ANALYTICAL INSTRUMENTS

A-96.250.611 / 030322

Operator’s Manual

Firmware V6.00 and higher

SWISS MADE

AMI INSPECTOR Conductivity

Customer Support

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Document Status

Title:	AMI INSPECTOR Conductivity Operator's Manual	
ID:	A-96.250.611	
Revision	**Issue**	
00	April 2010	First edition
01	August 2014	New mainboard V 2.4, update to firmware V5.30
02	January 2016	AMI Inspector Version 2-A (with AMIAKKU mainboard) and Firmware version 6.00

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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 AMI Operator's Manual in proximity of the instrument.

Qualification, Training

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

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

1.1. Warning Notices

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

DANGER

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

- Follow the prevention instructions carefully.

WARNING

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

- Follow the prevention instructions carefully.

CAUTION

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

- Follow the prevention instructions carefully.

Mandatory Signs

The mandatory signs in this manual have the following meaning:

Safety goggles

Safety gloves

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


Electrical shock hazard


Corrosive


Harmful to health


Flammable


Warning general


Attention general

1.2. General Safety Regulations

Legal Requirements

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

Spare Parts and Disposables

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

Modifications

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

WARNING

Electrical Shock Hazard

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

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

WARNING

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

WARNING

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

2. Product Description

2.1. Description of the System

The portable AMI INSPECTOR instrument is a complete monitoring system mounted on a small panel with supporting stand and a rechargeable battery for stand-alone operation (>24 h), designed as an inspection equipment for quality assurance of online process monitors.

Application range

The conductivity is a parameter for the total quantity of ions present in the solution. It can be used for the monitoring of:

- the condition of waters
- water purification
- water hardness
- completeness of ion analysis

Features

General Features of AMI INSPECTORs are:

- Battery life after full charge:
  - >24 h at full load (use of 3 relays, USB, signal output, logger)
  - >36 h at minimum load (use of logger only)
- Charging time: approx. 6 hours
- Controlled shut-down if battery is empty.
- Display of remaining battery life in hours.
- For longer battery life the back light of the LC Display is disabled.
- Continuous operation using power adapter. The battery should be discharged at least once a month (normal usage until the monitor automatically shuts down).

Battery

The Li-ion battery is located in the housing of the AMI transmitter.

See chapter Power Supply, p. 20 regarding power supply and charging of the battery.

USB interface

Built-in USB interface for logger download. Use the USB stick supplied by Swan only (other USB sticks can dramatically reduce battery life).

Special features

Many temperature compensation curves for specific conductivity measurement:

- none
- Coefficient
- Neutral salts
- High-purity water
- Strong acids
- Strong bases
- Ammonia, Eth. am.
- Morpholine

Signal output

One signal output programmable for measured values (freely scaleable, linear or bilinear) or as continuous control output (control parameters programmable).

Current loop: 0/4–20 mA
Maximal burden: 510 Ω

Relay

Two potential-free contacts programmable as limit switches for measuring values, controllers or timer for system cleaning with automatic hold function.

Maximum load: 100 mA/50 V

Alarm relay

One potential free contact.

Alternatively:

- Open during normal operation, closed on error and loss of power.
- Closed during normal operation, open on error and loss of power.

Summary alarm indication for programmable alarm values and instrument faults.

Input

For potential-free contact to freeze the measuring value or to interrupt control in automated installations (hold function or remote-off)

Safety features

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

Measuring principle

The conductivity of high purity water is determined with a sensor consisting of two metal electrodes. The characteristics of each sensor is expressed as cell constant. An alternating voltage (to minimize polarization effects) is applied to two electrodes. Depending on the concentration of ions in the sample, a signal results between the electrodes which is proportional to the conductivity of the water. The measuring result is indicated as conductivity.

Temperature compensation

The mobility of ions in water increase with higher temperature which enlarges the conductivity. Therefore, the temperature is measured simultaneous by an integrated Pt1000 temperature sensor and the conductivity is compensated to 25 °C. Several temperature compensation curves, designed for different water compositions, can be chosen.
After cation exchanger (cation conductivity), the temperature compensation curve strong acids has to be set.
For more information see: **Influence of Temperature on Electrical Conductivity, PPChem (2012)**

Standard temperature

The displayed conductivity value is compensated to 25 °C standard temperature.

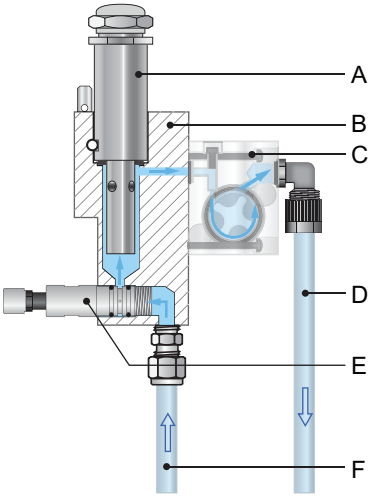
Fluidics

The flow cell QV-Flow UP-Con SL consists of the flow cell block [B], the flow sensor [C] and the flow regulating valve [E].

The Swansensor UP-Con1000 SL [A] with integrated temperature sensor is inserted into the flow cell block [B].

The sample enters at the sample inlet [F]. It flows through the flow regulating valve [E], where the flow rate can be adjusted. Then the sample flows through the flow cell block were the conductivity and temperature of the sample is measured.

The sample leaves the flow cell block via flow meter through the sample outlet [D].



A *Swansensor Up-Con1000 SL*
B *Flow cell block*
C *Flow sensor*
D *Sample outlet*
E *Flow regulating valve*
F *Sample inlet*

2.2. Instrument Overview

A *AMI transmitter*
B *Swansensor UP-Con1000 SL*
C *Flow cell QV-Flow UP-Con SL*
D *Sample outlet*
E *Flow meter*
F *Sample inlet*
G *Flow regulating valve*

2.3. Technical Data

Power Supply

Battery

Use original, supplied power adapter only.

Voltage:	85–265 VAC, 50/60 Hz
Power consumption:	max. 20 VA
Charging time:	6 h
Battery type:	Li-ion

During charging protect from heat impact and keep splash-proof (not IP66).

Operating time

Stand-alone (battery):	>24 h
Connected adapter:	continuous

Controlled shut-down when battery is empty, remaining time is displayed.

Electronics 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, 75 x 45 mm

Sample requirements

Flow rate:	5–20 l/h
Temperature:	up to 50 °C
Inlet pressure:	up to 2 bar
Outlet pressure:	pressure free

On-site requirements

The analyzer site must permit connections to:

Sample inlet:	1/4” Swagelok tube adapter
Sample outlet:	flexible tube 6x8 mm

Measuring range

Range:	Resolution:
0.055 to 0.999 µS/cm	0.001 µS/cm
1.00 to 9.99 µS/cm	0.01 µS/cm
10.0 to 99.9 µS/cm	0.1 µS/cm
100 to 999 µS/cm	1 µS/cm
1.00 to 2.99 mS/cm	0.01 mS/cm
3.0 to 9.9 mS/cm	0.1 mS/cm
10 to 30 mS/cm	1 mS/cm

Automatic range switching.

Accuracy	±1% of measured value or ±1 digit (whichever is greater).	
Sensor UP-Con1000 SL	The Swansensor UP-Con1000 SL is a 2-electrode conductivity sensor for the continuous measurement of specific and acid conductivity with a built-in temperature sensor.	
	Sensor Cell Constant k:	~0,04 cm^{-1}
	Temperature sensor:	Pt1000
Materials	Shaft:	SS 316L, stainless steel
	Electrode:	Titanium
	Isolation:	PEEK
Operating conditions	Continuous temperature:	100 °C at 6,5 bar
	Max. temperature:	120 °C at 6,5 bar
	Max. pressure:	30 bar at 25 °C

The cell constant (ZK) and the temperature correction (DT) are written on the sensor label.

3. Installation

3.1. Installation Checklist

Check	◆ Instrument's specification must conform to your AC power ratings. See External power adapter, p. 21. ◆ Check if the battery is fully charged.
Site requirements	◆ Sample line with sufficient flow and pressure, see Sample requirements, p. 14.
Installation	◆ Connect the sample and waste line.
Electrical connections	◆ Connect all external devices like limit switches and current loops, see Connection Diagram, p. 19.
Power-up	◆ Turn on sample flow. ◆ Switch on power. ◆ Adjust the sample flow to 5–20 l/h.
Instrument Setup	◆ Program all sensor specific parameters (cell constant, temp. correction, cable length). ◆ Program all parameters for external devices (interface, recorders, etc.). ◆ Program all parameters for instrument operation (limits, alarms, etc.).
Run-in period	◆ Let the instrument run continuously for 1 h. ***Note:*** *If the conductivity value of the sample is very low, the sensor might need some time until the correct reading is displayed.*

3.2. Connecting Sample Inlet and Outlet

3.2.1 Swagelok Fitting Stainless Steel at Sample Inlet

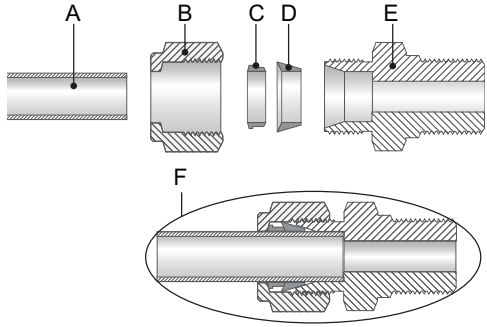
Preparation

Cut the tube to length and deburr it. The tube must be straight and free from blemishes for approximately 1,5 x tube diameter from the end.

Lubrication with lubricating oil, MoS2, Teflon etc. is recommended for the assembly and reassembly of bigger sized unions (thread, compression cone).

Installation

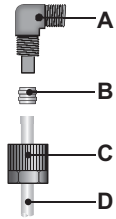
1. Insert the compression ferrule [C] and the compression cone [D] into the union nut [B].
2. Screw on the union nut onto the body, do not tighten it.
3. Push the stainless steel pipe through the union nut as far as it reaches the stop of the body.
4. Tighten down the union nut 1¾ rotation using an open ended spanner. Hold Body from turning with a second wrench.



A *Tube*
B *Union nut*
C *Compression ferrule*
D *Compression cone*
E *Body*
F *Tightened connection*

3.2.2 Sample Outlet

Flexible tube 8x6 mm. Connect the tube to the serto elbow union and insert it into a pressure free drain of sufficient capacity.



A *Elbow union*
B *Compression ferrule*
C *Knurled nut*
D *Flexible tube*

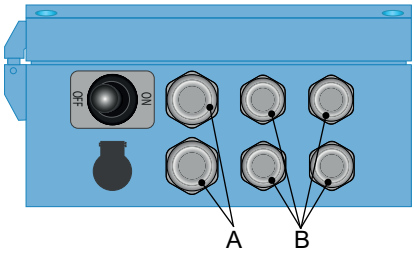
3.3. Electrical Connections

WARNING

Always turn off DC power before manipulating electric parts. 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 9 cable gland: cable $Ø_{outer}$ 4–8 mm*
B *PG 7 cable gland: cable $Ø_{outer}$ 3–6.5 mm*

Note: *Protect unused cable glands*

Wire

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

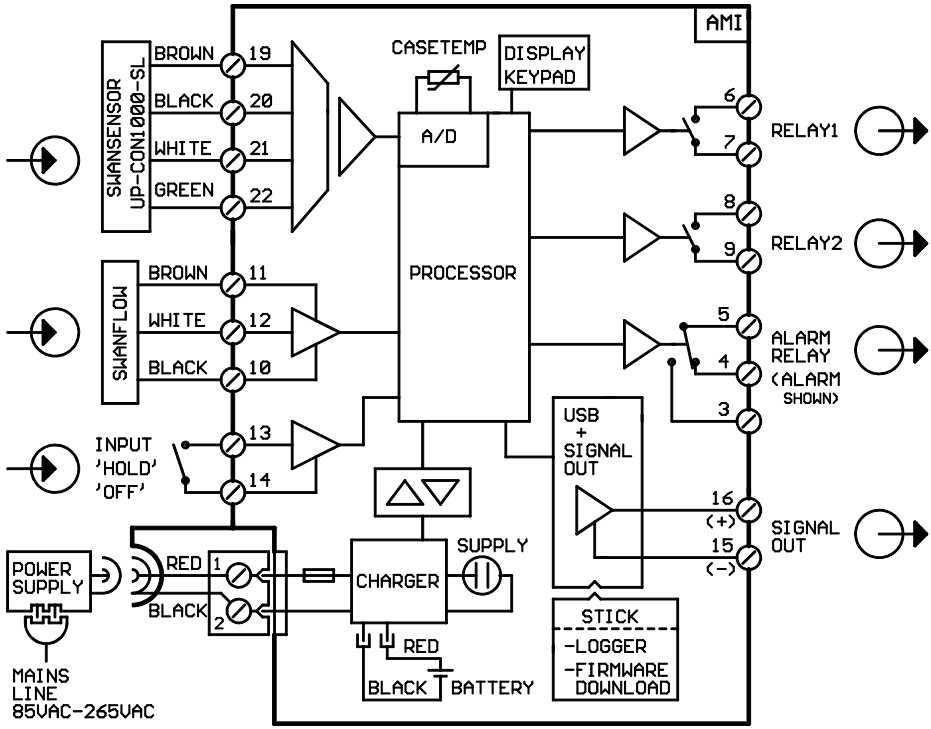
WARNING

External voltage

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

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

3.4. 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.

3.4.1 Power Supply

WARNING

Do not provide power directly to the transmitter as this will destroy the motherboard. All AMI INSPECTOR transmitters are supplied with power by battery only.

Charging

Use the supplied power adapter to charge AMI INSPECTOR only. Charging time: approx 6h.

Fully charged, a stand-alone operating time of at least 24 h is guaranteed:

- >24 h at full load (use of 3 relays, USB, signal output, logger)
- >36 h at minimal load (use of logger only)

When the battery is completely discharged, the instrument automatically shuts down.

Continuous operation

For continuous operation use the power adapter as well.

CAUTION

- If the AMI powers ON and then immediately shuts OFF, the battery is empty. Do not hold the toggle switch in ON position, as this can damage the battery.

CAUTION

- During charging protect from heat impact and keep splash-proof (plug of power adapter is not IP66).
- Do not supply external devices, e.g. pumps, magnetic valves or any other current consumers with AMI INSPECTOR.

CAUTION

- Use the supplied power adapter to charge AMI INSPECTOR only. Use of any other power adapter can damage the battery or cause malfunction

External power adapter

- Universal input range 85–265 VAC
- Continuous short circuit protection
- Overvoltage protection
- LED indicator for power on
- 2-pin AC inlet (IEC 320-C8) for country-specific power cord

Power cords

Two different power cords are supplied:

- Power cord with type C plug (Europlug)
- Power cord with type A plug (NEMA-1)

If a different plug type is needed, please purchase a suitable power cord from your local supplier.

3.5. Relay Contacts

Programming of the relay contacts see 4.2 Relay Contacts, p. 50.

3.5.1 Input

Note: *Use only potential-free (dry) contacts.*

Terminals 13/14

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

For programming see menu 5.3.4, p. 60.

3.5.2 Alarm Relay

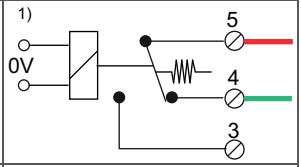
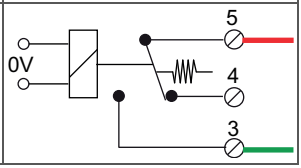
Note: *Max. load 1 A / 250 VAC.*

Alarm output for system errors.

Error codes see Troubleshooting, p. 38.

Programming see menu 5.3.1, p. 55.

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.*

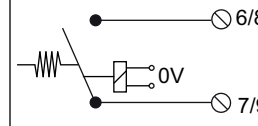
	Terminals	Description	Relay connection
NC[1] Normally Closed	5/4	Active (opened) during normal operation. Inactive (closed) on error and loss of power.	
NO Normally Open	5/3	Active (closed) during normal operation. Inactive (opened) on error and loss of power.	

1) *usual use*

3.5.3 Relay Contacts 1 and 2

Note: *Rated load 100 mA / 50 V.*

For programming see Menu Installation 5.3.2 and 5.3.3, p. 57

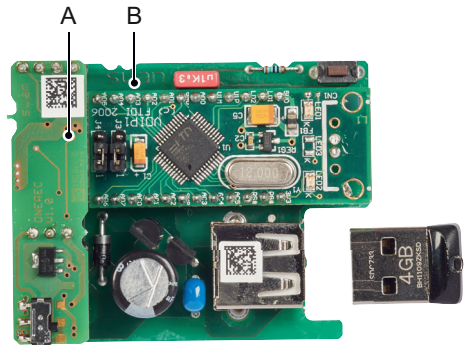
	Terminals	Description	Relay connection
NO Normally Open	6/7: Relay 1 8/9: Relay 2	Inactive (opened) during normal operation and loss of power. Active (closed) when a programmed function is executed.	

3.6. Signal Output

The signal output 0/4–20 mA PCB is plugged onto the USB interface PCB.

Note: *Max. burden 510 Ω*

Terminals 16 (+) and 15 (-).
For programming see menu 5.2 Signal Outputs, p. 51.



A *Signal output 0/4–20 mA PCB*
B *USB interface PCB*

4. Instrument Setup

4.1. Programming

Sensor parameters

Program all sensor parameters in Menu 5.1.2, <Installation>/<Sensors>/<Sensor parameters>:

Enter the:

- Cell constant [cm^{-1}]
- Temperature correction in °C
- Cable length
- Temperature compensation

The sensor characteristics are printed on the label of each sensor.

87-344.203	UP-Con1000SL	Sensor type
SW-xx-xx-xx	ZK = 0.0417	Cell constant
SWAN AG	DT = 0.06 °C	Temperature correction

Cable length

Set the cable length to 0.0 m if the sensor is installed in the flow cell of the AMI INSPECTOR Conductivity.

Temp. compensation

Menu 5.1.3

Choose between:

- none
- Coefficient
- Neutral salts
- High-purity water
- Strong acids
- Strong bases
- Ammonia, Ethanolamine
- Morpholine

Measuring unit

Menu 5.1.1.2

Set the <Measuring unit> according to your requirements:

- µS/cm
- µS/m

External devices

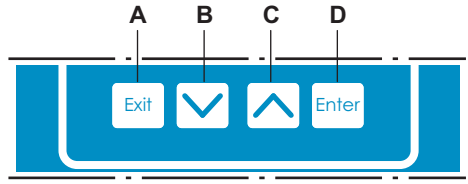
Program all parameters for external devices (interface, recorders, etc.) See program list and explanations 5.2 Signal Outputs, p. 51 and 4.2 Relay Contacts, p. 50.

Limits alarms

Program all parameters for instrument operation (limits, alarms). See program list and explanations 4.2 Relay Contacts, p. 50.

5. Operation

5.1. Keys



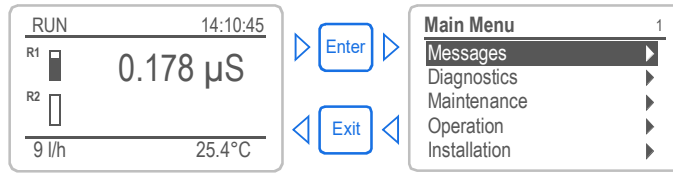
A to exit a menu or command (rejecting any changes)
to move back to the previous menu level

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

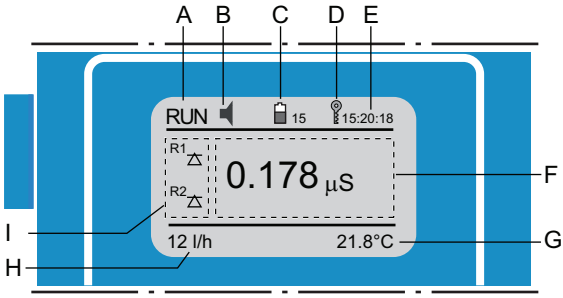
C to move UP in a menu list and to increase digits

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

Program Access, Exit



5.2. Display



A RUN — normal operation

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

OFF — input closed: control/limit is interrupted (shows status of signal outputs).

B ERROR — Error — Fatal Error

C Battery status (remaining operating time in h)

D Keys locked, transmitter control via Profibus

E Time

F Process values

G Sample temperature

H Sample flow

I Relay status

Relay status, symbols

upper/lower limit not yet reached

upper/lower limit reached

control upw./downw. no action

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

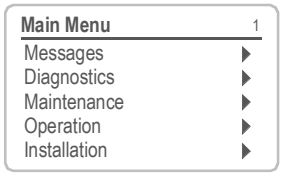
motor valve closed

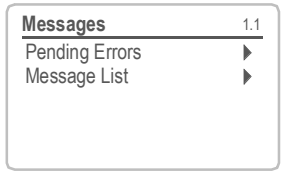
motor valve: open, dark bar indicates approx. position

timer

timer: timing active (hand rotating)

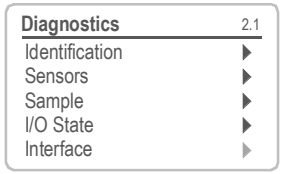
5.3. Software Structure





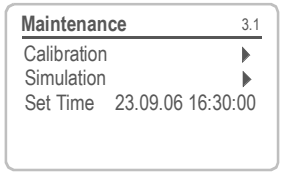
Menu **Messages 1**

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



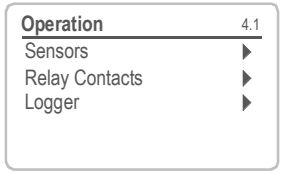
Menu **Diagnostics 2**

Provides user relevant instrument and sample data.



Menu **Maintenance 3**

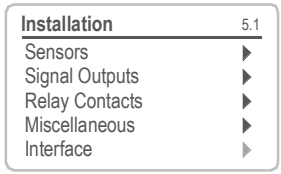
For instrument calibration, relay and signal output simulation, and to set the instrument time.
It is used by the service personnel.



Menu **Operation 4**

User relevant parameters that might need to be modified during daily routine. Normally password protected and used by the process-operator.

Subset of menu 5 - Installation, but process-related.



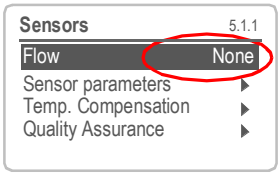
Menu **Installation 5**

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

5.4. Changing Parameters and values

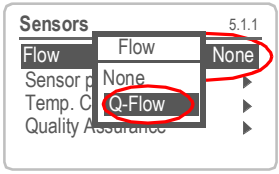
Changing parameters

The following example shows how to set the Q-Flow sensor:



1 Select the parameter you want to change.

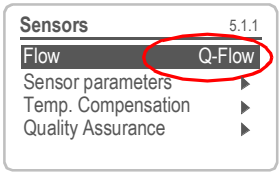
2 Press [Enter].



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

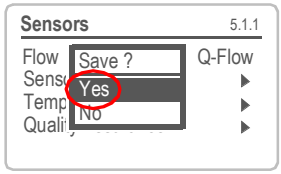
4 Press [Enter] to confirm the selection or [Exit] to keep the previous parameter.

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



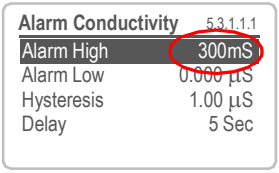
5 Press [Exit].

⇒ *Yes is highlighted.*



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

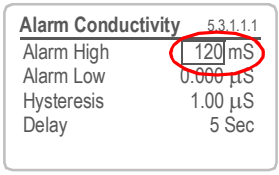
Changing values



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

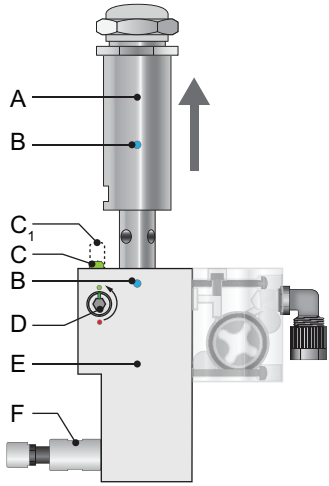
6.1. Maintenance Schedule

Monthly	◆ Check sample flow.
If required	◆ Clean conductivity sensor.

6.2. Stop of Operation for Maintenance

1 Stop sample flow.
2 Shut off power of the instrument.

6.3. Maintenance of the Sensor



A *Conductivity sensor*
B *Alignment marks*
C *Locking pin unlocked*
C$_1$ *Locking pin locked*
D *Locking screw open*
E *Flow cell*
F *Flow regulating valve*

Remove the Sensor from the Flow Cell

To remove the sensor from the flow cell proceed as follows:

1. Stop the sample flow.
2. Press the locking pin [C_1] down.
3. Turn the locking screw [D] with a 5 mm allen key counterclockwise 180°.
   ⇒*The locking pin remains down.*
4. Remove the sensor.

Cleaning

If the sensor is slightly contaminated, clean it with soapy water and a pipe cleaner. If the sensor is strongly contaminated, dip the tip of the sensor into 5% hydrochloric acid for a short time.

Install the Sensor into the Flow Cell

1. Make sure that the locking mechanism is in unlocked position, locking pin in position [C].
2. Put the sensor into the flow cell with the alignment marks [B] in line.
3. Turn the locking screw with a 5 mm allen key clockwise 180°.
   ⇒*The locking pin moves up in lock position [C_1].*

6.4. Quality Assurance of the Instrument

Every SWAN on-line instrument is equipped with integrated, autonomous quality assurance functions to survey the plausibility of each measurement.
For AMI Powercon Specific and AMI Powercon Acid these are:

- continuous monitoring of sample flow
- continuous monitoring of the temperature inside the transmitter case
- periodic accuracy test with ultra high precision resistors

In addition, a manual, menu-driven inspection procedure can be carried out using a certified reference instrument. After activating the quality assurance procedure by setting the quality assurance level, the instrument periodically reminds the user to perform the procedure and the results are stored in a history for review.

Quality assurance level

Central feature of the quality assurance function is the assignment of the monitored process to a quality assurance level.
There are three predefined levels plus a user level. Hereby the inspection interval, the deviation limits of temperature and measuring result between the inspection equipment and the monitoring instrument are defined.

- Level 1: **Trend;** Measurement is used as an additional information to follow the process indicating trends.
- Level 2: **Standard;** Monitoring of conductivity. In case of instrument failure, other parameters can be used for process monitoring.
- Level 3: **Crucial;** Monitoring of critical processes, value is used for control of another part or subsystem (valve, dosing unit, etc.).

Additional level:

- Quality level 4: **User;** User defined inspection interval, maximal deviation of temperature and measuring result.

Limits and intervals:

Quality level	max. deviation temperature [°C][a)]	max. deviation result [%]	min. inspection interval
0: Off	**off**	**off**	off
1: Trend	**0.5 °C**	**10%**	annual
2: Standard	**0.4 °C**	**5%**	quarterly
3: Crucial	**0.3 °C**	**5%**	monthly
4: User	**0–2 °C**	**0–20%**	annual, quarterly, monthly

a) sample temperature must be 25 °C +/- 5 °C.

Procedure The standard workflow consists of the following steps:

1. Activation of SWAN quality assurance procedure
2. Pre-test
3. Connecting instruments
4. Carrying out comparison measurement
5. Completion of the measurement

Note: *The procedure should only be carried out by qualified personnel.*

6.4.1 Activate SWAN quality assurance procedure

Enable quality assurance procedure on the process monitor(s) which shall be checked by selecting the quality level in menu 5.1.4.1. The corresponding submenus are then activated.

Note: *The activation is necessary the first time only.*

6.4.2 Pre-test

- Reference instrument: AMI INSPECTOR Conductivity
  - Check certificate; Reference instrument certificate not older than one year.
  - Check battery; Battery of the AMI INSPECTOR Conductivity should be completely charged. Remaining operating time on display minimum 20 hours.
  - Disable temperature compensation (set to “none”)
- On-line instrument: AMI Powercon:
  - Good order and condition; Flow cell free of particles, sensor surface free of deposits.
  - Check message list; Review the message list in menu 1.3 and check for frequently occurring alarms (as for example flow alarms). If alarms occur frequently remove cause before starting the procedure.

6.4.3 Connecting sample lines

See corresponding chapter in the manual of the process monitor which shall be checked.

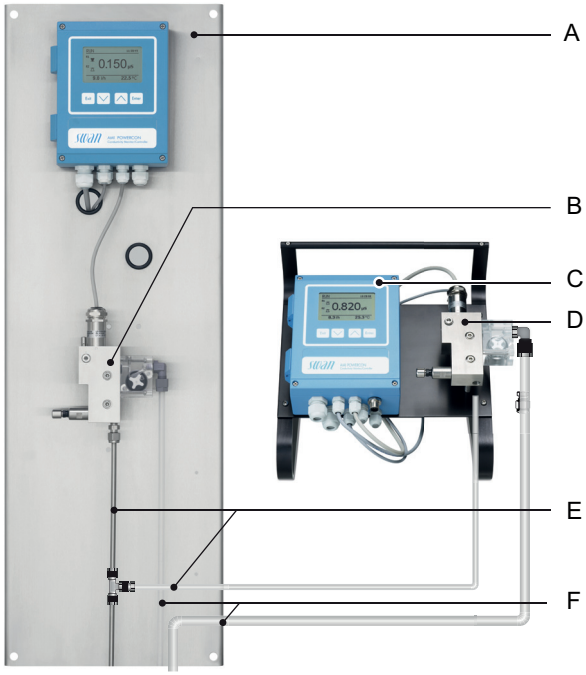
The choice of sampling depends strongly on local conditions on site. Possible sampling:

- via sample point,
- via T-fitting or
- via piggyback/downstream

Note:

- *avoid ingress of air, use screwed fitting,*
- *sample as near as possible to the process monitor,*
- *while the measurement is running, wait approx. 10 minutes until the measured value and temperature have stabilized.*

Example As an example, the following picture shows the connection of the reference instrument to the process monitor via a T-fitting.



A *Monitor AMI Powercon*
B *Online flow cell*
C *AMI INSPECTOR Conductivity*
D *Reference flow cell*
E *Sample inlets with T-fitting*
F *Sample outlets*

1 Stop sample flow to the AMI Powercon by closing the appropriate valve, e.g. back pressure regulator, sample preparation or flow regulating valve at flow cell.

2 Connect sample line of the AMI Powercon with the sample inlet of the reference instrument AMI INSPECTOR. Use the supplied tube made of FEP.

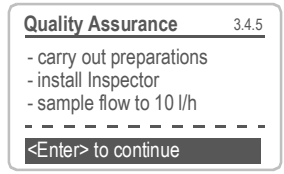
3 Connect the sample outlet of the AMI INSPECTOR to the sample outlet funnel of the monitor.

4 Switch on the AMI INSPECTOR. Open the flow regulating valve and adjust the sample flow.

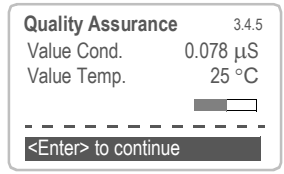
6.4.4 Carry out comparison measurement

1 Navigate to menu <Maintenance>/<Quality Assurance>.

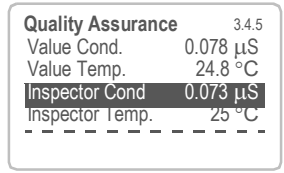
2 Follow the dialog on the display.



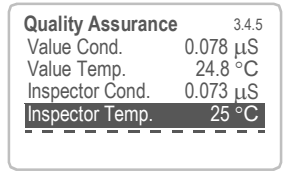
3 Carry out pre-test preparations.
Connect instructions.
Regulate sample flow to 10 l/h using the appropriate valve.



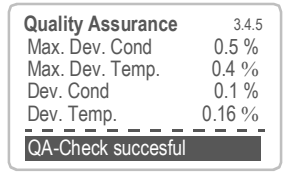
4 Wait 10 minutes while measurement is running.
Press [Enter] to continue.



5 Read the µS value of the reference instrument and enter it in the "Inspector Cond." field.
Press [Enter] to confirm.



6 Read the temperature value of the reference instrument and enter it in the "Inspector Temp." field.
Press [Enter] to confirm.
Press [Enter] to continue.



⇒ *The results are saved in the QA history regardless if successful or not.*

If the QA check is not successful, it is recommended to clean the sensor. If the QA check fails again, contact your local SWAN distributor for support.

6.4.5 Completion of the measurement

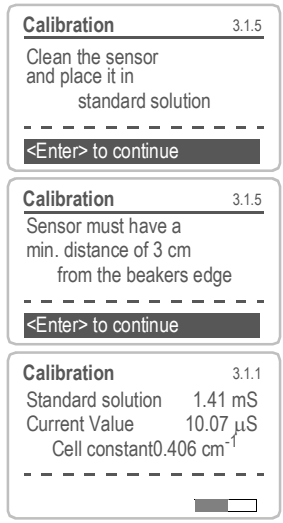
1. Stop the sample flow.
2. Close flow regulating valve of the AMI INSPECTOR.
3. Disconnect the AMI INSPECTOR by removing the tubes and connect the sample outlet of the AMI Powercon to the sample outlet funnel again.
4. Start sample flow again and regulate sample flow.
5. Shut down the AMI INSPECTOR.

6.5. Calibration

If you use a UP-Con1000 sensor it is not necessary to calibrate the instrument. A zero measurement is automatically performed every day at 00:30 AM.

A calibration is necessary if the cell constant of a sensor is not known. To perform a calibration proceed as follows:

1. Stop sample flow.
2. Navigate to menu Maintenance / Calibration.
3. Press [Enter] and follow the dialog on the Display.
4. Remove the sensor from the flow cell.
5. Clean the sensor carefully and rinse it with clean water, see Maintenance of the Sensor, S. 30.
6. Use a one liter beaker and fill it with one liter calibration solution.
7. Put the sensor into the beaker filled with calibration solution.



8 Wait at least 5 minutes to permit temperature equilibration between sensor and calibration solution.

9 Start the calibration procedure.

10 Press [Enter], to save the values if the calibration was successful.

11 Install the sensor into the flow cell.

Note: *The temperature algorithm of the 1.413 mS/cm at 25 °C calibration solution is stored in the AMI INSPECTOR Conductivity transmitter. Provided that the calibration solution has a temperature between 5 °C and 50 °C, and the built-in temperature sensor is in temperature equilibrium with the solution by waiting at least 5 minutes, a correct calibration will be done (independent of the chosen temperature compensation set in menu 5.1.3.1). During calibration control is interrupted. The signal outputs are frozen if hold has been programmed (menu 4.2.4.2). Otherwise the outputs track the measured value. Hold after calibration is indicated by Hold in the display.*

6.6. Longer Stop of Operation

1 Stop sample flow.

2 Shut off power of the instrument.

3 Unscrew and remove the sensor.

4 Empty and dry the flow cell.

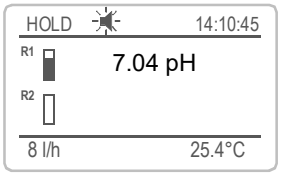
7. Troubleshooting

7.1. Error List

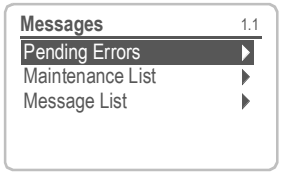
Error
Non-fatal error. Indicates an alarm if a programmed value is exceeded.
Such errors are marked **E0xx** (bold and black).

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

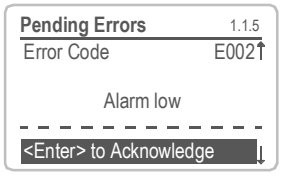
- Errors which disappear if correct measuring conditions are recovered (i.e. sample flow low).
  Such errors are marked **E0xx** (bold and orange)
- Errors which indicate a hardware failure of the instrument.
  Such errors are marked **E0xx** (bold and red)



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



Navigate to menu <Messages>/ <Pending Errors>.



Press [ENTER] to acknowledge the Pending Errors.
⇒ *The error is reset and saved in the message list.*

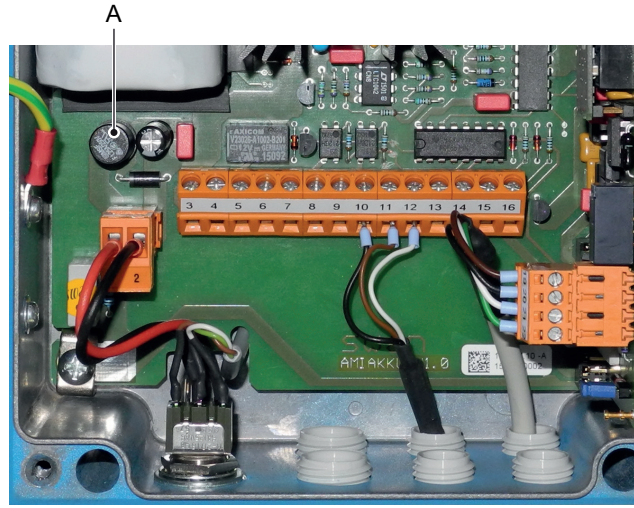
Error	Description	Corrective action
E001	Alarm high	– check process – check programmed value, see 5.3.1.1.1, p. 56
E002	Alarm low	– check process – check programmed value, see 5.3.1.1.25, p. 56
E007	Sample Temp. high	– check process – check programmed value, see 5.3.1.3.1, p. 56
E008	Sample Temp. low	– check process – check programmed value, see 5.3.1.3.25, p. 57
E009	Sample Flow high	– check Inlet pressure – readjust sample flow – check programmed value, see 5.3.1.2.2, p. 56
E010	Sample Flow low	– check Inlet pressure – readjust sample flow – clean flow cell – check programmed value, see 5.3.1.2.35, p. 56
E011	Temp. shorted	– Check wiring of sensor, see Connection Diagram, p. 19 – Check sensor
E012	Temp. disconnected	– Check wiring of sensor, see Connection Diagram, p. 19 – Check sensor
E013	Case Temp. high	– check case/environment temperature – check programmed value, see 5.3.1.4, p. 57

Error	Description	Corrective action
E014	Case Temp. low	– check case/environment temperature – check programmed value, see 5.3.1.5, p. 57
E017	Control Timeout	– check control device or programming in Installation, Relay contact, Relay 1/2 see 5.3.2 and 5.3.3, p. 57
E024	Input active	– See If Fault Yes is programmed in Menu see 5.3.4, p. 60
E026	IC LM75	– call service
E030	EEProm Frontend	– call service
E031	Calibration Recout	– call service
E032	Wrong Frontend	– call service
E033	Power-on	– none, normal status
E034	Power-down	– none, normal status

7.2. Replacing Fuses

Find and repair the cause for the short circuit before replacing the fuse. Use tweezers or needle-nosed pliers to remove the defective fuse.

Use original fuses provided by SWAN only.



A *1.25 AF/250V Instrument power supply*

8. Program Overview

For explanations about each parameter of the menus see Program List and Explanations, p. 47.

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

8.1. Messages (Main Menu 1)

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

8.2. Diagnostics (Main Menu 2)

Identification	Designation	AMI Powercon		* Menu numbers
2.1*	Version	V6.00-11/15		
	Factory Test	*Instrument*	2.1.3.1*	
	2.1.3*	*Motherboard*		
		Front End		
	Operating Time	*Years / Days / Hours / Minutes / Seconds*		2.1.4.1*
	2.1.4*			
Sensors	**Cond. Sensor**	*Current value*		
2.2*	2.2.1*	*Raw value*		
		Cell constant		
		Cal. History	*Number, Date, Time*	2.2.1.5.1*
		2.2.1.5*		
	Miscellaneous	Case Temp.	*2.2.2.1**	
	2.2.2*			
Sample	*Sample ID*	2.3.1*		
2.3*	*Temperature*			
	(Pt1000)			
	Sample Flow			
	Raw value			
I/O State	*Alarm Relay*	2.4.1*		
2.4*	*Relay 1/2*	2.4.2*		
	Input			
	Signal Output 3			
Interface	*Protocol*	2.5.1*		(only with RS485
2.5*	*Baud rate*			interface)

8.3. Maintenance (Main Menu 3)

Calibration	*Follow instructions*	3.1.5*	*Menu numbers
3.1*			
Simulation	*Alarm Relay*	3.3.1*	
3.2*	*Relay 1*	3.3.2*	
	Relay 2	3.3.3*	
	Signal Output 3	3.3.4*	
Set Time	*(Date), (Time)*		
3.4*			

8.4. Operation (Main Menu 4)

Sensors	*Filter Time Const.*	4.1.1*		
4.1*	*Hold after Cal*	4.1.2*		
Relay Contacts	**Alarm Relay**	**Alarm Conductivity**	*Alarm High*	4.2.1.1.1*
4.2*	4.2.1*	4.2.1.1*	*Alarm Low*	4.2.1.1.23*
			Hysteresis	4.2.1.1.33*
			Delay	4.2.1.1.43*
	Relay 1/2	*Setpoint*	4.2.x.100*	
	4.2.2*/4.2.3*	*Hysteresis*	4.2.x.200*	
		Delay	4.2.x.30*	
	Input	*Active*	4.2.4.1*	
	4.2.4*	*Signal Outputs*	4.2.4.2*	
		Output / Control	4.2.4.3*	
		Fault	4.2.4.4*	
		Delay	4.2.4.5*	
Logger	*Log Interval*	4.3.1*		
4.3*	*Clear Logger*	4.3.2*		
	Eject USB Stick	4.3.3		

8.5. Installation (Main Menu 5)

Sensors	**Flow**	*None*		*Menu numbers
5.1*	*5.1.1**	*Q-Flow*		
	Sensor parameters	*Cell Constant*	5.1.2.1*	
	5.1.2*	*Temp. Corr.*	5.1.2.2*	
		Cable length	5.1.2.3*	
		Meas. unit	5.1.2.4	
	Temp.Compensation	Comp.	*none*	
	5.1.3*	5.1.3.1*	*Coefficient*	
			Neutral salts	
			High-purity water	
			Strong acids	
			Strong bass	
			Ammonia, Etham	
			Morpholine	
Signal Outputs	**Signal Output 3**	*Parameter*	5.2.1.1*	
5.2*	5.2.1*	*Current Loop*	5.2.1.2*	
		Function	5.2.1.3*	
		Scaling	*Range Low*	5.2.1.40.10*
		5.2.1.40	*Range High*	5.2.1.40.20*
Relay Contacts	**Alarm Relay**	**Alarm Conductivity**	*Alarm High*	5.3.1.1.1*
5.3*	5.3.1*	5.3.1.1*	*Alarm Low*	5.3.1.1.23*
			Hysteresis *	5.3.1.1.33
			Delay	5.3.1.1.43*
		Sample Flow	*Flow Alarm*	5.3.1.2.1*
		5.3.1.2*	*Alarm High*	5.3.1.2.2
			Alarm Low	5.3.1.2.33
		Sample Temp.	*Alarm High*	5.3.1.3.1*
		5.3.1.3*	*Alarm Low*	5.3.1.3.23*
		Case Temp.high	5.3.1.4*	
		Case Temp.low	5.3.1.5*	
	Relay 1/2	*Function*	5.3.2.1 / 5.3.3.1*	
	5.3.2/5.3.3*	*Parameter*	5.3.2.20 / 5.3.3.20*	
		Setpoint	5.3.2.300 / 5.3.3.300*	
		Hysteresis	5.3.2.400 / 5.3.3.400*	
		Delay	5.3.2.50 / 5.3.3.50*	

	Input	*Active*	5.3.4.1*
	5.3.4*	*Signal Outputs*	5.3.4.2*
		Output/Control	5.3.4.3*
		Fault	5.3.4.4*
		Delay	5.3.4.5*
Miscellaneous	*Language*	5.4.1*	
5.4*	*Set defaults*	5.4.2*	
	Load Firmware	5.4.3*	
	Password	*Messages*	5.4.4.1*
	5.4.4*	*Maintenance*	5.4.4.2*
		Operation	5.4.4.3*
		Installation	5.4.4.4*
	Sample ID	5.4.5*	
Interface	*Protocol*	5.5.1*	

*Menu numbers

9. Program List and Explanations

1 Messages

1.1 Pending Errors

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

1.2 Message List

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

2 Diagnostics

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

2.1 Identification

Desig.: Designation of the instrument.
Version: Firmware of instrument (e.g. V6.00-11/15)

2.1.4 **Factory Test**: Test date of the instrument, motherboard and frontend

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

2.2 Sensors

2.2.1 **Cond. Sensor**

- *Current value* in µS
- *Raw value* in µS
- Cell Constant

2.2.1.5 **Cal. History:** Review diagnostic values of the last calibrations. Only for diagnostic purpose.

- *Number*
- Date, Time
- Cell constant

Max. 64 data records are memorized. One process calibration corresponds to one data record.

2.2.2 **Miscellaneous**:

2.2.2.1 *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 *Temperature*: Shows the current sample temperature in °C.
(Pt 1000): Shows the current temperature in Ohm.
o *Sample Flow*: Shows the current sample flow in l/h
(Raw Value) in Hz.
The Sample flow must be above 5 l/h.

2.4 I/O State

Shows current status of all in- and outputs.

2.4.1/2.4.2

Alarm Relay:	Active or inactive.
Relay 1 and 2:	Active or inactive.
Input:	Open or closed.
Signal Output 3:	Actual current in mA

2.5 Interface

2.5.1 Protocol USB Stick.

3 Maintenance

3.1 Calibration

Follow the commands on the screen. Save the value with the [Enter] key.

3.2 Simulation

To simulate a value or a relay state, select the

- alarm relay,
- relay 1 and 2
- signal output 3 (signal outputs 1 and 2 are deactivated)

with the [▲] or [▼] key.

Press the [Enter] key.

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

Press the [Enter] key.

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

3.2.1	*Alarm Relay:*	Active or inactive.
3.2.2	*Relay 1:*	Active or inactive.
3.2.3	*Relay 2*	Active or inactive.
3.2.4	*Signal Output 3*	Actual current in mA

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.

3.3 Set Time

Adjust date and time.

4 Operation

4.1 Sensors

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

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

4.2 Relay Contacts

See Relay Contacts, p. 22

4.3 Logger

The instrument is equipped with an internal logger. The data can be copied to a PC with the installed USB stick.
The logger can save approx. 1500 data records. The Records consists of: Date, time, alarms, measured value, measured value uncompensated, temperature, flow.

4.3.1 *Log Interval:* Select a convenient log interval. Consult the table below to estimate the max logging time. When the logging buffer is full, the oldest data record is erased to make room for the newest one (circular buffer).
Range: 1 Second to 1 hour

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

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

4.3.3 *Eject USB Stick*: With this function all logger data are copied to the USB stick before the USB stick is deactivated.

5 Installation

5.1 Sensors

5.1.1 **Flow**:

- None
- Q-Flow

Select “Q-Flow” if the sample flow should be monitored and shown on the display and when using a QV-Flow cell.

5.1.2 Sensor parameters

5.1.2.1 *Cell Constant*: Enter the cell constant printed on the sensor label.

5.1.2.2 *Temp. Corr*: Enter the temperature correction printed on the sensor label.

5.1.2.3 *Cable length*: Enter the cable length. Set the cable length to 0.0 m if the sensors are installed in the flow cell on the AMI monitor.

5.1.2.4 *Meas. unit*: Select the measuring unit as µs/cm or as µs/m.

5.1.3 **Temp. comp**:

5.1.3.1 *Comp.*: Available compensation models are:

- none
- Coefficient
- Neutral salts
- High purity water
- Strong acids
- Strong bases
- Ammonia, Eth.am.
- Morpholine

5.1.4 **Quality Assurance**:

Not applicable.

5.2 Signal Outputs

5.2.1 **Signal Output 3 (signal outputs 1 and 2 are deactivated)**

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

- Conductivity
- Temperature
- Sample flow
- Cond. uc

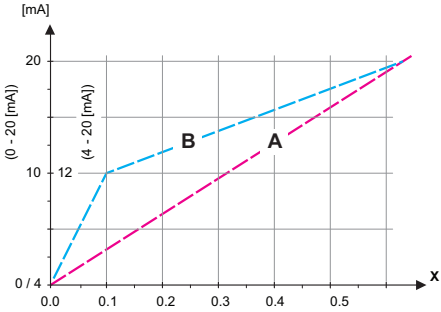
5.2.1.2 *Current Loop:* Select the current range of the signal output.
Make sure the connected device works with the same current range.
Available ranges: 0–20 mA or 4–20 mA

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:

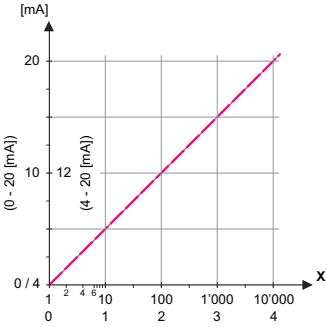
- Linear, bilinear or logarithmic for process values.
  See As process values, p. 52
- Control upwards or control downwards for controllers.
  See As control output, p. 53

As process values

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



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



X *Measured value (logarithmic)*

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

Parameter Conductivity:

5.2.1.40.10 Range low: 0 µS–300 mS

5.2.1.40.20 Range high: 0 µS–300 mS

Parameter Temperature

5.2.1.40.11 Range low: -25 to +270 °C

5.2.1.40.21 Range high: -25 to +270 °C

Parameter Sample flow

5.2.1.40.12 Range low: 0 –50 l/h

5.2.1.40.22 Range high: 0 –50 l/h

Parameter Cond. uc:

5.2.1.40.13 Range low: 0 µS–300 mS

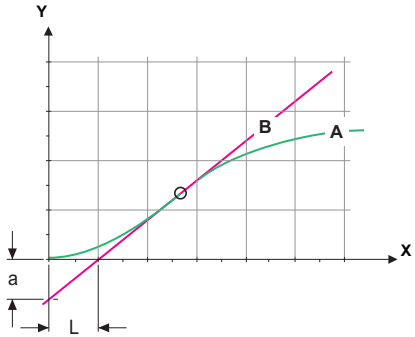
5.2.1.40.23 Range high: 0 µS–300 mS

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 set-point, within the dosing intensity is reduced from 100% to 0% to reach the setpoint without overshooting.

5.2.1.43 **Control Parameters:** if Parameters = Conductivity

5.2.1.43.10 Setpoint
Range: 0 µS–300 mS

5.2.1.43.20 P-Band:
Range: 0 µS–300 mS

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

5.2.1.43.11 Setpoint
Range: -25 to +270 °C

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

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

5.2.1.43.12 Setpoint
Range: 0 –50 l/h

5.2.1.43.22 P-Band:
Range: 0 –50 l/h

5.2.1.43 **Control Parameters:** if Parameters = Cond. uc.

5.2.1.43.13 Setpoint
Range: 0 µS–300 mS

5.2.1.43.23 P-Band:
Range: 0 µS–300 mS

5.2.1.43.3 *Reset time:* The reset time is the time till the step response of a single I-controller will reach the same value as it will be suddenly reached by a P-controller.
Range: 0–9'000 sec

5.2.1.43.4 *Derivative time:* The derivative time is the time till the ramp response of a single P-controller will reach the same value as it will be suddenly reached by a D-controller.
Range: 0–9'000 sec

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

5.3 Relay Contacts

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

The contact is inactive at:

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

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

- Alarm Conductivity
- Sample Flow
- Sample Temp.
- Case Temp. high
- Case Temp. low

5.3.1.1 Alarm Conductivity

5.3.1.1.1 *Alarm High:* If the measured value rises above the alarm high value, the alarm relay is activated and E001, is displayed in the message list.
Range: 0 µS–300 mS

5.3.1.1.25 *Alarm Low:* If the measured value falls below the alarm low value, the alarm relay is activated and E002 is displayed in the message list.
Range: 0 µS–300 mS

5.3.1.1.35 *Hysteresis:* Within the hyst. range, the relay does not switch. This prevents damage of relays contacts when the measured value fluctuates around the alarm value.
Range. 0 µS–300 mS

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

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

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

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

5.3.1.2.2 *Alarm High:* If the measuring values rises above the programmed value E009 will be issued.
Range: 10–50 l/h

5.3.1.2.35 *Alarm Low:* If the measuring values falls below the programmed value E010 will be issued.
Range: 0–9 l/h

5.3.1.3 Sample Temp.

5.3.1.3.1 *Alarm High:* If the measured value rises above the alarm high value, the alarm relay is activated and E007, is displayed in the message list.
Range: 30–200 °C

5.3.1.3.25 *Alarm Low:* If the measured value falls below the alarm low value, the alarm relay is activated and E008 is displayed in the message list.
Range: -10 to + 20 °C

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

5.3.1.5 Case Temp. low
Alarm 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

5.3.2 and 5.3.3 **Relay 1 and 2:** The function of relay contacts 1 or 2 is defined by the user.

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

1 First select the functions as:
- Limit upper/lower,
- Control upwards/downwards,
- Timer
- Fieldbus

2 Then enter the necessary data depending on the selected function. The same values may also be entered in menu 4.2 Relay Contacts, p. 50

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
Conductivity	0 µS–300 mS
Temperature	-25 to +270 °C
Sample flow	0–50 l/h
Cond. uc	0 µS–300 mS

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
Conductivity	0 µS–300 mS
Temperature	0 to +100 °C
Sample flow	0–50 l/h
Cond. uc	0 µS–300 mS

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 one of the following process values.

- Conductivity)
- Temperature
- Sample Flow
- Cond. uc

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. 54
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. 54
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. 54
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)

5.3.2.340 Interval/Start time/Calendar: Dependent on options operating mode.

5.3.2.44 *Run time:* 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 the behavior of the signal outputs when the relay closes. Available values: cont., hold, off

5.3.2.7 *Output/Control:* select the behavior of the control outputs when the relay closes. Available values: cont., hold, off

5.3.2.1 Function = Fieldbus:

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

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

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

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

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

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

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

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

5.3.4.4 *Fault:*

No:	No message is issued in pending error list and the alarm relay does not close when input is active.
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 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-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 a USB interface is installed. No further settings are possible.	

10. Default Values

Operation:

Sensors:	Filter Time Const.:	10 s
	Hold after Cal.:	300 s
Relay Contacts	Alarm Relay	same as in Installation
	Relay 1 and 2	same as in Installation
	Input	same as in Installation
Logger:	Logger Interval:	30 min
	Clear Logger:	no

Installation:

Sensors	Flow:	None
	Sensor Parameters; Cell Constant	0.0415 cm^{-1}
	Sensor Parameters; Temp. corr.	0.00 °C
	Sensor Parameters; Cable length	0.0 m
	Sensor Parameters; Meas. unit	µS/cm
	Temp. Compensation; Comp.	none
	Quality Assurance; Level	0: Off
Signal Output	Parameter:	Conductivity
	Current loop:	0 / 4 –20 mA
	Function:	linear
	Scaling: Range low:	0.000 µS
	Scaling: Range high:	1 mS
Alarm Relay:	Alarm Conductivity:	
	Alarm high:	300 mS
	Alarm low:	0.000 µS
	Hysteresis:	1.00 µS
	Delay:	5 s
	Sample Flow:	
	Flow Alarm	yes
	Alarm high:	20 l/h
	Alarm low:	5 l/h
	Sample Temp:	
	Alarm High:	160 °C
	Alarm Low:	0 °C
	Case Temp. high:	65 °C
	Case Temp. low:	0 °C

Relay 1 and 2

Function:.....limit upper
Parameter:.....Conductivity
Setpoint: .....30 mS
Hysteresis:.....10 µS
Delay: .....30 s

If Function = Control upw. or dnw:

Parameter:.....Conductivity
Settings: Actuator: ..... Frequency
Settings: Pulse Frequency: 120/min
Settings: Control Parameters: Setpoint:.....30 mS
Settings: Control Parameters: P-band: .....10 µS
Settings: Control Parameters: P-band: .....1 mS
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:	- - - - - - - -
Interface	Protocol:	USB stick

11. Index

12. Notes

swan
ANALYTICAL INSTRUMENTS

A-96.250.611 / 030322

Swan Products - Analytical Instruments for:

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

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SWISS MADE

AMI INSPECTOR Conductivity