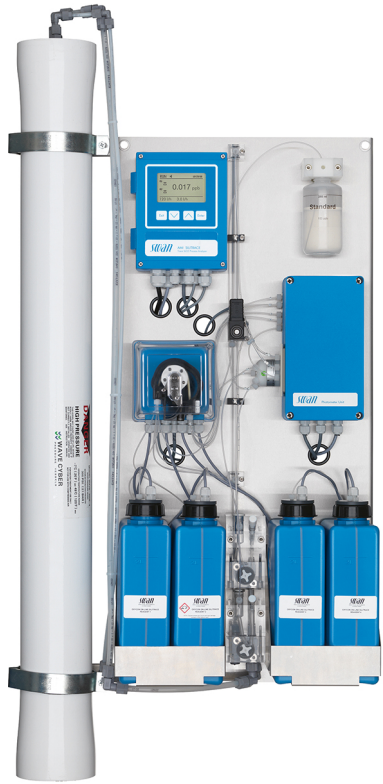
ANALYTICAL INSTRUMENTS

A-96.250.831 / 030122

Operator's Manual

Firmware V6.20 and higher



SWISS MADE

AMI Silitrace Ultra

Customer Support

Swan and its representatives maintain a fully trained staff of technical specialists around the world. For any technical question, contact your nearest Swan representative, or the manufacturer:

Swan Analytische Instrumente AG
Studbachstrasse 13
8340 Hinwil
Switzerland

Internet: www.swan.ch
E-mail: support@swan.ch

Document Status

Title:	AMI Silitrace Ultra Operator's Manual	
ID:	A-96.250.831	
Revision	**Issue**	
00	June 2016	First Edition

Table of Contents

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

The AMI Silitrace Ultra is a complete monitoring system for the automatic, continuous measurement of trace amounts of silica in ultra-pure water.

Measuring Principle

Dissolved silica in water is concentrated with the use of an RO (reverse osmosis) membrane followed by photometric detection of silica.

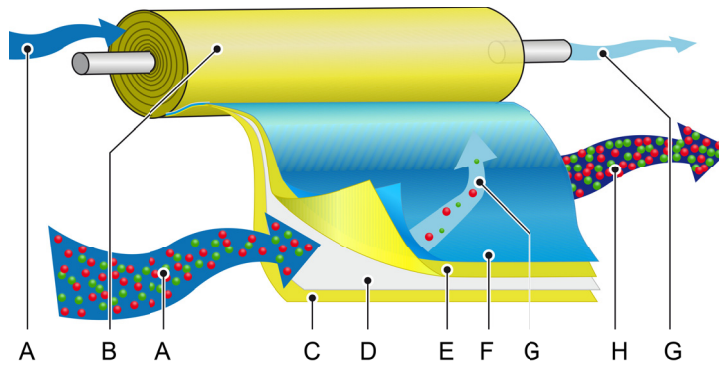
Photometric Detection of Silica

The determination of silica is done by the photometric analysis of molybdate blue at 815 nm.
Silica and ortho-phosphates react at low pH with ammonium molybdate to the yellow colored molybdosilic acid respectively molybdophosphoric acid. The molybdophosphoric acid is destroyed with oxalic acid before the molybdosilic acid is reduced with iron-(II)-ammonium-sulfate to the heteropolyblue complex.
Especially the reaction speed of the first reaction step to the molybdosilic acid is relatively slow. It is the most time-consuming part of the whole reaction. As the reaction speed increases with increasing temperature, it is time saving to heat up the sample. The AMI Silitrace therefore uses a thermostatic reaction chamber with a constant temperature of 45 °C.
At 45 °C the complete reaction only needs 150 s (2.5 min). Because the reaction time plays an important rule in the color development, the pump speed is adjusted constantly. Due to the automatic heating and reaction time regulation a very high precision is achieved.

Degassing membrane (option)

Membrane degassing module for the treatment of samples with high gas content or gas-saturated samples. It minimizes bubble formation during heating of the sample in the photometer, which could interfere with the measurement. Requires an external vacuum pump (not included).

Concentrator function principle



A *Feed water*
B *Spiral-wound RO module*
C *RO membrane*
D *Feed spacer*
E *RO membrane*
F *Product spacer*
G *Permeate*
H *Concentrate*

The Carrcentrator acts as a mesh that holds back large molecules such as silica and allows smaller molecules (water, Na, etc.) to pass through. The membrane is rolled to obtain as many layers as possible. Most of the water (permeate) flows through the membrane and only a small part forms the concentrate. The permeate and the concentrate leave the module via two separate outlets.
The separation of permeate and concentrate needs a high flow rate. As a minimum 100 l/h at 2 bar must be provided to press the water through the membrane.
The aim of this measurement is to detect the silica in the concentrate and calculate it back to the feed water. Three points must be taken into account:

- Concentration factor: Distribution ratio between the total flow and the concentrate flow.
- Separation efficiency: Constant factor of 90%.
- Background: Silica reading of the permeate. This reading is the sum of the silica which is in the reagents and the silica which passes the membrane. However, at a concentration factor of 30–40, the contribution of the silica passing through the membrane is negligible and the background value can be taken as an approximation for the amount of silica in the reagents.

The background is measured daily, the efficiency is fixed and the concentration factor is changed constantly by the flows.

The silica reading on the display is calculated as follows:

$$\text{Sample concentration} = \frac{\text{reading Concentrate} - \text{reading Permeate (Blanc)}}{\text{Concentration factor}}$$

Where

$$\text{Concentration factor} = \text{Efficiency} \bullet \frac{\text{Total flow}}{\text{Concentrate flow}}$$

$$\text{Reading Concentrate} = -\text{Log}\left(\frac{V_{Conc}}{V_{Zero}}\right) \qquad \text{Reading Permeate} = -\text{Log}\left(\frac{V_{Perm}}{V_{Zero}}\right)$$

Fluidic

The sample enters at the sample inlet [S] and flows through the concentrator [Q]. The sample is divided into a permeate and a concentrate outlet which are led to the flow cell high flow [J] (permeate) and the flow cell low flow [I] (concentrate). The flow rate is measured with the flow meters attached to the flow cells [I] and [J].

The concentrate is connected to the 6-way valve [H] position 1, the permeate to position 6. Excess sample overflows into the sample outlet.

The peristaltic pump [O] sucks the concentrate from the 6-way valve and pumps it into the reaction chamber [C]. The reaction chamber is wrapped around a heating device. It has 4 inlets to allow dosing of the necessary reagents.

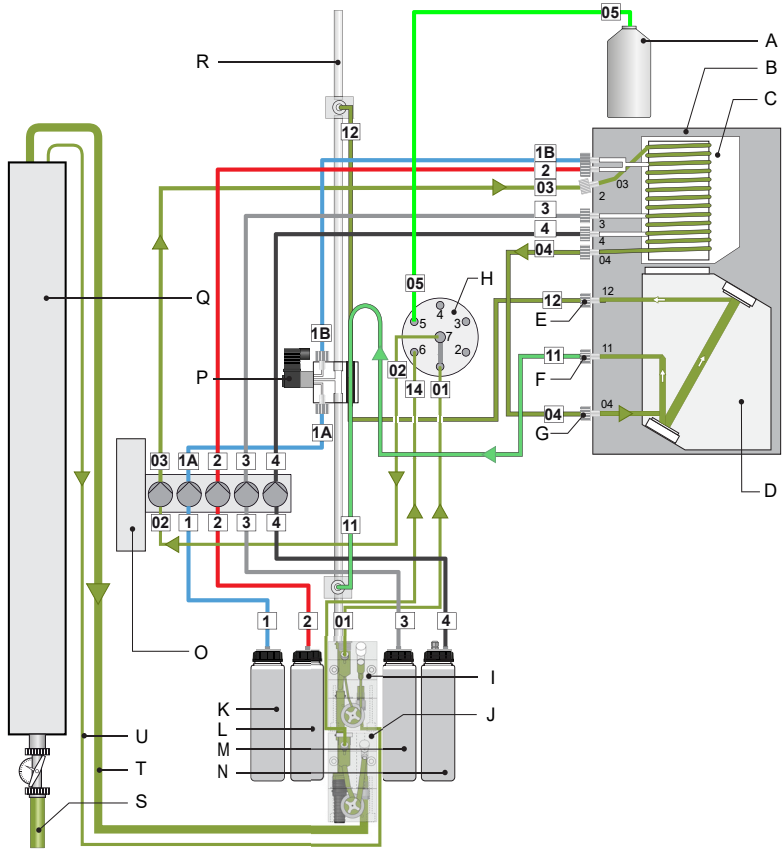
In the reaction chamber the sample is heated up to 45 °C, eliminating temperature deviations of the sample. In a first step Ammonium-molybdate [K] and sulfuric acid [L] are added, to form the yellowish molybsilic acid and molybdophosphoric acid.

Afterwards the oxalic acid [M] is added to mask the molybdophosphoric complex. At last the reducing agent ammonium ferrous (II) sulfate [N] is added. The color of the sample turns to blue. As silica is only present in trace amounts, the blue color can not be seen.

Afterwards the colored sample flows into the thermostatic cuvette [D] until it is filled completely. Now the intensity of the color is measured at 815 nm. The color development is proportional to the silica concentration in the sample.

As the level of the sample in the cuvette increases, the sample overflows into the siphon tube [F] and eventually the cuvette is drained spontaneously through the siphon tube. The sample is led via the aeration and drain tube [R] into the sample outlet.

Dosing, mixing and filling of the photometer are determined by the rotating speed of the peristaltic pump [O]. This speed is adjusted automatically and guarantees the correct timing of the measurement.



A	*Standard bottle*	***L***	*Reagent 2*
B	*Photometer module*	***M***	*Reagent 3*
C	*Reaction chamber*	***N***	*Reagent 4*
D	*Cuvette*	***O***	*Peristaltic pump*
E	*Cuvette de-aeration*	***P***	*Zero calibration valve*
F	*Sample outlet (siphon tube)*	***Q***	*Concentrator*
G	*Inlet from reaction chamber*	***R***	*Aeration and drain tube*
H	*6-way valve*	***S***	*Sample inlet*
I	*Flow cell low flow*	***T***	*Permeate*
J	*Flow cell high flow*	***U***	*Concentrate*
K	*Reagent 1*		

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 Ohm

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 measured values, controllers or timer for system cleaning with automatic hold function. Both contacts can be used as normally open or normally closed.
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

One input for potential-free contact to freeze the measured value or to interrupt control in automated installations (*hold* function or *remote-off*).

Communication Interface (optional)

- USB Interface for logger download
- Third signal output (can be used in parallel to the USB interface)
- RS485 with Fieldbus protocol Modbus or Profibus DP
- HART interface

Safety Features

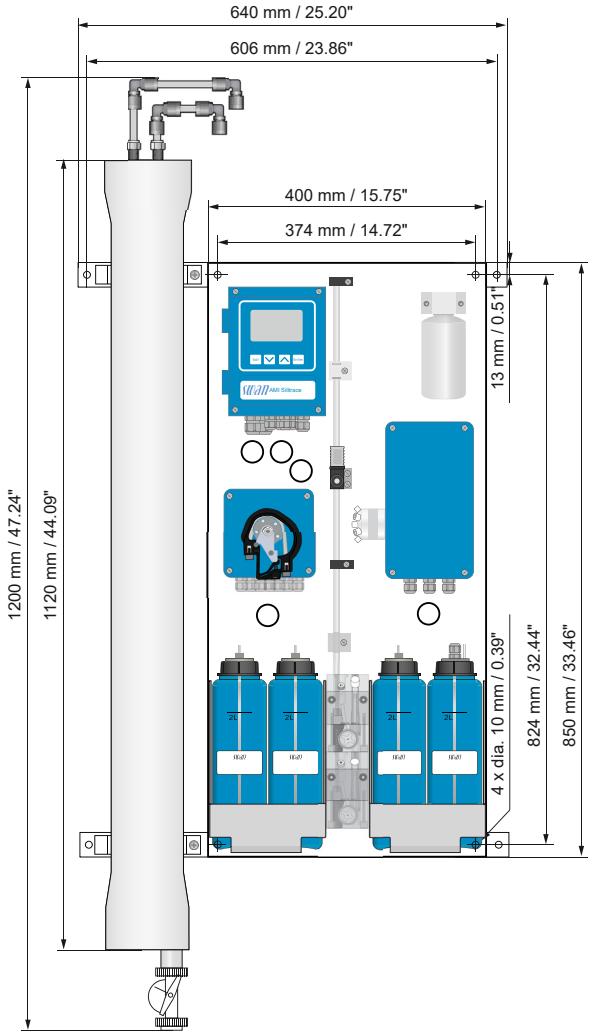
No data loss after power failure. All data is saved in non-volatile memory. Overvoltage protection of inputs and outputs. Galvanic separation of measuring inputs from signal outputs.

2.2. Instrument Specification

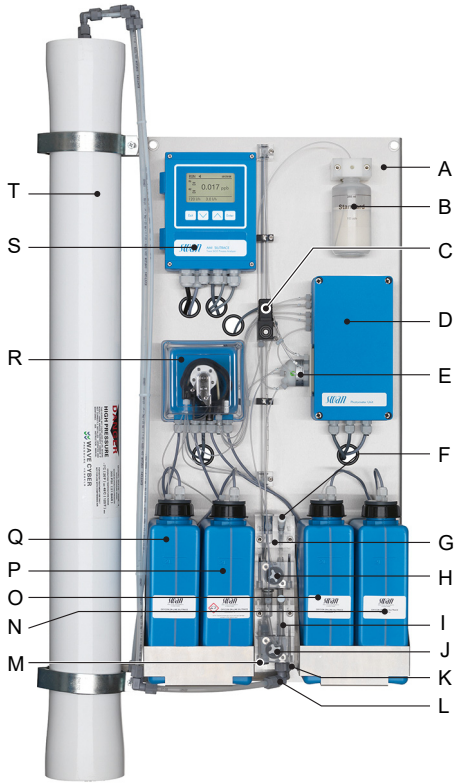
Power Supply	Voltage:	100–240 VAC (± 10%) 50/60 Hz (± 5%) DC version not available
	Power consumption:	max. 50 VA
Transmitter specifications	Electronics housing	Aluminium with a protection degree of IP 66 / NEMA 4X
	Ambient temperature:	-10 to +50 °C
	Storage and transport:	-30 to +85 °C
	Humidity:	10–90% rel., non condensing
	Display:	backlit LCD, 75 x 45 mm
Sample requirements	Flow rate:	100 l/h
	Temperature:	5 to 50 °C
	Inlet pressure:	2 to 20 bar
	Outlet pressure:	pressure free
On-site requirements	The analyzer site must permit connections to:	
	Sample inlet:	$^3/_4$" NPT
	Sample outlet:	Flexible Tube 15x20 mm
	Ambient temperature:	5 to 50 °C
Silica measurement	Measuring range:	0.005 ppb to 25 ppb
	Reproducibility:	±0.005 ppb or ±5%, whichever is greater
	Cycle time:	3 min

Dimensions

Panel:	stainless steel
Panel dimensions:	400x850x150 mm
Screws:	8 mm
Weight:	30.0 kg



2.3. Instrument Overview



A *Panel*
B *Standard bottle*
C *Solenoid valve*
D *Photometer module*
E *6-way valve*
F *Flow regulating valve*
G *Flow cell low flow*
H *Flow meter*
I *Flow cell high flow*
J *Flow meter*
K *Sample inlet low flow*
L *Sample inlet high flow*
M *Sample outlet*
N *Reagent 4*
O *Reagent 3*
P *Reagent 2*
Q *Reagent 1*
R *Peristaltic pump*
S *Transmitter*
T *Concentrator*

3. Installation

3.1. Installation Checklist

On site requirements	100–240 VAC (± 10%), 50/60 Hz (± 5%) Power consumption: 50 VA maximum. Protective earth connection required. Sample line with sufficient sample flow and pressure (see Instrument Specification, p. 15).
Installation	Assemble the Concentrator, p. 19 Mounting of Instrument Panel, p. 22 Connect Sample and Waste, p. 23
Electrical Wiring	Connect all external devices like limit switches, current loops and pumps. Electrical Connections, p. 27 Connect power cord, see Power Supply, p. 30.
Start-up	Proceed according to Start-up Procedure, p. 37.

3.2. Assemble the Concentrator

The concentrator is delivered in the following parts:

A *Concentrator housing*
B *Concentrator membrane*
C *Tube set for high and low flow*
D *2 O-rings*
E *2 covers*
F *4 cover fixing plates with 4 fixing screws*
G *Blind plug*
H *Serto fitting for sample inlet*
I *2 hollow profiles with pipe clamps and fixing screws*

1 Insert the concentrator membrane [B] into the concentrator housing [A].

⇒ *Consider the flow direction indicated on the membrane label. The flow direction is from bottom to top.*

2 Mark the sample outlet on the concentrator housing.

A *Concentrator housing*
D *O-Ring*
E *Cover*

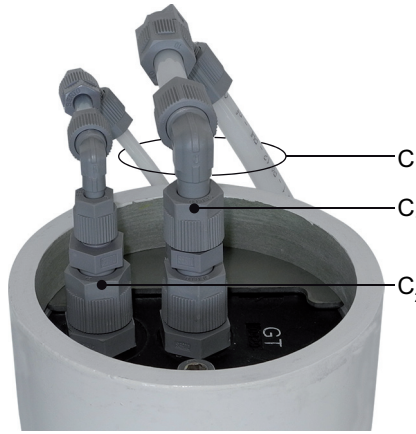
3 Put the O-ring [D] into the groove of the cover [E].

4 Put the cover onto the concentrator housing [A].

5 Put the cover fixing plates [F] into the grove of the concentrator housing.

6 Fix it with the screws, tighten it well.

7 With the second cover, repeat steps 2 to 4 on the other side.



C *Tube set for high and low flow*
C1 *Serto fitting high flow*
C2 *Serto fitting low flow*

Note: *When installing the sample outlet tubes consider the flow direction. Install the tube set on the side you marked as sample outlet.*

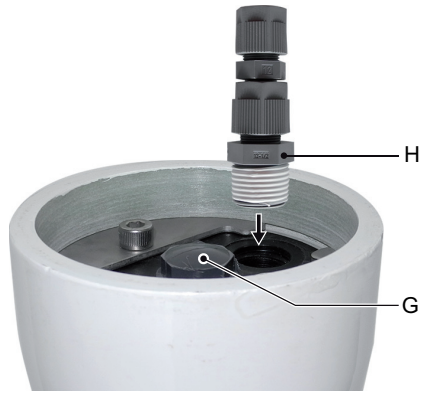
8 Screw the serto fitting [C_1], high flow outlet, into the center thread of the cover.

9 Screw the serto fitting [C_2], low flow outlet, into the thread at the edge of the cover.

10 Tighten the serto fittings well.

11 At the bottom side close the center thread with the blind plug [G].

12 At the bottom side screw the serto fitting [H] into the thread at the edge of the cover.



G *Blind plug*
H *Serto fitting sample inlet*

3.3. Mounting of Instrument Panel

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

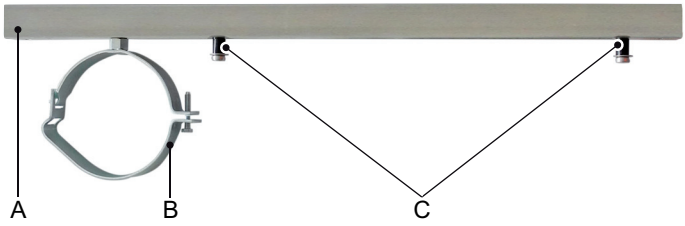
- The instrument must only be installed by trained personnel.
- Mount the instrument in vertical position.
- For ease of operation mount it so that the display is at eye level.
- For the installation a kit containing the following installation material is available:
  - 4 Screws 8x60 mm
  - 4 Dowels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

Mounting requirements

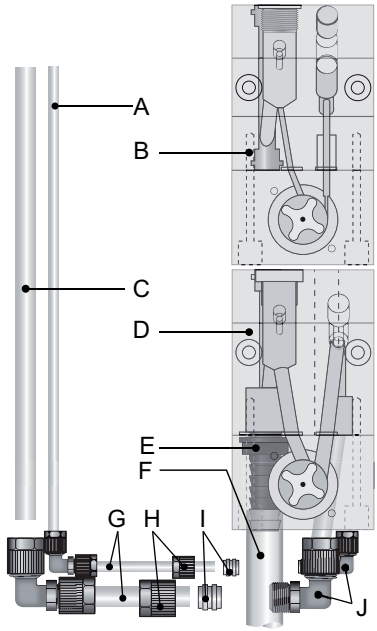
The instrument is only intended for indoor installation.
For dimensions see Dimensions, p. 16.

Mount the hollow profiles

Mount the hollow profiles [A] to a wall or a suitable support.with the pipe clamps [B] facing to the left side
Install the instrument panel to the hollow profiles using the fixing screws [C].



3.4. Connect Sample and Waste



A *Sample inlet low flow*
B *Flow cell low flow*
C *Sample inlet high flow*
D *Flow cell high flow*
E *Hose nozzle*
F *1/2" tube*
G *Plastic tubes*
H *Knurled nuts*
I *Compression ferrules*
J *Serto elbow unions*

Sample inlet Use plastic tubes (FEP, PA, or PE) to connect the sample.

1. Slide the knurled nuts [H] and the compression ferrules [I] over the plastic tubes [G].
2. Push the plastic tubes into the Serto elbow unions [J] at the corresponding sample inlets.
3. Tighten the knurled nuts well.

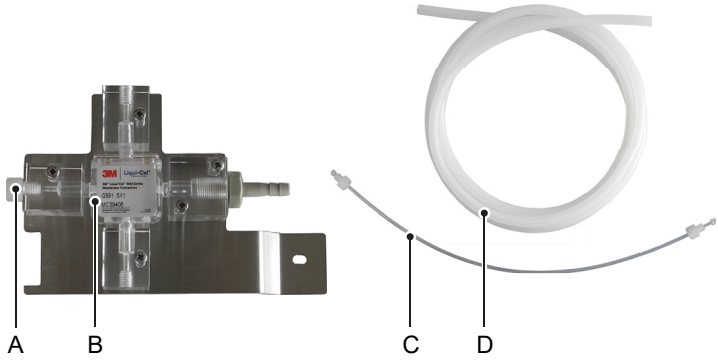
Waste Push the 1/2" tube [F] over the hose nozzle [E] and place it into a pressure free drain of sufficient capacity.

3.5. Degassing Membrane (Option)

3.5.1 Scope of Supply

The option includes the following items:

- Degassing membrane mounted on steel panel [B] with blind plug [A] on the left port.
- Additional sample tube [C]
- 2-meter tube [D] for connection of the degassing membrane to the vacuum pump



3.5.2 Additionally Required Items

Vacuum pump

In addition to the items included in the delivery, a suitable vacuum pump must be procured by the customer. The vacuum pump must guarantee a vacuum of at least -0.3 bar.

The degassing membrane has been successfully tested with the following vacuum pump:

Manufacturer:	KnF
Type:	Laboport N86KT.18

It is possible to use a different vacuum pump, but the characteristics should be similar to those of the tested pump.

Vacuum manometer

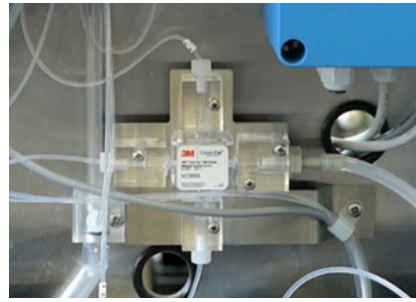
Optionally, it is possible to connect a manometer to the port on the left side of the degassing membrane. The port has an M6 female thread and is sealed with a blind plug when delivered.

The vacuum manometer must be procured by the customer if required.

3.5.3 Installation

Mounting

1 Mount the degassing membrane to the instrument panel as shown in the picture. Use the screw of the cable holder to fix it.



Connecting tubes

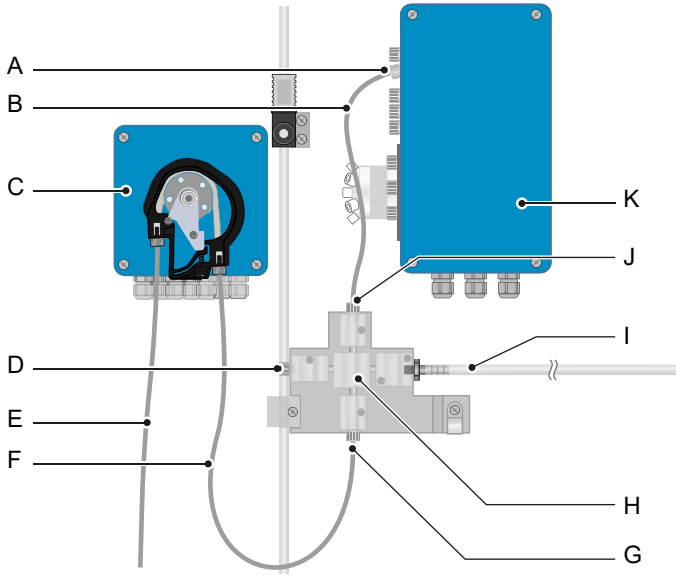
2 Unscrew tube 03 from inlet [A] of the reaction coil and screw it to inlet [G] of the degassing membrane.

3 Connect outlet [J] of the degassing membrane with inlet [A] of the reaction coil using the additional tube.

4 Connect the degassing membrane to the vacuum pump using tube [I] included in this installation kit. Shorten the tube to the required length if necessary.

5 If applicable, remove the blind plug [D] and connect a suitable manometer.

Connection overview



A *Inlet of reaction coil*
B *Additional sample tube*
C *Peristaltic pump*
D *Blind plug / possibility to connect a manometer*
E *Tube 02*
F *Tube 03*
G *Inlet of degassing membrane*
H *Degassing membrane*
I *Tube from vacuum pump*
J *Outlet of degassing membrane*
K *Photometer*

3.6. Electrical Connections

WARNING

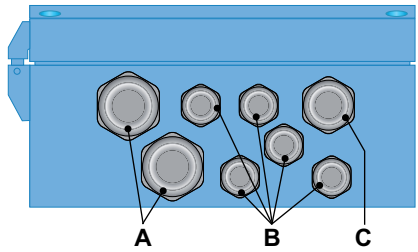
Risk of electrical shock.

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

- Always turn off power before manipulating electric parts.
- Grounding requirements: Only operate the instrument from a 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.
Externally 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

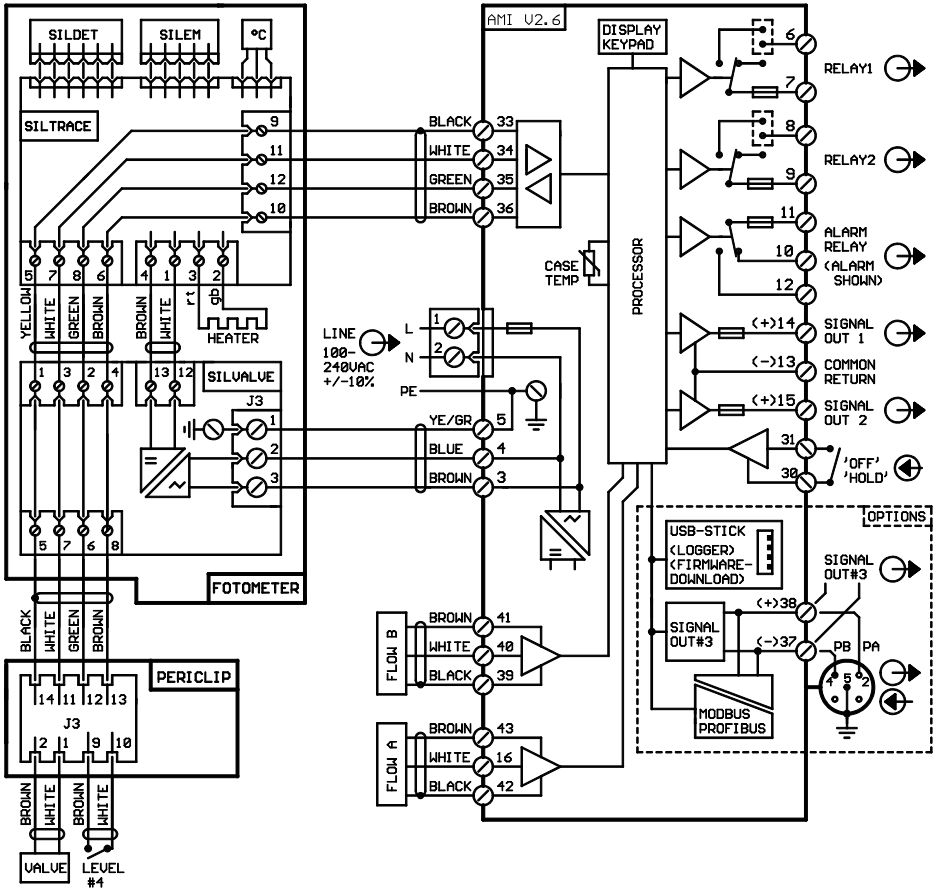
WARNING

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.

3.6.1 Connection Diagram



CAUTION

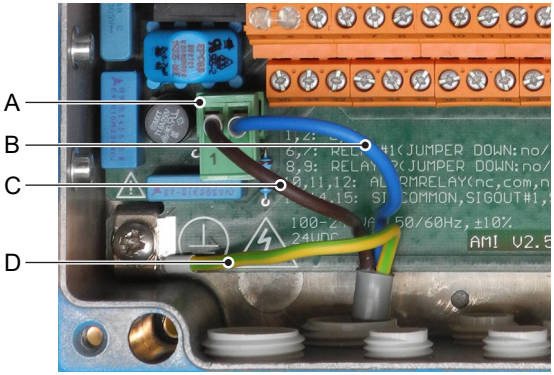
Use only the terminals shown in this diagram, and only for the mentioned purpose. Use of any other terminals will cause short circuits with possible corresponding consequences to material and personnel.

3.6.2 Power Supply

WARNING

Electrical shock hazard

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



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

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

Installation requirements

The installation must meet the following requirements.

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

3.7. Relay Contacts

3.7.1 Input

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

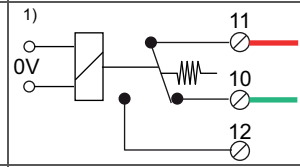
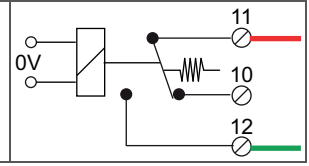
Terminals 30/31
For programming see Program List and Explanations, p. 84.

3.7.2 Alarm Relay

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

Alarm output for system errors.
Error codes see Troubleshooting, p. 62.

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.	

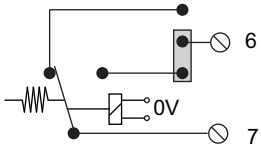
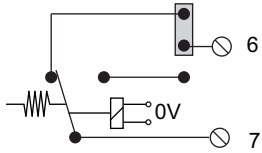
1) *usual use*

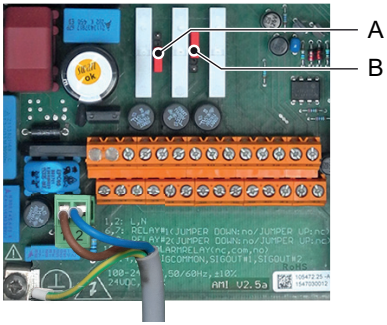
3.7.3 Relay 1 and 2

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

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

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

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



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

For more information see Program List and Explanations, p. 84.

CAUTION

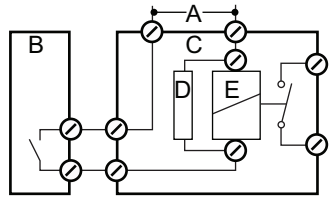
Risk of damage of the relays in the AMI Transmitter due to heavy inductive load.

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

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

Inductive load

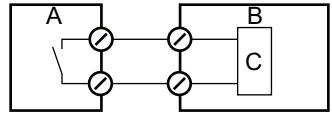
Small inductive loads (max 0.1 A) as for example the coil of a power relay can be switched directly. To avoid noise voltage in the AMI Transmitter it is mandatory to connect a snubber circuit in parallel to the load.
A snubber circuit is not necessary if an AMI relaybox is used.



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

Resistive load

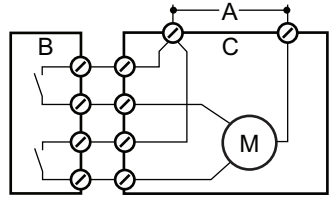
Resistive loads (max. 1 A) and control signals for PLC, impulse pumps and so on can be connected without further measures



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

Actuators

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



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

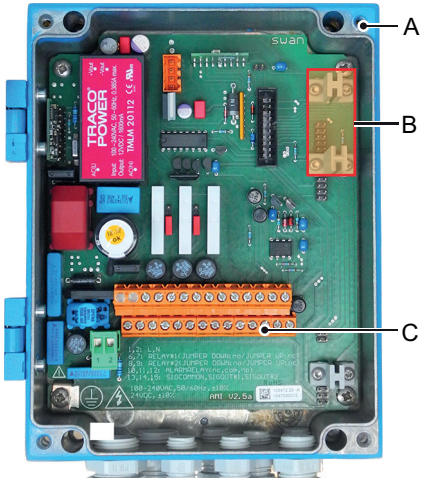
3.8. Signal Outputs

3.8.1 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. 84, Menu Installation.

3.9. Interface Options



A *AMI Transmitter*
B *Slot for interfaces*
C *Screw terminals*

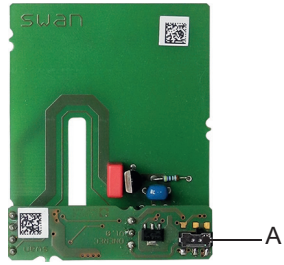
The slot for interfaces can be used to expand the functionality of the AMI instrument with either:

- an additional signal output
- a Profbus or Modbus connection
- a HART interface
- an USB Interface

3.9.1 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.*



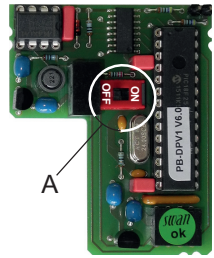
Third signal output 0/4 - 20 mA PCB

A *Operating mode selector switch*

3.9.2 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.*

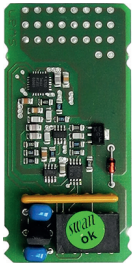


Profibus, Modbus Interface PCB (RS 485)

A *On - OFF switch*

3.9.3 HART Interface

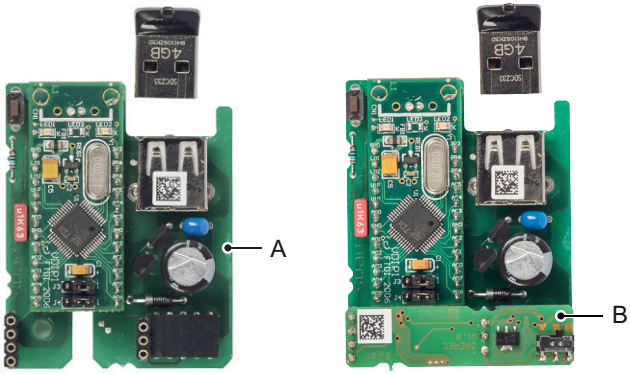
Terminals 38 (+) and 37 (-).
The HART interface PCB allows for communication via the HART protocol. For detailed information, consult the HART manual.



HART Interface PCB

3.9.4 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. Start-up Procedure

The following table lists all necessary steps for a successful commissioning of the AMI Silitrace Ultra. Additionally, the expected result and corrective actions are specified for each step.

Note: *It is important to verify the result of each step before proceeding with the next step. We recommend to work exactly in the order given in the table.*

Prerequisites Analyzer has been mounted, connected to the sample and waste line and connected to power (see Installation, p. 18).

Step	Expected result	Corrective action
Prepare reagents 🗎 39, Prepare standard 🗎 39	n/a	n/a
Switch on power 🗎 41	◆ The AMI transmitter starts up ◆ The main screen is displayed	◆ Check electrical wiring ◆ Check fuses
Adjust sample flow 🗎 41 (the concentration factor should be between 30 and 40).	◆ The flow is indicated on the main screen	◆ Check sample line ◆ Check wiring of flow sensors
Activate the peristaltic pump 🗎 42, fill system 🗎 42	◆ The tubes are filled ◆ The liquid moves with a speed of approximately 1 cm every 5 s	◆ Tighten connections to the pump tubes ◆ Check if occlusion frames are snapped properly ◆ Check if occlusion frames and pump tubes are aligned in a 90° angle to the rotor.
Programming 🗎 42	n/a	n/a

Step	Expected result	Corrective action
Let the system run for at least one hour	◆ Flow rates for concentrate and permeate are stable.	◆ Ensure stable flow conditions ◆ Allow more time for the membrane to run in
Resolve all pending errors	◆ No errors are displayed	◆ See 🗎 62
Visual check of the reaction chamber 🗎 43	◆ No air bubbles in the reaction chamber	◆ Tighten all tube connections
Check photometer raw value 🗎 44	◆ The photometer's raw value follows a fill/empty pattern ◆ While the photometer is being filled, an unstable raw value is normal ◆ Once the cuvette is completely filled, the raw value must remain stable	◆ Cuvette blocked ◆ Cuvette not snapped completely
Check P2P period 🗎 45	◆ P2P period is different from "0 Sec"	◆ Wait until the system is free from air bubbles. ◆ Wait until the cuvette has been emptied twice
Perform a background calibration 🗎 45	◆ Background calibration is successful	◆ Ensure stable flow conditions ◆ Allow more time for the membrane to run in ◆ See 🗎 66.
Perform a zero measurement 🗎 45	◆ The raw value is close to 2.2 V	◆ Clean cuvette / flush system with ammonia solution 🗎 61 ◆ Perform a cuvette factor determination 🗎 89 ◆ Check if the zero calibration valve is switching ◆ See 🗎 66.

Step	Expected result	Corrective action
Compare the raw values of the zero measurement and the background calibration.	◆ The raw value of the zero measurement is higher than or equal to the raw value of the background calibration	◆ Ensure stable flow conditions ◆ Allow more time for the membrane to run in ◆ See 66.
Perform a standard calibration 54	◆ The calibration factor is between 0.5 and 2.0	◆ Check programmed concentration of standard ◆ Repeat calibration with fresh standard solution

4.2. Prepare reagents

See Refill or replace Reagents, p. 51.

4.3. Prepare Standard

Following standard solutions are available:
- 100 ppb standard in a 250 ml bottle
- 100 ppm stock solution in a 100 ml bottle

Standard 100 ppb

Ready for use.

Stock solution 100 ppm

From the stock solution you can produce your own standard. Standards from 10 to 1000 ppb can be used for the AMI Silitrace Ultra SWAN does not recommend to mix your own standard!
By default the instrument is programmed for a standard of 100 ppb.

Note: *If you prepare a standard different from 100 ppb, program the standard concentration in menu <Installation>/<Sensors>/<Meas. Parameters>/<Cal./Verif.>/<Standard>.*

Make the following dilution to obtain a standard of 100 ppb:

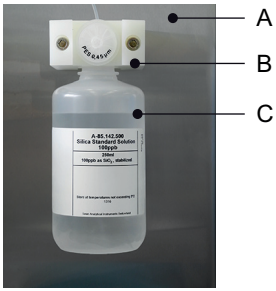
1. Put a 250 ml bottle on to a balance, set balance to 0 g.
2. Fill in 250 µg stock solution 100 ppm.
3. Fill up to 250 g with demineralized water.
4. Mark the bottle with the correct concentration.
5. Program the instrument accordingly, see 5.1.1.1.1, p. 91

Standard consumption

During a calibration or verification approximately 15 ml standard is consumed. Therefore a standard bottle lasts for 3 months at default interval settings.
The default interval settings are:

Start time:	06:00:00
Monday:	Verification
All other days:	Off

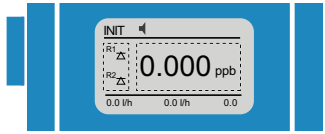
Screw the standard bottle [C] to the bottle holder [B].



A *Panel*
B *Bottle holder*
C *Standard bottle*

4.4. Switch on Power

Open the sample tap and switch on the instrument.

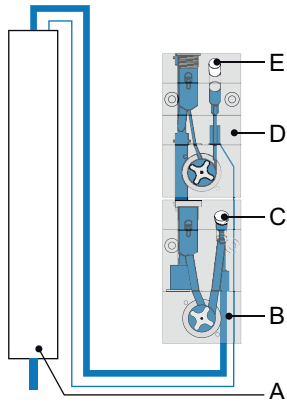


After switching on, the instrument starts to warm up the reaction chamber. During the warm-up phase, the display shows <INIT> and alarm E008 is active.

> ***Note:*** *The duration of the warm-up phase depends on the ambient temperature at the operating site.*

After the reaction chamber has reached its operating temperature, the instrument changes to <RUN> and is ready for operation.

4.5. Adjust Sample Flow



A *Concentrator*
B *Flow cell high flow*
C *Blind plug*
D *Flow cell low flow*
E *Flow regulating valve*

1 Adjust the main flow so that the concentration factor lays between 30 and 40. This should be possible with a flow permeate of 130 l/h and a flow concentrate of 3 l/h.

> ***Note:*** *Detection limits in the low ppt range are only achieved with a concentration factor of 35 and more.*

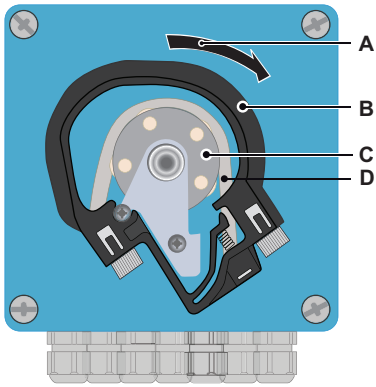
2 If there is not enough flow available, adjust the flow regulating valve [E] to about 3 l/h.

4.6. Activate the Peristaltic Pump

The occlusion frames of the peristaltic pump are opened during transport and storage. This prevents the pump tubes from sticking together at the pressure points.

1 Turn the occlusion frame [B] clockwise to activate the peristaltic pump.

Note: *Make sure the occlusion frames and pump tubes are aligned in a 90° angle to the rotor.*



A *Turn to lock*
B *Occlusion frame*
C *Rotor*
D *Pump tube*

Fill system Select <Maintenance>/<Service>/<Fill system>. This activates the reagent pump and fills all tubes from the container to the cuvette outlet.

4.7. Programming

Program all parameters for external devices (interface, recorders, etc.). Program all parameters for instrument operation (limits, alarms). See Program List and Explanations, p. 84.

4.8. Run-in period

Once the sample flow is adjusted, let the instrument run in for at least one hour.

Note: *This time is needed to have stable flow and concentration allocation in the membrane. Any variation of the input sample flow as well as pressure shifts will disturb that process.*

4.9. Final Tests

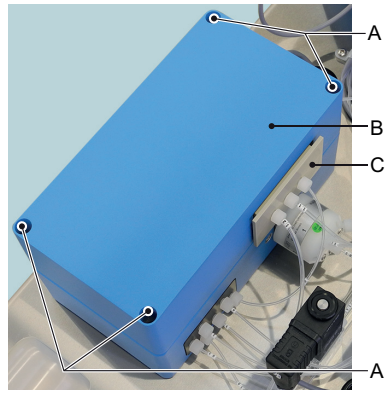
Pending errors

Resolve all pending errors, see Troubleshooting, p. 62.

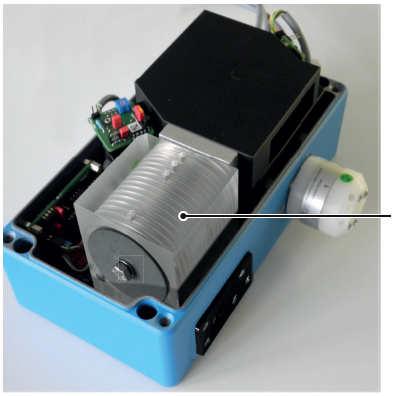
Visual check of reaction chamber

Carefully pull out the cuvette [C] from the photometer module and open the cover [B]. Check that there are no air bubbles in the reaction chamber [D].
If this check fails:

- check if all tube connections are tight



A *Cover fixing screws*
B *Photometer module cover*
C *Cuvette*

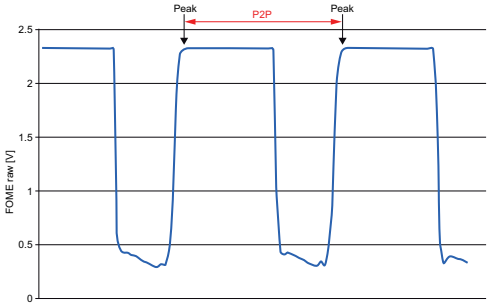


D *Reaction chamber*

Close the cover again and snap in the cuvette.

Photometer raw value

Select <Diagnostics>/<Sensors>/<SilTrace>/<Photometer>. Check if the photometer raw value follows a fill/empty pattern, see example below:



While the cuvette is being filled, an unstable raw value is normal. Once the cuvette is completely filled, the raw value must remain stable.
If this check fails:

- check if the cuvette is blocked
- check if the cuvette is snapped in properly

P2P Cycle

Select <Diagnostics>/<Sensors>/<Cycle diagnostics>.
Check if the analyzer has already performed a valid measuring cycle. This is recognizable by a P2P period different from “0 Sec”.
If this check fails:

- wait until all air bubbles have left the system
- wait until the cuvette has been emptied twice

Background Calibration

Manually start a background calibration.
If the background calibration fails:

- ensure stable flow conditions
- let the membrane run in longer and try again.

Zero measurement

Manually start a zero measurement, then review the raw value in <Diagnostics>/<Sensors>/<History>/<Zero History>. The raw value must be close to 2.2 V.
If this check fails:

- check if the zero calibration valve is switching (reagent 1 should be led into the waste during a zero calibration)
- clean the photometer using an ammonia solution (see Clean the Photometer, p. 61)
- perform a cuvette factor determination (see 3.5.3, p. 89)

Next, review the raw value of the background calibration in <Diagnostics>/<Sensors>/<History>/<Background History>. The raw value of the zero measurement must be higher than or equal to the raw value of the background calibration.
If this check falis:

- ensure stable flow conditions
- let the membrane run in longer and try again.

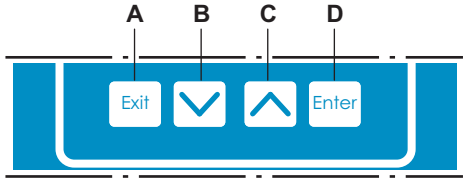
Standard Calibration

Manually start a standard calibration (Calibration, p. 54), then review the calibration factor in <Diagnostics>/<Sensors>/<Cal. History>. The calibration factor must be between 0.5 and 2.0.
If this check fails:

- check if the programmed concentration matches the reference value of the standard solution used
- repeat calibration with a fresh standard solution

5. Operation

5.1. Keys



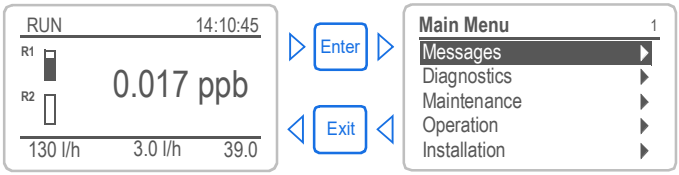
A *to exit a menu or command (rejecting any changes)*
to move back to the previous menu level

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

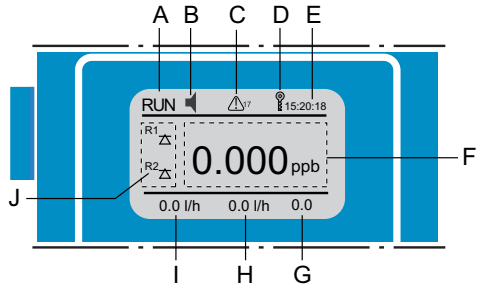
C *to move UP in a menu list and to increase digits*

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 Reagent low, indicates remaining reagents in % (17% = 340 ml)

D Keys locked, transmitter control via Profibus

E Time

F Process values

G Concentration factor

H Flow concentrate

I Flow permeate

J 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

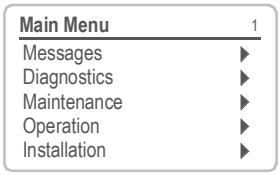
motor valve closed

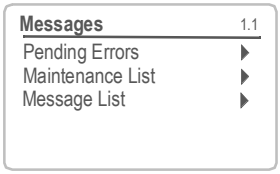
motor valve: open, dark bar indicates approx. position

timer

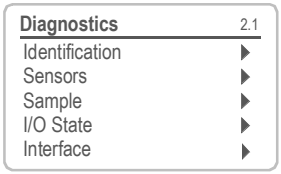
timer: timing active (hand rotating)

5.3. Software Structure

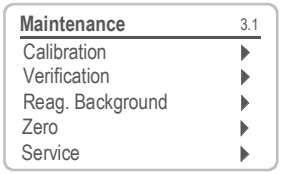




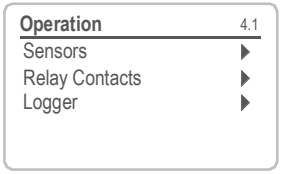
Menu **Messages 1**
Reveals pending errors as well as an event history (time and state of events that have occurred at an earlier point of time).
It contains user relevant data.



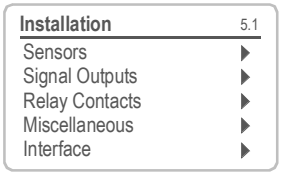
Menu **Diagnostics 2**
Provides user relevant instrument and sample data.



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.

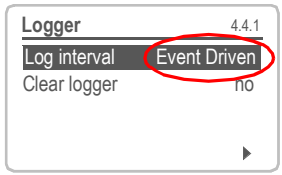


Menu **Installation 5**
For initial instrument set up by SWAN authorized person, to set all instrument parameters. Can be protected by means of password.

5.4. Changing Parameters and values

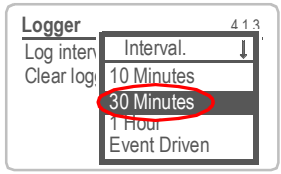
Changing parameters

The following example shows how to change the logger interval:



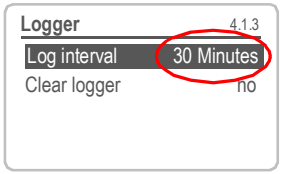
1 Select the parameter you want to change.

2 Press [Enter]



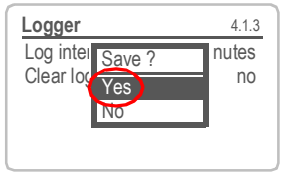
3 Press [▲] or [▼] key to highlight the required parameter.

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



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

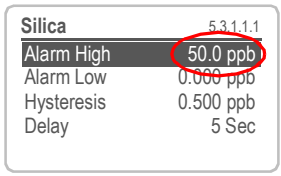
5 Press [Exit].



⇒ *Yes is highlighted.*

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

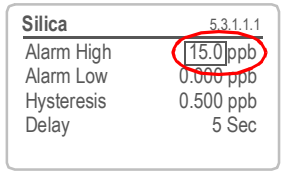
Changing values



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

6.1. Maintenance Table

Monthly	Replace reagents.
Every 2–3 months	Check standard solution and exchange if necessary.
Semiannual	Exchange reagent pump tubes. Perform a calibration after exchanging the pump tubes.
By occurrence	E020,FOME dirty. Clean the Photometer with 5% NH_3 solution, see Clean the Photometer, p. 61.

Note: *A verification is performed automatically each week, programmed by default on Monday at 06:00 AM. Make sure that a standard bottle containing sufficient standard solution is connected.*

6.2. Stop of Operation for Maintenance

The prepare maintenance function will flush the complete analyzer with water. It is recommended to start this function before starting any maintenance.

1. Start <prepare maintenance>.
2. Follow the instruction on the display.
   (Put suction lances into a bucket with high purity water).
3. Wait until the peristaltic pump has stopped.
4. Stop sample flow.
5. Put suction lances into an empty bucket
6. Shut off power of the instrument.

6.3. Refill or replace Reagents

The liquid level in container 4 is monitored. The following messages are displayed:

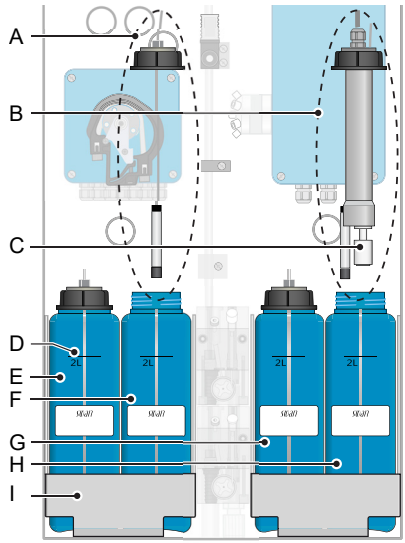
Container almost empty	Maintenance E065 - Reagents low and the remaining reagent volume in % (starting at 17 % = 340 ml).
Container empty	Error E022 - Reagent empty

WARNING

Health hazard

- For safe handling of the reagents you must read and understand the Material Safety Data Sheets (MSDS).
- Only persons trained in handling dangerous chemicals are allowed to prepare the reagents.

Canister setup



A *Suction lance without level detector (containers 1-3)*
B *Suction lance with level detector (container 4)*
C *Level detector*
D *2 L mark*
E *Reagent container 1*
F *Reagent container 2*
G *Reagent container 3*
H *Reagent container 4*
I *Holder*

Reagent consumption

Each 2 liter reagent canister will last for approximately 1 month of operation.

Note: *Excessive use of the flush/fill function or frequent flow interruptions will shorten this period.*

Contents of the reagent set

Reagent 1: Bags 1a and 1b for Canister 1
ammonium molybdate and sodium hydroxyde

Reagent 2: Bottle 2 for Canister 2
sulfuric acid 25%

Reagent 3: Bag 3 for Canister 3
oxalic acid dihydrate

Reagent 4: Bag 4a and bottle 4b for Canister 4
ammonium ferrous sulfate hexahydrate
sulfuric acid 25% containing detergent

Reagent filters (12x)

Note: *Never use concentrated sulfuric acid that has been filled into glass bottles.*

Personal protective equipment:

Reagent 3:
H302: Harmful if swallowed
H312: Harmful in contact with skin
H315: Causes skin irritation.
H318: Causes serious eye damage.
H373: May cause damage to organs through prolonged or repeated exposure.

Reagent 4a:
H315: Causes skin irritation
H319: Causes serious eye irritation
H335: May cause respiratory irritation

Reagent 1b, Reagent 2, Reagent 4b:
H314: Causes severe skin burns and eye damage

Preparation

Note: *Please consider the following two points when preparing new reagents:*

- *Reagent 3, Oxalic Acid dissolves very slowly, we therefore recommend to prepare Reagent 3 first.*
- *Reagent 1, add Sodium hydroxide (Reagent 1b) first.*
- *Before refilling rinse all containers well with demineralized water.*

Reagent 3

1 Fill canister 3 with approx. 1.5 liters of ultrapure water.
2 Add reagent 3 to canister 3.
3 Close the canister with a screw cover and shake well.
4 Fill up the canister to the 2 L mark, close it and shake again.

Reagent 1

1 Fill canister 1 with approx. 1.5 liters of ultrapure water.
2 First add the content of bag 1b (sodium hydroxyde).
3 Close the canister with a screw cover and shake well until the sodium hydroxyde is dissolved.
4 Add the content of bag 1a.
5 Fill up the canister to the 2 L mark, close it and shake again.

Reagent 2

1 Fill canister 2 with approx. 1.5 liters of ultrapure water.
2 Add the bottle 2 (sulfuric acid 25%).
3 Close the canister with a screw cover and shake well.
4 Fill up the canister to the 2 L mark, close it and shake again.

Reagent 4

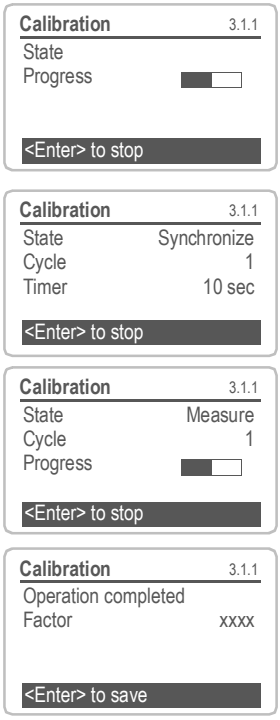
1 Fill canister 4 with approx. 1.5 liters of ultrapure water.
2 First add bag 4a.
3 Close the canister with a screw cover and shake well.
4 Add bottle 4b. Rinse the residual foam in bottle 4b with ultrapure water and fill it into the canister until the 2 L mark is reached.
5 Close the canister with a screw cover and shake well.
⇒ *Some foam forms on the surface.*

All canisters
Always replace the reagent filters (included with each reagent set) when preparing new reagents.
Insert suction lances into the containers. Make sure that the numbers on the suction lances correspond to the numbers on the containers.

6.4. Calibration

Select Menu 3.1 <Maintenance>/<Calibration> and follow the instructions on the display.
Relay status during calibration:

- Signal outputs are on hold
- All limits are switched off

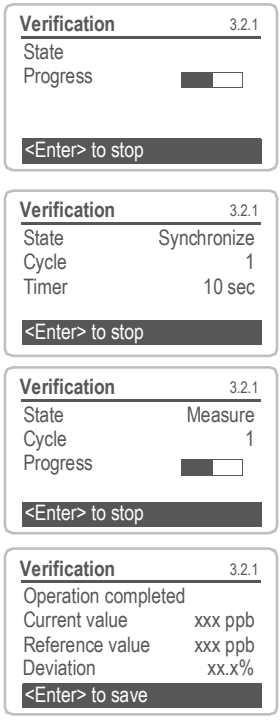


Press [Enter] to save the value in the calibration history or leave the menu with [Exit].

6.5. Verification

Select Menu 3.2 <Maintenance>/<Verification> and follow the instructions on the display.
Relay status during calibration:

- Signal outputs are on hold
- All limits are switched off

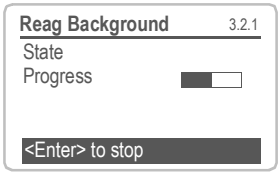


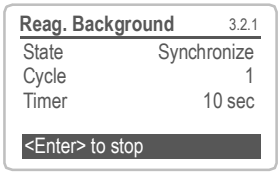
Press [Enter] to save the value in the verification history or leave the menu with [Exit].

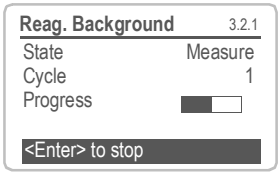
6.6. Background

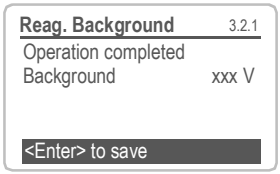
Select Menu 3.3 <Maintenance>/<Reag.Background> and follow the instructions on the display.
Relay status during calibration:

- Signal outputs are on hold
- All limits are switched off







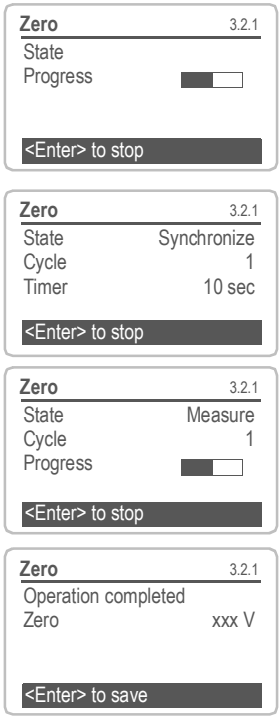


Press [Enter] to save the value in the background history or leave the menu with [Exit].

6.7. Zero

Select Menu 3.4 <Maintenance>/<Zero> and follow the instructions on the display.
Relay status during calibration:

- Signal outputs are on hold
- All limits are switched off



Press [Enter] to save the value in the zero history or leave the menu with [Exit].

6.8. Replace the Pump Tubes

The pump tube [D] of the peristaltic pump is exposed to a minimal wear. It is therefore recommended to exchange the pump tube semi-annually.

Note: *it is highly recommended to replace all pump tubes at once. Replacement of only one pump tube may lead to uneven dosing.*

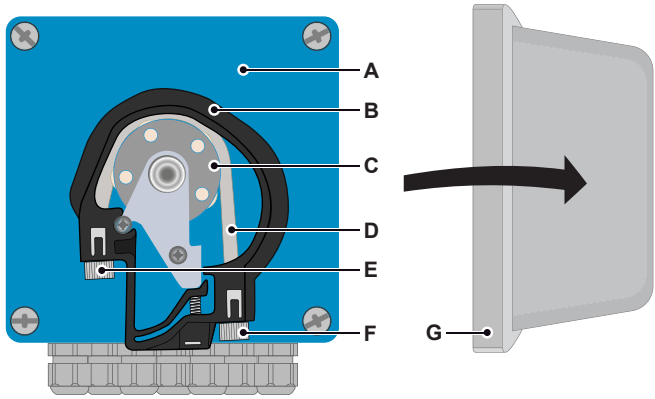
CAUTION

Pollution of reagents possible.

If the occlusion frames are opened during operation, already mixed reagents will flow back into the reagent canisters and pollute the reagents.

- Never open the occlusion frames if the instrument is in operation.
- Proceed according to Stop of Operation for Maintenance, p. 50 before opening the occlusion frames.

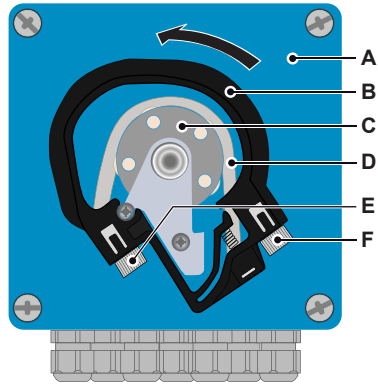
Overview



A *Pump housing*
B *Occlusion frame closed*
C *Rotor*
D *Pump tube*
E *Pump inlet*
F *Pump outlet*
G *Protection cap*

Dismount pump tubes

The pump tubes can easily be dismounted and mounted. Proceed as follows:



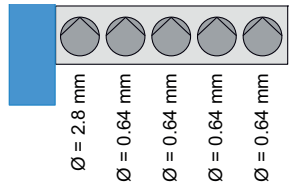
A *Pump housing*
B *Occlusion frame open*
C *Rotor*
D *Pump tube*
E *Pump inlet*
F *Pump outlet*

1. Switch off the instrument according to instructions in Stop of Operation for Maintenance, p. 50.
2. Remove the protection cap.
3. Open the occlusion frames [B] by turning them counter-clockwise.
4. Remove the pump tubes [D] from the rotor [C] by pulling the complete occlusion frames [B] out of the holder.

Install new pump tubes

1. Disconnect the reagent tubes from the old pump tubes and connect them to the new pump tubes.
2. Install the new pump tubes by pushing the occlusion frames onto the holder.

   Note: *Consider that the tube nearest to the housing (sample tube) has a diameter of 2.8 mm. All other tubes have a diameter of 0.64 mm.*



3 Lock the occlusion frames. Check that the occlusion frames and the tubes are aligned perpendicular to the axis of the rotor.

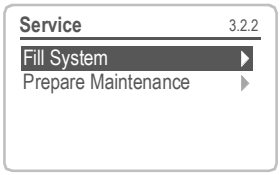
4 Insert the suction lances into the corresponding containers.

5 Start the <Fill system> function.

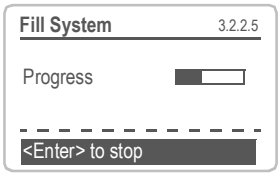
6.9. Fill system

Fill the reagent tubing:

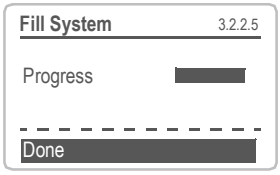
- at first start-up
- after refilling the reagent containers
- after replacing the pump tubes



Navigate to menu< Maintenance / Service/Fill system>.
Press [Enter].



The peristaltic pump is activated for 1.5 minutes.



Press [Exit] 4 times to return to the operating display mode.

6.10. Clean the Photometer

To clean the photometer, flush it with 5% ammonia solution.

CAUTION

If the optional degassing membrane is installed, it must be bypassed during flushing with ammonia solution. Otherwise, the membrane will be damaged.

1. Fill a beaker with 5% ammonia solution.
2. Place all suction lances in the beaker.
3. Navigate to menu <Maintenance>/<Service>/<Fill system>.
4. Press [Enter].

6.11. Longer Stop of Operation

1. Proceed according to chapter Stop of Operation for Maintenance, p. 50.
2. Relax the occlusion frames of the Peristaltic pump.
   See Replace the Pump Tubes, p. 58.

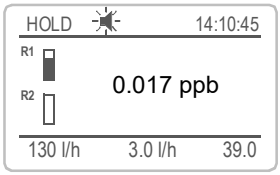
7. Troubleshooting

7.1. Error List

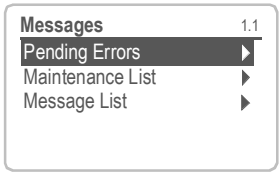
Error
Non-fatal Error. Indicates an alarm if a programmed value is exceeded. Such Errors are marked **E0xx** (bold and black).

Fatal Error (blinking symbol)
Control of dosing devices is interrupted.
The indicated measured values are possibly incorrect.
Fatal Errors are divided in the following two categories:

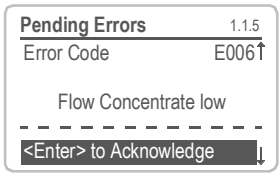
- Errors which disappear if correct measuring conditions are recovered (i.e. Sample Flow low).
  Such Errors are marked **E0xx** (bold and orange)
- Errors which indicate a hardware failure of the instrument.
  Such Errors are marked **E0xx** (bold and red)



Error or fatal Error
Error not yet acknowledged.
Check **Pending Errors 1.1.5** and take corrective action.



Navigate to menu <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	Silica high	– Check process – Check programmed value, see 5.3.1.1.1, p. 96
E002	Silica low	– Check process – Check programmed value, see 5.3.1.1.22, p. 96
E003	Flow permeate high	– Check inlet pressure – Re-adjust sample flow – Check programmed value, see 5.3.1.2.2.1, p. 97
E004	Flow permeate low	– Check inlet pressure – Re-adjust sample flow – Check programmed value, see 5.3.1.2.2.22, p. 97
E005	Flow concentrate high	– Check inlet pressure – Re-adjust sample flow – Check programmed value, see 5.3.1.2.3.1, p. 97
E006	Flow concentrate low	– Check inlet pressure – Re-adjust sample flow – Check programmed value, see 5.3.1.2.3.22, p. 97
E007	Silitr. Temp. high	– Call service

E008	Silitr. Temp. low	***Note:*** *Depending on the circumstances under which this error occurs, it either disappears automatically as soon as correct measurement conditions are established or it must be actively acknowledged.*
		– If the error occurs when starting up:
		  – In this case usually no action is necessary. Just wait until the photometer has heated up and the error disappears automatically. At room temperature this takes about 20 minutes.
		  – If the error does not disappear after this time, continue with the steps described below.
		– If the error occurs during operation:
		  – Check whether one or more fatal errors (marked in red and orange in this list) are present. These errors cause the heater to be switched off.
		  – Eliminate the causes and acknowledge all fatal errors.
		  – To restart the heating, also acknowledge error E008.

Error	Description	Corrective action
E011	Absorbance too high	– Check process – Check tube connections for air leakages
E012	Temp. Timeout	– Check ambient temperature (min 5°C) – Close the photometer lid – Heater defective, call service.
E013	Case Temp. high	– Check case/environment temperature – Check programmed value, see 5.3.1.3, p. 97
E014	Case Temp. low	– Check case/environment temperature – Check programmed value, see 5.3.1.4, p. 97
E015	Pump Speed high	– Flow in reaction coil too slow – Check tubes for air leakages – Replace pump tubing, see Replace the Pump Tubes, p. 58
E016	Pump Speed low	– Flow in reaction coil too fast – Check PeriClip pump tubing (tube sizes) – Check tube connections
E017	Control Timeout	– Check control device or programming in Installation, Relay contact, Relay 1 and 2 see 5.3.2 and 5.3.3, p. 98
E018	Reagent Pump	– Check cable connection – Check PeriClip version (Diagnostic/Identification/ Periphery) – Call service
E019	Siltrace	– Check cable connection – Check Siltrace version (Diagnostic/Identification/ Periphery) – Call service
E020	FOME dirty	– Cuvette dirty – Clean cuvette lenses with a tissue – Replace cuvette, see Replace the Cuvette, p. 71.

Error	Description	Corrective action
E021	Signal Timeout	– Unsuccessful peak detection can be caused by: ◆ interrupted light path ◆ no water/too much air in the reaction chamber – Check if reaction chamber is clogged, replace it if necessary, see Replace the Reaction Chamber, p. 67. – Check position of the cuvette (make sure that it is pushed into the slot as far as it will go – Check tube connections
E022	Reagent empty	– Refill reagents, see Refill or replace Reagents, p. 51
E024	Input active	– No action necessary – This message is displayed if “Fault=Yes” is programmed, see 5.3.4, p. 102
E025	Rovalve (6-way valve)	– Check cable connection, see Connection Diagram, p. 29 – Replace the 6-way valve, see Replace the 6-Way Valve, p. 69
E026	IC LM75	– call service
E028	Signal output open	– check wiring on signal outputs 1 and 2
E030	EEProm Fron-tend	– call service
E031	Cal. Recout	– call service
E032	Wrong Frontend	– call service
E033	Power-on	– none, normal status
E034	Power-down	– none, normal status

7.2. Troubleshooting List

Background calibration fails

Problem	Possible Reasons
Stability criteria not reached after 16 cycles	◆ Air in the reaction coil ◆ Loose tube connections ◆ Reagent consumption unequal between canisters (positioning of PeriClip pump's occlusion frames) ◆ Poor run-in time of the membrane
Time-out error	No peak found during 600 s ◆ Check peristaltic pump ◆ Check tube connections ◆ Check position of cuvette

Zero calibration fails

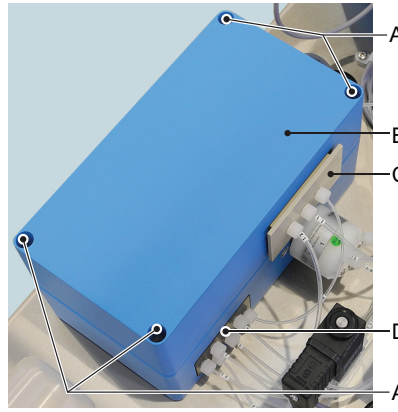
Problem	Possible Reasons
Stability criteria not reached after 16 cycles	◆ Air in the reaction coil ◆ Loose tube connections ◆ Reagent consumption unequal between canisters (positioning of PeriClip pump's occlusion frames) ◆ Check if reagent 1 flows to the drain
Time-out error	No peak found during 600 s ◆ Check peristaltic pump ◆ Check tube connections ◆ Check position of cuvette

Zero smaller than background

Problem	Possible Reasons
Zero is smaller than background	◆ Zero calibration outdated ◆ Magnetic valve defective ◆ Poor membrane performance ◆ Poor run-in time of the membrane

7.3. Replace the Reaction Chamber

Replacing the reaction chamber may be necessary if:
Error 12, <Temp. time out> is shown.
Error 21 <Signal time out> is shown.



A *Cover fixing screws*
B *Photometer module cover*
C *Cuvette*
D *Connection panel*

To replace the reaction chamber proceed as follows:

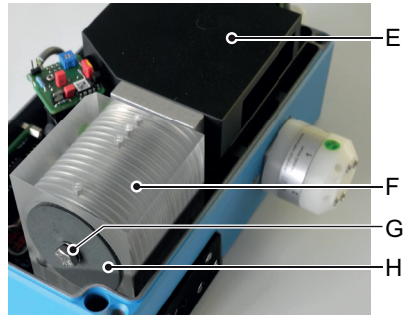
1 Shut down the Instrument according to Stop of Operation for Maintenance, p. 50.

2 Pull the cuvette [C] out of the photometer unit.

3 Remove all tube connections from the connection panel [D].

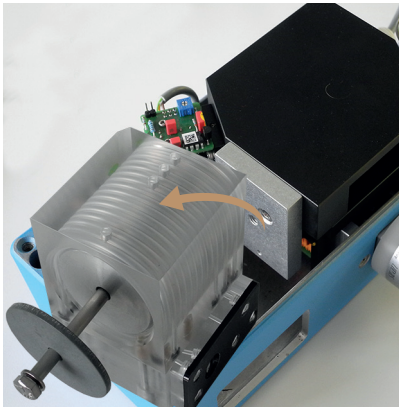
4 Unscrew and remove the 4 cover fixing screws [A].

5 Remove the cover [B] from the photometer unit.



E *Cuvette housing*
F *Reaction chamber*
G *Fixing screw*
H *Insulating disc*

6 Loosen the fixing screw [G] of the reaction chamber.



7 Remove the reaction chamber from the photometer housing.

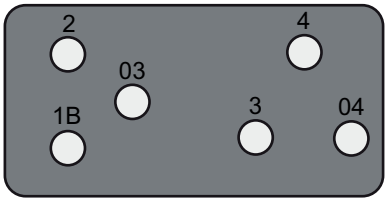
Install the new mixing unit

1 Insert the new reaction chamber into the photometer housing and tighten the fixing screw [G].

2 Put the cover [B] onto the photometer unit and tighten the 4 cover fixing screws [A].

3 Push the cuvette into the slot of the cuvette housing.

4 Connect all tubes to the connection panel according to the diagram below.



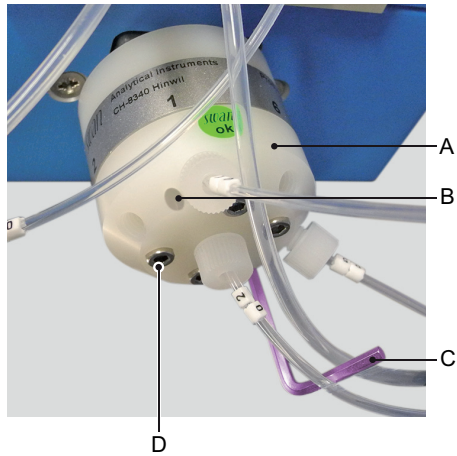
7.4. Replace the 6-Way Valve

CAUTION

Never loosen the 4 allen screws [D] visible on the 6-way valve body.

Remove the 6-way valve

Replacing the 6-way valve may be necessary if error 25, <Rovalve> is shown.

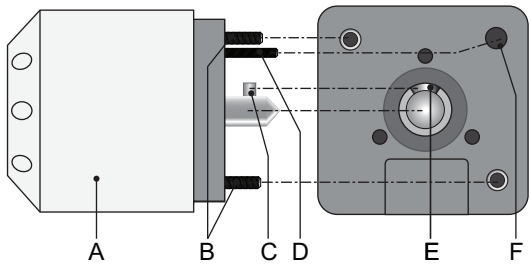


A *6-way valve body*
B *Fixing screw*
C *Allen key 2.5 mm*
D *Valve screws*

To remove the 6-way valve from the housing proceed as follows:

1. Shut down the Instrument according to Stop of Operation for Maintenance, p. 50.
2. Disconnect all tubes from the 6-way valve.
3. Disconnect all blind plugs from the 6-way valve.
4. Unscrew the fixing screws [B] with the allen key [C].
5. Remove the 6-way valve.

Install the 6-way valve



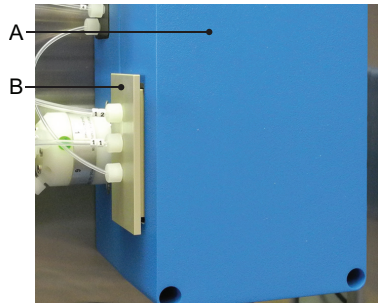
A *Blind plug*
B *6-way valve*
C *Fixing screw*
D *Valve shaft with driving pin*
E *Positioning screw*
F *Driving slot*
G *Guiding hole*

Seal all unused Inputs with the enclosed blind plugs [A]. Proceed as follows:

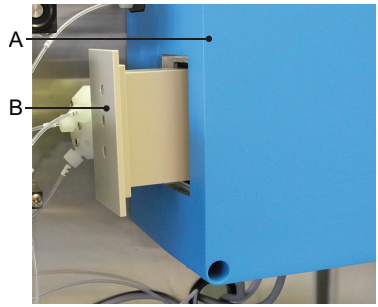
1. Make sure that the valve shaft with driving pin [D] is aligned with the driving slot [F].
2. Install the 6-way valve so that the valve shaft with driving pin fits into the driving slot of the motor shaft and the positioning screw [E] fits into the guiding hole [G].
3. Attach the 6-way valve with the fixing screws [C] to the valve housing, use the enclosed 2.5 mm Allen key.
4. Fit all tubes to the corresponding outputs/inputs of the 6-way valve [B], see Replace the Reagent Tubes, p. 72.
5. Screw the blind plugs into the unused outputs (2, 3, 4) of the 6-way valve.
6. Switch on the instrument and select <Maintenance>/<Service>/<Fill System>.
7. Check all tube connections for leakage.

7.5. Replace the Cuvette

Replacing the cuvette may be necessary if:
Error 20 <FOME Dirty> is shown.



A *Photometer module*
B *Cuvette*



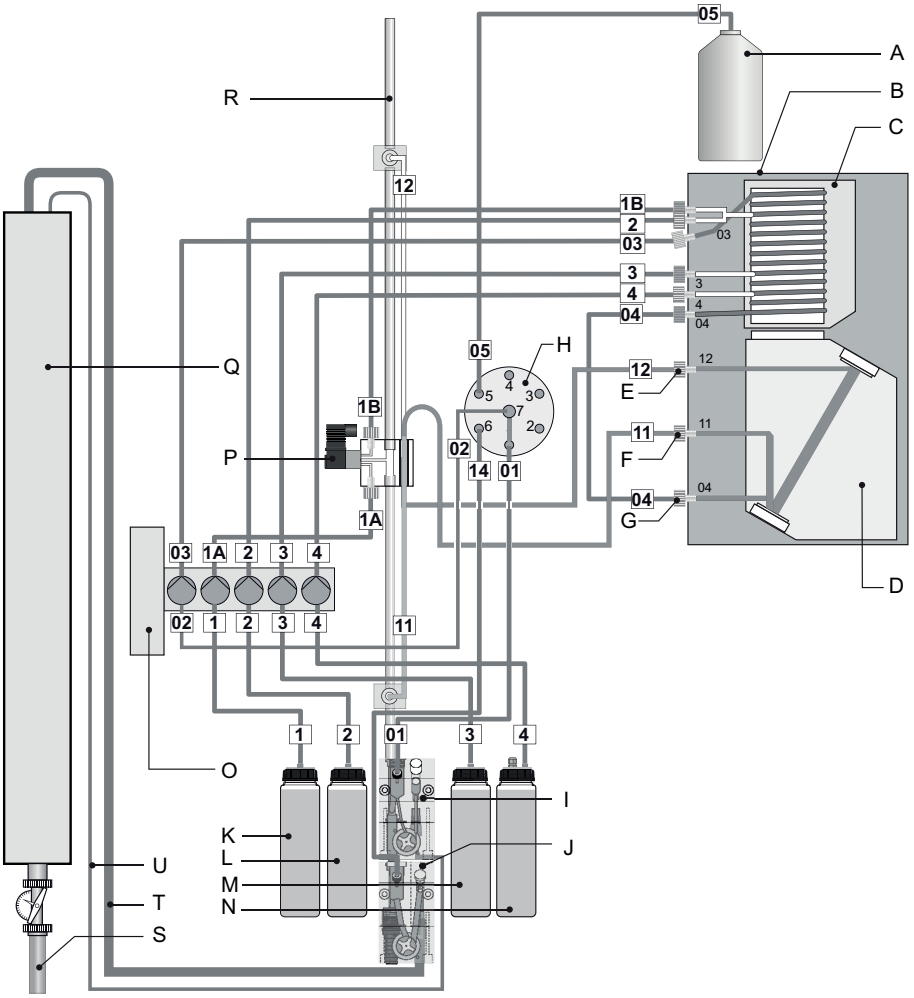
A *Photometer module*
B *Cuvette*

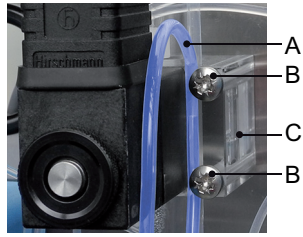
To exchange the cuvette proceed as follows:

1. Shut down the Instrument according to Stop of Operation for Maintenance, p. 50.
2. Remove all tubes from the cuvette.
3. Pull the cuvette out of the photometer module.
4. Push the new cuvette as far as it will go into the slot of the photometer module.
5. Connect all tubes to the cuvette, see Replace the Reagent Tubes, p. 72.
6. Switch on the instrument and select <Maintenance>/<Service>/<Fill System>.
7. Perform a cuvette factor determination, see 3.5.3, p. 89.

7.6. Replace the Reagent Tubes

Tube numbering



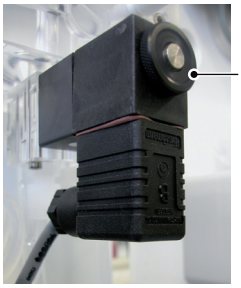
Nr.	from	to	Length
1	Canister 1 [K]	Peristaltic pump [O] inlet 2	1200 mm
2	Canister 2 [L]	Peristaltic pump [O] inlet 3	1200 mm
3	Canister 3 [M]	Peristaltic pump [O] inlet 4	1200 mm
4	Canister 4 [N]	Peristaltic pump [O] inlet 5	1200 mm
1A	Peristaltic pump [O] outlet 2	Solenoid valve [P] bottom	280 mm
1B	Solenoid valve [P] top	Reaction chamber [C] 1B	125 mm
2	Peristaltic pump outlet 3	Reaction chamber [C] 2	400 mm
3	Peristaltic pump outlet 4	Reaction chamber [C] 3	400 mm
4	Peristaltic pump outlet 5	Reaction chamber [C] 4	400 mm
01	Flow cell low flow [I]	6-way valve [H] 1	340 mm
14	Flow cell high flow [J]	6-way valve [H] 6	440 mm
02	6-way valve [H] 7	Peristaltic pump inlet 1 (diam.2.8)	340 mm
03	Peristaltic pump outlet 1	Reaction chamber [C] 03	400 mm
04	Reaction chamber [C] 04	Cuvette [D] 04	160 mm
05	Standard [A]	6-way valve [H] 5	720 mm
11	Cuvette [D] (Siphon tube) 	lower venting block Fix the siphon tube [A] with the two screws [B] to the lower venting block [C].	470 mm
12	Cuvette	upper venting block	300 mm

7.7. Cleaning the solenoid valve

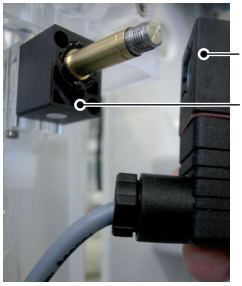
Disassemble the solenoid valve

The solenoid valve should be disassembled if it does not switch anymore or if it is clogged.

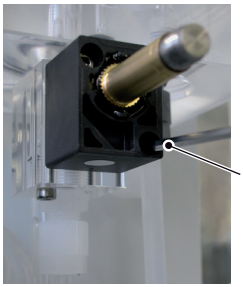
1 Switch off the instrument according to instructions in Stop of Operation for Maintenance, p. 50.



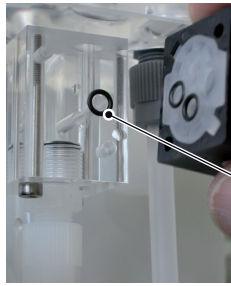
2 Loosen the nut (A).



3 Remove the solenoid coil (B) from the valve body (C).

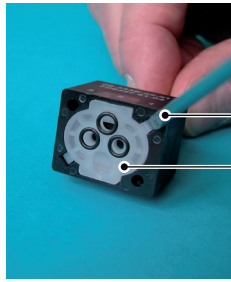


4 Loosen the fixing screws of the valve body with a 2.5 mm Allen key (D).

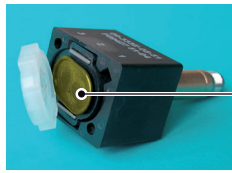


Note: *The O-rings inside the valve body may stick on the flow cell and fall down if the valve body is removed.*

5 Remove the valve body from the flow cell.



6 Remove the base plate (G) with a screw driver size 0 (F).



⇒*The membrane (H) is now visible.*

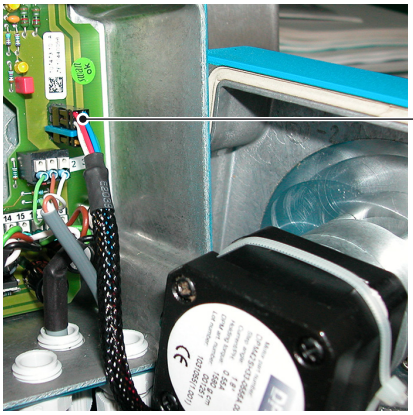
7 Clean base plate (G) and membrane (H) with clean water.

Assemble Assemble the solenoid valve in reverse order.

7.8. Opening the peristaltic pump housing

For some electrical connections (e.g. when replacing suction lances), it is necessary to open the housing of the peristaltic pump. To do this, proceed as follows:

1. Switch off the analyzer according to Stop of Operation for Maintenance, p. 50.
2. Remove the protection cap and all pump tubes as described in Dismount pump tubes, p. 59.
3. Unscrew the 4 screws of the peristaltic pump housing and remove the cover.
4. Disconnect the motor connector [A].



A *Motor connector*

5. Feed the cable into the housing through one of the PG7 cable glands.
6. Connect the cable to the terminal block of the peristaltic pump according to Connection Diagram, p. 29.
7. Reassemble in reverse order.

7.9. Replacing Fuses

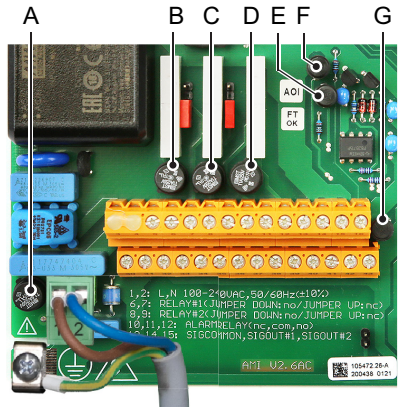
WARNING

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 *1.6 AT/250V Instrument power supply*
B *1.0 AT/250V Relay 1*
C *1.0 AT/250V Relay 2*
D *1.0 AT/250V Alarm relay*
E *1.0 AF/125V Signal output 2*
F *1.0 AF/125V Signal output 1*
G *1.0 AF/125V Signal output 3*

8. Program Overview

For explanations about each parameter of the menus see Program List and Explanations, p. 84.

- 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	1.2.1*	
Message List 1.3*	*Number*	1.3.1*	
	Date, Time		

8.2. Diagnostics (Main Menu 2)

Identification	Desig.	AMI Silitrace Ultra		* Menu numbers
2.1*	Version	V6.20-05/16		
	Peripherals	*PeriClip*		
	2.1.3*	*RoValve*		
		SiliTrace		
	Factory Test	*Instrument*	2.1.3.1*	
	2.1.4*	*Motherboard*		
	Operating Time	*Years / Days / Hours / Minutes / Seconds*		2.1.4.1*
	2.1.5*			
Sensors	**SilTrace**	*Temp.*		
2.2*	2.2.1*	*PWM*		
		Photometer	*Current value*	2.2.1.3.1*
		2.2.1.3*	*(Raw value)*	2.2.1.3.2*
			Absorbance	2.2.1.3.3*
			FOME Mean	2.2.1.3.4*
	Miscellaneous	Case Temp.	2.2.2.1*	
	2.2.2*	State Machine	2.2.2.2*	
	History	**Zero History**	*Number*	2.2.3.1.1*
	2.2.3*	2.2.3.1*	*Date, Time*	
			Zero	
		Cal. History	*Number*	2.2.3.2.1*
		2.2.3.2*	*Date, Time*	
			Factor	
		Ver. History	*Number*	2.2.3.3.1*
		2.2.3.3*	*Date, Time*	
			Meas. Value	
			Reference value	
			Deviation	
		Background History	*Number*	2.2.3.4.1*
		2.2.3.4*	*Date, Time*	
			Background	
			Conc Factor	
	Cycle diagnostics	*P2P period*		
	2.2.4*	*P2P counter*		
		Pump speed		
		Adjust cycle		

Sample	*Sample ID*	2.3.1*		* Menu numbers
2.3*	**Sample flow**	*Flow Permeate*	2.3.2.1*	
	2.3.2*	*(Raw value)*	2.3.2.2*	
		Flow Concentrate	2.3.2.3*	
		(Raw value)	2.3.2.4*	
		Concentration Factor	2.3.2.5*	
I/O State	*Alarm Relay*	2.4.1*		
2.4*	*Relay 1 and 2*	2.4.2*		
	Input			
	Signal Output 1 and 2			
Interface	*Protocol*	2.5.1*		(only with RS485
2.5*	*Baud rate*			interface)

8.3. Maintenance (Main Menu 3)

Calibration			
3.1			
Verification			
3.2*			
Reag. Background			
3.3*			
Zero			
3.4*			
Service	**Fill System**	Progress	
3.5*	3.5.1*		
	Prepare maintenance	Progress	
	3.5.2*		
	Cuvette factor det.	Progress	
	3.5.3*		
Simulation	*Alarm Relay*	3.2.1*	
3.6*	*Relay 1*	3.2.2*	
	Relay 2	3.2.3*	
	Signal Output 1	3.2.4*	
	Signal Output 2	3.2.5*	
	Magnetic valve	3.2.6*	
	Rotary valve	3.2.7*	
Set Time	*(Date), (Time)*		
3.7*			

8.4. Operation (Main Menu 4)

Sensors	*Filter Time Const.*	4.1.1*		* Menu numbers
4.2*	*Hold after Cal.*	4.1.2*		
Relay Contacts	**Alarm Relay**	**Alarm**	*Alarm High*	4.2.1.1.1*
4.3*	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*
	Relay 1 and 2	*Setpoint*	4.2.x.100*	
	4.2.2* and 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*		
4.4*	*Clear Logger*	4.3.2*		

8.5. Installation (Main Menu 5)

Sensors	**Meas parameters**	**Cal./Verif.**	*Standard*	* Menu numbers
5.1*	5.1.1*	5.1.1.1*	5.1.1.1.1*	
			Parameters	*Start time*
			5.1.1.1.2*	*Monday*
				Tuesday
				Wednesday
				Thursday
				Friday
				Saturday
				Sunday
		Auto-Background	*Auto-Background*	5.1.1.2.1*
		5.1.1.2*	*Start time*	5.1.1.2.2
			5.1.1.3*	
	Sample	**Flow Permeate**	*Offset*	5.1.2.1.1*
	5.1.2	5.1.2.1*	*Slope*	5.1.2.1.2*
		Flow Concentrate	*Offset*	5.1.2.2.1*
		5.1.2.2*	*Slope*	5.1.2.2.2*
Signal Outputs	**Signal Output 1 and 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 Silica**	*Alarm High*	5.3.1.1.1*
5.3*	5.3.1*	5.3.1.1*	*Alarm Low*	5.3.1.1.25*
			Hysteresis	5.3.1.1.35*
			Delay	5.3.1.1.45*
		Sample Flow	*Flow Alarm*	5.3.1.2.1*
		5.3.1.2*	**Flow Permeate**	*Alarm High*
			5.3.1.2.2	*Alarm Low*
			Flow Concentrate	*Alarm High*
			5.3.1.2.3	*Alarm Low*
		Case Temp. high	5.3.1.5*	
		Case Temp. low	5.3.1.60*	

	Relay 1 and 2	*Function*	5.3.2.1 – 5.3.3.1*	* Menu numbers
	5.3.2* and 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*		
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*		
	Line Break Detection	5.4.6*		
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 Demands necessary maintenance, e.g. preparing new reagents.

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

Designation: Designation of the instrument.
Version: Firmware of instrument (e.g. V6.20-06/16)

2.1.3 Peripherals

2.1.3.1 *PeriClip*: Firmware of peristaltic pump (e.g. 1.06)
RoValve: Firmware of rotary valve (6-way valve) (e.g. 1.60)
SiliTrace: Firmware of heater in the photometer module (e.g. 1.00).

2.1.4 Factory Test: Test date of the Instrument and Motherboard

2.1.5 Operating Time: Years / Days / Hours / Minutes / Seconds

2.2 Sensors

2.2.1 SilTrace (photometer module):

- *Temp.* Temperature inside the reaction chamber in °C
- *PWM*: Heating power in %, (100 % at start up)

2.2.1.3 Photometer:

- *Current value*: Shows the photometer signal in ppb.
  (Raw value): Shows the actual photometer signal in V.
- *Absorbance*:

$$A = -\log_{10}\left(\frac{\text{FOME mean}}{\text{zero}}\right)$$

o *FOME Mean*: Raw signal in V, measured during T3 (pump stopped) to calculate the concentration.

2.2.2 Miscellaneous:

o *Case Temp:* Shows the current temperature in °C inside the transmitter.

o *State Machine*: Shows the current process of the instrument.

WARMUP	The instrument is heating up after start up or recovery from a fatal error.
WAITRDY	The instrument has a fatal error i.e. pump and heater off. The instrument will stay in this state until the fatal error is acknowledged or self cleared.
WAITFLOW	The instrument has a sample flow low (E010) alarm. In this case, the pump stops but the heater stays on. It remains in this state until sample flow is re-established.
FLUSH/ RINSE	Before and after performing a background, a calibration or a verification and after recovering from an alarm, the instrument is flushing and rinsing.

Measurement cycle

FIND PEAK	Step 1 of measurement: The instrument is in measuring mode, waiting for the peak.
WAIT T1	Step 2 of measurement: The instrument is in measuring mode, peak found and filling the photometer de-aeration tube and the siphon tube. See Fluidic, p. 12.
WAIT T2	Step 3 of measurement: The instrument is in measuring mode waiting for stabilization. The pump has stopped.
WAIT T3	Step 4 of measurement: The instrument is in measuring mode, FOME mean is recorded (after this state, instrument is going back to FIND PEAK). Pump has stopped.

Calibration, verification, zero or background procedure

CAL INIT	A calibration, verification, zero or background has been initiated.
CAL END	A calibration, verification, zero or background has finished or been aborted.

Service functions

FILL INIT	Service function ‘Fill system’ or ‘Prepare maintenance’ is initiated (always manually).
FILL	The instrument fills the system.
STOP	The instrument has finished ‘fill system’ or ‘prepare maintenance’. The pump stops, the heater is on.

2.2.3 History

2.2.3.1 Zero History

- *Number*: Counter of zero measurements
- *Date, Time*: Date and time when a zero was performed.
- *Zero*: Measured value in V of the concentrate without reagent 1, which is responsible for coloring the sample. A too high value may result in a FOME dirty error.

2.2.3.2 Cal. History

- *Number*: Counter of standard calibrations
- *Date, Time*: Date and time when the standard calibration was performed.
- *Factor*: Correction factor of the calibration curve

2.2.3.3 Ver. History

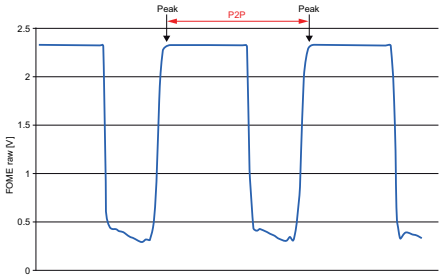
- *Number*: Counter of verifications.
- *Date, Time*: Date and time when the verification was performed.
- *Meas. Value*: measured value of the standard in ppb.
- *Reference value*: silica concentration of the standard in ppb.
- *Deviation*: deviation between measurement and reference value in %.

2.2.3.4 Background History

- *Number:* Counter of background calibrations.
- Date, Time: Date and time when the background calibration was performed.
- Background: measured value in V of the permeate with color-forming reagent.
- *Concentration Factor:* Distribution ratio between the total flow and the concentrate flow.

2.2.4 Cycle diagnostics

P2P Diagram



- *P2P period*: interval between the last two peaks
- *P2P counter*: constant time measurement (stop during T2&T3)
- *Pump speed*: shows the current speed code of the pump (0 – 30)
- *Adjust cycle*: when the P2P period 3 times exceeds a given time limit, the pump speed will be readjusted. <Adjust cycles> shows how many cycles are left before an adjustment (0 – 3).

2.3 Sample

- *Sample ID*: Shows the assigned sample identification. This identification is defined by the user to identify the location of the sample.

2.3.2 Sample flow:

- *Flow Permeate:* shows the permeate flow in l/h (Raw value): shows the permeate flow in Hz
- *Flow Concentrate:* shows the concentrate flow in l/h (Raw value): shows the concentrate flow in Hz
- *Concentration Factor:* Shows the distribution ratio between feed and concentrate flow.

2.4 I/O State

Shows the actual status of all in- and outputs.

2.4.1

Alarm Relay:	Active or inactive.
Relay 1 and 2:	Active or inactive.
Input:	Open or closed.
Signal Output 1 and 2:	Actual current in mA
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 Calibration

3.1.5 During calibration, a solution of known silica concentration (standard) is measured and the measured value is compared with the reference value of the standard (set in 5.1.1.1, p. 91). The instrument then sets the calibration factor to adjust the photometer sensitivity.
It is recommended to perform a calibration:

- at first start-up
- after replacing the pump tubes
- after replacing the cuvette

All calibrations are saved in the Calibration History.

3.2 Verification

3.2.5 During verification, a standard solution is measured and the measured value is compared with the reference value of the standard. The deviation is expressed in percent. Unlike a calibration, a verification does not change the calibration factor.
It is recommended to check the performance of the system by an automatic weekly verification (default setting).
All verifications are saved in the Verification History.

3.3 Reag. Background

3.3.5 The reagents stored in the canisters contain small amounts of silica. The background calibration eliminates the influence of these small amounts of silica on the measurement.
It is recommended to program an automatic daily background calibration (default setting).

3.4 Zero

3.4.5 To determine the electronic offset and light intensity of the photometer the sample is measured without adding the color forming reagent 1. This function serves as a diagnostic tool and can only be started manually.

3.5 Service

3.5.1 Fill system

Activates the reagent pump and fills all tubes from the container to the cuvette outlet.

3.5.2 Prepare maintenance

All tubes are rinsed and emptied when starting this function.

Note: *Follow the instructions on the screen carefully, otherwise the reagents in the canisters will be polluted with already mixed reagents.*

3.5.3 Cuvette factor determination

The cuvette factor is unique for each combination of photometer and cuvette. Therefore, a cuvette factor determination must be performed whenever a cuvette or a photometer is replaced.
The cuvette factor is set at the factory and stored in a protected memory area (i.e. it is not deleted by a complete firmware reset or a firmware upgrade).

3.6 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.*

3.6.1	*Alarm Relay:*	Active or inactive
3.6.2	*Relay 1*	Active or inactive
3.6.3	*Relay 2:*	Active or inactive
3.6.4	*Signal Output 1:*	Actual current in mA
3.6.5	*Signal Output 2:*	Actual current in mA
3.6.6	*Magnetic valve:*	Active or inactive
3.6.7	*Rotary valve*	Position 1 to 6
3.6.8	*Pump*	Active or inactive

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.

3.7 Set Time

Adjust date and time.

4 Operation

4.1 Sensors

4.1.1 *Filter Time Constant:* Used to damp noisy signals. The higher the filter time constant, the slower the system reacts to changes of the measured value.
Range: 5–300 Sec

4.1.2 *Hold after Cal:* Delay permitting the instrument to stabilize again after calibration, verification, zero or background measurement. During calibration plus hold-time, the signal outputs are frozen (held on last valid value), alarm values, limits are not active.
Range: 0–6‘000 Sec

4.2 Relay Contacts

See Relay Contacts, p. 31

4.3 Logger

The instrument is equipped with an internal logger. The logger data can be copied to a PC with an USB stick if option USB interface is installed.
The logger can save approx. 1500 data records. Records consists of: Date, time, alarms, measured value, temperature, flow.
Range: 1 Second to 1 hour

4.3.1 *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	Event driven
Time	25 min	2 h	25 h	5 d	10 d	31 d	62 d	

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

5 Installation

5.1 Sensors

5.1.1 Meas. Parameters

5.1.1.1 Cal./Verif.

5.1.1.1.1 *Standard*: The default standard is 100 ppb.
During a calibration or verification 15 ml standard is consumed. Therefore a standard bottle lasts for 3 months at default interval settings. The default interval settings are:

Start time: 06:00:00
Monday: Verification
All other days: Off

Range: 10.0 ppb to 1.0 ppm (1000 ppb)

5.1.1.1.2 Parameters

5.1.1.1.2.1 *Start time*: Program the daily start time of a verification or calibration. Default setting is 06:00:00

5.1.1.1.2.2 *Monday*: Program a verification, a calibration or Off for this day. A verification or calibration will be started at the programmed <start time>.

5.1.1.1.2.3 Tuesday: Same as Monday.

5.1.1.1.2.4 Wednesday: Same as Monday.

5.1.1.1.2.5 Thursday: Same as Monday.

5.1.1.1.2.6 Friday: Same as Monday.

5.1.1.1.2.7 Saturday: Same as Monday.

5.1.1.1.2.8 Sunday: Same as Monday.

Note: *If there is an overlap between a programmed background calibration and a programmed calibration/verification, the background calibration is prioritized and the calibration/ verification is skipped.*

5.1.1.2 Auto-Background

5.1.1.2.1 *Auto-Background:* Activate or deactivate the automatic daily background calibration.

> ***Note:*** *The background calibration is essential for a correct measurement. Swan therefore strongly recommends to have the option Auto-Background activated.*
> *If the option is deactivated, the background calibration must be started manually or via fieldbus at regular intervals.*

5.1.1.2.2 *Start Time:* Enter the start time of an auto-background.

5.1.1.3 *Cuvette factor:* Shows the current cuvette factor.

5.1.2 Sample

5.1.2.1/2 Flow Permeate/Flow Concentrate

5.1.2.x.1 Offset/Slope: Enter the offset/slope values printed on the label when replacing a flow meter.

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:

- Silica
- Flow Permeate
- Flow Concentrate

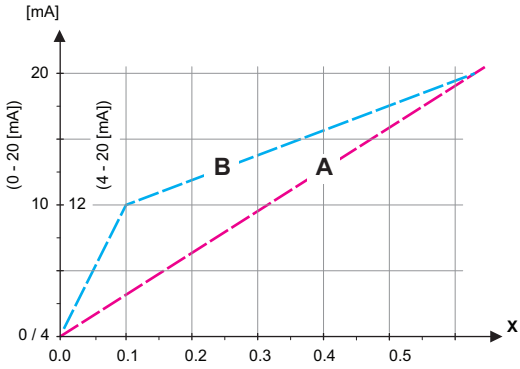
5.2.1.2 *Current Loop:* Select the current range of the signal output. Make sure the connected device works with the same current range. Available ranges: 0–20 mA or 4–20 mA

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:

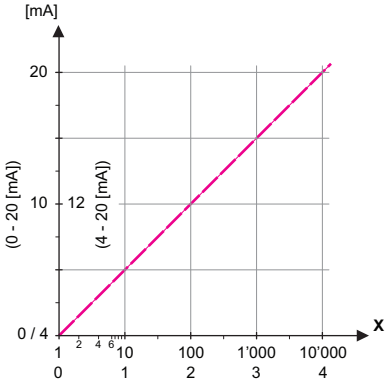
- Linear, bilinear or logarithmic for process values.
  See As process values, p. 93
- Control upwards or control downwards for controllers.
  See As control output, p. 94

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 Silica:

5.2.1.40.10 *Range low*: 0.000 ppb to 50.0 ppb
5.2.1.40.20 *Range high*: 0.000 ppb to 50.0 ppb

Parameter Flow Permeate:

5.2.1.40.11 *Range low*: 0.0–200.0 l/h
5.2.1.40.21 *Range high*: 0.0–200.0 l/h

Parameter Flow Concentrate:

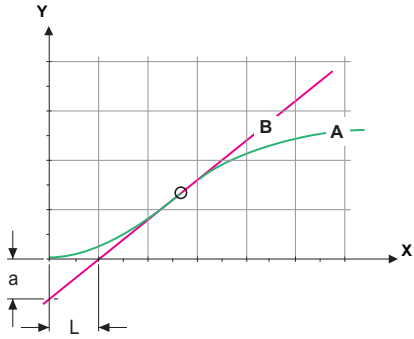
5.2.1.40.12 *Range low*: 0.0–20.0 l/h
5.2.1.40.22 *Range high*: 0.0–20.0 l/h

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.

If Control upwards or Control downwards is active:

5.2.1.43 **Control Parameters**

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

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

5.2.1.43 **Control Parameters:** if Parameters = Silica

5.2.1.43.10 *Setpoint*: 0.000 ppb to 50.0 ppb

5.2.1.43.20 P-Band: 0.000 ppb to 50.0 ppb

5.2.1.43 **Control Parameters:** if Parameters = Flow Permeate

5.2.1.43.11 *Setpoint*: 0.0–200.0 l/h

5.2.1.43.21 P-Band: 0.0–200.0 l/h

5.2.1.43 **Control Parameters:** if Parameters = Flow Concentrate

5.2.1.43.12 *Setpoint*: 0.0–20.0 l/h

5.2.1.43.22 P-Band: 0.0–20.0 l/h

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 if:

- Power loss
- Detection of system faults like defective sensors or electronic parts
- High case temperature
- Process values out of programmed ranges.

Program alarm levels for the following parameters:

- Silica
- Sample Flow
- Case Temperature high
- Case Temperature low

5.3.1.1 Alarm Silica

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: 0.000–50.0 ppb

5.3.1.1.22 *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: 0.000–50.0 ppb

5.3.1.1.32 *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: 0.000–50.0 ppb

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

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

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

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

5.3.1.2.2 Flow Permeate

5.3.1.2.2.1 *Alarm High:* If the measured value rises above the programmed value E003 will be issued.
Range: 0–200 l/h

5.3.1.2.2.22 *Alarm Low:* If the measured value falls below the programmed value E004 will be issued.
Range: 0–200 l/h

5.3.1.2.3 Flow Concentrate

5.3.1.2.3.1 *Alarm High:* If the measured value rises above the programmed value E005 will be issued.
Range: 0–20 l/h

5.3.1.2.3.22 *Alarm Low:* If the measured value falls below the programmed value E006 will be issued.
Range: 0–20 l/h

5.3.1.3 *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

5.3.1.4 *Case Temp. low:* Set the alarm low value for temperature of electronics housing. If the value falls below the programmed value E014 is issued.
Range: -10–20 °C

5.3.2 and 5.3.3 **Relay 1 and 2:** The contacts can be set as normally open or normally closed with a jumper. See Relay 1 and 2, p. 32. 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
- Measuring

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:
- Silica
- Flow Permeate
- Flow Concentrate

5.3.2.300 *Setpoint*: If the measured value rises above respectively falls below the set-point, the relay is activated.
Range: 0.000–50.0 ppb

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.
Range: 0.000–50.0 ppb

5.3.2.50 *Delay:* Duration, the activation of the alarm relay is retarded after the measured value has risen above/fallen below the programmed alarm.
Range. 0–600 sec

5.3.2.1 Function = Control upwards/downwards:

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

5.3.2.22 *Parameter:* Choose on of the following process values.
- Silica
- Flow Permeate
- Flow Concentrate

5.3.2.32 **Settings***:* Choose the respective actuator:
- Time proportional
- Frequency
- Motor valve

5.3.2.32.1 Actuator = Time proportional

Examples of metering devices that are driven time proportional are solenoid valves, peristaltic pumps.
Dosing is controlled by the operating time.

5.3.2.32.20 *Cycle time:* duration of one control cycle (on/off change).
Range: 0–600 sec.

5.3.2.32.30 *Response time:* Minimal time the metering device needs to react.
Range: 0–240 sec.

5.3.2.32.4 Control Parameters
Range for each Parameter same as 5.2.1.43, p. 95

5.3.2.32.1 Actuator = Frequency

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

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

5.3.2.32.31 Control Parameters
Range for each Parameter same as 5.2.1.43, p. 95

5.3.2.32.1 Actuator = Motor valve

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

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

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

5.3.2.32.4 Control Parameters
Range for each Parameter same as 5.2.1.43, p. 95

5.3.2.1 Function = Timer:

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

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

5.3.2.24 Interval

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

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

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

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

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

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

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

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

Cont.: Controller continues normally.

Hold: Controller continues based on the last valid value.

Off: Controller is switched off.

5.3.2.24 daily

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

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

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

Range: 00:00:00–23:59:59

5.3.2.44 *Run Time*: see Interval
5.3.2.54 *Delay*: see Interval
5.3.2.6 *Signal Outputs*: see Interval
5.3.2.7 *Output/Control*: see Interval

5.3.2.24 weekly

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

5.3.2.342 **Calendar**:
5.3.2.342.1 *Start time*: The programmed start time is valid for each of the programmed days. To set the start time see 5.3.2.341, p. 101.
Range: 00:00:00–23:59:59
5.3.2.342.2 *Monday*: Possible settings, on or off
to
5.3.2.342.8 *Sunday*: Possible settings, on or off
5.3.2.44 *Run Time*: see Interval
5.3.2.54 *Delay*: see Interval
5.3.2.6 *Signal Outputs*: see Interval
5.3.2.7 *Output/Control*: see Interval

5.3.2.1 Function = Fieldbus:

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

5.3.2.1 Function = Measuring:

The relay is used to indicate if the instrument is measuring. While the instrument is in measuring mode (FIND PEAK, WAIT T1, WAIT T2, WAIT T3), the relay is active. During all other states, the relay is inactive.

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:
The measurement is interrupted during the time the input is active.

No:	Input is never active.
When closed	Input is active if the input relay is closed
When open:	Input is active if the input relay is open

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

Cont.:	Signal outputs continue to issue the measured value.
Hold:	Signal outputs issue the last valid measured value. Measurement is interrupted. Errors, except fatal errors, are not issued.
Off:	Set to 0 or 4 mA respectively. Errors, except fatal errors, are not issued.

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

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

5.3.4.4 Fault:

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

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

5.4 Miscellaneous

5.4.1 *Language:* Set the desired language.

Language
German
English
French
Spanish

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

Set defaults
no
Calibration
In parts
Completely

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

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

Load Firmware
no
yes

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

5.4.4.1 Messages
5.4.4.2 Maintenance
5.4.4.3 Operation
5.4.4.4 Installation.
Each menu may be protected by a *different* password.
If you forgot the passwords, contact the closest SWAN representative.

5.4.5 *Sample ID:* Identify the process value with any meaning full text, such as KKS number.

5.4.6 *Line Break Detection:* If activated, error message E028 is shown in case of line break on signal outputs 1 and 2.

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 no.:	Range: Analyzer; Manufacturer; Multivariable
5.5.40	Local operation:	Range: Enabled, Disabled
5.5.1	*Protocol:* **Modbus RTU**	
5.5.21	Device address:	Range: 0–126
5.5.31	Baud rate:	Range: 1200–115200 Baud
5.5.41	Parity:	Range: none, even, odd
5.5.1	*Protocol:* **USB-Stick**	
	Only visible if an USB interface is installed. No further settings are possible.	
5.5.1	*Protocol:* **HART**	
5.5.24	Device address:	Range: 0–63

10. Safety Data sheets

Catalogue No.:	A-85.420.860
Product name:	AMI Silitrace Reagent 1a Ammonium molybdate tetrahydrate.
Catalogue No.:	A-85.420.860
Product name:	AMI Silitrace Reagent 1b Sodium hydroxide
Catalogue No.:	A-85.420.860
Product name:	AMI Silitrace Reagent 2 Sulphuric acid
Catalogue No.:	A-85.420.860
Product name:	AMI Silitrace Reagent 3 Oxalic acid dihydrate
Catalogue No.:	A-85.420.860
Product name:	AMI Silitrace Reagent 4a Ammonium iron(II) sulfate hexahydrate
Catalogue No.:	A-85.420.860
Product name:	AMI Silitrace Reagent 4b Sulphuric acid
Catalogue No.:	A-85.142.500
Product name:	Silica Standard, 100 ppb Calibration solution

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

11. Default Values

Operation:

Sensors:	Filter Time Const.:	10 s
	Hold after Cal.:	720 s
Relay Contacts	Alarm Relay	same as in Installation
	Relay 1 and 2	same as in Installation
	Input	same as in Installation
Logger:	Logger Interval:	Event driven
	Clear Logger:	no

Installation:

Sensors	Meas. Parameters; Cal/Verif:	100 ppb
	Meas. Parameters; Parameters; Start time:	06:00:00
	Meas. Parameters; Parameters; Monday:	Verification
	Meas. Parameters; Parameters; Tuesday:	Off
	Meas. Parameters; Parameters; Wednesday:	Off
	Meas. Parameters; Parameters; Thursday:	Off
	Meas. Parameters; Parameters; Friday:	Off
	Meas. Parameters; Parameters; Saturday:	Off
	Meas. Parameters; Parameters; Sunday:	Off
	Meas. Parameters; Auto-Background:	active
	Meas. Parameters; Auto-Background; Start time:	00:30:00
Signal Output 1	Parameter:	Silica
	Current loop:	4–20 mA
	Function:	linear
	Scaling: Range low:	0.000 ppb
	Scaling: Range high:	50.0 ppb
Signal output 2	Parameter:	Flow Permeate
	Current loop:	4–20 mA
	Function:	linear
	Scaling: Range low:	50.0 l/h
	Scaling: Range high:	200.0 l/h
Alarm Relay:	Alarm Silica:	
	Alarm high:	50.0 ppb
	Alarm low:	0.000 ppb
	Hysteresis:	0.500 ppb
	Delay:	30 s

Sample Flow:

Flow Alarm: ..... Yes
Flow Permeate; Alarm High: ..... 200 l/h
Flow Permeate; Alarm Low: ..... 50.0 l/h
Flow Concentrate; Alarm High: ..... 20 l/h
Flow Concentrate; Alarm Low: ..... 2.5 l/h
Case temp. high: ..... 65 °C
Case temp. low: ..... 0 °C

Relay 1 and 2

Function: ..... limit upper
Parameter: ..... Silica

Setpoint: ..... 50.0 ppb
Hysteresis: ..... 0.500 ppb
Delay ..... 30 s

If Function = Control upw. or dnw:

Parameter: ..... **Silica**
Settings: Actuator: ..... Frequency
Settings: Pulse Frequency: 120/min
Settings: Control Parameters: Setpoint: ..... 50.0 ppb
Settings: Control Parameters: P-band: ..... 0.500 ppb

Parameter: ..... **Flow Permeate**
Settings: Actuator: ..... Frequency
Settings: Pulse Frequency: 120/min
Settings: Control Parameters: Setpoint: ..... 200.0 l/h
Settings: Control Parameters: P-band: ..... 5.0 l/h

Parameter: ..... **Flow Concentrate**
Settings: Actuator: ..... Frequency
Settings: Pulse Frequency: 120/min
Settings: Control Parameters: Setpoint: ..... 20.0 l/h
Settings: Control Parameters: P-band: ..... 1.0 l/h

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

swan
ANALYTICAL INSTRUMENTS

A-96.250.831 / 030122

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.

Swan Analytical Instruments · CH-8340 Hinwil
www.swan.ch · swan@swan.ch

SWISS MADE

AMI Silitrace Ultra