ANALYTICAL INSTRUMENTS

A-96.250.551 / 260121

Operator's Manual

Firmware V6.20 and higher

SWISS MADE

AMI Soditrace

Customer Support

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Table of Contents

AMI Soditrace–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.

2. Product Description

2.1. Description of the System

Application Range

Sodium measurement is used for quality control in high purity water applications and to monitor break through of ion exchangers.

Signal Outputs

Two signal outputs programmable for measured values (freely scalable, linear, bilinear, log) 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).

Relays

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).*

Communication interfaces (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

Safety Features

No data loss after power failure. All data is saved in non-volatile memory.
Over voltage protection of in- and outputs.
Galvanic separation of measuring inputs and signal outputs.

Measuring principle

The sodium measurement as used in this instrument is based on a proven glass ion sensitive electrode. The logarithmic response can be described as follows:

$$E = E_O + SI_{Na} * \log \{(C_{Na} + C_B) / C_{ISO}\}$$

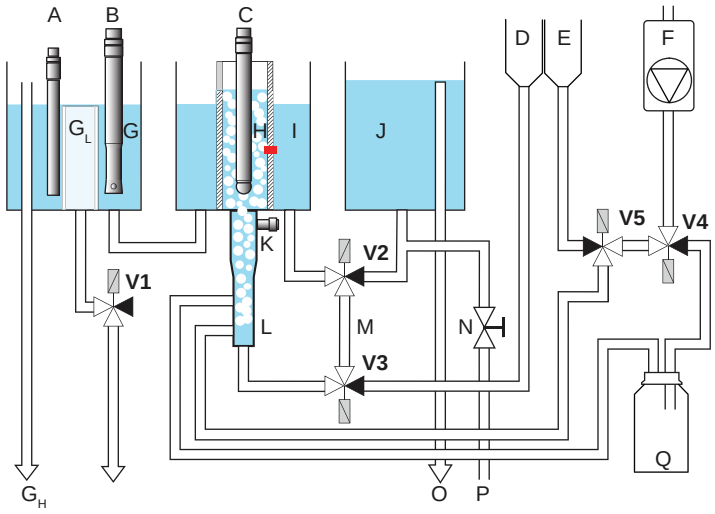
With the abbreviations

E	The measured potential of the electrode pair.	**[mV]**
E_O	The measured potential when the Sodium concentration in the sample equals C_{iso}.	**[mV]**
SI_{NA}	The temperature dependent slope of the electrode response (R*T / n*F).	**[mV/ dec]**
C_{Na}	The Sodium concentration in the sample.	**[ppb]**
C_B	The detection limit of the system. This term is used to define the curvature of the electrode response near the detection limit. It depends on pH, other interferences like potassium and other ions, and temperature.	**[ppb]**
C_{ISO}	The Sodium concentration in the sample where the measured potential of the electrode pair is temperature-independent. It equals the reference point for the temperature compensation.	**[ppb]**

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 0.001 ppb sodium requires the conditioning of the sample to a minimum of pH 12 while sample integrity has to be maintained. The best results are obtained with disopropylamine (DIPA).

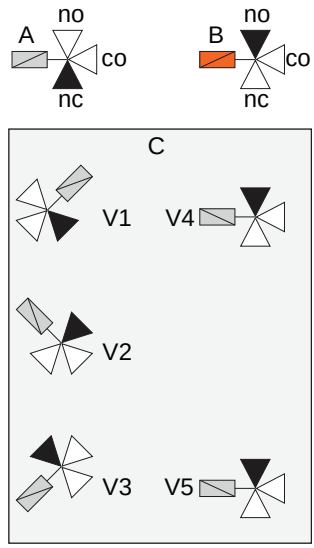
Fluidics overview



A *Temperature sensor*
B *Reference electrode*
C *Sodium electrode*
D *Standard solution*
E *Regeneration solution*
F *Air pump*
G *Reference chamber*
G_L *Overflow low level*
G_H *Overflow high level*
H *Measuring chamber*
I *Calibration chamber*
J *Constant head*
K *Conductivity sensor*
L *Air lift pump*
M *Calibration loop*
N *Flow regulating valve*
O *Overflow constant head*
P *Sample inlet*
Q *Reagent bottle (DIPA)*

Solenoid valves

The following illustration gives an overview of the solenoid valves' positions on the valve block [C] and their switching states if they are de-energized.



A *Solenoid valve de-energized*
B *Solenoid valve energized*
C *Valve block*

no *normally open*
nc *normally closed*
co *common*

V1 Sample outlet valve
- open during on-line measurement
- closed during calibration.

V2 Sample inlet valve
- Doses the standard solution for the calibration by filling the calibration loop [M]

V3 Sample inlet valve
- Doses the standard solution for the calibration by filling the calibration loop [M]

V4 Reagent valve
- Valve V4 is controlled via the conductivity sensor [K]
- Supplies the air lift pump either with air or DIPA vapor
- Is used for reagent dosing (DIPA).

V5 Regeneration valve
- Supplies the air lift pump during on-line measurement
- adds regeneration solution during regeneration cycle.

On-line operation

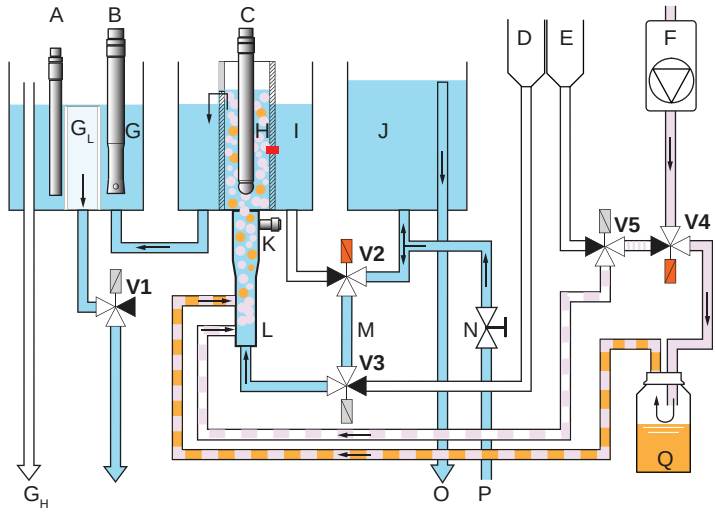
During on-line operation, the AMI Soditrace works in the <Low Level> mode. The sample enters the system at the sample inlet [P] and flows into the constant head [J]. Adjust the flow regulating valve [N] so that always a small part of the sample flows through the overflow tube [O] into the waste. This adjustment ensures a sufficient sample flow through valve V2 and V3 and then via air lift pump [L] into the measuring chamber [H] where the sodium electrode [C] is installed. This arrangement guarantees a very constant sample stream of 20 ml per minute and at the same time a sample conditioning to pH 12 (see Control of reagent addition below).

To prevent any back-diffusion and thus contamination in the measuring chamber [H], the sample overflows into the calibration chamber [I], from there into the reference chamber [G] and through the low level overflow [G_L] and valve V1 into the waste. The temperature is measured in the reference chamber with the temperature sensor [A]. It is used to compensate the sodium reading following the Nernst algorithm.

Control of reagent addition

The reagent addition system is driven by the air pump [F]. The air flows through the energized valve V4 to the reagent bottle [Q], where it is picking up reagent vapor. From there it flows to the air lift pump, where the sample is enriched with DIPA. If valve V4 is not energized, the air flows directly to the air lift pump [L] via valves V4 and V5.

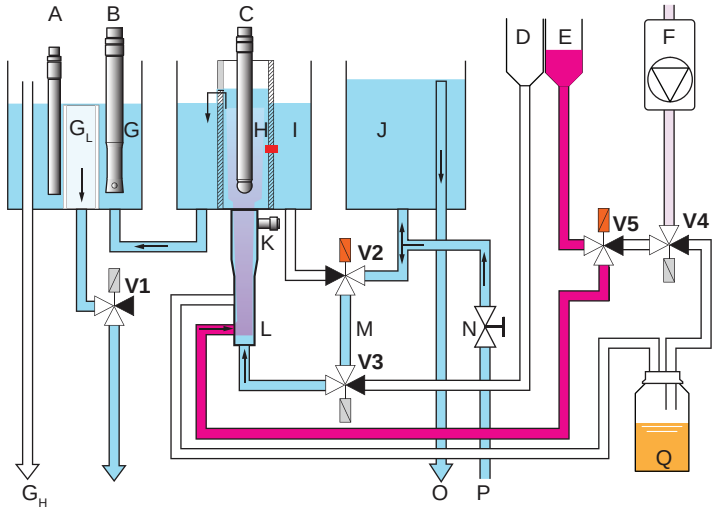
The conductivity sensor [K] measures the amount of reagent added to the sample, and a PID controller activates or deactivates valve 4 so that the conductivity reading remains constant. A conductivity of 450 µS/cm should be maintained for low sodium readings. Upon exhaustion of the reagent, the conductivity will fall below the set-point and trigger an error message.



A *Temperature sensor*
B *Reference electrode*
C *Sodium electrode*
D *Standard solution*
E *Regeneration solution*
F *Air pump*
G *Reference chamber*
G_L *Low level overflow*
G_H *High level overflow*
H *Measuring chamber*
I *Calibration chamber*
J *Constant head*
K *Conductivity sensor*
L *Air lift pump*
M *Calibration loop*
N *Flow regulating valve*
O *Overflow constant head*
P *Sample inlet*
Q *Reagent bottle (DIPA)*

Regeneration

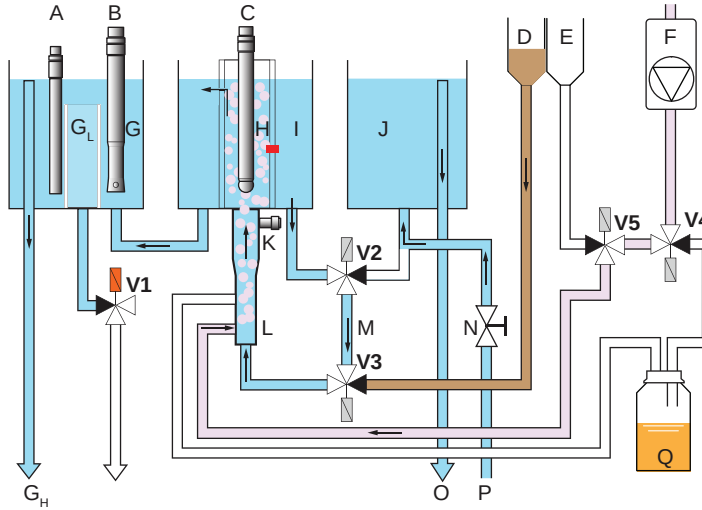
The system automatically regenerates the sodium electrode [C] according to the programmed interval or 12 h before a calibration. By opening valve V5, the regeneration solution [E] flows through the air lift pump [L] and etches the sodium electrode [C].



A *Temperature sensor*
B *Reference electrode*
C *Sodium electrode*
D *Standard solution*
E *Regeneration solution*
F *Air pump*
G *Reference chamber*
G_L *Overflow low level*
G_H *Overflow high level*
H *Measuring chamber*
I *Calibration chamber*
J *Constant head*
K *Conductivity sensor*
L *Air lift pump*
M *Calibration loop*
N *Flow regulating valve*
O *Overflow constant head*
P *Sample inlet*
Q *Reagent bottle (DIPA)*

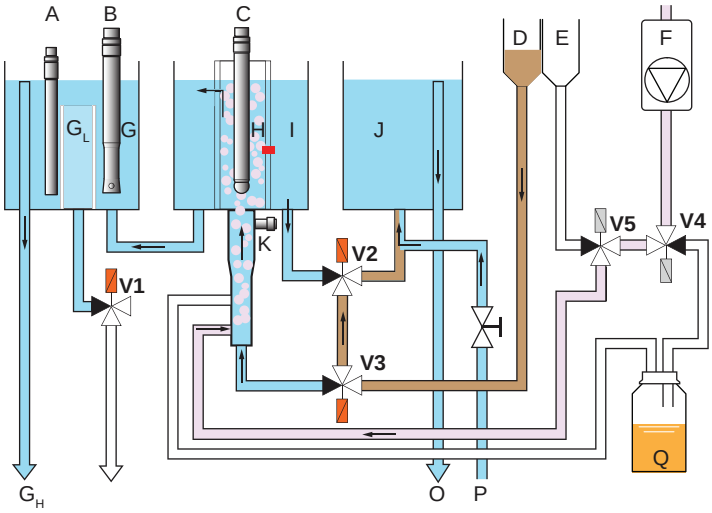
Calibration

Before the 3-point calibration starts, valve V1 closes and the measuring cell is filled until the sample overflows via the overflow high level [G_H] into the waste. Then the sample flow is stopped by de-energizing valve V2, and the trapped volume of sample circulates in a closed loop through valve 2 and valve 3 driven by the air lift pump [L].This circulation is called Mix, see figure below.

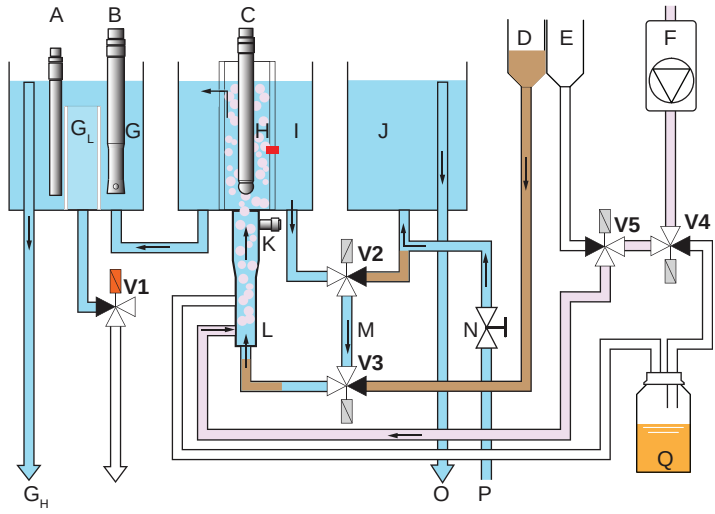


A *Temperature sensor*
B *Reference electrode*
C *Sodium electrode*
D *Standard solution*
E *Regeneration solution*
F *Air pump*
G *Reference chamber*
G_L *Overflow low level*
G_H *Overflow high level*
H *Measuring chamber*
I *Calibration chamber*
J *Constant head*
K *Conductivity sensor*
L *Air lift pump*
M *Calibration loop*
N *Flow regulating valve*
O *Overflow constant head*
P *Sample inlet*
Q *Reagent bottle (DIPA)*

To this volume, a 500 times smaller volume of standard is added. The calibration loop [M] is filled with standard [D] by activating valves V2 and V3 simultaneously.



When the valves are deactivated, the content of the calibration loop is flushed into the measuring cell. For the first calibration point, the calibration loop is filled once with standard and then flushed into the measuring cell. The sample is then recirculated until a constant mV reading is attained.



For the second calibration point, the calibration loop is filled and flushed, twice. Again the sample is recirculated until a constant mV reading is attained.

For the third calibration point, the calibration loop is filled and flushed seven times.

With three addition steps, an increase of one order of magnitude in Sodium concentration is achieved.

Example Standard concentration: 5 ppm

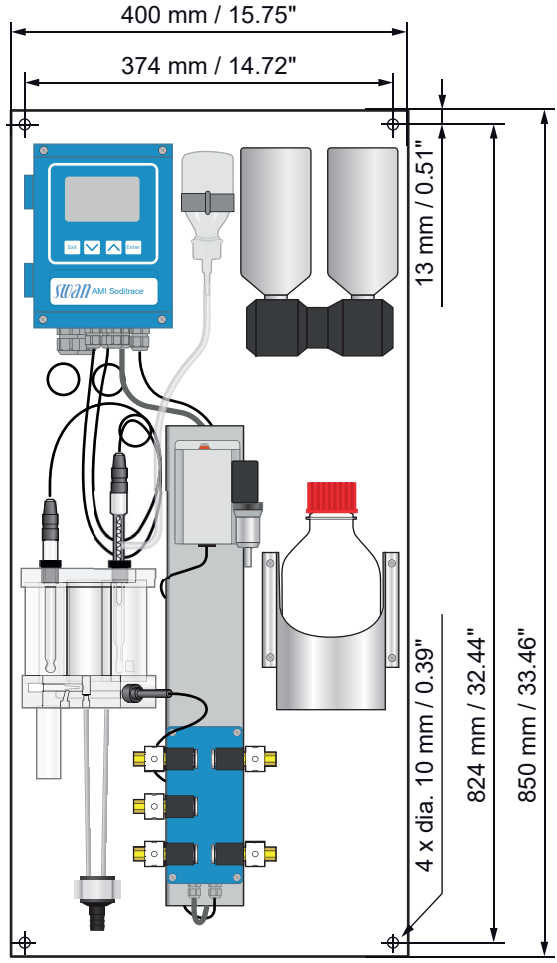
Point No	No of additions	Final concentration [ppb]
1	1	10
2	2	30
3	7	100

The ability to produce 1 ppb sodium concentration additions with the factory calibrated injection loop gives credibility to subsequent readings below 1 ppb.

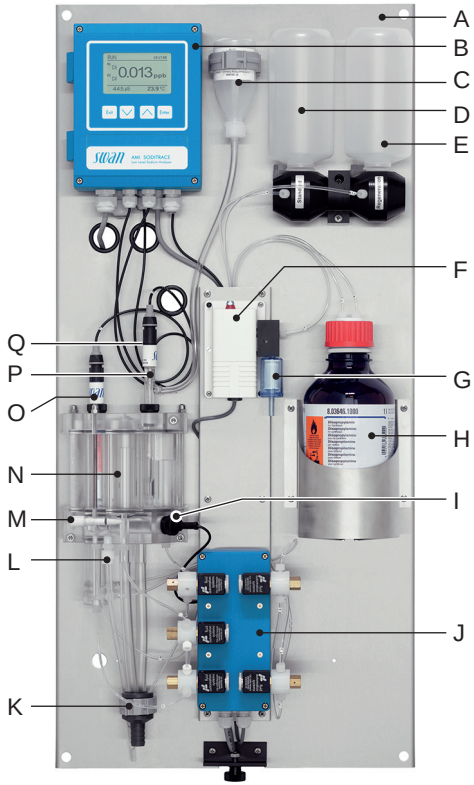
2.2. Instrument Specification

Power Supply	AC variant:	100–240 VAC (± 10%) 50/60 Hz (± 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
	Display:	backlit LCD, 75 x 45 mm
Sample requirements	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
	pH value:	>= pH7.0
	Ammonium concentration:	< 10 ppm
	Acidity:	< 50 ppm (CaCO3)
	Dissolved solids:	< 10 ppm
	no oil and no grease	
On-site requirements	The analyzer site must permit connections to:	
	Sample inlet:	Serto PVDF 6 mm
	Sample outlet:	G ½" adapter for flexible tube 20 x 15 mm

Dimensions	Panel:	stainless steel
	Dimensions:	400x860x150 mm
	Screws:	8 mm diameter
	Weight:	13.0 kg /28.70 lbs



2.3. Instrument Overview



A *Panel*
B *Transmitter*
C *Reference electrolyte bottle*
D *Standard solution*
E *Regeneration solution*
F *Air pump*
G *Air filter*
H *Reagent bottle (DIPA)*
I *Conductivity sensor*
J *Valve block*
K *Waste*
L *Sample inlet*
M *Flow regulating valve*
N *Flow cell*
O *Sodium electrode*
P *Reference electrode*
Q *Temperature sensor (behind reference electrode)*

3. Installation

3.1. Installation Checklist Monitors

On site requirements	AC variant: 100–240 VAC (± 10%), 50/60 Hz (± 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. 20).
Installation	Mounting of Instrument Panel, p. 24. Connecting Sample and Waste, p. 25.
Install the electrodes	Install the Sodium Electrode, p. 27: ◆ Check for air bubbles inside the electrode. ◆ Install the sodium electrode. ◆ Connect the cable S to the sodium electrode. ◆ Etch the sodium electrode Install the Reference Electrode, p. 28: ◆ Connect the KCl bottle to the supply pipe of the reference electrode ◆ Puncture the KCl bottle. ◆ Open and close the ground joint diaphragm of the reference electrode. ◆ Install KCl bottle. ◆ Connect the cable R to the reference electrode.
Electrical Wiring	Connect all external devices like limit switches, current loops and pumps (see Connection Diagram, p. 38.)
Reagent and filter connections	We recommend to use DIPA to operate the instrument. Use a reagent bottle with either G45 thread (Schott) or a bottle from Merck with a thread adapter.
Standard and Regeneration	◆ Rinse the standard and regeneration bottle well with deionized water. ◆ Prepare the sodium standard according to your needs. ◆ Install the standard bottle. ◆ Install the regeneration bottle.

Power-up	Open the flow regulating valve and adjust the sample flow. Wait until the flow cell is completely filled. Switch on power.
Instrument set-up	◆ Program all parameters for sensor and external devices (interface, recorders, etc.). ◆ Program all parameters for instrument operation (limits, alarms). ◆ Make sure that the standard concentration is programmed correctly.
Fill tubes	Make sure that ◆ tube 2, ◆ tube 4, ◆ tube13 are bubble-free. See Tube Replacement, p. 71
Check solenoid valves	Check all solenoid valves for proper function.
Run-in period	Let the instrument run continuously for 24 h.

3.2. Mounting of Instrument Panel

The first part of this chapter describes the preparing and placing of the system 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

For dimensions see picture Dimensions, p. 21.

Mounting requirements

The instrument is only intended for indoor installation.

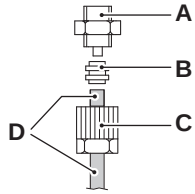
3.3. Connecting Sample and Waste

Sample inlet Use plastic tube (FEP, PA, or PE 4 x 6 mm) to connect the sample inlet and outlet.

CAUTION

Damage of flow cell possible

- Never use steel tubings or fittings directly on the acrylic glass.



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

Waste Connect the 1/2” tube to the waste nozzle and place it into the atmospheric drain.

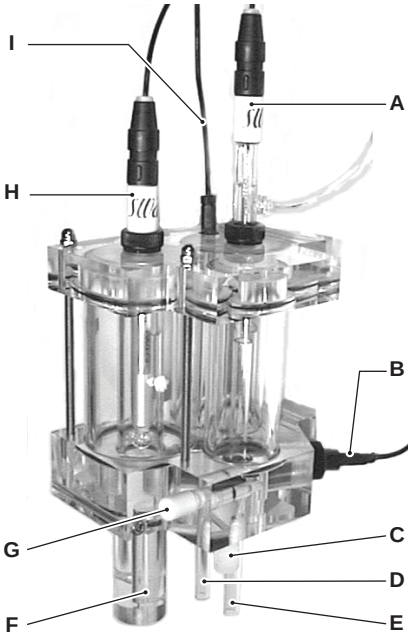
3.4. Installation of Electrodes

Position of electrodes in the flow cell

The cables of the electrodes are already connected. The temperature sensor is fixed to the mounting panel with a tape. The conductivity sensor is factory-mounted.

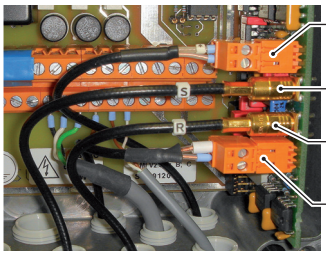
The picture below shows the measuring cell with the electrode's positions.

How to install the sodium and reference electrode is shown on the following pages. (See also Maintenance of Sodium Electrode, p. 58 and Maintenance of Reference Electrode, p. 59.)



A *Reference electrode*
B *Conductivity sensor*
C *Sample inlet*
D *Reference chamber overflow*
E *Constant head overflow*
F *Air lift pump*
G *Regulation valve*
H *Sodium electrode*
I *Temperature sensor*

Sensor connections on front-end board



A *Conductivity*
B *Sodium*
C *Reference*
D *Temperature*

3.4.1 Install the Sodium Electrode

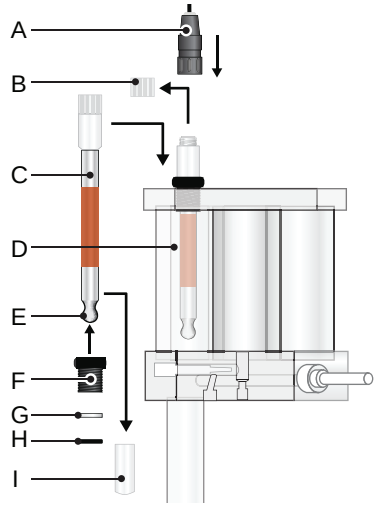
General

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.

Unpacking

The electrode is supplied separately and is installed into the flow cell after the installation of the monitor is finished. The electrode is protected with a protective cap on the sensing glass bulb as well as on the electrical connector.
Remove the connector cap from the connector only when the electrode is mounted in the measuring cell.



A *Sensor plug*
B *Connector cap*
C *Electrode shaft*
D *Measuring chamber*
E *Sensing glass bulb*
F *Union screw*
G *Washer*
H *O-ring*
I *Protective cap*

Install the sodium electrode as follows:

1 Remove the protective cap [I] from the electrode with a careful turning and pulling movement.

2 Slip the union nut [F], and washer [G] on the electrode shaft [C].

3 Wet the O-ring [H] and slip it carefully over the electrode shaft [C].

4 Make sure that no air bubbles are trapped in the sensing glass bulb [E]. If necessary, shake the electrode like a clinical thermometer until the bubble disappears.

5 Insert the electrode into the measuring chamber [C] and push it down completely.

6 Tighten the union screw [F] finger tight.

7 Remove the connector cap [B] from the electrode.

8 Screw the connector [A] onto the electrode.

3.4.2 Install the Reference Electrode

General

Sodium electrodes are sensitive, electrochemical devices with a very high internal impedance. 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.

Unpacking

The electrode is supplied separately and is installed into the flow cell after the installation of the monitor is finished. The electrode is protected with a protective cap on the ground joint diaphragm as well as on the electrical connector.
Remove the connector cap from the connector only when the electrode is mounted in 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

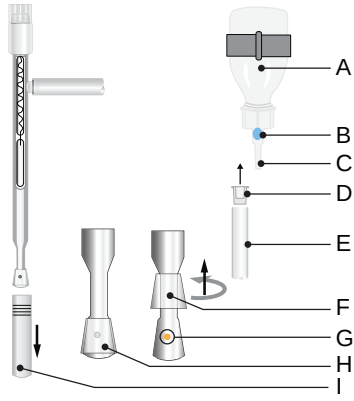
After longer storage of the reference electrode, the diaphragm may be clogged with salt deposits of KCl. Therefore it is recommended to open and clean the diaphragm before installing the reference electrode.

CAUTION

Damage of flow cell possible

Electrolyte is corrosive.

- Prevent electrolyte from dripping onto the measuring cell.



A *KCl bottle*
B *Trapped air bubble*
C *Dosing tip*
D *Stopper*
E *KCl supply pipe*
F *Ring-shaped sleeve opened*
G *Electrolyte outlet hole*
H *Ring-shaped sleeve closed*
I *Protective cap*

To clean the reference electrode proceed as follows:

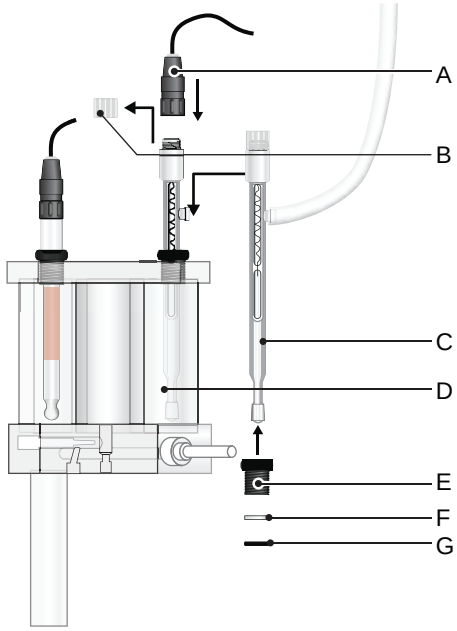
1. Remove the protective cap [I] from the ground joint diaphragm with a careful turning and pulling movement.
2. Remove the stopper [D] from the KCl supply pipe [E].
3. Connect the KCl supply pipe to the dosing tip [C] of the KCl bottle.
4. Fix the KCl bottle upside down in the holder on the panel.
5. Puncture the bottle bottom to allow pressure equilibration.
6. Hold the reference electrode with the ground joint diaphragm pointing downwards.
7. Slightly lift the ring-shaped sleeve of the ground-joint diaphragm and allow a little electrolyte to flow out into a tissue.

8 Push the ring-shaped sleeve carefully over the ground-joint diaphragm.

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.*

9 Knock against the KCl bottle to remove trapped air bubbles [B] in the dosing tip.

Install the reference sensor



A *Sensor plug*
B *Connector cap*
C *Sensor shaft*
D *Reference chamber*
E *Union screw*
F *Washer*
G *O-ring*

Install the reference electrode as follows:

1 Slip the union screw [E], and washer [F] on the electrode shaft [C].
2 Wet the O-ring [G] and slip it carefully over the electrode shaft [C].

3 Insert the electrode into the reference chamber [C] and push it down until he ground joint diaphragm is about 0.5 cm above the bottom.

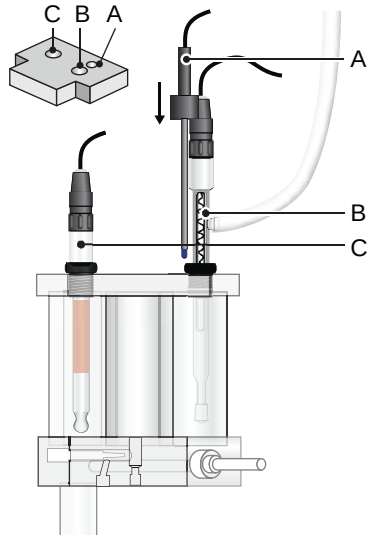
4 Tighten the union screw [E] finger tight.

5 Remove the connector cap [B] from the electrode.

6 Screw the connector [A] onto the electrode.

3.4.3 Install 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.



A *Temperature sensor*
B *Reference sensor*
C *Sodium sensor*

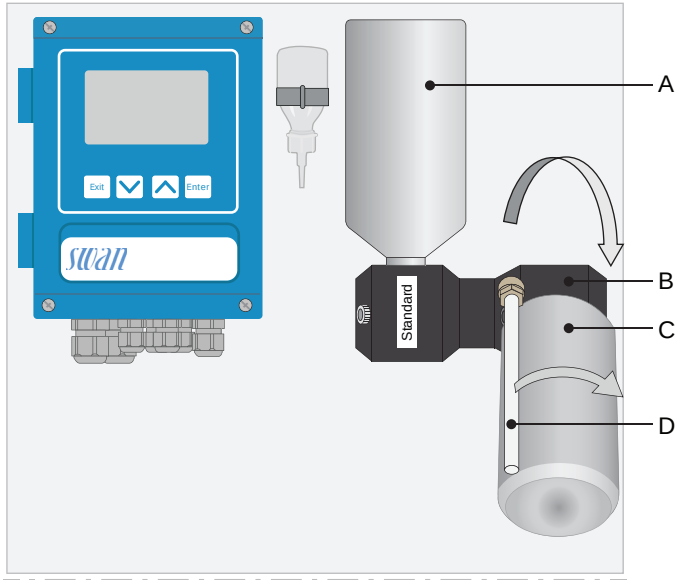
To install the temperature sensor proceed as follows:

1 Remove the temperature sensor [A] from the panel.

2 Put the temperature sensor in the designated hole marked with [A].

3 Push it into the hole as far as it will go.

3.5. Install Standard and Regeneration Bottle



A *Standard bottle*
B *Bottle holder*
C *Regeneration bottle*
D *Pressure compensation*

Mixing standard

Prepare sodium standard using the 1'000 ppm stock solution. The final concentration must correspond to the concentrations programmed in the instrument (default = 16 ppm).

1. Before preparing the standard, rinse bottle carefully with high purity water.
2. Depending on measuring range use amount of stock solution according table below.
3. Fill up standard bottle to 500 ml with high purity water.
4. Turn the bottle holder [B] downwards and screw the standard bottle on firmly.
5. Turn the bottle holder upwards in vertical position.

Meas. Range	Amount of standard	Result
< 1 ppb	**2 ml**	4’000 ppb (4 ppm)
< 5 ppb	**5 ml**	10’000 ppb
< 10 ppb	**10 ml**	20’000 ppb

Note:

- *Do not prepare standards below 1 ppm.*
- *If using a concentration other than the default setting (16 ppm), change the setting in menu 4.1.3, p. 98.*
- *Standards with a low concentration should preferably be produced directly in the standard plastic bottle in order to avoid contamination.*

CAUTION

Upon first installation and after changing the standard concentration, flush the tube well with standard.
See Liquid System Function Test, p. 46.

Regeneration solution

Only use original Swan regeneration solution.

1 Turn the bottle holder downwards and screw the regeneration bottle on firmly.

2 Turn the bottle upwards in vertical position

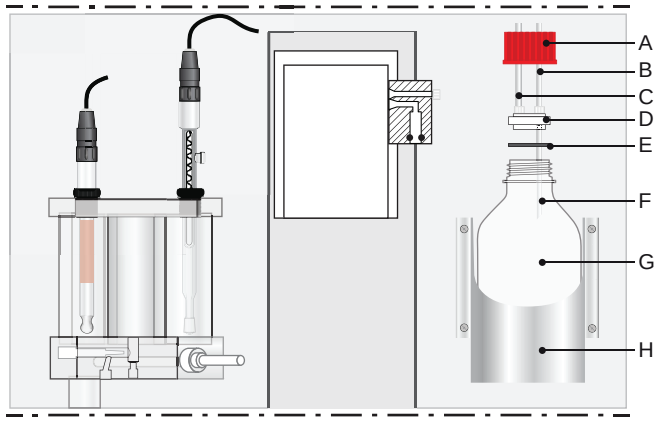
3.6. Install Reagent Bottle



WARNING

Diisopropylamine is corrosive.

- Read the Safety Data Sheets (SDS) first.
- Wear suitable protective clothing, gloves and eye/face protection.
- Avoid inhalation of DIPA vapor. To prevent formation of reagent vapors:
  - close the reagent bottle firmly
  - check the EPDM seal regularly
  - 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.

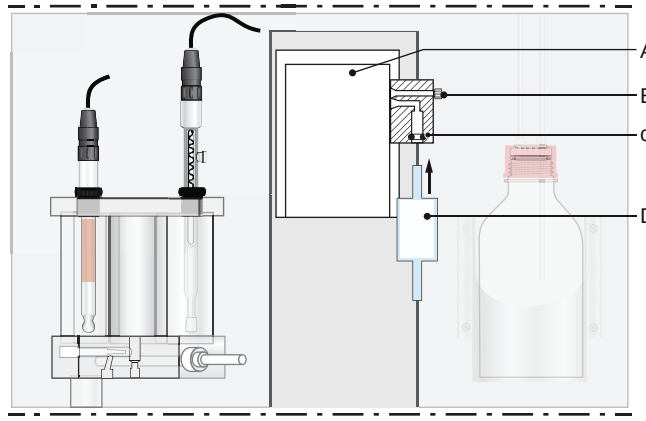


A *Screw cover G 45*
B *Tube 11 from air lift pump*
C *Tube 8 to valve 4*
D *Tube holder*
E *EPDM seal*
F *Short tube*
G *DIPA reagent bottle*
H *Bottle holder*

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 onto the DIPA bottle and tighten it firmly.

3.7. Install Air Filter



A *Air pump*
B *Outlet tube 7 to valve 4*
C *Air inlet with O-ring seal*
D *Air filter*

To install the air filter proceed as follows:

1 Push the air filter [D] into the air inlet [C] of the air pump [A] as far as it will go.

For commissioning of the instrument see chapter 4, Instrument Set-up, p. 46

3.8. Electrical Connections

WARNING

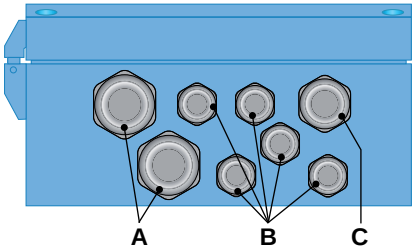
Risk of electrical shock.

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* $Ø_{outer}$ *5–10 mm*
B *PG 7 cable gland: cable* $Ø_{outer}$ *3–6.5 mm*
C *PG 9 cable gland: cable* $Ø_{outer}$ *4–8 mm*

Note: *Protect unused cable glands*

Wire

- For Power and Relays: Use max. 1.5 mm^2 / AWG 14 stranded wire with end sleeves.
- For Signal Outputs and Input: Use 0.25 mm^2 / 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

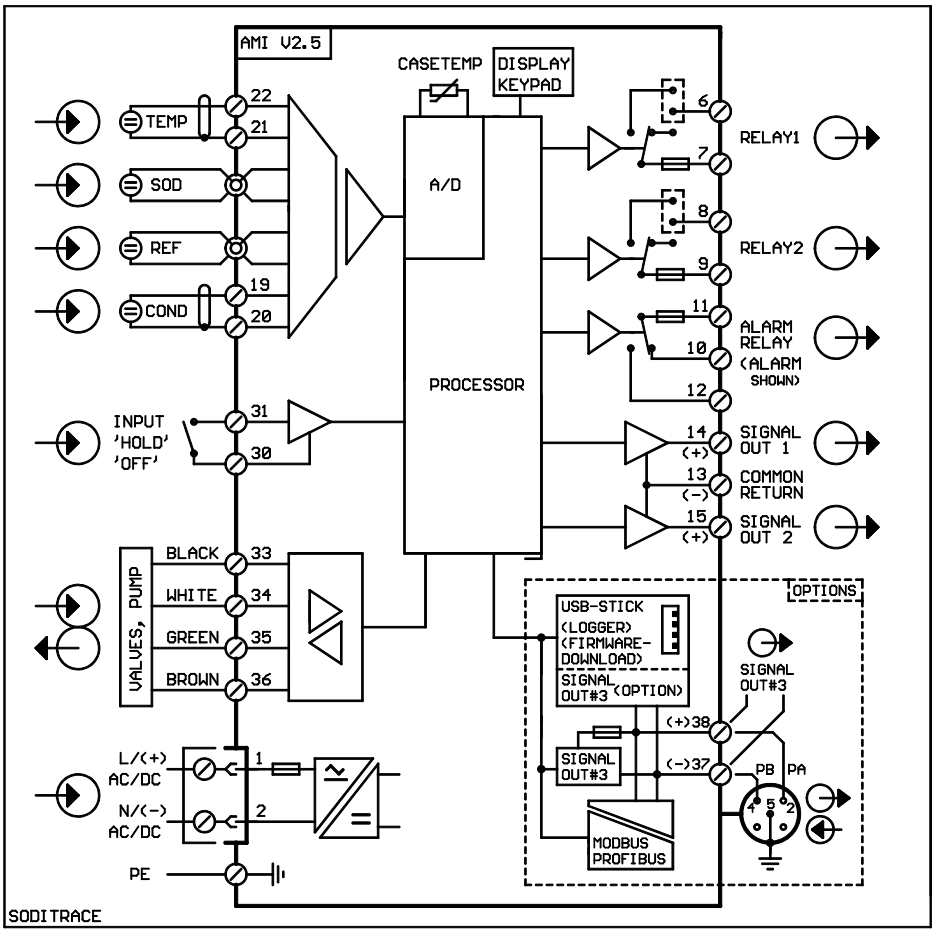
WARNING

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

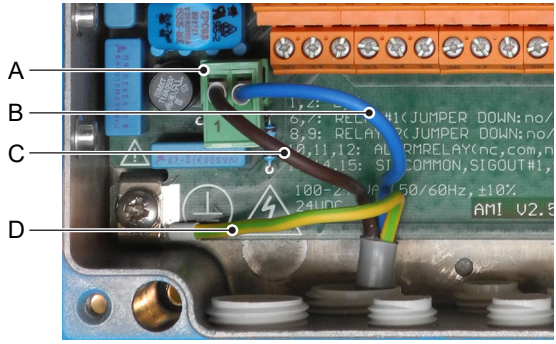
Use only the terminals shown in this diagram, and only for the mentioned purpose. Use of any other terminals will cause short circuits with possible corresponding consequences to material and personnel.

3.8.2 Power Supply

WARNING

Risk of electrical shock

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 Soditrace

3.9. Relay Contacts

Programming of the relay contacts see 5.3 Relay Contacts, p. 105

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.*

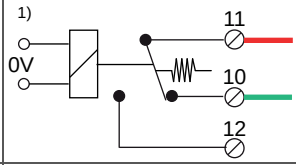
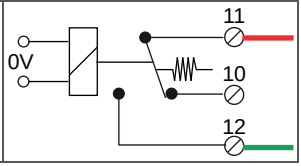
If signal output is set to hold, measurement is interrupted if input is active.

3.9.2 Alarm Relay

Note: *Max. load 1 AT / 250 VAC*

Alarm output for system errors.
Error codes see Troubleshooting, p. 75

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.	

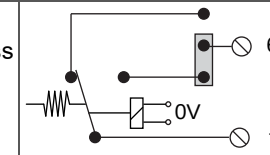
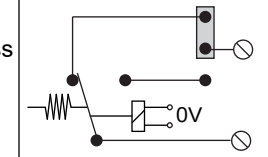
1) *usual use*

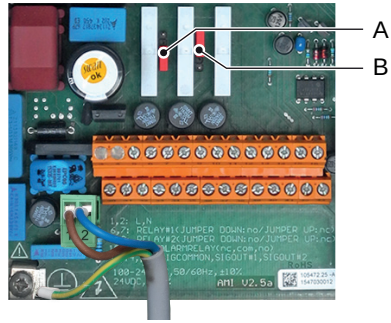
3.9.3 Relay Contacts 1 and 2

Note: *Rated load 1 AT / 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 Menu Installation 5.3.2 and 5.3.3, p. 107

CAUTION

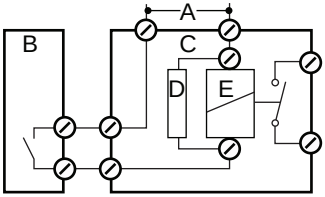
Risk of damage of the relays in the AMI Transmitter due to heavy inductive load

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

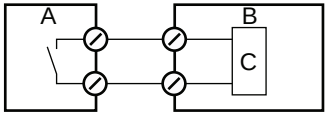
Small inductive loads (max 0.1 A) as for example the coil of a power relay can be switched directly. To avoid noise voltage in the AMI Transmitter it is mandatory to connect a snubber circuit in parallel to the load. A snubber is not necessary if an AMI relaybox is used.



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

Resistive load

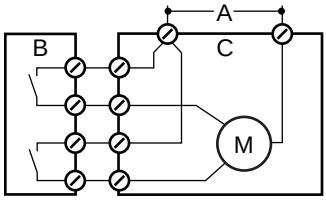
Resistive loads (max. 1 A) and control signals for PLC, impulse pumps and so on can be connected without further measures



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

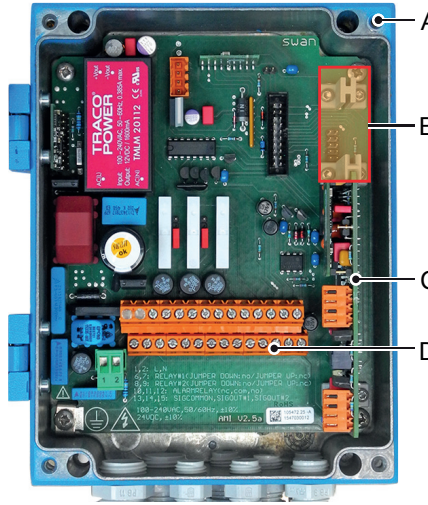
3.10.1 Signal Output 1 and 2 (current outputs)

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 Program List and Explanations, p. 94, Menu Installation

3.11. Interface Options



A *AMI Transmitter*
B *Slot for interfaces*
C *Frontend PCB*
D *Screw terminals*

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

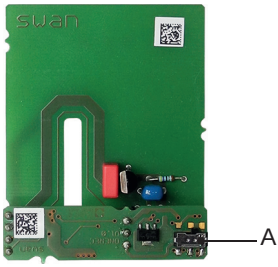
- a third signal output
- a Profibus or Modbus connection
- a HART connection
- a USB Interface

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

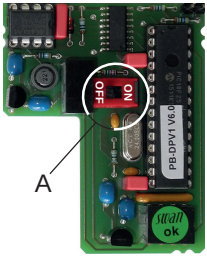
A *Operating mode selector switch*

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.*



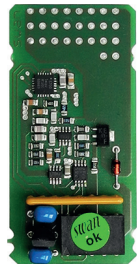
Profibus, Modbus Interface PCB (RS 485)

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.

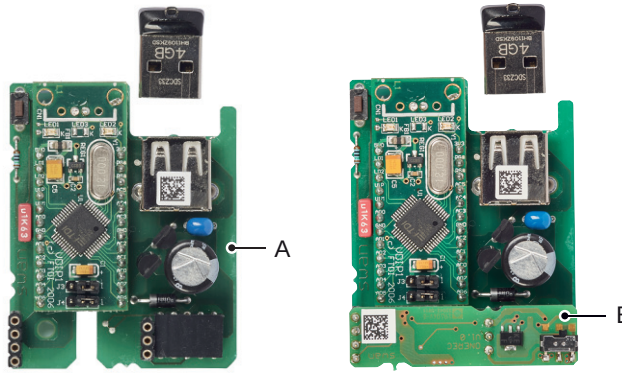


HART Interface PCB

3.11.4 USB Interface

The USB Interface is used to store Logger data and for Firmware upload. 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*

4. Instrument Setup

4.1. Establish Sample Flow

1 Open sample flow tap.
2 Wait until the flow cell is completely filled.
3 Switch on power.

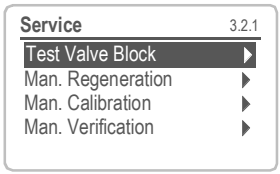
4.2. Liquid System Function Test

The liquid system function test is of vital importance to ensure that all tubes are filled and connected without leakage and that all solenoid valves are working properly.

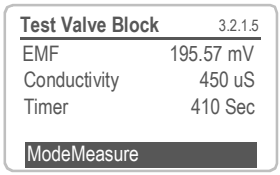
Possible sources of error are listed at the end of each test. Should an error occur during a test, see chapter Troubleshooting, p. 75 for correction of errors.

Perform the liquid system function test exactly in the order described below. Do not start the next test if the current test has failed.

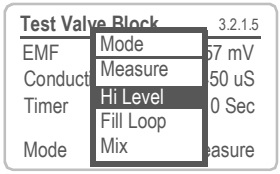
Navigate to Menu <Maintenance>/<Service>/<Test Valve Block>.
Press [Enter].



Mode Measure is already highlighted.
Press [Enter].

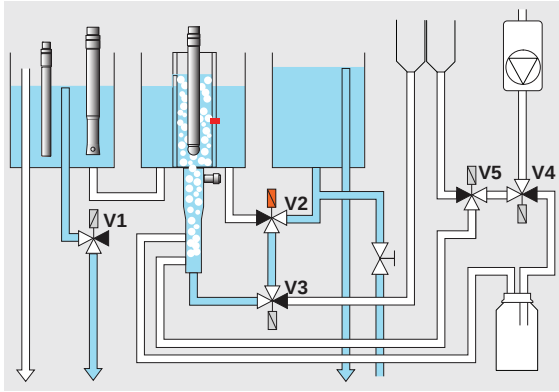


Start with the test “Hi Level”, see chap. 4.2.1, 🗎 47.
Then continue with the tests “Fill Loop” see 4.2.2, 🗎 48 and “Mix” see 4.2.3, 🗎 48.

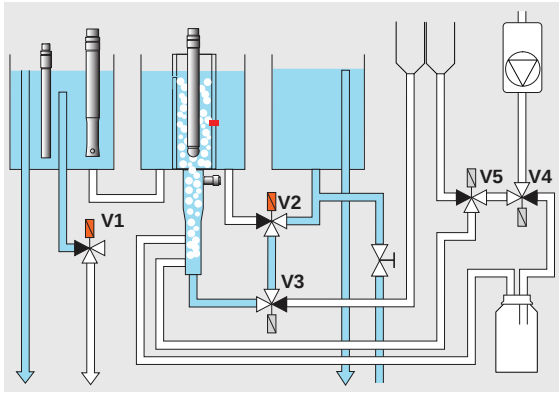


4.2.1 Hi Level Test

With the “Hi Level” test, the function of valve 1 is tested. High level must be reached within 4 minutes.



Low level

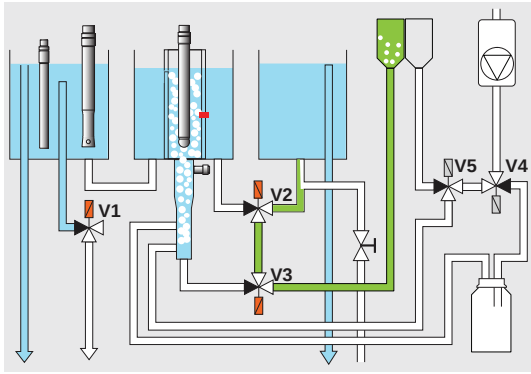


High level

If High Level is not reached within 4 minutes, see Problems During Liquid System Function Test, p. 76.

4.2.2 Fill Loop

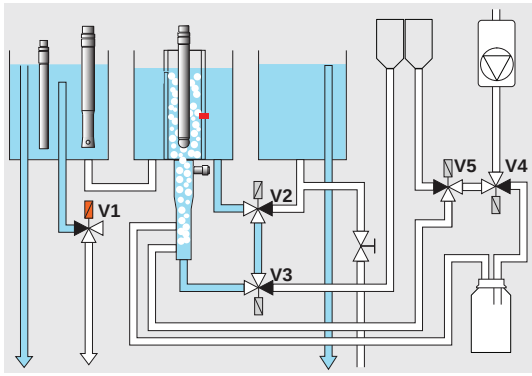
With the “Fill Loop” test, the function of valves 2 and 3 is tested. Standard flow is OK if air bubbles are forming in the standard bottle.



If no air bubbles are forming in the standard bottle, see Problems During Liquid System Function Test, p. 76.

4.2.3 Mix

With the “Mix” test, the function of valves 2 and 3 is tested. Observe the mV indication. The mV reading must go through a maximum within 30 s and reach stable values after 5 min.

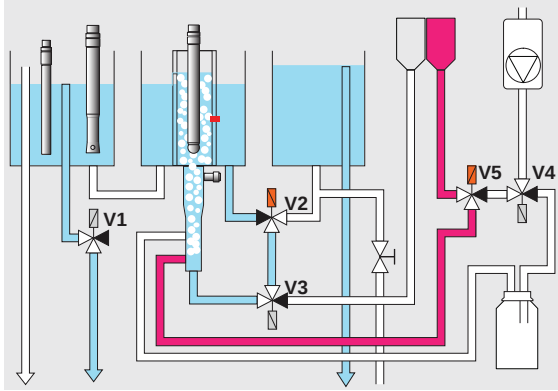


If the values are not stable after 5 min, see Problems During Liquid System Function Test, p. 76.

4.2.4 Test Valve 5

Navigate to menu <Man. Regeneration> and start the regeneration: The instrument displays the current state of the regeneration process in the following order: Mix –> Regenerate –> End.

When Regenerate is displayed, valve 5 is opened and regeneration solution flows through tube 13, valve 5, and tube 10 into the flow cell. If the flow of regeneration solution is OK, air bubbles are formed in the regeneration solution bottle and the conductivity reading is >2000 µS.



If the conductivity value is not reached, message E022, “No Reg. Agent” is displayed, see Other Errors, p. 82.

4.2.5 Test Valve 4

Perform this test only after all other tests have been completed successfully.

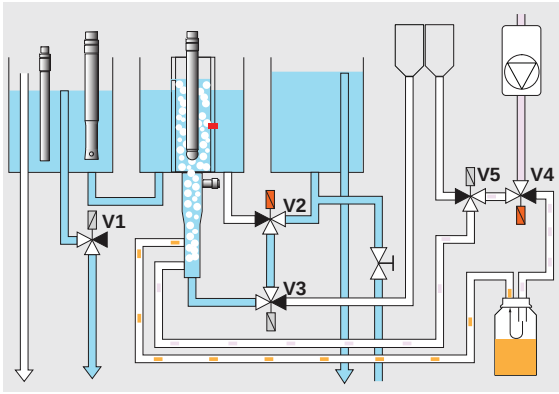


WARNING

DIPA is
- Flammable
- Corrosive
- Harmful

Carefully read the Safety Data Sheet before handling DIPA

With this test the control of valve 4 via conductivity sensor is tested.



Return to normal operation, let the instrument run and check the following parameters.

- Menu <Diagnostics>/<Sensors>/<Cond. Sensor>:
  Conductivity must fluctuate between 430 and 450 µS/cm
- Menu <Diagnostics>/<Sample>:
  Check (Ctl) Actual and Ctl Average
  (Ctl) Actual must be <90 %, if it remains on 100 % the DIPA bottle is not connected

If the specified values are not reached, see Problems During Liquid System Function Test, p. 76.

4.3. Programming

4.3.1 Calendar

The implemented calendar is based on the CRON format. It starts with Sunday and ends with Saturday. Usually a month has three full weeks and two weeks which are part thereof.

Therefore, if you program a task which has to be carried out weekly, always program the task in the 2nd, 3rd or 4th week of a month.

Example:

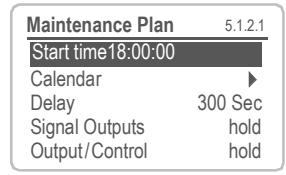
In the table below it can be seen, that if a task is programmed on Monday in the 1st week, it is not carried out because the week starts only on Wednesday

Week	Sun	Mon	Tues	Wed	Thurs	Fri	Sat
1st				1	2	3	4
2nd	5	6	7	8	9	10	11
3rd	12	13	14	15	16	17	18
4th	19	20	21	22	23	24	25
Last	26	27	28	29	30		

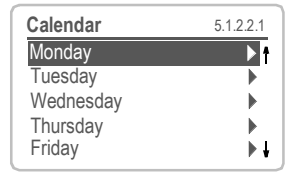
Programming

Example how to program a regeneration on Monday in the 3rd week of a month.

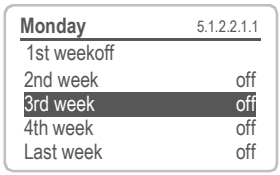
Navigate to Menu <Installation>, <Sensors>, <Maintenance Plan>.
Press [Enter].
Set the desired “Start time”.
Press [Enter].



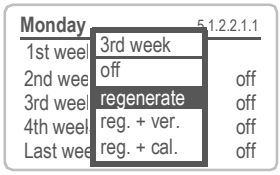
Navigate to Calendar.
Press [Enter].
Monday is already highlighted.



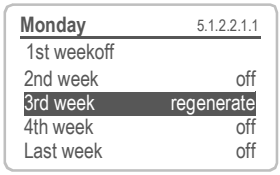
To change the settings of Monday.
Press [Enter].
1st week is already highlighted. Navigate to 3rd week.



Press [Enter].
Navigate to “regenerate”.
Press [Enter].

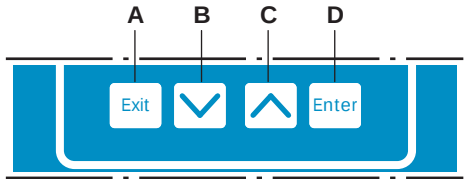


The 3rd week is set to “regenerate”.
Press [Exit].
Press [Enter] to save.



5. Operation

5.1. Keys



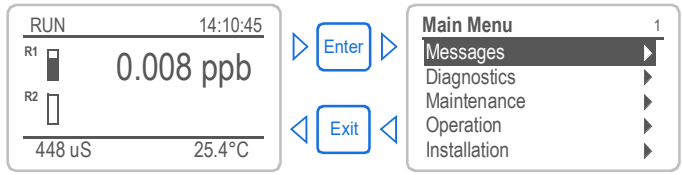
A to exit a menu or command (rejecting any changes)
to move back to the previous menu level

B to move DOWN in a menu list and to decrease digits

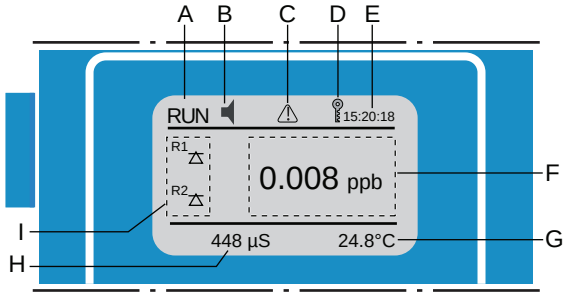
C to move UP in a menu list and to increase digits

D to open a selected sub-menu
to accept an entry

Program Access, Exit



5.2. Display



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 Indicates a verification error

D Keys locked, transmitter control via Profibus

E Time

F Process values

G Sample temperature

H Conductivity

I Relay status

Relay status, symbols

upper/lower limit not yet reached

upper/lower limit reached

control upw./downw. no action

control upw./downw. active, dark bar indicates control intensity

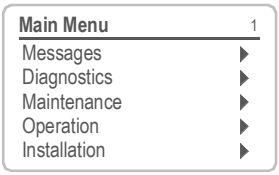
motor valve closed

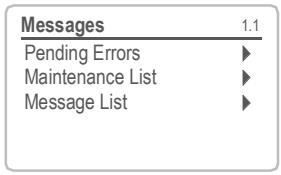
motor valve: open, dark bar indicates approx. position

timer

timer: timing active (hand rotating)

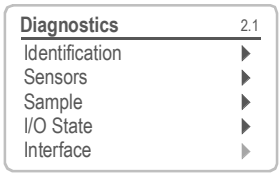
5.3. Software Structure





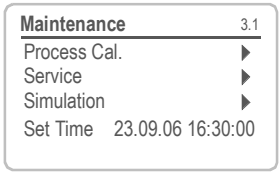
Menu **Messages 1**

Reveals pending errors as well as an event history (time and state of events that have occurred at an earlier point of time).
It contains user relevant data.



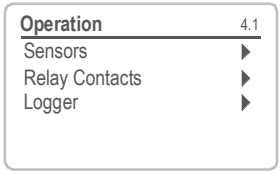
Menu **Diagnostics 2**

Provides user relevant instrument and sample data.



Menu **Maintenance 3**

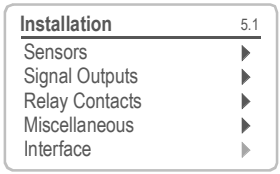
For instrument calibration, relay and signal output simulation, and to set the instrument time.
It is used by the service personnel.



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.



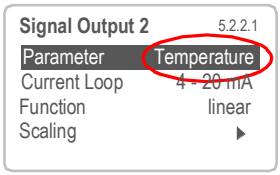
Menu **Installation 5**

For initial instrument set up by SWAN authorized person, to set all instrument parameters. Can be protected by means of password.

5.4. Changing Parameters and values

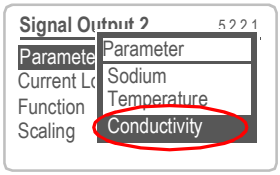
The following example shows how to change the Signal Output 2:

Changing parameters



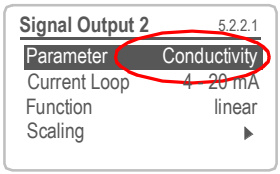
1 Select the parameter you want to change.

2 Press <Enter>



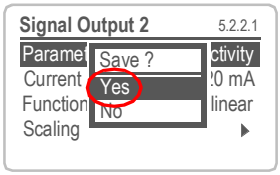
3 Press <▲> or<▼> key to highlight the required parameter.

4 Press <Enter> to confirm the selection or <Exit> to keep the previous parameter).



⇒ *The selected parameter is highlighted (but not saved yet).*

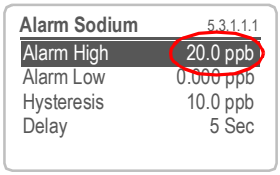
5 Press <Exit>.



⇒ *Yes is highlighted.*

6 Press <Enter> to save the new parameter.
⇒ *The system reboots, the new parameter is set.*

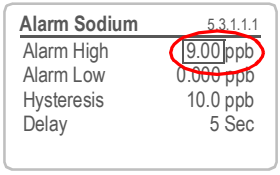
Changing values



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.*

6 Press <Enter> to save the new value.

6. Maintenance

WARNING

Stop operation before maintenance.

- Remove DIPA bottle and wait until conductivity is approximately 0.
- Stop sample flow.
- Shut off power of the instrument.

6.1. Maintenance Schedule

Weekly or every 2 weeks	◆ Check air lift pump for regular bubble formation. ◆ Check the liquid level in all bottles.
Monthly	◆ Check the sealing of the reagent (DIPA) bottle.
Half-yearly	◆ Replace the sealing of reagent bottle (EPDM)
Yearly	◆ Replace the membrane of valve 4. ◆ Replace the sodium electrode. ◆ Replace the reference electrode. ◆ If necessary, remove deposited iron in the system by washing in soft detergent and using rust remover. ◆ Replace the tubes if heavily covered with iron.
After maintenance work on solenoid valves or tubes	◆ Perform a Liquid System Function test.

Reagent consumption

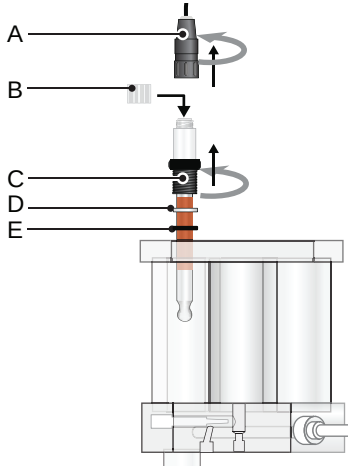
The following specifications are valid if the SWAN standard calendar settings are used.

- One 100 ml bottle electrolyte lasts for one month.
- 500 ml standard solution containing 16 ppm Na lasts for 2 months.
- 500 ml regeneration solution lasts for 4 months.

6.2. 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.



A *Sensor plug*
B *Connector cap*
C *Union screw*
D *Washer*
E *O-ring*

Remove the sodium electrode

1. Unscrew and remove the sensor plug [A].
   ⇒ *Take care that the connector stays dry and clean as long as no electrode is connected.*
2. Screw the connector cap 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.

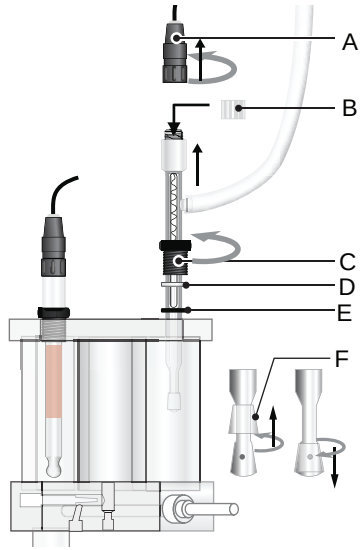
Cleaning

Remove adhered iron deposits by wiping the electrode gently with a paper tissue. Rinse the electrode with distilled water.

Install

See Install the Sodium Electrode, p. 27
After installation etch the sodium electrode.

6.3. Maintenance of Reference Electrode



A *Sensor plug*
B *Connector cap*
C *Union screw*
D *Washer*
E *O-ring*
F *Ring-shaped sleeve*

Remove the reference electrode

1. Completely unscrew the union screw [C] from the threaded hole.
2. Remove the KCl bottle from its holder.
   ⚠ *Remember that the bottle was punctured - do not spill KCl.*
3. Remove the reference electrode from the flow cell.

Cleaning

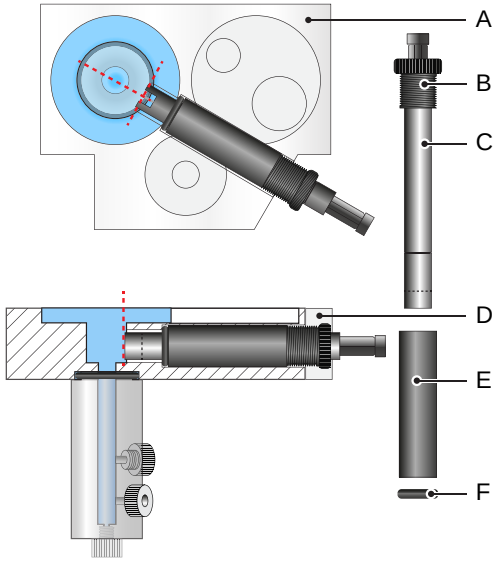
1. Remove any iron deposits with a soft paper tissue.
2. Slip the ring-shaped sleeve [F] upwards with a turning and pushing movement.
3. Let flow out about 1 ml KCl.
4. Fix the ring-shaped sleeve finger tight with a gentle turning and pulling movement.
5. Replace or refill KCl reservoir. Use only original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

Install the reference electrode

See Install the Reference Electrode, p. 28

6.4. Maintenance of Conductivity Sensor

The conductivity sensor is used to maintain a constant conductivity of 450 µS/cm. To obtain correct measured values, it is of vital importance that the conductivity sensor is installed and aligned correctly.



A *Base plate top view*
B *Union screw*
C *Conductivity sensor*
D *Base plate side view*
E *Guiding sleeve*
F *O-ring*

Remove the conductivity sensor

1. Completely unscrew the union screw [B] from the threaded hole.
2. Remove the conductivity sensor from the base plate.

Cleaning

Remove any iron deposits with a soft paper tissue. Do not use organic detergents!

Install the conductivity sensor

1. Insert the conductivity sensor into the base plate.
2. Insert the conductivity sensor so that its sensing tip is aligned with the outer edge of the sample inlet hole and its measuring slot is aligned vertically (see dashed red lines).
3. Tighten the union screw.

6.5. Maintenance of Solenoid Valve

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

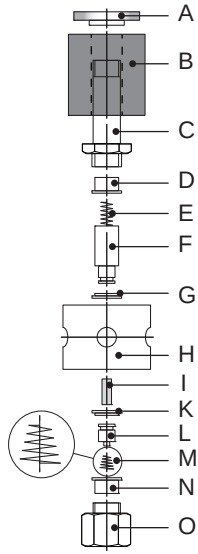
Dismount

1. Drain the measuring cell completely before dismounting a solenoid valve.
2. Tilt the standard and regeneration bottles down.
3. Remove the tubes from the defective valve.
4. Unscrew knurled nut [A].
5. Pull valve assembly out of coil body [B].

Disassembling

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 finger tightly.
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 finger tightly.

Mounting

1. Push valve assembly in coil body.
2. Mount all tubes.
3. Only then screw on the knurled nut finger tightly.

6.6. Maintenance of Flow Cell

CAUTION

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.

Note: *Never use silicone oil or grease to seal standard bottle holder and o-rings.*
Use teflon paste or spray to grease moving parts.

Dismount

1. Shut off the instrument and stop the sample flow.
2. Drain the measuring cell completely by pulling downwards the two overflow tubes [M] and [N].
3. Tilt the standard and the regeneration bottle down
4. Remove all sensors.
5. Remove all tube connections.
6. Unscrew the M5x70 mm fixing screw of the cover plate [E].
7. Unscrew the two M5x70 mm fixing screws [S] of the base plate.
8. Remove the measuring cell from the panel.

Disassembling

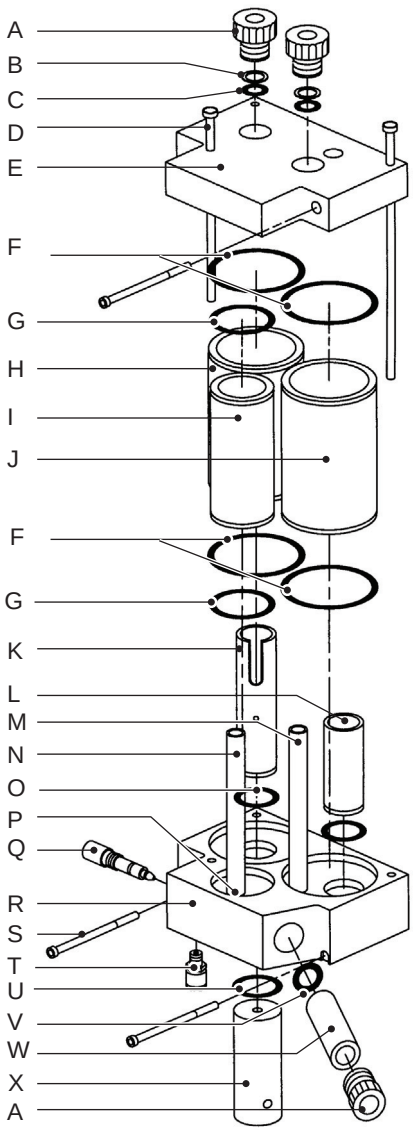
1. Remove the air lift pump [X].
2. Unscrew and remove the three M5x115 mm screws [D].
3. Remove the cover plate [E].
4. Remove the:
   - Calibration cell tube [H]
   - Constant head tube [I]
   - Reference cell tube [J]
   - Measuring cell tube [K]
   - Overflow tube low level [L]
   - Overflow tube high level [M]
   - Overflow tube constant head [N]
   - Conductivity sensor

   and their O-rings from the base plate.

Cleaning

Clean all parts with a soft detergent and rinse well afterwards. Grease all O-rings with teflon spray or paste.

Exploded drawing

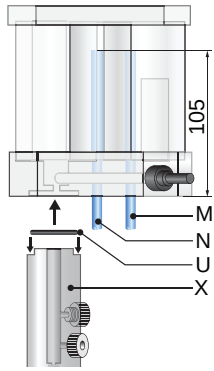


A *Union screw M20*
B *Washer*
C *O-ring 11x3.5*
D *Screw M5x115*
E *Cover plate*
F *O-ring 54x3.5*
G *O-ring 34x3.5*
H *Calibration cell tube*
I *Constant head tube*
J *Reference cell tube*
K *Measuring cell tube*
L *Overflow tube low level*
M *Overflow tube high level*
N *Overflow tube constant head*
O *O-ring 21x3*
P *O-ring 10x4*
Q *Flow regulating valve*
R *Base plate*
S *Fixing screw M5x70*
T *Serto tube adapter*
U *O-ring 24x3.5*
V *O-ring 11x3.5*
W *Guiding sleeve for Conductivity sensor*
X *Air lift pump*

Assembling

1. Mount the o-rings on all tubes.
2. Insert the measuring cell tube [K] into the inner bore at the left side of the base plate (see exploded drawing).
3. Insert the overflow tube low level [L] into the inner bore at the right side of the base plate (see exploded drawing).
4. Insert the Calibration cell tube [H] and the Reference cell tube [J] into the outer bores of the base plate (see exploded drawing).
5. Insert the constant head tube [I] into the bore of the base plate (see exploded drawing).
6. Put the cover plate on the tubes and push down firmly until it rests on the tubes.
7. Screw the flow cell assembly together with the three M5x115 mm screws. Do not force!

Detail drawing



M *Overflow tube high level*
N *Overflow tube constant head*
U *O-ring 24x3.5*
X *Air lift pump*

8. Push the two overflow tubes [M] and [N] through the bores of the base plate 105 mm into the flow cell, measured from the lower edge of the base plate (see detail drawing).
9. Mount the air lift pump [X].

Install the flow cell onto the panel

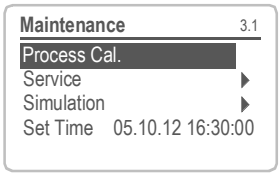
1. Screw the cell assembly onto the panel.
2. Mount all tubes according to chapter Tube Replacement, p. 71
3. Install all sensors according to chapter Installation of Electrodes, p. 26.
4. Turn on sample flow and instrument.

   Note: *Run the instrument in normal operation for at least 24 hours before performing a calibration.*

6.7. Process Calibration

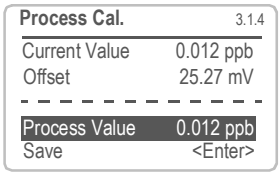
The process calibration is based on a comparative measurement using a reference instrument. Compare the two values and enter the correct value under <Maintenance>/<Process Cal.> if necessary.

The deviation of the measuring values is shown as offset in mV. Select <Save> and press <Enter> to save the correct measured value.



1 Navigate to <Maintenance>/ <Process Cal.>.

2 Press <[Enter]



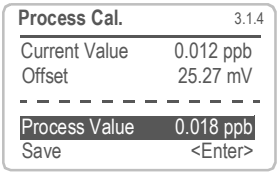
The following values are displayed:

- Current value
- Offset
- Process value

Current value and Process value are equal.

3 Press <[Enter].

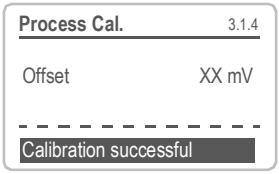
4 Enter the Process value measured with the calibrated comparative electrode.
⇒ *Use the* [▲] or [▼] *keys to increase or decrease the Process value.*



5 Press <[Enter] to confirm.

6 Press <[Enter] to save.

The process value is saved and the new Offset in mV is displayed.



6.8. Regeneration

The regeneration is used to etch the sodium sensor periodically. This guarantees a fast response and reliable measured values over a long period of time and an extended service life of the sodium sensor.

When to perform a manual regeneration

Performing a manual regeneration is only recommended after commissioning of the instrument, maintenance work or if the verification fails. If you perform a manual regeneration consider the following:

- Do not perform a manual regeneration if a calibration (manual or automatic) starts in less than 12 h.

Please consider that it takes several hours after a regeneration until very low sodium values will be displayed correctly again.

***Note:** Man. Regeneration does not start if:*

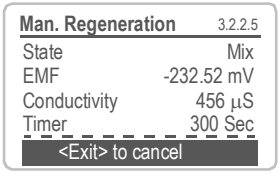
- *There is no sample flow*
- *There is no reagent (diisopropylamine)*
- *There is too much Reagent (defect valve).*

Start a manual regeneration

Navigate to Menu: <Maintenance/Service/Man. Regeneration>. Press <Enter> to start a manual regeneration. It starts immediately.

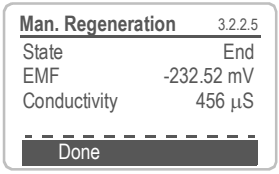
Start of regeneration procedure:

- State: shows the current state
- EMF: actual value in mV
- Conductivity: actual value in µS
- Timer: counts from 10 s



End of regeneration procedure:

- State:
- EMF: actual value in mV
- Conductivity: actual value in µS



The settings in <Installation/Sensors/Maintenance Plan> are also valid during the manual regeneration. This means, the signal outputs and the Output/Control remain during manual regeneration and delay time in the programmed state either:
<cont> or <hold> or <off>

6.9. Calibration

The 3-point calibration is used to recalculate the slope and determine the offset of the sodium sensor periodically.

The calibration consists of three steps. On each step an exactly defined amount of a known concentration of a standard solution is added to the closed sample loop. After each addition the concentration is measured and at the end of the calibration, slope and offset will be calculated and stored from these measuring values.

If performing a manual calibration

Performing a manual calibration is only recommended after commissioning of the instrument or maintenance work. If you perform a manual calibration consider the following:

- Do not run more than one calibration per week.
- Wait at least 12 h after a regeneration before performing a calibration.
- Do not run a manual calibration if an automatic calibration will be performed within the next 12 h, check the calendar.
- After start up wait 24 h before performing a calibration.

Please consider that it takes some hours after a calibration until very low sodium values will be displayed correctly again.

Note: *Manual calibration does not start if:*

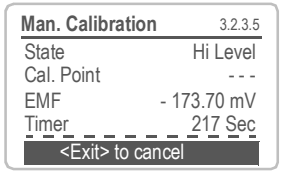
- *There is no sample flow.*
- *There is no reagent (diisopropylamine).*
- *There is too much reagent (valve defective).*

Start calibration

Navigate to menu: <Maintenance/Service/Man. Calibration>. Press <Enter> to start the manual calibration.

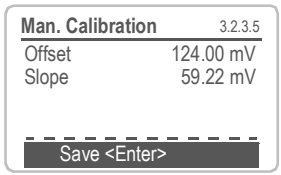
Start of calibration procedure:

- State: Shows all calibration steps
- Cal-point: 3 Calibration-points
- EMF: actual value in [mV]
- Timer: Progress Calibration-time



End of calibration procedure:

- Press <Enter> to save the calibration
- Press <Exit> to discard the calibration



The settings in <Installation/Sensors/Maintenance Plan> are also valid during the manual regeneration. This means, the signal outputs and the Output/Control remain during manual calibration and delay time in the programmed state either:
<cont> or <hold> or <off>

6.10. Verification

The verification is used to check the response of the sodium electrode. To obtain the best results, start the verification 12 h after a regeneration.

During the verification a precisely defined amount of calibration solution flows from the standard solution bottle via valve 3 into the measuring cell.

If the expected measuring value is reached within a predefined time, the verification was successful.

If the time limit is exceeded start a manual regeneration.

If performing a manual verification

Performing a manual verification is only recommended after commissioning of the instrument or maintenance work. If you perform a manual calibration consider the following:

- Perform a regeneration before starting a verification.
- Wait at least 12 h after a regeneration before performing a verification.

Note: *Manual verification does not start if:*

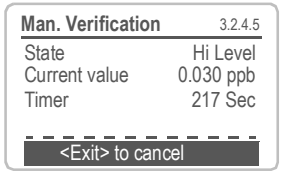
- *There is no sample flow*
- *There is no reagent (Diisopropylamine)*
- *There is too much reagent (valve defective).*

Start verification

Navigate to Menu: <Maintenance/Service/Man. Calibration>. Press <Enter> to start the manual verification.

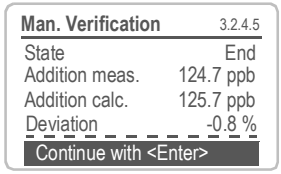
Start of verification procedure:

- State: Shows all verification steps
- Current value
- Timer: Progress of verification time



End of verification procedure:

- Addition meas.
- Addition calc.
- Deviation



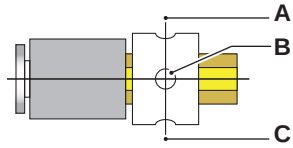
The settings in <Installation/Sensors/Maintenance Plan> are also valid during the manual verification. This means, the signal outputs and the Output/Control remain during manual calibration and delay time in the programmed state either: <cont> or <hold> or <off>

6.11. Tube Replacement

6.11.1 Tube Numbering

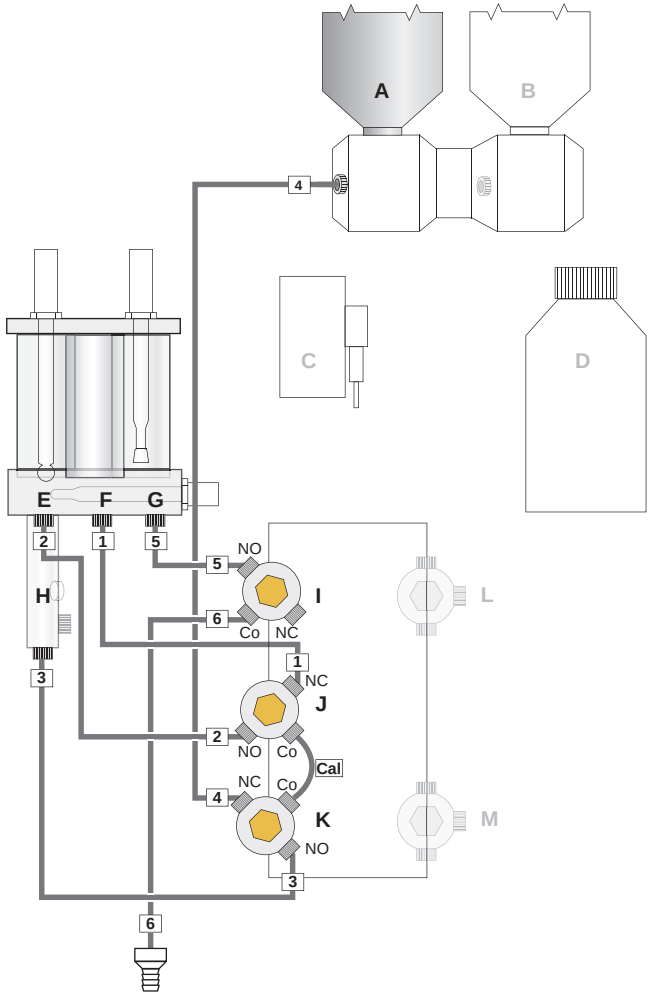
Number	Length	from	to
1	155	Measuring cell constant head	Valve 2 NC
2	230	Measuring cell calibration cell	Valve 2 NO
3	230	Measuring cell air lift pump	Valve 3 NO
4	670	Standard bottle	Valve 3 NC
5	90	Measuring cell reference cell	Valve 1 NO
6	125	Valve 1 co	Waste
7	670	Air pump	Valve 4 Co
8	700	Reagent bottle	Valve 4 NC
10	350	Measuring cell air lift pump	Valve 5 Co
11	670	Measuring cell air lift pump	Reagent bottle
12	186	Valve 4 NO	Valve 5 NO
13	800	Valve 5 NC	Regeneration bottle
Cal	48.5	Valve 2 Co	Valve 3 Co
Reag	60	Inside reagent bottle	

Solenoid valve connections



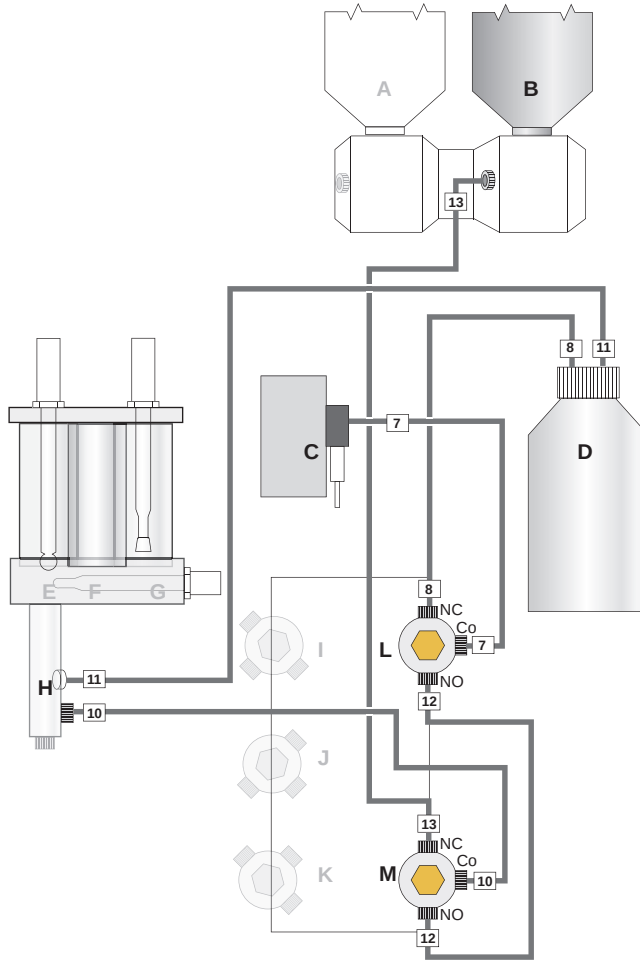
A *Connection NO*
B *Connection Co*
C *Connection NC*

6.11.2 Tube Connections Liquid Handling



A *Standard bottle*
E *Calibration chamber*
F *Constant head*
G *Reference chamber*
H *Air lift pump*
I *Valve 1*
J *Valve 2*
K *Valve 3*

6.11.3 Tube Connections Reagent and Regeneration Handling



B *Regeneration bottle*
C *Air pump*
D *Reagent bottle*
H *Air lift pump*
L *Valve 4*
M *Valve 5*

6.12. Longer Stop of Operation

1 Stop sample flow.

WARNING

Diisopropylamine is corrosive.

- Read the Safety Data Sheets (SDS) first.
- Wear suitable protective clothing, gloves and eye/face protection.
- Avoid inhalation of DIPA vapor. To prevent formation of reagent vapors:
  - close the reagent bottle firmly
  - In case of contact with eyes, rinse immediately with plenty of water eyelid wide open for at least 10 min and summon medical advice. In case of accident or if you feel unwell, summon medical advice immediately.

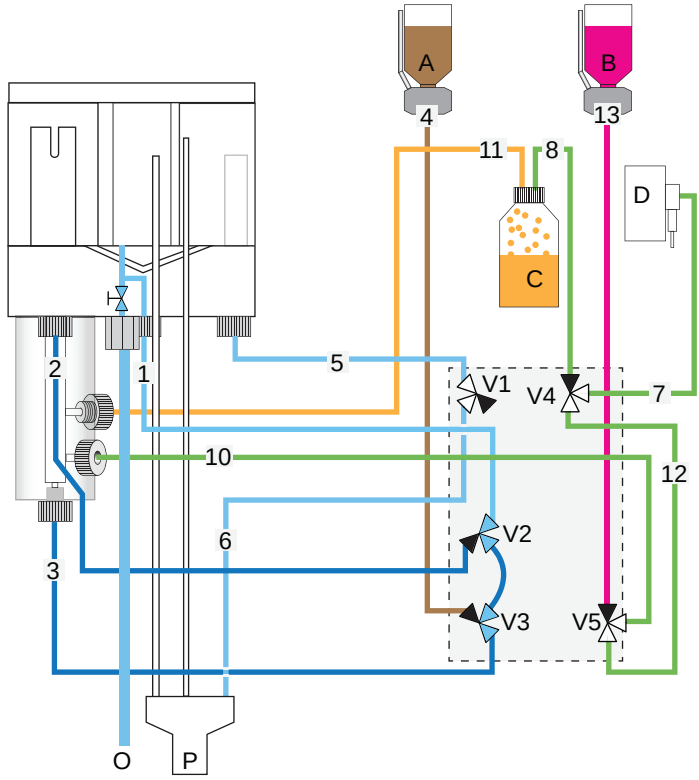
2 Dismount reagent bottle and close it firmly.
Wait until 0 µS is displayed (Reagent empty error)

3 Shut off power of the instrument.

Note: *If the reagent bottle stays connected to the instrument, reagent vapors will damage the membranes of valve 4 and the air pump.*

7. Troubleshooting

7.1. Tubing overview



7.2. Problems During Liquid System Function Test

Hi Level Test

If High Level is not reached within 4 minutes check the following:

Possible cause	Corrective Action
No sample flow.	Check pressure of sample supply line.
Valve 1 is leaking. *No sample must flow into the waste via tube 6.*	Repair valve 1, see Maintenance of Solenoid Valve, p. 61.
Air pump defective.	If the air pump is defective contact service to have it replaced.

Fill Loop

If no air bubbles are formed in the standard bottle check the following:

Possible cause	Corrective Action
Air bubbles are trapped in tube 4.	Wait until <Fill Loop> is active: Then close the pressure compensation tube of the bottle [A] and squeeze the bottle until the tube is filled with standard solution.
Valve 2 and/or valve 3 are not working properly.	If necessary repair valves, see Maintenance of Solenoid Valve, p. 61.

Mix

If the values are not stable after 5 min check the following:

Possible cause	Corrective Action
Air bubbles are trapped in tube 2.	If necessary, vent tube 2.
Valve 2 and/or valve 3 are not working properly.	◆ If the mV value increases, Standard leaks into the measuring cell. ⇒ *Leakage of valve 3* ◆ If the mV value decreases, sample leaks into the measuring cell. ⇒ *Leakage of valve 2* If necessary repair valves, see Maintenance of Solenoid Valve, p. 61.

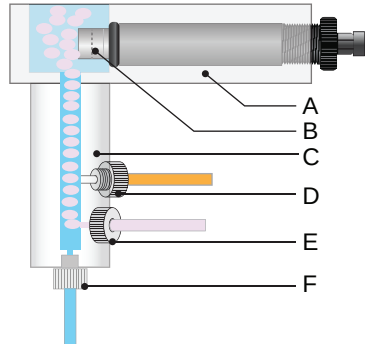
Test valve 5

See Other Errors, p. 82 error 22.

Test valve 4

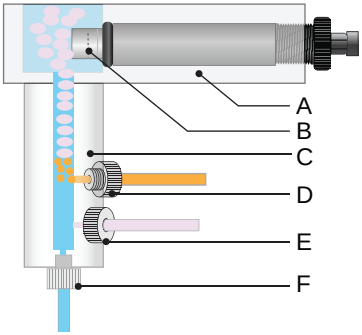
If the specified end value is not reached, check the following:

Possible cause	Corrective Action
DIPA bottle is empty.	Refill DIPA bottle.
Screw cover of DIPA bottle not enough tightened. (a strong smell of fuel indicates a leakage).	Retighten the screw cover.
Tube 8 and/or tube 11 are leaking.	Retighten the tube(s).
Air pump defective. *Visible if no continuous, regular stream of air bubbles is formed beginning from the air inlet [E].*	If the air pump is defective contact service to have it replaced.



A *Base plate*
B *Conductivity sensor*
C *Air lift pump*
D *DIPA vapor inlet inactive (tube 11)*
E *Air inlet active (tube 10)*
F *Sample inlet*

Possible cause	Corrective Action
Valve 4 defective.	Check the following: If valve 4 has switched the air bubble stream has to be stopped for about 1 second and DIPA vapor bubbles are formed at the DIPA vapor inlet [D]. If this is not the case: Repair valve 4, see Maintenance of Solenoid Valve, p. 61.
Conductivity sensor wrong positioned.	Align the conductivity sensor according to chapter Maintenance of Conductivity Sensor, p. 60



A *Base plate*
B *Conductivity sensor*
C *Air lift pump*
D *DIPA vapor inlet active (tube 11)*
E *Air inlet inactive (tube 10)*
F *Sample inlet*

7.3. Calibration Errors

High background, E020

The error High background occurs after the first addition of the calibration. It is triggered if the difference between the pure sample and the sample after the first addition is too small. Check the following:

Possible cause	Corrective Action
Air bubbles trapped in tube 2.	Remove tube 2 from valve 2 and vent it.
The concentration of the standard is too low in relation to the sample.	Double the standard concentration and enter the new concentration in menu <Operation>/<Sensors>/ <Standard>.
Measuring cell contaminated.	Let the instrument run for 24 h and try again.
Air bubbles trapped in tube 4.	Wait until <Fill Loop> is active: Then close the pressure compensation tube of the bottle [A] and squeeze the bottle until the tube is filled with standard solution.
Valve 2 and/or valve 3 are not working properly. Check for leakage.	Perform test sequence Hi Level –> Fill loop –> Mix. See chap 4.2., 46. If necessary repair valve 2 or 3, see Maintenance of Solenoid Valve, p. 61.

Sodium offset, E018

The error Sodium offset is related to the second addition of the calibration. It is triggered at the end of the calibration if the response of the sodium electrode was too slow. If this error occurs do the following:

Possible cause	Corrective Action
Wrong concentration of standard	Check programmed standard concentration.
Sodium electrode too slow.	Perform a regeneration. See Regeneration, p. 67
Sodium electrode defective.	Replace the sodium electrode. See Maintenance of Sodium Electrode, p. 58

Sodium slope, E019

The error Sodium slope is related to the third addition of the calibration.It is triggered at the end of the calibration if the sodium or reference electrode does not work properly. If this error occurs check the following:

Possible cause	Corrective Action
KCl flow of the reference electrode too low.	See Maintenance of Reference Electrode, p. 59.
Sodium electrode too slow.	Perform a regeneration. See Regeneration, p. 67. If this does not lead to any improvement, exchange the sodium electrode, see Maintenance of Sodium Electrode, p. 58.

Sodium Stability, E021

The error Sodium stability is triggered if the sodium concentration is not stable during the calibration procedure. If this error occurs check the following:

Possible cause	Corrective Action
Sodium electrode too slow.	Perform a regeneration. See Regeneration, p. 67. If this does not lead to any improvement, exchange the sodium electrode, see Maintenance of Sodium Electrode, p. 58.
Valve 1 is leaking. *No sample must flow into the waste via tube 6.*	Perform test High Level, see Hi Level Test, p. 47. If necessary repair valve 1, see Maintenance of Solenoid Valve, p. 61
Valve 2 and/or valve 3 are not working properly.	Perform test sequence Hi Level –> Fill loop –> Mix. See chap 4.2., 🗎 46. If necessary repair valve 2, see Maintenance of Solenoid Valve, p. 61
KCl flow of the reference electrode is too high.	See Maintenance of Reference Electrode, p. 59
Check if sodium electrode is defective.	See Maintenance of Sodium Electrode, p. 58. If necessary replace the sodium electrode.

7.4. Other Errors

No reagent, E005

Possible cause	Corrective Action
DIPA bottle empty.	Refill diisopropylamine.
Tubes 8 and/or 11 are not connected to the DIPA bottle.	Connect tube 8 and 11 to the DIPA bottle.
The screw cover of the DIPA bottle is not tightened well.	Tighten the screw cover again.
The EPDM seal in the screw cover is brittle.	Replace the EPDM seal.
Valve 4 does not work properly.	Perform test valve 4, see Test Valve 4, p. 50. If necessary repair valve 4, see Maintenance of Solenoid Valve, p. 61.

No sample, E006

Possible cause	Corrective Action
No sample flow.	Check pressure of sample supply line.
Air pump defective.	◆ Check if regular bubbles are formed in the air lift pump. ◆ Remove tube 7 from the inlet of valve 4 and check if air is pumped through the tube. If the air pump is defective contact our service to have it replaced.

Reagent high, E015

Possible cause	Corrective Action
The pH value of the sample is < 7	Check process.
No sample flow.	Check pressure of sample supply line.
Valve 4 does not work properly.	Perform test valve 4, see Test Valve 4, p. 50. If necessary repair valve 4, see Maintenance of Solenoid Valve, p. 61.

No Reg. Agent, E022

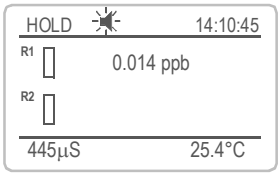
Possible cause	Corrective Action
Regeneration bottle empty.	Refill regeneration agent.
Air bubbles are trapped in tube 13.	Wait until <Regenerate> is active: ◆ Then close the pressure compensation tube of the bottle [B] and squeeze the bottle until the tube is filled with regeneration solution.
Valve 5 does not work properly.	Perform test valve 5, see Test Valve 5, p. 49. If necessary repair valve 2 or 3, see Maintenance of Solenoid Valve, p. 61
Conductivity sensor wrong positioned.	Align the conductivity sensor according to chapter Maintenance of Conductivity Sensor, p. 60
Tube 13 is kniked.	Replace tube 13.

7.5. Error List

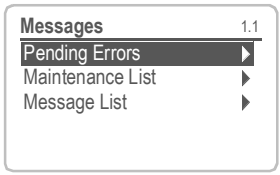
Error
Non-fatal Error. Indicates an alarm if a programmed value is exceeded.
Such Errors are marked **E0xx** (bold and black).

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:

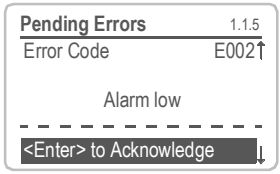
- Errors which disappear if correct measuring conditions are recovered (i.e. Sample Flow low).
  Such Errors are marked **E0xx** (bold and orange)
- Errors which indicate a hardware failure of the instrument.
  Such Errors are marked **E0xx** (bold and red)



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 Alarm high	– check process – check programmed value, see 5.3.1.1, p. 105
E002	Sodium Alarm low	– check process – check programmed value, see 5.3.1.1, p. 105
E003	Cond. Alarm high	– check process, see Other Errors, p. 82 – check programmed value, see 5.3.1.3, p. 106
E004	Cond. Alarm low	– check process, see Other Errors, p. 82 – check programmed value, see 5.3.1.3, p. 106
E005	No Reagent	– see Other Errors, p. 82
E006	No Sample	– see Other Errors, p. 82
E007	Sample Temp. high	– check process – check programmed value, see 5.3.1.2, p. 105
E008	Sample Temp. low	– check process – check programmed value, see 5.3.1.2, p. 105
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, see 5.3.1.4, p. 106
E014	Case Temp. low	– check case/environment temperature – check programmed value, see 5.3.1.5, p. 106
E015	Reagent high	– see Other Errors, p. 82

Error	Description	Corrective action
E017	Control Timeout	– check control device or programming in Installation, Relay contact, Relay 1/2 see 5.3.2 and 5.3.3, p. 107
E018	Sodium Offset	– see Calibration Errors, p. 79
E019	Sodium Slope	– see Calibration Errors, p. 79
E020	High Background	– see Calibration Errors, p. 79
E021	Sodium Stability	– see Calibration Errors, p. 79
E022	No Reg. Agent	– see Other Errors, p. 82
E024	Input active	– See If Fault Yes is programmed in Menu see 5.3.4, p. 111
E026	IC LM75	– call service
E028	Signal output open	– check wiring on signal outputs 1 and 2
E030	EEProm Frontend	– call service
E031	Cal. Recout	– call service
E032	Wrong Frontend	– call service
E033	Power-on	– none, normal status
E034	Power-down	– none, normal status
E065	Verification Error	– information that a verification failed – check standard, reg. agent electrodes valves

7.6. Replacing Fuses

WARNING

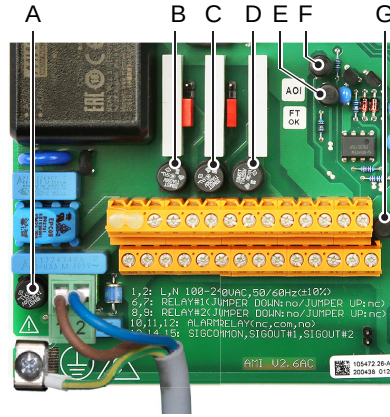
External Voltage

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/250 V Instrument power supply*
DC variant: 3.15 AT/250 V 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 1.1*	*Pending Errors*	1.1.5*	* Menu numbers
Maintenance List 1.2*	*Maintenance List*	1.2.5*	
Message List 1.3*	*Number*	1.3.1*	
	Date, Time		

8.2. Diagnostics (Main Menu 2)

Identification	Designation	AMI Soditrace		* Menu numbers
2.1*	Version	V6.20-05/18		
	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 ppm*		
2.2*	2.2.1*	*EMF*		
		Cal. History	*Number*	2.2.1.4.1*
		2.2.1.4*	*Date, Time*	
			Offset	
			Slope	
		Ver. History	*Number*	2.2.1.5.1*
		2.2.1.5*	*Date, Time*	
			Addition meas.	
			Addition calc.	
			Deviation	
	Cond. Sensor	*Current Value*	2.2.2.1*	
	2.2.2*	*(Raw value 1)*		
		(Raw value 2)		
	Miscellaneous	*Case Temp.*	*2.2.3.1**	
	2.2.3*			
Sample	*Sample ID*	2.3.1*		
2.3*	*Temperature*			
	(NT5K)			
	Ctl Actual			
	Ctl Average			
I/O State	*Alarm Relay*	2.4.1*		
2.4*	*Relay 1/2*	2.4.2*		
	Input			
	Signal Output 1/2			
Interface	*Protocol*	2.5.1*		(only with RS485
2.5*	*Baud rate*			interface)

8.3. Maintenance (Main Menu 3)

Process Cal	Process Cal.	*Current Value*	
3.1*	3.1.1*	*Offset*	
		Process Value	
Service	**Test Valve Block**	*EMF*	
3.2*	3.2.1*	*Conductivity*	
		Timer	
		Mode	3.2.1.5*
	Man. Regeneration	*Progress*	3.2.2.5*
	3.2.2*		
	Man. Calibration	*Progress*	3.2.3.5*
	3.2.3		
	Man. Verifikation	*Progress*	3.2.4.5*
	3.2.4		
Simulation	*Alarm Relay*	3.3.1*	
3.3*	*Relay 1*	3.3.2*	
	Relay 2	3.3.3*	
	Signal Output 1	3.3.4*	
	Signal Output 2	3.3.5*	
Set Time	*(Date), (Time)*		
3.4*			

* Menu numbers

8.4. Operation (Main Menu 4)

Sensors	*Filter Time Const.*	4.1.1*		* Menu numbers
4.1*	*Standard*	4.1.2*		
	Verification	*Additions*		
	4.1.3*	*Concentration*		
Relay Contacts	**Alarm Relay**	**Alarm Sodium**	*Alarm High*	4.2.1.1.1*
4.2*	4.2.1*	4.2.1.1*	*Alarm Low*	4.2.1.1.26*
			Hysteresis	4.2.1.1.36*
			Delay	4.2.1.1.46*
		Alarm Conductivity	*Alarm High*	4.2.1.2.1*
		4.2.1.2*	*Alarm Low*	4.2.1.2.26*
			Hysteresis	4.2.1.2.36*
			Delay	4.2.1.2.46*
	Relay 1/2	*Setpoint*	4.2.x.100*	
	4.2.2*/4.2.3*	*Hysteresis*	4.2.x.200*	
		Delay	4.2.x.30*	
	Input	*Active*	4.2.4.1*	
	4.2.4*	*Signal Outputs*	4.2.4.2*	
		Output / Control	4.2.4.3*	
		Fault	4.2.4.4*	
		Delay	4.2.4.5*	
Logger	*Log Interval*	4.3.1*		
4.3*	*Clear Logger*	4.3.2*		

8.5. Installation (Main Menu 5)

Sensors	*Ref. Electrodes*	5.1.1*		* Menu numbers
5.1*	**Maintenace Plan**	*Start time*	5.1.1.1*	
	5.1.2*	**Calendar**	**Monday to Sunday**	*1st week*
		5.1.2.2*	5.1.2.2.1 to 5.1.2.2.7*	*2nd week*
				3rd week
				4th week
				Last week
		Delay	5.1.2.3*	
		Signal Outputs	5.1.2.4*	
		Output/Control	5.1.2.5*	
Signal Outputs	**Signal Output 1/2**	*Parameter*	5.2.1.1 - 5.2.2.1*	
5.2*	5.2.1* - 5.2.2*	*Current Loop*	5.2.1.2 - 5.2.2.2*	
		Function	5.2.1.3 - 5.2.2.3*	
		Scaling	*Range Low*	5.2.x.40.10/10*
		5.2.x.40	*Range High*	5.2.x.40.20/20*
Relay Contacts	**Alarm Relay**	**Alarm Sodium**	*Alarm High*	5.3.1.1.1*
5.3*	5.3.1*	5.3.1.1*	*Alarm Low*	5.3.1.1.26
			Hysteresis	5.3.1.1.36
			Delay	5.3.1.1.46
		Sample Temp.	*Alarm High*	5.3.1.2.1*
		5.3.1.2*	*Alarm Low*	5.3.1.2.26*
		Alarm Conductivity	*Alarm High*	5.3.1.3.1*
		5.3.1.3*	*Alarm Low*	5.3.1.3.26
			Hysteresis	5.3.1.3.36
			Delay	5.3.1.3.46
		Case Temp. high	5.3.1.4*	
		Case Temp. low	5.3.1.5*	
	Relay 1/2	*Function*	5.3.2.1–5.3.3.1*	
	5.3.2* - 5.3.3*	*Parameter*	5.3.2.20–5.3.3.20*	
		Setpoint	5.3.2.300–5.3.3.301*	
		Hysteresis	5.3.2.400–5.3.3.401*	
		Delay	5.3.2.50–5.3.3.50*	
	Input	*Active*	5.3.4.1*	
	5.3.4*	*Signal Outputs*	5.3.4.2*	
		Output/Control	5.3.4.3*	
		Fault	5.3.4.4*	
		Delay	5.3.4.5*	

Miscellaneous	*Language*	5.4.1*		* Menu numbers
5.4*	*Set defaults*	5.4.2*		
	Load Firmware	5.4.3*		
	Password	*Messages*	5.4.4.1*	
	5.4.4*	*Maintenance*	5.4.4.2*	
		Operation	5.4.4.3*	
		Installation	5.4.4.4*	
	Sample ID	5.4.5*		
Interface	*Protocol*	5.5.1*		(only with RS485
5.5*	*Device Address*	5.5.21*		interface)
	Baud Rate	5.5.31*		
	Parity	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 Maintenance List

1.2.5 Provides the list of necessary maintenance. Cleared maintenance messages are moved to the Message list.

1.3 Message List

1.3.1 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

Desig.: Designation of the instrument.

Version: Firmware of instrument (e.g. V6.20-05/18)

2.1.3 **Factory Test**: Test date of the Instrument and Motherboard

2.1.4 **Operating Time:** Years / Days / Hours / Minutes / Seconds

2.2 Sensors

2.2.1 **Sodium Sensor:**

- *Current value:* Shows the actual measuring value in ppm.
- *EMF:* Electromotive force. Shows the actual voltage potential between sodium sensor and reference electrode in mV.

2.2.1.4 **Cal. History:** Shows the diagnostic values of the last calibrations.

- *Number*: Counter of the calibrations
- *Date, Time:* Date and time assigned to a number
- *Offset:* Zero point displacement from the reference position in mV
- *Slope:* Steepness of the straight line in mV/Decade

2.2.1.5 **Ver. History:** Shows the diagnostic values of the last verifications.
- o *Number:* Counter of the verifications
- o *Date, Time:* Date and time assigned to a number
- o *addition meas.:* measured value of addition of standard
- o *addition calc.:* calculated value of addition of standard
- o *Deviation*: Deviation of [measured], [calculated] in %

2.2.1 **Cond. Sensor:**
- o *Current value:* Shows the actual measuring value in µS/cm.
  (Raw value 1): Uncompensated value in µS/cm.
  (Raw value 2): Temperature compensated value in µS/cm.

2.2.3 **Miscellaneous**:

2.2.3.1 *Case Temp:* Shows the actual 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:* Shows the actual temperature in °C and NT5K in Ohm.
- o *Ctl Actual:* Actual dosage of Diisopropylamine.
- o *Ctl Average*: Average dosage of Diisopropylamine.

2.4 I/O State

Shows actual 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 (option)*:	Actual current in mA

2.5 Interface

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

3 Maintenance

3.1 Process Cal.

3.1.4
- o *Current Value*: shows the actual measuring value in ppm.
- o *Offset*: shows the offset value in mV of the difference of the current value and the process value.
- o *Process Value*: Enter the measured value of a reference instrument.

3.2 Service

3.2.1 **Test Valve Block:** The function Test Valve Block provides several tests to check the proper function of the solenoid valves 1 to 3.

3.2.1.5
- o *EMF*: Electromotive force. Shows the voltage potential between sodium sensor and reference electrode in mV
- o *Conductivity*: The conductivity value represents a pH value. The ideal conductivity value is 450 µS/cm at a pH of 11.
- o *Timer*: shoes the elapsed time.

3.2.1.5 *Mode*: press [Enter] and select the test you want to carry out. You can chose between:

Mode	
Measure	normal operating mode
Hi Level	(see Hi Level Test, p. 47)
Fill Loop	(see Fill Loop, p. 48)
Mix	(see Mix, p. 48)

3.2.2 **Man. Regeneration**: If activated, the instrument will immediately start a regeneration. Please wait at least 12 h before starting a calibration or verification.
- o *EMF*: Electromotive force. The potential generated between the sodium electrode and the reference electrode.
- o *Conductivity*: The conductivity value represents a pH value. The ideal conductivity value is 450 µS/cm at a pH of 11.
- o *Timer*: Progress Regeneration-time.

3.2.3 **Man. Calibration**: If activated, the instrument will immediately start a calibration without a regeneration. The display shows each calibration step (High level, Background, 1. Calibration Point, 2. Calibration Point, 3. Calibration Point).

State: shows the actual state of the calibration procedure

- *Cal. Point*: shows which calibration measuring point is in progress
- *EMF*: Electromotive force. Shows the actual voltage potential between sodium sensor and reference electrode in mV.
- *Timer*: Progress Calibration-time

3.2.4 **Man. Verification**: Perform a manual regeneration 12 h before starting a verification. If verification is activated, the instrument will start immediately. The display shows each verification step.

3.3 Simulation

To simulate a value or a relay state, select the

- alarm relay
- relay 1 and 2
- signal output 1 and 2

with the [▲] or [▼] key.

Press the [Enter] key.

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

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

3.3.1	*Alarm Relay:*	Active or inactive
3.3.2	*Relay 1*	Active or inactive
3.3.3	*Relay 2:*	Active or inactive
3.3.4	*Signal Output 1:*	Actual current in mA
3.3.5	*Signal Output 2:*	Actual current in mA
3.3.6	*Signal Output 3:*	Actual current in mA (option)

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 *Standard:* Enter the concentration of your standard.
Press [Exit] and save be confirming yes, only then the concentration will be calculated based on the new concentration value.
Range: 500 ppb–800 ppm

4.1.3 Verification:

4.1.3.1
- *Additions*: Enter the desired number of additions of standard.
- *Concentration*: shows the calculated, expected concentration of the sample based on the standard concentration and the number of additions.

4.2 Relay Contacts

See Relay Contacts 1 and 2, p. 41

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. The Records consists of: Date, time, alarms, measured value, measured value uncompensated, temperature, flow.
Range: 1 Second to 1 hour

4.4.1 *Log Interval:* Select a convenient log interval. Consult the table below to estimate the max logging time. When the logging 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

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

5 Installation

5.1 Sensors

5.1.1 *Ref. Electrode*: Only Calomel is possible for this application.

5.1.2 **Maintenance Plan**: The menu Maintenance Plan includes all settings, necessary to carry out regularly maintenance tasks.

5.1.2.1 *Start time*. Enter the Time at which you want to start a task.

5.1.2.2 Calendar: The implemented calendar is based on the CRON format. It starts with Sunday and ends with Saturday. Usually a month has three full weeks and two weeks which are part thereof.

Therefore, if you program a task which has to be carried out weekly, always program the task in the 2nd, 3rd or 4th week of a month.

Example:

Looking at the table below you can see, that if a task is programmed on Monday in the 1st week, it is not carried out because the week only starts on Wednesday!

Week	Sun	Mon	Tues	Wed	Thurs	Fri	Sat
1st				1	2	3	4
2nd	5	6	7	8	9	10	11
3rd	12	13	14	15	16	17	18
4th	19	20	21	22	23	24	25
Last	26	27	28	29	30		

5.1.2.2.1 **Monday**:

5.1.2.2.1.1 *1st week*: Press <Enter> and select the function which should be performed at this time.

Available functions:

- **off** (no function will be performed)
- **regenerate** (performs a regeneration of the sodium electrode)
- **reg. + ver.** (A regeneration of the sodium electrode with subsequently verification is performed)
- **reg. + cal.** (A regeneration of the sodium electrode with subsequently calibration is performed)

5.1.2.2.1.2 *2nd week*: The same functionality as 1st week.

5.1.2.2.1.3 *3rd week*: The same functionality as 1st week.

5.1.2.2.1.4 *4th week*: The same functionality as 1st week.

5.1.2.2.1.5 *Last week*: The same functionality as 1st week.

5.1.2.2.2–5.1.2.2.7 **Tuesday to Sunday:** The same functionality and sub functionality as Monday.

5.1.2.3 *Delay*. During the

- regeneration
- regeneration and verification
- regeneration and calibration

and the programmed delay time, the status of the signal outputs, and relay 1 and 2 will be continuous/hold/off, as programmed. The delay is also active during and after

- manual regeneration
- manual calibration
- manual verification

5.1.2.4 *Signal Outputs*. the signal outputs can be set to

- cont
  Signal outputs track the actual measuring value during regeneration, calibration or verification and delay time. All programmed alarms are active.
- hold
  The signal outputs are on hold and the last valid measuring value is shown during calibration and delay time. Alarms are not active.
- off
  The signal outputs are switched off during calibration and delay time. Alarms are not active.

5.1.2.5 *Output/Control*.

- cont
  The programmed limits are active during regeneration, calibration or verification and delay time. All programmed alarms are active.
- hold
  The limits are on hold during regeneration, calibration or verification and delay time. Alarms are not active.
- off
  The limits and alarms are not active. The relays are open during regeneration, calibration or verification and delay time

5.2 Signal Outputs

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

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.

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

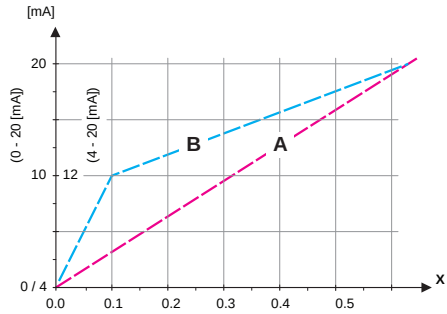
- Sodium
- Temperature
- Conductivity

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

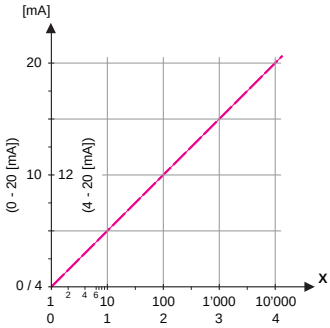
5.2.1.3 *Function:* Define if the signal output is used to transmit a process value or to drive a control unit. Available functions are:

- Linear, bilinear or logarithmic for process values.
  See As process values, p. 101
- Control upwards or control downwards for controllers.
  See As control output, p. 103

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



A *linear*
B *bilinear*
X *Measured value*



X *Measured value (logarithmic)*

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:

5.2.1.40.10 *Range low*: 0.000 ppb – 20.00 ppm

5.2.1.40.20 *Range high*: 0.000 ppb – 20.00 ppm

Parameter Temperature:

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

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

Parameter Conductivity:

5.2.1.40.12 *Range low*: 0 – 2000 µS

5.2.1.40.22 *Range high*: 0 – 2000 µS

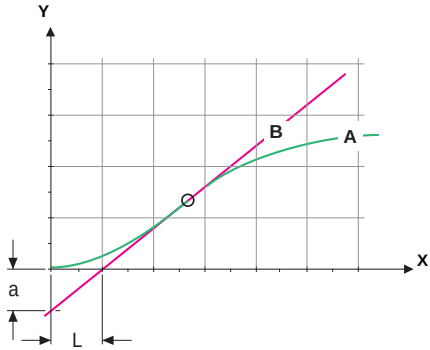
As control output

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 or downwards

Setpoint: User defined precess value for the selected parameter.

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

5.2.1.43 **Control Parameters:** Sodium

5.2.1.43.10 Setpoint:
Range: 0.000 ppb – 20.00 ppm

5.2.1.43.20 P-Band:
Range: 0.000 ppb – 20.00 ppm

5.2.1.43 **Control Parameters:** Temperature

5.2.1.43.11 Setpoint:
Range: -30 °C to +120 °C

5.2.1.43.21 P-Band:
Range: 0 °C to 100 °C

5.2.1.43 **Control Parameters:** Conductivity

5.2.1.43.11 Setpoint:
Range: 0 – 2000 µS/cm

5.2.1.43.21 P-Band:
Range: 0 – 2000 µS/cm

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
- Process values out of programmed ranges.

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

- Sodium
- Sample temperature
- Conductivity
- Case Temperature high
- Case Temperature low

5.3.1.1 Alarm Sodium

5.3.1.1.1 *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: 0.000 ppb–20.00 ppm

5.3.1.1.25 *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: 0.000 ppb–20.00 ppm

5.3.1.1.35 *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. 0.000 ppb–20.00 ppm

5.3.1.1.45 *Delay:* Duration, the activation of the alarm relay is retarded after the measuring value has risen above/fallen below the programmed alarm.
Range: 0–28‘800 Sec

5.3.1.2 Sample Temp

5.3.1.2.1 *Alarm High:* If the measured value rises above the alarm high value, the alarm relay is activated and E007, is displayed in the message list.
Range: 30–70 °C

5.3.1.2.25 *Alarm Low:* If the measured value falls below the alarm low value, the alarm relay is activated and E008 is displayed in the message list.
Range: 0–20 °C

5.3.1.3 **Alarm Conductivity:** Define at which conductivity an alarm should be issued.

5.3.1.3.1 *Alarm High:* If the measured value rises above the alarm high value, the alarm relay is activated
Range: 0–10000 µS/cm

5.3.1.3.25 *Alarm Low:* If the measured value rises above the alarm high value, the alarm relay is activated.
Range: 0–10000 µS/cm

5.3.1.3.35 *Hysteresis:* Within the hysteresis range, the relay does not switch. This prevents damage of relays contacts when the measured value fluctuates around the alarm value.
Range: 0–10000 µS/cm

5.3.1.3.45 *Delay:* Duration, the activation of the alarm relay is retarded after the measuring value has risen above/fallen below the programmed alarm.
Range: 0–28‘800 Sec

5.3.1.4 *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

5.3.1.5 *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 Contacts 1 and 2, p. 41.
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 identical. 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

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	0.000 ppb – 20.00 ppm
Temperature	-30 °C to + 120 °C
Conductivity	0 – 2000 µS/cm

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	0.000 ppb – 20.00 ppm
Temperature	0 °C to + 100 °C
Conductivity	0 – 2000 µS/cm

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 or control 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
- Temperature
- Conductivity

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

See 5.2.1.43, p. 104

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.

5.3.2.32.4 Control Parameters

See 5.2.1.43, p. 104

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** See 5.2.1.43, p. 104
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 1–1440 min.
5.3.2.44	*Run Time*: Enter the time the relay stays active. Range: 5–32400 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: 0–6000 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. 110.
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.

5.3.4 **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.

5.3.4.1 *Active:* Define when the input should be 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:

Continuous:	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):

Continuous:	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: 1200–115 200 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 sheets

10.1. Reagents

- Regeneration Solution for SS Na
  Catalogue No. A-85.810.200
- Reference Filling Solution KCl
  Catalogue No. A-87.892.400
- Sodium Standard Solution 1000 ppm
  Catalogue No. A-85.141.400
- Diisopropylamine for synthesis
  Catalogue No. 803646

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

Operation:

Sensors:	Filter Time Const.: 60 s
	Standard.: 16.0 ppm
	Verification; Additions 5
Alarm Relay	same as in Installation
Relay 1and 2	same as in Installation
Input	same as in Installation
Logger:	Logger Interval: 30 min
	Clear Logger: no

Installation:

Sensors	Ref. Electrode: Calomel
	Maintenance Plan; Start Time: 18:00:00
	Maintenance Plan; Calendar; Monday 1st week: off
	Maintenance Plan; Calendar; Monday 2nd week: off
	Maintenance Plan; Calendar; Monday 3rd week: off
	Maintenance Plan; Calendar; Monday 4th week: off
	Maintenance Plan; Calendar; Monday Last week: off
	Maintenance Plan; Calendar; Tuesday 1st week: reg. + cal.
	Maintenance Plan; Calendar; Tuesday 2nd week: reg. + ver.
	Maintenance Plan; Calendar; Tuesday 3rd week: reg. + ver.
	Maintenance Plan; Calendar; Tuesday 4th week: reg. + ver.
	Maintenance Plan; Calendar; Tuesday Last week: reg. + ver.
	Maintenance Plan; Calendar; Wednesday 1st week: off
	Maintenance Plan; Calendar; Wednesday 2nd week: off
	Maintenance Plan; Calendar; Wednesday 3rd week: off
	Maintenance Plan; Calendar; Wednesday 4th week: off
	Maintenance Plan; Calendar; Wednesday Last week: off
	Maintenance Plan; Calendar; Thursday 1st week: regenerate
	Maintenance Plan; Calendar; Thursday 2nd week: regenerate
	Maintenance Plan; Calendar; Thursday 3rd week: regenerate
	Maintenance Plan; Calendar; Thursday 4th week: regenerate
	Maintenance Plan; Calendar; Thursday Last week: regenerate
	Maintenance Plan; Calendar; Friday 1st week: off
	Maintenance Plan; Calendar; Friday 2nd week: off
	Maintenance Plan; Calendar; Friday 3rd week: off
	Maintenance Plan; Calendar; Friday 4th week: off
	Maintenance Plan; Calendar; Friday Last week: off

	Maintenance Plan; Calendar; Saturday 1st week: ..... off
	Maintenance Plan; Calendar; Saturday 2nd week: ..... off
	Maintenance Plan; Calendar; Saturday 3rd week: ..... off
	Maintenance Plan; Calendar; Saturday 4th week: ..... off
	Maintenance Plan; Calendar; Saturday Last week: ..... off
	Maintenance Plan; Calendar; Sunday 1st week: ..... regenerate
	Maintenance Plan; Calendar; Sunday 2nd week: ..... regenerate
	Maintenance Plan; Calendar; Sunday 3rd week: ..... regenerate
	Maintenance Plan; Calendar; Sunday 4th week: ..... regenerate
	Maintenance Plan; Calendar; Sunday Last week: ..... regenerate
	Delay: ..... 300 s
	Signal Outputs: ..... hold
	Output/Control ..... hold
Signal Output 1	Parameter: ..... Sodium
	Current loop: ..... 4 –20 mA
	Function: ..... linear
	Scaling: Range low: ..... 0.000 ppb
	Scaling: Range high: ..... 1.00 ppm
Signal Output 2	Parameter: ..... Temperature
	Current loop: ..... 4 –20 mA
	Function: ..... linear
	Scaling: Range low: ..... 0.0 °C
	Scaling: Range high: ..... 50.0 °C
Alarm Relay:	Alarm Sodium:
	Alarm high: ..... 20.00 ppm
	Alarm low: ..... 0.000 ppb
	Hysteresis: ..... 10.0 ppb
	Delay: ..... 5 s
	Sample Temp:
	Alarm High: ..... 55 °C
	Alarm Low: ..... 5 °C
	Alarm Conductivity:
	Alarm high: ..... 10000 µS
	Alarm low: ..... 0 µS
	Hysteresis: ..... 10 µS
	Delay: ..... 10 s
	Case temp. high: ..... 65 °C
	Case temp. low: ..... 0 °C
Relay 1 and 2	Function: ..... limit upper
	Parameter: ..... Sodium
	Setpoint: ..... 1.00 ppm
	Hysteresis: ..... 10.0 ppb
	Delay: ..... 30 s

If Function = Control upw. or dnw:
Parameter: ..... **Sodium**
Settings: Actuator: ..... Frequency
Settings: Pulse Frequency: 120/min
Settings: Control Parameters: Setpoint: ..... 1.00 ppm
Settings: Control Parameters: P-band: ..... 10.0 ppb

Parameter: ..... **Temperature**
Settings: Actuator: ..... Frequency
Settings: Pulse Frequency: 120/min
Settings: Control Parameters: Setpoint: ..... 30.0 °C
Settings: Control Parameters: P-band: ..... 1.0 °C

Parameter: ..... **Conductivity**
Settings: Actuator: ..... Frequency
Settings: Pulse Frequency: 120/min
Settings: Control Parameters: Setpoint: ..... 500 µS
Settings: Control Parameters: P-band: ..... 10 µS

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

13. Notes

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ANALYTICAL INSTRUMENTS

A-96.250.551 / 260121

Swan Products - Analytical Instruments for:

Swan is represented worldwide by subsidiary companies and distributors and cooperates with independent representatives all over the world. For contact information, please scan the QR code.

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