

Operator's Manual

Firmware V6.21 and higher



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Operator's Manual

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

1. Safety Instructions

General The instructions included in this section explain the potential risks associated with instrument operation and provide important safety practices designed to minimize these risks. If you carefully follow the information contained in this section, you can protect yourself from hazards and create a safer work environment.

More safety instructions are given throughout this manual, at the respective locations where observation is most important. Strictly follow all safety instructions in this publication.

Target audience Operator: Qualified person who uses the equipment for its intended purpose. Instrument operation requires thorough knowledge of applications, instrument functions and software program as well as all applicable safety rules and regulations.

OM Location Keep the AMI Operator's Manual in proximity of the instrument.

Qualification, Training To be qualified for instrument installation and operation, you must:

- ◆ read and understand the instructions in this manual as well as the Material Safety Data Sheets.
- ◆ know the relevant safety rules and regulations.

1.1. Warning Notices

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



DANGER

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

- ◆ Follow the prevention instructions carefully.



WARNING

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

- ◆ Follow the prevention instructions carefully.



CAUTION

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

- ◆ Follow the prevention instructions carefully.

Mandatory Signs

The mandatory signs in this manual have the following meaning:



Safety goggles



Safety gloves

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



Electrical shock hazard



Corrosive



Harmful to health



Flammable



Warning general



Attention general

1.2. General Safety Regulations

Legal Requirements

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

Spare Parts and Disposables

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

Modifications

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

WARNING

Electrical Shock Hazard



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

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

WARNING



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

WARNING



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

1.3. Restrictions for use

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

If the sample contains only little disinfectant concentrations, or there is the danger of biological growth, we recommend to use the optional Cleaning module from Swan.

WARNING



Health hazard

Some reagents are etching and can cause severe burns or eye damage.

- ◆ For safe handling of the reagents you must read and understand the instructions in this manual, as well as the Material Safety Data Sheets (MSDS)

Download MSDS

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

- ◆ OXYCON ON-LINE DPD
- ◆ OXYCON ON-LINE Buffer
- ◆ OXYCON ON-LINE KI
- ◆ Buffer solution pH 4
- ◆ Buffer solution pH 7
- ◆ Buffer solution pH 9

2. Product Description

Application range

The AMI Codes-II CC is a complete monitoring system for the automatic, continuous measurement and dosing control of chlorine based on the DPD colorimetric method APHA 4500 Cl-G and on EN ISO 7393-2.

It can be used for measuring disinfectants in:

- ◆ Pools and sanitary water
- ◆ Cooling water
- ◆ Waste water effluent

It is also applicable for water containing additives like corrosion inhibitors, cyanuric acid and antiscalants.

Determines free available chlorine, total chlorine and calculates monochloramine, dichloramine and combined chlorine.

Necessary reagents:

- ◆ Oxycon on-line DPD
- ◆ Oxycon on-line Buffer
- ◆ Oxycon on-line KI

Disinfectant measurement

Disinfectant	Measuring range	Accuracy
Free available chlorine,	0.00–1.00 ppm	± 0.01 ppm
Total chlorine	1.00–3.00 ppm	± 0.06 ppm
	3.00–5.00 ppm	± 0.20 ppm

Signal outputs

Two signal outputs programmable for measured values (freely scalable, linear or bilinear) or as continuous control output (control parameters programmable).

Current loop: 0/4–20 mA

Maximal burden: 510 Ω

Third signal output available as an option. The third signal output can be operated as a current source or as a current sink (selectable via switch).

Relay

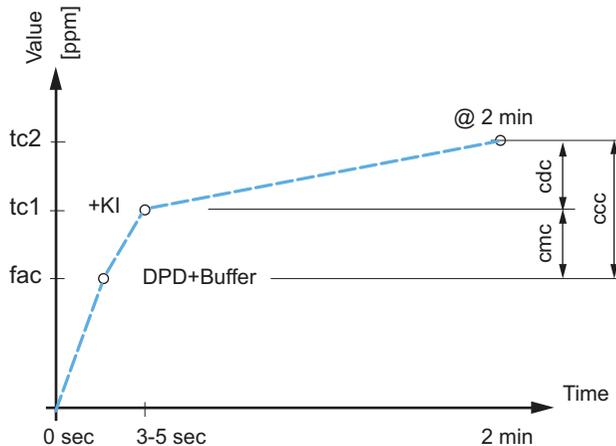
Two potential-free contacts programmable as limit switches for measuring values, controllers or timer for system cleaning with automatic hold function. Both contacts can be used as normally open or normally closed.

Maximum load: 1 A/250 VAC

Alarm relay	One potential free contact. Alternatively: <ul style="list-style-type: none">◆ Open during normal operation, closed on error and loss of power.◆ Closed during normal operation, open on error and loss of power. Summary alarm indication for programmable alarm values and instrument faults.
Input	For potential-free contact to freeze the measuring value or to interrupt control in automated installations (hold function or remote-off).
Special feature	Possibility to interrupt the measurement by activating the input. See Program List and Explanations, 5.3.4, p. 102 .
Safety features	No data loss after power failure. All data is saved in non-volatile memory. Overvoltage protection of inputs and outputs. Galvanic separation of measuring inputs from signal outputs.
Communication interface (optional)	<ul style="list-style-type: none">◆ Third signal output (can be used in parallel to the USB interface)◆ USB Interface for logger download◆ RS485 with Fieldbus protocol Modbus or Profibus DP◆ HART interface
pH	Optional pH measurement is possible (pH correction or calibration).
Relay box	The AMI Relay Box is designed for the direct power supply and activation of dosing devices which are controlled with an AMI transmitter, e. g. to connect two solenoid valves or one motor valve for disinfectant additions.
Cleaning module	Optional module for automatic chemical cleaning.

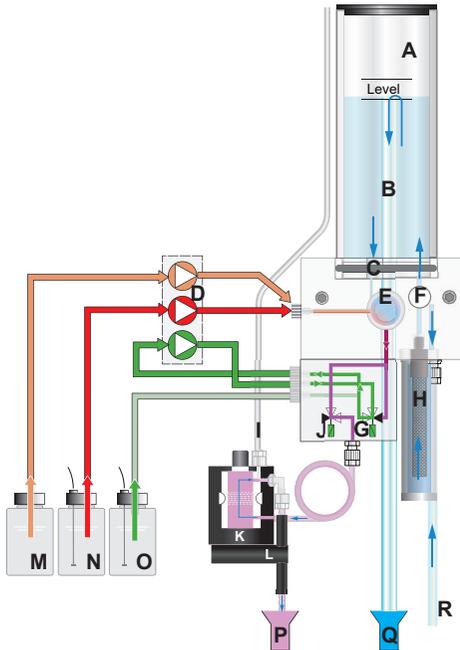
Glossary Abbreviations used for the measured chlorine forms:

Abbr.	Term	Comment
fac	<u>F</u> ree <u>a</u> vailable <u>cl</u> hlorine	Immediate reaction with DPD (includes cyanuric acid fractions)
tc1	<u>T</u> otal <u>cl</u> hlorine <u>1</u>	Immediate reaction of DPD + KJ (mainly monochloramine)
tc2	<u>T</u> otal <u>cl</u> hlorine <u>2</u>	Reaction with DPD + KJ after 2 min. reaction
cmc	<u>C</u> alculated <u>m</u> onochloramine	$cmc = tc1 - fac$
cdc	<u>C</u> alculated <u>d</u> ichloramine	$cdc = tc2 - tc1$
ccc	<u>C</u> alculated <u>c</u> ombined <u>cl</u> hlorine	$ccc = tc2 - fac$
pH/T	<u>p</u> H and <u>T</u> emperature	(Optional)
B/s	<u>B</u> ubbles per <u>s</u> econd	Sample flow



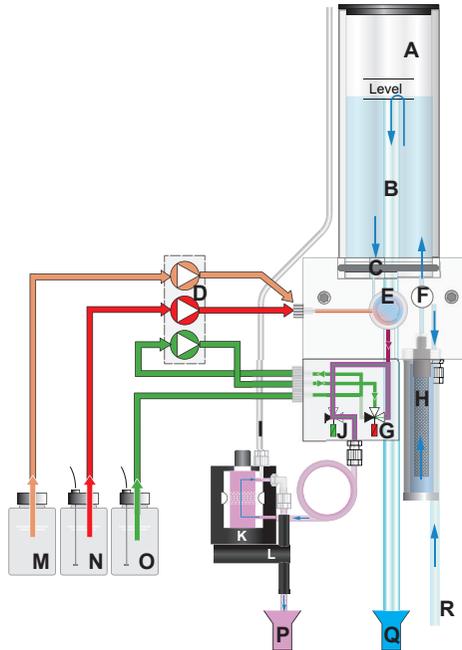
Fluidics The sample flows through the sample inlet [R] and the inlet filter [H] into the constant head [A]. Adjust the flow regulating valve [F] so that always a small part of the sample flows through the overflow tube [B] into the constant head drain [Q].

Free available chlorine A part of the sample flows through the photometer inlet [C] into the mixing chamber [E], where the reagents [M] and [N] are added by the peristaltic pump [D] and mixed with the sample. The mixed sample flows through the photometer [K] where the free available chlorine is measured.



- | | |
|--------------------------------|----------------------------------------|
| A Constant head | J Solenoid valve V 1 |
| B Overflow tube | K Photometer |
| C Photometer inlet | L Air bubble detector |
| D Peristaltic pump | M Reagent Oxycon on-line DPD |
| E Mixing chamber | N Reagent Oxycon on-line Buffer |
| F Flow regulating valve | O Reagent Oxycon on-line KI |
| G Solenoid valve V2 | P Photometer drain |
| H Inlet Filter | Q Constant head drain |
| I Photometer air inlet | R Sample inlet |

- Total chlorine 1 After the measurement of free available chlorine is finished the solenoid valve [G] is energized for a short time and reagent [O] is added to determine total chlorine 1.
- Total chlorine 2 To ensure the necessary reaction time of 2 min. for the determination of total chlorine 2, the sample flow is stopped by the solenoid valve [J]. After the time has elapsed, total chlorine is measured and solenoid valve [J] opens again.



After the measurement the sample flows through the outlet of the photometer where it will be aerated through air inlet [I] to generate bubbles. Then the sample flows through the bubble detector [L] into the photometer drain [P].

- General** Two different types of measurements are distinguished:
- ◆ Free available chlorine (fac) measurement
 - ◆ Overall measurement including free available chlorine (fac), total chlorine 1 (tc1) and total chlorine 2 (tc2).

The Interval fac and the Interval tc2 can be set individually:

- ◆ Interval fac between 0 and 12 min.
- ◆ Interval tc2 between 0 and 60 min (overall measurement).

Note: *If the fac interval is set to zero, it is nevertheless measured in the overall measurement.*

The default setting for fac measurement interval is 5 min and for overall measurement interval 20 min.

**Time
sequence of an
overall
measurement**

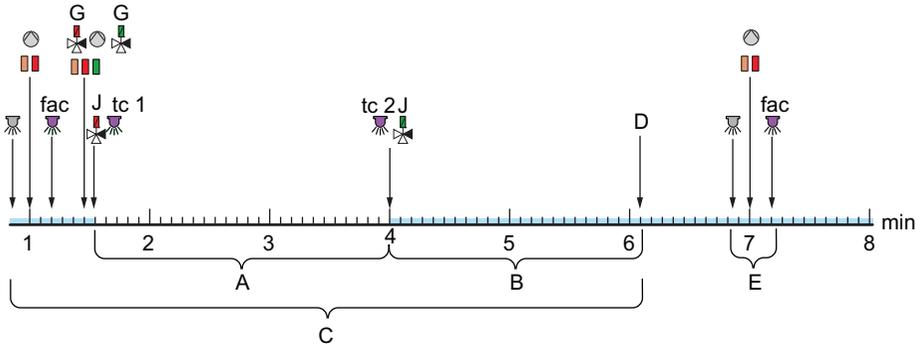
The blue bar represents the sample flow through the photometer. At the beginning the solenoid valve [J] is de-energized and the sample flows through the photometer. A short time before the measurement starts, a zero point measurement is performed. Then the peristaltic pump starts and a small portion of the reagents "Oxycon on-line DPD" and "OXYCON ON-LINE Buffer" is pumped into the mixing chamber. During this time, the solenoid valve [G] is de-energized and the "Oxycon On-line KI" circulates between the peristaltic pump and the valve block.

A short time after, if the mixture is in the photometer, the free available chlorine (fac) of the sample is measured.

After about 25 sec the peristaltic pump starts again. Now the solenoid valve [G] is energized and a small portion of the reagents "Oxycon on-line DPD", "OXYCON ON-LINE Buffer" and "Oxycon On-line KI" is pumped into the mixing chamber.

A short time after, the solenoid valve [J] is energized and the sample flow through the photometer is stopped. Immediately after that, the tc 1 is measured.

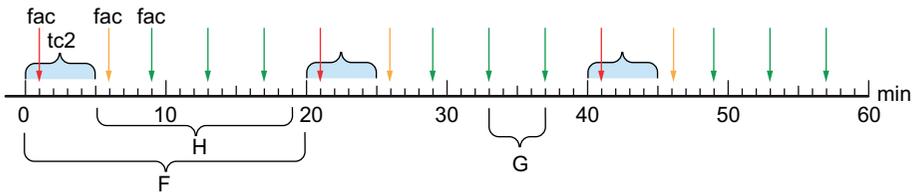
The "calculated monochloramine" (cmc) is calculated and displayed. After about 120 sec the tc 2 is measured and then the "calculated dichloramine" (cdc) and the "calculated combined chlorine" (ccc) are calculated and displayed. After the measurement is finished, the solenoid valve [J] is de-energized and sample flows through the photometer and a flush time of 2 minutes follows.



- A** Reaction time for measuring *tc 2*
- B** Flush time
- C** Overall measurement time
- D** Flush time end
- E** *fac* measurement
- G** Valve 1 for adding OXYCON ON-LINE KI
- J** Valve 2 for closing photometer inlet
- fac** Free available chlorine

- tc1** Total chlorine 1
- tc2** Total chlorine 2
- OXYCON ON-LINE DPD
- OXYCON ON-LINE Buffer
- OXYCON ON-LINE KI
- Zero point measurement
- Sample measurement
- Peristaltic pump active for a short time

The programmed measuring intervals of *tc2* [F] and *fac* [G] may overlap each other. The *tc2* measurement has priority and therefore always takes place in the programmed measuring interval [F]. The *fac* measurement is filled in the gaps [H] of the overall measurement and may be shifted (orange arrow) in respect to programmed interval. If 2 *fac* measurements are programmed during an overall measurement one of them is cancelled (red arrow).



2.1. Instrument Specification

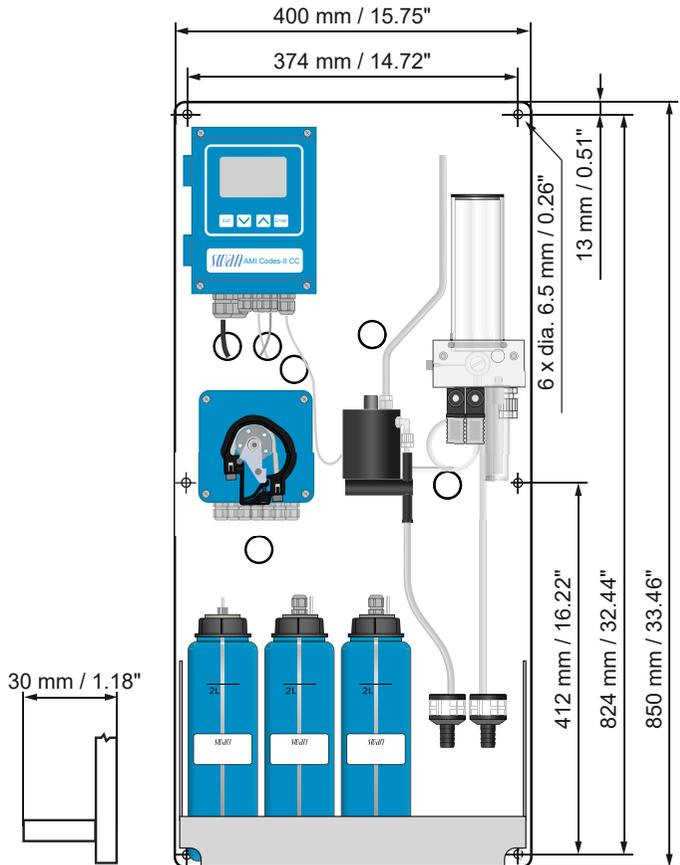
Power Supply	AC variant:	100–240 VAC ($\pm 10\%$) 50/60 Hz ($\pm 5\%$)
	DC variant	10–36 VDC
	Power consumption:	max. 35 VA
Transmitter specifications	Housing:	aluminum, with a protection degree of IP 66 / NEMA 4X
	Ambient temperature:	–10 to +50 °C
	Storage and transport:	–30 to +85 °C
	Humidity:	10–90% rel., non condensing
Sample requirements	Display:	backlit LCD, 75 x 45 mm
	Flow rate:	min. 10 l/h
	Temperature:	5–50 °C
	Inlet pressure:	0.15–2 bar
Outlet pressure:	pressure free	

Note: *No oil, no grease, no sand.*

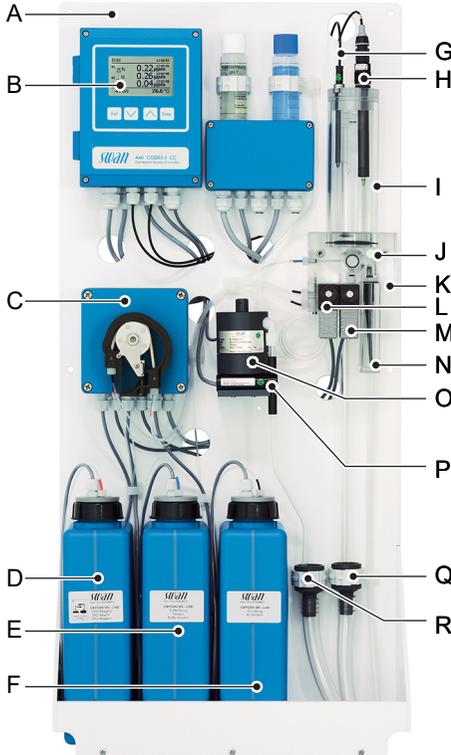
On-site requirements	The analyzer site must permit connections to:	
	Sample inlet:	Tube 6 x 8 mm
	Sample outlet:	1/2" hose nozzle for flexible tube diam. 20x15 mm

Measuring Range	Free chlorine, monochloramine, total residual chlorine	
	0.00–1.00 ppm	± 0.01 ppm
	1.00–3.00 ppm	± 0.06 ppm
	3.00–5.00 ppm	± 0.2 ppm
	pH measurement (optional)	
2–12 pH	0.01 pH	

Dimensions	Panel:	PVC
	Dimensions:	400x850x200 mm
	Screws:	5 mm or 6 mm diameter
	Weight:	12.0 kg without reagents and sample water 17.0 kg with reagents and sample water



2.2. Instrument Overview



- | | |
|----------------------------------------|--------------------------------|
| A Panel | J Flow regulating valve |
| B Transmitter | K Sample inlet |
| C Peristaltic pump | L Valve 1 (Photometer) |
| D Reagent Oxycon on-line DPD | M Valve 2 (KI dosing) |
| E Reagent Oxycon on-line Buffer | N Inlet filter |
| F Reagent Oxycon on-line KI | O Photometer |
| G Temperature sensor | P Air bubble detector |
| H pH sensor | Q Constant head drain |
| I Constant head | R Photometer drain |

3. Installation

3.1. Installation Checklist

On-site requirements	AC variant: 100–240 VAC ($\pm 10\%$), 50/60 Hz ($\pm 5\%$) DC variant: 10–36 VDC Power consumption: 35 VA maximum. Protective earth connection required. Sample line with sufficient sample flow and pressure (see Instrument Specification, p. 18).
Installation	Mount the instrument in vertical position. Display should be at eye-level. Mount the filter, filter vessel, and constant head cover. Connect the sample and waste line. See Connecting Sample and Waste, p. 23
Electrical Wiring	Do not switch on the Instrument until all electrical connections are made. Connect all external devices like limit switches, current loops and pumps. Connect power cord. See Electrical Connections, p. 29
If ordered: pH Option	See Install the pH Option, p. 25
Reagents	Prepare reagents. See Refill or replace Reagents, p. 49 . Insert the suction lances.
Power-up	Lock pump tubes. Turn on the sample flow and wait until the flow cell is completely filled. Switch on power. Start <Fill system>. See Fill or Flush Reagent System, p. 41
Instrument Setup	Program all parameters for external devices (interface, recorders, etc.). Program all parameters for instrument operation (limits, alarms, measuring interval).
Run-in period	Let the instrument run continuously for 1 h.
pH sensor calibration	If ordered: Calibrate pH sensor. See Calibration, p. 53

Process calibration	Make 3 manual measurements. Use a high quality photometer, e.g. Chematest from Swan. Calculate average value and compare this value to the value, indicated by the AMI. If necessary, correct the value. The zero point is done automatically before each measurement.
----------------------------	------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------

3.2. Mounting of Instrument Panel

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

- ◆ The instrument must only be installed by trained personnel.
- ◆ Mount the instrument in vertical position.
- ◆ For ease of operation mount it so that the display is at eye level.
- ◆ For the installation a kit containing the following installation material is available:
 - 6 Screws 6x60 mm
 - 6 Dowels
 - 6 Washers 6.4/12 mm

Mounting requirements

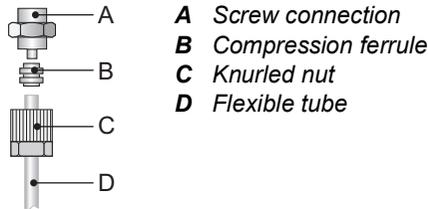
The instrument is only intended for indoor installation. For dimensions see  19.

3.3. Connecting Sample and Waste

3.3.1 FEP Tube at Sample Inlet

Use plastic tube (FEP, PA, or PE 6 x 8 mm) to connect the sample line.

Mounting of
SERTO fitting



3.3.2 FEP Tube at Sample Outlet

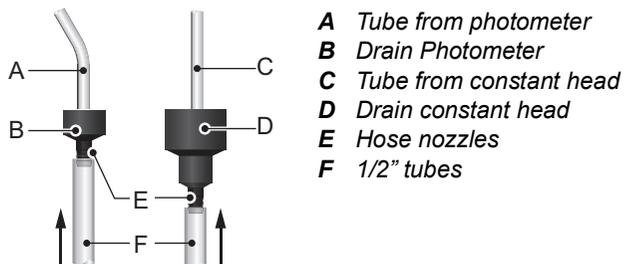
WARNING



Risk of water pollution

The drain of the photometer outlet contains DPD.

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



Connect the 1/2" tubes [F] to the hose nozzles [E] and place them into a pressure free drain with sufficient capacity.

3.4. Installation of Flow Cell

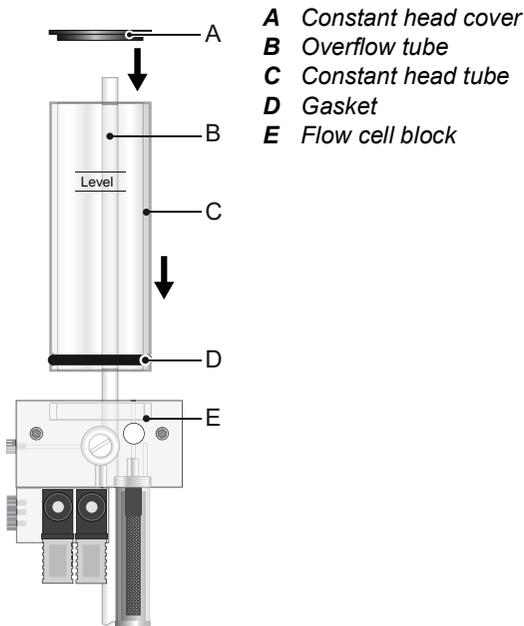


CAUTION

Fragile Part

Handle the constant head tube with care.

To avoid damage during the transport, the constant head tube [C] of the AMI Codes-II CC is not installed.



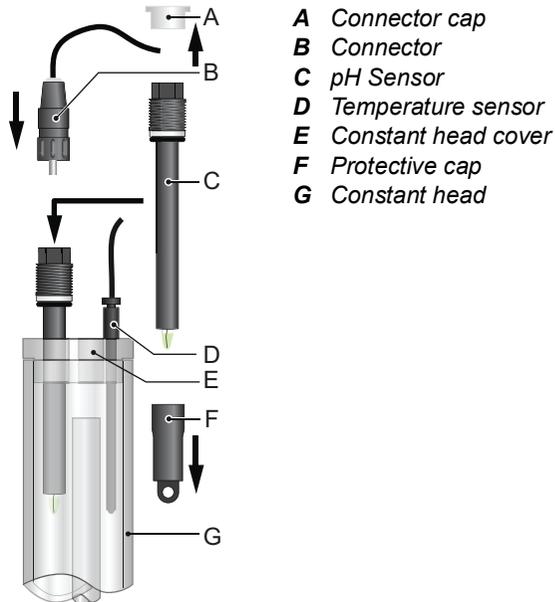
To install the constant head tube proceed as follows:

- 1 Unpack the constant head tube [C].
- 2 Push the constant head tube into the flow cell block [E].
- 3 Put the constant head cover [A] onto the constant head tube.
- 4 Check if the overflow tube [B] is aligned with the upper level mark.

3.5. Install the pH Option

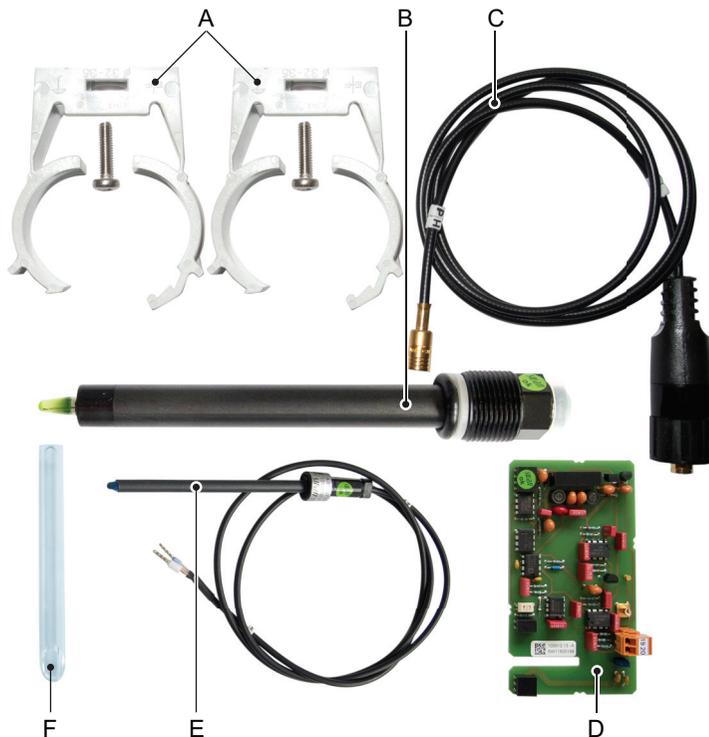
3.5.1 pH as Option ex works

If the pH option was ordered with the AMI Codes-II CC, the pH sensor cable as well as the temperature sensor are already connected to the AMI transmitter.



- 1 Carefully pull off the protective cap [F] from the pH sensor [C] by turning it clockwise.
- 2 Store the protective cap in safe place.
- 3 Rinse the pH sensor tip with clean water.
- 4 Insert the pH sensor into one of the holes in the constant head cover [E].
- 5 Insert temperature sensor [D] into the small hole.
- 6 Remove the connector cap from the connector of the pH sensor. Store it in safe place.
- 7 Screw the connector [B] onto the pH sensor.

3.5.2 pH Option as Retrofit Kit



A 2 Clamps with screws

B pH sensor

C Sensor cable

D Frontend PCB

E Temperature sensor

F Short overflow tube

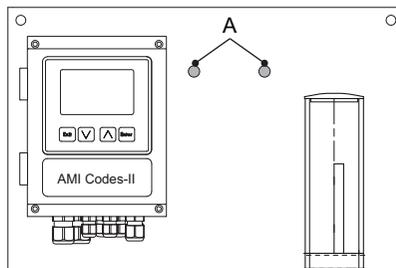


WARNING

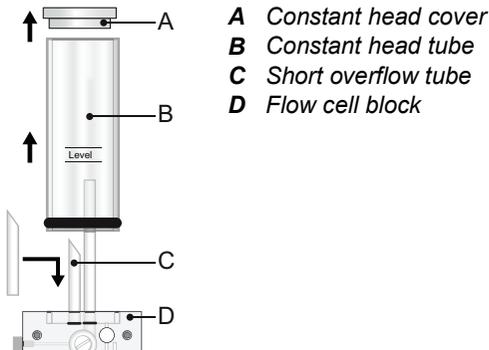
Risk of electrical shock

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.

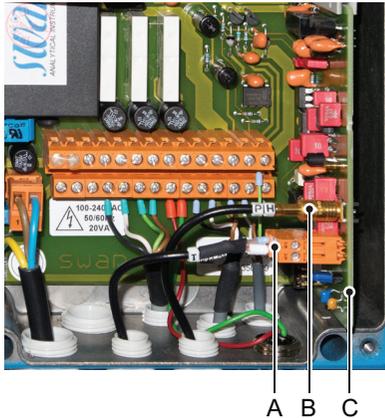
- 1 Screw the clamps for calibration solution onto the panel. Use the already drilled holes [A].



- 2 Stop sample flow. Wait until flow cell is empty.
- 3 Switch off the AMI transmitter (disconnect power).



- 4 Remove the constant head cover [A] and the constant head tube [B] from the flow cell block [D].
- 5 Insert the short overflow tube [C] into the outlet hole leading to the photometer.
- 6 Install the constant head tube and the constant head cover.



- A** Front end PCB
- B** pH sensor plug
- C** Temperature sensor plug

- 7 Open the cover of the AMI transmitter housing.
- 8 Install the front end PCB.
- 9 Feed the cable of the pH sensor through one of the cable glands (see [Cable thicknesses](#), p. 29) into the AMI transmitter housing.
- 10 Connect it to the BNC socket.
- 11 Feed the cable of the Temperature sensor through one of the cable glands into the AMI transmitter housing.
- 12 Connect the temperature sensor cable to the plug as follows:
 - ♦ Terminal 19: line
 - ♦ Terminal 20: shield.
- 13 Close the cover of the AMI transmitter housing.
- 14 Install the pH sensor, see [pH as Option ex works](#), p. 25.
- 15 Turn on sample flow and wait until flow cell has been filled completely.
- 16 Switch power ON. The instrument automatically detects the front end PCB during start-up.

3.6. Electrical Connections



WARNING

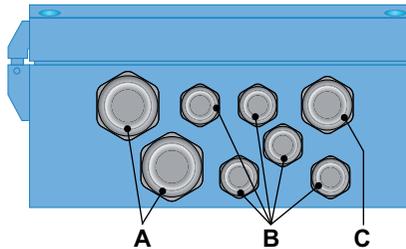
Risk of electrical shock.

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

Note: Protect unused cable glands.

Wire

- ♦ For Power and Relays: Use max. 1.5 mm² / AWG 14 stranded wire with end sleeves.
- ♦ For Signal Outputs and Input: Use 0.25 mm² / AWG 23 stranded wire with end sleeves.





WARNING

External Voltage

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 continuing installation.
 - relay 1
 - relay 2
 - alarm relay



WARNING

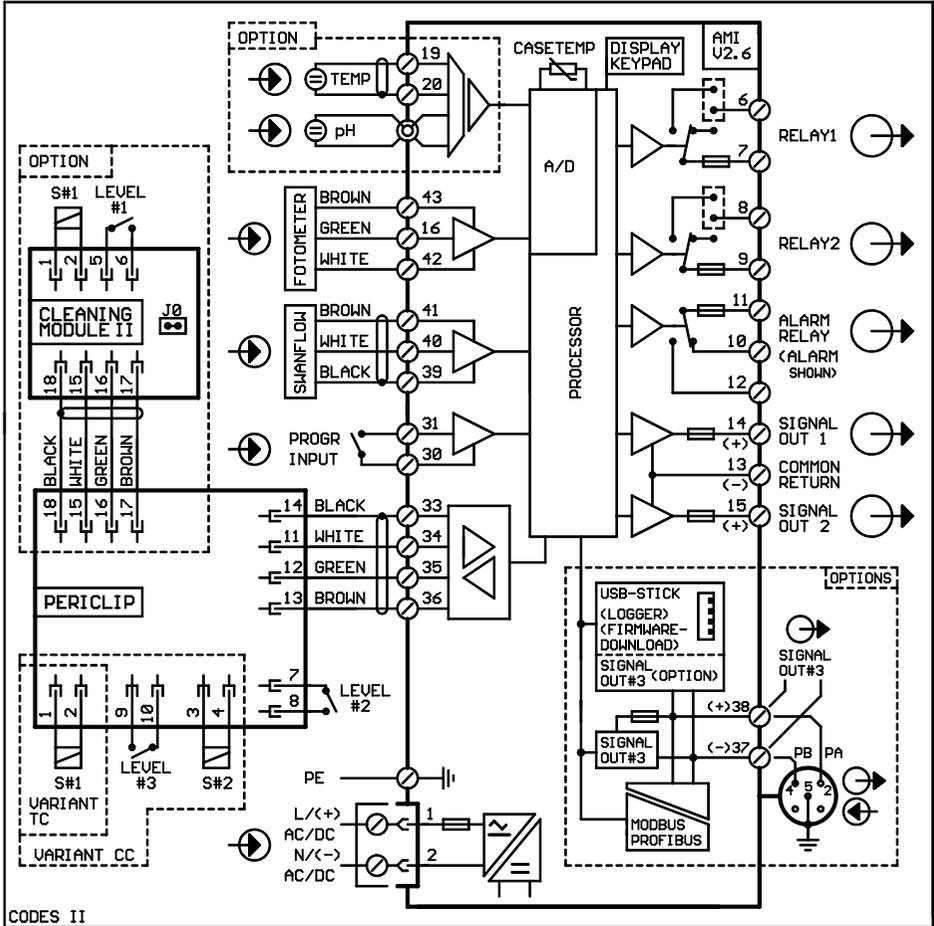
To prevent from electrical shock, do not connect the instrument to the power unless the ground wire (PE) is connected.



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



CODES II

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.

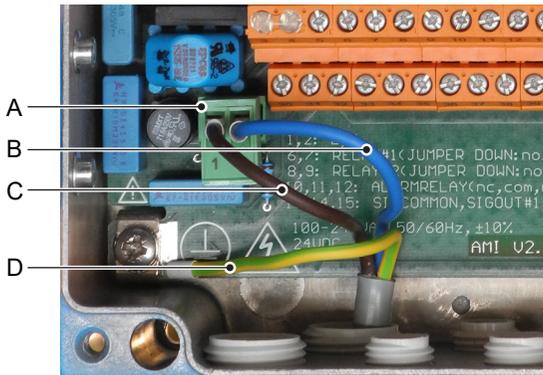
3.6.2 Power Supply



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 Codes-II CC

3.7. 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 and 31

For programming see chap. 9, menu Installation, [5.3.4, p. 102](#).

3.8. Relay Contacts

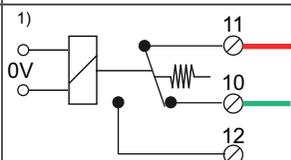
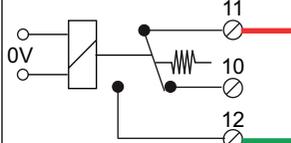
3.8.1 Alarm Relay

Note: Max. load 1 A / 250 VAC

Alarm output for system errors.

Error codes see [Troubleshooting, p. 68](#).

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

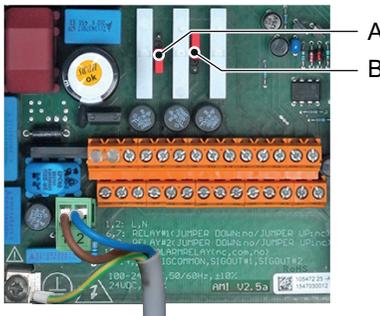
3.8.2 Relay 1 and 2

Note: Max. load 1 A/250 VAC.

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

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

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



A Jumper set as normally open (standard setting)

B Jumper set as normally closed

For programming see menu Installation [5.3.2](#) and [5.3.3](#), p. 98.



CAUTION

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

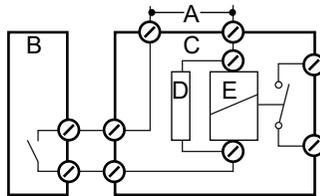
Heavy inductive or directly controlled loads (solenoid valves, dosing pumps) may destroy the relay contacts.

- ♦ 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.

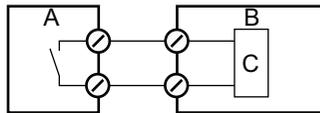
A snubber circuit is not necessary if an AMI relaybox is used.



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

Resistive load

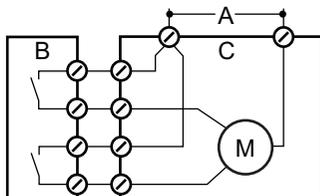
Resistive loads (max. 1 A) and control signals for PLC, impulse pumps and so on can be connected without further measures



- 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

3.9. Signal Outputs

3.9.1 Signal Output 1 and 2 (current outputs)

Note: Max. burden 510 Ω

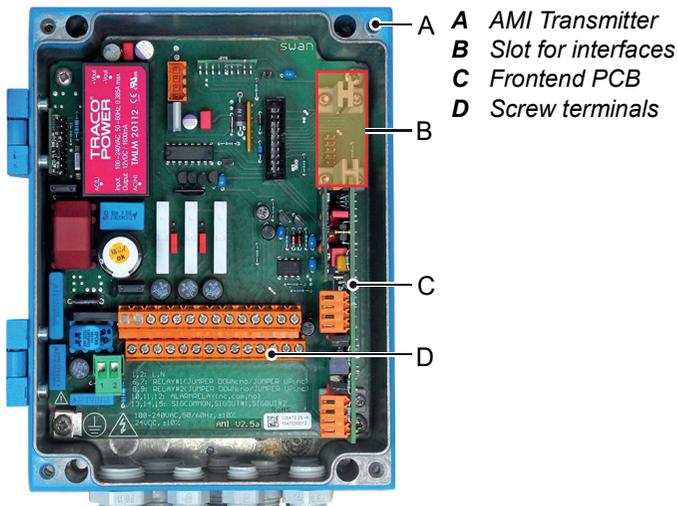
If signals are sent to two different receivers, use signal isolator (loop isolator).

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

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

For programming see [Program List and Explanations, p. 83](#), menu Installation

3.10. Interface Options



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

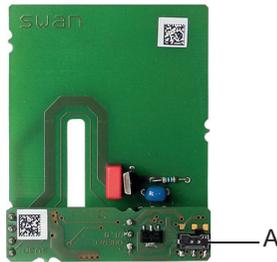
- ◆ Third signal output
- ◆ a Profibus or Modbus connection
- ◆ a HART connection
- ◆ an USB Interface

3.10.1 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

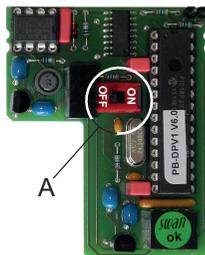
A Operating mode selector switch

3.10.2 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

3.10.3 HART Interface

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

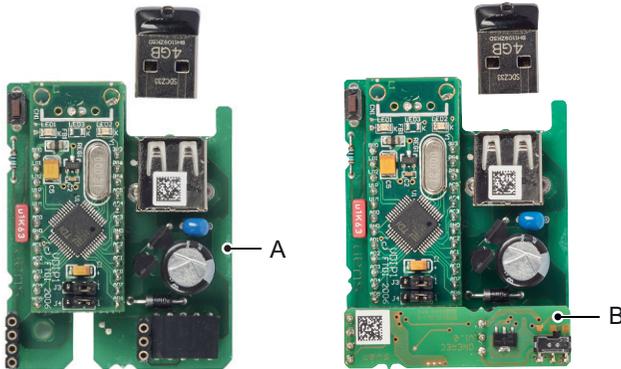


HART Interface PCB

3.10.4 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

After installation according to checklist proceed as following:

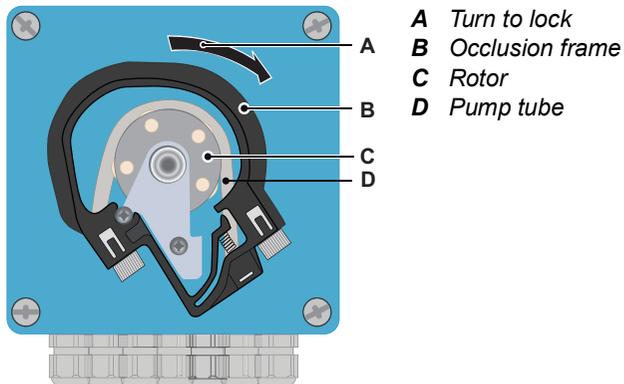
4.1. Prepare Reagents

- 1 Prepare reagents. See [Refill or replace Reagents, p. 49](#).
- 2 Insert the suction lances into the containers.

4.2. Peristaltic Pump

The instrument is delivered with opened occlusion frames.

- 1 Activate the peristaltic pump tubes by closing the occlusion frames [B].



4.3. Establish Sample Flow

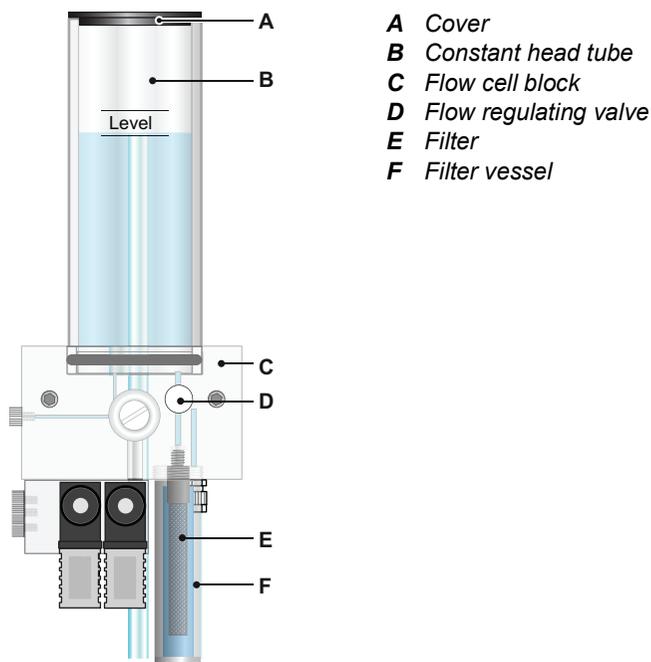


WARNING

Water pollution

The drain of the photometer outlet contains DPD.

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

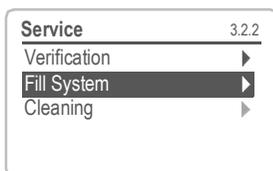


- 1 Open the flow regulating valve (D) and wait until the flow cell is completely filled.
- 2 Switch on power.
- 3 Adjust the sample flow so that always a small part of the sample drains off through the overflow tube.
- 4 Start <Fill system>, see [Fill or Flush Reagent System](#), p. 41.

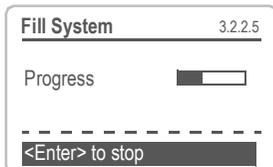
4.4. Fill or Flush Reagent System

Fill or flush the reagent tubing:

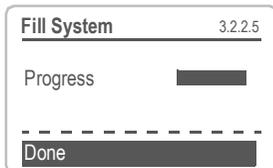
- ◆ upon the initial instrument setup,
- ◆ after refilling the reagent containers,
- ◆ before a system shut-down to flush the system with demineralized water until no more reagent is left in the system.



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



The peristaltic pump is activated for 1.5 minutes.



Press [Exit] 4 x to go back to the operating mode.

- 1 Check tubing and flow cell for leaks and repair if necessary.
- 2 Let the instrument run continuously for 1 hour.

4.5. Programming

Programming

Program all parameters for external devices (interface, recorders, etc.)

Program all parameters for instrument operation (disinfectant, limits, alarms).

Program the DPD value of the Verikit in menu <Installation/Sensors/Ref. Verification>.

If pH option is installed, program the two buffers you want to use for calibration in menu <Installation/Sensors/Standards>.

See [Program List and Explanations, p. 83](#).

4.6. Calibration

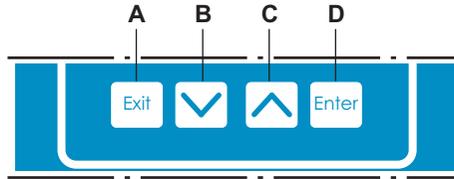
- 1** Calibrate pH sensor (if pH option is installed).
See [Standard pH, p. 55](#).
- 2** Perform process calibration.
See [Process Calibration of tc & fc, p. 53](#)

**If ordered:
Calibration of
pH sensor**

The instrument should be operating for 1 h before performing a pH calibration.
Program the two buffers you want to use for calibration in menu <Installation/Sensors/Standards>. Calibrate the pH sensor with two buffers, e.g. pH 7.00 and pH 9.00. See chapter [Calibration, p. 53](#) for details.

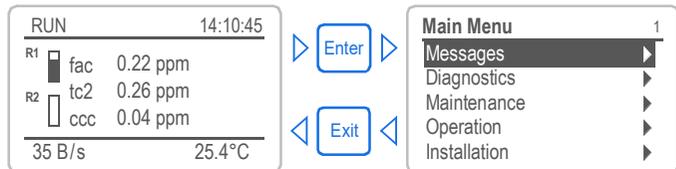
5. Operation

5.1. Keys

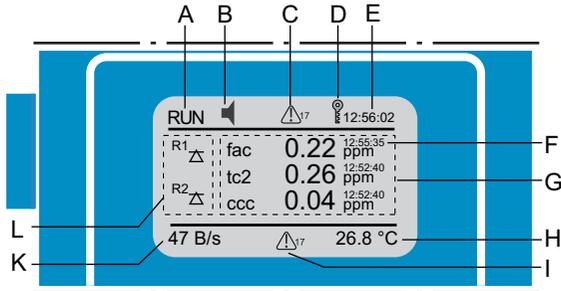


- A** to exit a menu or command (rejecting any changes) to move back to the previous menu level
- B** to move DOWN in a menu list and to decrease digits
- C** to move UP in a menu list and to increase digits to switch between display 1 and 2
- D** to open a selected sub-menu to accept an entry

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** Time stamp (time of the last valid measuring value)
- G** Process values
- H** Sample temperature (only with pH option)
- I** Cleaning solution low, indicates remaining cleaning solution in %
- K** Sample flow
- L** 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

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

Messages	1.1
Reagent Status	▶
Pending Errors	▶
Maintenance List	▶
Message List	▶

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

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

Operation	4.1
Sensors	▶
Relay Contacts	▶
Logger	▶

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

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.

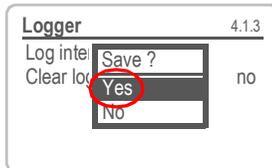
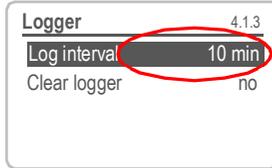
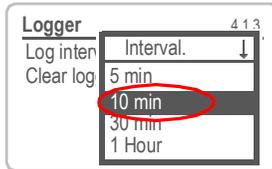
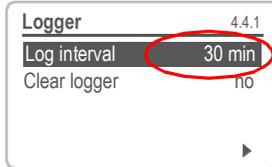
Menu **Installation 5**

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).

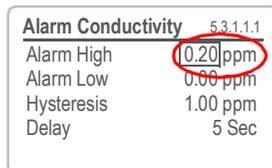
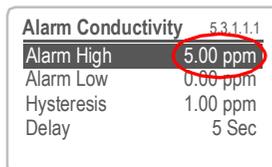
⇒ *The selected parameter is highlighted but not saved yet.*

- 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 Schedule

Daily (dirty water) up to every 2 weeks (clean water)	Check sample supply for dirt. Clean all filters and strainers, if necessary. Clean AMI Codes protection filter, if necessary. Check sample flow (see also Troubleshooting, p. 68)
Every 4–6 weeks	Clean reagent containers and prepare new reagents. Let instrument run for 1 h. Make 3 manual measurements. Compare average value to displayed value. If necessary, perform process calibration.
Monthly	Recommendation: Check photometer with verification kit Verification, p. 52
Yearly	Exchange reagent pump tubes.
By occurrence	E020, FOME dirty: Cleaning the Photometer, p. 57 E022, Reagent empty: Refill or replace Reagents, p. 49 E065, Reagents low: Refill or replace Reagents, p. 49

If pH option is installed

Weekly	Perform a process calibration, see Process pH, p. 54 .
Every 2 months	Perform a standard calibration, see Standard pH, p. 55 .

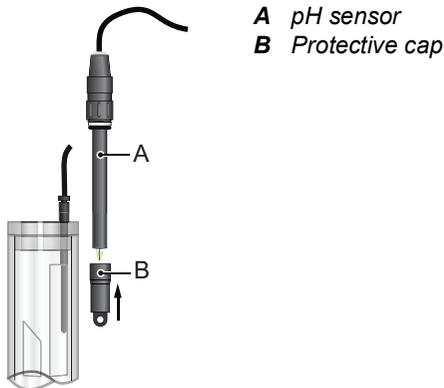


6.2. Stop of Operation for Maintenance

- 1 Put the suction lances into a bucket with clean water.
- 2 Start <Fill system>.
⇒ *The reagent tubes are flushed with water.*
- 3 Remove the suction lances from the water.
- 4 Start <Fill system> again.
⇒ *The water will be pumped out of the reagent tubes.*
- 5 Stop sample flow.
- 6 Wait until the flow cell is empty.
- 7 Shut off power of the instrument.

If pH option is installed:

- 8 Remove the pH sensor [A] from the flow cell.
- 9 Fill the protective cap [B] with water.
- 10 Put the protective cap onto the sensor tip.



6.3. Refill or replace Reagents

The liquid level in containers 2 and 3 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

Note: Before refilling the reagents, rinse the containers with demineralized water.

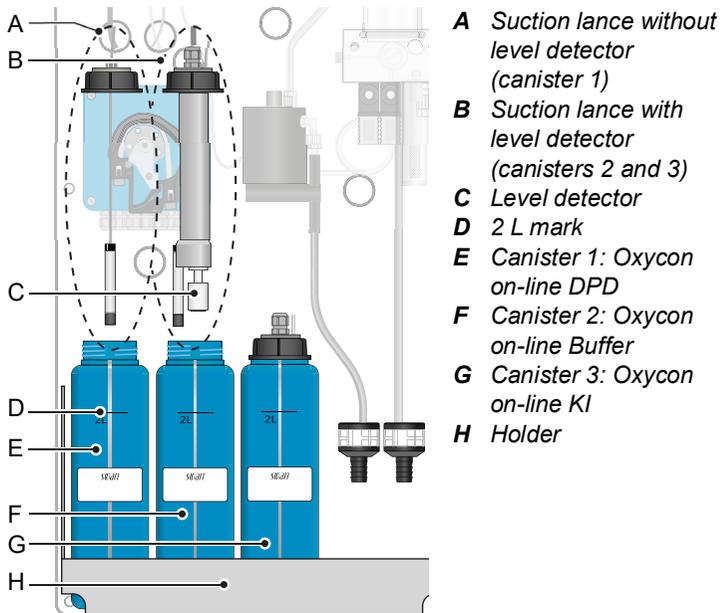


CAUTION

Chemical exposure hazard

- ♦ Observe the necessary security measures when manipulating dangerous chemicals.
- ♦ Read the Material Safety Data Sheets carefully!

Canister set up



Reagent consumption

The 2 liter reagent container for DPD & Buffer will last for 19 days of operation (with measurement interval of 4 minutes). The 2 liter reagent container for KI will last for 66 days of operation (with measurement interval of 20 minutes). The provided reagent set (for 8 containers) therefore lasts for 5 respectively 17 months of operation. As the reagent consumption is not linear find further examples below:

Measuring interval		Duration of DPD/Buffer		Duration of KI	
fc	tc	one canister filling	reagent set	one canister filling	reagent set
2 minutes	10 minutes	~ 14 days	3 months	~ 33 days	8 months
4 minutes	20 minutes	~ 19 days	5 months	~ 66 days	17 months

Contents of the reagent sets

A-85.410.120:
 ♦ Oxycon On-Line DPD (8 bottles)
 ♦ Oxycon On-Line Buffer (8 bags)

A-85.419.200:
 ♦ Oxycon On-Line KI (8 bags)

Personal protective equipment:



Oxycon On-Line DPD:
 H314: Causes severe skin burns and eye damage.
 H318: Causes serious eye damage.



Oxycon On-Line KI:
 H372: Causes damage to organs through prolonged or repeated exposure.



6.3.1 Reagents for measuring free chlorine and total chlorine

Prepare Oxycon On-line DPD

- 1 Rinse the canister [E] labelled "OXYCON ON LINE DPD Reagent" with demineralized water.
- 2 Fill the canister up to the 2 liter mark [D] with demineralized water.

- 3 Slowly pour the content of one bottle of concentrate Oxycon On-line DPD (50 ml) into the canister.
⚠ Avoid splashing!
 - 4 Close the canister with the screw cover and tighten it well.
 - 5 Mix the demineralized water and the reagents well.
 - 6 Put the canister [E] into the holder [H].
 - 7 Remove the screw cover and insert the suction lance [A] and tighten the screw cover.
- Prepare Oxycon On-line Buffer**
- 1 Rinse the canister [F] labelled “OXYCON ON LINE Buffer” solution with demineralized water.
 - 2 Fill the canister up to the 2 liter mark [D] with demineralized water.
 - 3 Slowly pour the content of one bag of buffer Oxycon On-line Buffer into the canister.
⚠ Avoid splashing!
 - 4 Close the canister with the screw cover and tighten it well.
 - 5 Mix the demineralized water and the reagents well.
 - 6 Put canister [F] into holder [H].
 - 7 Remove the screw cover, insert the suction lance [B] and tighten the screw cover.
- Prepare Oxycon On-line KI**
- 1 Rinse the canister [G] labelled “OXYCON ON LINE KI” solution with demineralized water.
 - 2 Fill the canister up to the 2 liter mark [D] with demineralized water.
 - 3 Slowly pour the content of one bag of Oxycon On-line KI into the canister.
⚠ Avoid splashing!
 - 4 Close the canister with the screw cover and tighten it well.
 - 5 Mix the demineralized water and the reagents well.
 - 6 Put canister [G] into holder [H].
 - 7 Remove the screw cover, insert suction lance [B] and tighten the screw cover.
- Start-up** Fill reagent system. See [Fill or Flush Reagent System](#), p. 41.

6.4. Verification

The “Verification kit for AMI Photometer” is available as an accessory. An optical window with a precisely determined absorbance value is placed into the light beam of the photometer. The actual measured absorbance will be compared to the reference value labeled on each kit.



Set reference value: Prior to performing the verification the DPD reference value, e.g. 0.255, needs to be set in menu 5.1.4 <Installation>/<Sensors>/<Ref. Verification>.

Verification procedure: Follow the dialog in menu 3.2.1 <Maintenance>/<Service>/<Verification>.

***Note:** Start any time, if a measuring cycle is in progress wait for next prompt.*

- 1 Stop sample flow by closing the regulating valve. Wait for next prompt: The constant head will be drained and an automatic zero will be defined.
- 2 Open cuvette of the photometer and insert the verification filter. Press [Enter] to continue.
- 3 Align the triangle shape either to the front or back side and adjust for minimal absorbance (see AMI display).
- 4 Press [Enter] to save the verification measurement. The verification is successful if the difference is within the limits. Press [Enter] to continue.
- 5 Remove the filter, close the cuvette and open the regulating valve. Press [Enter] to finish and [Exit] to return to the main screen.

Verification history: Can be reviewed in menu 2.2.1.5 <Diagnostics>/<Sensors>/<Photometer>/<Ver. History>.

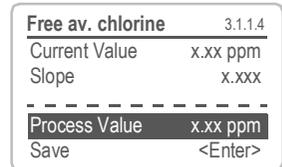
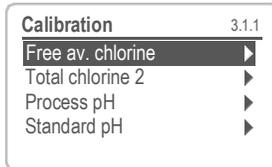
6.5. Calibration

Process Calibration of tc & fc

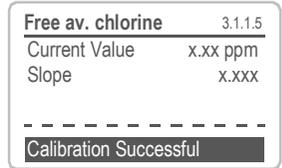
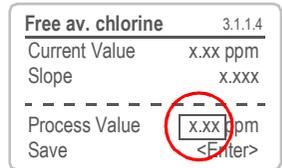
Note: Perform process calibration for free chlorine or total residual chlorine only if:

- the sample concentration is close to the desired process value (stable value).
- you are sure that the reagents are mixed completely and correctly.
- if the difference to the manual measurement is significant.
- Keep in mind the accuracy of your manual measurement.

Use Chematest (or equivalent photometer) to determine the sample disinfectant concentration. Determine the sample disinfectant value by 3 manual DPD measurements. Take the sample direct form the constant head. Calculate the average value. Compare this value to the value, indicated by the AMI transmitter. Keep in mind the accuracy of your manual measurement. Only correct the instrument if the difference is significant.



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



Press 3 x [Exit]

Possible error messages see [Calibration Errors, p. 69](#).

Zero A zero is automatically done before each measurement.

Process pH Use a Chematest photometer (or equivalent) to determine the sample pH value. Insert the electrode through a hole in the constant head cover into the constant head.

Note: Make sure your reference instrument is calibrated correctly!

Maintenance	3.1
Calibration	▶
Service	▶
Simulation	▶
Set Time	01.01.05 16:30:00
Cleaning	▶



Calibration	3.1.2
Free av. chlorine	▶
Total chlorine 2	▶
Process pH	▶
Standard pH	▶

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

Process pH	3.1.2.4
Current Value	7.78 pH
Offset	x mV

Process Value	7.78 pH
Save	<Enter>

Process pH	3.1.2.4
Current Value	7.78 pH
Offset	x mV

Process Value	7.70 pH
Save	<Enter>

Process pH	3.1.2.5
Current Value	7.70 pH
Offset	y mV
Slope	x.xx mV

Calibration successful	

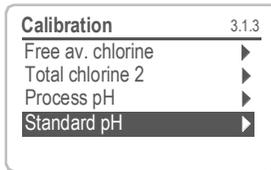
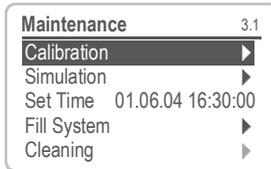


Process pH	3.1.2.5
Current Value	7.70 pH
Offset	y mV

Process Value	7.70 pH
Save	<Enter>

◆ Possible error messages see [Calibration Errors, p. 69](#).

Standard pH



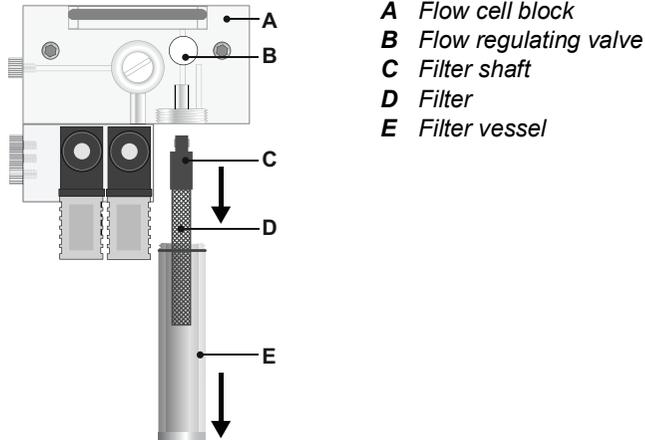
- 1 Navigate to menu <Maintenance>/<Calibration>.
- 2 Press [Enter].
- 3 Remove the pH sensor from the flow cell.
- 4 Follow the instructions on the display.

Display instructions

- 1 Rinse and dry the pH sensor and put it into standard 1.
 - 2 Standard 1, current value (Progress is shown).
 - 3 Rinse and dry the pH sensor and put it in standard 2.
 - 4 Standard 2, current value (Progress is shown).
 - 5 Rinse and dry the pH sensor and put it into the flow cell.
- ◆ Possible error messages see [Calibration Errors, p. 69](#).

6.6. Cleaning the protective Filter

Switch off the instrument according to instructions in [Stop of Operation for Maintenance](#), p. 48.



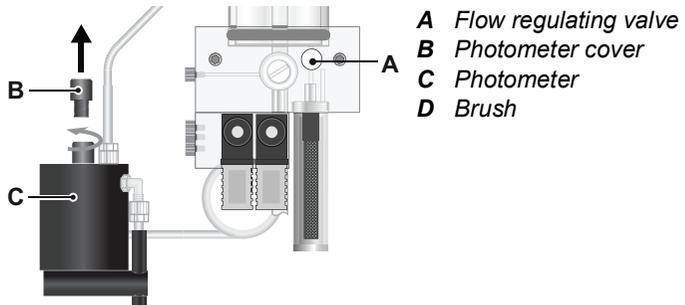
Normally the filter in your sample supply line will retain most debris. If the filter shows deposits, proceed as follows:

- 1 Close the main tap of the sample inlet.
- 2 Close flow regulating valve [B].
- 3 Unscrew and remove the filter vessel [E] from the flow cell block [A].
- 4 Hold the filter [D] on the shaft [C] and unscrew and remove it.
- 5 Backwash the filter under pressure of tap water.
- 6 Clean the outside of the filter.
- 7 Install the filter and the filter vessel again.
- 8 Establish the sample flow.
- 9 Adjust sample flow with the regulating valve.

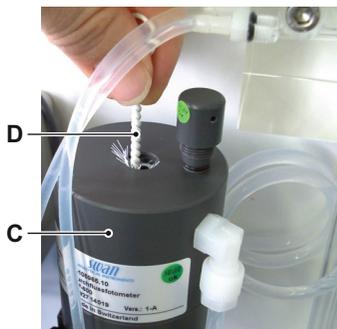
6.7. Cleaning the Photometer

Clean the photometer after indication by alarm (E020, FOME dirty). Switch off the instrument according to instructions in [Stop of Operation for Maintenance, p. 48](#).

Material Small brush.
Procedure



- 1 Close the flow regulating valve [A].
- 2 Wait until the sample flow through the photometer has stopped.
- 3 Unscrew the cover [B] from the photometer [C].



- 4 Clean the Photometer with a small brush [D].
- 5 Screw the cover to the photometer.
- 6 Open the flow regulating valve.

Clean the photometer after indication by alarm (E020, FOME dirty).

6.8. Cleaning the Flow Cell



CAUTION

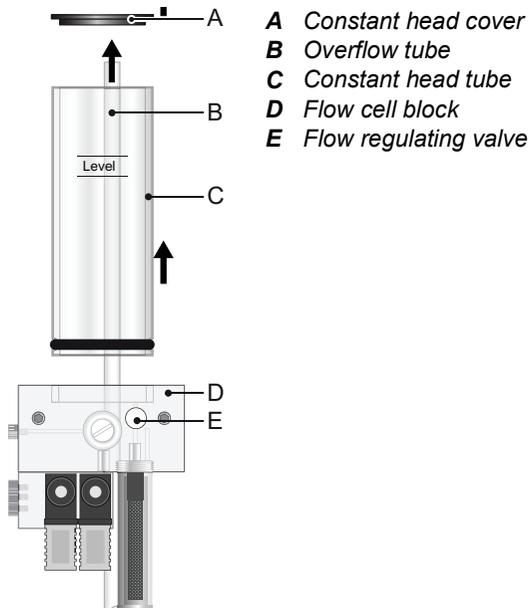
Acrylic glass parts are fragile and scratch-sensitive

Possible damage of acrylic glass parts due to scrubbing materials.

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

6.8.1 Disassemble the Flow Cell

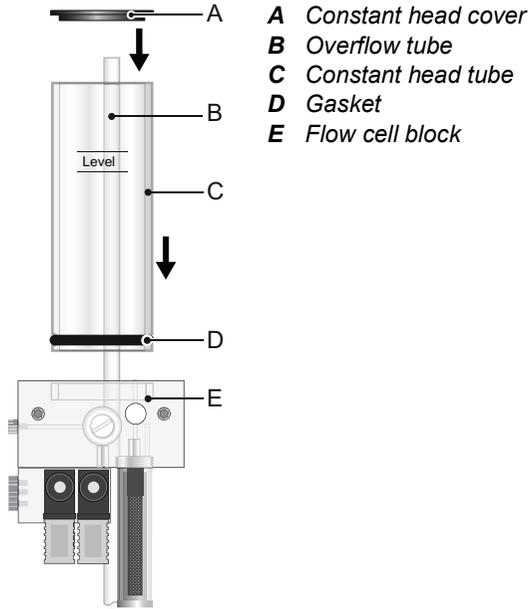
The flow cell can be easily disassembled. Before disassembling the flow cell, switch off the instrument according to instructions in [Stop of Operation for Maintenance, p. 48](#).



- Cleaning**
- 1 Switch off the instrument according to instructions in [Stop of Operation for Maintenance, p. 48](#).
 - 2 Remove the constant head cover [A].
 - 3 Remove the constant head tube [C] from the flow cell block.
 - 4 Pull the overflow tube [B] out of the flow cell block [D].
 - 5 Clean all acrylic parts with a soft brush (bottle cleaner) and soapy water.
 - 6 Remove lime deposits with a common household deliming agent with standard concentrations.
 - 7 Rinse the parts carefully with clean water.



6.8.2 Assemble the Flow Cell

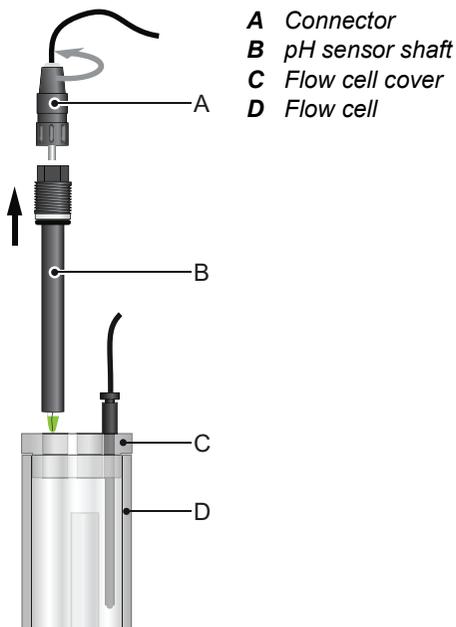


- 1 Replace the gasket [D] before reassembling the flow cell.

Note: A film of teflon paste (e.g. Fomblin from Solvay Solexis) on the gaskets improves tightness and life time.

- 2 Push the overflow tube [B] through the flow cell block as far as it reaches the drain.
- 3 Install the constant head tube [C] onto the flow cell block.
- 4 Put the cover onto the constant head.
- 5 Align the overflow tube with the upper level mark.

6.9. Maintenance of pH sensor



Clean pH sensor

- 1 Remove the pH sensor [B] from the flow cell.
- 2 Unscrew and remove the connector [A] from the pH sensor.
⚠ Prevent the connectors from getting wet
- 3 If necessary wipe the pH sensor shaft and the green tip cautiously with a soft, clean, and damp paper tissue.
- 4 Remove grease with a tissue moistened with alcohol.
- 5 If the sensor is very dirty put it into 1% diluted hydrochloric acid for 1 min.
⚠ CAUTION! hydrochloric acid is corrosive!
- 6 Rinse the pH sensor with clean water.

6.10. Tube Replacement

6.10.1 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 annually.



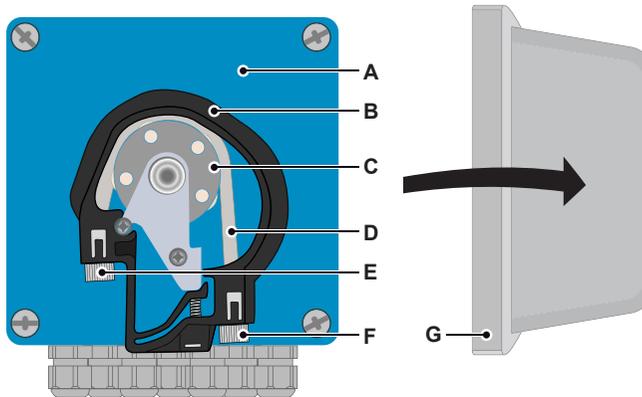
CAUTION

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. 48](#) before opening the occlusion frames.

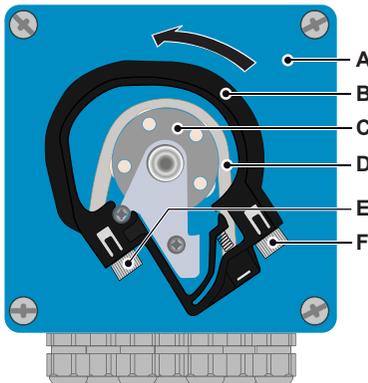
Overview



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

**Dismount
pump tubes**

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

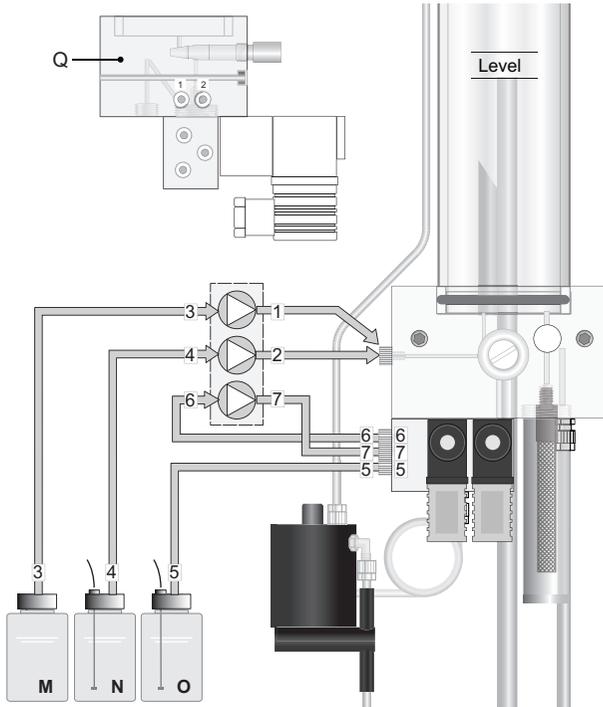


- A** Pump housing
- B** Occlusion frame open
- C** Rotor
- D** Pump tube
- E** Pump inlet
- F** Pump outlet

- 1 Switch off the instrument according to instructions in [Stop of Operation for Maintenance, p. 48](#).
- 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.
- 5 Disconnect the reagent tubes from the old pump tubes and connect them to the new pump tubes
- 6 Install the new pump tubes by pushing the occlusion frames onto the holder.
- 7 Lock the occlusion frames. Check that the occlusion frames and the tubes are aligned perpendicular to the axis of the rotor.
- 8 Insert the suction lances into the corresponding containers.
- 9 Start the <Fill system> function.

6.10.2 Replace the Reagent Tubes

Tube numbering

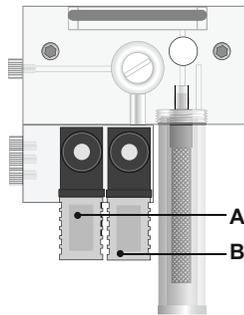


Nr.	from	to
1	Pump outlet rear frame	Flow cell block, connection 1 <i>see Flow cell block side view Q</i>
2	Pump outlet middle frame	Flow cell block, connection 2 <i>see Flow cell block side view Q</i>
3	Reagent container (M) Oxycon on-line DPD	Pump inlet rear frame
4	Reagent container (N) Oxycon on-line Buffer	Pump inlet middle frame
5	Reagent container (O) Oxycon on-line KI	Valve block connection 5
6	Valve block connection 6	Pump inlet front frame 6
7	Pump outlet front frame	Valve block connection 7

6.11. Cleaning the solenoid valve

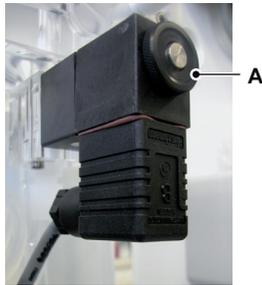
Disassemble the solenoid valve

The solenoid valves are mounted at the bottom of the flow cell block. The solenoid valve should be disassembled if it does not switch anymore or if it is clogged.

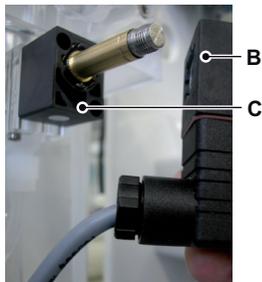


- A** Valve 1 switches the sample flow through the photometer on and off.
- B** Valve 2 is used for adding the Reagent Oxycon on-line KI.

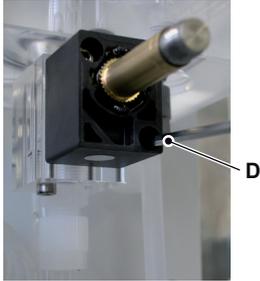
- 1 Switch off the instrument according to instructions in [Stop of Operation for Maintenance, p. 48](#)



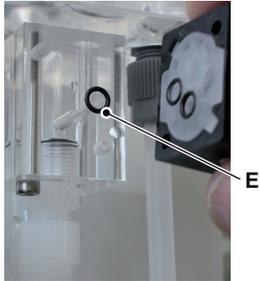
- 2 Loosen the nut (A).



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

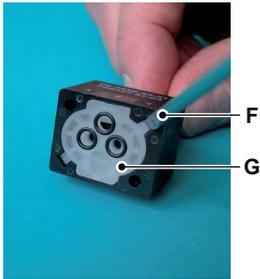


- 4 Loosen the fixing screws of the valve body with a 2.5 mm Allen key (D).



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.
8 If necessary replace the membrane.

Assemble Assemble the solenoid valve in reverse order.

6.12. Longer Stop of Operation

- 1 Put the suction lances into a bucket with clean water.
- 2 Start <Fill system>.
⇒ *The reagent tubes are flushed with water.*
- 3 Remove the suction lances from the water.
- 4 Start <Fill system> again.
⇒ *The water will be pumped out of the reagent tubes.*
- 5 Stop sample flow.
- 6 Wait until level in flow cell has fallen to the shorter tube inside the cell.
- 7 Shut off power of the instrument.
- 8 Empty the flow cell completely.
- 9 Open the occlusion frames of the peristaltic pump, see [Replace the Pump Tubes, p. 62.](#)

If pH option is installed

- 10 Unscrew and remove the connector from the pH sensor.
- 11 Put the connector cap onto the sensor connector.
- 12 Fill 3.5 molar KCl (if not available: water) into the rubber cap.
- 13 Remove the pH sensor from the flow cell and place the rubber cap on the tip of the sensor



CAUTION

Damage of pH sensor

Wrong storage will damage the pH sensor.

- ◆ Never store the pH sensor dry.
- ◆ Store the pH sensor with tip pointing downwards in a frost-protected room.

7. Troubleshooting

This chapter provides some hints to make troubleshooting easier. For any detailed information how to handle or clean parts please see [Maintenance, p. 47](#). For any detailed information how to program the instrument please see [Program List and Explanations, p. 83](#).

7.1. General Instructions

Note: *The sample for the manual measurement (with DPD) must be taken directly from the flow cell.*

If you need further help please contact your dealer. Note serial number of instrument and all diagnostic values before doing so.

Diagnostic values
 Zero photometry: 10'000–16'000 Hz (mostly near 16 000 Hz)
 Slope photometry: 0.8–1.2
 pH offset: new pH sensor: near 0, old pH sensor > ± 50 mV
 pH slope: typically: 55–62 mV/pH unit.

Frequently asked questions

Problem

Possible Reasons

Unstable values

- ◆ Sample taken too close to feeding line
- ◆ Sample flow too irregular or too low

Codes display higher or lower than manual measurement

- ◆ Wrong manual measurement or old chemicals have been used. Repeat the verification.
- ◆ Reagents of AMI Codes mixed wrongly or not completely

Sample flow alarm, but there is sample

- ◆ Check sample flow at photometer outlet. It must be at least 100 ml/min. For that place the photometer outlet tube into a measuring cup for 1 minute.
- ◆ Check sample line for pressure fluctuation.
- ◆ Check for regular air bubble pattern.
- ◆ Check flow alarm values in menu [5.3.1.3, p. 96](#))

7.2. Calibration Errors

7.2.1 Process calibration tc or fc

Possible error message

Slope error:

Possible cause	Corrective Action
Wrong manual measurement.	Repeat the manual measurement. Use fresh reagents.
<ul style="list-style-type: none"> ♦ Wrong reagent mixture ♦ Reagents not completely solved in water. 	<ul style="list-style-type: none"> ♦ Make a correct mixture. ♦ Mix long and intensively.

7.2.2 Process pH

Possible error message

Offset error:

Possible cause	Corrective Action
Manual measurement wrong.	Repeat the manual measurement.
Slope of last calibration wrong.	Set default calibration values, see 5.4.2, p. 103 Repeat the calibration
pH sensor dirty, old or defect.	Clean or replace pH sensor, see Maintenance of pH sensor, p. 61 .
Cable connector corroded.	Replace cable and sensor.

7.2.3 Standard pH

Possible error message

Offset error or Slope error:

Possible cause	Corrective Action
Old, dirty or wrong buffer solutions.	Check buffers expiration date if necessary order new buffer.
Verify programmed buffer values with the values of the buffer solution used.	Change programmed buffer values or use correct buffer solution.
pH sensor dirty, old or defect.	Clean or replace pH sensor, see Maintenance of pH sensor, p. 61 .
Cable connector corroded.	Replace cable and sensor.

7.3. Error List

Error

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

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

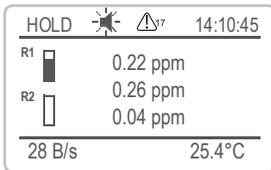
Fatal Error

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)



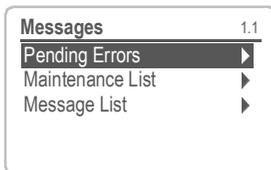
Error or fatal Error

Error not yet acknowledged.

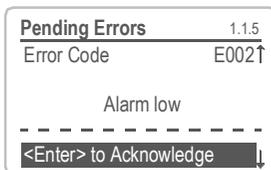
Check **Pending Errors 1.1.5** and take corrective action.

Reagent level low

Indicates the remaining reagent in percent



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	Alarm high fac (Free available chlorine)	<ul style="list-style-type: none"> – check process – check programmed value 5.3.1.1.1.1, p. 95.
E002	Alarm low fac (Free available chlorine)	<ul style="list-style-type: none"> – check process – check programmed value 5.3.1.1.1.26, p. 95
E003	Alarm high tc1 (Total chlorine 1)	<ul style="list-style-type: none"> – check process – check programmed value 5.3.1.1.2, p. 96
E004	Alarm low tc1 (Total chlorine 1)	<ul style="list-style-type: none"> – check process – check programmed value, 5.3.1.1.2, p. 96
E005	Alarm high tc2 (Total chlorine 2)	<ul style="list-style-type: none"> – check process – check programmed value 5.3.1.1.3, p. 96
E006	Alarm low tc2 (Total chlorine 2)	<ul style="list-style-type: none"> – check process – check programmed value 5.3.1.1.3, p. 96
E007	Sample Temp.high	<ul style="list-style-type: none"> – check sample temperature – check programmed value 5.3.1.5, p. 97
E008	Sample Temp. low	<ul style="list-style-type: none"> – check sample temperature – check programmed value 5.3.1.5, p. 97
E009	Sample Flow high	<ul style="list-style-type: none"> – check Inlet pressure – readjust sample flow – check program value 5.3.1.4.2, p. 97
E010	Sample Flow low	<ul style="list-style-type: none"> – check Inlet pressure – readjust sample flow – clean instrument, see Cleaning the protective Filter, p. 56 – check program value 5.3.1.4.36, p. 97



Error	Description	Corrective action
E011	Temp. shorted	<ul style="list-style-type: none"> – check wiring of temperature sensor, see Connection Diagram, p. 31 – check temperature sensor
E012	Temp. disconnected	<ul style="list-style-type: none"> – check wiring of temperature sensor, see Connection Diagram, p. 31 – check temperature sensor
E013	Case Temp. high	<ul style="list-style-type: none"> – check case/environment temperature – check program value 5.3.1.2, p. 96
E014	Case Temp. low	<ul style="list-style-type: none"> – check case/environment temperature – check program value 5.3.1.3, p. 96
E015	Valve 1 defective	<ul style="list-style-type: none"> – Check Valve 1, see Cleaning the solenoid valve, p. 65
E016	DIS invalid	<ul style="list-style-type: none"> – This error appears after start-up and will disappear after the first valid measurement is finished.
E017	Control Timeout	<ul style="list-style-type: none"> – check control device or programming in Installation, Relay contact, Relay 1/2 5.3.2 and 5.3.3, p. 98
E018	Reagent Pump	<ul style="list-style-type: none"> – shut off power – check wiring, see Connection Diagram, p. 31
E019	Photometer not connected	<ul style="list-style-type: none"> – shut off power – check wiring, see Connection Diagram, p. 31
E020	Photometer dirty	<ul style="list-style-type: none"> – check process – clean the photometer, see Cleaning the Photometer, p. 57
E021	Absorbance too high	<ul style="list-style-type: none"> – Appears if disinf. value is too high – Check dosing system or process
E022	Reagent empty	<ul style="list-style-type: none"> – refill reagents, see Refill or replace Reagents, p. 49

Error	Description	Corrective action
E023	Cleaning Solution	– refill cleaning solution, see Refill or replace Reagents, p. 49
E024	Input active	– See If Fault Yes is programmed in Menu 5.3.4, p. 102
E026	IC LM75	– call service
E028	Signal output open	– check wiring on signal outputs 1 and 2
E030	EEProm Frontend	– call service
E031	Calibration Recout	– call service
E032	Wrong Frontend	– call service
E039	Alarm high pH	– check process – check programmed value 5.3.1.6, p. 97
E040	Alarm low pH	– check process – check programmed value 5.3.1.6, p. 97
E049	Power-on	– none, normal status
E050	Power-down	– none, normal status
E065	DPD / Buffer	– Operating display, upper status line: The number next to the triangle, indicates the remaining reagents in%. Refill reagents on time. See Refill or replace Reagents, p. 49
E067	Cleaning Solution	– Operating display, lower status line: The number next to the triangle, indicates the remaining cleaning solution in%. Refill cleaning solution on time.



7.4. 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. 48](#).
- 2 Remove the protection cap and all pump tubes as described in [Dismount pump tubes, p. 63](#).
- 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. 31](#).
- 7 Reassemble in reverse order.

7.5. Replacing Fuses



WARNING

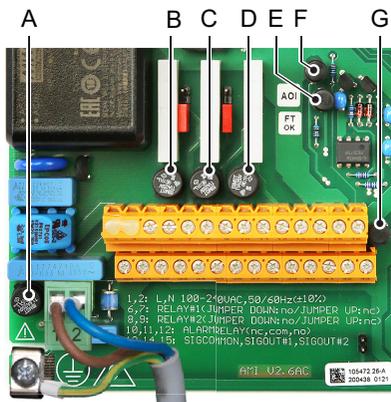
External Voltage.

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

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

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



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

8. Program Overview

For explanations about each parameter of the menus see [Program List and Explanations](#), p. 83.

- ♦ 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)

Reagent Status 1.1*	<i>DPD/Buffer</i> <i>Potassium Iodide</i> <i>Cleaning Solution</i>	1.1.1*	* Menu numbers
Pending Errors 1.2*	<i>Pending Errors</i>	1.2.5*	
Maintenance List 1.3*	<i>Maintenance List</i>	1.3.5*	
Message List 1.4*	<i>Number</i> <i>Date, Time</i>	1.4.1*	

8.2. Diagnostics (Main Menu 2)

Identification	<i>Designation</i>	<i>AMI Codes-II CC</i>	* Menu numbers
2.1*	<i>Version</i>	<i>V6.21 - 07/17</i>	
	Peripherals	<i>PeriClip 1 / 1.03</i>	2.1.3.1*
	2.1.3*	<i>PeriClip 2</i>	only with cleaning module
	Factory Test	<i>Instrument</i>	2.1.4.1*
	2.1.4*	<i>Motherboard</i>	
		<i>Front End</i>	
	Operating Time	<i>Years / Days / Hours / Minutes / Seconds</i>	2.1.5.1*
	2.1.5*		
Sensors	Photometer	<i>Absorbance</i>	
2.2*	2.2.1*	<i>(Raw value) Hz</i>	
		Cal. History	2.2.1.4.1*
		2.2.1.4*	<i>Number</i>
			<i>Date, Time</i>
			<i>Factor fc</i>
			<i>Factor tc</i>
		Ver. History	2.2.1.5.1*
		2.2.1.5*	<i>Number</i>
			<i>Date, Time</i>
			<i>Absorbance</i>
			<i>Reference value</i>
	pH Electrode	<i>Current Value / (Raw value)</i>	
	2.2.2*	Cal. History	2.2.2.5.1*
		2.2.2.5*	<i>Number</i>
			<i>Date, Time</i>
			<i>Offset / Slope</i>
	Miscellaneous	<i>Case Temp.</i>	2.2.3.1*
	2.2.3*		
Sample	<i>Sample ID</i>	2.3.1*	
2.3*	<i>Sample Flow B/s</i>		
	<i>(Raw value) Hz</i>		
	<i>Temperature / (Nt5k)</i>		
I/O State	<i>Alarm Relay</i>	2.4.1*	
2.4*	<i>Relay 1 & 2</i>	2.4.2*	
	<i>Input</i>		
	<i>Signal Output 1 & 2</i>		
Interface	<i>Protocol</i>	2.5.1*	(only with RS485 interface)
2.5*	<i>Baud rate</i>		



8.3. Maintenance (Main Menu 3)

Calibration	Free av. chlorine	<i>Current Value</i>	* Menu numbers
3.1*	3.1.1*	<i>Factor</i>	
		<i>Process Value</i>	3.1.1.4*
	Total chlorine 2	<i>Current Value</i>	
	3.1.2*	<i>Factor</i>	
		<i>Process Value</i>	3.1.2.4*
	Process pH	<i>Current Value</i>	
	3.1.3*	<i>Offset</i>	
		<i>Process Value</i>	3.1.3.4*
	Standard pH	<i>(Progress)</i>	3.1.4.5*
	3.1.4*		
Service	Verification	<i>(Progress)</i>	3.2.1.1*
3.2*	3.2.1*		
	Fill System	<i>(Progress)</i>	3.2.2.5*
	3.2.2*		
Simulation	<i>Alarm Relay</i>	3.3.1*	
3.3*	<i>Relay 1</i>	3.3.2*	
	<i>Relay 2</i>	3.3.3*	
	<i>Signal Output 1</i>	3.3.4*	
	<i>Signal Output 2</i>	3.3.5*	
	<i>Valve 1</i>	3.3.6*	
	<i>Valve 2</i>	3.3.7*	
Set Time	<i>(Date), (Time)</i>		
3.4*			
Cleaning	Parameter	<i>Mode</i>	3.5.1.1*
3.5*	3.5.1*	<i>Start time / Calendar</i>	3.5.1.xx*
		<i>Delay</i>	3.5.1.3*
		<i>Signal Outputs</i>	3.5.1.4*
		<i>Output/Control</i>	3.5.1.5*
	Fill Channel 11	<i>(Progress)</i>	3.5.2.5*
	3.5.2*		
	Fill Channel 12	<i>(Progress)</i>	3.5.3.5*
	3.5.3*		

8.4. Operation (Main Menu 4)

Sensors 4.1*	<i>Filter Time Const.</i> <i>Hold after Cal.</i> <i>Interval fac</i> <i>Interval tc2</i> <i>Default pH</i>	4.1.1* 4.1.2* 4.1.3* 4.1.4* 4.1.5*		* Menu numbers
Relay Contacts 4.2*	Alarm Relay 4.2.1*	Free av. chlorine 4.2.1.1* Total chlorine 1 4.2.1.2* Total chlorine 2 4.2.1.3* Calc. Monochl. 4.2.1.4* Alarm pH 4.2.1.5*	<i>Alarm High</i> <i>Alarm Low</i> <i>Hysteresis</i> <i>Delay</i> <i>Alarm High</i> <i>Alarm Low</i> <i>Hysteresis</i> <i>Delay</i> <i>Alarm High</i> <i>Alarm Low</i> <i>Hysteresis</i> <i>Delay</i> <i>Alarm High</i> <i>Alarm Low</i> <i>Hysteresis</i> <i>Delay</i>	4.2.1.1.1* 4.2.1.1.25* 4.2.1.1.35* 4.2.1.1.45* 4.2.1.2.1* 4.2.1.2.25* 4.2.1.2.35* 4.2.1.2.45* 4.2.1.3.1* 4.2.1.3.25* 4.2.1.3.35* 4.2.1.3.45* 4.2.1.4.1* 4.2.1.4.25* 4.2.1.4.35* 4.2.1.4.45* 4.2.1.5.1* 4.2.1.5.25* 4.2.1.5.35* 4.2.1.5.45*
	Relay 1 & 2 4.2.2* & 4.2.3*	Parameter <i>Setpoint</i> <i>Hysteresis</i> <i>Delay</i>	4.2.x.200* 4.2.x.300* 4.2.x.40*	
	Input 4.2.4*	<i>Active</i> <i>Signal Outputs</i> <i>Output / Control</i> <i>Fault</i> <i>Delay</i>	4.2.4.1* 4.2.4.2* 4.2.4.3* 4.2.4.4* 4.2.4.5*	



Logger	<i>Log Interval</i>	4.3.1*	
4.3*	<i>Clear Logger</i>	4.3.2*	
	<i>Eject USB Stick</i>	4.3.3*	(If USB interface is installed)
Display	Screen 1	Row 1	4.4.1.1*
4.4*	4.4.1*	Row 2	4.4.1.2*
		Row 3	4.4.1.3*
	Screen 2	Row 1	4.4.2.1*
	4.4.2*	Row 2	4.4.2.2*
		Row 3	4.4.2.3*

* Menu numbers

8.5. Installation (Main Menu 5)

Sensors	<i>Dimension</i>	5.1.1*			* Menu numbers
5.1*	<i>Interpolation</i>	5.1.2*			
	<i>Ref. Verification</i>	5.1.3*			
	Standards	<i>Standard 1</i>	5.1.4.1*		only with pH option
	5.1.4*	<i>Standard 2</i>	5.1.4.2*		
	<i>Cleaning</i>	5.1.5			only with Cleaning Module
Signal Outputs	Signal Output 1 & 2	<i>Parameter</i>	5.2.1.1 & 5.2.2.1*		
5.2*	5.2.1* & 5.2.2*	<i>Current Loop</i>	5.2.1.2 & 5.2.2.2*		
		<i>Function</i>	5.2.1.3 & 5.2.2.3*		
		Scaling	<i>Range Low</i>	5.2.x.40.10*	
		5.2.x.40	<i>Range High</i>	5.2.x.40.20*	
Relay Contacts	Alarm Relay	Disinfection	Free av. chlorine	<i>Alarm High</i>	5.3.1.1.1.1*
5.3*	5.3.1*	5.3.1.1*	5.3.1.1.1*	<i>Alarm Low</i>	5.3.1.1.1.25*
				<i>Hysteresis</i>	5.3.1.1.1.35*
				<i>Delay</i>	5.3.1.1.1.45*
			Total chlorine 1	<i>Alarm High</i>	5.3.1.1.2.1*
			5.3.1.1.2*	<i>Alarm Low</i>	5.3.1.1.2.25*
				<i>Hysteresis</i>	5.3.1.1.2.35*
				<i>Delay</i>	5.3.1.1.2.45*
			Total chlorine 2	<i>Alarm High</i>	5.3.1.1.3.1*
			5.3.1.1.3*	<i>Alarm Low</i>	5.3.1.1.3.25*
				<i>Hysteresis</i>	5.3.1.1.3.35*
				<i>Delay</i>	5.3.1.1.3.45*
		<i>Case Temp. high</i>	5.3.1.2*		
		<i>Case Temp. low</i>	5.3.1.3*		
		Sample Flow	<i>Flow Alarm</i>	5.3.1.4.1*	
		5.3.1.4*	<i>Alarm High</i>	5.3.1.4.2*	
			<i>Alarm Low</i>	5.3.1.4.35*	
		Temperature	<i>Alarm High</i>	5.3.1.5.1*	
		5.3.1.5*	<i>Alarm Low</i>	5.3.1.5.25*	
		pH	<i>Alarm High</i>	5.3.1.6.1*	
		5.3.1.6*	<i>Alarm Low</i>	5.3.1.6.25*	
			<i>Hysteresis</i>	5.3.1.6.35*	
			<i>Delay</i>	5.3.1.6.45*	



	Relay 1 & 2	<i>Function</i>	5.3.2.1 & 5.3.3.1*
	5.3.2* & 5.3.3*	<i>Parameter</i>	5.3.2.x & 5.3.3.x*
		<i>Setpoint</i>	5.3.2.x & 5.3.3.x*
		<i>Hysteresis</i>	5.3.2.x & 5.3.3.x*
		<i>Delay</i>	5.3.2.x & 5.3.3.x*
	Input	<i>Active</i>	5.3.4.1*
	5.3.4*	<i>Signal Outputs</i>	5.3.4.2*
		<i>Output/Control</i>	5.3.4.3*
		<i>Fault</i>	5.3.4.4*
		<i>Delay</i>	5.3.4.5*
Miscellaneous	<i>Language</i>	5.4.1*	
5.4*	<i>Set defaults</i>	5.4.2*	
	<i>Load Firmware</i>	5.4.3*	
	Password	<i>Messages</i>	5.4.4.1*
	5.4.4*	<i>Maintenance</i>	5.4.4.2*
		<i>Operation</i>	5.4.4.3*
		<i>Installation</i>	5.4.4.4*
	<i>Sample ID</i>	5.4.5*	
	<i>Line break detection</i>	5.4.6*	
Interface	<i>Protocol</i>	5.5.1*	(only with RS485 interface)
5.5*	<i>Device Address</i>	5.5.21*	
	<i>Baud Rate</i>	5.5.31*	
	<i>Parity</i>	5.5.41*	*Menu numbers

9. Program List and Explanations

1 Messages

1.1 Reagent Status

- 1.1.1
 - o *DPD/Buffer*: Shows the fill level of the DPD/Buffer.
 - o *Potassium Iodide*: Shows the fill level of the Potassium Iodide.
 - o *Cleaning solution*: Shows the fill level of the Cleaning solution.A ✓ behind the reagent means that the filling level is ok. If the filling level falls below 17%, it is shown in %.

1.2 Pending Errors

- 1.2.5 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.

1.3 Maintenance List

- 1.3.5 Demands necessary maintenance, e.g. preparing new reagents.

1.4 Message List

- 1.4.1 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

- o *Designation*: View the Designation of instrument.
- o *Version*: Firmware of instrument (e.g. V6.21-07/17)

2.1.3 Peripherals: PeriClip 1: Firmware of peristaltic pump (e.g. 1.06)

2.1.4 Factory Test: Test date of the Instrument, Motherboard and Frontend. QC factory test.

2.1.5 Operating Time: Years/days/hours/minutes/seconds

2.2 Sensors

2.2.1 Photometer:

- o *Absorbance*: Process value, depends on sample.
- o *Raw value*: Shows the actual photometer signal in Hz.

- 2.2.1.4 Cal. History:** Shows the diagnostic values of the last calibrations.
- o *Number:* Counter for the calibrations
 - o *Date, Time:* Date and time assigned to a number.
 - o *Factor fc:* Factor fc is the multiplier applied to the slope of the free chlorine calibration line. The ideal factor is 1.00.
 - o *Factor tc:* Factor tc is the multiplier applied to the slope of the total chlorine calibration line. The ideal factor is 1.00
- 2.2.1.5 Ver. History:** Shows the verification values of the last verifications:
- o *Number:* Calibration counter.
 - o *Date, Time:* Date and time of the calibration.
 - o *Absorbance:* Measured absorbance of the reference kit.
 - o *Reference value:* True value of the reference kit according to label.
- 2.2.2 pH Electrode:** Only if pH option is installed.
- o *Current Value:* Shows the actual measured pH value.
 - o *Raw value:* Shows the actual electrode voltage in mV.
- 2.2.2.5 Cal. History:** Shows the calibration values of the last pH sensor calibrations. Offset in mV and slope in mV/pH.
- Typical offset of pH electrode: $\lt; \pm 30 \text{ mV}$.
- Max. tolerated offset: $\lt; \pm 60 \text{ mV}$
- Typical slope of pH electrode: 55–65 mV/pH unit.
- Max. limits: 40–65 mV/pH
- 2.2.3 Miscellaneous:**
- 2.2.3.1 Case Temp:** Shows the current temperature in °C inside the transmitter.

2.3 Sample

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

2.4 I/O State

Shows current status of all in- and outputs.

2.4.1 & 2.4.2

<i>Alarm Relay:</i>	Active or inactive
<i>Relay 1 & 2:</i>	Active or inactive
<i>Input:</i>	Open or closed
<i>Signal Output 1 & 2:</i>	Actual current in mA
<i>Signal Output 3:</i>	Actual current in mA (if option is installed)

2.5 Interface

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

3 Maintenance

3.1 Calibration

In this menu, you can correct measuring values (disinfectant and pH) or calibrate offset and slope of pH electrode.

- 3.1.1 **Free av. chlorine:** Possibility to correct the free available chlorine value. See [Process Calibration of tc & fc, p. 53](#), for more details.
- 3.1.2 **Total chlorine 2:** Possibility to correct the total chlorine value. See [Process Calibration of tc & fc, p. 53](#), for more details.
- 3.1.3 **Process pH:** Only available, if pH option has been installed. Correction of pH electrode. See [Process Calibration of tc & fc, p. 53](#), for details.
- 3.1.4 **Standard pH:** Only available, if pH option has been installed. Calibration of pH electrode with the two standard solutions programmed in Installation 5.1.3. See [Standard pH, p. 55](#), for details.

3.2 Service

- 3.2.1 **Verification:** Performs a verification using the reference kit. Follow dialog. See [Verification, p. 52](#)
- 3.2.2 **Fill System:** Activates the reagent pump. The function Fill System is used to fill or flush the reagent tubes.

3.3 Simulation

To simulate a value or a relay state, select the

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

with the [▲] or [▼] key.

Press the [Enter] key.

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

Press the [Enter] key.

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

Alarm Relay: Active or inactive

Relay 1 & 2: Active or inactive

Signal Output 1 & 2: Actual current in mA

Signal Output 3: Actual current in mA (if option is installed)

Valve 1 (photometer) Active or inactive

Valve 2 (KI supply) 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.

3.4 Set Time

Adjust date and time.

3.5 Cleaning

Automatic cleaning process using the optional Cleaning Module-II.

Cleaning is not possible if one of the following errors is active:

- ♦ E009/E010 Sample flow high/low
- ♦ E023 Cleaning solution

3.5.1 Parameters

- 3.5.1.1 *Mode:* The following modes can be chosen: interval, daily, weekly or off.

If Mode = Interval

- 3.5.1.20 *Interval:* Select one of the following cleaning intervals:
 1 h, 2 h, 3 h, 4 h, 6 h, 8 h, 12 h.
- 3.5.1.3 *Delay:* During cleaning plus the delay time, the status of the signal and control outputs is as set in 3.5.1.4 and 3.5.1.5.
 Range: 0–6000 s
- 3.5.1.4 *Signal Outputs:* Select the operation mode of the signal outputs during cleaning:
 - 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.
- 3.5.1.5 *Output/Control:* Relay or signal output:
 - Cont.:* Controller continues normally.
 - Hold:* Controller continues based on the last valid value.
 - Off:* Controller is switched off.

If Mode = daily

- The start of the daily cleaning cycle can be set to any time of day.
- 3.5.1.21 *Start time:* Time of the automatic start of the cleaning process.
 Range: 00:00:00–23:59:59
 - 3.5.1.3 *Delay:* see mode interval.
 - 3.5.1.4 *Signal Outputs:* see mode interval.
 - 3.5.1.5 *Output/Control:* see mode interval.

If Mode = weekly

The start of the automatic cleaning cycle can be set to one or more weekdays and any time of day. The programmed time of day is valid for all selected weekdays.

- 3.5.1.22 Calendar:**
 - 3.5.1.22.1 Start time: Time of the automatic start of the cleaning process (valid for all selected weekdays).
 - 3.5.1.22.2 Monday: Possible settings: on or off to
 - 3.5.1.22.8 Sunday: Possible settings: on or off

- 3.5.1.3 *Delay*: see mode interval.
- 3.5.1.4 *Signal Outputs*: see mode interval.
- 3.5.1.5 *Output/Control*: see mode interval.

all modes

- 3.7.2 *Fill Channel 11*: Activates the cleaning pump and switches the valve to cleaning solution 1 (right canister).
- 3.7.3 *Fill Channel 12*: Activates the cleaning pump and switches the valve to cleaning solution 2 (left canister).

4 Operation

4.1 Sensors

- 4.1.1 *Filter Time Constant*: Used to damp noisy signals. The higher the filter time constant, the slower the system reacts to changes of the measured value.
Range: 5–300 Sec
- 4.1.2 *Hold after Cal*: Delay permitting the instrument to stabilize again after calibration. During calibration plus hold time, the signal outputs are frozen (held on last valid value), alarm values, limits are not active.
Range: 0–6'000 Sec
- 4.1.3 *Interval fac*: The measuring interval of “Free available chlorine” can be set according to the process requirements.
Range: 0–12 min
- 4.1.4 *Interval tc2*: The measuring interval of “Total chlorine 2” can be set according to the process requirements. If the interval is set to 0 min only fac is measured.
Range: 0–60 min
- 4.1.5 *Default pH*: If the pH value of the sample is known it can be entered in this menu. This menu only appears if the pH option is not installed.
Range: 0–14 pH

4.2 Relay Contacts

See [5.3 Relay Contacts](#), p. 95

4.3 Logger

The instrument is equipped with an internal logger. The 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, measuring values, 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 login buffer is full, the oldest data record is erased to make room for the newest one. (circular buffer)

Interval	1 s	5 s	1 min	5 min	10 min	30 min	1 h	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.

4.4 Display

Process values are displayed on two screens. Toggle screens with the [] key. Each screen displays max. 3 process values.

4.4.1 Screen 1

4.4.1.1 Row 1

4.4.1.2 Row 2

4.4.1.3 Row 3

Possible settings for all rows are:

- ◆ None
- ◆ Free av. chlorine (*Free available chlorine*)
- ◆ Total chlorine 1
- ◆ Total chlorine 2
- ◆ Calc. monochl. (*Calculated monochloramine*)
- ◆ Calc. comb. cl. (*Calculated combined chlorine*)
- ◆ Calc. dichloramine (*Calculated dichloramine*)
- ◆ pH

4.4.2 Screen 2

Same as screen 1.



5 Installation

5.1 Sensors

- 5.1.1 *Dimension:* The measuring value can be displayed as ppm or mg/l
- 5.1.2 *Interpolation:*
- o *Yes:* Calculates the average of the 2 last measuring values of free chlorine measurement. Use this mode to avoid high spikes in the control loop.
 - o *No:* The true measuring value is displayed and available at the outputs.
- 5.1.3 *Ref. Verification:* Set absorbance value of verification kit according to label.
Range: 0.200–0.600
- 5.1.40 Standards:** Program the two standard solutions for the calibration of the pH electrode. If pH electrode is not connected the programmed standards are not active.
Range: 1.00 pH - 13.00 pH
- 5.1.5 Cleaning:** Program whether the cleaning module uses one or two solutions.
Range: 1 solution, 2 solutions

5.2 Signal Outputs

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

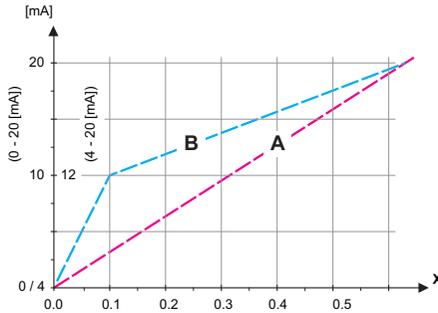
Note: *The navigation in the menu <Signal Output 1> and <Signal Output 2> is equal. For reason of simplicity only the menu numbers of Signal Output 1 are used in the following.*

- 5.2.1.1 *Parameter:* Assign one of the process values to the signal output.
Available values:
- ◆ Free av. chlorine (*Free available chlorine*)
 - ◆ Total chlorine 1
 - ◆ Total chlorine 2
 - ◆ Calc. monochl. (*Calculated monochloramine*)
 - ◆ Calc. comb. cl. (*Calculated combined chlorine*)
 - ◆ Calc. dichloramine (*Calculated dichloramine*)
 - ◆ Temperature
 - ◆ Sample flow
 - ◆ pH
- 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

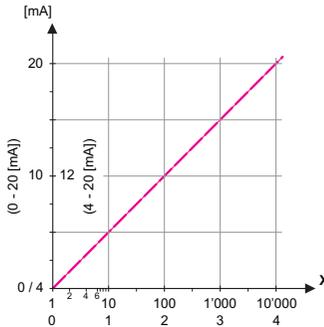
- 5.2.1.3 *Function*: Define if the signal output is used to transmit a process value or to drive a control unit. Available functions are:
- ♦ Linear, bilinear or logarithmic for process values.
 See [As process values, p. 91](#)
 - ♦ Control upwards or control downwards for controllers.
 See [As control output, p. 93](#)

As process values

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



A linear **X** Measured value
B bilinear



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 Free av. chlorine

5.2.1.40.10 *Range low:* 0–10 ppm or 0–10 mg/l

5.2.1.40.20 *Range high:* 0–10 ppm or 0–10 mg/l

Parameter Total chlorine 1

5.2.1.40.11 *Range low:* 0–10 ppm or 0–10 mg/l

5.2.1.40.21 *Range high:* 0–10 ppm or 0–10 mg/l

Parameter Total chlorine 2

5.2.1.40.12 *Range low:* 0–10 ppm or 0–10 mg/l

5.2.1.40.22 *Range high:* 0–10 ppm or 0–10 mg/l

Parameter Calc. monochl.

5.2.1.40.13 *Range low:* 0–10 ppm or 0–10 mg/l

5.2.1.40.23 *Range high:* 0–10 ppm or 0–10 mg/l

Parameter Calc. comb. cl.

5.2.1.40.14 *Range low:* 0–10 ppm or 0–10 mg/l

5.2.1.40.24 *Range high:* 0–10 ppm or 0–10 mg/l

Parameter Calc. dichloramine

5.2.1.40.15 *Range low:* 0–10 ppm or 0–10 mg/l

5.2.1.40.25 *Range high:* 0–10 ppm or 0–10 mg/l

Parameter Temperature

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

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

Parameter Sample flow

5.2.1.40.17 *Range low:* 0 –600 B/s

5.2.1.40.27 *Range high:* 0 –600 B/s

Parameter pH

5.2.1.40.18 *Range low:* 0 –14 pH

5.2.1.40.28 *Range high:* 0 –14 pH

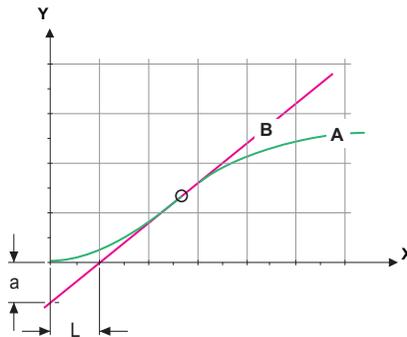
As control output

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 $X_p = 1.2/a$
B Tangent on the inflection point $T_n = 2L$
X Time $T_v = L/2$

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

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

Control upwards / downwards

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

5.2.1.43 Control Parameters: if Parameters = Free av. chlorine

5.2.1.43.10 *Setpoint*: 0–10 ppm or 0–10 mg/l

5.2.1.43.20 *P-Band*: 0–10 ppm 0–10 mg/l

5.2.1.43 Control Parameters: if Parameters = Total chlorine 1

5.2.1.43.11 *Setpoint*: 0–10 ppm or 0–10 mg/l

5.2.1.43.21 *P-Band*: 0–10 ppm 0–10 mg/l

5.2.1.43 Control Parameters: if Parameters = Total chlorine 2

5.2.1.43.12 *Setpoint*: 0–10 ppm or 0–10 mg/l

5.2.1.43.22 *P-Band*: 0–10 ppm 0–10 mg/l

5.2.1.43 Control Parameters: if Parameters = Calc. monochl.

5.2.1.43.13 *Setpoint*: 0–10 ppm or 0–10 mg/l

5.2.1.43.23 *P-Band*: 0–10 ppm 0–10 mg/l

5.2.1.43 Control Parameters: if Parameters = Calc. comb. cl.

5.2.1.43.14 *Setpoint*: 0–10 ppm or 0–10 mg/l

5.2.1.43.24 *P-Band*: 0–10 ppm 0–10 mg/l

5.2.1.43 Control Parameters: if Parameters = Calc. dichloramine

5.2.1.43.15 *Setpoint*: 0–10 ppm or 0–10 mg/l

5.2.1.43.25 *P-Band*: 0–10 ppm 0–10 mg/l

5.2.1.43 Control Parameters: if Parameters = Temperature

5.2.1.43.16 *Setpoint*: -30 to +120 °C

5.2.1.43.26 *P-Band*: 0–100 °C

5.2.1.43 Control Parameters: if Parameters = Sample Flow

5.2.1.43.17 *Setpoint*: 0 –600 B/s

5.2.1.43.27 *P-Band*: 0 –200 B/s

5.2.1.43 Control Parameters: if Parameters = pH

5.2.1.43.18 *Setpoint*: 0 –14 pH

5.2.1.43.28 *P-Band*: 0 –14 pH

5.3.2.32.31.3 *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

- 5.3.2.32.31.4 *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
- 5.3.2.32.31.5 *Control timeout*: If a controller action (dosing intensity) is constantly over 90% during a defined period of time and the process value does not come closer to the setpoint, the dosing process will be stopped for safety reasons.
Range: 0–720 min

5.3 Relay Contacts

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

The contact is inactive at:

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

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

- ◆ Free chlorine
- ◆ Total chlorine 1
- ◆ Total chlorine 2
- ◆ Case Temperature high and low
- ◆ Sample flow
- ◆ Temperature
- ◆ pH

5.3.1.1 Disinfection

5.3.1.1.1 Free av. chlorine

- 5.3.1.1.1.1 *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: 0.00–10.00 ppm
- 5.3.1.1.1.26 *Alarm Low*: If the measured value falls below the alarm low value, the alarm relay is activated and E002 is displayed in the message list.
Range: 0.00–10.00 ppm
- 5.3.1.1.1.36 *Hysteresis*: Within the hyst. range, the relay does not switch. This prevents damage of relays contacts when the measured value fluctuates around the alarm value.
Range: 0.00–10.00 ppm

5.3.1.1.1.46 *Delay:* Duration, the activation of the alarm relay is retarded after the measuring value has risen above/fallen below the programmed alarm.
Range: 0.00–28'800 Sec

5.3.1.1.2 Total chlorine 1

5.3.1.1.2.1 *Alarm High:* If the measured value rises above the alarm high value, the alarm relay is activated and E003 is displayed in the message list. Range: 0.00–10.00 ppm

5.3.1.1.2.26 *Alarm Low:* If the measured value falls below the alarm low value, the alarm relay is activated and E004 is displayed in the message list.
Range: 0.00–10.00 ppm

5.3.1.1.2.36 *Hysteresis:* Within the hyst. range, the relay does not switch. This prevents damage of relays contacts when the measured value fluctuates around the alarm value.
Range. 0.00–10.00 ppm

5.3.1.1.2.46 *Delay:* Duration, the activation of the alarm relay is retarded after the measuring value has risen above/fallen below the programmed alarm.
Range: 0.00–28'800 Sec

5.3.1.1.3 Total chlorine 2

5.3.1.1.3.1 *Alarm High:* If the measured value rises above the alarm high value, the alarm relay is activated and E005 is displayed in the message list. Range: 0.00–10.00 ppm

5.3.1.1.3.26 *Alarm Low:* If the measured value falls below the alarm low value, the alarm relay is activated and E006 is displayed in the message list.
Range: 0.00–10.00 ppm

5.3.1.1.3.36 *Hysteresis:* Within the hyst. range, the relay does not switch. This prevents damage of relays contacts when the measured value fluctuates around the alarm value.
Range. 0.00–10.00 ppm

5.3.1.1.3.46 *Delay:* Duration, the activation of the alarm relay is retarded after the measuring value has risen above or fallen below the programmed alarm.
Range: 0.00–28'800 Sec

5.3.1.2 *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

5.3.1.3 *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 to +20 °C

- 5.3.1.4 Sample Flow:** Define at which sample flow a flow alarm should be issued.
- 5.3.1.4.1 *Flow Alarm:* Program if the alarm relay should be activated if there is a flow alarm. Choose between yes or no. The flow alarm will always be indicated in the display, pending error list, saved in the message list and the logger.
Available values: Yes or no
Note: *Sufficient flow is essential for a correct measurement. We recommend to program yes.*
- 5.3.1.4.2 *Alarm High:* If the measuring values rises above the programmed value E009 will be issued.
Range: 100–600 B/s
- 5.3.1.4.36 *Alarm Low:* If the measuring values falls below the programmed value E010 will be issued.
Range: 5–80 B/s
- 5.3.1.5 Temperature:** Only available if pH option is installed. Define the measuring value, which should issue an alarm high respectively low.
- 5.3.1.5.1 *Alarm High:* If the sample temperature rises above the programmed value E007 is issued.
Range: 30–70 °C
- 5.3.1.5.26 *Alarm Low:* If the sample temperature falls below the programmed value E008 is issued.
Range: 0–20 °C
- 5.3.1.6 Alarm pH:** Only available if pH option is installed. Define the measuring value, which should issue an alarm high respectively low.
- 5.3.1.6.1 *Alarm High:* If the measured value rises above the alarm high value, the alarm relay is activated and E039 is displayed in the message list.
Range: 0–14 pH
- 5.3.1.6.26 *Alarm Low:* If the measured value falls below the alarm low value, the alarm relay is activated and E040 is displayed in the message list
Range: 0–14 pH
- 5.3.1.6.36 *Hysteresis:* Within the hyst. range, the relay does not switch. This prevents damage of relays contacts when the measured value fluctuates around the alarm value
Range: 0–14 pH
- 5.3.1.6.46 *Delay:* Duration, the activation of the alarm relay is retarded after the measuring value has risen above/fallen below the programmed alarm.
Range: 0–28'800 Sec

5.3.2 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. 34](#).
 The function of relay contacts 1 or 2 are defined by the user.

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

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

5.3.2.1 Function = Limit upper/lower:

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

5.3.2.20 *Parameter:* select a process value

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

Parameter	Range
Free av. chlorine	0–10 ppm
Total chlorine 1	0–10 ppm
Total chlorine 2	0–10 ppm
Calc. monochl.	0–10 ppm
Calc. comb. cl.	0–10 ppm
Calc. dichloramine	0–10 ppm
Temperature	-30 to +120 °C
Sample flow	0 –600 B/s
pH	0–14 pH

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

Parameter	Range
Free av. chlorine	0–10 ppm
Total chlorine 1	0–10 ppm
Total chlorine 2	0–10 ppm
Calc. monochl.	0–10 ppm
Calc. comb. cl.	0–10 ppm
Calc. dichloramine	0–10 ppm
Temperature	0 to +100 °C
Sample flow	0 –200 B/s
pH	0–14 pH

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

5.3.2.1 Function = Control upwards/downwards:

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

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

- ◆ Free av. chlorine (*Free available chlorine*)
- ◆ Total chlorine 1
- ◆ Total chlorine 2
- ◆ Calc. monochl. (*Calculated monochloramine*)
- ◆ Calc. comb. cl. (*Calculated combined chlorine*)
- ◆ Calc. dichloramine (*Calculated dichloramine*)
- ◆ Temperature
- ◆ Sample flow
- ◆ pH

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. 94](#)

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. 94](#)

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. 94](#)

5.3.2.1 **Function = Timer:**
The relay will be active repetitively depending on the programmed time scheme.

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

5.3.2.24 **Interval**

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

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

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

5.3.2.6 *Signal Outputs*: Select operating mode of the signal output:
Cont.: Signal outputs continue to issue the measured value.
Hold: Signal outputs hold the last valid measured value. Measurement is interrupted. Errors, except fatal errors, are not issued.
Off: Signal outputs are switched off (set to 0 or 4 mA). Errors, except fatal errors, are not issued.

5.3.2.7 *Output/Control*: Select operating mode of the controller output:
Cont.: Controller continues normally.
Hold: Controller continues based on the last valid value.
Off: Controller is switched off.

5.3.2.24 *daily*

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

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

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

Range: 00:00:00–23:59:59

5.3.2.44 *Run Time*: see Interval

5.3.2.54 *Delay*: see Interval

5.3.2.6 *Signal Outputs*: see Interval

5.3.2.7 *Output/Control*: see Interval

5.3.2.24 *weekly*

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

5.3.2.342 Calendar:

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

5.3.3.1 **Function = End of Batch**

This function is only available on relay 2. It is used to communicate with canal switching instruments from third-party suppliers. The relay closes for 1 sec. after each valid measurement. If End of Batch is selected, no further selection is possible.

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.
Available settings: German/English/French/Spanish
- 5.4.2 *Set defaults:* Reset the instrument to factory default values in three different ways:
- ◆ **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.
- 5.4.4 **Password:** Select a password different from 0000 to prevent unauthorized access to the menus “Messages”, “Maintenance”, “Operation” and “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-Nr.: Range: Analyzer; Manufacturer; Multivariable
- 5.5.40 Local operation: Range: Enabled, Disabled

5.5.1 *Protocol: Modbus RTU*

- 5.5.21 Device address: Range: 0–126
- 5.5.31 Baud Rate: Range: 1200–115 200 Baud
- 5.5.41 Parity: Range: none, even, odd

5.5.1 *Protocol: USB stick*

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

5.5.1 *Protocol: HART*

- Device address: Range: 0–63

10. Material Safety Data sheets

10.1. Reagents

Catalogue No.:	A-85.410.120
Product name:	OXYCON ON-LINE DPD
Catalogue No.:	A-85.410.120
Product name:	OXYCON ON-LINE Buffer
Catalogue No.:	A-85.419.200
Product name:	OXYCON ON-LINE KI
Catalogue No.:	A-85.112.300
Product name:	Calibration Solution pH 4
Catalogue No.:	A-85.113.300
Product name:	Calibration Solution pH 7
Catalogue No.:	A-85.114.300
Product name:	Calibration Solution pH 9

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



11. Default Values

Note: *The parameter Cleaning is only visible if an optional Cleaning Module is connected to the AMI Codes II.
 The parameters pH and temperature are only visible if the pH option is installed.*

Operation

Sensors	Filter Time Const.:30 s
	Hold after Cal.:120 s
	Interval fac:5 min
	Interval tc220 min
	default pH: <i>(If pH option is not installed)</i>7 pH
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
Display	Display 1; Line 1 Free av. chlorine
	Display 1; Line 2 Total chlorine 2
	Display 1; Line 3 Calc. comb. cl.
	Display 2; Line 1 Total chlorine 1
	Display 2; Line 2 Calc. dichloramine
	Display 2; Line 3 Total chlorine 2

Installation

Sensor	Dimension: ppm
	Interpolation: no
	Ref. Verification: 0.255
	Standard: Standard 1:7.00 pH
	Standard: Standard 2:9.00 pH
	Cleaning2 Solutions
Signal Output	Parameter: Free av. chlorine.
1 and 2	Current loop:4 - 20 mA
	Function: linear
	Scaling: Range low: 0.00 ppm
	Scaling: Range high: 5.00 ppm
	Scaling: Temperature: Range low: 0.0 °C
	Scaling: Temperature: Range high: 50.0 °C
	Scaling: pH: Range low:0.00 pH
	Scaling: pH: Range high: 14.00 pH

	Scaling: Sample Flow: Range low:	0 B/s
	Scaling: Sample Flow: Range high:	200 B/s
Alarm Relay	Disinfection	
	Free av. chlorine, Alarm high:	10.00 ppm
	Free av. chlorine, Alarm low:	0.00 ppm
	Free av. chlorine, Hysteresis:	0.10 ppm
	Free av. chlorine, Delay:	5 s
	Total chlorine 1, Alarm high:	10.00 ppm
	Total chlorine 1, Alarm low:	0.00 ppm
	Total chlorine 1, Hysteresis:	0.10 ppm
	Total chlorine 1, Delay:	5 s
	Total chlorine 2, Alarm high:	10.00 ppm
	Total chlorine 2, Alarm low:	0.00 ppm
	Total chlorine 2, Hysteresis:	0.10 ppm
	Total chlorine 2, Delay:	5 s
	pH: Alarm high:	14.00 pH
	pH: Alarm low:	0.00 pH
	pH: Hysteresis:	0.10 pH
	pH: Delay:	5 s
	Sample Flow: Flow Alarm:	yes
	Sample Flow: Alarm High:	500 B/s
	Sample Flow: Alarm Low:	5 B/s
	Sample Temp.: Alarm High:	55 °C
	Sample Temp.: Alarm Low:	5 °C
	Case temp. high:	65 °C
	Case temp. low:	0 °C
Relay1 and 2	Function:	Limit upper
	Parameter:	Free av. chlorine
	Setpoint:	5.00 ppm
	Hysteresis:	0.10 ppm
	Delay:	30 s
	If Function = Control upw. or dnw:	
	Parameter:	Free av. chlorine
	Settings: Actuator:	Frequency
	Settings: Pulse Frequency:	120/min
	Settings: Control Parameters: Setpoint:	5.00 ppm
	Settings: Control Parameters: P-band:	0.10 ppm
	Parameter:	Total chlorine 1 and 2
	Settings: Actuator:	Frequency
	Settings: Pulse Frequency:	120/min
	Settings: Control Parameters: Setpoint:	5.00 ppm
	Settings: Control Parameters: P-band:	0.10 ppm

Parameter:.....**Calc. monochl.**
 Settings: Actuator: Frequency
 Settings: Pulse Frequency: 120/min
 Settings: Control Parameters: Setpoint: 5.00 ppm
 Settings: Control Parameters: P-band: 0.10 ppm

Parameter:.....**Calc. comb. cl.**
 Settings: Actuator: Frequency
 Settings: Pulse Frequency: 120/min
 Settings: Control Parameters: Setpoint: 5.00 ppm
 Settings: Control Parameters: P-band: 0.10 ppm

Parameter:.....**Calc. dichloramine**
 Settings: Actuator: Frequency
 Settings: Pulse Frequency: 120/min
 Settings: Control Parameters: Setpoint: 5.00 ppm
 Settings: Control Parameters: P-band: 0.10 ppm

Parameter:.....**Temperature**
 Settings: Actuator: Frequency
 Settings: Pulse Frequency: 120/min
 Settings: Control Parameters: Setpoint: 30 °C
 Settings: Control Parameters: P-band: 1 °C

Parameter:.....**Sample Flow**
 Settings: Actuator: Frequency
 Settings: Pulse Frequency: 120/min
 Settings: Control Parameters: Setpoint: 200 B/s
 Settings: Control Parameters: P-band: 20 B/s

Parameter:.....**pH**
 Settings: Actuator: Frequency
 Settings: Pulse Frequency: 120/min
 Settings: Control Parameters: Setpoint: 7 pH
 Settings: Control Parameters: P-band: 0.1 pH

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

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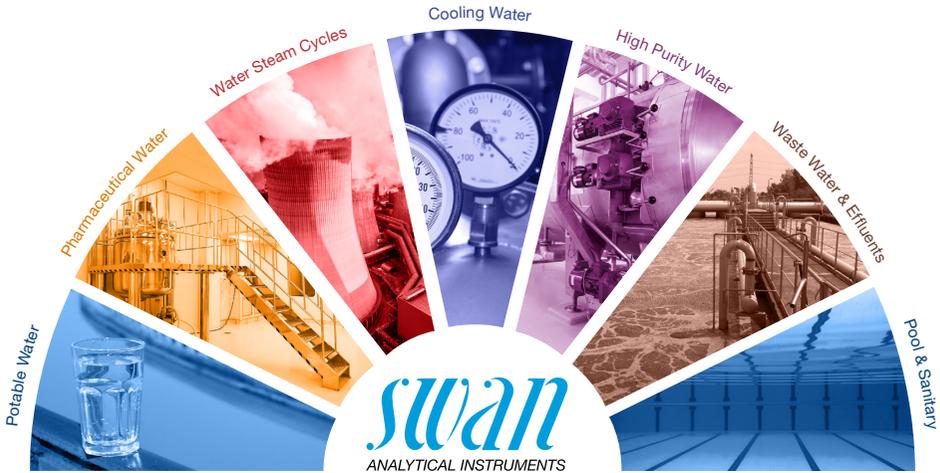
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