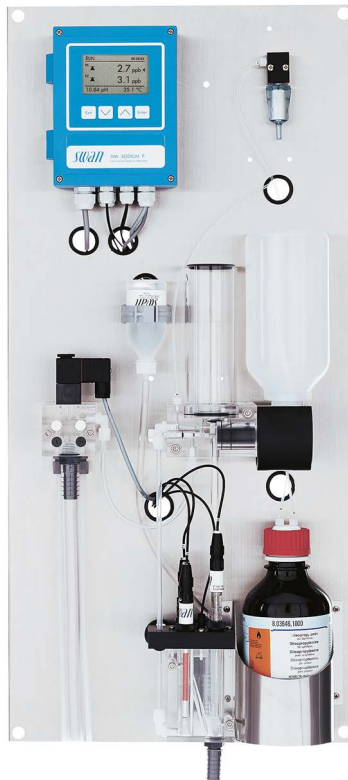


Operator's Manual

Firmware V6.22 and higher



SWISS  MADE



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The information contained in this document is subject to change without notice.

Table of Contents

1. Safety Instructions	6
1.1. Warning Notices	7
1.2. General Safety Regulations	9
1.3. Restrictions for use	10
2. Product Description	11
2.1. Instrument Specification	15
2.2. Instrument Overview	19
3. Installation	20
3.1. Installation Checklist	20
3.2. Mounting of Instrument Panel	22
3.3. Connecting Sample and Waste	23
3.3.1 FEP Tube at Sample Inlet	23
3.3.2 Sample Outlet	23
3.4. Installing Sensors	24
3.4.1 Installing the Sodium Electrode	25
3.4.2 Installing the Reference Electrode	27
3.4.3 Installing the pH Electrode	31
3.4.4 Installing the Temperature Sensor	32
3.4.5 Installing the reagent bottle	32
3.5. Installing the 2nd Sample Stream Option	33
3.6. AMI Sodium P Connected to AMI Sample Sequencer	35
3.7. Installing the Automatic Regeneration Option	36
3.8. Electrical Connections	39
3.8.1 Connection Diagram	41
3.9. Relay Contacts	43
3.9.1 Input	43
3.9.2 Alarm Relay	43
3.9.3 Relay 1 and 2	44
3.10. Signal Outputs	46
3.10.1 Signal Output 1 and 2 (current outputs)	46
3.11. Interface Options	46
3.11.1 Signal Output 3	47
3.11.2 Profibus, Modbus Interface	47
3.11.3 HART Interface	48
3.11.4 USB Interface	48
3.12. Connection of Sensors	49

4. Instrument Setup	50
4.1. Installing the Reagent Bottle	50
4.2. Installing the Regeneration Solution Bottle	51
4.3. Establish Sample Flow	52
4.4. Switch on Power	53
4.5. Programming	53
4.6. Fill Tube of Automatic Regeneration Module	53
4.7. Perform a Calibration	53
5. Operation	54
5.1. Keys, Display	54
5.2. Software Structure	56
5.3. Changing Parameters and Values	57
5.4. Grab Sample	58
6. Maintenance	60
6.1. Maintenance Schedule	60
6.2. Stop of Operation for Maintenance	61
6.3. Maintenance of Sodium Electrode	62
6.4. Maintenance of Reference Electrode	64
6.5. Maintenance of pH Sensor	65
6.6. Maintenance of Solenoid Valve	66
6.6.1 2 nd Sample Stream Option	66
6.6.2 Automatic Regeneration Option	68
6.7. Maintenance of Flow Cell and Constant Head	70
6.7.1 Cleaning the Flow cell	71
6.7.2 Cleaning the Constant Head	72
6.8. Replacing the Air Filter	74
6.9. Preparing the Standard	75
6.10. Calibration	76
6.10.1 pH Process Calibration	76
6.10.2 Standard Sodium 1-Point Calibration	77
6.10.3 2-Point Calibration	79
6.11. Tube Replacement	80
6.11.1 Tube Numbering	80
6.11.2 Replacing the Reaction Tube	81
6.11.3 Replacing the EPDM Seal and the Air Inlet Tube	82
6.12. Longer Stop of Operation	83
7. Troubleshooting	84
7.1. Error List	84
7.2. Automatic Regeneration	87
7.3. Replacing Fuses	88

8. Program Overview 89

8.1. Messages (Main Menu 1) 89

8.2. Diagnostics (Main Menu 2) 90

8.3. Maintenance (Main Menu 3) 91

8.4. Operation (Main Menu 4) 92

8.5. Installation (Main Menu 5) 92

9. Program List and Explanations 94

1 Messages 94

2 Diagnostics 94

3 Maintenance 95

4 Operation 97

5 Installation 99

10. Material Safety Data Sheet 113

10.1. Reagents 113

11. Default Values 114

12. Index 117

13. Notes 119

Operator's Manual

This document describes the main steps for instrument setup, operation and maintenance.

1. Safety Instructions

General	The instructions included in this section explain the potential risks associated with instrument operation and provide important safety practices designed to minimize these risks. If you carefully follow the information contained in this section, you can protect yourself from hazards and create a safer work environment. More safety instructions are given throughout this manual, at the respective locations where observation is most important. Strictly follow all safety instructions in this publication.
Target audience	Operator: Qualified person who uses the equipment for its intended purpose. Instrument operation requires thorough knowledge of applications, instrument functions and software program as well as all applicable safety rules and regulations.
OM Location	Keep the AMI Operator's Manual in proximity of the instrument.
Qualification, Training	To be qualified for instrument installation and operation, you must: ♦ read and understand the instructions in this manual as well as the Material Safety Data Sheets. ♦ know the relevant safety rules and regulations.

1.1. Warning Notices

The symbols used for safety-related notices have the following meaning:



DANGER

Your life or physical wellbeing are in serious danger if such warnings are ignored.

- ♦ Follow the prevention instructions carefully.



WARNING

Severe injuries or damage to the equipment can occur if such warnings are ignored.

- ♦ Follow the prevention instructions carefully.



CAUTION

Damage to the equipment, minor injury, malfunctions or incorrect process values can be the consequence if such warnings are ignored.

- ♦ Follow the prevention instructions carefully.

Mandatory Signs

The mandatory signs in this manual have the following meaning:



Safety goggles



Safety gloves

Warning Signs The warning signs in this manual have the following meaning:



Electrical shock hazard



Corrosive



Harmful to health



Flammable



Warning general



Attention general

1.2. General Safety Regulations

Legal Requirements

The user is responsible for proper system operation. All precautions must be followed to ensure safe operation of the instrument.

Spare Parts and Disposables

Use only official SWAN spare parts and disposables. If other parts are used during the normal warranty period, the manufacturer's warranty is voided.

Modifications

Modifications and instrument upgrades shall only be carried out by an authorized Service Technician. SWAN will not accept responsibility for any claim resulting from unauthorized modification or alteration.

WARNING

Electrical Shock Hazard



If proper operation is no longer possible, the instrument must be disconnected from all power lines, and measures must be taken to prevent inadvertent operation.

- ♦ To prevent from electrical shock, always make sure that the ground wire is connected.
- ♦ Service shall be performed by authorized personnel only.
- ♦ Whenever electronic service is required, disconnect instrument power and power of devices connected to.
 - relay 1,
 - relay 2,
 - alarm relay

WARNING



For safe instrument installation and operation you must read and understand the instructions in this manual.

WARNING



Only SWAN trained and authorized personnel shall perform the tasks described in this document.

1.3. Restrictions for use

The sample must not contain any particles, which may block the flow cell. Sufficient sample flow is coercive for the correct function of the instrument.

This instrument is only suitable for water with a pH value of more than 7.



WARNING

For safe instrument installation and operation you must read and understand the instructions in this manual, as well as the Material Safety Data Sheets (MSDS)

- ♦ Etching kit for sodium electrodes (powder + liquid)
- ♦ Regeneration solution for sodium electrodes (ready-to-use solution for automatic regeneration module)
- ♦ Sodium calibration solution
- ♦ Electrolyte for reference electrode
- ♦ Alcalizing reagent (e. g. Diisopropylamine)

Only SWAN trained and authorized personnel shall perform the tasks described in this document.

Download MSDS

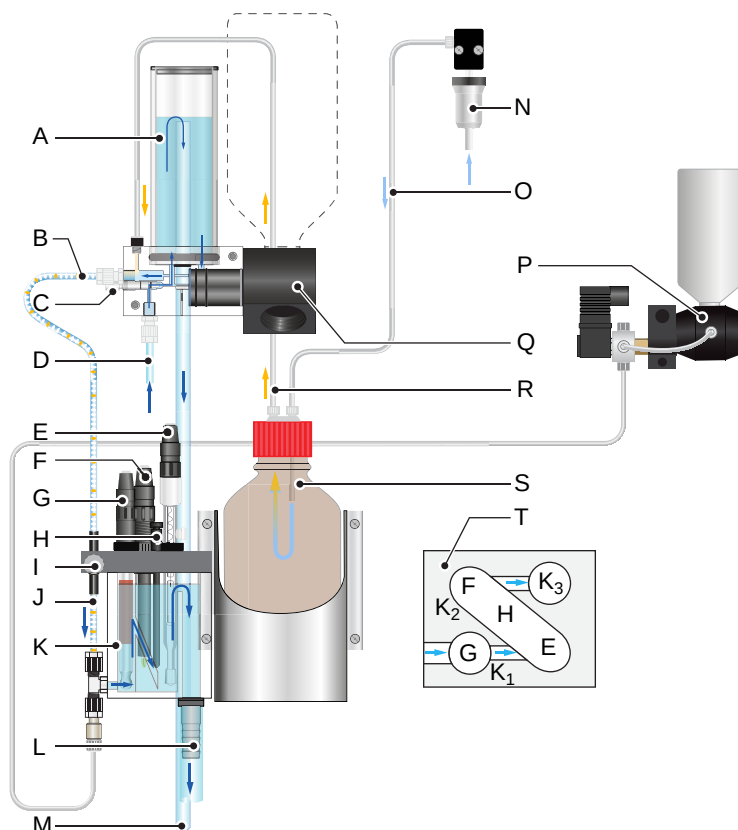
The current Material Safety Data Sheets (MSDS) can be downloaded from **www.swan.ch**.

2. Product Description

Application	Sodium measurement is used for quality control in high purity water applications and to monitor break through of mixed bed ion exchangers, condenser leaks and the prevention of caustic corrosion of turbines. The AMI Sodium P is suitable for samples with a pH value higher than pH7. For samples with a pH lower than pH7, use the AMI Sodium A.
Measuring principle	The sodium measurement used in this instrument is based on a potentiometric measuring method. For this purpose a proven sodium ion sensitive glass electrode and a reference electrode is used. These two electrodes produce a different electrical potential which is used to calculate the sodium concentration of the sample. According to Nernsts Law, the ion concentration depends on the temperature, therefore a temperature sensor measures the sample temperature. With the current temperature the measuring value is expressed for the standard temperature of 25 °C by using programmed temperature compensation curves. Sodium measurements below 1 ppb require a special glass formulation for the sensing electrode response. Ammonium and pH interferences from the unconditioned sample are eliminated by a suitable reagent. The measuring limit of 0.1 ppb sodium requires the conditioning of the sample to a minimum of pH 10.5 while sample integrity has to be maintained. The best results are obtained with Diisopropylamine (DIPA).
Signal Outputs	Two signal outputs programmable for measured values (freely scalable, linear or bilinear) or as continuous control output (control parameters programmable). Current loop: 0/4 - 20 mA Maximal burden: 510 Ω Third signal output available as an option. The third signal output can be operated as a current source or as a current sink (selectable via switch).
Relay	Two potential-free contacts programmable as limit switches for measuring values, controllers or timer for system cleaning with automatic hold function. Maximum load: 1 A / 250 VAC

Alarm Relay	One potential free contact. Alternatively: ♦ Open during normal operation, closed on error and loss of power. ♦ Closed during normal operation, open on error and loss of power. Summary alarm indication for programmable alarm values and instrument faults.
Input	For potential-free contact to freeze the measuring value or to interrupt control in automated installations (hold function or remote-off).
Safety Features	No data loss after power failure. All data is saved in non-volatile memory. Overvoltage protection of inputs and outputs. Galvanic separation of measuring inputs from signal outputs.
Communication Interface (optional)	♦ USB Interface for logger download. ♦ Third signal output (can be used in parallel to the USB interface) ♦ RS485 with Fieldbus protocol Modbus or Profibus DP ♦ HART interface
On-line Operation	The sample flows into the constant head [A] via the sample inlet [D] and the flow regulating valve [C]. Adjust the flow regulating valve so that always a small part of the sample flows through the overflow tube [M] into the waste. This adjustment ensures a sufficient sample flow through the flow cell [K]. First, the sample flows into the measuring chamber [K₁] where the sodium electrode [G] is installed and the sodium concentration of the sample is measured. From there it flows into the measuring chamber [K₂] where the pH electrode [F], the temperature sensor [H] and the reference electrode [E] are installed and thereafter it flows via flow cell [K₃] through the sample outlet [L]. During on-line operation, the standard bottle holder [R] is completely turned down, and the sample flows from the constant head [A] into the reaction tube [B]. Due to the different level of the constant head and the flow cell, a negative pressure is created in the reaction tube [B]. As a result, reagent-saturated air is sucked into the reaction tube, raising the pH of the sample to a value of 10.5, and forming a regular stream of air bubbles [J]. The bubble stream is used to monitor the correct sample flow with the bubble detector [I]. An inconsistent sample flow causes an interruption of the bubble formation and produces a system error. If the automatic regeneration module [P] is installed, the solenoid valve [Q] opens at configurable intervals, which automatically etches (i.e. regenerates) the sodium sensor.

Fluidics



A Constant head
B Reaction tube
C Flow regulating valve
D Sample inlet
E Reference electrode
F pH electrode
G Sodium electrode
H Temperature sensor
I Bubble counter
J Sample with air bubbles
K Flow cell

L Sample outlet
M Overflow tube
N Air inlet filter
O Air tube to DIPA bottle
P Automatic regeneration module (option)
Q Magnetic valve
R Standard bottle holder
S Tube with DIPA-saturated air
T Reagent bottle
U Flow cell top view

Second Sample Stream	If required the AMI Sodium P can be equipped with the optional second sample stream module. To install the 2 nd sample stream option, an AMI Sodium P with 400 mm or 375 mm panel width is required.
Sample Sequencer	If measurement of more than two sample streams is required, the AMI Sodium P can be connected to a Sample Sequencer, which allows to measure up to six sample streams.
Automatic Regeneration	Optionally, the AMI Sodium P can be equipped with a module for automatic sensor regeneration. To install the automatic regeneration module, an AMI Sodium P with 400 mm panel width is required.
Grab Sample	The standard bottle holder can also be used for a grab sample measurement. For details, see Grab Sample, p. 58 .
Calibration	A standard bottle is screwed in the standard bottle holder [Q] and turned upwards into the vertical position, thus switching the sample flow from the constant head to the standard bottle. Constant pressure within the standard bottle is maintained by the pressure-equalizing tube inside the bottle. One liter of standard is consumed in approx. 10 min. The sodium electrode must reach constant readings within this time to obtain an exact calibration. For details, see Calibration, p. 42.
Consumables	The filling of the 100 ml KCl bottle lasts for one month of operation.

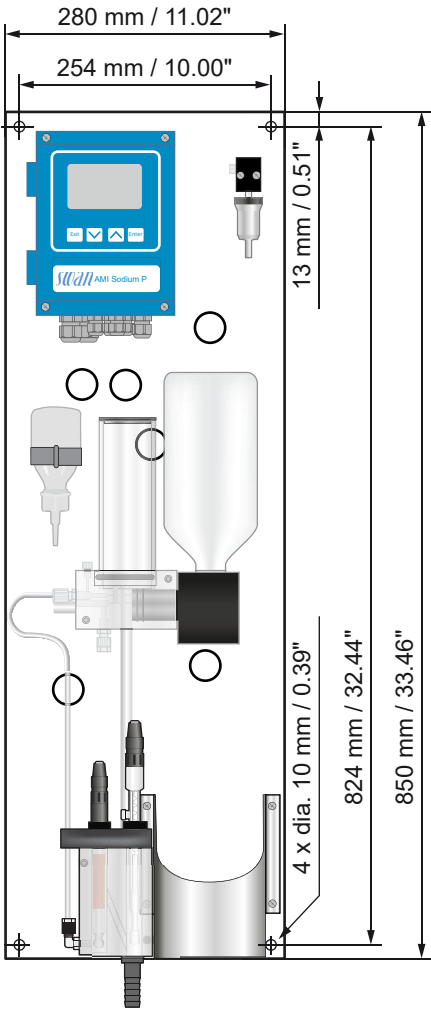
2.1. Instrument Specification

Power Supply	AC variant:	100–240 VAC ($\pm 10\%$) 50/60 Hz ($\pm 5\%$)
	DC variant	10–36 VDC
	Power consumption:	max. 35 VA
Transmitter specifications	Housing:	aluminum, with a protection degree of IP 66 / NEMA 4X
	Ambient temperature:	–10 to +50 °C
	Storage and transport:	–30 to +85 °C
	Humidity:	10–90% rel., non condensing
Sample requirements	Display:	backlit LCD, 75 x 45 mm
	pH value:	$\geq$ pH 7.0
	Ammonium concentration:	<10 ppm
	Flow rate:	min. 100 ml/min.
	Temperature:	5–45 °C (41–113 °F)
	Inlet pressure:	0.3–3 bar (4–43 PSI)
	Outlet pressure:	pressure free

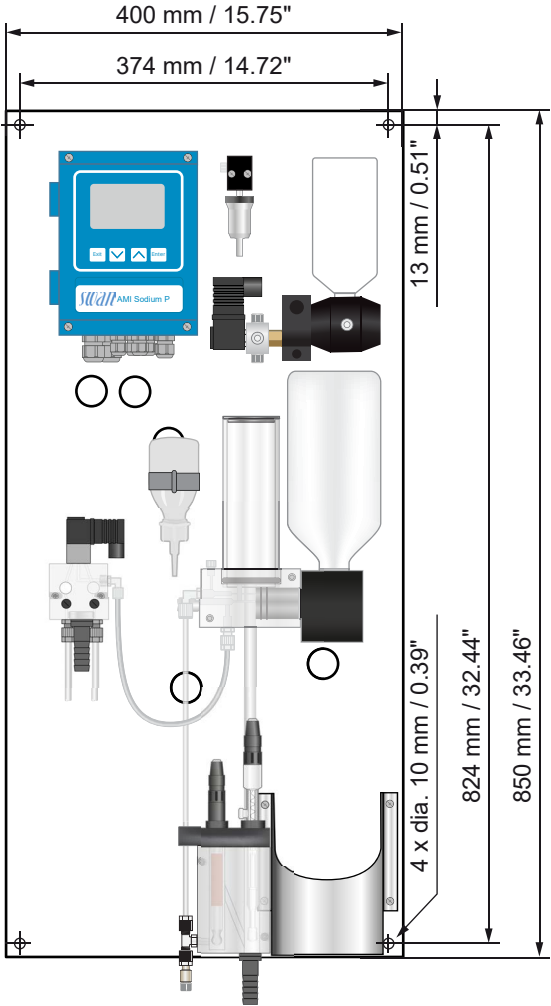
Note: No oil, no grease, no sand.

On-site requirements	The analyzer site must permit connections to:	
	Sample inlet:	Tube 4 x 6 mm
	Sample outlet:	1/2" hose nozzle for flexible tube diam. 20x 15 mm

Dimensions	Panel:	stainless steel
	Dimensions:	280 x 850 x 200 mm
	Screws:	8 mm diameter
	Weight:	9.0 kg / 19.85 lbs without sample water



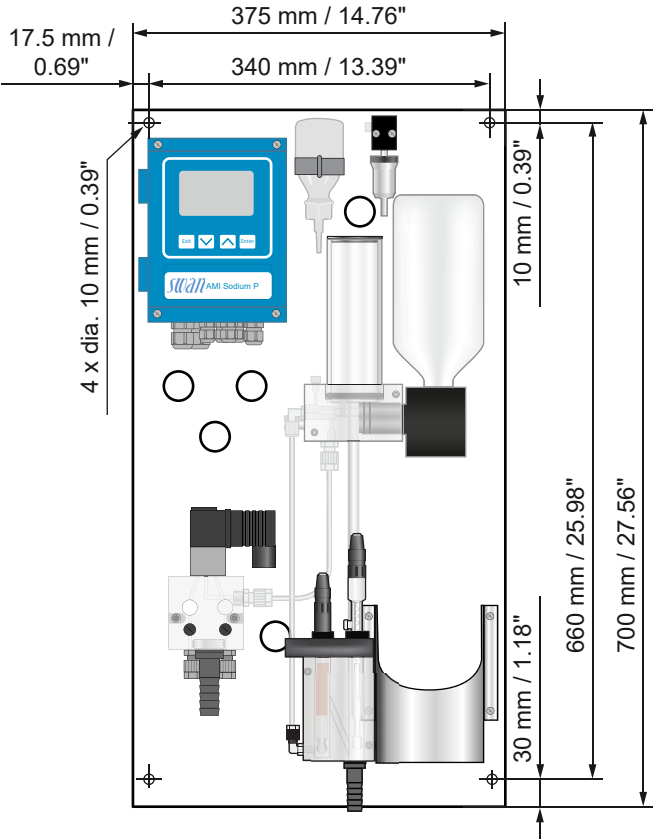
Dimensions with 2nd sample stream	Panel:	stainless steel
	Dimensions:	400 x 850 x 200 mm
	Screws:	8 mm diameter
	Weight:	12.0 kg / 26.5 lbs without sample water



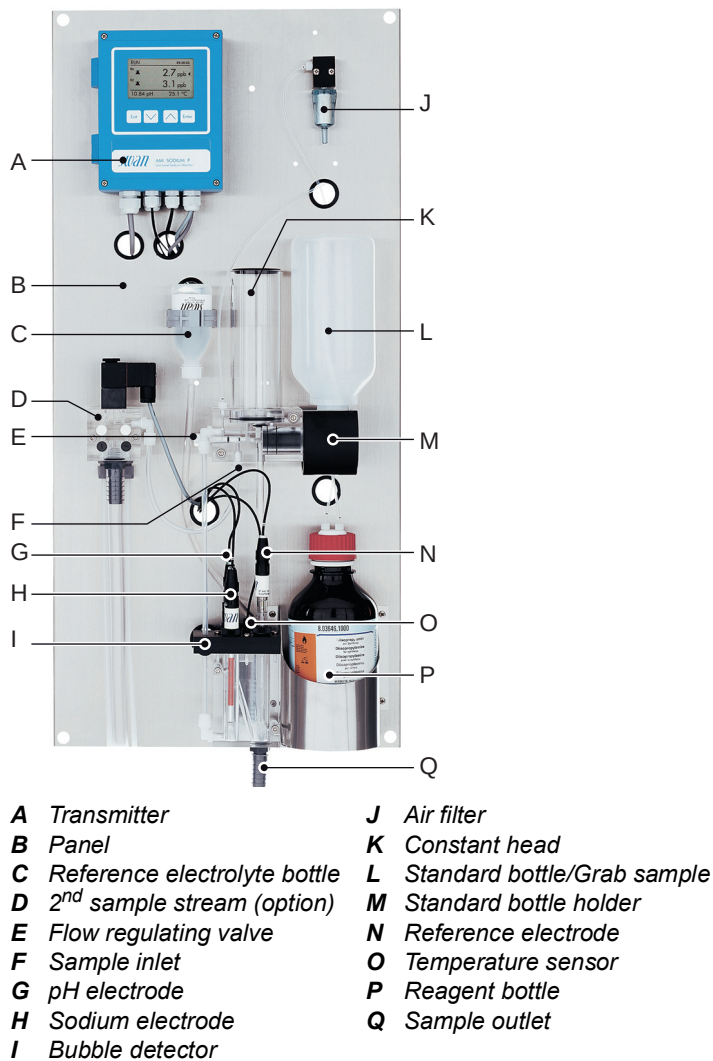
AMI Sodium P
Product Description



Dimensions of compact panel version	Panel:	stainless steel
	Dimensions:	375 x 700 x 200 mm
	Screws:	8 mm diameter
	Weight:	9.0 kg / 19.85 lbs without sample water



2.2. Instrument Overview



3. Installation

3.1. Installation Checklist

On-site requirements	AC variant: 100–240 VAC ($\pm 10\%$), 50/60 Hz ($\pm 5\%$) DC variant: 10–36 VDC Power consumption: 35 VA maximum. Protective earth connection required. Sample line with sufficient sample flow and pressure (see Instrument Specification, p. 15).
Installation	Install the instrument in vertical position. Display should be at eye-level. Connect the sample and waste line(s). See Connecting Sample and Waste, p. 21.
Electrodes	Sodium electrode: Installing the Sodium Electrode, p. 25. ◆ Etch the sodium electrode ◆ Rinse it well and check for air bubbles inside the electrode ◆ Install the sodium electrode ◆ Connect cable S to the sodium electrode Reference electrode: Installing the Reference Electrode, p. 27. ◆ Install KCl bottle ◆ Check the ground joint diaphragm ◆ Install the reference electrode ◆ Puncture the KCl bottle ◆ Connect cable R to the reference electrode pH electrode: Installing the pH Electrode, p. 31. ◆ Install the pH electrode ◆ Connect cable pH to the pH electrode
Electrical wiring	Connect all external devices like limit switches, see Electrical Connections, p. 22. Connect power cord.
Power-up	Turn on the sample flow and wait until the measuring cell is completely filled. Adjust the sample flow until the bubble stream is regular. Switch on power. See Establish Sample Flow, p. 39

Reagent and filter connections	Install the air filter. Install the reagent bottle. We recommend to use DIPA to operate the instrument. Use a reagent bottle with either G45 thread (Schott) or a bottle from Merck using a thread adapter. Close the bottle well to prevent the formation of reagent vapors. For installation see Installing the Reagent Bottle, p. 50. If the automatic regeneration module is installed: Screw a bottle of SWAN regeneration solution to the holder and fill the tube with regeneration solution by calling the <Maintenance>/<Regenerations>/<Manual Operation> menu item.
Instrument setup	Program all parameters for external devices (interface, recorders, etc.). Program all parameters for instrument operation (limits, alarms, measuring interval).
Run-in period	Let the instrument run continuously for 1 h.
Calibrate pH	See pH Process Calibration, p. 43.
Calibration of sodium electrode	Rinse the standard bottles well with deionized water. Prepare the sodium standards directly in the graduated standard bottles using a precision pipette. Make sure the concentrations are programmed correctly. Etch the sodium electrode and then perform a two-point calibration. See Calibration, p. 76.

3.2. Mounting of Instrument Panel

The first part of this chapter describes the preparing and placing of the instrument for use.

- ♦ The instrument must only be installed by trained personnel.
- ♦ Mount the instrument in vertical position.
- ♦ For ease of operation mount it so that the display is at eye level.
- ♦ For the installation a kit containing the following installation material is available:
 - 4 Screws 8x60 mm
 - 4 Dowels
 - 4 Washers 8.4/24 mm

Mounting requirements

The instrument is only intended for indoor installation.
For dimensions see  16.

3.3. Connecting Sample and Waste

3.3.1 FEP Tube at Sample Inlet



CAUTION

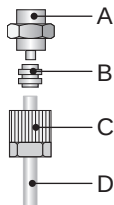
Damage of acrylic glass flow cell

Never screw steel fittings directly into the threads of the acrylic glass.

- ♦ Only use steel tubings with special fitting.

Use plastic tube 4 x 6 mm to connect the sample line.

Mounting of SERTO fitting



- A** Screw connection
- B** Compression ferrule
- C** Knurled nut
- D** Flexible tube

3.3.2 Sample Outlet

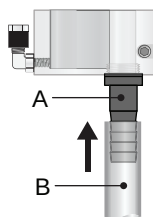


WARNING

Risk of water pollution

The drain of the flow cell outlet contains diisopropylamine (DIPA).

- ♦ At no means recirculate it into the water system.



- A** Hose nozzle
- B** 1/2" tube

Connect the 1/2" tube [B] to the hose nozzle [A] and place it into a pressure free drain with sufficient capacity.

3.4. Installing Sensors

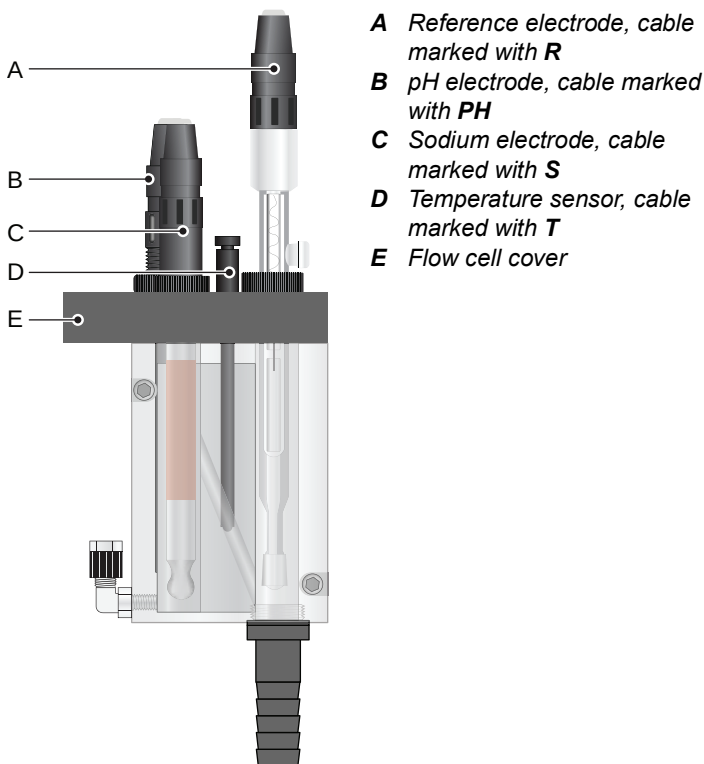


CAUTION

The electrodes are made of glass and therefore very sensitive

- ♦ Handle with care.

Position of sensors



- A** Reference electrode, cable marked with **R**
- B** pH electrode, cable marked with **PH**
- C** Sodium electrode, cable marked with **S**
- D** Temperature sensor, cable marked with **T**
- E** Flow cell cover

Unpacking

The electrodes are supplied separately and are installed into the flow cell after mounting of the instrument panel. The electrodes are protected with protective caps at their tips as well as on the electrical connectors.

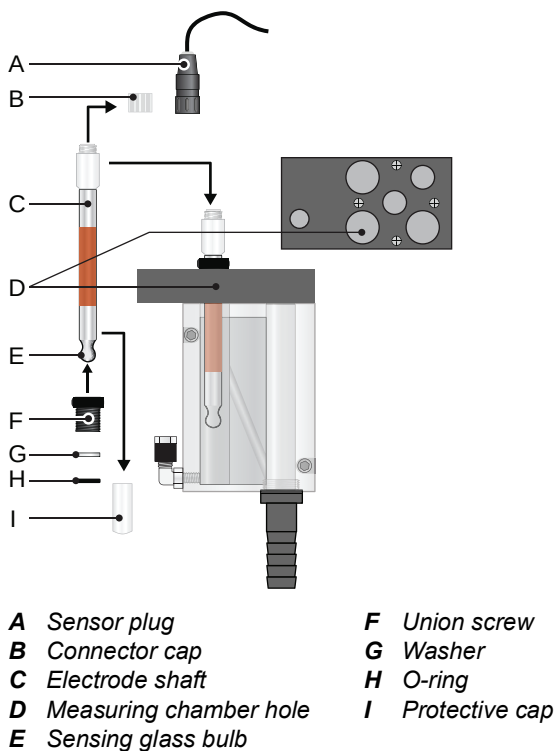
Remove the connector caps from the connector only when the electrode is mounted in the measuring cell.

3.4.1 Installing the Sodium Electrode

General Sodium electrodes are sensitive, electrochemical devices with a very high internal impedance. To maintain correct operation make sure that:

- ♦ the sensing glass bulb stays clean.
- ♦ no air bubbles are trapped in the glass bulb of the electrode.
- ♦ the electrical connectors stay clean and dry.

The electrode is delivered with protective caps on the sensing glass bulb as well as on the electrical connector.



Install the sodium electrode as follows:

- 1 Remove the protective cap [I] from the electrode with a careful turning and pulling movement.
- 2 Etch the electrode, see [Cleaning and etching, p. 63](#) and note the warning about handling of the chemicals.
- 3 Rinse the electrode with demineralized water.
- 4 Slip the union nut [F], and washer [G] on the electrode shaft [C].
- 5 Wet the O-ring [H] and slip it carefully over the electrode shaft [C].
- 6 Make sure no air bubbles are trapped in the sensing glass bulb [E]. Shake the electrode like a clinical thermometer with its tip pointing downwards until the bubble is vanished.
- 7 Insert the electrode through the measuring chamber hole [D] into the measuring chamber and push down completely.
- 8 Tighten the union screw [F] finger tight.
- 9 Remove the connector cap [B] from the electrode.
- 10 Screw the connector [A], of the cable marked with S, onto the electrode.
- 11 Connect the cable to the front end in the AMI Transmitter, see [Connection of Sensors, p. 49](#).

3.4.2 Installing the Reference Electrode

General The SWAN reference electrode is a double junction Calomel / KCl type electrode. The outer liquid junction is a liquid glass sleeve, guaranteeing easy maintenance and long life time.

To maintain correct operation make sure that:

- ♦ the ground joint diaphragm stays clean and a KCl flow of about 1ml/day is maintained.
- ♦ no air bubbles are trapped in the electrode and in the tube to the KCl reservoir.
- ♦ the electrical connectors stay clean and dry.

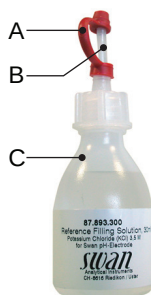


CAUTION

KCl is corrosive

Do not let electrolyte drop on the measuring cell.

Prepare the KCl Bottle

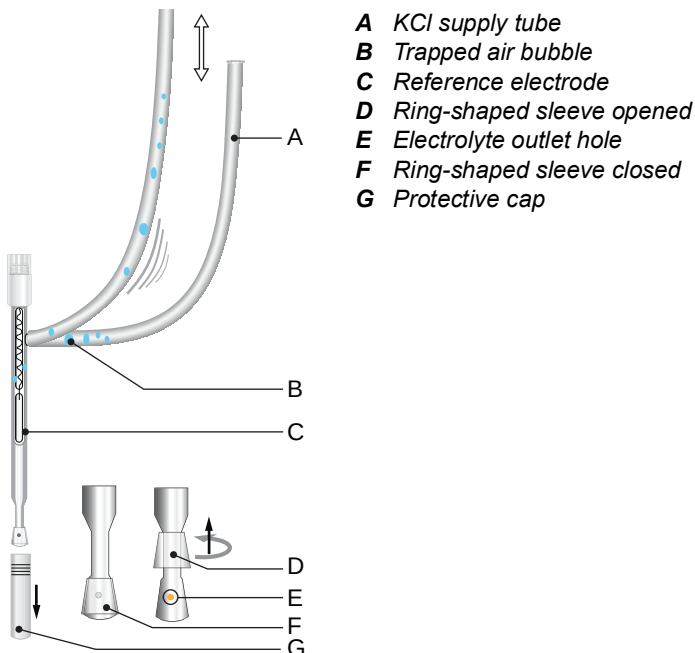


- A** Seal cap
- B** Dosing tip
- C** KCl bottle

- 1 Remove the seal cap [A] from the dosing tip [B].
- 2 Cut off the upper sealed part of the dosing tip.

**Prepare the
reference
electrode**

After longer storage of the reference electrode, the diaphragm may be clogged with salt deposits of KCl. Therefore it is recommended to open and clean the diaphragm before installing the reference electrode.

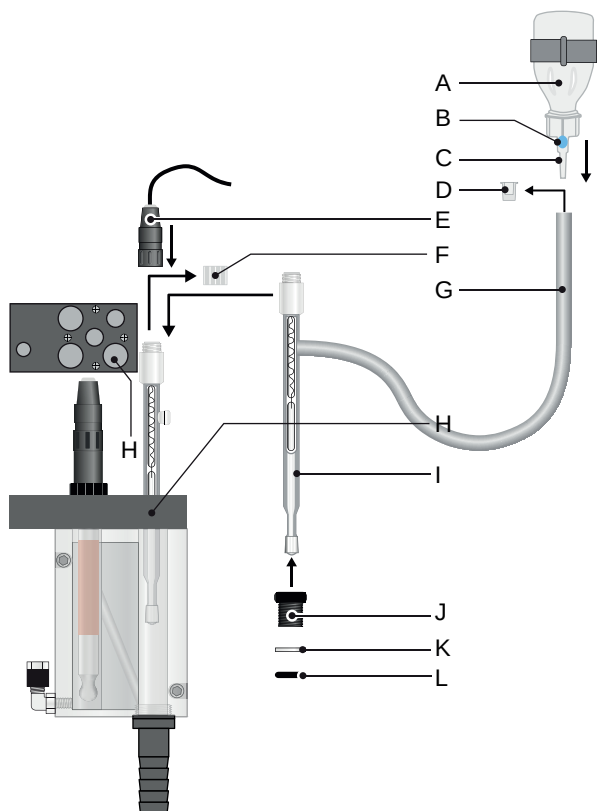


- A** KCl supply tube
- B** Trapped air bubble
- C** Reference electrode
- D** Ring-shaped sleeve opened
- E** Electrolyte outlet hole
- F** Ring-shaped sleeve closed
- G** Protective cap

To clean the reference electrode proceed as follows:

- 1** Remove the protective cap [G] from the ground joint diaphragm with a careful turning and pulling movement.
- 2** Hold the reference electrode with the ground joint diaphragm pointing downwards.
- 3** Slightly lift the ring-shaped sleeve of the ground-joint diaphragm and allow a little electrolyte to flow out into a tissue.
- 4** Rinse the electrode tip well with deionized water.
- 5** Push the ring-shaped sleeve carefully over the ground-joint diaphragm.
- 6** While holding the electrode tip pointing downwards pull the KCl supply tube several times so that the air bubbles can escape upwards.

**Install the
reference
electrode**



- | | |
|-----------------------------|---------------------------------|
| A KCl bottle | G KCl supply tube |
| B Trapped air bubble | H Reference chamber hole |
| C Dosing tip | I Electrode shaft |
| D Stopper | J Union screw |
| E Sensor plug | K Washer |
| F Connector cap | L O-ring |

Install the reference electrode as follows:

- 1 Remove the stopper [D] from the KCl supply tube [G].
- 2 Connect the KCl supply tube to the dosing tip [C] of the KCl bottle (the compact panel version requires an additional extension tube, see [Extension tube on compact panel version, p. 30](#)).

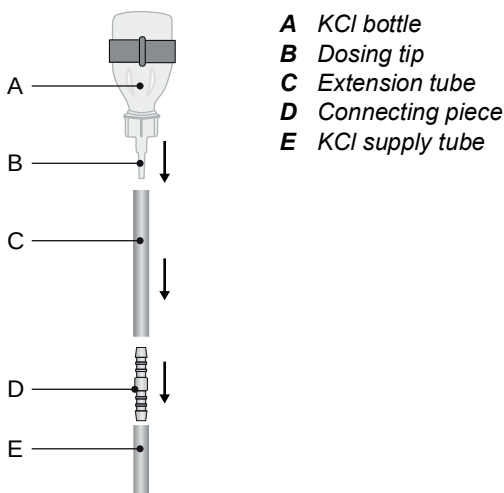
- 3 Fix the KCl bottle upside down in the holder on the panel.
- 4 Puncture the bottle bottom to allow pressure equilibration.
- 5 Knock against the KCl bottle to remove trapped air bubbles [B] in the dosing tip.

Note: Air bubbles trapped in the dosing tip of the KCl bottle may stop the KCl flow to the reference electrode, which results in wrong measuring values.

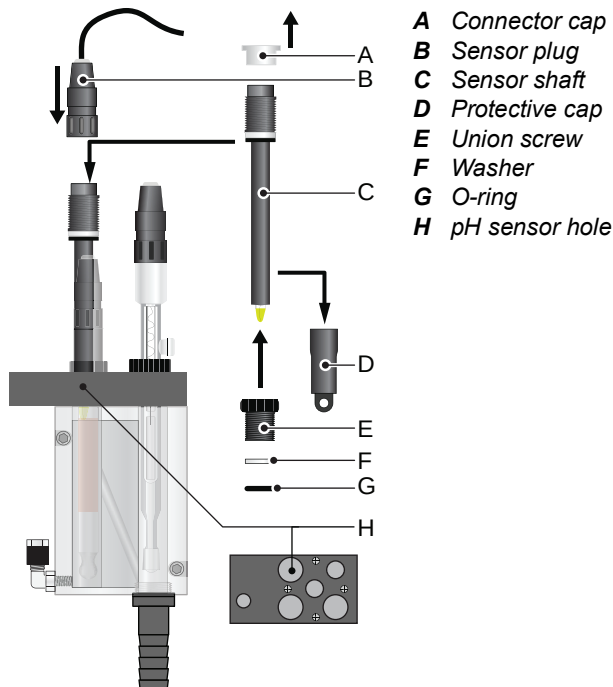
- 6 Slip the union screw [J], and washer [K] on the electrode shaft [I].
- 7 Wet the O-ring [L] and slip it carefully over the electrode shaft [I].
- 8 Insert the electrode through the hole [H] into the reference chamber and push it down until the ground joint diaphragm is about 0.5 cm above the bottom.
- 9 Tighten the union screw [J] finger tight.
- 10 Remove the connector cap [F] from the electrode.
- 11 Screw the connector [E], of the cable marked with R, onto the electrode.
- 12 Connect the cable to the front end in the AMI Transmitter, see [Connection of Sensors, p. 49](#).

**Extension tube
on compact
panel version**

On the compact panel version, use the enclosed extension tube [C] and the connecting piece [D] to connect the KCl bottle.



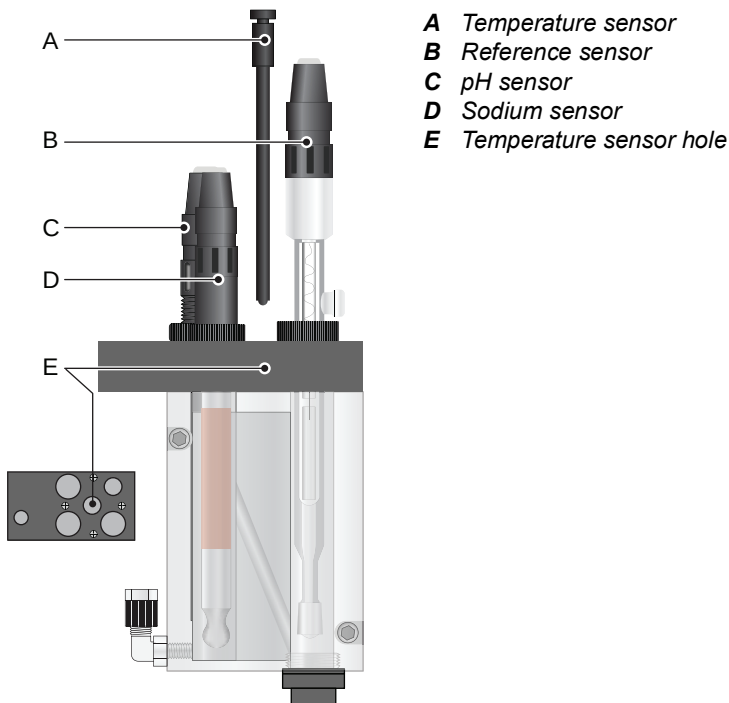
3.4.3 Installing the pH Electrode



- 1 Carefully remove the protective cap [D] from the electrode tip. Turn it clockwise only.
- 2 Rinse the electrode tip with clean water.
- 3 Slip union screw [E], and washer [F] on the electrode shaft [C].
- 4 Wet the O-ring [G] and slip it carefully over the electrode shaft.
- 5 Insert the electrode through the hole [H] in into the flow cell.
- 6 Tighten the union screw [E] hand-tight.
- 7 Remove the connector cap [A].
- 8 Screw the connector [B], of the cable marked with pH, onto the pH electrode.
- 9 Keep the protective caps on a secure place for later use.
- 10 Connect the cable to the front end in the AMI Transmitter, see [Connection of Sensors, p. 49](#).

3.4.4 Installing the Temperature Sensor

The temperature sensor is fixed to the panel with an adhesive tape and already connected to the front end PCB in the AMI transmitter.



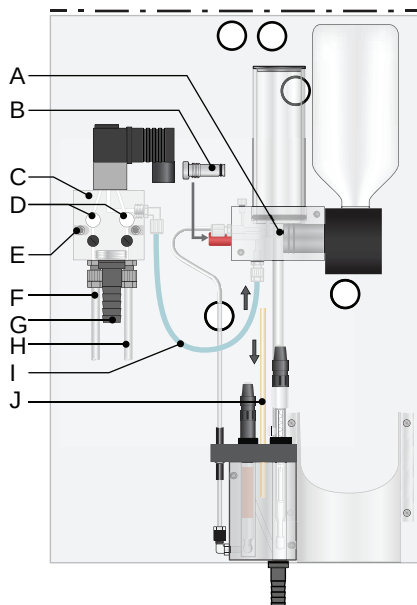
To install the temperature sensor proceed as follows:

- 1 Remove the temperature sensor [A] from the panel.
- 2 Insert the temperature sensor through the hole [E] into the flow cell.
- 3 Push it into the hole as far as it will go.

3.4.5 Installing the reagent bottle

The DIPA bottle will be installed shortly before commissioning, see chapter 4, [Installing the Reagent Bottle, p. 50](#).

3.5. Installing the 2nd Sample Stream Option



- | | |
|---|---------------------------------------|
| A Constant head support | F Sample stream 1 |
| B Blind plug | G Hose nozzle for drain funnel |
| C 2 nd sample stream option with solenoid valve | H Sample stream 2 |
| D Flow regulating valves | I Connection tube |
| E Fixing screws | J Existing sample inlet tube |

Mechanical installation

To install the optional 2nd sample stream, proceed as follows:

- 1 Stop the sample flow at the main tap.
- 2 Switch off the instrument.
- 3 Replace the flow regulating valve from the constant head support [A] with the blind plug [B].
- 4 Remove the existing sample inlet tube [J] from the constant head support inlet.
- 5 Screw the 2nd sample stream option [C] to the panel using the enclosed screws.

- 6 Install the connection tube [I] between the 2nd sample stream outlet and the constant head support inlet.
- 7 Connect sample inlet 1 [F] and sample inlet 2 [H] to the corresponding inlets at the 2nd sample stream.
- 8 Connect a 1/2" tube to the hose nozzle [G] and put it into a pressure free drain.

**Electrical
connection**

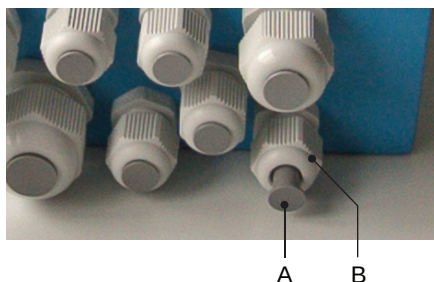


WARNING

Electrical shock hazard!

Before opening the AMI transmitter switch power off.

Use one of the PG7 cable glands to feed the cable of the solenoid valve into the AMI transmitter housing.



- 1 Remove the plug [A] from the cable gland [B].
- 2 Open the transmitter housing.
- 3 Feed the cable of the solenoid valve through the cable gland [B] into the AMI transmitter housing.
- 4 Connect the wires to the terminals in the AMI transmitter according to the [Connection Diagram, p. 41](#).
⇒ Referred to as "Selector" in the connection diagram.

3.6. AMI Sodium P Connected to AMI Sample Sequencer

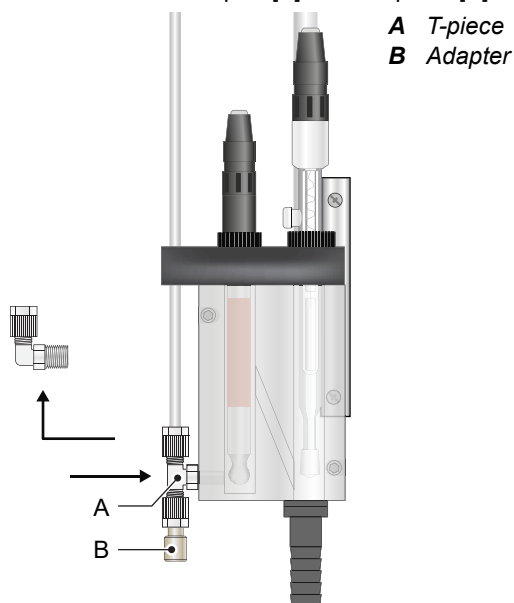
If more than two sample streams are required, an AMI Sample Sequencer can be connected to the AMI Sodium P, which allows to measure up to six sample streams. The electrical connection is described in the manual of the AMI Sample Sequencer.

Note: *If the AMI Sodium P is already equipped with a 2nd Sample Stream option, it is not possible to operate it with an AMI Sample Sequencer. Before connecting an AMI Sample Sequencer remove the 2nd Sample Stream option.*

3.7. Installing the Automatic Regeneration Option

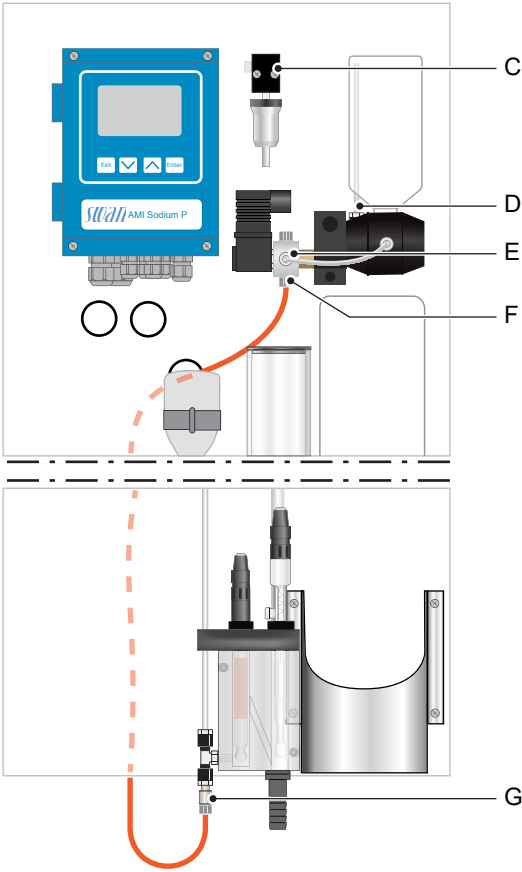
**Mechanical
installation**

- 1 Stop the sample flow at the main tap.
- 2 Switch off the instrument.
- 3 Remove the elbow piece from the inlet of the flow cell and screw in the enclosed T-piece [A].
- 4 Connect the adapter [B] to the T-piece [A].



- 5 Connect the ventilation tube [D] to the bottle holder of the automatic regeneration module.
- 6 Screw the automatic regeneration module to the panel using the supplied screws (if necessary, unscrew the air filter [C] and screw it back on at the attachment points further to the left).
- 7 Use tube 4 to connect the outlet of the bottle holder with the inlet [E] of the 3-way valve.
- 8 Use tube 3 to connect the outlet [F] of the 3-way valve with the inlet [G] of the flow cell.

Note: The unused port of the 3-way valve must be sealed with a blind plug.



**Electrical
connection**

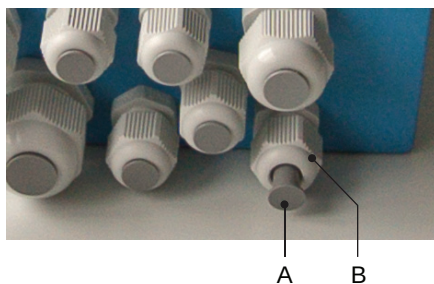


WARNING

Electrical shock hazard!

Before opening the AMI transmitter switch power off.

Use one of the PG7 cable glands to feed the cable of the solenoid valve into the AMI transmitter housing.



- 1 Remove the plug [A] from the cable gland [B].
- 2 Open the transmitter housing.
- 3 Feed the cable of the solenoid valve through the cable gland [B] into the AMI transmitter housing.
- 4 Connect the wires to the terminals in the AMI transmitter according to the [Connection Diagram, p. 41](#).

Referred to as "Regeneration" in the connection diagram.

3.8. Electrical Connections



WARNING

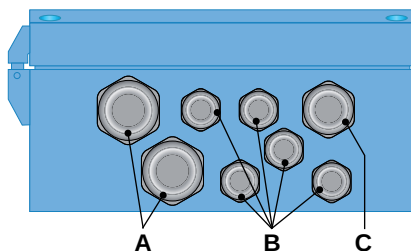
Risk of electrical shock

Do not perform any work on electrical components if the transmitter is switched on. Failure to follow safety instructions could result in serious injury or death.

- ♦ Always turn off power before manipulating electric parts.
- ♦ Grounding requirements: Only operate the instrument from an power outlet which has a ground connection.
- ♦ Make sure the power specification of the instrument corresponds to the power on site.

Cable thicknesses

In order to comply with IP66, use the following cable thicknesses



A PG 11 cable gland: cable $\varnothing_{outer}$ 5–10 mm

B PG 7 cable gland: cable $\varnothing_{outer}$ 3–6.5 mm

C PG 9 cable gland: cable $\varnothing_{outer}$ 4–8 mm

Note: Protect unused cable glands

Wire

- ♦ For power and relays: Use max. 1.5 mm² / AWG 14 stranded wire with end sleeves.
- ♦ For signal outputs and input: Use 0.25 mm² / AWG 23 stranded wire with end sleeves.



WARNING

External Voltage.

External supplied devices connected to relay 1 or 2 or to the alarm relay can cause electrical shocks

- ♦ Make sure that the devices connected to the following contacts are disconnected from the power before resuming installation.
 - relay 1
 - relay 2
 - alarm relay



WARNING

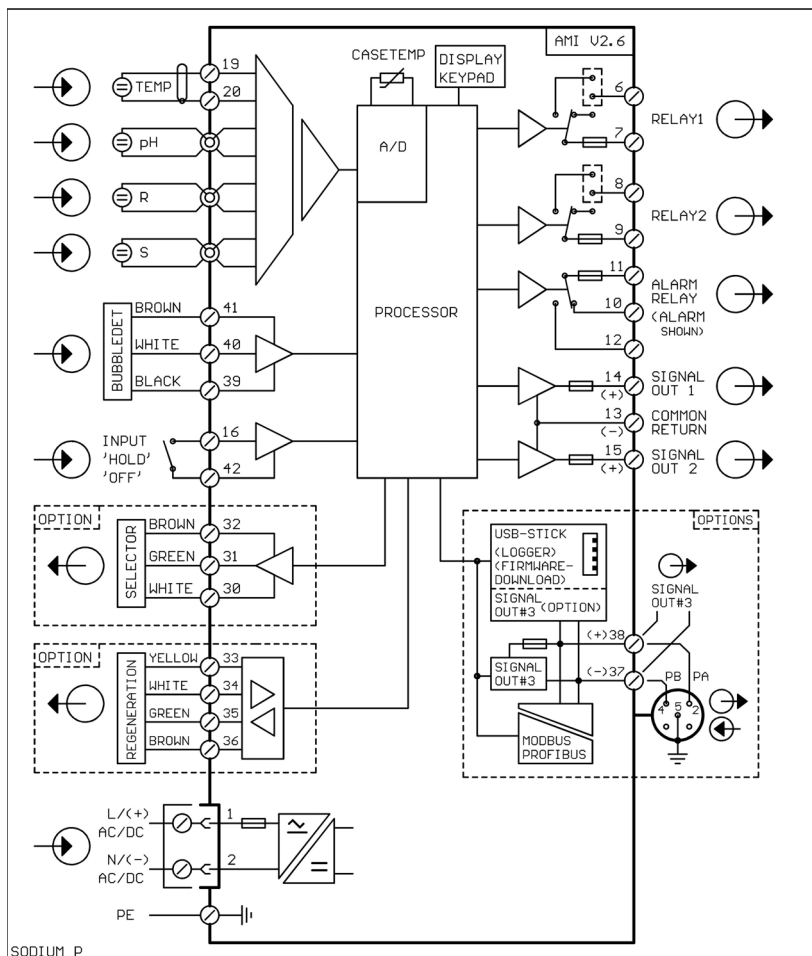
To prevent from electrical shock, do not connect the instrument to the power unless the ground wire (PE) is connected.



WARNING

The mains of the AMI Transmitter must be secured by a main switch and appropriate fuse or circuit breaker.

3.8.1 Connection Diagram



CAUTION



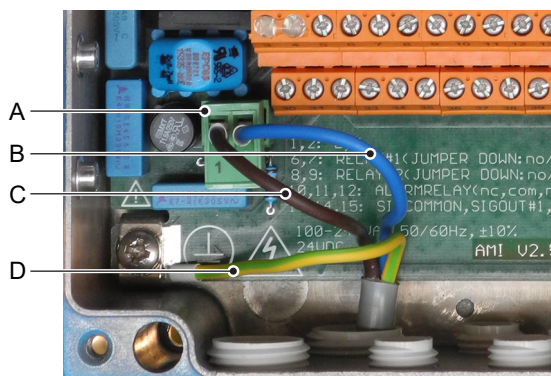
Use only the terminals shown in this diagram, and only for the mentioned purpose. Use of any other terminals will cause short circuits with possible corresponding consequences to material and personnel.



WARNING

Electrical shock hazard

Installation and maintenance of electrical parts must be performed by professionals. Always turn off power before manipulating electric parts.



- A Power supply connector
- B Neutral conductor, Terminal 2
- C Phase conductor, Terminal 1
- D Protective earth PE

Note: The protective earth wire (ground) has to be connected to the grounding terminal.

Installation requirements

The installation must meet the following requirements.

- ♦ Mains cable to comply with standards IEC 60227 or IEC 60245; flammable rating FV1
- ♦ Mains equipped with an external switch or circuit-breaker
 - near the instrument
 - easily accessible to the operator
 - marked as interrupter for AMI Sodium P

3.9. Relay Contacts

3.9.1 Input

Note: Use only potential-free (dry) contacts.
The total resistance (sum of cable resistance and resistance of the relay contact) must be less than 50 Ω .

Terminals 16/42

For programming see Program list and explanation, [5.3.4, p. 110](#).

3.9.2 Alarm Relay

Note: Max. load 1 A / 250 VAC

Alarm output for system errors.

Error codes see [Troubleshooting, p. 84](#).

Note: With certain alarms and certain settings of the AMI transmitter the alarm relay does not switch. The error, however, is shown on the display.

	Terminals	Description	Relay connection
NC ¹⁾ Normally Closed	10/11	Active (opened) during normal operation. Inactive (closed) on error and loss of power.	
NO Normally Open	12/11	Active (closed) during normal operation. Inactive (opened) on error and loss of power.	

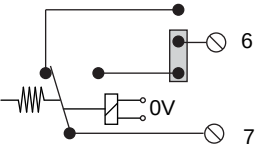
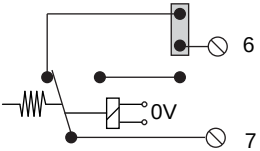
1) usual use

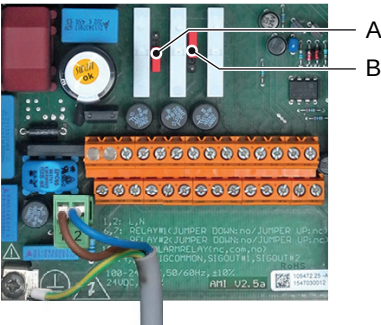
3.9.3 Relay 1 and 2

Note: Max. load 1 A/250 VAC

Relay 1 and 2 can be configured as normally open or as normally closed. Standard for both relays is normally open. To configure a Relay as normally closed, set the jumper in the upper position.

Note: Some error codes and the instrument status may influence the status of the relays described below.

Relay config.	Terminals	Jumper pos.	Description	Relay configuration
Normally Open	6/7: Relay 1 8/9: Relay 2		Inactive (opened) during normal operation and loss of power. Active (closed) when a programmed function is executed.	
Normally Closed	6/7: Relay 1 8/9: Relay 2		Inactive (closed) during normal operation and loss of power. Active (opened) when a programmed function is executed.	



- A Jumper set as normally open (standard setting)
- B Jumper set as normally closed

For programming see 5.3.2 and 5.3.3, p. 106, menu Installation.



CAUTION

Risk of damage of the relays in the AMI Transmitter due to heavy inductive load.

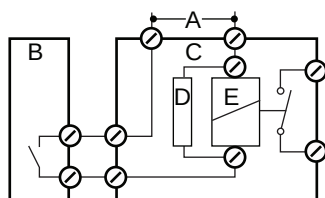
Heavy inductive or directly controlled loads (solenoid valves, dosing pumps) may destroy the relay contacts.

- To switch inductive loads > 0.1 A use an AMI relay box available as an option or suitable external power relays.

Inductive load

Small inductive loads (max 0.1 A) as for example the coil of a power relay can be switched directly. To avoid noise voltage in the AMI Transmitter it is mandatory to connect a snubber circuit in parallel to the load.

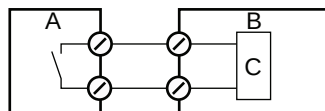
A snubber circuit is not necessary if an AMI relaybox is used.



- A** AC or DC power supply
- B** AMI Transmitter
- C** External power relay
- D** Snubber
- E** Power relay coil

Resistive load

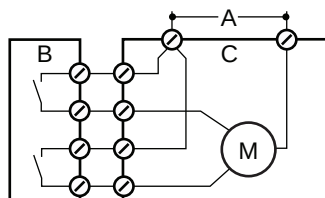
Resistive loads (max. 1 A) and control signals for PLC, impulse pumps and so on can be connected without further measures



- A** AMI Transmitter
- B** PLC or controlled pulse pump
- C** Logic

Actuators

Actuators, like motor valves, are using both relays: One relay contact is used for opening, the other for closing the valve, i.e. with the 2 relay contacts available, only one motor valve can be controlled. Motors with loads bigger than 0.1 A must be controlled via external power relays or an AMI relay box.



- A** AC or DC power supply
- B** AMI Transmitter
- C** Actuator

3.10. Signal Outputs

3.10.1 Signal Output 1 and 2 (current outputs)

Note: Max. burden 510 Ω

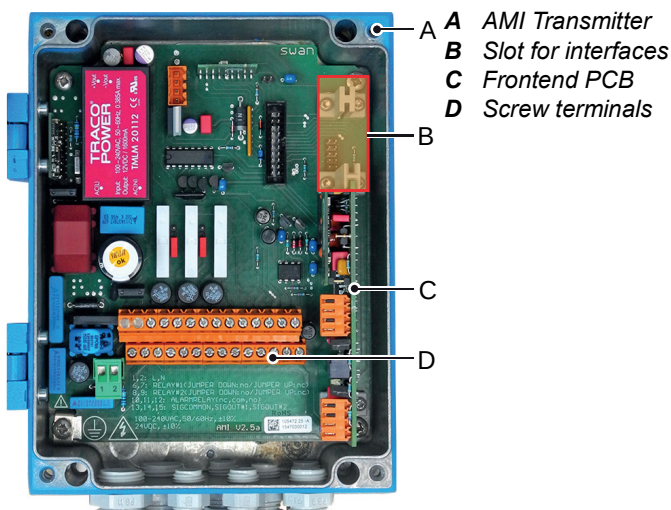
If signals are sent to two different receivers, use signal isolator (loop isolator).

Signal output 1: Terminals 14 (+) and 13 (-)

Signal output 2: Terminals 15 (+) and 13 (-)

For programming see [5.2 Signal Outputs](#), p. 99.

3.11. Interface Options



The slot for interfaces can be used to expand the functionality of the AMI instrument with either:

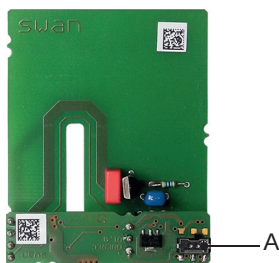
- ♦ Third signal output
- ♦ a Profibus or Modbus connection
- ♦ a HART connection
- ♦ an USB Interface

3.11.1 Signal Output 3

Terminals 38 (+) and 37 (-).

Requires the additional board for the third signal output 0/4–20 mA. The third signal output can be operated as a current source or as a current sink (switchable via switch [A]). For detailed information see the corresponding installation instruction.

Note: Max. burden 510 Ω .



Third signal output 0/4 - 20 mA PCB

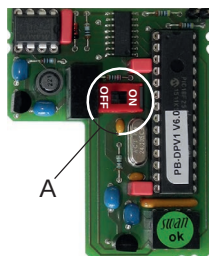
A Operating mode selector switch

3.11.2 Profibus, Modbus Interface

Terminal 37 PB, Terminal 38 PA

To connect several instruments by means of a network or to configure a PROFIBUS DP connection, consult the PROFIBUS manual. Use appropriate network cable.

Note: The switch must be ON, if only one instrument is installed, or on the last instrument in the bus.



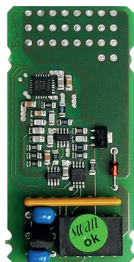
Profibus, Modbus Interface PCB (RS 485)

A On - OFF switch

3.11.3 HART Interface

Terminals 38 (+) and 37 (-).

The HART interface PCB allows for communication via the HART protocol. For detailed information, consult the HART manual.

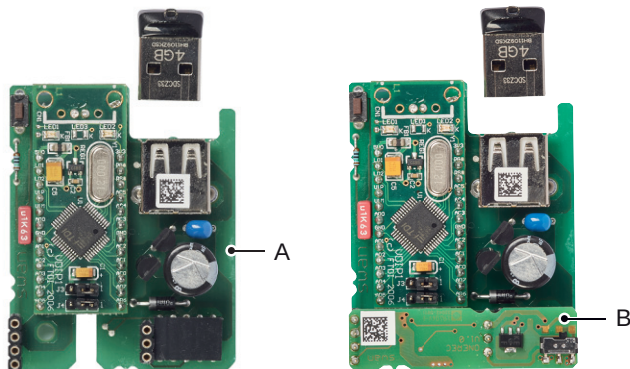


HART Interface PCB

3.11.4 USB Interface

The USB Interface is used to store Logger data and for Firmware up-load. For detailed information see the corresponding installation instruction.

The optional third signal output 0/4 – 20 mA PCB [B] can be plugged onto the USB interface and used in parallel.



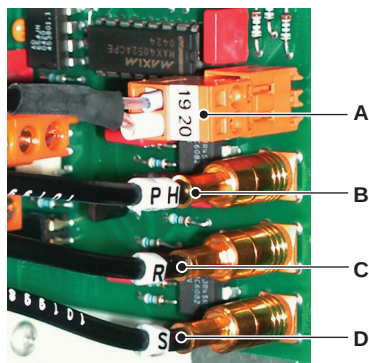
USB Interface

A USB interface PCB

B Third signal output 0/4 - 20 mA PCB

3.12. Connection of Sensors

Front-end board



- A** Temperature sensor cable marked with **T**, Terminal 19 / 20
- B** pH electrode cable marked with **pH**
- C** Reference electrode cable marked with **R**
- D** Sodium electrode cable marked with **S**

4. Instrument Setup

4.1. Installing the Reagent Bottle

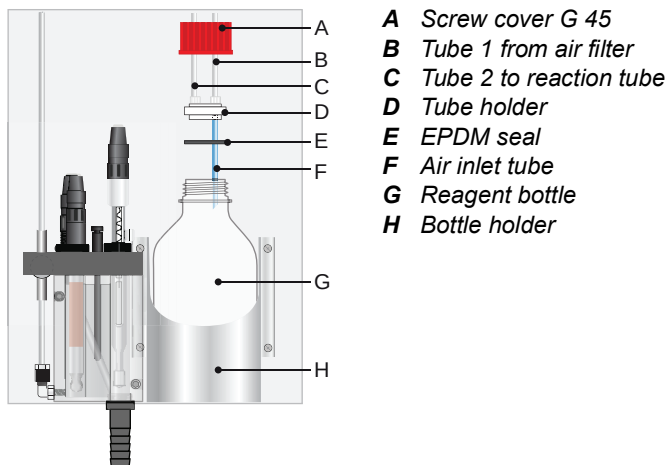


CAUTION

Formation of reagent vapor

To prevent formation of reagent vapors:

- ♦ close the reagent bottle firmly
- ♦ check the EPDM seal regularly
- ♦ install air tubes and filter properly



- A** Screw cover G 45
- B** Tube 1 from air filter
- C** Tube 2 to reaction tube
- D** Tube holder
- E** EPDM seal
- F** Air inlet tube
- G** Reagent bottle
- H** Bottle holder

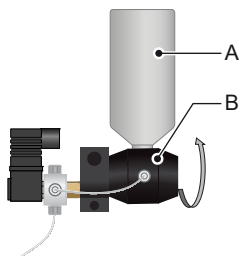
Note: Operate the instrument only with diisopropylamine.

The tubes are already installed into the tube holder [D] and the EPDM seal [E] seats on the bottom of the tube holder. To install the DIPA bottle proceed as follows:

- 1 Put the DIPA bottle [G] into the bottle holder [H].
- 2 Put the tube holder onto the DIPA bottle.
- 3 Screw the screw cover [A] onto the DIPA bottle and tighten it firmly.
- 4 Screw the tube fitting of tube 1 [B] into the tube holder [D], so that it is connected to the air inlet tube.
- 5 Screw the tube fitting of tube 2 [C] into the tube holder [D], so that it is connected to the DIPA vapor outlet.

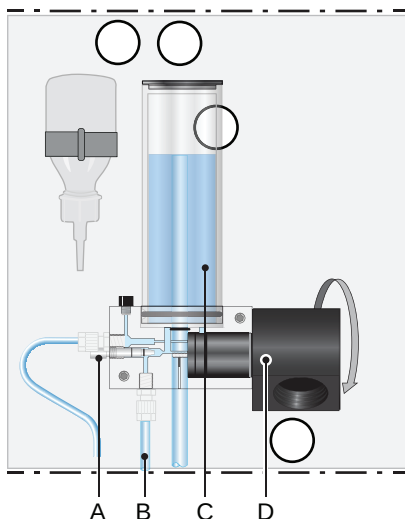
4.2. Installing the Regeneration Solution Bottle

If the automatic regeneration option is installed, screw a bottle of SWAN regeneration solution to the holder and swing it upwards.



- A** Bottle with Swan regeneration solution
- B** Bottle holder

4.3. Establish Sample Flow



- A** Flow regulating valve
- B** Sample inlet
- C** Constant head
- D** Holder for grab sample bottle



WARNING

Risk of water pollution

The drain of the Flow cell outlet contains Diisopropylamine (DIPA)

- ♦ At no means recirculate it into the water system.

- 1 Swing down the bottle holder [D] as far as it will go.
- 2 Open the flow regulating valve [A].
- 3 Adjust the sample flow so that a small part of the sample overflows into the waste.
- 4 Check tubing connections and flow cell for leaks and repair if necessary.

4.4. Switch on Power

Let the instrument run continuously for 1 hour with sample.

4.5. Programming

External devices	Program all parameters for external devices (interface, recorders, etc.). See 5.2 Signal Outputs, p. 99 and 5.3 Relay Contacts, p. 103 .
Limits, alarms	Program all parameters for instrument operation (limits, alarms). See 4.2 Relay Contacts, p. 98 .
2nd sample stream option	If the 2 nd sample stream option is installed, select the the channel switching mode. See 5.1.4, p. 99 for details.
Automatic regeneration option	If the automatic regeneration option is installed, configure the time and days of the week on which an automatic regeneration should be performed. See 3.2.2, p. 96 for details.

4.6. Fill Tube of Automatic Regeneration Module

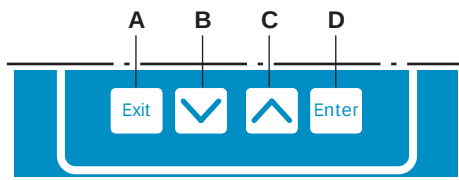
If the automatic regeneration module is installed, fill the tube with regeneration solution by calling the <Maintenance>/<Regeneration>/<Manual Operation> menu item.

4.7. Perform a Calibration

- 1 Prepare the standards, see [Preparing the Standard, p. 75](#).
- 2 Calibrate the pH sensor, see [pH Process Calibration, p. 76](#).
- 3 Etch and calibrate the sodium electrode, see [Standard Sodium 1-Point Calibration, p. 77](#).

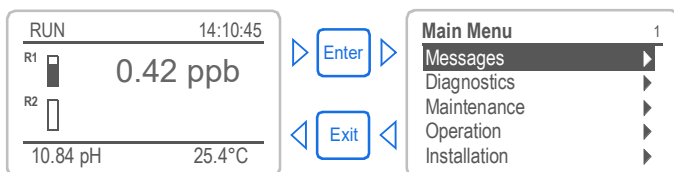
5. Operation

5.1. Keys, Display



- A to exit a menu or command (rejecting any changes) to move back to the previous menu level
- B to move DOWN in a menu list and to decrease digits
- C to move UP in a menu list and to increase digits
- D to open a selected sub-menu to accept an entry

Program Access, Exit



A diagram of a handheld water quality meter. The device has a blue body with a grey display screen. The screen shows the following information: 'RUN' with a speaker icon, a battery level indicator, and the time '15:20:18'. Below this, there are two rows of data: 'R1' with a triangle icon and '21.5 ppm', and 'R2' with a triangle icon and '16.8 ppm'. At the bottom of the screen, it shows '10.88 pH' and '22.1°C'. Labels A through H point to various parts of the device: A points to the top left corner, B points to the top center, C points to the top right corner, D points to the right side, E points to the '21.5 ppm' reading, F points to the '16.8 ppm' reading, G points to the '10.88 pH' reading, and H points to the '22.1°C' reading.

- | | | | |
|----------|--|---|---|
| A | RUN | normal operation | |
| | HOLD | input closed or cal delay: Instrument on hold (shows status of signal outputs). | |
| | OFF | input closed: Control/limit is interrupted (shows status of signal outputs). | |
| B | ERROR |  Error |  Fatal Error |
| C | Transmitter control via Profibus | | |
| D | Time | | |
| E | Process values: | | |
| | 2 channel operation:  the active channel is flushed | | |
| |  measurement of active channel | | |
| | 1 channel operation: In 1 channel operation no symbols are displayed. | | |
| F | Sample temperature | | |
| G | pH value in flow cell | | |
| H | Relay status | | |

	upper/lower limit not yet reached
	upper/lower limit reached
	control upw./downw. no action
	control upw./downw. active, dark bar indicates control intensity
	motor valve closed
	motor valve: open, dark bar indicates approx. position
	timer
	timer: timing active (hand rotating)

5.2. Software Structure

Main Menu	1
Messages	▶
Diagnostics	▶
Maintenance	▶
Operation	▶
Installation	▶

Messages	1.1
Pending Errors	▶
Message List	▶

Menu **Messages 1**
Reveals pending errors as well as an event history (time and state of events that have occurred at an earlier point of time).
Contains user-relevant data.

Diagnostics	2.1
Identification	▶
Sensors	▶
Sample	▶
I/O State	▶
Interface	▶

Menu **Diagnostics 2**
Provides user-relevant instrument and sample data.

Maintenance	3.1
Calibration	▶
Service	▶
Simulation	▶
Set Time	23.09.06 16:30:00

Menu **Maintenance 3**
For instrument calibration, relay and signal output simulation, and to set the instrument time.
Used by service personnel.

Operation	4.1
Sensors	▶
Relay Contacts	▶
Logger	▶

Menu **Operation 4**
User relevant parameters that might need to be modified during daily routine. Normally password protected and used by the process-operator.
Subset of menu 5 - Installation, but process related.

Installation	5.1
Sensors	▶
Signal Outputs	▶
Relay Contacts	▶
Miscellaneous	▶
Interface	▶

Menu **Installation 5**
For initial instrument set up by a SWAN-authorized person, to set all instrument parameters. Can be protected by means of password.

5.3. Changing Parameters and Values

Changing parameters

The following example shows how to change the logger interval:

Logger 4.4.1
Log interval 30 min
Clear logger no

1 Select the parameter you want to change.

2 Press [Enter]

Logger 4.1.3
Log interval Interval.
Clear log 5 min
10 min
30 min
1 Hour

3 Press [▲] or [▼] key to highlight the required parameter.

4 Press [Enter] to confirm the selection or [Exit] to keep the previous parameter).

⇒ The selected parameter is highlighted but not saved yet.

Logger 4.1.3
Log interval 10 min
Clear logger no

5 Press [Exit].

⇒ Yes is highlighted.

Logger 4.1.3
Log interval Save ?
Clear log Yes
No

6 Press [Enter] to save the new parameter.

⇒ The system reboots, the new parameter is set.

Changing values

Alarm 1 5.3.1.1.1
Alarm High 5.00 ppm
Alarm Low 0.00 ppm
Hysteresis 1.00 ppm
Delay 5 Sec

1 Select the value you want to change.

2 Press [Enter].

3 Set required value with [▲] or [▼] key.

4 Press [Enter] to confirm the new value.

5 Press [Exit].

⇒ Yes is highlighted.

Alarm 1 5.3.1.1.1
Alarm High 2.00 ppm
Alarm Low 0.00 ppm
Hysteresis 1.00 ppm
Delay 5 Sec

6 Press [Enter] to save the new value.

5.4. Grab Sample



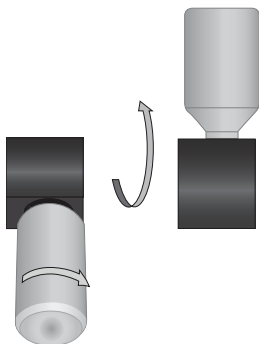
CAUTION

Incorrect measurement

If the automatic regeneration option is installed, make sure that no automatic regeneration is running when starting the grab sample measurement. This would falsify the measured value.

To perform a grab sample measurement proceed as follows:

- 1 Rinse a standard bottle well and fill it with grab sample.
⇒ *Do not use closed bottles.*
- 2 Screw the grab sample bottle into the standard bottle holder and swing it upwards.
⇒ *This stops the sample flow from the constant head and allows the grab sample to flow through the flow cell.*



- 3 Press the [] key.
⇒ *GRAB appears on the left side of the upper status line and the instrument is measuring the grab sample now.*

Note: The measured value of the grab sample will not be saved in the transmitter. Wait until the measured value is stable and then write it down for later use.

- 4 After the grab sample bottle is empty, swing the bottle holder down and unscrew the grab sample bottle.
- 5 Press the [] key again.
⇒ *HOLD appears in the display (= cal delay). After the delay time is over, the instrument goes back to the normal operating mode.*

6. Maintenance

6.1. Maintenance Schedule

Weekly or every 2 weeks	♦ Check for regular bubble formation. ♦ Check fill level of DIPA bottle ♦ Etch the sodium electrode using SWAN's etching kit. ♦ Perform a one-point calibration. ♦ Instrument with automatic regeneration module: Check fill level of the regeneration solution bottle and replace it if necessary.
Monthly	♦ Check sealing of reagent bottle, replace it if necessary. ♦ Check level of KCl reservoir. If necessary replace the bottle. ♦ Etch the sodium electrode using SWAN's etching kit. ♦ Perform a two-point calibration. ♦ Perform a pH measurement and correct the value if necessary.
Yearly	♦ Replace the sodium electrode see Maintenance of Sodium Electrode, p. 62. ♦ Replace the reference electrode, see Maintenance of Reference Electrode, p. 64. ♦ Replace the pH sensor, see Maintenance of pH Sensor, p. 65. ♦ If necessary, remove deposited iron in the system by washing in soft detergent and by using rust remover. ♦ If covered heavily with iron, replace the reaction tube.
As required	♦ Replace the air filter.

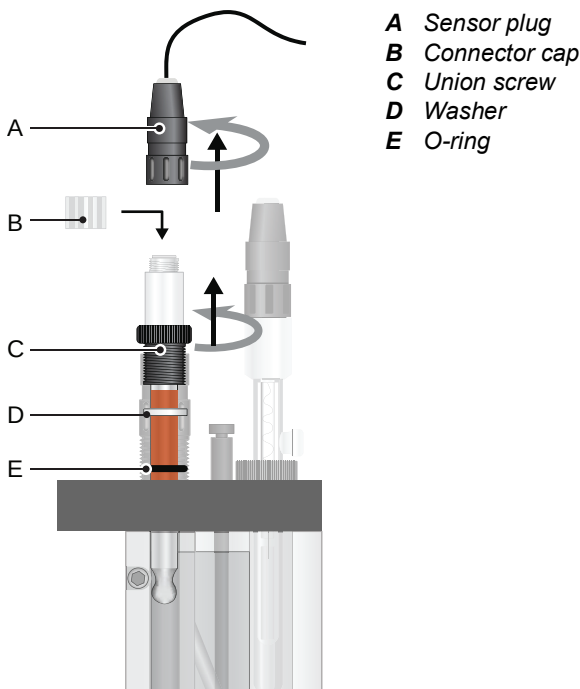
6.2. Stop of Operation for Maintenance

- 1** Stop sample flow.
- 2** Shut off power of the instrument.
- 3** Disconnect the reagent bottle and close it.
- 4** If the automatic regeneration module is installed, swing down, unscrew and close the regeneration solution bottle.
- 5** Empty the constant head and the flow cell completely.

6.3. Maintenance of Sodium Electrode

Sodium electrodes are sensitive electrochemical devices with very high internal impedance. To maintain correct operation, make sure that

- ♦ the sensing glass bulb stays clean
- ♦ no air bubbles are trapped between glass bulb and glass tube
- ♦ the electrical connectors stay absolutely clean and dry.



Remove the sodium electrode

- 1 Unscrew and remove the sensor plug [A].
⚠ *Prevent the connector from getting wet.*
- 2 Put on the connector cap [B] onto the sensor.
- 3 Completely unscrew the union screw [C] from the threaded hole.
- 4 Remove the electrode together with the union screw, washer and O-ring from the measuring cell.
- 5 Slip the O-ring carefully over the measuring bulb and remove both nut and washer.

Mix the etching
solution



WARNING

Health hazard

Diluted acidic fluoride solutions are harmful and irritating. Harmful if ingested, irritates skin and eyes. Contains less than 0.5% hydrofluoric acid. Contains less than 1% acetic acid. For laboratory use only.

- ♦ Short contact with skin is harmless, nevertheless wash with lots of water.

Note: Only use the original etching solution from SWAN.

The etching solution is delivered in two bottles, one containing the acidic solvent, the other containing the fluoride salt.

Dissolve the salt in the solvent before use and mark the date of mixing.

Note: Once the fluoride salt is dissolved, the life time of the solution is limited to 6 months.

Cleaning and
etching

- 1 Remove adhered iron deposits by wiping the electrode gently with a paper tissue.
- 2 Rinse the electrode with distilled water.
- 3 Insert the electrode for 2 minutes into the etching solution.
- 4 Rinse the electrode with distilled water again.

 Do not dry the sensing glass bulb.

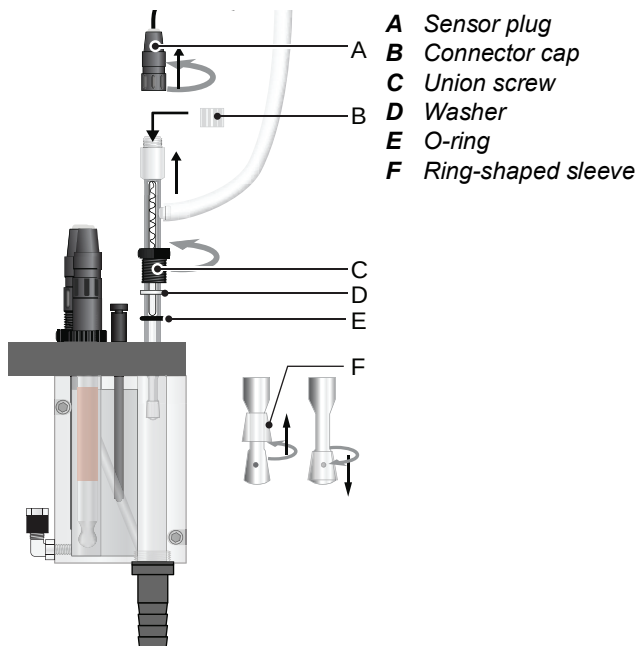
Install

See [Installing the Sodium Electrode, p. 25](#).

Replace the
sodium electrode

- 1 Proceed according to [Remove the sodium electrode, p. 62](#).
- 2 Insert the new electrode for 2 minutes into the etching solution.
- 3 Rinse the electrode with distilled water again.
 Do not dry the sensing glass bulb.
- 4 Install the sodium electrode, see [Installing the Sodium Electrode, p. 25](#).

6.4. Maintenance of Reference Electrode



Remove the reference electrode

- 1 Unscrew and remove the electrode plug [A].
⚠ Prevent the connector from getting wet.
- 2 Put on the connector cap [B] onto the electrode.
- 3 Completely unscrew the union screw [C] from the threaded hole.
- 4 Remove the KCl bottle from its holder.
⚠ Remember that the bottle was punctured - do not spill KCl.
- 5 Remove the reference electrode from the flow cell.

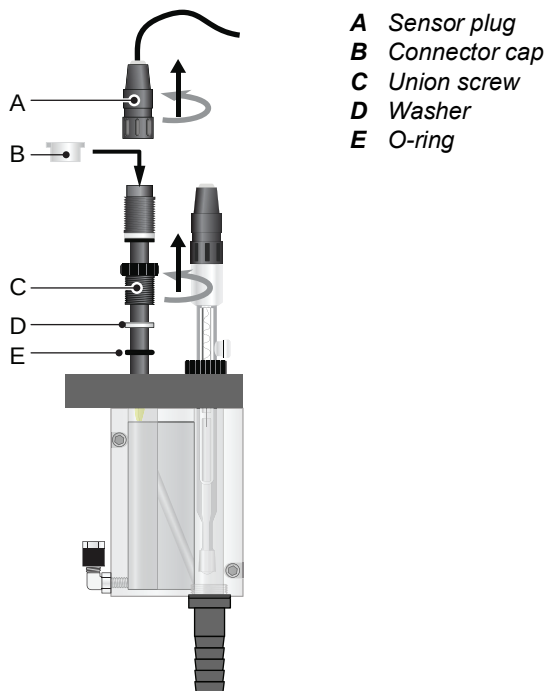
Cleaning

- 1 Remove any iron deposits with a soft paper tissue.
- 2 Slip the ring-shaped sleeve [F] upwards with a turning and pushing movement and allow a little electrolyte to flow out.
- 3 Fix the ring-shaped sleeve finger tight with a gentle turning and pulling movement.
- 4 Replace or refill KCl reservoir. Use only original SWAN KCl.

Install

See [Installing the Reference Electrode, p. 27](#)

6.5. Maintenance of pH Sensor



Clean pH sensor

- 1 Unscrew and remove the sensor plug [A].
 *Prevent the connector from getting wet.*
- 2 Put the connector cap [B] onto the sensor.
- 3 Completely unscrew the union screw [C] from the threaded hole.
- 4 Remove the pH electrode together with the union screw [C], washer [D] and O-ring [E] from the measuring cell.
- 5 If necessary wipe the pH sensor shaft and the green tip cautiously with a soft, clean, and damp paper tissue.
 *Do not insert into acids.*
- 6 Rinse the pH sensor with clean water.

Install

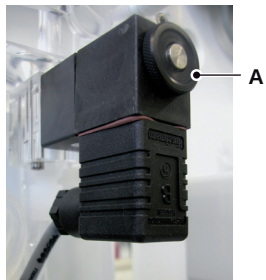
See [Installing the pH Electrode, p. 31](#).

6.6. Maintenance of Solenoid Valve

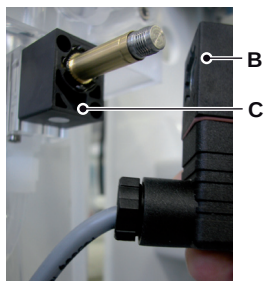
6.6.1 2nd Sample Stream Option

Disassemble the solenoid valve

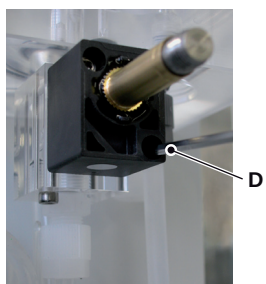
- 1 Switch off the instrument according to instructions in [Stop of Operation for Maintenance, p. 61](#).



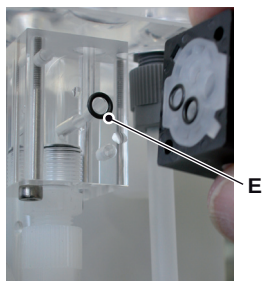
- 2 Loosen the nut [A].



- 3 Remove the solenoid coil [B] from the valve body [C].

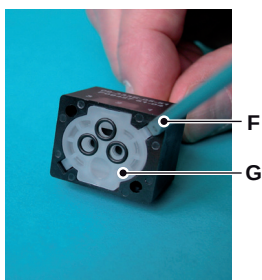


- 4 Loosen the fixing screws of the valve body with a 2.5 mm Allen key [D].

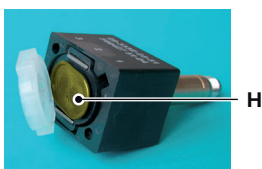


Note: The O-rings inside the valve body may stick on the flow cell and fall down if the valve body is removed.

- 5 Remove the valve body from the flow cell.



- 6 Remove the white plate [G] with a screw driver size 0 [F].



⇒ The membrane [H] is now visible.

- 7 Clean base plate [G] and membrane [H] with clean water.

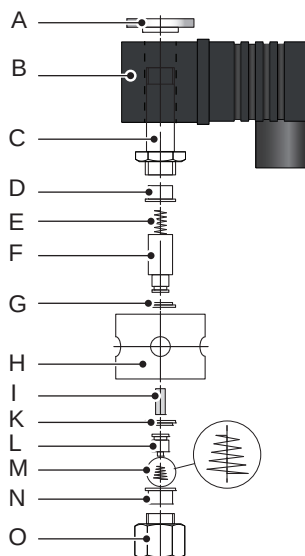
Assemble Assemble the solenoid valve in reverse order.

6.6.2 Automatic Regeneration Option

Note: *Never use the membranes again after a valve has been opened.*

- | | |
|----------------------|---|
| Preparation | <ol style="list-style-type: none">1 Swing down and remove the regeneration solution bottle.2 Screw on a bottle filled with water and swing it upwards.3 Open the solenoid valve via the <Maintenance>/<Regeneration>/<Manual Operation> menu item and rinse it thoroughly with water.4 Empty the regeneration solution tube and the flow cell completely.5 Switch off the instrument. |
| Dismount | <ol style="list-style-type: none">1 Remove the tubes from the defective valve.2 Unscrew knurled nut [A].3 Disconnect the coil body [B] from the solenoid valve.4 Unmount the automatic regeneration module from the panel.5 Unmount the solenoid valve from the automatic regeneration module. |
| Disassembling | <ol style="list-style-type: none">1 Unscrew solenoid support [C] and bottom nut [O]. Take care not to lose the springs!2 Remove the membrane holders. Normally, the membranes stick to the valve body.3 Remove the membranes with pointed pliers. Do not use the membranes again!4 Clean the valve body [H] with soft detergent. |

Drawing



- A** Knurled nut
- B** Coil body
- C** Solenoid support
- D** Washer 2
- E** Long spring
- F** Solenoid with membrane holder
- G** Membrane 2
- H** Valve body
- I** Teflon distance bar
- K** Membrane 1
- L** Membrane holder
- M** Conical spring
- N** Washer 1
- O** Bottom nut

Assembling

- 1 Put new membranes on the membrane holders.
- 2 Place membrane 1 with holder in valve body.
- 3 Place washer 1 on membrane and push down carefully.
- 4 Place conical spring with smaller end on membrane holder.
- 5 Screw on the bottom screw fingertight.
- 6 Turn valve body upside down and place Teflon distance bar in center hole of valve body.
- 7 Place membrane 2 with holder in valve body.
- 8 Place washer 2 on membrane and push down carefully.
- 9 Place long spring in solenoid.
- 10 Screw on the solenoid support fingertight.

Mounting

- 1 Mount the solenoid valve to the automatic regeneration module.
- 2 Mount the automatic regeneration module to the panel.
- 3 Connect tubes 3 and 4 (see [Tube Numbering, p. 80](#)).
- 4 Connect the coil body [B] to the solenoid valve.
- 5 Screw on the knurled nut [A] fingertight.

6.7. Maintenance of Flow Cell and Constant Head

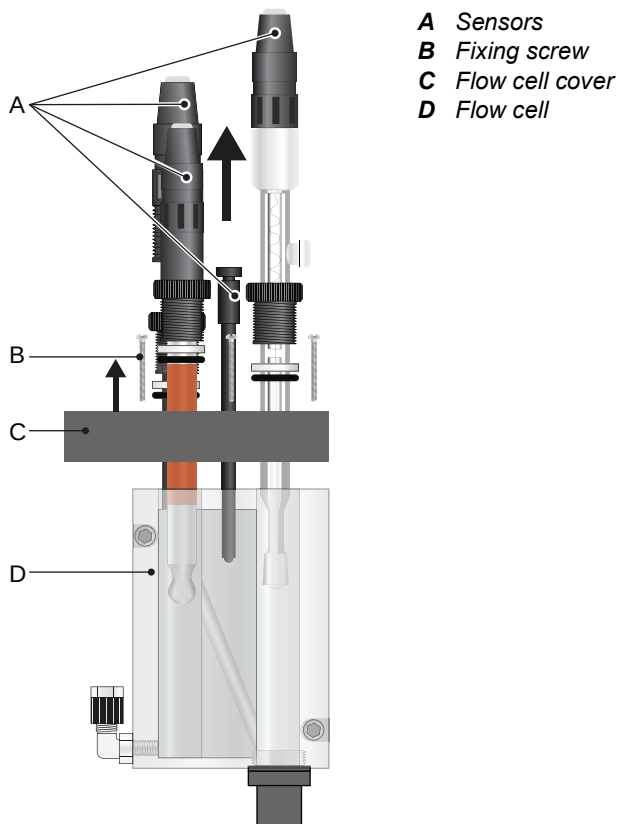


CAUTION

Acrylic glass parts are fragile and scratch-sensitive

Possible damage of acrylic glass parts due to scrubbing materials.

- ♦ Never use organic solvents or scrubbing materials to clean acrylic glass parts.
- ♦ Use soft detergent and rinse well.
- ♦ Remove iron deposits with a rust remover (i.e. iron x)



6.7.1 Cleaning the Flow cell

Disassemble the flow cell

- 1 Shut off the instrument.
- 2 Close the sample flow main tap.
- 3 Drain the flow cell [D] completely.
- 4 Remove all sensors [A].
- 5 Remove all tube connections.
- 6 Unscrew the 4 screws [B] of the flow cell cover [C] and remove it.
- 7 Clean the flow cell with a soft brush.

Assemble the flow cell

- 1 Screw the cover onto the flow cell.
- 2 Install all tubes, see [Tube Replacement, p. 80](#).
- 3 Install all sensors, see [Installing Sensors, p. 24](#).
- 4 Open sample flow main tap.
- 5 Switch on the instrument.



6.7.2 Cleaning the Constant Head

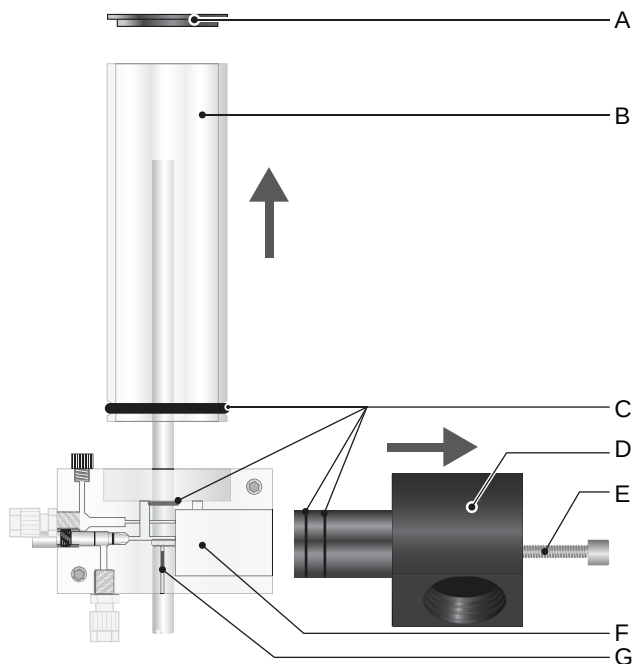


CAUTION

Acrylic glass parts are fragile and scratch-sensitive.

Possible damage of acrylic glass parts due to scrubbing materials.

- ♦ Never use organic solvents or scrubbing materials to clean acrylic glass parts.
- ♦ Use soft detergent and rinse well. Eliminate lime deposits with a common household deliming agent in standard concentration.
- ♦ Do not drop the constant head tube



A Constant head cover
B Constant head tube
C O-Rings
D Standard bottle holder

E Fixing screw
F Flow cell block
G Set screw

**Disassemble
the flow cell**

The flow cell can be easily disassembled. Proceed as follows:

- 1 Shut off the instrument.
- 2 Stop sample flow.
- 3 Drain the constant head completely.
- 4 Remove the constant head cover [A].
- 5 Pull the constant head tube [B] out of the flow cell block [F].
- 6 Release the set screw [G] with a 1 mm allen key.
- 7 Unscrew and remove the fixing screw [E].
- 8 Remove the standard bottle holder [D] from the flow cell block.
- 9 Clean all acrylic parts with a soft brush (bottle cleaner) and soapy water.

***Note:** Grease the O-rings only with teflon paste or spray.*

**Assemble the
flow cell**



- 1 Replace all O-rings [C] before assembling the flow cell.

CAUTION

Damage of flow cell block possible.

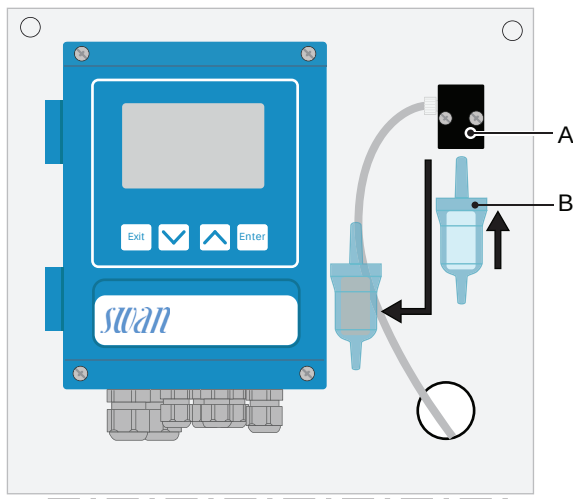
If screws which are screwed into the flow cell block are tightened too much, the thread or the flow cell block may be damaged.

- ♦ Only tighten such screws slightly.

- 2 Push the standard bottle holder [D] into the flow cell block.
- 3 Slightly tighten the fixing screw [E].
- 4 Lock the fixing screw with the set screw.
- 5 Push the constant head tube [B] into the flow cell block [F].
- 6 Put the cover onto the constant head tube.

6.8. Replacing the Air Filter

Insert the air filter [B] in the holder [A] on the right of the transmitter.



A Holder

B Air filter

To replace the air filter proceed as follows:

- 1 Pull out the polluted air filter of the holder [A].
- 2 Push the new air filter [B] into the hole of the holder [A] as far as it will go.

6.9. Preparing the Standard

Rinse the standard bottles well with deionized water. Prepare the sodium standards directly in the graduated standard bottles using a precision pipette. Make sure the concentrations are programmed correctly. See menu [5.1.5, p. 99](#).

Prepare two standards

Prepare the 2 standards directly in the marked bottle using the stock solution. The final concentration must correspond to the concentrations programmed in the instrument.

The standard stock solution has a concentration of 1'000 ppm.

Mixing standard

Amount of standard	Filled up to 1 l with high purity water	Result
0.2 ml (= 200 µl)	- - -	200 ppb
1 ml	- - -	1'000 ppb
2 ml	- - -	2'000 ppb

6.10. Calibration



CAUTION

Incorrect measurement

If the automatic regeneration option is installed, make sure that no automatic regeneration is running when starting the pH process or sodium standard calibration. This would falsify the result of the calibration.

When starting the calibration, you first have to perform the pH calibration and then the sodium calibration! The sodium measurement is dependent on the pH value.

6.10.1 pH Process Calibration

You need a high quality pH meter to do the correction. We recommend using a Chematest series instrument with a pH electrode. The handheld pH meter must be calibrated correctly.

Navigate to menu <Maintenance>/<Calibration>/<Process pH>.

The signal outputs and alarms are on hold.

- 1 Stop the sample flow by swinging the standard bottle holder half-way upwards.
- 2 Take the sodium electrode out of the flow cell and insert the pH electrode of your hand held pH meter instead.
- 3 Wait until the value of your instrument is stable.

Process pH	3.1.2.4
Current Value	10.78 pH
Offset	0.33 mV

Process Value	10.78 pH
Save	<Enter>

- 4 Press [Enter].

Process pH	3.1.2.4
Current Value	10.78 pH
Offset	0.33 mV

Process Value	10.70 pH
Save	<Enter>

- 5 Enter the correct value with the [▲] or [▼] key.

Process pH 3.1.2.4	
Current Value	10.78 pH
Offset	0.33 mV

Process Value	10.70 pH
Save	<Enter>

6 Press [Enter] to save.

Process pH 3.1.2.5	
Current Value	10.70 pH
Offset	-3.80 mV

Calibration successful	

7 Remove pH electrode from the measuring cell.

8 Remount the sodium electrode.

9 Press [Exit] to leave programming mode.

Note: If you receive an error message, clean the electrode or replace it if necessary.

6.10.2 Standard Sodium 1-Point Calibration

Navigate to menu <Maintenance>/<Calibration>/<Standard Sodium>.

Note: Before each calibration:

- Etch the sodium electrode for half a minute.
- Use SWAN's etching kit only.

Electrode Offset

The instrument guides you through the complete calibration process. If you have completed the required action press <Enter> to proceed.

Standard Sodium 3.1.1.5	
Unmount Electrode and rinse in deionized water	

<Enter> to continue	

1 Dismount electrode and rinse in deionized water.

Standard Sodium 3.1.1.5	
Etch electrode for 30 seconds and rinse well	

<Enter> to continue	

2 Etch sodium electrode for 30 seconds and rinse well.

Standard Sodium 3.1.1.5
Mount electrode
and wait
2 - 3 minutes

<Enter> to continue

Standard Sodium 3.1.1.5
Screw standard 1 bottle
onto holder and swing
bottle upwards

<Enter> to continue

Standard Sodium 3.1.1.5
Standard 1 200 ppb
Current Value 199 ppb
Offset 405 mV

<Enter> to save

Standard Sodium 3.1.1.5
Remove bottle. Press
<Exit> if only one
cal. point is needed

<Enter> to continue

- 3** Mount electrode and wait 2-3 minutes.
- 4** Screw standard bottle 1 onto the holder and swing bottle upwards.
- 5** Wait until the process has finished.
- 6** Press <Enter> to save.
- 7** Remove the bottle from the bottle holder.
- 8** Press <Enter> for 2-point-calibration or <Exit> if you only want to make a one-point calibration.

6.10.3 2-Point Calibration

Electrode Slope

Standard Sodium		3.1.1.5
Screw standard 2 bottle onto holder and swing bottle upwards		
<Enter> to continue		

Standard Sodium		3.1.1.5
Standard 2	2.00 ppm	
Current Value	2.03 ppm	
Offset	- 950 mV	
<Enter> to save		

Standard Sodium		3.1.1.5
Swing bottle down and remove it from holder		
<Enter> to continue		

Standard Sodium		3.1.1.5
Current Value	2.03 ppm	
Offset	2 mV	
Slope	1	
Calibration Successful		

- 1 Screw standard bottle 2 onto the holder and swing bottle upwards.
- 2 Wait until the process has finished.
- 3 Press <Enter> to save.
- 4 Remove the bottle from the bottle holder.

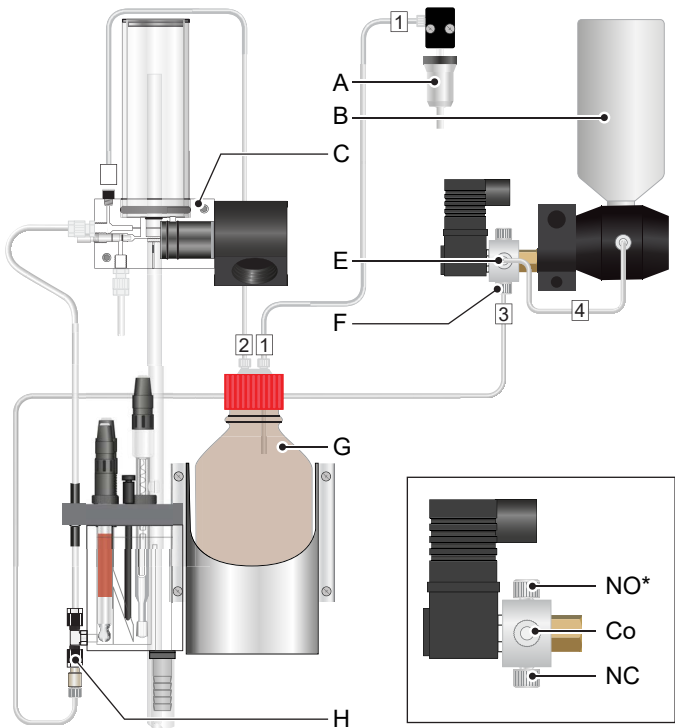
Note: If no stable value is reached before the bottle is empty (approx. 10 min) take the following actions:

- Clean and etch the sodium electrode
- Clean the reference electrode (see [Installing the Reference Electrode, p. 27](#))
- Check if the flow is regular

By pressing <Exit>, a running calibration can be aborted at any time. During calibration procedure plus programmed delay time the signal outputs are frozen. If the delay time is 0 the outputs show the measured value. During calibration delay, HOLD is displayed.

6.11. Tube Replacement

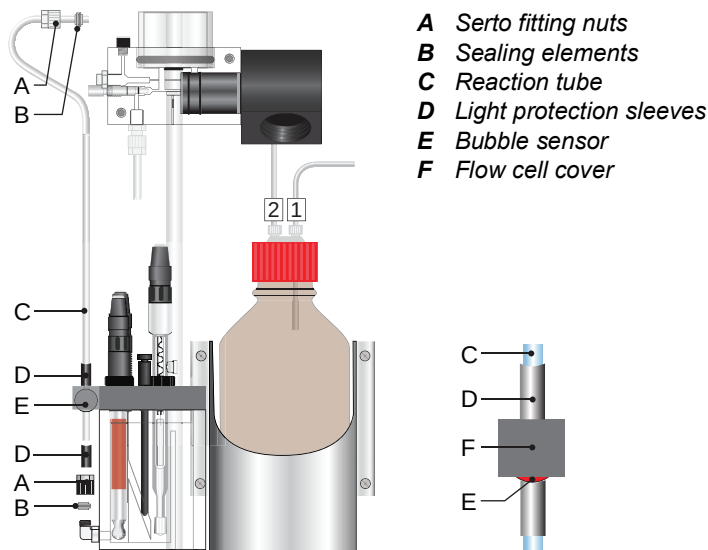
6.11.1 Tube Numbering



Tube No	from	to
1	Air filter [A]	Reagent [G]
2	Reagent [G]	Flow cell block [C]
3	Solenoid valve NC [F]	T-piece [H]
4	Solenoid valve Co [E]	Regeneration solution bottle [B]

*The "NO" port of the 3-way valve must be sealed with a blind plug.

6.11.2 Replacing the Reaction Tube



- 1 Release SERTO fitting nuts [A].
 - 2 Remove the sealing elements [B] from the reaction tube.
 - 3 Pull reaction tube [C] out of the flow cell cover.
 - 4 First slide one light protecting sleeve [D] over the new reaction tube with the plain side facing towards the flow cell cover.
 - 5 Then push the new reaction tube through the hole in the flow cell cover and the bubble detector.
 - 6 Finally slide the other light protecting sleeve with the rounded side facing towards the flow cell cover over the reaction tube.
- Note:** *Extraneous light may distort the bubble measurement. Therefore it is important that there is no gap between the light protection sleeves and the flow cell cover respectively the bubble sensor.*
- 7 Push the sealing elements [B] over the reaction tube.
 - 8 Push the reaction tube into the SERTO fittings.
 - 9 Tighten the nuts of the SERTO fittings.

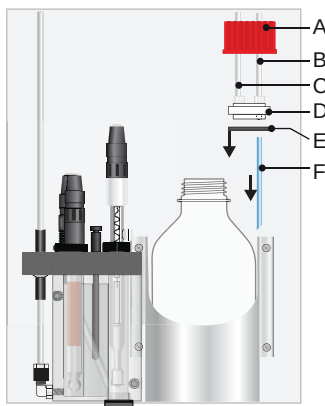
6.11.3 Replacing the EPDM Seal and the Air Inlet Tube



WARNING

Diisopropylamine is corrosive.

- ◆ Read the Material Safety Data Sheets (MSDS) first.
- ◆ Wear suitable protective clothing, gloves and eye/face protection.
- ◆ Avoid inhalation of DIPA vapor.
- ◆ In case of contact with eyes, rinse immediately with plenty of water eyelid wide open for at least 10 min, summon medical advice. In case of accident or if you feel unwell, summon medical advice immediately (show the label where possible).



- A** Screw cover G 45
- B** Tube 1 from air filter
- C** Tube 2 to air lift pump
- D** Tube holder
- E** EPDM seal
- F** Air inlet tube

- 1 Carefully unscrew and remove the screw cover with tube holder from the DIPA bottle.
- 2 Close the DIPA bottle with the original cover.
- 3 Remove the EPDM seal [E] and replace it with a new one.
- 4 Pull the air inlet tube [F] out of the tube holder [D].
- 5 Push the new air inlet tube into the hole of the tube holder which is connected with the tube 1 from air filter [B].
- 6 Unscrew and remove the original cover from the DIPA bottle and screw the screw cover with tube holder on it instead.
- 7 Tighten the screw cover well.

6.12. Longer Stop of Operation

Note: Store all sensors with tip pointing downwards in a frost-protected room.

- | | | |
|-----------------------|----|---|
| | 1 | Stop sample flow. |
| | 2 | Drain the measuring cell completely. |
| | 3 | Fill deionized water into the rubber caps of the electrodes. |
| | 4 | Put the rubber caps on the tips of the electrodes. |
| Remove bottles | 5 | Remove the reagent bottle and replace it by an empty one. |
| | 6 | Remove the standard bottle from the bottle holder and close it. |
| | 7 | If the automatic regeneration module is installed, swing down the regeneration solution bottle, unscrew and close it. Rinse the tube with sample water using the <Maintenance>/<Regeneration>/<Manual Operation> menu item. |
| pH sensor | 8 | Unscrew and remove the connector from the pH sensor. |
| | 9 | Put the connector cap onto the sensor connector. |
| | 10 | Fill 2 molar KCl (if not available: water) into the rubber cap. |
| | 11 | Remove the pH sensor from the flow cell and place the rubber cap on the tip of the sensor. |
-
- 

CAUTION

Damage of pH sensor

Wrong storage will damage the pH sensor.

 - ♦ Never store the pH sensor dry.
-
- | | | |
|----------------------------|----|--|
| Reference electrode | 12 | Remove the electrolyte bottle from its holder. |
| | |  Remember that it is punctured. |
| | 13 | Remove the supply pipe from the electrolyte bottle |
| | 14 | Leave the remaining electrolyte in the supply pipe. |
| | 15 | Seal the supply pipe with a stopper. |
| Power off | 16 | Shut off power of the instrument. |

7. Troubleshooting

7.1. Error List

Error

Non-fatal Error. Indicates an alarm if a programmed value is exceeded.

Such Errors are marked **E0xx** (bold and black).

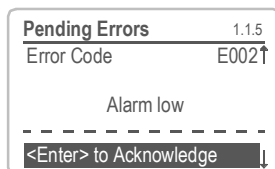
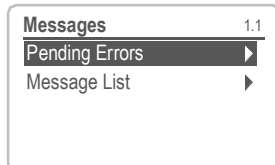
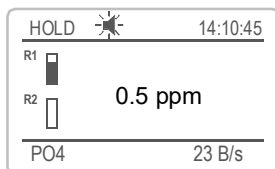
Fatal Error (blinking symbol)

Control of dosing devices is interrupted.

The indicated measured values are possibly incorrect.

Fatal Errors are divided in the following two categories:

- ♦ Errors which disappear if correct measuring conditions are recovered (i.e. Sample Flow low).
Such Errors are marked **E0xx** (bold and orange)
- ♦ Errors which indicate a hardware failure of the instrument.
Such Errors are marked **E0xx** (bold and red)



Error or fatal Error

Error not yet acknowledged.

Check **Pending Errors 1.1.5** and take corrective action.

Navigate to <Messages>/<Pending Errors>.

Press [ENTER] to acknowledge the Pending Errors.

⇒ *The Error is reset and saved in the Message List.*

Error	Description	Corrective action
E001	Sodium 1 Alarm high	– check process – check programmed value 5.3.1.1/2, p. 104
E002	Sodium 1 Alarm low	– check process – check programmed value 5.3.1.1/2, p. 104
E003	pH Alarm high	– check process (sample pH > 11.5) – check programmed value, 5.3.1.3.1, p. 104
E004	pH Alarm low	– check if reagent bottle is empty – refill reagent
E005	Sodium 2 Alarm high	– check process – check programmed value 5.3.1.1/2, p. 104 – check if 2nd stream is installed correctly
E006	Sodium 2 Alarm low	– check process – check programmed value 5.3.1.1/2, p. 104 – check if 2nd stream is installed correctly
E007	Sample Temp. high	– check sample temperature – check programmed value 5.3.1.5, p. 105
E008	Sample Temp. low	– check sample temperature – check programmed value 5.3.1.1/2, p. 104
E009	Sample Flow high	– check Inlet pressure – readjust sample flow – check programmed value 5.3.1.4.1, p. 105
E010	Sample Flow low	– check Inlet pressure – readjust sample flow – clean instrument, see Maintenance of Flow Cell and Constant Head, p. 70. – check progr. value 5.3.1.4.2, p. 105.

Error	Description	Corrective action
E011	Temp. shorted	– check wiring of temperature sensor – check temperature sensor
E012	Temp. disconnected	– check wiring of temperature sensor – check temperature sensor
E013	Case Temp. high	– check case/environment temperature – check programmed value 5.3.1.6, p. 105
E014	Case Temp. low	– check case/environment temperature – check programmed value 5.3.1.7, p. 105
E017	Control Timeout	– check control device or programming in Installation, Relay 5.3.2 and 5.3.3, p. 106
E018	Reagent empty	– check DIPA bottle – if necessary refill diisopropylamine
E019	No Sample	– readjust the sample flow – check if tubes are blocked
E020	pH low	– check process – check programmed value, 5.3.1.3.25, p. 104
E024	Input active	– information that the Input is active – see If Fault Yes is programmed in Menu 5.3.4, p. 110
E026	IC LM75	– call service
E028	Signal output open	– check wiring on signal outputs 1 and 2
E030	EEprom Frontend	– call service
E031	Calibration Recout	– call service
E032	Wrong Frontend	– call service
E033	Power-on	– none, normal status
E034	Power-down	– none, normal status

7.2. Automatic Regeneration

Note: Only applicable if the automatic regeneration module is installed.

Problem

No automatic regeneration is performed

Possible Reasons

The automatic regeneration does not start if one of the following errors is present:

- ♦ E010 Sample flow low
- ♦ E018 Reagent empty

In addition, the automatic regeneration does not start if the instrument is in the HOLD state (e.g. after filling the tube using the <Maintenance>/<Regeneration>/<Manual operation> menu item).

7.3. Replacing Fuses



WARNING

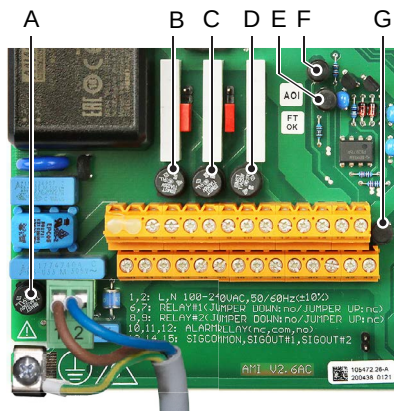
External Voltage.

External supplied devices connected to relay 1 or 2 or to the alarm relay can cause electrical shocks.

- ♦ Make sure that the devices connected to the following contacts are disconnected from the power before resuming installation.
 - relay 1
 - relay 2
 - alarm relay

When a fuse has blown, find out the cause and fix it before replacing it with a new one.

Use tweezers or needle-nosed pliers to remove the defective fuse. Use original fuses provided by SWAN only.



- A** AC variant: 1.6 AT/250V Instrument power supply
DC variant: 3.15 AT/250V Instrument power supply
- B** 1.0 AT/250V Relay 1
- C** 1.0 AT/250V Relay 2
- D** 1.0 AT/250V Alarm relay
- E** 1.0 AF/125V Signal output 2
- F** 1.0 AF/125V Signal output 1
- G** 1.0 AF/125V Signal output 3

8. Program Overview

For explanations about each parameter of the menus see [Program List and Explanations, p. 94](#)

- ♦ Menu 1 **Messages** informs about pending errors and maintenance tasks and shows the error history. Password protection possible. No settings can be modified.
- ♦ Menu 2 **Diagnostics** is always accessible for everybody. No password protection. No settings can be modified.
- ♦ Menu 3 **Maintenance** is for service: Calibration, simulation of outputs and set time/date. Please protect with password.
- ♦ Menu 4 **Operation** is for the user, allowing to set limits, alarm values, etc. The presetting is done in the menu Installation (only for the System engineer). Please protect with password.
- ♦ Menu 5 **Installation**: Defining assignment of all inputs and outputs, measuring parameters, interface, passwords, etc. Menu for the system engineer. Password strongly recommended.

8.1. Messages (Main Menu 1)

Pending Errors	Pending Errors	1.1.5*	* Menu numbers
1.1*			
Message List	Number	1.2.1*	
1.2*	Date, Time		

8.2. Diagnostics (Main Menu 2)

Identification	Designation	AMI Sodium P	* Menu numbers
2.1*	Version	V6.22 - 06/21	
	Factory Test	Instrument	2.1.3.1*
	2.1.3*	Motherboard	
		Front End	
	Operating Time	Years / Days / Hours / Minutes / Seconds	2.1.4.1*
	2.1.4*		
Sensors	Sodium Sensor	Current Value	
2.2*	2.2.1*	(Raw value 1)	
		Cal. History	Number
		2.2.1.5*	2.2.1.5.1*
			Date, Time
			Offset
			Slope
	pH Electrode	Current Value	
	2.2.2*	(Raw value)	
		Cal. History	Number
		2.2.2.5*	2.2.2.5.1*
			Date, Time
			Offset
			Slope
	Miscellaneous	Case Temp.	2.2.3.1*
	2.2.3*		
Sample	Sample ID	2.3.1*	
2.3*	Temperature		
	(Nt5k)		
	Sample Flow		
	(Raw value)		
I/O State	Alarm Relay	2.4.1*	
2.4*	Relay 1	2.4.2*	
	Relay 2		
	Input		
	Signal Output 1		
	Signal Output 2		
Interface	Protocol	2.5.1*	(only with RS485 interface)
2.5*	Baud rate		

8.3. Maintenance (Main Menu 3)

Calibration 3.1*	Standard Sodium 3.1.1*	<i>(Progress)</i>	* Menu numbers
	Process pH 3.1.2*	<i>Current Value</i> <i>Offset</i> <i>Process Value</i> <i>Save <Enter></i>	<i>3.1.2.4*</i> <i>3.1.2.5*</i>
Regeneration 3.2*	Manual Operation 3.2.1*	Valve 3.2.1.1*	<i>Open</i> <i>Closed</i>
	Parameters 3.2.2*	<i>Start time</i> Calendar 3.2.2.2*	<i>3.2.2.1*</i> Monday to Sunday 5.1.2.2.1 to 5.1.2.2.7*
		<i>Duration</i> <i>Delay</i> <i>Signal Outputs</i> <i>Output/Control</i>	<i>3.2.2.3*</i> <i>3.2.2.4*</i> <i>5.1.2.4*</i> <i>3.2.2.5*</i>
Simulation 3.3*	<i>Alarm Relay</i> <i>Relay 1</i> <i>Relay 2</i> <i>Signal Output 1</i> <i>Signal Output 2</i> <i>Magnetic valve</i>	3.2.1* 3.2.2* 3.2.3* 3.2.4* 3.2.5* 3.2.6*	
Set Time 3.4*	<i>(Date), (Time)</i>		

8.4. Operation (Main Menu 4)

Sensors	<i>Filter Time Const.</i>	4.1.1*	* Menu numbers	
4.1*	<i>Hold after Cal.</i>	4.1.2*		
	<i>Channel selection</i>	4.1.3*		
Relay Contacts	Alarm Relay	Alarm Sodium 1 and 2	<i>Alarm High</i>	4.2.1.x.1*
4.2*	4.2.1*	4.2.1.1* - 4.2.1.2*	<i>Alarm Low</i>	4.2.1.x.x*
			<i>Hysteresis</i>	4.2.1.x.x*
			<i>Delay</i>	4.2.1.x.x*
		Alarm pH	<i>Alarm High</i>	4.2.1.3.1*
		4.2.1.3*	<i>Alarm Low</i>	4.2.1.3.x*
			<i>Hysteresis</i>	4.2.1.3.x*
			<i>Delay</i>	4.2.1.3.x*
	Relay 1 and 2	<i>Setpoint</i>	4.2.x.x*	
	4.2.2* and 4.2.3*	<i>Hysteresis</i>	4.2.x.x*	
		<i>Delay</i>	4.2.x.x*	
	Input	<i>Active</i>	4.2.4.1*	
	4.2.4*	<i>Signal Outputs</i>	4.2.4.2*	
		<i>Output / Control</i>	4.2.4.3*	
		<i>Fault</i>	4.2.4.4*	
		<i>Delay</i>	4.2.4.5*	
Logger	<i>Log Interval</i>	4.3.1*		
4.3*	<i>Clear Logger</i>	4.3.2*		

8.5. Installation (Main Menu 5)

Sensors	<i>Sensor type</i>	<i>Sodium</i>		
5.1*	<i>Temperature</i>	<i>NT5K</i>		
	<i>Channel switch</i>	<i>None / Auto / User defined / Fieldbus</i>	5.1.3*	
	Standards	<i>Standard 1</i>	5.1.5.1*	
	5.1.5*	<i>Standard 2</i>	5.1.5.2*	
Signal Outputs	Signal Output 1 and 2	<i>Parameter</i>	5.2.1.1 - 5.2.2.1*	
5.2*	5.2.1* and 5.2.2*	<i>Current Loop</i>	5.2.1.2 - 5.2.2.2*	
		<i>Function</i>	5.2.1.3 - 5.2.2.3*	
		Scaling	<i>Range Low</i>	5.2.x.40.x*
		5.2.x.40	<i>Range High</i>	5.2.x.40.x*

Relay Contacts 5.3*	Alarm Relay 5.3.1*	Alarm Sodium 1 and 2 5.3.1.1* - 5.3.1.2*	<i>Alarm High</i> <i>Alarm Low</i> <i>Hysteresis</i> <i>Delay</i>	5.3.1.x.1* 5.3.1.x.x* 5.3.1.x.x* 5.3.1.x.x*
		Alarm pH 5.3.1.3*	<i>Alarm High</i> <i>Alarm Low</i> <i>Hysteresis</i> <i>Delay</i>	5.3.1.3.1* 5.3.1.3.x* 5.3.1.3.x* 5.3.1.3.x*
		Sample Flow 5.3.1.4*	<i>Flow Alarm</i> <i>Alarm High</i> <i>Alarm Low</i>	5.3.1.4.1* 5.3.1.4.x* 5.3.1.4.x*
		Sample Temp. 5.3.1.5*	<i>Alarm High</i> <i>Alarm Low</i>	5.3.1.5.1* 5.3.1.5.x*
		<i>Case Temp. high</i> <i>Case Temp. low</i>	5.3.1.6* 5.3.1.7*	
	Relay 1 and 2 5.3.2* - 5.3.3*	<i>Function</i> <i>Parameter</i> <i>Setpoint</i> <i>Hysteresis</i> <i>Delay</i>	5.3.2.1 - 5.3.3.1* 5.3.2.x - 5.3.3.x* 5.3.2.x - 5.3.3.x* 5.3.2.x - 5.3.3.x* 5.3.2.x - 5.3.3.x*	
	Input 5.3.4*	<i>Active</i> <i>Signal Outputs</i> <i>Output/Control</i> <i>Fault</i> <i>Delay</i>	5.3.4.1* 5.3.4.2* 5.3.4.3* 5.3.4.4* 5.3.4.5*	
Miscellaneous 5.4*	<i>Language</i>	5.4.1*		
	<i>Set defaults</i>	5.4.2*		
	<i>Load Firmware</i>	5.4.3*		
	Password 5.4.4*	<i>Messages</i> <i>Maintenance</i> <i>Operation</i> <i>Installation</i>	5.4.4.1* 5.4.4.2* 5.4.4.3* 5.4.4.4*	
	<i>Sample ID</i>	5.4.5*		
	<i>Line Break Detection</i>	5.4.6*		
Interface 5.5*	<i>Protocol</i>	5.5.1*		(only with RS485 interface)
	<i>Device Address</i>	5.5.21*		
	<i>Baud Rate</i>	5.5.31*		
	<i>Parity</i>	5.5.41*		

9. Program List and Explanations

1 Messages

1.1 Pending Errors

- 1.1.5 Provides the list of active errors with their status (active, acknowledged). If an active error is acknowledged, the alarm relay is active again. Cleared errors are moved to the Message list.

1.2 Message List

- 1.2.1 Shows the error history: Error code, date / time of issue and status (active, acknowledged, cleared). 65 errors are memorized. Then the oldest error is cleared to save the newest error (circular buffer).

2 Diagnostics

In diagnostics mode, the values can only be viewed, not modified.

2.1 Identification

Designation: View the designation of instrument.

Version: Firmware of instrument (e.g. V6.22-06/21).

- 2.1.3 **Factory Test:** Test date of the instrument, motherboard and frontend QC factory test.
- 2.1.4 **Operating Time:** Years/days/hours/minutes/seconds.

2.2 Sensors

2.2.1 Sodium Sensor:

- o *Current value:* Shows the sodium concentration in ppm.
- (*Raw value*): Shows the uncompensated potential in mV.

- 2.2.1.5 **Cal. History:** Shows the diagnostic values of the last calibrations of the sodium electrode. Max. 65 data records are memorized.

Typical offset of sodium sensor	+ 125	mV
Max. tolerated offset	≤ ± 20	mV
Typical slope of sodium sensor	59	mV/decade Na
Max. limits	± 3	mV

2.2.2 pH Electrode:

- o *Current Value:* Shows the measured pH value.
- (*Raw value*): Shows the electrode voltage in mV.

- 2.2.2.5 **Cal. History:** Shows the diagnostic values of the last pH electrode calibrations, offset in mV and slope in mV/pH.

Typical offset of pH Electrode	0 mV	±	30 mV
Typical slope of pH Electrode	59 mV/pH	±	3 mV/pH

2.2.3 Miscellaneous:

- 2.2.3.1 **Case Temp:** Temperature in °C inside the transmitter.

2.3 Sample

- 2.3.1
- o **Sample ID:** Shows the identification assigned to a sample. This identification is defined by the user to identify the location of the sample.
 - o **Temperature:** Actual temperature in °C and in Ohm (NT5K).
 - o **Sample Flow:** Shows the actual sample flow B/s (bubbles per second). Sample flow must be above 5 B/s.
 - o **(Raw value) (Hz):** Shows the raw value in Hz.

2.4 I/O State

Shows current status of all in- and outputs.

- 2.4.1
- 2.4.2
- o **Alarm Relay:** Active or inactive
 - o **Relay 1 and 2:** Active or inactive
 - o **Input:** Open or closed
 - o **Signal Output 1 and 2:** Actual current in mA
 - o **Signal Output 3:** Actual current in mA (if option is installed)

2.5 Interface

Only available if optional interface is installed.
Shows the programmed communication settings.

3 Maintenance

3.1 Calibration

In this menu, you can correct measured values, or calibrate offset and slope of pH electrode.

- 3.1.1 **Standard Sodium:** Possibility to correct the sodium sensor value. Follow the commands on the screen. Save the value with the <Enter> key. See [Calibration, p. 76](#), for more details.
- 3.1.2 **Process pH:** Correction of pH electrode. See [pH Process Calibration, p. 76](#), for details.

3.2 Regeneration

Note: *The Regeneration menu is only visible if the automatic regeneration option is installed.*

- 3.2.1 **Manual operation:** Allows to manually open and close the solenoid valve to test it or to fill the tube with regeneration solution.

3.2.2 Parameters:

- 3.2.2.1 **Start time:** The programmed start time is valid for each of the programmed days.

3.2.2.2 Calendar:

- 3.2.2.2.1 Monday: Possible settings: on or off
to

- 3.2.2.2.7 Sunday: Possible settings: on or off

- 3.2.2.3 **Duration:** Duration of the automatic sensor regeneration.

Range: 10–60 sec

- 3.2.2.4 **Delay:** During regeneration plus delay time, parameters [3.2.2.5, p. 96](#) and [3.2.2.6, p. 96](#) apply.

Range: 0–6'000 Sec

- 3.2.2.5 **Signal Outputs:** Select the operation mode of the signal outputs during regeneration:

Cont.: Signal outputs continue to issue the measured value.

Hold: Signal outputs hold the last valid measured value. Errors, except fatal errors, are not issued.

Off: Signal outputs are switched off (set to 0 or 4 mA).
Errors, except fatal errors, are not issued.

- 3.2.2.6 **Output/Control:** Relay or signal output:

Cont.: Controller continues normally.

Hold: Controller continues based on the last valid value.

Off: Controller is switched off.

3.3 Simulation

To simulate a value or a relay state, select the

- ♦ alarm relay,
- ♦ relay 1 or 2
- ♦ signal output 1 or 2
- ♦ valve 1

with the [] or [] key.

Press the [Enter] key.

Change the value or state of the selected item with the [] or [] key.

Press the [Enter] key.

⇒ *The value is simulated by the relay/signal output.*

3.3.1	<i>Alarm Relay:</i>	Active or inactive
3.3.2	<i>Relay 1:</i>	Active or inactive
3.3.3	<i>Relay 2</i>	Active or inactive
3.3.4	<i>Signal Output 1:</i>	Actual current in mA
3.3.5	<i>Signal Output 2</i>	Actual current in mA
3.3.6	<i>Signal Output 3:</i>	Actual current in mA (option)
3.3.7	<i>Solenoid valve</i>	Not available.

At the absence of any key activities, the instrument will switch back to normal mode after 20 min. If you quit the menu, all simulated values will be reset.

3.4 Set Time

Adjust date and time.

4 Operation

4.1 Sensors

- 4.1.1 *Filter Time Constant:* Used to damp noisy signals. The higher the filter time constant, the slower the system reacts to changes of the measured value.
 Range: 5–300 sec
- 4.1.2 *Hold after Cal:* Delay permitting the instrument to stabilize again after calibration. During calibration- plus hold-time, the signal outputs are frozen (held on last valid value), alarm values, limits are not active.
 Range: 0–6'000 sec

- 4.1.31 *Interval:* Only visible if <Channel switch> in menu 5.1.4 is set to <Auto>. The measuring interval can be set in steps of 15 min. Range: 15 min to 120 min
- 4.1.32 *Channel selection:* Only visible if <Channel switch> in menu 5.1.4 is set to <User defined>. The following selections are available:
- Channel 1: Only channel 1 is measured.
- Channel 2: Only channel 2 is measured.
- Dig. Input: The channel can be selected via input. The function Input in menu 5.3.4 is set to <Active = no>.

4.2 Relay Contacts

See [5.3 Relay Contacts, p. 103](#).

4.3 Logger

The instrument is equipped with an internal logger. The logger data can be copied to a PC with an USB stick if option USB interface is installed.

The logger can save approx. 1500 data records. Records consists of: Date, time, alarms, measured value, pH, temperature, flow.

- 4.3.1 *Log Interval:* Select a convenient log interval. Consult the table below to estimate the max logging time. When the login buffer is full, the oldest data record is erased to make room for the newest one (circular buffer).

Interval	1 s	5 s	1 min	5 min	10 min	30 min	1 h
Time	25 min	2 h	25 h	5 d	10 d	31 d	62 d

- 4.3.2 *Clear Logger:* If confirmed with **yes**, the complete logger data is deleted. A new data series is started.

5 Installation

5.1 Sensors

- o *Sensor type*: Display of the used sensor type.(e.g. Sodium)
- o *Temperature*: Display of the temperature sensor type. (e.g. NT5K)
- o *Flow*: Display of the actual sample flow B/s

5.1.4 Channel switch: For single sample stream select “None”.

If a second sample stream has been installed, select one of the following options, depending on your needs:

- o *None*: The switchover between the channels is disabled.
- o *Auto*: Automatic channel switch. The interval can be defined in menu <Operation> [4.1.31, p. 98](#).
- o *User defined*: Channel selection can be defined by the user in menu <Operation> [4.1.32, p. 98](#).
- o *Fieldbus*: Channel switch by fieldbus

5.1.5 Standards: Enter the concentration of the standard calibration.

5.1.5.1 Standard 1: Solution 1 (low concentration).

Do not select concentrations lower than 100 ppb

Range: 0.00 ppb–20 ppm

5.1.5.2 Standard 2: Solution 2 (high concentration).

Select concentration at least 10 times higher than solution 1.

Range: 0.00 ppb–20 ppm

5.2 Signal Outputs

5.2.1 and 5.2.2 Signal Output 1 and 2: Assign process value, the current loop range and a function to each signal output.

Note: *The navigation in the menu <Signal Output 1> and <Signal Output 2> is equal. For reason of simplicity only the menu numbers of Signal Output 1 are used in the following.*

5.2.1.1 Parameter: Assign one of the process values to the signal output.

Available values: Sodium 1 and 2, pH, temperature and sample flow.

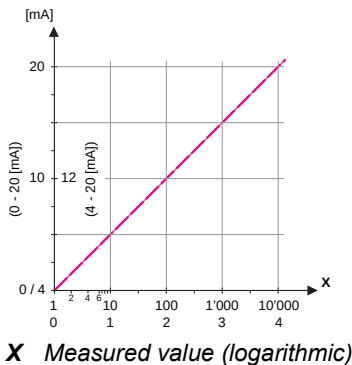
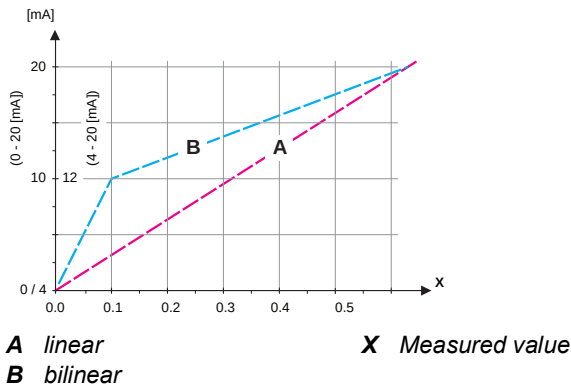
5.2.1.2 Current Loop: Select the current range of the signal output.

Make sure the connected device works with the same current range. Available ranges: 0–20 mA or 4–20 mA

5.2.1.3 Function: Define if the signal output is used to transmit a process value or to drive a control unit. Available functions are:

- ♦ Linear, bilinear or logarithmic for process values.
See [As process values, p. 100](#).
- ♦ Control upwards or control downwards for controllers.
See [As control output, p. 101](#).

As process values The process value can be represented in 3 ways: linear, bilinear or logarithmic. See graphs below.



5.2.1.40 Scaling: Enter beginning and end point (Range low & high) of the linear or logarithmic scale. In addition, the midpoint for the bilinear scale.

Parameter Sodium 1

5.2.1.40.10 Range low: 0 ppb–20 ppm

5.2.1.40.20 Range high: 0 ppb–20 ppm

Parameter Sodium 2

5.2.1.40.11 Range low: 0–20 ppm

5.2.1.40.21 Range high: 0–20 ppm

Parameter pH

5.2.1.40.12 *Range low:* 0 – 14 pH

5.2.1.40.22 *Range high:* 0 – 14 pH

Parameter Temperature

5.2.1.40.13 *Range low:* -30 to +120 °C

5.2.1.40.23 *Range high:* -30 to +120 °C

Parameter Sample flow

5.2.1.40.14 *Range low:* 0 – 1000 B/s

5.2.1.40.24 *Range high:* 0 – 1000 B/s

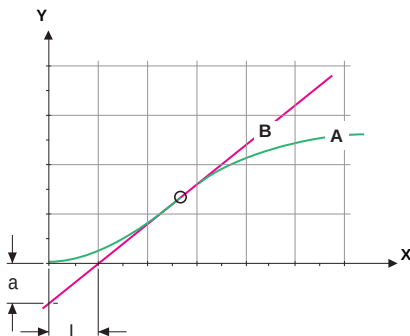
**As control
 output**

Signal outputs can be used for driving control units. We distinguish different kinds of controls:

- ♦ *P-controller:* The controller action is proportional to the deviation from the setpoint. The controller is characterized by the P-Band. In the steady-state, the setpoint will never be reached. The deviation is called steady-state error.
 Parameters: setpoint, P-Band
- ♦ *PI-controller:* The combination of a P-controller with an I-controller will minimize the steady-state error. If the reset time is set to zero, the I-controller is switched off.
 Parameters: setpoint, P-Band, reset time.
- ♦ *PD-controller:* The combination of a P-controller with a D-controller will minimize the response time to a fast change of the process value. If the derivative time is set to zero, the D-controller is switched off.
 Parameters: setpoint, P-Band, derivative time.
- ♦ *PID-controller:* The combination of a P-, an I - and a D-controller allows a proper control of the process.
 Parameters: setpoint, P-Band, reset time, derivative time.

Ziegler-Nichols method for the optimization of a PID controller:

Parameters: Setpoint, P-Band, Reset time, Derivative time.



A Response to maximum control output $Xp = 1.2/a$

B Tangent on the inflection point $Tn = 2L$

X Time $Tv = L/2$

The point of intersection of the tangent with the respective axis will result in the parameters a and L.

Consult the manual of the control unit for connecting and programming details. Choose control upwards or downwards.

Control upwards/downwards

Setpoint: User-defined process value (Measured value or flow)

P-Band: Range below (upwards control) or above (downwards control) the set-point, within the dosing intensity is reduced from 100% to 0% to reach the set-point without overshooting.

5.2.1.43 Control Parameters: if Parameters = Sodium 1

5.2.1.43.10 **Setpoint:** 0–20 ppm

5.2.1.43.20 **P-Band:** 0–20 ppm

5.2.1.43 Control Parameters: if Parameters = Sodium 2

5.2.1.43.11 **Setpoint:** 0–20 ppm

5.2.1.43.21 **P-Band:** 0–20 ppm

5.2.1.43 Control Parameters: if Parameters = pH

5.2.1.43.12 **Setpoint:** 0–14 pH

5.2.1.43.22 **P-Band:** 0–14 pH

- 5.2.1.43** Control Parameters: if Parameters = Temperature
5.2.1.43.13 *Setpoint*: -30 to +120 °C
5.2.1.43.23 *P-Band*: 0–100 °C
- 5.2.1.43** Control Parameters: if Parameters = Sample Flow
5.2.1.43.14 *Setpoint*: 0–1000 B/s
5.2.1.43.24 *P-Band*: 0–1000 B/s
5.2.1.43.3 *Reset time*: The reset time is the time till the step response of a single I-controller will reach the same value as it will be suddenly reached by a P-controller.
Range: 0–9'000 sec
5.2.1.43.4 *Derivative time*: The derivative time is the time till the ramp response of a single P-controller will reach the same value as it will be suddenly reached by a D-controller.
Range: 0–9'000 sec
5.2.1.43.5 *Control timeout*: If a controller action (dosing intensity) is constantly over 90% during a defined period of time and the process value does not come closer to the setpoint, the dosing process will be stopped for safety reasons.
Range: 0–720 min

5.3 Relay Contacts

- 5.3.1 Alarm Relay:** The alarm relay is used as cumulative error indicator. Under normal operating conditions the contact is active.

The contact is inactive at:

- ♦ Power loss
- ♦ Detection of system faults like defective sensors or electronic parts
- ♦ High case temperature
- ♦ Lack of reagents or ion exchanger exhaustion
- ♦ Process values out of programmed ranges.

Program alarm levels, hysteresis values and delay times for the following parameters:

- ♦ Sodium 1
- ♦ Sodium 2
- ♦ pH
- ♦ sample flow
- ♦ sample temperature
- ♦ case temperature.

5.3.1.1/2 Alarm Sodium 1 and 2

5.3.1.x.x *Alarm High:* If the measured value rises above the alarm high value, the alarm relay is activated and E001 is displayed in the message list.

Range: 0.00–20.00 ppm

5.3.1.x.x *Alarm Low:* If the measured value falls below the alarm low value, the alarm relay is activated and E002 is displayed in the message list.

Range: 0.00–20.00 ppm

5.3.1.x.x *Hysteresis:* Within the hyst. range, the relay does not switch. This prevents damage of relays contacts when the measured value fluctuates around the alarm value.

Range: 0.00–20.00 ppm

5.3.1.x.x *Delay:* During run time plus the delay time the signal and control outputs are held in the operating mode.

Range: 0.00–28'800 sec

5.3.1.3 Alarm pH: Define the measuring value, which should issue an alarm high respectively low.

5.3.1.3.1 *Alarm High:* If the measured value rises above the alarm high value, the alarm relay is activated and E003 is displayed in the message list.

Range: 0–14.00 pH

5.3.1.3.25 *Alarm Low:* If the measured value falls below the alarm low value, the alarm relay is activated and E004 is displayed in the message list

Range: 0–14.00 pH

5.3.1.3.35 *Hysteresis:* Within the hyst. range, the relay does not switch. This prevents damage of relays contacts when the measured value fluctuates around the alarm value

Range: 0–14.00 pH

5.3.1.3.45 *Delay:* During run time plus the delay time the signal and control outputs are held in the operating mode

Range: 0–28'800 Sec

5.3.1.4 Sample Flow: Define at which sample flow a flow alarm should be issued.

- 5.3.1.4.1 *Flow Alarm:* Program if the alarm relay should be activated if there is a flow alarm. Choose between yes or no. The flow alarm will always be indicated in the display, pending error list, saved in the message list and the logger.
Available values: Yes or No

Note: *Sufficient flow is essential for a correct measurement.
We recommend to program yes.*

- 5.3.1.4.2 *Alarm High:* If the measuring values rises above the programmed value E009 will be issued.
Range: 5–1000 B/s
- 5.3.1.4.35 *Alarm Low:* If the measuring values falls below the programmed value E010 will be issued.
Range: 5–1000 B/s
- 5.3.1.5 Sample Temperature:** Define the measuring value, which should issue an alarm high respectively low.
- 5.3.1.5.1 *Alarm High:* If the sample temperature rises above the programmed value E007 is issued.
Range: 30–70 °C
- 5.3.1.5.x *Alarm Low:* If the sample temperature falls below the programmed value E008 is issued.
Range: 0–20 °C
- 5.3.1.6 Case Temp. high:** Set the alarm high value for temperature of electronics housing. If the value rises above the programmed value E013 is issued.
Range: 30–75 °C
- 5.3.1.7 Case Temp. low:** Set the alarm low value for temperature of electronics housing. If the value falls below the programmed value E014 is issued.
Range: -10–20 °C

5.3.2 and 5.3.3 Relay 1 and 2: The contacts can be set as normally open or normally closed with a jumper. See [Relay 1 and 2, p. 44](#).

The function of relay contacts 1 or 2 are defined by the user.

Note: *The navigation in the menu <Relay 1> and <Relay 2> is equal. For reason of simplicity only the menu numbers of Relay 1 are used in the following.*

- 1** First select the functions as:
 - Limit upper/lower,
 - Control upwards/downwards,
 - Timer
 - Fieldbus
 - Channel Selection (relay 2 only)
- 2** Then enter the necessary data depending on the selected function.

5.3.2.1 Function = Limit upper/lower:

When the relays are used as upper or lower limit switches, program the following:

5.3.2.20 Parameter: select a process value

5.3.2.300 Setpoint: If the measured value rises above respectively falls below the set-point, the relay is activated.

Parameter	Range
Sodium 1	0–20 ppm
Sodium 2	0–20 ppm
pH	0–14 pH
Temperature	-30 to +120 °C
Sample flow	0–1000 B/s

5.3.2.400 Hysteresis: within the hysteresis range, the relay does not switch. This prevents damage of relay contacts when the measured value fluctuates around the alarm value.

Parameter	Range
Sodium 1	0–20 ppm
Sodium 2	0–20 ppm
pH	0–14 pH
Temperature	0 to +100 °C
Sample flow	0–1000 B/s

5.3.2.50 *Delay*: Duration, the activation of the alarm relay is retarded after the measuring value has risen above/fallen below the programmed alarm.

Range: 0–600 sec

5.3.2.1 Function = Control upwards/downwards:

The relays may be used to drive control units such as solenoid valves, membrane dosing pumps or motor valves. When driving a motor valve both relays are needed, relay 1 to open and relay 2 to close the valve.

5.3.2.22 *Parameter*: Choose on of the following process values.

- ♦ Sodium 1
- ♦ Sodium 2
- ♦ pH
- ♦ Temperature
- ♦ Sample flow)

5.3.2.32 Settings: Choose the respective actuator:

- ♦ Time proportional
- ♦ Frequency
- ♦ Motor valve

5.3.2.32.1 Actuator = Time proportional

Examples of metering devices that are driven time proportional are solenoid valves, peristaltic pumps.

Dosing is controlled by the operating time.

5.3.2.32.20 *Cycle time*: duration of one control cycle (on/off change).

Range: 0–600 sec.

5.3.2.32.30 *Response time*: Minimal time the metering device needs to react.

Range: 0–240 sec.

5.3.2.32.4 Control Parameters

Range for each Parameter same as [5.2.1.43, p. 102](#)

5.3.2.32.1 Actuator = Frequency

Examples of metering devices that are pulse frequency driven are the classic membrane pumps with a potential free triggering input. Dosing is controlled by the repetition speed of dosing shots.

5.3.2.32.21 *Pulse frequency*: Max. pulses per minute the device is able to respond to. Range: 20–300/min.

5.3.2.32.31 Control Parameters

Range for each Parameter same as [5.2.1.43, p. 102](#)

5.3.2.32.1 Actuator = Motor valve

Dosing is controlled by the position of a motor driven mixing valve.

5.3.2.32.22 Run time: Time needed to open a completely closed valve
 Range: 5–300 sec.

5.3.2.32.32 Neutral zone: Minimal response time in % of the runtime. If the requested dosing output is smaller than the response time, no change will take place.
 Range: 1–20 %

5.3.2.32.4 Control Parameters

Range for each Parameter same as [5.2.1.43, p. 102](#)

5.3.2.1 Function = Timer:

The relay will be activated repetitively depending on the programmed time scheme.

5.3.2.24 Mode: Operating mode (interval, daily, weekly)

5.3.2.24 Interval

5.3.2.340 Interval: The interval can be programmed within a range of 1–1'440 min.

5.3.2.44 Run Time: Enter the time the relay stays active.
 Range: 5–32'400 sec.

5.3.2.54 Delay: during run time plus the delay time the signal and control outputs are held in the operating mode programmed below.
 Range: 0–6'000 sec.

5.3.2.6 Signal Outputs: Select operating mode of the signal output:

Cont.: Signal outputs continue to issue the measured value.

Hold: Signal outputs hold the last valid measured value.
 Measurement is interrupted. Errors, except fatal errors, are not issued.

Off: Signal outputs are switched off (set to 0 or 4 mA).
 Errors, except fatal errors, are not issued.

5.3.2.7 *Output/Control:* Select operating mode of the controller output:

Cont.: Controller continues normally.

Hold: Controller continues based on the last valid value.

Off: Controller is switched off.

5.3.2.24 *daily*

The relay contact can be activated daily, at any time of a day.

5.3.2.341 *Start time:* to set the start time proceed as follows:

- 1 Press [Enter], to set the hours.
- 2 Set the hour with the [▲] or [▼] keys.
- 3 Press [Enter], to set the minutes.
- 4 Set the minutes with the [▲] or [▼] keys.
- 5 Press [Enter], to set the seconds.
- 6 Set the seconds with the [▲] or [▼] keys.

Range: 00:00:00–23:59:59

5.3.2.44 *Run Time:* see Interval

5.3.2.54 *Delay:* see Interval

5.3.2.6 *Signal Outputs:* see Interval

5.3.2.7 *Output/Control:* see Interval

5.3.2.24 *weekly*

The relay contact can be activated at one or several days, of a week.
 The daily starting time is valid for all days.

5.3.2.342 Calendar:

5.3.2.342.1 *Start time:* The programmed start time is valid for each of the programmed days. To set the start time see [5.3.2.341, p. 109](#).

Range: 00:00:00–23:59:59

5.3.2.342.2 *Monday:* Possible settings, on or off
 to

5.3.2.342.8 *Sunday:* Possible settings, on or off

5.3.2.44 *Run Time:* see Interval

5.3.2.54 *Delay:* see Interval

5.3.2.6 *Signal Outputs:* see Interval

5.3.2.7 *Output/Control:* see Interval

5.3.2.1 Function = Fieldbus:

The relay will be switched via the Profibus input. No further parameters are needed.

5.3.2.1 Function = Channel Selection:

If the 2nd sample stream option is installed, relay 2 can be used to indicate which channel is selected. No further parameters are needed.

Relay 2 inactive: Channel 1 is selected

Relay 2 active: Channel 2 is selected

5.3.4 Input: The functions of the relays and signal outputs can be defined depending on the position of the input contact, i.e. no function, closed or open.

Note: If <Channel Selection> in Menu <Installation>/<Sensors> is set to <User defined/Dig. Input>, the Input is set to "Active = no" and can be used to switch the 2nd Sample Stream Option via an external device.

5.3.4.1 **Active:** Define when the input should be active:
The measurement is interrupted during the time the input is active.

No: Input is never active.

When closed Input is active if the input relay is closed

When open: Input is active if the input relay is open

5.3.4.2 **Signal Outputs:** Select the operation mode of the signal outputs when the relay is active:

Cont.: Signal outputs continue to issue the measured value.

Hold: Signal outputs issue the last valid measured value. Measurement is interrupted. Errors, except fatal errors, are not issued.

Off: Set to 0 or 4 mA respectively. Errors, except fatal errors, are not issued.

5.3.4.3 *Output/Control:* (relay or signal output):

Cont.: Controller continues normally.
Hold: Controller continues on the last valid value.
Off: Controller is switched off.

5.3.4.4 *Fault:*

No: No message is issued in pending error list and the alarm relay does not close when input is active. Message E024 is stored in the message list.
Yes: Message E024 is issued and stored in the message list. The Alarm relay closes when input is active.

5.3.4.5 *Delay:* Time which the instrument waits, after the input is deactivated, before returning to normal operation.
 Range: 0–6'000 sec

5.4 Miscellaneous

5.4.1 *Language:* Set the desired language.

Language
German
English
French
Spanish

5.4.2 *Set defaults:* Reset the instrument to factory default values in three different ways:

Set defaults
no
Calibration
In parts
Completely

- ♦ **Calibration:** Sets calibration values back to default. All other values are kept in memory.
- ♦ **In parts:** Communication parameters are kept in memory. All other values are set back to default values.
- ♦ **Completely:** Sets back all values including communication parameters.

- 5.4.3 **Load Firmware:** Firmware updates should be done by instructed service personnel only.

Load Firmware
no
yes

- 5.4.4 Password:** Select a password different from 0000 to prevent unauthorized access to the following menus:

- 5.4.4.1 Messages
- 5.4.4.2 Maintenance
- 5.4.4.3 Operation
- 5.4.4.4 Installation.

Each menu may be protected by a *different* password.

If you forgot the passwords, contact the closest SWAN representative.

- 5.4.5 **Sample ID:** Identify the process value with any meaning full text, such as KKS number.
- 5.4.6 **Line Break Detection:** Define if message E028 should be issued in case of a line break on signal output 1 or 2.
 Choose between <Yes> or <No>.

5.5 Interface

Select one of the following communication protocols. Depending on your selection, different parameters must be defined.

5.5.1 Protocol: Profibus

- 5.5.20 Device address: Range: 0–126
- 5.5.30 ID-Nr.: Range: Analyzer; Manufacturer; Multivariable
- 5.5.40 Local operation: Range: Enabled, Disabled

5.5.1 Protocol: Modbus RTU

- 5.5.21 Device address: Range: 0–126
- 5.5.31 Baud Rate: Range: 1200–115200 Baud
- 5.5.41 Parity: Range: none, even, odd

5.5.1 Protocol: USB stick

Only visible if an USB interface is installed. No further settings are possible.

5.5.1 Protocol: HART

- Device address: Range: 0–63

10. Material Safety Data Sheet

10.1. Reagents

Catalogue No.:	A-87.729.010A
Product name:	Etching Kit A
Catalogue No.:	A-87.729.010B
Product name:	Etching Kit B
Catalogue No.:	A-85.141.400
Product name:	Sodium Standard Solution 1'000 ppm
Catalogue No.:	803646
Product name:	Diisopropylamine
Catalogue No.:	A-85.810.200
Product name:	Regeneration solution for sodium electrodes
Catalogue No.:	A-87.892.400
Product name:	Electrolyte for Swansensor Sodium Reference

**Download
MSDS** The current Material Safety Data Sheets (MSDS) for the above listed Reagents are available for downloading at **www.swan.ch**.

11. Default Values

***Note:** The <Maintenance>/<Regeneration> menu is only visible if the automatic regeneration option is installed.*

Maintenance:

Regeneration Start time 01:00:00
 Calendar: Monday to Sunday: Off
 Duration: 20 s
 Delay: 300 s
 Signal Outputs: hold
 Output/Control: hold

Operation:

Sensors Filter Time Const.: 180 s
 Hold after Cal.: 300 s

Alarm Relay same as in Installation
Signal Output same as in Installation
Relay 1 and 2 same as in Installation
 Input same as in Installation
Logger Logger Interval: 30 min
 Clear Logger: no

Installation:

Sensor Sensor type: Sodium
 Temperature: NT5K
 Channel switch: none
 Standard: Standard 1: 200 ppb
 Standard: Standard 2: 2.00 ppm

Signal Output 1 Parameter: Sodium 1
 Current loop: 4 - 20 mA
 Function: linear
 Scaling: Range low: 0.00 ppb
 Scaling: Range high: 1.00 ppm

Signal Output 2 Parameter: Temperature
 Current loop: 4 - 20 mA
 Function: linear
 Scaling: Temperature: Range low: 0.0 °C
 Scaling: Temperature: Range high: 50.0 °C
 Further Parameters:
 Scaling: pH: Range low: 0.00 pH

	Scaling: pH: Range high:	14.00 pH
	Scaling: Sample Flow: Range low:	0 B/s
	Scaling: Sample Flow: Range high:	1000 B/s
Alarm Relay	Alarm Sodium:	
	Alarm high:	20.00 ppm
	Alarm low:	0.00 ppb
	Hysteresis:	10.0 ppb
	Delay:	5 s
	pH: Alarm high:	14.00 pH
	pH: Alarm low:	0.00 pH
	pH: Hysteresis:	0.10 pH
	pH: Delay:	5 s
	Flow Alarm:	Yes
	Sample flow.: Alarm High:	1000 B/s
	Sample flow.: Alarm Low:	5 B/s
	Sample Temp.: Alarm High:	55 °C
	Sample Temp.: Alarm Low:	5 °C
	Case temp. high:	65 °C
	Case temp. low:	0 °C
Relay 1 and 2	Function:	Limit upper
	Parameter: Relay1 and 2	Sodium 1
	Setpoint: Relay1 and 2	1.00 ppm
	Hysteresis:	10 ppb
	Delay:	30 s
	If Function = Control upw. or dnw:	
	Parameter:	Sodium 1 and 2
	Settings: Actuator:	Frequency
	Settings: Pulse Frequency:	120/min
	Settings: Control Parameters: Setpoint:	1.00 ppm
	Settings: Control Parameters: P-band:	10 ppb
	Parameter:	pH
	Settings: Actuator:	Frequency
	Settings: Pulse Frequency:	120/min
	Settings: Control Parameters: Setpoint:	7.00 pH
	Settings: Control Parameters: P-band:	0.10 pH
	Parameter:	Temperature
	Settings: Actuator:	Frequency
	Settings: Pulse Frequency:	120/min
	Settings: Control Parameters: Setpoint:	30 °C
	Settings: Control Parameters: P-band:	1 °C

Parameter: **Sample Flow**
 Settings: Actuator: Frequency
 Settings: Pulse Frequency: 120/min
 Settings: Control Parameters: Setpoint: 1000 B/s
 Settings: Control Parameters: P-band: 100 B/s
Common settings
 Settings: Control Parameters: Reset time: 0 s
 Settings: Control Parameters: Derivative Time: 0 s
 Settings: Control Parameters: Control Timeout: 0 min
 Settings: Actuator: Time proportional
 Cycle time: 60 s
 Response time: 10 s
 Settings: Actuator Motor valve
 Run time: 60 s
 Neutral zone: 5%
If Function = Timer:
 Mode: Interval
 Interval: 1 min
 Mode: daily
 Start time: 00.00.00
 Mode: weekly
 Calendar; Start time: 00.00.00
 Calendar; Monday to Sunday: Off
 Run time: 10 s
 Delay: 5 s
 Signal output: cont
 Output/Control: cont
 Input Active when closed
 Signal Outputs hold
 Output/Control off
 Fault no
 Delay 10 s
 Miscellaneous Language: English
 Set default: no
 Load firmware: no
 Password: for all modes 0000
 Sample ID: - - - - -
 Line break detection no

12. Index

A

Alarm	
Sample flow	104
Alarm pH.	104
Alarm Relay	43, 115

C

Cable thicknesses	39
Cal. History	94
Calendar	109
Changing values	57
Consumables	14
Current outputs	46

D

Default Values	114
Diagnostics	94

E

Electrical Connections	39
Electrical Wiring	20

F

Flow Alarm	105
----------------------	-----

H

HART	48
----------------	----

I

I/O State	95
Identification.	94
Input	43
Instrument Setup	21
Interface	93, 95
HART	48
Modbus.	47

Profibus	47
USB	48

L

Logger.	114
Longer Stop of Operation.	83

M

Maintenance	
Reference electrode	64
Sodium electrode.	62
Maintenance Schedule	60
Message List	94
Miscellaneous	93
Modbus	47
Mounting requirements	22

O

On-site requirements	15, 20
Operating Time	94

P

Pending Errors	94
pH Electrode	94
Power Supply	15
Process pH.	95
Profibus	48

R

Relay Contacts.	93, 106
-------------------------	---------

S

Safety Data sheets	113
Sample Flow	95, 104
Sample requirements	15
Sample Temperature	105

Sensors 92, 94, 114
Signal Outputs 46, 92, 114
Simulation 97
Software Structure. 56

T
Temperature 95
Terminals 41, 43–44, 47

U
USB Interface 48

W
Wire 39

13. Notes

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