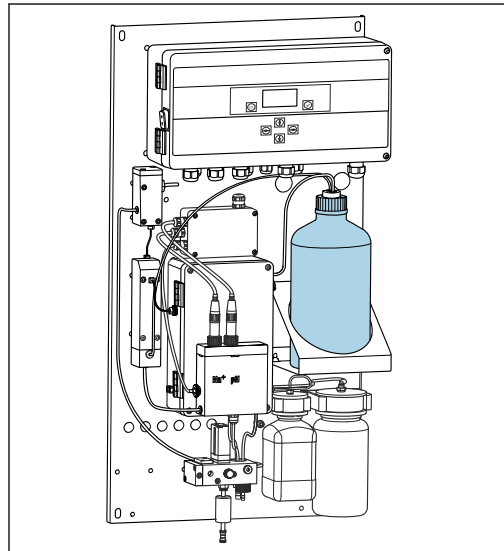
No adapter required for connection to the analyzer, the bottle connection including thread adapter nut and seal are ready to use

Bottles with alkalization reagent with S40 thread

A different union is supplied for connection to the analyzer, can be reordered as an accessory for the analyzer

- Use bottles made of solid material, e.g. glass, for alkalization reagent.

There is space for a 2.5 liter bottle on the analyzer (0.66 US gal). An empty bottle is supplied as a protective measure.



10 Bottle for alkalization reagent

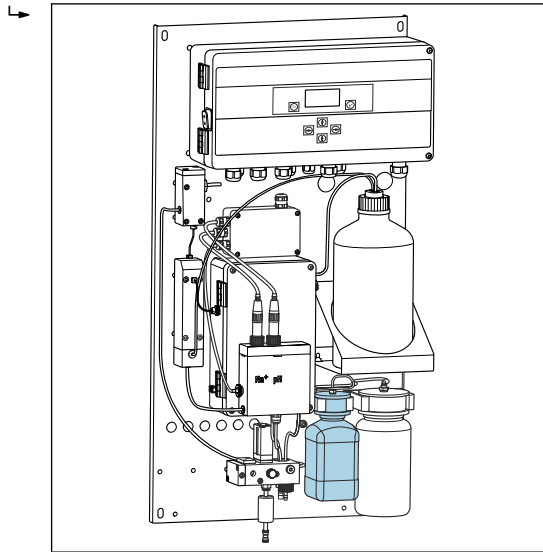
1. Unscrew the empty bottle and remove it from the holder.
2. Place the new bottle in the holder.
3. Open the bottle cap.
4. When using a bottle with S40 thread: replace the union, the bottle connection including seal remain the same.
5. Screw the bottle connection with the union nut onto the new bottle.

Connecting the bottle with standard solution

The standard solution is ready-to-use when delivered.

1. Open the bottle.

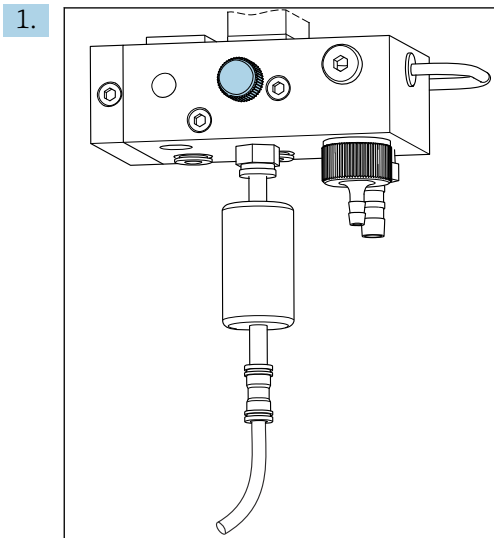
2. Screw the bottle into the head provided. In doing so, make sure you do not touch the hoses.



11 Connected bottle for sodium standard solution, incl. head

8.1.4 Setting the sample flow

The control valve is used to adjust the sampling volume so that the sample flows off evenly at the overflow.



12 Control valve

Set the sample flow to 5 to 10 l/h (1.32 to 2.64 gal/h) at the control valve.

2. Wait until sample flows off evenly via the overflow.
3. Repeat the process for all available channels.

8.2 Setting up PROFIBUS communication

1. In the main menu, select **Parameters/Outputs/Profibus**.
2. Configure the PROFIBUS slave address of the analyzer.
3. Switch off the device.
4. Connect the PROFIBUS cable to the PROFIBUS interface .

5. Switch on the device.
6. Import the GSD file via the configuration program.
7. During the integration phase, select the module according to the number of channels installed on the device.

8.3 Post-installation and 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.
- ▶ Before commissioning, check whether the correct fuse is installed for the specific voltage range.



The analyzer is fitted with a fuse, T 1.25 A, for the 215 to 240 V AC voltage level. If the analyzer is operated with 100 to 130 V AC, replace the fuse with the T 2.5 A fuse supplied. The fuse is located in the cover of the electronics unit.

8.4 Switching on the measuring instrument

- ▶ Switch on the analyzer at the mains switch.

8.5 Configuring the measuring instrument

The following steps must be performed once the analyzer has been switched on:

1. Wait for a run-in period of 4 hours.
2. Calibration of the electrodes
3. Configure the basic parameters
4. Repeat calibration of the electrodes (after at least 12 hours)

8.5.1 Calibrating the electrodes

1. Calibrate the pH electrode →  54.
2. Calibrate the sodium electrode →  55.

Occasionally a calibration error can occur when calibrating for the first time after commissioning. This is caused by impurities that entered during transportation, mounting and commissioning.

3. Repeat calibration of the electrodes after the analyzer has been in operation for at least 12 hours. This is necessary to purge the entire system after transportation and installation.

8.5.2 Configuring the basic parameters

1. Switch to automatic mode after calibrating the electrodes:
2. In the **Maintenance** menu, select the **Operating Mode** submenu and confirm with .
3. Enter the factory password 1111, or a new password that has been assigned and confirm with .

4. Use the ☐ key to select the **Mode** function and confirm with ☒.
5. Select the **AUTOMATIC** option and confirm with ☒.
6. Navigate to the **Parameters** menu.
7. Enter the factory password 2222, or a new password that has been assigned.
8. Define the required basic parameters in the **Parameters** menu.

9 Operation

9.1 Main menu, measured value display

The measured value display shows the measured value at the selected channel. The measured value display is the standard display screen in automatic mode.

1. Use the  and  keys to switch between the detailed status and measured value overview and the overview of the current outputs for the analog signal output for the channels.
2. Use the  and  keys to switch between the last measured values of the various channels and the laboratory sample.
3. Use the  key to navigate to the main menu.

Function	Options	Info
Hold	Read only	The measured value displayed is frozen. This happens in the following situations: ■ Until pH regulation is stable ■ Until the calibration is completed ■ For a defined time following a change of channel (e.g. the first 10 minutes in the case of a 15-minute measuring interval.)
Channel 1	Read only	Indicates the channel whose measured value is shown on the display
MST 1	Read only	Displays the name of the channel. The channel name can be edited .
pH, °C	Read only	Displays the pH value currently measured and the sample temperature
Status:	Read only	Displays alarms and error messages
H:MM	Read only	Displays the time until the next analysis of the selected measuring channel

The main menu is broken down into the following submenus:

- Diagnosis
- Maintenance
- Parameters

1. Select the submenus:  or .
2. Open the submenus: .

9.1.1 Detailed status overview

Use the  and  keys to switch from the measured value display to the detailed status overview and measured value overview.

The status and measured value overview displays the following parameters.

Function	Options	Info
Na	Read only	Displays the sodium concentration determined at the selected channel and the measured potential of the sodium electrode.
pH	Read only	Displays the pH measured value at the selected channel and the measured potential of the pH electrode.

Function	Options	Info
S	Read only	Displays the slope of the sodium electrode.
E0	Read only	Displays the standard electrode potential of the sodium electrode.

9.1.2 Overview of the current outputs

Use the  and  keys to switch from the measured value display to the overview of the analog current outputs.

Function	Options	Info
Channel 1... 6	Read only	Displays the current output at channels 1-6

9.2 Inputs and outputs

9.2.1 Status output via switch outputs

The current operating status is indicated via relays K3 to K8 at terminals X6, X9, and X11.

The measurement of a channel is indicated by the specific relay switching (see table).

At the start of a measurement, the measured value is in the "HOLD" state until the actual measured value is reached. During the "HOLD" phase, the previous measured value is displayed on the channel, and all relays except the one assigned to the channel are switched on.

If "HOLD" is exited, all the relays switch over. Only the relay assigned to the channel is then switched on.

Calibration, regeneration, filling, and laboratory sample are indicated by combination switchings of relays K3 to K8.

Function	Relay
Meas. Ch. 1	K3
Meas. Ch. 2	K4
Meas. Ch. 3	K5
Meas. Ch. 4	K6
Meas. Ch. 5	K7
Meas. Ch. 6	K8
Calibration	K3 + K5
Regeneration	K3 + K6
Laboratory sample measurement	K3 + K7
Fill	K3 + K8

9.2.2 External control via contacts

For external control of a channel, the contact at the corresponding input must be closed (see table).

The analysis is performed as long as the contact is closed and only ends when the contact is opened.

To start a calibration, contacts IN1 and IN2 must be closed simultaneously; for a regeneration, contacts IN1 and IN3. The contacts must remain closed until the corresponding process has been completed by the analyzer.

Premature opening of the contacts results in the premature termination of the process. Channel switching is immediate, but after selecting a new channel, the measured value is only released after a minimum time of 10 minutes has elapsed.

The contacts can be scanned to determine whether a regeneration or calibration has been completed. →  33

- To use the external control function, select **EXTERNAL (Operating Mode/Mode)**.
 - ↳ The analyzer is now controlled externally only. The automatic program sequence is no longer possible.

Function	Potential-free inputs to be switched
Meas. Ch. 1	IN1
Meas. Ch. 2	IN2
Meas. Ch. 3	IN3
Meas. Ch. 4	IN4
Meas. Ch. 5	IN5
Meas. Ch. 6	IN6
Calibration	IN1 + IN2
Regeneration	IN1 + IN3

9.3 Diagnostics

The **Diagnosis** submenu is not password-protected and can be accessed by all users. It shows logbook entries, status messages and diagnostic messages. The information displayed cannot be edited in this submenu.

Diagnosis		
Function	Options	Info
Logbook	Read only	Records the following information with the date and time: ■ Parameter changes ■ Alarms ■ Calibrations ■ Device initializations ■ Measurements from lab samples The entries are in chronologically descending order. The logbook contains up to 5600 events. The last row contains a filter option, which allows the user to perform a simplified search for events.
Entry-No.		Number of the entry displayed. The entries are in chronologically descending order.
Change of Parameter		Displays parameter changes
Operation Mode		Displays the operation mode You can start individual analysis programs and the automatic program sequence. You can freeze all the output values for maintenance.

Diagnosis		
Function	Options	Info
Status	Read only	Displays the following information: ■ Error messages and warnings present ■ Time since the last calibration or regeneration ■ Time until the next calibration or regeneration
Error No Error	Read only	Displays pending error messages → ⓘ 47 ("No error" in this example).
Warning No Warn.	Read only	Displays pending warnings ("No warning" in this example)
Last Cal. XXX.x h	Read only	Displays the time the last calibration was performed.
Last Reg. XXX.x h	Read only	Displays the time the last regeneration was performed.
Next Cal. XXX.x h	Read only	Displays the time of the next calibration.
Next Reg. XXX.x h	Read only	Displays the time of the next regeneration.
Na Calibration	Read only	Displays the parameters for monitoring the Na calibration. The parameters cannot be edited as the device determines the parameters during each calibration.
Na0 ... Na3	Read only	Displays the concentration increments for a sodium calibration including the measured mV values
S/E0 mV	Read only	Slope/standard electrode potential
C0 °C	Read only	Initial concentration, average calibration temperature
Error	Read only	Displays errors that occurred during the calibration.
Na Limits	Read only	Displays the limit values set for the sodium concentration in the specific measuring channel.
Software Version	Read only	Displays the version of the software installed for the amplifier and the electronics unit.

9.4 Maintenance

Maintenance		
Function	Options	Info
Password W		Enter the password to access the submenu. Factory password: 1111 1. Enter the first digit of the password using the  and  keys. 2. Go to the next digit with the  key. 3. Once you have entered the password, press  to confirm. 4. Press the  key for longer to return to the measured value display. If the wrong password has been entered, the Incorrect Password! message appears on the screen. The prompt to enter the password continues to be displayed.
Operating Mode		You can start individual analysis programs and the automatic program sequence. You can freeze all the output values for maintenance.
Maintenance	Selection ▪ ON ▪ OFF	If OFF is selected, normal device operation is guaranteed. If ON is selected, all the information output by the device is frozen. Measured values, errors and alarms are not forwarded. Switch on this function if performing maintenance or tests.
Mode	Selection ▪ AUTOMATIC ▪ OFF ▪ EXTERNAL	AUTOMATIC Switches on the automatic program sequence for the analyzer. The analyzer immediately starts analyzing the first channel that has been assigned a measuring duration. After this, the individual channels are analyzed according to the set channel sequence and measuring duration. OFF Switches off the automatic program sequence for the analyzer. EXTERNAL The analyzer is controlled externally only. Switches off the automatic program sequence for the analyzer and automatic calibration does not take place.
Manual	Selection ▪ OFF ▪ CALIB. ▪ Channel 1 to 6 ▪ Grab-test ▪ Fill ▪ Regener.	▪ OFF: No program selected manually ▪ CALIB.: Multipoint calibration is performed ▪ Channel 1 ... 6: Channels 1 to 6 are analyzed ▪ Grab-test: Lab sample is analyzed ▪ Fill: Hose of the standard solution pump and dosing loop are filled ▪ Regener.: Sodium electrode is regenerated

Maintenance		
Function	Options	Info
pH Calibration		Displays measured values and entry fields when calibrating the pH electrode. pH electrode calibration
pH1 pH ---		Enter the pH value of the first buffer solution used  The pH value of the first buffer solution should be lower than that of the second buffer solution.
pH2 pH ---		Enter the pH value of the second buffer solution used  The pH value of the second buffer solution should be greater than that of the first buffer solution.
Temp.		Displays the zero point shift
S mV/D		Enter the average temperature of the buffer solutions; temperature compensation can be switched on or off
E0 mV		Displays the slope
Meas.pot. mV		Displays the measuring potential
Meas.value pH		Displays the measured value for pH
Reagent Exchange		► Run after replacing the standard solution.
Interface 20mA		Specify a 4-20 mA current signal for each channel, e.g. for loop checks to the central process control system. 1. Enter the desired mA value. 2. Switch to ON to activate the outputting of a current signal for the specific channel. 3. Press  to confirm. ↳ The outputting of a current signal is automatically set to off when you exit the menu item. The analyzer outputs the current mA value.

Maintenance		
Function	Options	Info
Alarm		► Use this function to adapt the switching states of the alarm relays and of the current output to the individual requirements. The following states are possible for relay 1: ▪ OFF: No message ▪ Test: Relay test function ▪ Alerts: The relay reports all alarms: ▪ pH too small! (E32) ▪ No Reagent! (E30) ▪ Cal: No Reagent! (E31) The following states are possible for relay 2: ▪ OFF: No message ▪ Test: Relay test function ▪ Warning: The relay reports all warnings: ▪ all calibration errors (E1 to E7) ▪ No Sample! (E10) ▪ Limit ! (E20) ▪ Limit: The relay reports only when the configured Na limit value concentrations are exceeded (E20) ▪ Slope: The relay reports errors E4 to E7 only Response of the current interface if a message is reported: ▪ OFF: 23 mA is not forwarded ▪ Test: 23 mA current signal is tested ▪ Error: Current output switches to 23 mA for all errors that occur (errors are all alarms and warnings) ▪ Limit: Current output switches to 23 mA if the limit value is breached

9.5 Parameters

Parameters		
Function	Options	Info
Password P		Enter the factory password 2222, or a new password that has been assigned.
Basic Settings		Specify basic settings such as the measuring unit, language of the operating menu or the name of the measuring point.
Unit	Selection ▪ µg/l ▪ ppb	
Language	Selection ▪ German ▪ English	
WaterTest		Use WaterTest to activate water monitoring. If there is no sample or insufficient sample, the analyzer switches to the next channel. The analyzer switches to standby if no other channel is available for measurement due the set measurement frequency. The medium flow is then checked again in the defined time which must be configured under WaterTest .
MBF-Channel		Select the channel for the supply of MBF water (MBF = mixed bed filter). Select a channel where medium is available continuously and whose Na concentration is as low as possible (< 50 µg/l (ppb)). This ensures that the calibration sequence works correctly.
Autostart	Selection ▪ ON ▪ OFF	Switch on/off a restart after a power failure ▪ ON Switch on an automatic restart after a power failure ▪ OFF Switch off an automatic restart after a power failure
Date	Day, month, year	Displays the current date. If the date displayed differs significantly, set the correct date. 1. Select the value to be changed. 2. Press ☒ to activate.
Scan Time		Displays the current time. If the time displayed differs significantly, set the correct time. 1. Select the value to be changed (hour, minute, second). 2. Press ☒ to activate.

Parameters		
Function	Options	Info
Measurement Sequence	Calibration interval - Disabled 4 h 12 h 24 h 48 h 72 h 120 h 168 h Reg.: Number of regenerations 6 h 12 h 24 h Measuring time - Disabled 15 min 20 min 30 min 60 min 90 min 2 h	Make the following settings: - The intervals at which the analyzer starts an automatic calibration - How long the analyzer measures the sodium concentration in the particular channel - The number of regenerations to be performed in the calibration interval  It is not possible to guarantee the accuracy according to the specifications with a measuring time of 15 or 20 min. This is particularly true if channels with very different concentrations of sodium ions are measured in direct succession. Regenerations are performed automatically at equal intervals within the calibration interval. For example, if the time interval for the calibration is set to 48 hours and the number of regenerations is set to 3, a regeneration is performed 12 hours, 24 hours and 36 hours after the calibration, before a new calibration begins again after 48 hours. The regeneration is needed to maintain the functional integrity of the sodium electrode when operating in water that is low in sodium. In contrast to calibrations, the regeneration process requires significantly less time, thereby minimizing the time when the analyzer is not available for measurements. If the operating mode is set from OFF to AUTOMATIC, the device begins analyzing in succession - for the specified time - all the channels which have been assigned a measuring time. The time until the end of the current analysis of the channel displayed is shown on the bottom row of the measured value display. Once the time has elapsed (0 min on the measured value display), the device starts analyzing the channel again.
pH-Control		
pH set point		The set point for pH regulation can be changed depending on the accuracy requirements of the Na concentration measurement and the desired Na measuring range A set point of pH=11.00 is generally recommended.
pH lower limit		The lower limit value ensures that the pH value does not stray too much from the set point during the regulation. If the lower limit value is undershot for more than 10 minutes, the device switches to the Off state and stops the measurement. If this happens, the pH too small! error is displayed. If the set point has been set to pH=11, a value of 10.80 is recommended for the lower limit value. If a lower pH value is set, lower the limit further, while making sure to keep a ΔpH of at least 0.2.
Alarm delay		Alarm delay if value is under range Standard 600 s

Parameters		
Function	Options	Info
Na Limits		Specify upper limits for the sodium ion concentrations of the individual channels. If the analyzed concentration exceeds the set limit value, an error message is output via the alarm relays. In addition, the analog current output of the channel affected can transmit a signal to the central process control system. The settings for the relays and for the behavior of the current signal can be made as explained in the Alarm submenu. The parameters for the limit values can be changed in the same way as the time and date settings are changed.
Outputs		
Measuring Range		Assign the desired concentrations to the 4 to 20 mA values.
Scaling		Current transmission can be changed from linear to logarithmic
Current Calibration		Calibrate current outputs for the specific system that is connected.
Profibus	1 ... 126 Factory setting 126	Configure the slave address of the analyzer.
Names of Meas.Points		You can assign customized measuring point names to the individual channels. - Select a maximum of 7 letters or digits using the "arrow up" and "arrow down" keys. - Press the ☒ key to confirm. ↳ The measuring point names that have been defined are shown on the measured value display.
Password		Change the passwords for accessing the Maintenance and Parameters menus.  Only change the passwords of authorized personnel. Always make a note of the new passwords. A service technician must be consulted if the passwords are lost.
Password W	Factory setting 1111	Change the password for the Maintenance menu. Use a maximum of 4 digits.
Password P	Factory setting 2222	Change the password for the Parameters menu. Use a maximum of 4 digits.

9.6 PROFIBUS parameters

Input data (analyzer to PROFIBUS)

Group name	Starting address	Size (bytes)	Format	Parameter name	Description	Unit
Status 1	0	1	BYTE	Device status	Assignment of values for the device status →  44	
	1	1	BYTE	Errors	Assignment of error bits →  44	

Group name	Starting address	Size (bytes)	Format	Parameter name	Description	Unit
	2	2	BYTE	Warnings	Assignment of warning bits → 44	
	4	2	BYTE	Sample flow	Assignment of sample flow → 45	
	5	1	BYTE	Transmission	If current channel is in "hold", value: 0 If current channel is continuously transferring concentration data, value: 1	
	6	4	REAL	pH value	pH value currently measured	
	10	4	REAL	Sample temperature	Temperature of sample flow that is currently measured	°C
	14	2	INT16	Time since last Na calibration	Displays the time since the last Na calibration	min
	16	2	INT16	Time until next Na calibration	Displays the time until the next Na calibration	min
	18	2	INT16	Time since last Na regeneration	Displays the time since the last Na regeneration	min
	20	2	INT16	Time until next Na regeneration	Displays the time until the next Na regeneration	min
Status 2	22	4	REAL	S(Na)	Slope of the last Na calibration	mV/dec
	26	4	REAL	E0(Na)	E0 value from the last Na calibration	mV
	30	4	REAL	c0	c0 value from the last Na calibration	ppb
	34	4	REAL	T(Kal)	Average temperature from the last Na calibration	°C
	38	4	REAL	S(pH)	Slope of the last pH calibration	mV/dec
	42	4	REAL	E0(pH)	E0 value from the last pH calibration	mV
	46	2	INT16	Calibration interval	Shows the currently configured interval for Na calibration	h
	48	1	INT8	Number of regenerations	Number of regenerations performed between two calibrations	
	49	1	INT8	Filling level of stock solution	Filling level of the sodium stock solution	%
Channel 1	50	4	REAL	Na concentration 1	Measured sodium concentration of channel 1	ppb, µg/l
	54	1	BYTE	Status C1	Assignment of channel status → 45	
	55	1	BYTE	Reserve C1		
	56	2	INT16	Measuring time C1	Set measuring time in automatic mode ¹⁾	min

Group name	Starting address	Size (bytes)	Format	Parameter name	Description	Unit
Channel 2	58	4	REAL	Na concentration C2	Sodium concentration of channel 2	ppb, µg/l
	62	1	BYTE	Status C2	For assignment, see "Channel status" table	
	63	1	BYTE	Reserve C2		
	64	2	INT16	Measuring time C2	Set measuring time in automatic mode ²⁾	min
Channel 3	66	4	REAL	Na concentration C3	Sodium concentration of channel 3	ppb, µg/l
	70	1	BYTE	Status C3	Assignment of channel status → 45	
	71	1	BYTE	Reserve C3		
	72	2	INT16	Measuring time C3	Set measuring time in automatic mode ²⁾	min
Channel 4	74	4	REAL	Na concentration C4	Sodium concentration of channel 4	ppb, µg/l
	78	1	BYTE	Status C4	Assignment of channel status → 45	
	79	1	BYTE	Reserve C4		
	80	2	INT16	Measuring time C4	Set measuring time in automatic mode ²⁾	min
Channel 5	82	4	REAL	Na concentration C5	Sodium concentration of channel 5	ppb, µg/l
	86	1	BYTE	Status C5	Assignment of channel status → 45	
	87	1	BYTE	Reserve C5		
	88	2	INT16	Measuring time C5	Set measuring time in automatic mode ²⁾	min
Channel 6	90	4	REAL	Na concentration C6	Sodium concentration of channel 6	ppb, µg/l
	94	1	BYTE	Status C6	Assignment of channel status → 45	
	95	1	BYTE	Reserve C6		
	96	2	INT16	Measuring time C6	Set measuring time in automatic mode ²⁾	min

- 1) If the channel is active, the remaining measuring time is output; if no measuring time has been assigned: -1; if device is 1-channel device: -2
- 2) If the channel is active, the remaining measuring time is output; if no measuring time has been assigned: -1

Output data (PROFIBUS to analyzer)

Group name	Starting address	Size (bytes)	Format	Parameter name	Description
Remote control	0	2	2 BYTE	Remote control	Assignment of remote control → 45
	2	2	INT16	Calibration interval	Permitted values, index calibration interval → 46
	4	2	INT16	Number of regenerations	Maximum number of regenerations is limited, maximum permitted number: (calibration interval [h])/2)-1

Device status

Value	Device status	Description
0x00	Waiting	Device waiting for sample after insufficient sample flow
0x01	Na calibration	Na calibration is in progress
0x02	Meas. Ch. 1	Measurement of channel 1 is in progress
0x03	Meas. Ch. 2	Measurement of channel 2 is in progress
0x04	Meas. Ch. 3	Measurement of channel 3 is in progress
0x05	Meas. Ch. 4	Measurement of channel 4 is in progress
0x06	Meas. Ch. 5	Measurement of channel 5 is in progress
0x07	Meas. Ch. 6	Measurement of channel 6 is in progress
0x08	Lab. sample	Laboratory sample measurement is in progress
0x09	Fill	Filling of stock solution hose is in progress
0x0a	Regeneration	Regeneration of sodium electrode is in progress
0x0b	(not used)	
0x0c	(not used)	
0x0d	Off	Device is on standby (no analyses, calibrations or regenerations are in progress)
0x0e	(not used)	

Warning bits

Bit	Warnings	Description
0	(not used)	(not used)
1	CO error!	CO value of the Na calibration is too high.
2	Delta U too large	Delta U value of the Na calibration is too high.
3	STABW too large	Standard deviation of Na calibration is too high.
4	S Na too low	Slope of Na calibration is too low.
5	S Na too high	Slope of Na calibration is too high.
6	S pH too low	Slope of pH calibration is too low.
7	S pH too high	Slope of pH calibration is too high.
8	(not used)	(not used)
9	Limit channel 1	Na concentration limit has been exceeded on channel 1
10	Limit channel 2	Na concentration limit has been exceeded on channel 2
11	Limit channel 3	Na concentration limit has been exceeded on channel 3
12	Limit channel 4	Na concentration limit has been exceeded on channel 4
13	Limit channel 5	Na concentration limit has been exceeded on channel 5
14	Limit channel 6	Na concentration limit has been exceeded on channel 6
15	(not used)	(not used)

Error bits

Bit	Error	Description
0	pH too small!	The pH value is smaller than the set limit.
1	Na stock solution almost empty!	The Na stock solution is almost empty.
2	No Na stock solution!	The Na stock solution is empty and must be replaced or refilled.

Channel status

Bit 7	Bit 6	Channel status	Description
0	0	bad	pH value is too small (the pH value is smaller than the set limit)
0	1	uncertain	All calibration errors (warnings), stock solution empty, insufficient water flow
1	0	good	If no errors or warnings occurred during the measurement

Remote control

Bit	Remote control	Description
0	Start calibration	Starts calibration procedure
1	Start meas. ch. 1	Starts measurement of channel 1 (no time limit, switched off by "off")
2	Start meas. ch. 2	Starts measurement of channel 2 (no time limit, switched off by "off")
3	Start meas. ch. 3	Starts measurement of channel 3 (no time limit, switched off by "off")
4	Start meas. ch. 4	Starts measurement of channel 4 (no time limit, switched off by "off")
5	Start meas. ch. 5	Starts measurement of channel 5 (no time limit, switched off by "off")
6	Start meas. ch. 6	Starts measurement of channel 6 (no time limit, switched off by "off")
7	Start regeneration	Starts the automatic regeneration of the Na electrode
8	Off	Stops the technique currently running, the device then switches to standby
9	Start automatic	Starts the automatic program sequence
10	Set calibration interval	Sets the value for the calibration interval provided under "Calibration interval" (byte 2 and 3)
11	Set number of regenerations	Sets the value for the number of regenerations provided under "Number of regenerations" (byte 4 and 5)

Sample flow

Bit	Remote control	Description
0	-	-
1	No sample channel 1	Insufficient sample flow on channel 1
2	No sample channel 2	Insufficient sample flow on channel 2
3	No sample channel 3	Insufficient sample flow on channel 3
4	No sample channel 4	Insufficient sample flow on channel 4
5	No sample channel 5	Insufficient sample flow on channel 5
6	No sample channel 6	Insufficient sample flow on channel 6
7	-	-

Index calibration interval

Value	Calibration interval	Unit
0x00	Off	-
0x01	4	h
0x02	12	h
0x03	24	h
0x04	48	h
0x05	72	h
0x06	120	h
0x07	168	h

10 Diagnostics and troubleshooting

10.1 Diagnostic list

 The following table contains a list of the diagnostic messages, causes and remedial measures. If the recommended measures to troubleshoot the problem are unsuccessful, contact device support immediately.

Error code	Diagnostic message	Cause	Measure
E1	CO Error !	The initial concentration in the circuit is greater than 50 ppb Na ⁺ (only occurs after a calibration)	▶ Repeat calibration. ▶ Check the MBF channel.
E2	Delta U too large !	ΔU too high	▶ Repeat calibration.
E3	STABW too large !	Standard deviation too large.	▶ Repeat calibration.
E4	S Na too small !	Slope of the sodium electrode system outside the permitted limits (only occurs after a calibration)	▶ Check the electrode for damage. ▶ Check the calibration data. ▶ Check the standard solutions. ▶ Repeat calibration. ▶ Replace the electrode if necessary.
E5	S Na too large !	Slope of the sodium electrode system outside the permitted limits (only occurs after a calibration)	
E6	S pH too small !	Slope of the pH electrode outside the permitted limits (only occurs after a calibration)	
E7	S pH too large !	Slope of the pH electrode outside the permitted limits (only occurs after a calibration)	
E10	No Sample!	Insufficient flow in the overflow vessel	▶ Check the flow rate and regulate if necessary. ▶ Check the feed lines for leaks.
E20	Limit !	Limit value for Na ⁺ concentration exceeded.	▶ Reduce the Na⁺ concentration in the water ▶ Check the limit value settings. ▶ Check the current measuring conditions.
E30	No Reagent!	Insufficient standard solution in the supply vessel	▶ Top up standard solution or replace bottle containing standard solution.
E31	Cal: No Reagent!	Na ⁺ standard solution is empty.	▶ Top up standard solution or replace bottle containing standard solution.
E32	pH too small!	Alkalization bottle is empty. Hose to alkalization bottle is leaking. pH electrode defective, not calibrated or calibrated incorrectly. Alkalization pump defective.	▶ Check the level in the bottle containing alkalization reagent. ▶ Check the gas supply lines for leaks. ▶ Recalibrate the pH electrode or replace the electrode. ▶ Check the alkalization pump is functioning correctly.

10.2 Resetting the measuring instrument

 The settings presented below are basic settings that are stored in the analyzer after data have been deleted. These data are configured specifically for the device when the device is delivered.

Maintenance/Calibration/pH Calibration	
Parameter	Default value
pH1 pH ---	4.00
pH2 pH ---	7.00
S mV/D	25.0 °C

Parameters/Basic Settings	
Parameter	Default value
Unit	µg/l (ppb)
Language	English
WaterTest	On ----
MBF-Channel	1
Autostart	On
Date	Current date
Scan Time	Current time

Parameters/Measurement Sequence	
Parameter	Default value
Calibration	72 h
Channel 1 (per channel)	30 min
Regenerate	2

Parameters/Na Limits	
Parameter	Default value
Channel 1 (per channel)	100 µg/l (ppb)

Parameters/Outputs/Measuring Range	
Parameter	Default value
4 mA (per channel)	0 µg/l (ppb)
20 mA (per channel)	100 µg/l (ppb)

Parameters/Names of Meas.Points	
Parameter	Default value
Channel 1	MST 1
...	

Parameters/Passwords	
Parameter	Default value
Password W	1111
Password P	2222

10.3 Firmware history

Date	Version	Changes to firmware	Documentation
06/2022	V1.14.00	Complete revision	BA01706C/.../.../04.22
10/2019	V1.13.02	Extension to include PROFIBUS function  PROFIBUS interface, firmware version V1.04.01	BA01706C/.../.../03.19
04/2017	V1.11.00	Original software	BA01706C/.../.../01.17

11 Maintenance

WARNING

Electrical voltage

Risk of serious or fatal injury

- De-energize the device when performing maintenance work.

CAUTION

Failure to observe the maintenance intervals

Risk of personal injury and damage to property

- Keep to the recommended maintenance intervals

11.1 Maintenance schedule

Interval	Maintenance work
Daily	Visual inspection of the device
Weekly	Visual inspection of the level in the bottle containing alkalization reagent
Weekly	Visual inspection of the filter and housing to check for fouling
Weekly	Check the functional integrity of the sample conditioning unit
Weekly	Check the regulation of the sample flow
Approx. Once a month	Calibrate the pH electrode
As needed, approx. Once a month	Cleaning the flow through cell
As needed, approx. every 2 months	Replace the alkalization reagent
Every 6 months	Check the lines for leaks
As needed, every 6 months at the latest	Replace the standard solution
Approx. every 6 months	Replace the sodium electrode
Approx. every 6 months	Replace the pH electrode
Every 6 months	Alkalization reagent: check the bottle containing alkalization reagent and the hoses for leaks
Annually	Check the transmission of alarms and signals
As needed	Clean the filter of the sample conditioning unit
As needed	Replace the filter of the sample conditioning unit

11.2 Maintenance work

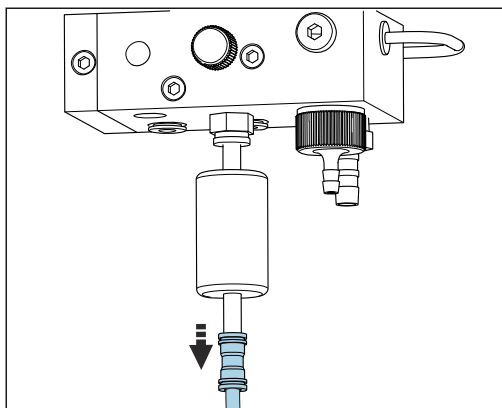
11.2.1 Before all maintenance tasks

1. Switch off the automatic mode via: **Maintenance/Operating Mode/Mode = OFF**.
 ↳ The device stops the program currently running. The analyzer is in the standby mode.
2. Shut off the supply of medium at the control valve by turning the valve clockwise
 →  3,  10.

11.2.2 Replacing the filter of the sample conditioning unit

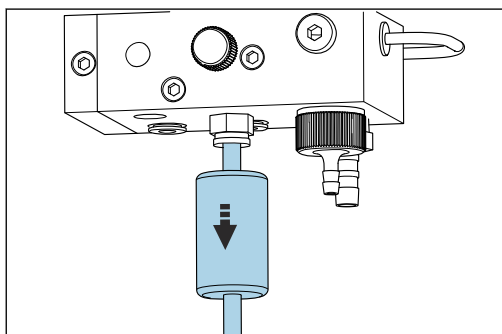
Tools are not required for the following series of steps.

1.



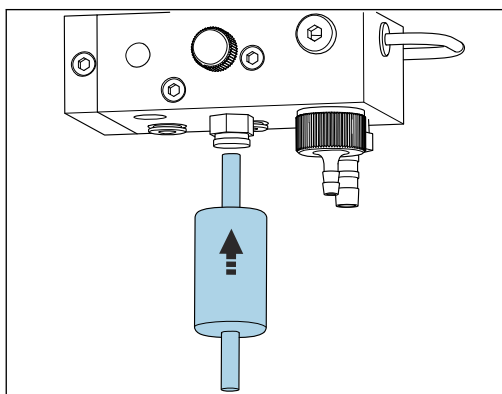
Remove the medium supply hose with a quick-release coupling at the filter.

2.



Remove the filter cartridge.

3.



Insert a new filter cartridge, while paying attention to the flow direction (indicated on the adhesive label on the filter)!

4.

Fit the medium supply hose with the quick-release coupling back on.

11.2.3 Cleaning the measuring unit

1.

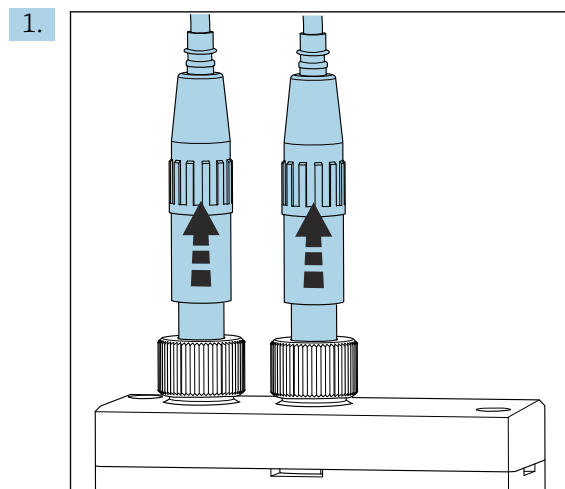
If you have not already done so:

Switch off the automatic mode via: **Maintenance/Operating Mode/OFF**.

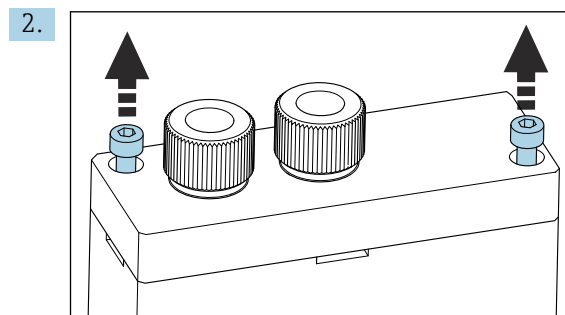
↳ The device stops the program currently running. The analyzer is in the standby mode.

2.

Shut off the supply of medium at the control valve by turning the valve clockwise
→  3,  10.

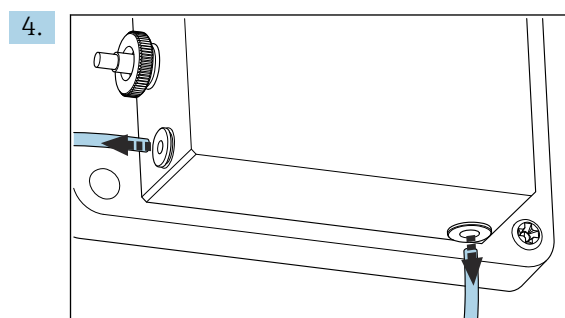
Removing the measuring unit

Untighten the coupling and remove the pH and sodium electrode from the measuring unit.

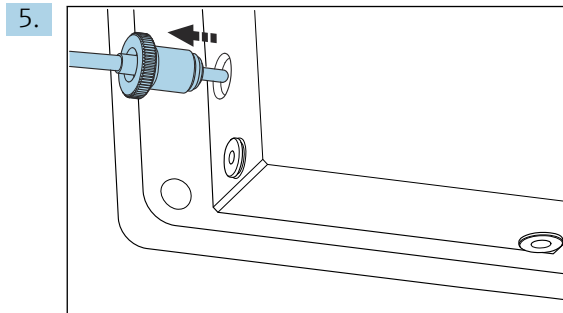


Loosen the Allen screws (AF4) of the cover and then remove the cover.

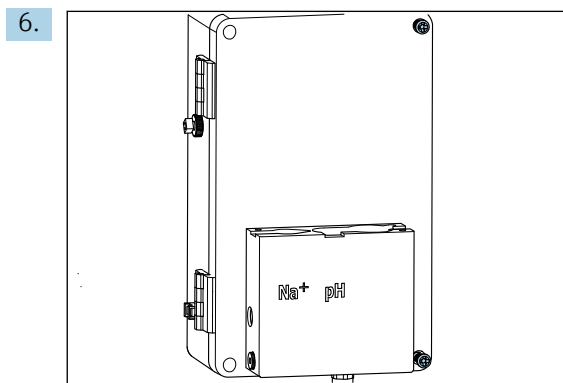
3. Empty the measuring unit, e.g. with a pipette.



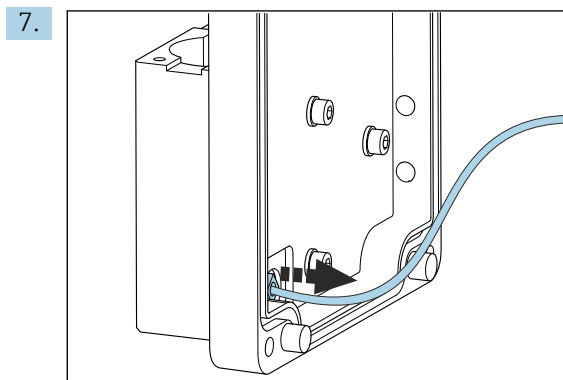
Untighten the hose connections of the measuring unit. To do so, gently squeeze the hoses in the direction of the connector, while pressing the locking ring, and remove the hose from the connector.



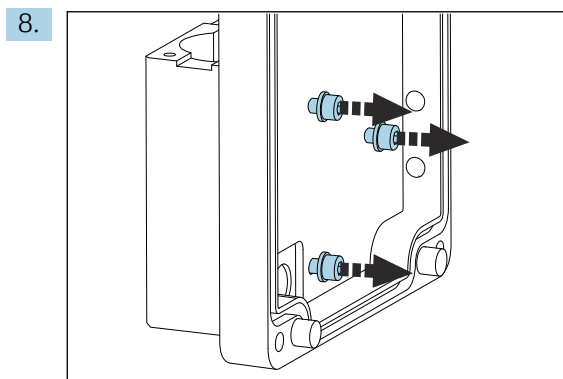
Remove the temperature sensor fitted on the left-hand side of the measuring unit, while making sure you do not lose the O-ring fitted in the measuring unit.



Loosen the 2 PH2 Phillips screws on the cover of the liquid control unit and open the cover.



Unscrew the hose to the circuit pump.



Hold the measuring unit steady and loosen the three securing screws on the inside of the cover of the liquid control unit with an Allen key (AF4).

9. Remove the measuring unit.

Cleaning the measuring unit

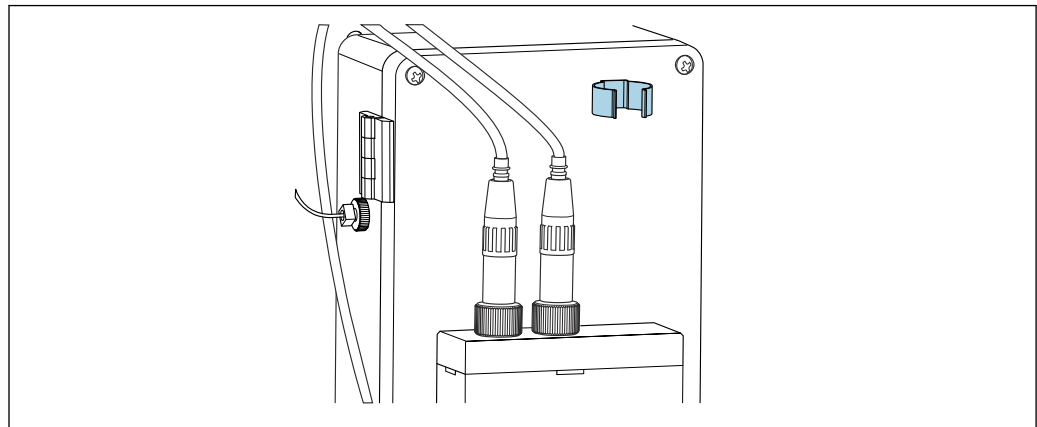
- When cleaning, do not use aggressive cleaning agents or aggressive cleaning methods.

Mounting the measuring unit

1. After cleaning, mount the measuring unit with the securing screws on the cover of the liquid control unit.
2. Insert the hose of the circuit pump and screw it tight.
3. Close the cover of the liquid control unit and screw it shut.
4. Fit the top part of the measuring unit and tighten the securing screws slightly finger-tight.
5. Mount the temperature sensor, while making sure you do not lose the O-ring fitted in the measuring unit.
6. Carefully re-establish all the cable and hose connections.
7. Install the pH electrode and sodium electrode.
8. Check the connections to ensure they are sealed tightly.
9. Switch on automatic mode via **Maintenance/Operating Mode/Mode= AUTOMATIC**.

11.2.4 Calibrating the pH electrode

- i** You can obtain good results with buffers with pH values of 4 and 7. The pH value of buffer pH1 should be lower than that of buffer pH2. Both solutions should have a similar temperature, ideally room temperature, and the same temperature as the pH electrode.



A0050105

13 Electrode holder on the housing of the liquid control unit

1. Navigate in the menu to **Maintenance**.
2. Enter the factory password 1111, or a new password that has been assigned.
3. Navigate to **Maintenance/Calibration/pH Calibration**.
4. **pH1 pH ---**: Enter the pH value of the buffer solution used.
5. **pH2 pH ---**: Enter the pH value of the buffer solution used.
6. **Temp.:** Enter the average temperature of the buffer solutions. Pay attention to the temperature dependency of the pH value of the buffer solution used.
7. After entering the values, remove the pH electrode from the measuring chamber and insert it into the electrode holder (→ **13**, **54**). Do not remove the measuring cable.
8. Rinse the pH electrode with deionized water.

9. Insert the pH electrode into the first buffer solution.
10. If the value for the measurement potential **Meas.pot. mV** remains stable for a minimum of 30 seconds, use the arrow keys to move to the right in the row from pH1 to "---".
11. Press ☒, select "set" and choose ☒ to confirm
12. After confirming, the "---" field appears again and the value has been accepted.
13. Repeat steps 8-12 for the second buffer solution.
 - ↳ Once the calibration has been performed successfully, the device updates the slope (S) and the zero point shift (E0).
14. Following the calibration, rinse the pH electrode with deionized water.
15. Carefully insert the pH electrode back into the measuring unit.

11.2.5 Calibrating the sodium electrode

During automatic calibration, standard solution is added several times to a defined sampling volume in the circuit. The sample is circulated through the circuit by switching the solenoid valves. Switching the solenoid valves and the circuit pump also causes the system to be rinsed and drained and a laboratory sample to be measured.

The sample must have a low sodium concentration (< 50 ppb), otherwise errors occur.

Automatically calibrating the sodium electrode

The analyzer has a built-in function for automatic calibration. Set the calibration interval for automatic calibration for this function.

1. Navigate in the menu to **Parameters/Measurement Sequence**.
2. Define the calibration interval.
3. The analyzer performs a calibration of the sodium electrode as per the defined interval.

Manually activating automatic calibration of the sodium electrode

 Automatic calibration of the sodium electrode must be manually activated only in the following cases:

- When commissioning the device
- After replacing the sodium electrode

Filling hoses after replacing standard solution

1. Navigate in the menu to **Maintenance**.
2. To access the **Maintenance** menu, enter the password 1111 (as-delivered state).
3. Press the ☒ key to open the **Operating Mode** menu item.
4. Select the **Manual** menu item.
5. Using the ☐ key, select the **Status: FILL** menu item. Press ☒ to confirm.
 - ↳ The analyzer fills the hose from the standard bottle to the valve unit with standard solution.
Any air in the hose to the standard solution pump is driven out. The dosing loop is filled with standard solution.

Manually activating automatic calibration

1. Navigate in the menu to **Maintenance**.
2. Enter the factory password 1111, or a new password that has been assigned.
3. Press the ☒ key to open the **Operating Mode** menu item.

4. Select the **Manual** menu item.
5. Select the **Calib.** menu item.
 - ↳ The analyzer performs an automatic calibration for approx. 1 h 15 min until approx. 2 h 30 min. The automatic mode can be re-established during the calibration. In this case, the device immediately starts automatic measurement on completion of the calibration.
6. Press the ☒ key to open the **Operating Mode** menu item.
7. Select **AUTOMATIC**.

11.2.6 Replacing electrodes

Removing electrodes

1. The analyzer is switched off or **Mode = OFF**.
Unscrew the plug of the cable marked "Na+" from the sodium electrode.
2. Unscrew the plug of the cable marked "pH" from the pH electrode.
3. Loosen the electrode screw connections on the measuring unit.
4. **NOTICE**
Risk of damaging the electrodes during the installation and removal procedure
 - ▶ Exercise care when inserting the electrodes into, and removing the electrodes from, the chambers of the flow through cell.
 - ▶ Do not touch against the glass bulbs of the electrodes.
 - ▶ Avoid air bubbles in the glass bulbs. If air bubbles are present, hold the electrode in a vertical position and shake it gently to remove the bubbles.
 - ▶ Do not allow the glass bulbs of the electrodes to become dry. Fit protection caps on the electrodes.

Remove electrodes from the left (sodium) and/or the right (pH) chamber.

5. **NOTICE**
The KCl solution can damage the sodium electrodes
 - ▶ Do not confuse the protection caps and storage solutions.

Fill the bottom sealing cap with the relevant electrode solution so that the electrodes do not dry out. For pH: use a 3-molar KCl solution. For sodium: use min. 1000 µg/l (ppb) sodium solution.

6. Fit the original sealing caps on the electrodes.

Preparing the new electrodes

1. Fill the measuring unit halfway with deionized water so that the electrodes do not dry out after installation.
2. Remove the electrodes from the packaging. The sodium electrode is marked "Na" on the shaft. The pH electrode has no marking.
3. Remove the lower sealing cap with the saline solution. If there are any salt crystals on the electrode, rinse them off carefully with deionized water.

The electrodes are now ready to be installed.

Installing the electrodes

1. Fit the plug of the cable marked "Na+" onto the sodium electrode.
2. Screw on the plug of the cable marked "Na+" finger-tight (right-hand thread).
3. Plug the plug of the cable marked "pH" onto the pH electrode.
4. Screw on the plug of the cable marked "pH" finger-tight (right-hand thread).

5. NOTICE

Incorrect electrode installation, removal and connection

Risk of damaging the electrodes and measuring cables

- ▶ Exercise care when inserting the electrodes into, and removing the electrodes from, the chambers of the flow through cell.
- ▶ Do not touch against the glass bulbs of the electrodes.
- ▶ Avoid air bubbles in the glass bulbs. If air bubbles are present, hold the electrode in a vertical position and shake it gently to remove the bubbles.
- ▶ Do not allow the glass bulbs of the electrodes to become dry. Fit protection caps on the electrodes.
- ▶ Protect the cable connections and plugs against corrosion, moisture, dirt and dust.
- ▶ Do not bend the electrode cables

Carefully insert the electrodes as far as they will go into the left-hand chamber (sodium) or right-hand chamber (pH).

6. Tighten the electrode coupling finger-tight.

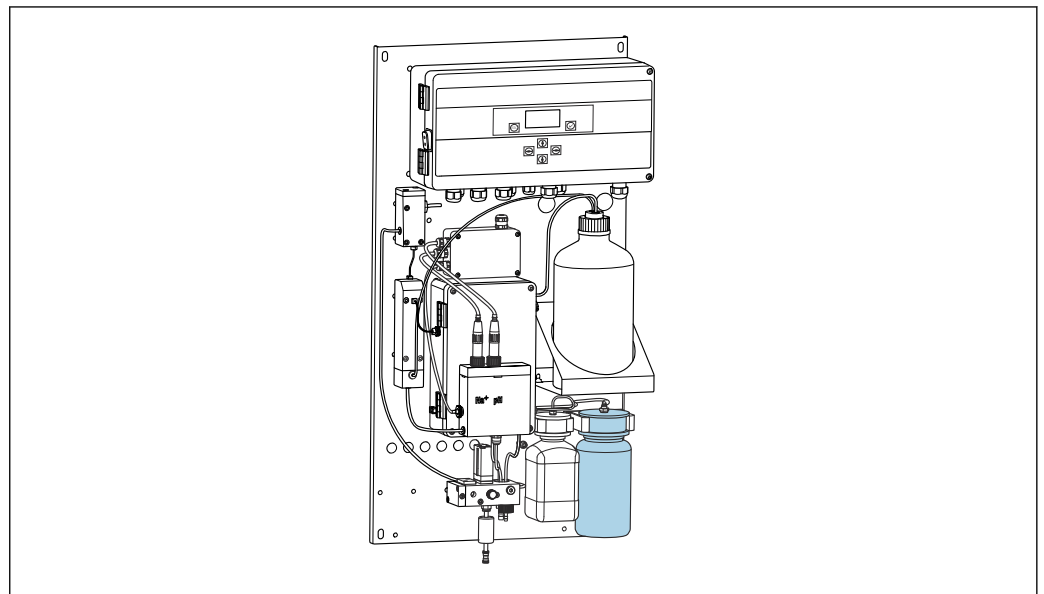
11.2.7 Measuring the laboratory sample

The measurement of a laboratory sample makes it possible to:

- Check manual samples from other measuring points for sodium ions
- Check the accuracy of the analyzer using self-produced or purchased standards

 Only use standards whose concentration is in the specified analyzer measuring range.

The analysis process is similar to a channel analysis. The difference is that the sample is conveyed by a separate pump, and not the static pressure. The result of the analysis is shown on the measured value screen. The measurement result is not output by a current signal. The result is recorded in the logbook where it can also be called up.



A0049211

 14 Lab sample bottle

1. Deactivate the **AUTOMATIC** operating mode.
2. The 1-liter (33.81 fl.oz) lab sample bottle that is supplied is rinsed. Fill the bottle with the sample to be measured.

3. Under **Operating Mode/Manual/Grab-sample** start the measurement.
 - ↳ The measured concentration is continuously updated. Depending on the sample measured beforehand, the value can sometimes vary greatly at the start of the measurement. The value should be constant at the end of the measurement after approx. 30 minutes. This final value is automatically entered in the logbook.

 For accurate measurements, the 30 minute limit should not be undershot. If the measurement is canceled, no entry is made in the logbook.

11.2.8 Replacing reagents

WARNING

Contact of chemicals with eyes and skin, and inhalation of vapors

Damage to the skin, eyes and respiratory organs

- ▶ Wear protective goggles, protective gloves and a lab coat when working with chemicals.
- ▶ Avoid any skin contact with chemicals.
- ▶ Do not inhale any vapors.
- ▶ Ensure the area is well ventilated.
- ▶ Comply with further instructions in the safety data sheets for the chemicals used.

Replacing the standard solution

NOTICE

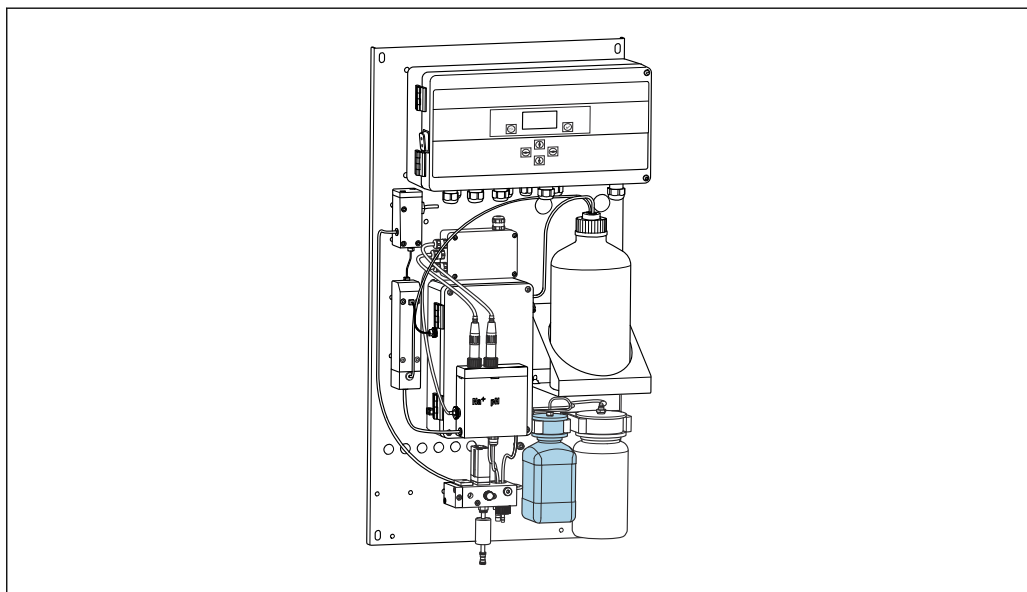
Escaping chemicals can contaminate the device

Incorrect measurements

- ▶ When changing the hoses, do not contaminate the hose ends with chemicals.
- ▶ Allow the ends of the hoses to drain fully.
- ▶ Do not touch the hoses when changing the standard solution.
- ▶ Ensure the area is well ventilated.

Replace the standard solution if the **No Reagent!** error message appears on the display, or if the standard solution is past the maximum shelf life date (6 months from date of production).

If the 0.5 liter (16.9 fl.oz) bottle containing standard solution is available, replace the empty bottle with it. This bottle can be ordered as an accessory.



A0049174

 15 Connected bottle for sodium standard solution, including head

 Do not touch the hoses when changing the standard solution.

1. Switch off the automatic mode via **Maintenance/Operating Mode/Mode = Off**.
 ↳ The device stops the program currently running. The analyzer is in the standby mode.
2. Unscrew the standard solution bottle from the head.
3. Carefully remove the standard solution bottle towards the bottom.
4. Screw the new bottle containing the standard solution into the head provided, while making sure not to touch the hose.
5. If larger containers of the standard solution have been purchased, top up the bottle with 0.5 liter (16.9 fl.oz) of standard solution (5100 µg/l (ppb) Na⁺) and screw it back into the holder.
6. Under **Maintenance/Reagent Exchange**, select the **Yes** option.
7. After replacing, execute the "Fill" sequence under **Maintenance/Operating Mode/Manual**. There should not be any air in the pipe system after replacing the solution. This would cause inaccuracies during the calibrations and measured errors during the subsequent measurements.

This completes the process of replacing the standard solution.

Replacing the alkalization reagent

WARNING

Diisopropylamine is a hazardous substance and can cause serious injuries.

- ▶ Wear protective goggles, protective gloves and a lab coat when working with chemicals.
- ▶ Avoid all contact with the skin.
- ▶ Do not inhale any vapors.
- ▶ Comply with the manufacturer's instructions in the safety data sheets.

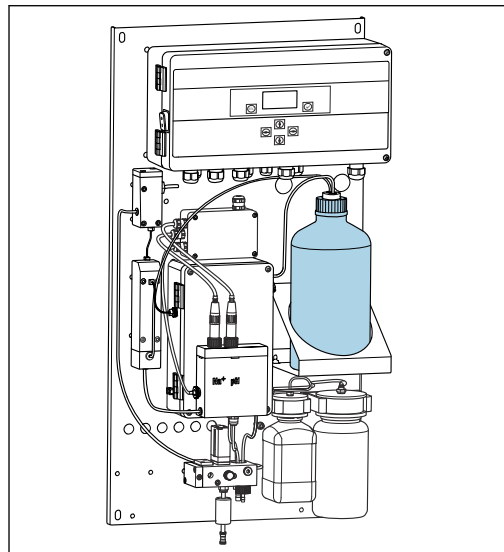
NOTICE**Escaping chemicals can contaminate the device**

Incorrect measurements

- ▶ When changing the hoses, do not contaminate the hose ends with chemicals.
- ▶ Allow the ends of the hoses to drain fully.
- ▶ Do not touch the hoses when changing the standard solution.
- ▶ Ensure the area is well ventilated.

i Purchase alkalization reagent separately (recommended: diisopropylamine (DIPA), > 99.0 % (GC), in a bottle made from a solid material, e.g. glass).

1. Follow the warning and safety instructions.
2. Comply with the instructions in the manufacturer's safety data sheets.



16 Bottle for alkalization reagent

If the alkalization reagent is used up, the **pH too small!** error message appears on the device display.

i Bottles with alkalization reagent with GL45 thread

No adapter required for connection to the analyzer, the bottle connection including thread adapter nut and seal are ready to use

Bottles with alkalization reagent with S40 thread

A different union is supplied for connection to the analyzer, can be reordered as an accessory for the analyzer

1. Switch off the automatic mode: **Maintenance/Operating Mode/Mode = OFF**.
 - ↳ The device stops the program currently running. The analyzer is in the standby mode.
2. Loosen the thread adapter nut of the bottle connection and remove it
3. Remove the empty bottle from the holder provided for the alkalization reagent.
4. Place the new bottle into the holder provided for the alkalization reagent.
5. Open the bottle cap of the new bottle.
6. When using a bottle with S40 thread: replace the union, the bottle connection including seal remain the same.
7. Screw the bottle connection with the thread adapter nut onto the new bottle.

This completes the process of replacing the alkalization reagent.

11.3 Decommissioning

WARNING

Contact of chemicals with eyes and skin, and inhalation of vapors

Damage to the skin, eyes and respiratory organs

- ▶ Wear protective goggles, protective gloves and a lab coat when working with chemicals.
- ▶ Avoid any skin contact with chemicals.
- ▶ Do not inhale any vapors.
- ▶ Ensure the area is well ventilated.
- ▶ Comply with further instructions in the safety data sheets for the chemicals used.

WARNING

Electrical voltage

Risk of serious or fatal injury

- ▶ De-energize the device when performing maintenance work.

CAUTION

Failure to observe the maintenance intervals

Risk of personal injury and damage to property

- ▶ Keep to the recommended maintenance intervals

NOTICE

Escaping chemicals can contaminate the device

Incorrect measurements

- ▶ When changing the hoses, do not contaminate the hose ends with chemicals.
- ▶ Allow the ends of the hoses to drain fully.
- ▶ Do not touch the hoses when changing the standard solution.
- ▶ Ensure the area is well ventilated.

Measuring unit: If the analyzer has not been in operation for more than 3 days, it must be taken out of service to avoid any damage to the device.

Proceed as follows to take the analyzer out of service:

1. In the **Operating Mode** menu, use the  key to select **Mode**.
2. Press  to confirm.
3. Press the  key to select **OFF**.
4. Press  to confirm.
 - ↳ The analyzer is in the standby mode for immediate restart.
5. Disconnect the analyzer from the mains.
6. Disconnect the bottle containing the alkalization reagent from the system.
7. Store the bottle containing the alkalization reagent, making sure it is securely sealed.
8. Remove the sodium and pH electrode from the measuring unit.
9. Fit the sodium and pH electrode with the original sealing caps.
10. **NOTICE**

The KCl solution can damage the sodium electrodes

 - ▶ Do not confuse the protection caps and storage solutions.

Fit the original covers on the storage solutions.
11. Fill the bottom sealing cap with the relevant electrode solution so that the electrodes do not dry out. For pH: use a 3-molar KCl solution. For sodium: use min. 1000 µg/l (ppb) sodium solution.
12. Completely empty the measuring unit with the supply vessel.

12 Repair

12.1 General notes

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).

12.2 Spare parts

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

<https://portal.endress.com/webapp/SparePartFinder>

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

12.3 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.

www.endress.com/support/return-material

12.4 Disposal

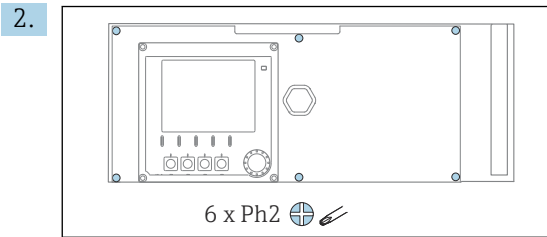


If required by the Directive 2012/19/EU on waste electrical and electronic equipment (WEEE), the product is marked with the depicted symbol in order to minimize the disposal of WEEE as unsorted municipal waste. Do not dispose of products bearing this marking as unsorted municipal waste. Instead, return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

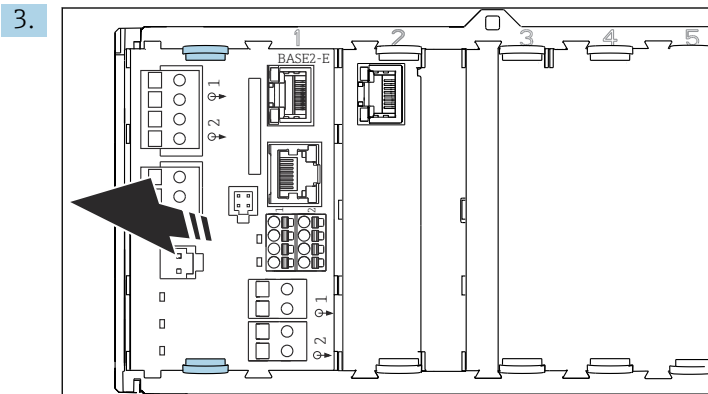
Battery disposal

A lithium button cell is located on the backplane of the controller. This must be removed as electronic waste prior to disposal of the device.

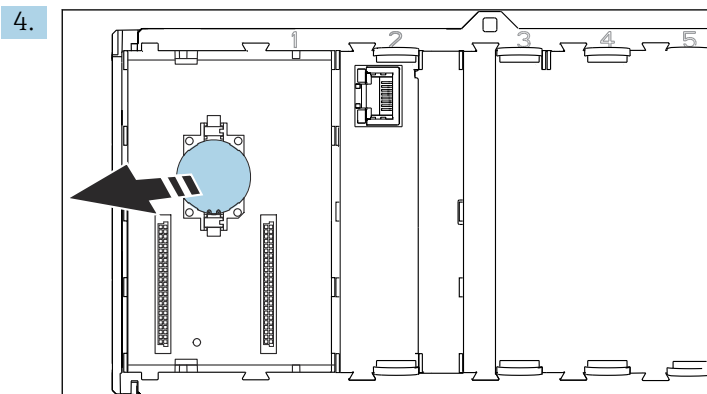
1. Disconnect the device from the power supply.



Release the six screws on the electronics compartment cover using a Phillips screwdriver and fold out the cover towards the front.



Press together the securing clips of the base module and pull them out of the base module.



Release the lithium button cell from the backplane and dispose of it according to local battery regulations.

Disposing of chemicals

CAUTION

Risk of injury if used reagents and reagent waste are disposed of incorrectly!

- ▶ Follow the instructions in the safety data sheets of the chemicals used.
- ▶ Observe the local regulations on disposal.

CAUTION

Danger of crushing or entrapment if the analyzer is mounted or disassembled incorrectly

- ▶ Two people are needed to mount and disassemble the analyzer.
- ▶ Wear suitable protective gloves to protect against mechanical risks.
- ▶ Comply with minimum spacing requirements when mounting.
- ▶ Use the spacers provided when mounting.

13 Accessories

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

Listed accessories are technically compatible with the product in the instructions.

1. Application-specific restrictions of the product combination are possible.
Ensure conformity of the measuring point to the application. This is the responsibility of the operator of the measuring point.
2. Pay attention to the information in the instructions for all products, particularly the technical data.
3. For accessories not listed here, please contact your Service or Sales Center.

13.1 Device-specific accessories

13.1.1 Starter kit

 Due to customs regulations, check with your local Sales Center regarding availability.

- pH electrode
- Sodium electrode
- Standard solution

Order No. 71358762

13.1.2 Electrode kit

- Sodium electrode
- pH electrode

Order No. 71371663

13.1.3 PROFIBUS upgrade kit for CA76NA

 Analyzers with software version V2.13 or higher can be upgraded to PROFIBUS.

PROFIBUS DP upgrade

Order No. 71439722

13.1.4 Sodium electrode for CA76NA

Sodium electrode

Order No. 71358110

13.1.5 pH electrode for CA76NA

pH electrode

Order No. 71358111

13.1.6 Consumables for CA76NA

Alkalization reagent

 Purchase alkalization reagent separately (recommended: diisopropylamine (DIPA), > 99.0 % (GC), in a bottle made from a solid material, e.g. glass).

Sodium standard solution

Standard solution 5100 µg/l (ppb) Na, 500 ml (16.9 fl.oz)

Order No. 71358761

pH buffer solutions**High-quality buffer solutions from Endress+Hauser - CPY20**

High-quality CPY20 pH buffers ensure maximum precision in pH calibrations. Available in pH 2.0, pH 4.0, pH 7.0, pH 9.0, pH 9.2, pH 10.0 and pH 12.0.

Further details and Product Configurator on the product page: www.endress.com/cpy20

13.1.7 Other accessories**Threaded adapter for alkalization bottle GL45 IG / S40 AG**

Order No. 71358132

14 Technical data

14.1 Input

Measured variables	Na [µg/l, ppb]	
Measuring range	CA76NA-**AD	0.1 to 9999 µg/l (ppb) Na
	CA76NA-**AE	0.1 to 200 µg/l (ppb) Na
	 A sample concentration < 50 ppb Na is required for the calibration.	
Input types	CA76NA-**AD	1 to 6 measuring channels
	CA76NA-**AE	1 measuring channel
Binary inputs	6 control inputs for external control of the analyzer	

14.2 Output

Output signal

Depending on version:
Up to 6 x 4 to 20 mA

PROFIBUS DP	
Signal encoding	EIA/TIA-485, PROFIBUS DP-compliant acc. to IEC 61158
Data transmission rate	9.6 kbit/s – 12 Mbit/s
Galvanic isolation	Yes
Connectors	M12 socket as per IEC 61072-2-101, 5-pin, b-coded

For version with PROFIBUS DP:

Maximum of two analog outputs for outputting the measured value

Load

Max. 500 Ω

Relay outputs

Relay

- 1 relay for alarm
- 1 relay for warnings
- Without PROFIBUS only:
6 relays for status signals

Relay types

- Changeover contact (alarm, warnings)
- Make contact (status signals)

Relay switching capacity

Switching voltage	Load (max.)	Switching cycles (min.)
250 V AC, $\cos\Phi = 0.8$ to 1	0.1 A	1,000,000
	0.5 A	200,000
	3 A	300,000
115 V AC, $\cos\Phi = 0.8$ to 1	0.1 A	1,000,000
	0.5 A	200,000
	3 A	30,000
24 V DC, L/R = 0 to 15 ms	0.5 A	200,000
	3 A	30,000

Protocol-specific data

Manufacturer ID	11 _h
Device type	1571D _h
Device database files (GSD files)	www.endress.com/profibus Device Integration Manager DIM
Output values	Status and measured values
Input variables	Remote control: measurement, calibration and regeneration of the analysis function
Supported features	■ PROFIBUS DP (DP-V0, cyclic data exchange), baud rate: 9.6 kbit/s – 12 Mbit/s ■ PROFIBUS device address configured via onsite operation or PROFIBUS Service "Set_Slave_Add" ■ GSD

14.3 Power supply**Supply voltage**

- 100 to 240 V AC (fuse must be replaced)
- 50 or 60 Hz
- Battery-free parameter backup



The analyzer is fitted with a fuse, T 1.25 A, for the 215 to 240 V AC voltage level. If the analyzer is operated with 100 to 130 V AC, replace the fuse with the T 2.5 A fuse supplied. The fuse is located in the cover of the electronics unit.

Power consumption

70 VA

14.4 Performance characteristics**Response time**

CA76NA-**AD

0.1 to 2000 µg/l (ppb)

180 seconds (95 %) within a calibration interval of 72 hours

2001 to 9999 µg/l (ppb)

600 seconds (95 %) within a calibration interval of 72 hours

CA76NA-**AE

< 55 s¹⁾

- 1) Response time from sample inflow to display change, T₉₀ depending on the stages of the concentration changes, 12 min. max.

Reference operating conditions	Sample pH 7, 25 °C (77 °F), 1 bar (14.5 psi)	
Maximum measurement error	CA76NA-**AD 0.1 to 2000 µg/l (ppb) 2001 to 9999 µg/l (ppb) CA76NA-**AE 0.1 to 40 µg/l (ppb) > 40 µg/l (ppb)	2 % of measured value; ±2 µg/l (ppb) (under reference conditions) 5 % of measured value; ±5 µg/l (ppb) (under reference conditions) 2 µg/l (ppb) 5 % of measured value
Repeatability	CA76NA-**AD 0.1 to 2000 µg/l (ppb) 2001 to 9999 µg/l (ppb) CA76NA-**AE	±2 % of display value; ±2 µg/l (ppb) (under reference conditions) ±5 % of display value; ±5 µg/l (ppb) (under reference conditions) Max. ±4 % of measured value or ±1 µg/l (ppb) (under reference conditions, for the same sample matrix)
Reagent consumption	CA76NA-**AD CA76NA-**AE	Typically 0.5 l (16.9 fl oz) per month at 25 °C (77 °F) Maximum 0.2 l (6.76 fl oz) per day at < 30 °C (86 °F) and alkalization to pH 11
Sample conditioning	CA76NA-**AD CA76NA-**AE	pH 3.5 to 11 (unbuffered) pH 2 to 4

14.5 Environment

Ambient temperature range	5 to 45 °C (41 to 113 °F)
Storage temperature	0 to 50 °C (32 to 122 °F)
Alkalization reagent and electrodes Store the alkalization reagent and electrodes at temperatures above +5 °C (41 °F).	
Relative humidity	10 to 95 %, non-condensing
Degree of protection	IP54 complete panel assembly IP65 electronics unit
Electromagnetic compatibility	Interference emission and interference immunity as per EN 61326-1, class A for industrial areas

Electrical safety	According to EN/IEC 61010-1:2010, Class I equipment Low voltage: overvoltage category II For installations up to 2000 m (6500 ft) above MSL
Pollution level	The product is suitable for pollution degree 2. Pollution degree 1 applies within the electronics unit.

14.6 Process

Sample temperature range	+10 to +40 °C (+50 to +104 °F)	
Supply pressure	1.0 to 5.0 bar (14.5 to 72.5 psi)	
pH of the sample	CA76NA-**AD CA76NA-**AE	pH 3.5 to 11 (unbuffered) pH 2 to 4 (alkalinity: based on pH 2 acidified with HCl and buffered with 225 ppm CaCO ₃)
Sample flow rate	10 to 15 l/h (2.64 to 3.96 gal/hr)	
Sample supply	■ 1 to 6 input channels with pressure regulator (regulates pressure to approx. 0.8 bar (11.6 psi)) ■ additional lab sample ■ pH regulation to pH 11	

14.7 Mechanical construction

Dimensions	→  15	
Weight	Approx. 23 kg (50.7 lbs)	
Hose specification	Medium inlet ■ Externally toleranced PE or PTFE hose with outer diameter of 6 mm on quick-release coupling ■ Hose minimum length: 200 mm (7.87 in) Medium outlet ■ Sample conditioning unit outlet: hose measuring 6 x 4 mm ■ Overflow vessel outlet, hose measuring 6 x 4 mm ■ General outlet: hose measuring 11 x 8 mm ■ Overflow valve outlet, 8 x 6 mm	

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