ANALYTICAL INSTRUMENTS

A-96.210.111 / 130226

AMI-II Trides

Operator's Manual

MADE IN SWITZERLAND

Customer Support

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This manual applies to firmware V1.00 and higher.
The information contained in this document is subject to change without notice.

Table of Contents

Operator's Manual

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

1. Safety Instructions

General

The instructions included in this section explain the potential risks associated with instrument operation and provide important safety practices designed to minimize these risks.
If you carefully follow the information contained in this section, you can protect yourself from hazards and create a safer work environment.
More safety instructions are given throughout this manual, at the respective locations where observation is most important. Strictly follow all safety instructions in this publication.

Target audience

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

OM location

Keep the 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


General warning


Attention

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.

1.3. Restrictions for Use

Sample requirements

The instrument cannot be used for measuring samples containing the following substances or for dosing control of these substances:

- disinfectants containing stabilizers like cyanuric acid or 5,5-dimethylhydantoine,
- organic chlorine compounds.

The sample must not contain cleaners, corrosion inhibitors (phosphates), sand (or other polishing material) or oil.
Do not use copper pipes in the water treatment system. Copper interferes with the sensor system.

Dechlorination

After dechlorination the disinfectant value is always (near) zero. To prevent biological growth, we strongly recommend to flush the flow cell and sensor occasionally with water of higher disinfectant concentration, e.g. by switching to a sample line before dechlorination.
To perform a sensor calibration, a certain amount of chlorine is required, which may not be available during normal operation.

Mixture of several disinfectants

The AMI-II Trides always measures the total of all added disinfectants. Separation measurements are not possible.

2. Product Description

2.1. Description of the System

Application range

The AMI-II Trides can be used to measure the following disinfectants in potable water, sanitary water and swimming pools.

- Hypochlorous acid
- Free chlorine
- Ozone
- Chlorine dioxide
- Bromine
- Iodine

There are two main applications:

1) Control of setpoint

The instrument is used to measure and maintain a certain disinfectant value in the system. The disinfectant is added with a dosing unit.

2) Dechlorination

The disinfectant is removed to protect equipment that is sensitive to disinfectants, such as a reverse osmosis system. The instrument detects the disinfectant content remaining after dechlorination and monitors that the disinfectant concentration does not exceed the limit value.

Available models

The instrument is available in two models:

- Model on standard PVC panel (280 mm × 850 mm)
- Model on small PVC panel (300 mm × 530 mm)

Options

The instrument can be equipped with the following options.

- pH and/or redox electrode
- AMI-II Relay Box (model on standard PVC panel only)

Signal outputs

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

Current loop: 0/4–20 mA

Maximal burden: 510 Ω

Two additional signal outputs with the same specifications available as an option.

Relays
Two potential-free contacts programmable as limit switches for measured values, controllers or timers with automatic hold function.
Maximum load: 1 A/250 VAC

AMI-II Relay Box (option)
The AMI-II Relay Box adds two additional relays to the AMI-II transmitter (displayed as relays 3 and 4 in the menu).
It is intended for the direct power supply (AC) and control of dosing devices, e.g. two solenoid valves, two dosing pumps or one motor valve.
Maximum load: 1.5 A/250 VAC

Alarm relay
Two potential-free contacts (one normally open and one normally closed contact). Summary alarm indication for programmable alarm values and instrument faults.
- Normally open contact:
  Closed during normal operation, open on error and loss of power.
- Normally closed contact:
  Open during normal operation, closed on error and loss of power.

Maximum load: 1 A/250 VAC

Input
One input for potential-free contact to freeze the measured value or to interrupt control in automated installations. Programmable as HOLD or OFF function.

Communication interface (optional)
- Two additional signal outputs
- RS485 with fieldbus protocol Modbus RTU or Profibus DP
- HART

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.

Measuring principle

The sensor consists of two platinum electrodes and a reference electrode. A voltage is applied between the measuring electrode (platinum rod) and the counter electrode (platinum ring). A small current flows depending on the disinfectant concentration. The reference electrode controls the voltage and guarantees optimal measuring conditions on the platinum sensor. For optimal sensitivity, a rotor continuously cleans the surfaces of the platinum electrodes (hydrodynamic cleaning).
At a constant disinfectant concentration, the measured value depends on the temperature and in case of chlorine/hypochlorous acid on the pH value. Temperature is compensated automatically with the integrated temperature sensor. The influence of pH on the measurement of chlorine/hypochlorous acid can be compensated for either by installing the optional pH measurement in the measuring cell or by programming the known and constant pH of the sample into the instrument firmware.

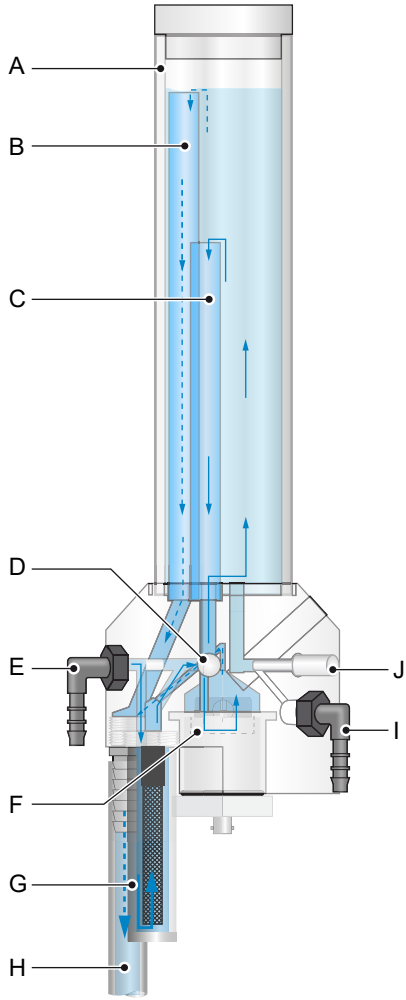
Fluidics

The sample enters at the sample inlet [E], passes the filter vessel [G] and the flow regulating valve [D] and fills the constant head [A]. To ensure a constant pressure at the sensor, a small amount of sample must always overflow into the drain via the overflow tube [B].
The rest of the sample flows through the tube [C] to the sensor, drives the rotor and flows into the drain. The rotational speed of the rotor is measured with a Hall effect sensor to monitor the sample flow.

Grab sample

The grab sample outlet [I] can be used to take a sample from the constant head. This sample can be used to perform a comparative measurement with another instrument.
The standard method to correct the AMI-II Trides is the DPD photometric method. Use a high quality photometer to determine the reference value, e.g. Swan Chematest.

Fluidics overview

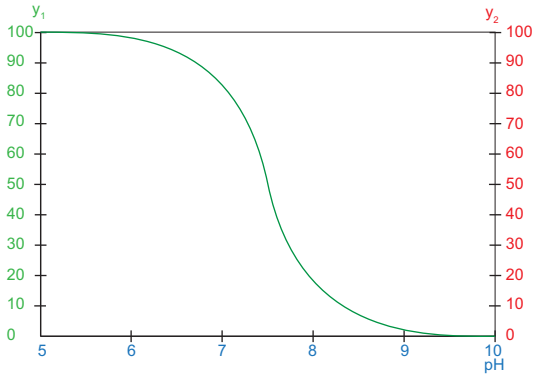


A *Constant head*
B *Overflow tube to waste*
C *Overflow tube to sensor*
D *Flow regulating valve*
E *Sample inlet*
F *Trides sensor*
G *Filter vessel*
H *Sample outlet*
I *Grab sample outlet*
J *Grab sample valve*

About free chlorine

When chlorine is dissolved in water, it reacts to hypochlorous acid and hypochlorite which are in acid-base equilibrium. “Free chlorine” is the sum of both species, hypochlorous acid and hypochlorite, and the concentration is generally expressed in ppm chlorine. The ratio of hypochlorous acid and hypochlorite depends on the pH value:

- At pH 7: 77% hypochlorous acid, 23% hypochlorite.
- At pH 8: 25% hypochlorous acid, 75% hypochlorite.



y1 *Percent of HOCl (hypochlorous acid)*
y2 *Percent of disinfection performance**

* Simplified assumption that hypochlorite does not contribute to disinfection performance

Hypochlorous acid is a much better disinfectant than hypochlorite. The efficiency of disinfection therefore depends on the pH value.

Hypochlorous acid

From the measured concentration of free chlorine and the pH value, the fraction of free chlorine present as hypochlorous acid is calculated according to the above acid-base equilibrium and displayed in ppm. The concentration of hypochlorous acid is a measure for the concentration of the active disinfectant and thus of the efficacy of disinfection in the sample.

Free chlorine and HOCl

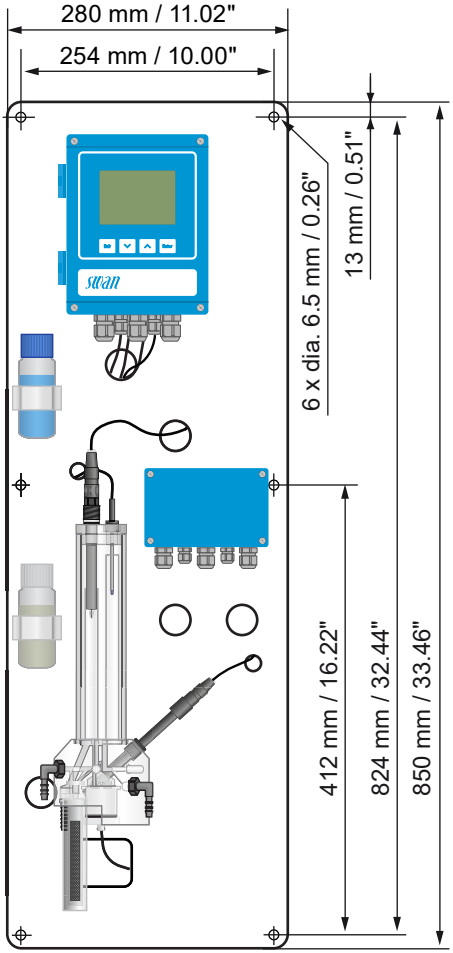
To have an immediate overview of the concentration of free chlorine and the efficacy of disinfection, both parameters can also be displayed simultaneously.

2.2. Instrument Specification

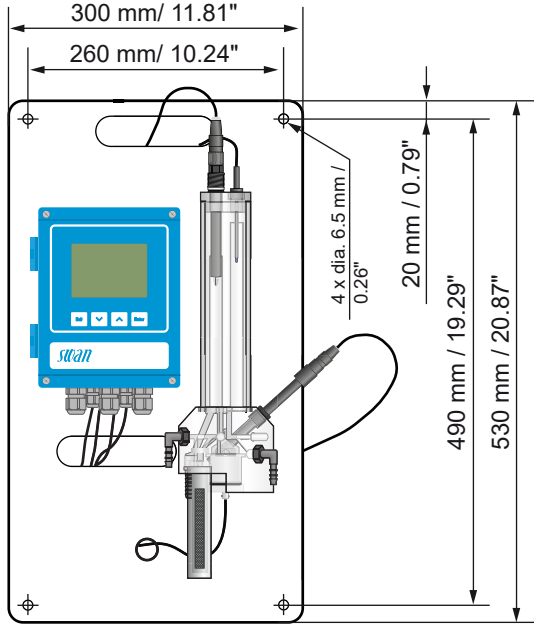
Power supply	AC variant:	100–240 VAC (±10%) 50/60 Hz (±5%)
	DC variant:	10–36 VDC
	Power consumption	max. 35 VA
Sample requirements	Water consumption:	approx. 40 l/h
	Temperature:	5 to 45 °C
	Inlet pressure:	max. 2 bar
	Outlet pressure:	pressure free
	Min. sample conductivity:	5 µS/cm
On-site requirements	The analyzer site must permit connections to:	
	Sample inlet:	hose nozzle for flexible tube, 6 mm inner Ø
	Sample outlet:	elbow hose nozzle for flexible tube, 15 mm inner Ø
Measuring range	**HOCl or free chlorine:**	
	Range:	Accuracy:
	0.00–1.00 ppm	±0.01 ppm
	1.00–3.00 ppm	±0.06 ppm
	3.00–5.00 ppm	±0.2 ppm
	Ozone:	
	Range:	Accuracy:
	0.000–1.000 ppm	±0.005 ppm
	Chlorine dioxide, iodine or bromine:	
	Range:	Accuracy:
	0.00–1.00 ppm	±0.01 ppm
	1.00–3.00 ppm	±0.06 ppm
Transmitter specifications	Housing:	aluminum, with a protection degree of IP 66 / NEMA 4X
	Ambient temperature:	-10 to +50 °C
	Humidity:	10–90% rel., non condensing
	Display:	backlit LCD, 74 x 53 mm

Dimensions

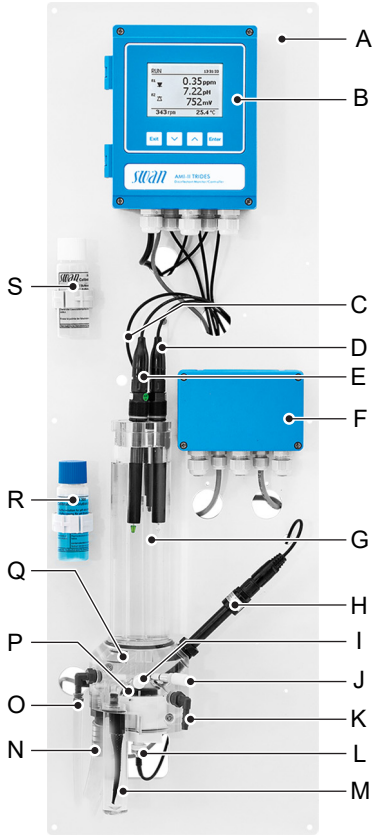
Panel:	PVC
Dimensions:	280×850×200 mm
Screws:	5 or 6 mm
Weight:	6 kg



Dimensions (version on small panel)	Panel:	PVC
	Dimensions:	300×530×200 mm
	Screws:	5 or 6 mm
	Weight:	5 kg



2.3. Instrument Overview



A *Panel*
B *Transmitter*
C *Temperature sensor*
D *Redox electrode (option)*
E *pH electrode (option)*
F *AMI-II Relay Box*
G *Constant head*
H *Reference electrode*
I *Flow regulating valve*
J *Grab sample valve*
K *Grab sample outlet*
L *Trides sensor*
M *Filter*
N *Sample outlet*
O *Sample inlet*
P *Rotor with Hall effect sensor*
Q *Flow cell block*
R *Calibration solution pH 9*
S *Calibration solution pH 7*

3. Installation

3.1. Installation Checklist

On-site requirements	AC variant: 100 – 240 VAC (±10 %), 50/60 Hz (±5 %). DC variant: 10 – 36 VDC. Power consumption: 35 VA maximum. Protective earth connection required. Sample line with sufficient sample flow and pressure (see Instrument Specification, p. 13).
Installation	Mount the instrument in vertical position. Display should be at eye level. Mount the filter and the filter vessel. Assemble the constant head. Connect sample inlet and outlet.
Electrical wiring	Connect all external devices like limit switches and current loops according to the connection diagram. Connect power cord.
Sensors	Install and connect the reference electrode. Install and connect the temperature sensor. Install and connect the pH and/or redox electrode (if applicable).
Power-up	Make sure that the grab sample valve is closed. Start sample flow and wait until the rotor on the Trides sensor begins to rotate. Switch on power.
Instrument setup	Adjust sample flow. Program all sensor parameters. Program all parameters for external devices (interface, recorders, etc.). Program all parameters for instrument operation (limits, alarms).
Calibration of pH/ redox electrode	Calibrate the pH and/or redox electrode, if installed.
Run-in period	Free chlorine >0.1 ppm: Let the instrument run for 24 h without interruption at normal sample conditions. Then correct disinfection value if necessary. Free chlorine <0.1 ppm: Let the instrument run for at least five days without interruption at normal sample conditions. Perform a zero calibration. Correct disinfection value if necessary.

3.2. Mounting the Instrument

Mounting requirements

Mount the instrument in vertical position. The display should be at eye level to simplify operation and maintenance.
The instrument is intended for indoor installation or weather-protected installation in cabinets.

Dimensions

For dimensions, see p. 14 and p. 15.

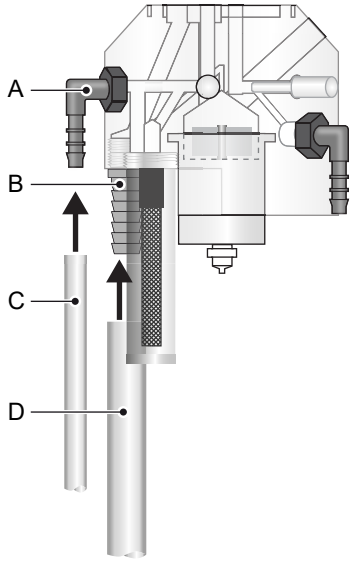
3.3. Connecting Sample and Waste

Sample inlet

Push the 6 mm tube [C] over the elbow hose nozzle [A] at the sample inlet.

Waste

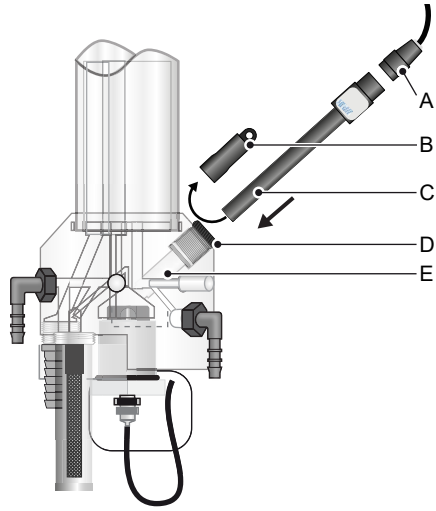
Connect the 15 mm tube [D] to the waste nozzle [B] and place it into the atmospheric drain.



A *Elbow hose nozzle at sample inlet*
B *Sample outlet*
C *6 mm plastic tube*
D *15 mm tube*

3.4. Install the Reference Electrode

The reference electrode is delivered separately and protected with a water-filled protective cap. The cable is fixed to the panel with adhesive tape, labelled “TR” and already connected to the front end PCB in the transmitter.



A *Connector*
B *Protective cap*
C *Reference electrode*
D *Union nut*
E *Flow cell block*

To install the reference electrode proceed as follows:

1 Loosen the union nut [D].

2 Remove the protective cap [B] from the reference electrode [C].

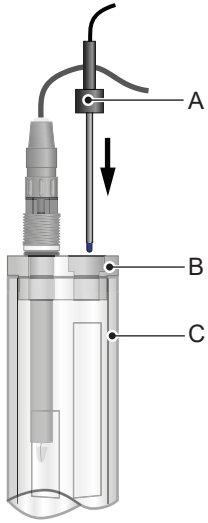
3 Push the reference electrode through the union nut [D] into the bore of the flow cell block [E] as far as it will go.

4 Tighten the union nut.

5 Remove the connector [A] from the panel and screw it onto the reference electrode.

3.5. Install the Temperature Sensor

The temperature sensor is fixed to the panel with adhesive tape, its cable is labelled “T” and already connected to the front end PCB in the transmitter.



A *Temperature sensor*
B *Constant head cover*
C *Constant head*

To install the temperature sensor proceed as follows:

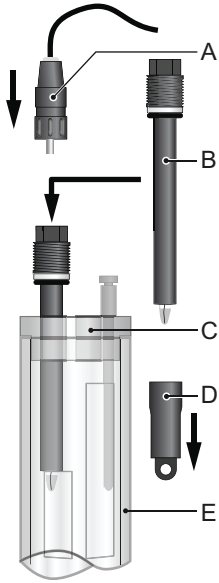
1 Remove the temperature sensor [A] from the panel.

2 Put the temperature sensor in the designated hole of the constant head cover [B].

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

3.6. Install the pH and/or Redox Electrode

The cable of the pH electrode is labelled “pH” and the cable of the redox sensor is labelled “R”.



A *Connector*
B *pH/Redox electrode*
C *Constant head cover*
D *Sensor cap*
E *Constant head*

1 Remove the cap [D] from the pH/redox electrode [B].

2 Insert the electrode through the cover [C] into the flow cell [E]

3 Screw the connector [A] onto the sensor.

3.7. Electrical Connections

WARNING

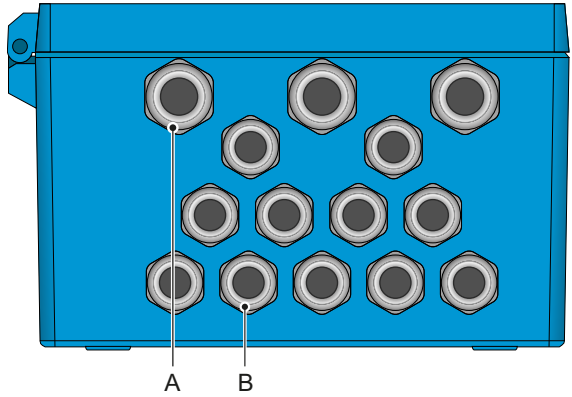
Risk of electrical shock

Failure to follow safety instructions can result in serious injury or death.

- Always turn off power before manipulating electric parts.
- Do not connect the instrument to power unless the ground wire (PE) is connected.
- 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. Protect unused cable glands.



A *M16 cable glands (3x): cable* $Ø_{outer}$ *5–10 mm*
B *M12 cable glands (11x): cable* $Ø_{outer}$ *3–6 mm*

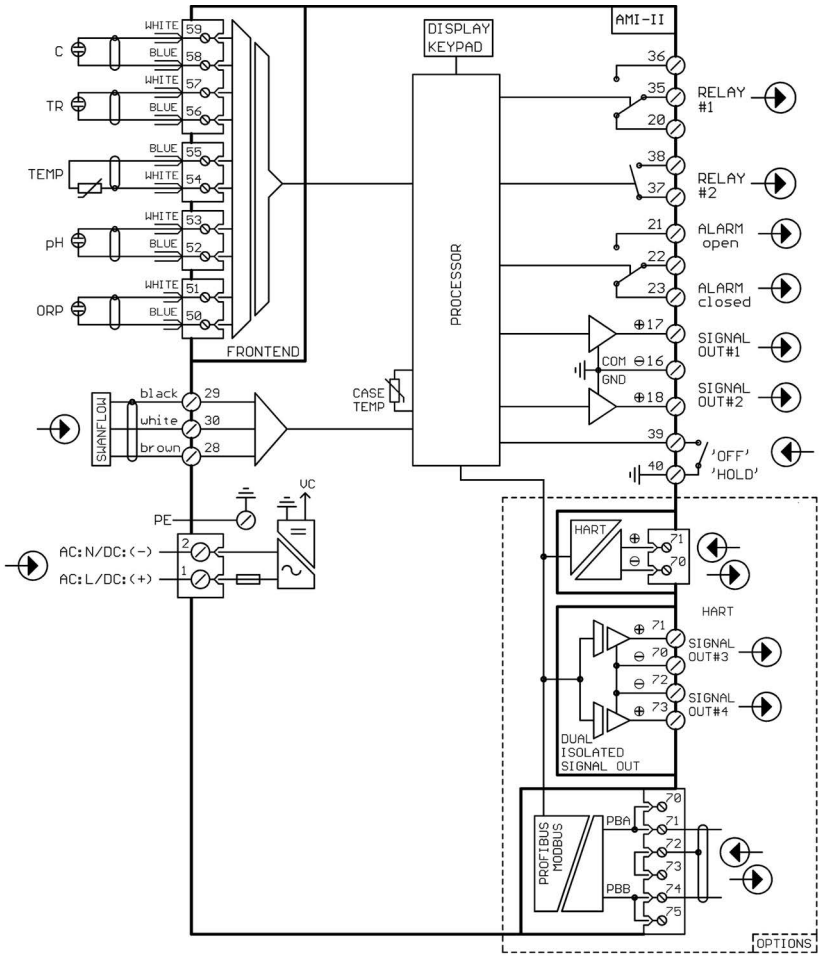
Wires

For power and relays: Use max. 1.5 mm^2 / AWG 14 stranded wire with end sleeves.
For signal outputs and input: Use 0.25 mm^2 / AWG 23 stranded wire with end sleeves.

AMI-II Relay Box

The connections of the AMI-II Relay Box are described in the enclosed instructions.

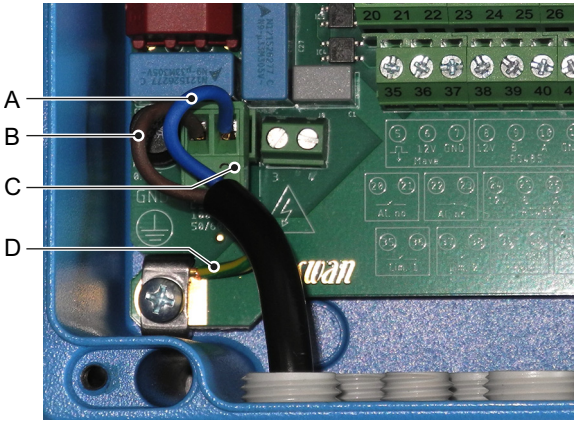
3.7.1 Connection Diagram



CAUTION

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

3.7.2 Power Supply



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

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-II Trides

3.8. Relay Contacts

3.8.1 Input

Use only potential-free (dry) contacts.
Terminals: 39/40

3.8.2 Alarm Relay

One alarm output for system errors.

- Normally open contact (terminals: 21/22):
  Active (closed) when no error is present. Inactive (opened) on error and loss of power.
- Normally closed contact (terminals: 22/23):
  Active (opened) when no error is present. Inactive (closed) on error and loss of power.

Max. load: 1 A/250 VAC.
For switching inductive loads, please observe the information in section Types of Loads, p. 26.

3.8.3 Relay 1 and 2

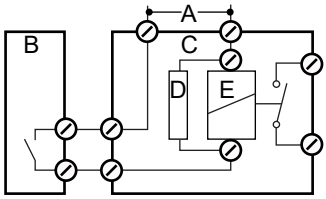
- Relay 1:
  - terminals 35/36 (normally open) or
  - terminals 35/20 (normally closed).
- Relay 2: terminals 37/38 (normally open).

Max. load 1 A/250 VAC.
For switching inductive loads, please observe the information in section Types of Loads, p. 26.

3.8.4 Types of Loads

Inductive loads

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-II transmitter it is mandatory to connect a snubber circuit in parallel to the load.

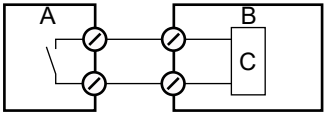


A *AC or DC power supply*
B *AMI-II transmitter*
C *External power relay*
D *Snubber*
E *Power relay coil*

To switch inductive loads higher than 0.1 A, use an AMI-II Relay Box (available as option) or suitable power relays.

Resistive loads

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



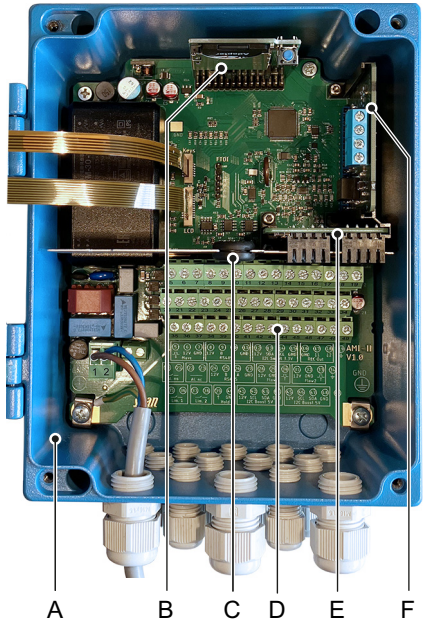
A *AMI-II transmitter*
B *PLC or controlled pulse pump*
C *Logic*

3.9. Signal Outputs

3.9.1 Signal Output 1 and 2 (Current Outputs)

Max. burden 510 Ω.
If signals are sent to two different receivers, use signal isolator (loop isolator).
Signal output 1: Terminals 17 (+) and 16 (-)
Signal output 2: Terminals 18 (+) and 16 (-)

3.10. Interface Options



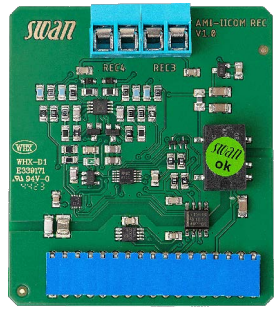
A *AMI-II transmitter*
B *SD card slot*
C *Cable grommet*
D *Screw terminals*
E *Frontend*
F *Communication option*

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

- Two additional signal outputs
- Profibus or Modbus
- HART

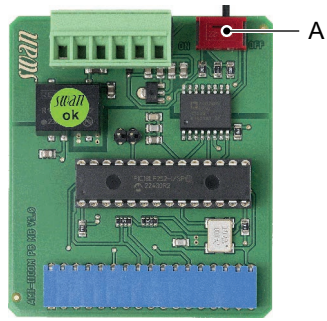
3.10.1 Signal Outputs 3 and 4

Max. burden 510 Ω.
If signals are sent to two different receivers, use signal isolator (loop isolator).
Signal output 3: terminals 71 (+) and 70 (-).
Signal output 4: terminals 73 (+) and 72 (-).



3.10.2 RS485 (Profibus or Modbus Protocol)

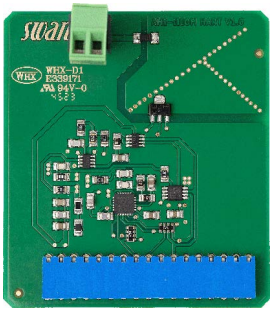
Terminal 74/75 PB, terminal 70/71 PA, terminal 72/73 shield
The switch [A] must be set to “ON” if only one instrument is installed or on the last instrument in the bus.



A *On/off switch*

3.10.3 HART

Terminals 71 (+) and 70 (-).



4. Instrument Setup

4.1. Establish Sample Flow

1. Make sure that the grab sample valve is closed.
2. Open the flow regulating valve.
3. Wait until the constant head is filled to the overflow tube and the rotor of the Trides sensor begins to rotate.
4. Switch on power.

4.2. Programming

Measuring unit
Menu 5.1.1.2
Set the measuring unit:
- ppm
- mg/l

External devices
Menu 5.2 Signal Outputs
Menu 5.4 Interface

Limits and alarms
Menu 5.3 Relay Contacts
Program all parameters for instrument operation (limits, alarms).

Calibration solutions
Menu 5.1.4 Standards
If a pH and/or redox sensor is installed, enter the values of the calibration solutions used.

4.3. Calibration of pH and/or Redox Electrode

See Process pH or Redox Calibration, p. 46, Standard pH Calibration, p. 47 and Standard Redox Calibration, p. 47.

4.4. Calibration of Trides Sensor

If you measure concentrations >0.1 ppm chlorine or 0.01 ppm ozone, calibrate the instrument after a 24-hour running-in period. Zero calibration is not necessary.

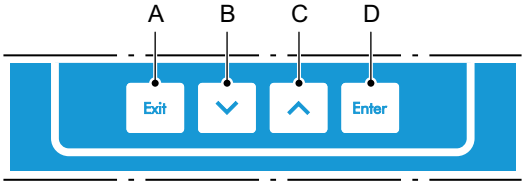
The standard method for calibrating the Trides sensor is the DPD photometric method. Use a high-quality photometer (e.g., Chematest) to determine the reference value. Perform three manual measurements and calculate the average value.

The manual sample must be taken from the grab sample outlet of the flow cell.

If you measure concentrations <0.1 ppm chlorine or <0.01 ppm ozone, let the instrument run continuously for at least 5 days in normal operation before performing a zero point calibration.

5. Operation

5.1. Keys



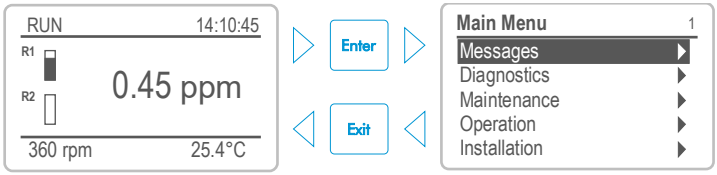
A to exit a menu or command (rejecting any changes)
to move back to the previous menu level

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

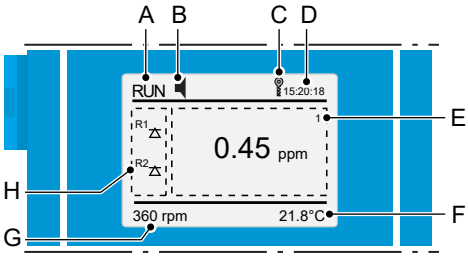
C to move up in a menu list and to increase digits

D to open a selected menu item
to accept an entry

Program access, exit



5.2. Display



A RUN — Normal operation

HOLD — Input active or cal delay: Instrument on hold (shows status of signal outputs).

OFF — Input active: Signal outputs go to 0/4 mA.

B ERROR — Non-fatal error — Fatal error

C Keys locked, transmitter control via Profibus

D Time

E Process values

F Sample temperature

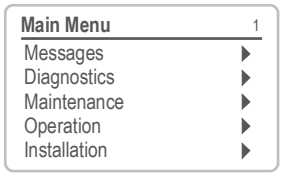
G Sample flow

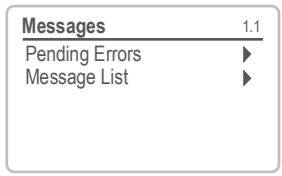
H Relay status
If the optional AMI-II Relay Box is installed, press the ⌄ key to display the status of relays 3 and 4.
Press the ⌄ key again to return to the status of relays 1 and 2.

Symbols used for relay status:

- Upper/lower limit not yet reached
- Upper/lower limit reached
- Control upw./downw. no action
- Control upw./downw. active, dark bar indicates control intensity
- Motor valve closed
- Motor valve open, dark bar indicates approximate position
- Timer
- Timer: timing active (hand rotating)
- Relay inactive (controlled via fieldbus)
- Relay active (controlled via fieldbus)

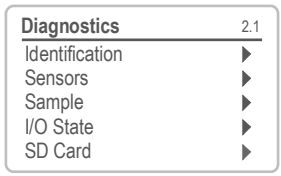
5.3. Software Structure





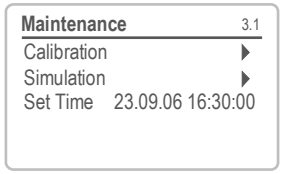
Menu Messages 1

Shows pending errors as well as the event history (time and state of events that have occurred at an earlier point of time).
Contains user-relevant data.



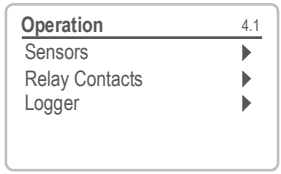
Menu Diagnostics 2

Provides user-relevant instrument and sample data.



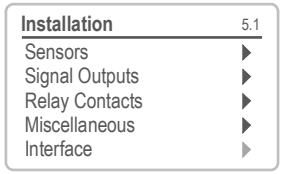
Menu Maintenance 3

For instrument calibration, relay and signal output simulation, and to set the instrument time.
Used by 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.



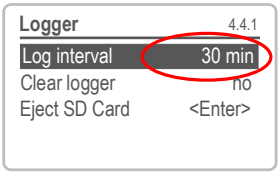
Menu Installation 5

For initial instrument set up by Swan authorized person.
Password protection strongly recommended.

5.4. Changing Parameters and Values

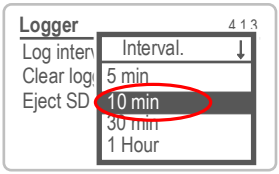
Changing parameters

The following example shows how to change the logger interval:



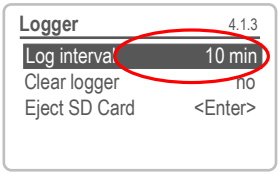
1 Select the parameter you want to change.

2 Press [Enter].



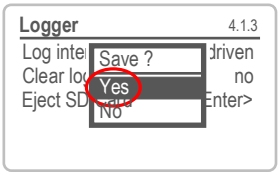
3 Press ^ or v to highlight the required parameter.

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



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

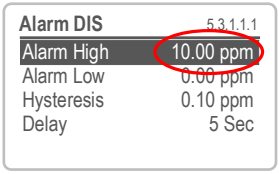
5 Press [Exit].



⇒ *Yes is highlighted.*

6 Press [Enter] to save the new parameter.

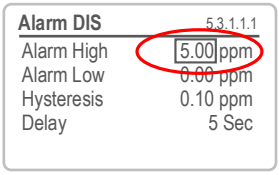
Changing values



1 Select the value you want to change.

2 Press [Enter].

3 Set required value with ^ or v.



4 Press [Enter] to confirm the new value.

5 Press [Exit].
⇒ *Yes is highlighted.*

6 Press [Enter] to save the new value.

6. Maintenance

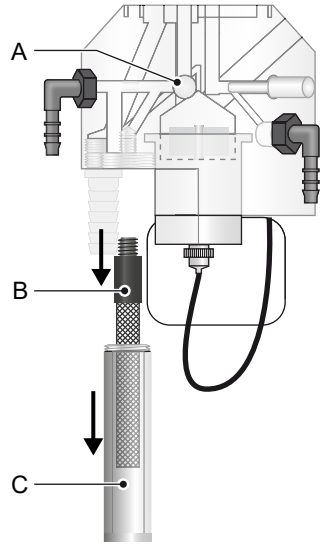
6.1. Maintenance Schedule

Daily to every two weeks	◆ Check sample supply for dirt. ◆ Clean all filters and strainers, if necessary. ◆ Clean the AMI-II Trides protection filter, if necessary ◆ Check sample flow.
Weekly (in some countries daily)	◆ Option pH/redox: Perform “Process pH” and/or “Process Redox” calibration. ◆ Determine disinfectant value using the DPD method and, if necessary, perform “Process Trides” calibration.
Every two months	◆ Option pH/redox: Perform “Standard pH” and/or “Standard Redox” calibration.
Every three to four years	◆ Replace the reference electrode.

If the measured value is near 0 ppm (control of dechlorination):

Seven days after startup	◆ Perform a “Zero Trides” calibration.
Daily to every two weeks	◆ Check sample supply for dirt. ◆ Clean all filters and strainers, if necessary. ◆ Clean the AMI-II Trides protection filter, if necessary ◆ Check sample flow.
Weekly (in some countries daily)	◆ If applicable, perform “Process pH” and/or “Process Redox” calibration. ◆ Before performing “Process Trides” calibration, flush the instrument with chlorinated water. Determine disinfectant value using the DPD method and, if necessary, perform “Process Trides” calibration.
Every two months	◆ Option pH/redox: Perform “Standard pH” and/or “Standard Redox” calibration.
Every three to four years	◆ Replace the reference electrode.

6.2. Cleaning the Filter



A *Flow regulating valve*
B *Filter*
C *Filter vessel*

If the protection filter shows deposits, proceed as follows:

1 Close the flow regulating valve [A].

2 Close the sample main tap before the filter.

3 Unscrew and remove the filter vessel [C] from the flow cell block.

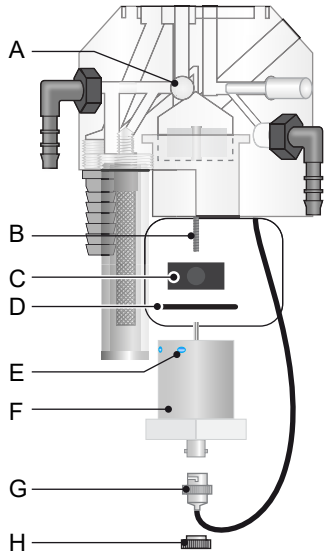
4 Unscrew and remove the filter from [B] the flow cell block.

5 Backwash the filter under pressure of tap water. Clean the outside of the filter.

6 Install the filter and filter vessel again.

7 Open sample supply and flow regulating valve again.

6.3. Cleaning of Trides Sensor



A *Flow regulating valve*
B *Threaded bolt*
C *Rotor*
D *O-Ring*
E *Orifices*
F *Trides sensor*
G *BNC connector*
H *Knurled nut*

1 Close the flow regulating valve [A].

2 Wait until rotor [C] stops and DIS reading is 0 ppm.

3 Shut off power of the instrument.

4 Disconnect the BNC connector [G] from the Trides sensor [F].

Prevent the connector from getting wet.

5 Unscrew and remove one of the two knurled nuts [H].

CAUTION

- Avoid damaging the Trides sensor during removal. Once damaged, the sensor needs to be replaced.
- Do not touch the platinum ring in the center of the Trides sensor with your fingers or metallic objects.

6 Hold the Trides sensor [F] with one hand while unscrewing and removing the 2nd knurled nut.

7 Remove the Trides sensor from the flow cell.

Prevent the BNC socket from getting wet.

8 Remove the rotor [C] from the Trides sensor.

9 Clean the two orifices [E] with a pipe cleaner.

Cleaning

1 Clean the rotor with a soft tissue.

2 Cautiously wipe the sensor with a soft tissue, mainly the platinum parts and the whole area which is in contact with water.
If necessary, strong calcareous deposits can be eliminated with 1% hydrochloric acid.

3 After cleaning rinse all parts well with clean water.

Install

1 Put rotor on the sensor.

2 Install the Trides sensor into the flow cell.

3 Fasten the knurled nuts hand-tight.

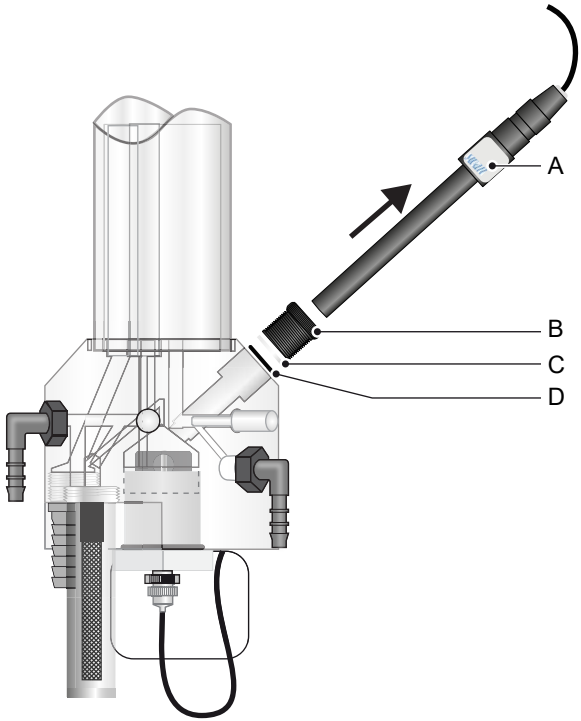
4 Connect the BNC connector to the Trides sensor.

5 Open the sample flow.

6 As soon as the rotor is turning, switch on power.

Note: *After cleaning the sensor, the measured value may be too high. Let the instrument run for about 24 h.*

6.4. Cleaning of Reference Electrode



A *Reference electrode*
B *Union nut*
E *Washer*
F *O-Ring*

1 Close the flow regulating valve.

2 Loosen the union nut [B].

3 Pull the reference electrode out.

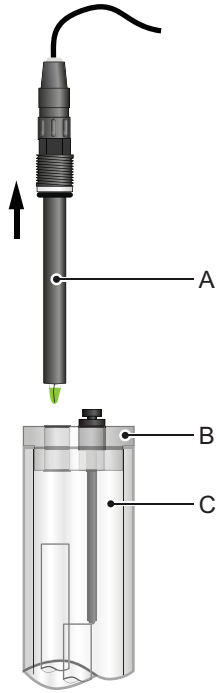
4 Wipe sensor tip cautiously with a soft tissue. If necessary use alcohol to remove oily deposits.

Do not use any acid!

5 Push the reference electrode through the union nut into the flow cell as far as it will go.

6 Tighten the union nut.

6.5. Cleaning of pH and/or Redox Electrode

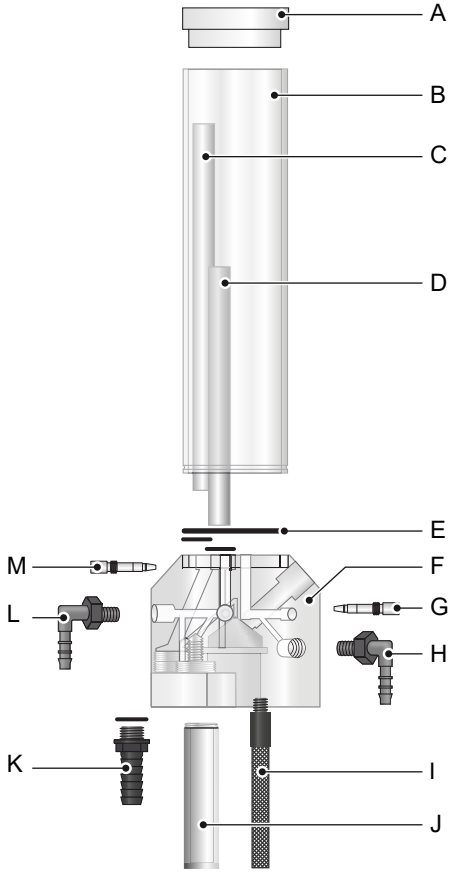


A *Electrode*
B *Constant head cover*
C *Constant head*

Clean electrode

1. Pull the electrode [A] out of the constant head.
2. If necessary wipe the electrode shaft and the tip cautiously with a soft, clean, and damp paper tissue.
3. Remove grease with a tissue moistened with alcohol.
4. If the electrode is very dirty, put its tip into 1% diluted hydrochloric acid for roughly 1 min.
5. Afterwards rinse the electrode tip thoroughly with clean water.
6. Install the electrode into the constant head again.
7. Let the electrode run-in for 1 h before the first calibration.

6.6. Cleaning of Flow Cell



A *Constant head cover*
B *Constant head tube*
C *Overflow tube to waste*
D *Overflow tube to sensor*
E *O-rings*
F *Flow cell block*
G *Grab sample tap*
H *Grab sample outlet*
I *Filter*
J *Filter vessel*
K *Sample outlet*
L *Sample Inlet*
M *Flow regulating valve*

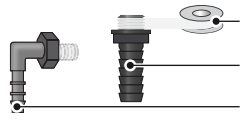
CAUTION

- Never use organic solvents or scrubbing materials to clean acrylic glass parts.
- Use soft detergent and rinse well. Eliminate calcareous deposits with a common household deliming agent in standard concentration.

Disassemble the flow cell

1. Switch off the instrument.
2. Stop the sample flow at the main tap before the sample inlet.
3. Open the grab sample tap [G] to empty the flow cell.
4. Remove all sensors.
5. Put the rubber cap on the tip of the reference (and pH) electrode and plug cap on sensor plug.
6. Remove the following parts from the flow cell block [F]:
   - Constant head cover
   - Constant head tube
   - Overflow tube long
   - Overflow tube short
   - O-ring
   - Grab sample tap
   - Grab sample outlet
   - Filter
   - Filter vessel
   - Sample outlet
   - Sample Inlet
   - Flow regulating valve
7. Clean all acrylic parts with a soft brush (e.g. a bottle cleaner) and soapy water. Remove calcareous deposits with a common household deliming agent with standard concentrations.
8. Clean the bores of the flow cell block with pipe cleaners.

Assemble the flow cell



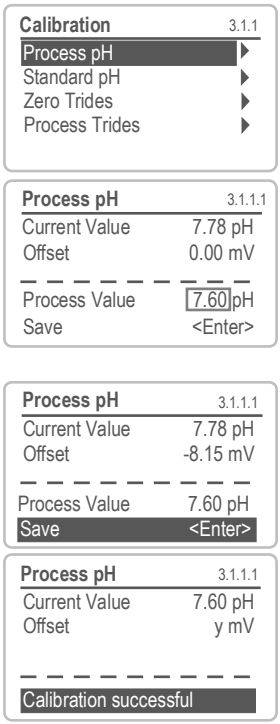
A *Teflon band*
B *Hose nozzle at sample outlet*
C *Elbow hose nozzle at sample inlet*

1. Wrap 7 turns of teflon tape around the hose nozzle thread.
2. Replace all o-rings and grease them with teflon paste.
3. Assemble the flow cell.
4. Install all sensors.
5. Open the main tap and wait until the flow cell is filled.
6. Check all connections for leaks, if necessary retighten leaky points.
7. Switch on the instrument.

6.7. Process pH or Redox Calibration

The process calibration is based on a comparative measurement of the on-line instrument with a calibrated comparative electrode. Perform a valid manual measurement with the calibrated comparative electrode. Then compare the measured value with the on-line instrument and if necessary, enter the correct measured value in the **Maintenance** > **Calibration** > **Process pH** or **Maintenance** > **Calibration** > **Process Redox** menu of the AMI-II Trides.
The deviation of the measured values is shown as offset in mV.
Select “Save” and press [Enter] to save the correct measured value.

Example of process pH calibration



1 Navigate to **Maintenance** > **Calibration** > **Process pH**.

2 Enter the value of the comparative measurement:
- Press [Enter].
- Use the ^ and v keys to increase or decrease value.
- Press [Enter] to confirm.

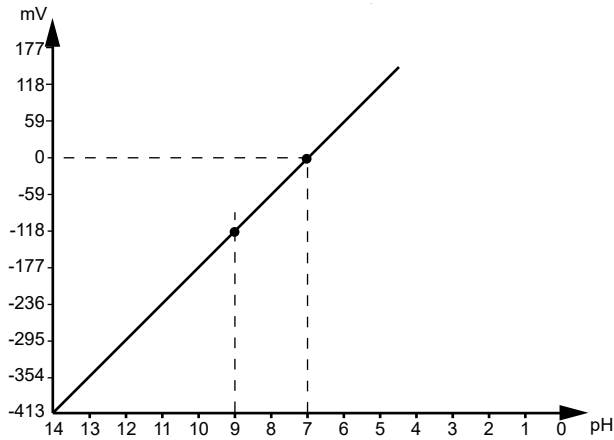
3 Press [Enter] to save.

⇒ *The process value is saved and the new offset in mV is displayed.*

6.8. Standard pH Calibration

Standard pH Calibration

The ideal pH electrode has an offset of 0 mV at pH 7 and a slope of 59.16 mV/pH unit. Real electrodes differ from this ideal. Therefore, pH electrodes are calibrated with two buffer solutions of different pH values.



To perform a standard calibration navigate to menu **Maintenance** > **Calibration** > **Standard pH** and follow the dialog on the screen.

6.9. Standard Redox Calibration

Ag/AgCl is used as the reference system. The measured value is roughly 50 mV higher than the calomel reference system. The slope of the redox sensor is not defined. To compensate the offset of gel electrodes, a calibration can be performed with one buffer solution. Because redox sensors are slow, it can take some time after calibration until the measured value is stable again.
To perform a standard calibration navigate to menu **Maintenance** > **Calibration** > **Standard Redox** and follow the dialog on the screen.

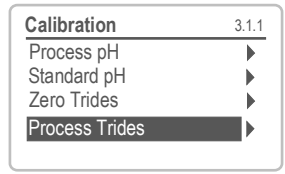
6.10. Zero Trides Calibration

If you measure concentrations of more than 0.1 ppm chlorine or 0.01 ppm ozone, a zero point calibration is not necessary.
Let the instrument run continuously for at least 5 days in normal operation before performing a zero point calibration.
Navigate to menu **Maintenance** > **Calibration** > **Zero Trides** and follow the instructions on the screen.

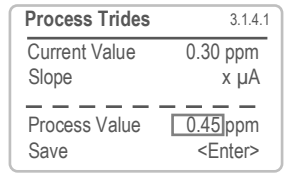
6.11. Process Trides Calibration

The standard method to correct the AMI-II Trides is the DPD photometric method. Use a high quality photometer to determine the reference value, e.g. Swan Chematest.
Take the sample from the grab sample outlet of the AMI-II Trides and perform three manual measurements. Then calculate the average value and use it to for comparison.
You need a certain amount of disinfectant in the water to be able to make a correction.

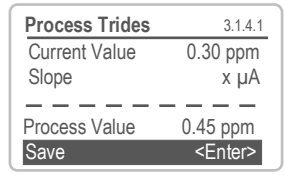
Example of process Trides calibration



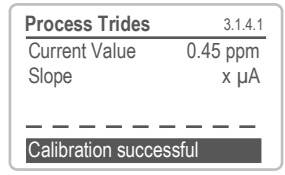
1 Navigate to **Maintenance** > **Calibration** > **Process Trides**.



2 Enter the value of the comparative measurement.
- Press [Enter].
- Use the ^ and v keys to increase or decrease value.
- Press [Enter] to confirm.



3 Press [Enter] to save.



⇒ *The process value is saved and the new slope in µA is displayed.*

6.12. Longer Stop of Operation

1. Stop sample flow at the main tap.
2. Close the needle valve of the AMI-II Trides.
3. Wait until the rotor stops turning and a disinfectant concentration of 0.00 ppm is displayed.
4. Switch the instrument off.
5. Open the grab sample tap to empty the flow cell.
6. Unscrew and remove the filter vessel, empty and dry it and screw it back onto the flow cell.
7. If installed, remove the pH and/or redox electrode, fill water into the protective caps and place them on the sensor tips.
8. Disconnect the cable from the pH and/or ORP sensor and place the caps on the connector plugs. Store the sensors dry and protected from frost with the tips pointing downwards.
9. Remove the reference electrode, fill water into the protective cap and place it on the electrode tip.
10. Disconnect the cable from the reference electrode and place the cap on the connector plug. Store it dry and protected it from frost with the tip pointing downwards.
11. Remove the BNC connector from the Trides sensor.
12. Unscrew and remove the two knurled nuts.
13. Hold the Trides sensor with one hand while unscrewing and removing the second knurled nut.
14. Remove the Trides sensor from the flow cell.

Make sure the BNC connector of the cable and the BNC socket of the Trides sensor stay dry.

15. Dry it with a soft, clean tissue and store dry.

7. Troubleshooting

This chapter provides some hints to make troubleshooting easier.
For information on how to handle/clean parts refer to Maintenance, p. 37.
For information on how to program the instrument refer to Program List and Explanations, p. 64.
If you need help please contact your local distributor. Note serial number of instrument and all diagnostic values before.

7.1. Diagnostic Values

Parameter	Unit	Typical	Limit
Flow measurement	rpm	320–380	270–500
pH offset	mV	±30	±60
pH slope	mV/pH	55–65	40–65
Disinfectant zero	µA	0–0.5	1.6
Disinfectant slope	µA/ppm	8–15	5–40
Reference voltage	mV	900–1100	800–1300
Redox offset	mV	±30	±200

7.2. Troubleshooting List

"No sample flow or current value too low" during Process Trides	◆ Insufficient or no sample flow. ◆ pH too high. The process value used for a calibration should be at least 0.15 ppm at a pH value of 7. The higher the pH value, the lower the current available for calibration. If the pH value is higher than 8 a process value of higher than 0.5 ppm is necessary for calibration. ◆ Contaminated sensor. The sensor does not provide enough current for the value measured with the DPD method. Clean sensor. In case of repeated sensor contamination, check for copper tubes and/or water treatment chemicals such as cyanuric acid and corrosion inhibitors. ◆ Zero too high. The last zero calibration was too high. Repeat the Zero Trides after a minimum of 48 hours of uninterrupted operation or perform "Set defaults Calibration". Attention: "Set defaults Calibration" deletes all previous calibration values
Unstable values	◆ Sample taken too close to feeding line. ◆ Sample flow too irregular or too low. ◆ Electrode cable broken or wet.
Trides display higher than manual measurement	◆ Disinfectant free chlorine: Check pH value of sample, check programmed/displayed value. ◆ Sand (or other abrasive material) in the sample. Stop sand addition, remove remaining sand and wait until the sensor signal has come down. ◆ Check if displayed temperature sensor value is correct. ◆ Sensor has just been cleaned. Wait until sensor signal has come down. ◆ Wrong manual measurement or old chemicals have been used. Repeat.
Trides display lower than manual measurement	◆ Disinfectant free chlorine: Check pH value of sample, check programmed/displayed value. ◆ Wrong manual measurement or old chemicals have been used. Repeat. ◆ Check if displayed temperature sensor value is correct. ◆ Trides sensor contaminated. Find contamination source. ◆ Check sensor cable.

Gain of Trides sensor continuously decreases	◆ Water treatment chemical contaminates the sensor. Find contamination source. If not possible or essential to the process contact your dealer.

7.3. Error List

Two categories of messages are distinguished:

Non-fatal error

Non-fatal instrument error or exceeding of a programmed limit value. Such errors are marked **E0xx** (bold and black) in the following list.

Fatal error (flashing symbol)

Fatal instrument error. Control is interrupted and the displayed measured values may not be correct.
Fatal errors are divided into the following two subcategories:

- Errors which disappear when correct measuring conditions are recovered (i.e. sample flow low).
  Such errors are marked **E0xx** (bold and orange) in the following list.
- Errors which indicate a hardware failure of the instrument.
  Such errors are marked **E0xx** (bold and red) in the following list.

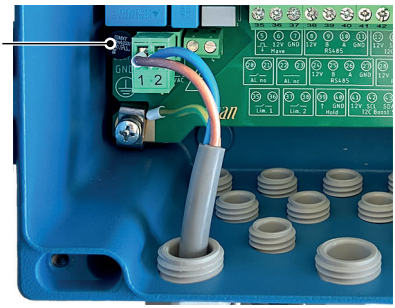
Error	Description	Corrective action
E001	DIS Alarm high	– Check process. – Check programmed value.
E002	DIS Alarm low	– Check process. – Check programmed value.
E003	pH Alarm high	– Check process. – Check programmed value.
E004	pH Alarm low	– Check process. – Check programmed value.
E005	Redox Alarm high	– Check process. – Check programmed value.
E006	Redox Alarm low	– Check process. – Check programmed value.
E007	Sample Temp. 1 high	– Check process. – Check programmed value.
E008	Sample Temp. 1 low	– Check process. – Check programmed value.
E009	Sample Flow high	– Check process. – Check programmed value.
E010	Sample Flow low	– Check process. – Check programmed value.
E011	Temp. shorted	– Check wiring of temperature sensor. – Check temperature sensor.
E012	Temp. disconnected	– Check wiring of temperature sensor. – Check temperature sensor.
E013	Case Temp. high	– Check case/environment temperature. – Check programmed value.
E014	Case Temp. low	– Check case/environment temperature. – Check programmed value.

Error	Description	Corrective action
E015	TRIDES Reference	– Check that the conductivity of the sample is higher than 5 µS/cm. – Check whether the Trides signal divided by the mean value of three DPD measurements results in a value higher than 2 µA/ppm. If this is not the case, clean the Trides sensor. – Replace the reference electrode.
E017	Control timeout	– Check control device or programming in menus **Installation** > **Relay contacts** > **Relay 1** and **Installation** > **Relay contacts** > **Relay 2**.
E024	Input active	– Message informing that the relay input has been actuated. – Can be deactivated in menu **Installation** > **Relay contacts** > **Input** > **Fault**.
E026	IC LM75	– Call support.
E030	I2C Frontend	– Call support.
E031	Calibration Recout	– Call support.
E032	Wrong Frontend	– Call support.
E049	Power-on	– None, normal status.
E050	Power-down	– None, normal status.

7.4. Replacing Fuses

When a fuse has blown, find out the cause and fix it before replacement. Use tweezers or needle-nosed pliers to remove the defective fuse.
Use original fuses provided by Swan only.

AMI-II transmitter



A *0.8 AT/250V Instrument power supply*

8. Program Overview

Explanations of each parameter in the menus can be found in chapter Program List and Explanations, p. 64

- 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 accessible to anyone at any time. No password protection. No settings can be modified.
- Menu 3 **Maintenance** is intended for service technicians: Calibration, simulation of outputs and set time/date. Please protect with password.
- Menu 4 **Operation** is intended for the user and allows setting of limit values, alarm values, etc. The presetting is made in the Installation menu (for the system engineer only). Please protect with password.
- Menu 5 **Installation**: Defining assignment of all inputs and outputs, measuring parameters, interface, passwords, etc. Menu for the system engineer. Password strongly recommended.

8.1. Messages (Main Menu 1)

Pending Errors 1.1*	*Pending Errors*	1.1.5*	* Menu numbers
Message List 1.3*	*Number*	1.3.1*	
	Date, Time		

8.2. Diagnostics (Main Menu 2)

Identification 2.1*	*Designation*			* Menu numbers
	Version			
	Factory Test 2.1.4*	*Motherboard*	2.1.4.1*	
		Front End		
	Operating Time 2.1.5*	*Years, days, hours, minutes, seconds*		2.1.5.1*
Sensors 2.2*	**Trides Sensor** 2.2.1*	*Current Value ppm*	2.2.1.1*	
		(Raw value 1) µA		
		(Raw value 2) µA		
		Ref Voltage mV		
		Cal. History 2.2.1.5*	*Number*	2.2.1.5.1*
			Date, Time	
			Offset	
			Slope	
	Electrode pH 2.2.2*	*Current value*	2.2.2.1*	
		(Raw value)		
		Cal. History 2.2.2.5*	*Number*	2.2.2.5.1*
			Date, Time	
			Offset	
			Slope	
	Electrode Redox 2.2.3*	*Measuring value*	2.2.3.1*	
		Raw value		
		Cal. History 2.2.3.3*	*Number*	2.2.3.3.1*
			Date, Time	
			Offset	
	Miscellaneous 2.2.4*	*Case Temp.*	2.2.4.1*	
Sample 2.3*	*Sample ID*	2.3.1*		
	Temperature (Pt1000)			
	Sample Flow (Raw value)			

I/O State	**Relays**	*Alarm Relay*	2.4.1.1*	
2.4*	2.4.1*	*Relay 1/2/3/4*		
		Input		
	Signal Outputs	*Signal Output 1/2/3/4*	2.4.2.1*	
	2.4.2*			
SD Card	*State*	2.5.1*		
2.5*				
Interface	*Protocol*	2.6.1*		(only with RS485
2.6*	*Baud rate*			interface)

8.3. Maintenance (Main Menu 3)

Calibration	*Zero Trides*	3.1.1*		* Menu numbers
3.1*	*Process Trides*	3.1.2*		
	Process pH	3.1.3*		
	Standard pH	3.1.4*		
	Process Redox	3.1.5*		
	Standard Redox	3.1.6*		
Simulation	**Relays**	*Alarm Relay*	3.2.1.1*	
3.2*	3.2.1*	*Relay 1*	3.2.1.2*	
		Relay 2	3.2.1.3*	
	Signal Outputs	*Signal Output 1*	3.2.2.1*	
	3.2.2*	*Signal Output 2*	3.2.2.2*	
Set Time	*(Date), (Time)*			
3.3*				

8.4. Operation (Main Menu 4)

Sensors	*Filter Time Const.*	4.1.1*		* Menu numbers
4.10*	*Hold after Cal*	4.1.2*		
	Default pH	4.1.3*		
Relay Contacts	**Alarm Relay**	**Alarm DIS.**	*Alarm High*	4.2.1.1.1*
4.2*	4.2.1*	4.2.1.1*	*Alarm Low*	4.2.1.1.24*
			Hysteresis	4.2.1.1.34*
			Delay	4.2.1.1.44*
		Alarm pH	*Alarm High*	4.2.1.2.1*
		4.2.1.2*	*Alarm Low*	4.2.1.2.24*
			Hysteresis	4.2.1.2.34*
			Delay	4.2.1.2.44*
		Alarm Redox	*Alarm High*	4.2.1.3.1*
		4.2.1.3*	*Alarm Low*	4.2.1.3.24*
			Hysteresis	4.2.1.3.34*
			Delay	4.2.1.3.44*
	Relay 1/2	*Setpoint*	4.2.x.200*	
	4.2.2*/4.2.3*	*Hysteresis*	4.2.x.300*	
		Delay	4.2.x.40*	
	Input	*Active*	4.2.4.1*	
	4.2.4*	*Signal Outputs*	4.2.4.2*	
		Output / Control	4.2.4.3*	
		Fault	4.2.4.4*	
		Delay	4.2.4.5*	
Logger	*Log Interval*	4.3.1*		
4.3*	*Clear Logger*	4.3.2*		
	Eject SD Card	4.3.3*		

8.5. Installation (Main Menu 5)

Sensors	**Type of Electrodes**	*None*		* Menu numbers
	5.1.1*	*pH*		
		Redox		
		Both		
5.1*	**Disinf.**	*Free chlorine*		
	5.1.3*	*Hypochl. acid*		
		Ozone		
		Chlorine dioxide		
		Bromine		
		Iodine		
		Free + HOCl		
	Dimension	*ppm*		
	5.1.4*	*mg/l*		
	Standards	*pH Standard 1*	5.1.5.1*	
	5.1.5*	*pH Standard 2*	5.1.5.2*	
		Redox Standard	5.1.5.3*	
Signal Outputs	**Signal Output 1/2**	*Parameter*	5.2.1.1/5.2.2.1*	
5.2*	5.2.1/5.2.2*	*Current Loop*	5.2.1.2/5.2.2.2*	
		Function	5.2.1.3/5.2.2.3*	
		Scaling	*Range Low*	5.2.x.40.10/11*
		5.2.x.40	*Range High*	5.2.x.40.20/21*
Relay Contacts	**Alarm Relay**	**Alarm DIS.**	*Alarm High*	5.3.1.1.1*
5.3*	5.3.1*	5.3.1.1*	*Alarm Low*	5.3.1.1.24*
			Hysteresis	5.3.1.1.34*
			Delay	5.3.1.1.44*
		Alarm pH	*Alarm High*	5.3.1.2.1*
		5.3.1.2*	*Alarm Low*	5.3.1.2.24*
			Hysteresis	5.3.1.2.34*
			Delay	5.3.1.2.44*
		Alarm Redox	*Alarm High*	5.3.1.3.1*
		5.3.1.3*	*Alarm Low*	5.3.1.3.24*
			Hysteresis	5.3.1.3.34*
			Delay	5.3.1.3.44*
		Sample Flow	*Alarm High*	5.3.1.43.1*
		5.3.1.43*	*Alarm Low*	5.3.1.43.2*
			Hysteresis	5.3.1.43.34*
			Delay	5.3.1.43.44*

		Sample Temp.	*Alarm High*	5.3.1.53.1*
		5.3.1.53*	*Alarm Low*	5.3.1.53.24*
		Case Temp. high	5.3.1.63*	
		Case Temp. high	5.3.1.7*	
	Relay 1/2	*Function*	5.3.2.1 / 5.3.3.1*	
	5.3.2/5.3.3*	*Parameter*	5.3.2.20 / 5.3.3.20*	
		Setpoint	5.3.2.300 / 5.3.3.301*	
		Hysteresis	5.3.2.400*	
		Delay	5.3.2.50*	
	Relay State	*On Calibration*	5.3.4.1*	* Menu numbers
	5.3.4	*On Alarm*	5.3.4.2*	
	Input	*Active*	5.3.5.1*	
	5.3.5*	*Signal Outputs*	5.3.5.2*	
		Output/Control	5.3.5.3*	
		Fault	5.3.5.4*	
		Delay	5.3.5.5*	
Miscellaneous	*Language*	5.4.1*		
5.4*	*Set defaults*	5.4.2*		
	Load Firmware	5.4.3*		
	Password	*Messages*	5.4.4.1*	
	5.4.4*	*Maintenance*	5.4.4.2*	
		Operation	5.4.4.3*	
		Installation	5.4.4.4*	
	Sample ID	5.4.5*		
Interface	*Protocol*	5.5.1*		(only with RS485
5.5*	*Device Address*	5.5.21*		interface)
	Baud Rate	5.5.31*		
	Parity	5.5.41*		

9. Program List and Explanations

1 Messages

1.1 Pending Errors

1.1.5 Provides the list of active errors with their status (active, acknowledged). When all active errors have been acknowledged, the alarm relay is active again. Cleared errors are moved to the message list.

1.2 Message List

1.2.1 Shows the error history: Error code, date and time of issue and status (active, acknowledged, cleared). 64 errors are memorized. Then the oldest error is cleared to save the newest one (circular buffer).

2 Diagnostics

2.1 Identification

Desig.: Designation of the instrument.
Version: Version of the instrument firmware.
Bootloader: Version of the bootloader.

2.1.4 **Factory Test:** Test date of the mainboard and frontend.

2.1.5 **Operating Time:** Years, days, hours, minutes, seconds.

2.2 Sensors

2.2.1 **Trides Sensor**

Current value: Shows the disinfectant concentration in ppm.
Raw value 1: Shows the sensor current in µA without temperature (and pH) compensation.
Raw value 2: Shows the sensor current in µA with temperature (and pH) compensation.
Ref. voltage: Shows the voltage of the counter electrode (CE) in mV. The values for most applications are in a range of 800–1300 mV.
Cal. History: Shows previous calibrations of the Trides sensor.

2.2.2 **Electrode pH (only available if a pH sensor is installed)**
Current value: Shows the pH value.
Raw value: Shows the voltage of the pH electrode in mV.
Cal. History: Shows previous calibrations of the pH electrode.

2.2.3 **Electrode Redox (only available if a Redox sensor is installed)**
Current value: Shows the Redox value.
Raw value: Shows the voltage of the Redox electrode in mV.
Cal. History: Shows previous calibrations of the redox electrode.

2.2.4 Miscellaneous

2.2.4.1 *Case Temp:* Shows the current temperature in [°C] inside the transmitter.

2.3 Sample

2.3.1 *Sample ID:* Shows the ID used to identify the location of the sample.
Temperature: Shows the sample temperature in °C.
(Nt5k): Shows the current sample temperature in Ohm.
Sample Flow: Shows the sample flow in rotations per minute (rpm).
Raw value: Shows the sample flow in Hz.

2.4 I/O State

2.4.1 Relays

2.4.1.1	*Alarm Relay:*	Active or inactive
	Relays 1 and 2:	Active or inactive
	Relays 3 and 4:	Active or inactive (if optional AMI-II Relay Box is installed)
	Input:	Open or closed

2.4.2 Signal Outputs

2.4.2.1	*Signal Outputs 1 and 2:*	Current in mA
	Signal Outputs 3 and 4:	Current in mA (if option is installed)

2.5 SD Card

2.5.1 *Status:* Shows the status of the SD card.

2.6 Interface

Settings of the installed communication option (if any).

3 Maintenance

3.1 Calibration

3.1.1 *Zero Trides:* See Zero Trides Calibration, p. 48.
3.1.2 *Process Trides:* See Process Trides Calibration, p. 49.
3.1.3 *Process pH:* See Process pH or Redox Calibration, p. 46.
3.1.4 *Standard pH:* See Standard pH Calibration, p. 47.
3.1.5 *Process Redox:* See Process pH or Redox Calibration, p. 46.
3.1.6 *Standard Redox:* See Standard Redox Calibration, p. 47.

3.2 Simulation

To simulate a value or a relay state, select
- alarm relay
- relay 1 or 2
- relay 3 or 4 (if optional AMI-II Relay Box is installed)
- signal outputs 1 or 2
- signal outputs 3 or 4 (if option is installed)

Change the value or state of the selected item with the arrow keys. Press [Enter].
⇒ *The value is simulated by the relay/signal output.*

At the absence of any key activities, the instrument will switch back to normal mode after 20 min.

3.2.1 Relays

3.2.1.1	*Alarm relay:*	Active or inactive
3.2.1.2	*Relay 1:*	Active or inactive
3.2.1.3	*Relay 2:*	Active or inactive
3.2.1.4	*Relay 3:*	Active or inactive
3.2.1.5	*Relay 4:*	Active or inactive

3.2.2 Signal outputs

3.2.2.1	*Signal outputs 1:*	Current in mA
3.2.2.2	*Signal outputs 2:*	Current in mA
3.2.2.3	*Signal outputs 3:*	Current in mA
3.2.2.4	*Signal outputs 4:*	Current in mA

3.3 Set Time

Adjust date and time.

4 Operation

When relays are used as a controllers, dosing is interrupted when entering the **Operation** menu.

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 s

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: 0–6000 s

4.1.3 *Default pH:* Used for pH compensation of free chlorine measurement if no pH electrode is connected and programmed. See About free chlorine, p. 12 for more details. For ozone, chlorine-dioxide, bromine, iodide, no pH compensation is necessary.
Range: 0.00–14.00 pH

4.2 Relay Contacts

See Relay Contacts, p. 73.

4.3 Logger

The instrument is equipped with an internal logger. The logger data can be copied to the SD card.

4.3.1 *Log Interval:* Select a convenient log interval.
Range: 1 s, 5 s, 1 min, 5 min, 10 min, 30 min or 1 h.

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

4.3.3 *Eject SD Card:* With this function all logger data are copied to the SD card and the SD card can be removed.

5 Installation

When relays are used as a controllers, dosing is interrupted when entering the **Installation** menu.

5.1 Sensors

5.1.1 *Type of Electrode:* Select the installed sensor type(s).
- None
- pH
- Redox
- Both

5.1.2 *Disinf.:* Select the disinfectant to be measured.
- Free chlorine
- Hypochlorous acid
- Ozone
- Chlorine dioxide
- Bromine
- Iodine
- Free + HOCl

5.1.3 *Dimension:* Set the dimension of the measured value either to ppm or to mg/l.

5.1.4 **Standards:** If you want to use standard solutions different from the recommended Swan standard solutions, enter the values.

5.1.4.x *pH Standard 1:* Range: pH 1 to pH 13.

5.1.4.x *pH Standard 2:* Range: pH 1 to pH 13.

5.1.4.x *Redox Standard:* Range: 400 to 500 mV.

5.2 Signal Outputs

Note: *The navigation in the menus 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 **Signal Output 1:** Assign process value, the current loop range and a function to each signal output.

5.2.1.1 *Parameter:* Assign one of the process values to the signal output. Available values:
- DIS
- pH
- Temperature
- Sample flow
- HOCl (if “Free + HOCl” is selected as disinfectant)
- Redox

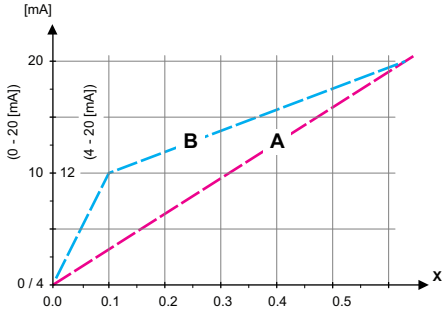
5.2.1.2 *Current Loop:* Select the current range of the signal output. Make sure the connected device works with the same current range. Available ranges: 0–20 mA or 4–20 mA

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:

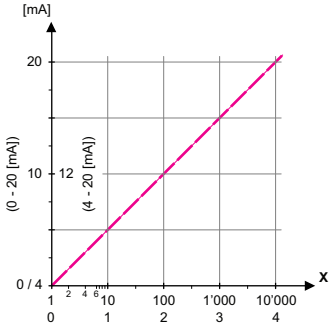
- Linear, bilinear or logarithmic for process values.
- Control upwards or control downwards.

As process values

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



A *Linear*
B *Bilinear*
X *Measured value*



X *Measured value (logarithmic)*

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

Parameter DIS:
5.2.1.40.10 *Range low*: 0.00–10.00 ppm
5.2.1.40.20 *Range high*: 0.00–10.00 ppm

Parameter pH:
5.2.1.40.11 *Range low*: -3.00 to +15.00 pH
5.2.1.40.21 *Range high*: -3.00 to +15.00 pH

Parameter Temperature:
5.2.1.40.12 *Range low*: -30–120 °C
5.2.1.40.22 *Range high*: -30–120 °C

Parameter Sample flow:
5.2.1.40.13 *Range low*: 0–600 rpm
5.2.1.40.23 *Range high*: 0–600 rpm

Parameter HOCl:
5.2.1.40.14 *Range low*: 0.00–10.00 ppm
5.2.1.40.24 *Range high*: 0.00–10.00 ppm

Parameter Redox:
5.2.1.40.15 *Range low*: -500–1500 mV
5.2.1.40.25 *Range high*: -500–1500 mV

As control output

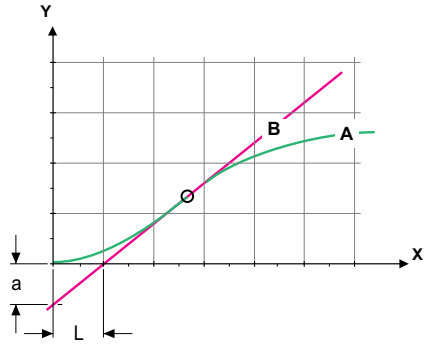
Signal outputs can be used for driving control units. We distinguish different kinds of controls:

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

controller is switched off.
Parameters: setpoint, P band, derivative time.

- *PID controller:* The combination of a P, an I and a D controller allows a proper control of the process.
  Parameters: setpoint, P band, reset time, derivative time.

Ziegler-Nichols method for the optimization of a PID controller:
Parameters: Setpoint, P band, reset time, derivative time.



A *Response to maximum control output* ***Xp*** *= 1.2/a*
B *Tangent on the inflection point* ***Tn*** *= 2L*
X *Time* ***Tv*** *= L/2*

The point of intersection of the tangent with the respective axis will result in the parameters a and L.
Consult the manual of the control unit for connecting and programming details. Choose control upwards or downwards.

Control upwards or downwards

Setpoint: User-defined process value for the selected parameter.
P band: Range below (upwards control) or above (downwards control) the setpoint, within the dosing intensity is reduced from 100 % to 0 % to reach the setpoint without overshooting.

5.2.1.43 **Control Parameters**: if Parameters = DIS

5.2.1.43.10 *Setpoint*
Range: 0.00 – 10.00 ppm

5.2.1.43.20 *P-Band*:
Range: 0.00 – 10.00 ppm

5.2.1.43 **Control Parameters**: if Parameters = pH

5.2.1.43.10 *Setpoint*
Range: -3.00–15.00 pH

5.2.1.43.20 *P-Band*:
Range: 0.00–2.00 pH

5.2.1.43 **Control Parameters**: if Parameters = Temperature

5.2.1.43.10 *Setpoint*
Range: -30.0–120.0 °C

5.2.1.43.20 *P-Band*:
Range: 0.0–100.0 °C

5.2.1.43 **Control Parameters**: if Parameters = Sample flow

5.2.1.43.10 *Setpoint*
Range: 0–600 rpm

5.2.1.43.20 *P-Band*:
Range: 0–600 rpm

5.2.1.43 **Control Parameters**: if Parameters = HOCl

5.2.1.43.10 *Setpoint*
Range: 0.00–10.00 ppm

5.2.1.43.20 *P-Band*:
Range: 0.00–10.00 ppm

5.2.1.43 **Control Parameters**: if Parameters = Redox

5.2.1.43.10 *Setpoint*
Range: -500–1500 mV

5.2.1.43.20 *P-Band*:
Range: -500–1500 mV

5.2.1.43.3 *Reset time:* The reset time is the time till the step response of a single I-controller will reach the same value as it will be suddenly reached by a P-controller.
Range: 0–9000 s

5.2.1.43.4 *Derivative time:* The derivative time is the time till the ramp response of a single P-controller will reach the same value as it will be suddenly reached by a D-controller.
Range: 0–9000 s

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

5.3 Relay Contacts

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

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

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

- Alarm DIS
- Alarm pH
- Alarm Redox
- Sample flow
- Sample temperature
- Case temperature high
- Case temperature low

5.3.1.1 Alarm DIS.

5.3.1.1.1 *Alarm High:* If the measured value rises above the alarm high value, the alarm relay switches and E001 is displayed in the message list.
Range: 0 – 10 ppm

5.3.1.1.25 *Alarm Low:* If the measured value falls below the alarm low value, the alarm relay switches and E002 is displayed in the message list.
Range: 0 – 10 ppm

5.3.1.1.35 *Hysteresis:* Within the hysteresis range, the alarm relay does not switch. This prevents damage of relays contacts when the measured value fluctuates around the alarm value.
Range. 0 – 10 ppm

5.3.1.1.45 *Delay:* Waiting time before the alarm relay becomes inactive after the measured value has risen above or fallen below the programmed alarm value.
Range: 0–28‘800 s

5.3.1.2 Alarm pH

5.3.1.2.1 *Alarm High:* If the measured value rises above the alarm high value, the alarm relay switches and E003 is displayed in the message list.
Range: -3.00 – 15.00 pH

5.3.1.2.25 *Alarm Low:* If the measured value falls below the alarm low value, the alarm relay switches and E004 is displayed in the message list.
Range: -3.00 – 15.00 pH

5.3.1.2.35 *Hysteresis:* Within the hysteresis range, the alarm relay does not switch. This prevents damage of relays contacts when the measured

value fluctuates around the alarm value.
Range. 0 –2 pH

5.3.1.2.45 *Delay:* Waiting time before the alarm relay becomes inactive after the measured value has risen above or fallen below the programmed alarm value.
Range: 0–28‘800 s

5.3.1.3 Alarm Redox

5.3.1.3.1 *Alarm High:* If the measured value rises above the alarm high value, the alarm relay switches and E005 is displayed in the message list.
Range: -500 –1500 mV

5.3.1.3.25 *Alarm Low:* If the measured value falls below the alarm low value, the alarm relay switches and E006 is displayed in the message list.
Range: -500 –1500 mV

5.3.1.3.35 *Hysteresis:* Within the hysteresis range, the alarm relay does not switch. This prevents damage of relays contacts when the measured value fluctuates around the alarm value.
Range. 0 –200 mV

5.3.1.3.45 *Delay:* Waiting time before the alarm relay becomes inactive after the measured value has risen above or fallen below the programmed alarm value.
Range: 0–28‘800 s

5.3.1.4 Sample Flow

5.3.1.4.1 *Flow Alarm:* Program if the alarm relay should switch if there is a flow alarm. The flow alarm will always be indicated on the display, in the 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. It is recommended to program yes.*

5.3.1.4.2 *Alarm High:* If the measured value rises above the alarm high value, the alarm relay switches and E009 is displayed in the message list.
Range: 400–9000 rpm

5.3.1.4.35 *Alarm Low:* If the measured value falls below the alarm low value, the alarm relay switches and E010 is displayed in the message list.
Range: 200–350 rpm

5.3.1.4.45 *Delay:* Waiting time before the alarm relay becomes inactive after the measured value has risen above or fallen below the programmed alarm value.
Range: 0–28‘800 s

5.3.1.5 Sample Temp.

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

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

5.3.1.6 *Case Temp. high:* Set the alarm high value for the temperature of the electronics housing. If the value rises above the programmed value E013 is issued.
Range: 30–75 °C

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

5.3.x Relay 1 and 2: The function of relay contacts 1 or 2 is defined by the user.

Note: *The navigation in the menus 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

2 Then enter the necessary data depending on the selected function. The same values can also be entered in menu 4.2.

5.3.2.1 Function = Limit upper/lower

If 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 setpoint, the relay is activated.

Parameter	Range
DIS	0.00–10.00 ppm
pH	-3.00–15.00 pH
Temperature	-30.0–120.0 °C
Sample flow	0–600 rpm
HOCl	0.00–10.00 ppm
Redox	-500–1500 mV

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
DIS	0.00–10.00 ppm
pH	0.00–2.00 pH
Temperature	0.0–100.0 °C
Sample flow	0–600 rpm
HOCl	0.00–10.00 ppm
Redox	0–200 mV

5.3.2.50 *Delay:* Time by which the switching of the alarm relay is delayed after the measured value has risen above or fallen below the programmed alarm.
Range. 0–600 s

5.3.2.50 *Open in Maint.:* Defines the behavior of relays 1 and 2 when entering the “Installation” or “Operation” menu.

Yes: Relay becomes inactive.

No: Relay remains in the state it was in before opening the menu.

5.3.2.1 Function = Control upwards/downwards

If the relays are used to control dosing units, program the following.

5.3.2.22 *Parameter:* Choose one of the following process values.
- DIS
- pH
- Temperature
- Sample flow
- Redox

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

5.3.2.32.1 Actuator = Time proportional

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 s.

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

5.3.2.32.4 **Control Parameters**
Range for each parameter same as 5.2.1.43.

5.3.2.32.1 Actuator = Frequency

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.

5.3.2.32.1 Actuator = Motor valve

> ***Note:*** *This function is only available for relays 3 and 4 (AMI-II Relay Box).*

Dosing is controlled by the position of a motor-driven mixing valve using two relays (i.e. two relays are needed to control one motor valve).

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

5.3.2.32.32 *Neutral zone:* Minimal response time in percent 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.

5.3.2.1 Function = Timer

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

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

5.3.2.24 Interval

5.3.2.340 *Interval:* The interval can be programmed within a range of 1–1440 min.

5.3.2.44 *Run Time:* Enter the time the relay stays active.
Range: 5–32400 s.

5.3.2.54 *Delay:* During run time plus the delay time the signal and control outputs are held in the operating mode programmed below.
Range: 0–6000 s.

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. 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.

5.3.2.50 *Open in Maint.:* Defines the behavior of relays 1 and 2 when entering the “Installation” or “Operation” menu.

Yes: A programmed timer will not start while the menu is open. A timer that is already running will be canceled. It is strongly recommended to program “Yes”.

No: Relay remains in the state it was in before opening the menu, i.e. if a timer was running, the relay stays active. Use this setting with caution! Make sure not to enter the Installation or Operation menu while a timer is running (see symbol on the display).

5.3.2.24 daily

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

5.3.2.341 *Start time:* Time of day at which the relay is activated.
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.

5.3.2.8 *Open in Maint.:* see Interval.

5.3.2.24 weekly

The relay contact can be activated on one or several days of a week.

5.3.2.342 Calendar

5.3.2.342.1 *Start time:* The programmed start time is valid for each of the programmed days.
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.
5.3.2.8 *Open in Maint.:* see Interval.

5.3.2.1 Function = Fieldbus

The relay is switched via Profibus or Modbus.

5.3.2.50 *Open in Maint.:* Defines the behavior of relays 1 and 2 when entering the “Installation” or “Operation” menu.

Yes: Relay becomes inactive and does not react to fieldbus commands. Fieldbus commands received while the menu is open are executed after exiting the menu.

No: Relay remains in the state it was in before opening the menu and does not react to fieldbus commands. Fieldbus commands received while the menu is open are executed after exiting the menu.

5.3.4 Relay State

5.3.4.1 *On Calibration:* Defines the behavior of relays 1 and 2 during the following procedures:

- Zero Trides calibration
- Process Trides calibration
- Process pH or Redox calibration
- Standard pH or Redox calibration

Select Hold or Off.
The behavior of the relays also depends on the function assigned to each relay, as shown in the table below.

	“On Calibration” set to	
Relay function	**Hold**	**Off**
Limit upper/lower	Relay remains in the state it was in before starting the calibration.	Relay becomes inactive.
Timer	Timer starts and stops as programmed.	Timer starts and stops as programmed.
Control upw./dnw.	Dosing is continued with the same control intensity. Use this setting with caution!	Dosing is stopped. It is strongly recommeded to program “Off”.
Fieldbus	The relay reacts normally to fieldbus commands.	The relay reacts normally to fieldbus commands.

5.3.4.2 *On Alarm:* Defines the behavior of relays 1 and 2 when a fatal alarm is active.

Select Hold or Off.
The behavior of the relays also depends on the function assigned to each relay, as shown in the table below.

	"On Alarm" set to	
Relay function	**Hold**	**Off**
Limit upper/lower	Relay remains in the state it was in before the alarm occurred.	Relay becomes inactive.
Timer	Timer starts and stops as programmed.	Timer starts and stops as programmed.
Control upw./dnw.	Dosing is continued with the same control intensity. Use this setting with caution!	Dosing is stopped. It is strongly recommeded to program "Off".
Fieldbus	The relay reacts normally to fieldbus commands.	The relay reacts normally to fieldbus commands.

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

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

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

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

Continuous:	Signal outputs continue to issue the measured value.
Hold:	Signal outputs hold the last valid measured value. Errors, except fatal errors, are not issued.
Off:	Sets the signal outputs to 0 or 4 mA. Errors, except fatal errors, are not issued.

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

Continuous:	Controller continues normally.
Hold:	Controller continues based 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 switch 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 switches when input is active.

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

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 can 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 meaningful text, such as KKS number.

5.5 Interface

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

5.5.1	*Protocol:* **Profibus**	
5.5.20	Device address:	Range: 0–126
5.5.30	ID no.:	Range: Analyzer; Manufacturer; Multivariable
5.5.40	Local operation:	Range: Enabled, Disabled
5.5.1	*Protocol:* **Modbus RTU**	
5.5.21	Device address:	Range: 0–126
5.5.31	Baud rate:	Range: 1 200–115 200 Baud
5.5.41	Parity:	Range: none, even, odd
5.5.1	*Protocol:* **HART**	
	Device address:	Range: 0–63

10. Default Values

Operation

Sensors:	Filter Time Const.:	30 s
	Hold after Cal.:	300 s
	Default pH	7.00 pH
Relay Contacts	Alarm Relay	same as in Installation
	Relay 1/2	same as in Installation
	Input	same as in Installation
Logger:	Logger Interval:	30 min
	Clear Logger:	no

Installation

Sensors	Type of Electrode:	pH
	Disinf.:	Free chlorine
	Dimension:	ppm
	Standards: pH Standard 1:	7.00 pH
	Standards: pH Standard 2:	9.00 pH
	Standards: Redox Standard:	475 mV
Signal Output 1	Parameter:	DIS
	Current loop:	4 –20 mA
	Function:	linear
	Scaling: Range low:	0.00 ppm
	Scaling: Range high:	10.00 ppm
Signal Output 2	Parameter:	Temperature
	Current loop:	4 –20 mA
	Function:	linear
	Scaling: Range low:	0.0 °C
	Scaling: Range high:	5.0 °C
Alarm Relay	Alarm DIS: Alarm high:	10.00 ppm
	Alarm DIS: Alarm low:	0.00 ppm
	Alarm DIS: Hysteresis:	0.10 ppm
	Alarm DIS: Delay:	5 s
	Alarm pH: Alarm high:	14.00 pH
	Alarm pH: Alarm low:	0.00 pH
	Alarm pH: Hysteresis:	0.10 pH
	Alarm pH: Delay:	5 s
	Alarm Redox: Alarm high:	1500 mV
	Alarm Redox: Alarm low:	-500 mV
	Alarm Redox: Hysteresis:	10 mV
	Alarm Redox: Delay:	5 s

Sample Flow: Flow Alarm: ..... yes
Sample Flow: Alarm high: ..... 500 rpm
Sample Flow: Alarm low: ..... 290 rpm
Sample Flow: Delay: ..... 5 s
Sample Temp.: Alarm high: ..... 55 °C
Sample Temp.: Alarm low: ..... 5 °C
Case temp. high: ..... 65 °C
Case temp. low: ..... 0 °C

Relay 1/2

Function: ..... limit upper
Parameter: ..... DIS
Setpoint: ..... 5.00 ppm
Hysteresis: ..... 0.10 ppm
Delay: ..... 30 s
Open in Maint.: ..... Yes

If Function = Control upw. or dnw:

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

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
Open in Maint.: ..... Yes

If Function = Fieldbus:

Open in Maint.: ..... Yes

Relay State	On Calbration:	Off
	On Alarm:	Off
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:	- - - - - - - -

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ANALYTICAL INSTRUMENTS

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