ANALYTICAL INSTRUMENTS

A-96.250.341 / 170621

Operator's Manual

Firmware V6.20 and higher

SWISS MADE

AMI Powercon

Customer Support

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Table of Contents

AMI Powercon–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.

2. Product Description

2.1. Description of the System

This manual describes the function of the instruments:

- AMI Powercon Specific
- AMI Powercon Acid

Both instruments are applicable for the measurement of conductivity in power cycles.
The AMI Powercon specific measures the specific (total) conductivity of a sample.
The AMI Powercon acid measures the acid (cation) conductivity of a sample. It is therefore delivered with a cation exchanger bottle.
The transmitter can be used with a two-electrode conductivity sensor with an integrated Pt1000 temperature sensor, e.g. Swansensor UP-Con1000.

Application range

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

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

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 Outputs

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

Current loop: 0/4–20 mA

Maximal burden: 510 Ω

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

Relays

Two potential-free contacts programmable as limit switches for measuring values, controllers or timer for system cleaning with automatic hold function. Both contacts can be used as normally open or normally closed.
Maximum load: 1 A/250 VAC

Alarm Relay

One potential free contact.
Alternatively:

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

Summary alarm indication for programmable alarm values and instrument faults.

Input

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

Communication interface (optional)

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

Safety Features

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

Measuring principle

When a voltage is set between two electrodes in an electrolyte solution, the result is an electric field which exerts force on the charged ions: the positively charged cations move towards the negative electrode (cathode) and the negatively charged anions towards the positive electrode (anode). The ions, by way of capture or release of electrons at the electrodes, are discharged and so a current *I* flows through this cycle and the Ohms law $V = I \times R$ applies. From the total resistance *R* of the current loop, only the resistance of the electrolyte solution, respectively its conductivity $^1/_R$, is of interest.
The cell constant of the sensor is determined by the manufacturer and is printed on the sensor label. If the cell constant has been programmed in the transmitter, the instrument measures correctly. No calibration needs to be done, the sensor is factory calibrated. Measuring unit is µS/cm or µS/m.

Specific Conductivity:

Conductivity from all ions in the sample, mainly the alkalization agent. The contribution of impurities is masked by the alkalization agent.

Cation Conductivity (Acid Conductivity):

Only with AMI Powercon acid.
The alkalization agent is removed in the cation column. All cationic ions are exchanged with H+, all anionic impurities (ions with negative charge) pass through the column unchanged.

Temperature compensation

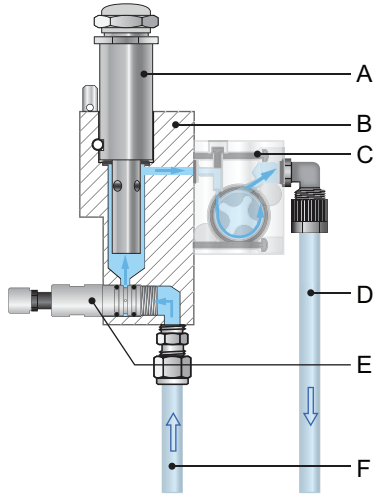
The mobility of ions in water increase with higher temperature which enlarges the conductivity. Therefore, the temperature is measured simultaneous by an integrated Pt1000 temperature sensor and the conductivity is compensated to 25 °C. Several temperature compensation curves, designed for different 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 AMI Powercon Specific

The flow cell (QV-Flow) consists of the flow cell block [B], the flow meter [C] and the flow regulating valve [E].
The conductivity sensor [A] with integrated temperature sensor is screwed into the flow cell block [B].
The sample flows via the sample inlet [F] through the flow regulating valve [E], where the flow rate can be adjusted, into the flow cell block [B], were the specific conductivity of the sample is measured.
The sample leaves the flow cell block via flow meter [C] through the sample outlet [D].



A *Conductivity sensor*
B *Flow cell block*
C *Flow meter*
D *Sample outlet*
E *Flow regulating valve*
F *Sample inlet*

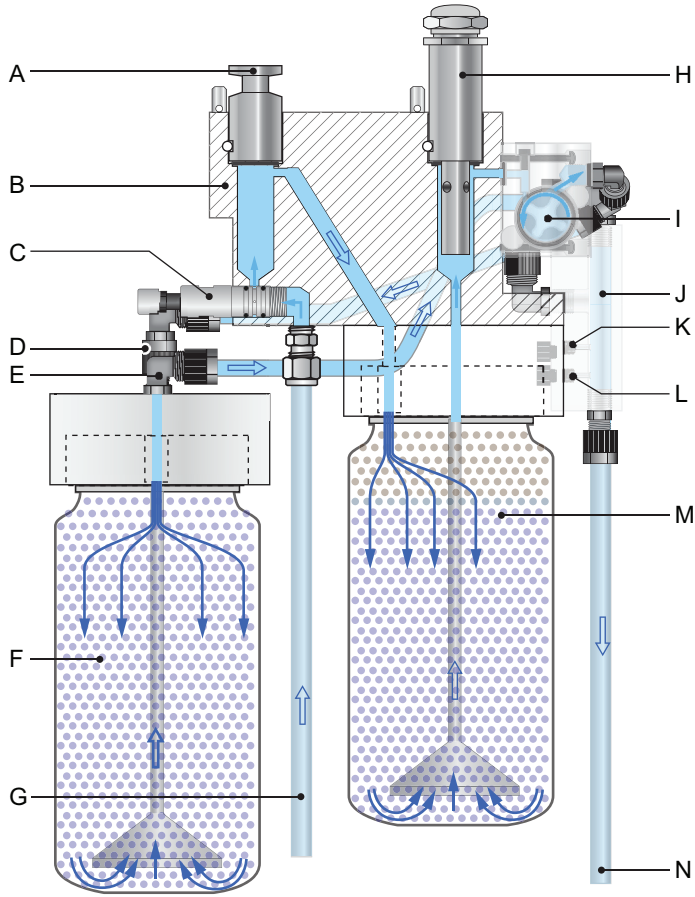
Fluidics AMI Powercon Acid

The sample flows via the sample inlet [G] through the flow regulating valve [C], where the flow rate can be adjusted, into the flow cell block [B].
The sample is led through the cation exchanger bottle [M] where all alkalization agent is eliminated. Afterwards the cation conductivity of the sample is measured with the conductivity sensor [H].
The sample leaves the measuring cell through the flow meter and the sample collector [J] and flows into the pressure-free sample outlet.
Temperature is measured with the temperature sensor integrated the conductivity sensor.

Pre-rinse Option

The AMI Powercon Acid with pre-rinse option allows fast replacement of the cation exchanger because the resin is pre-rinsed. Pre-rinsing has the effect to remove disturbing contaminations contained in the resin, which may cause incorrect measuring values. The two resin bottles are vented via small tubes connected to the sample collector [J].
If the pre-rinse option is installed, the sample flows via flow meter through the per-rinse inlet [D] into the second cation exchanger bottle [F] and from there via pre-rinse outlet [E] through the sample collector [J] into the waste funnel.
The cation exchanger bottles are vented via two small tubes which are connected to the flanges [K] and [L].

Fluidics with pre-rinse option



A *Blind plug*
B *Flow cell block*
C *Flow regulating valve*
D *Pre-rinse inlet*
E *Pre-rinse outlet*
F *Pre-rinsed cation exchanger bottle*
G *Sample inlet*
H *Conductivity sensor*
I *Flow meter*
J *Sample collector*
K *Venting tube of cation exchanger bottle*
L *Venting tube pre-rinse bottle*
M *Cation exchanger bottle*
N *Sample outlet*

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

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:	Swagelock tube 1/4” adapter
Sample outlet:	FEP flexible tube 6 mm

Measuring Range

Measuring 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 1000 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

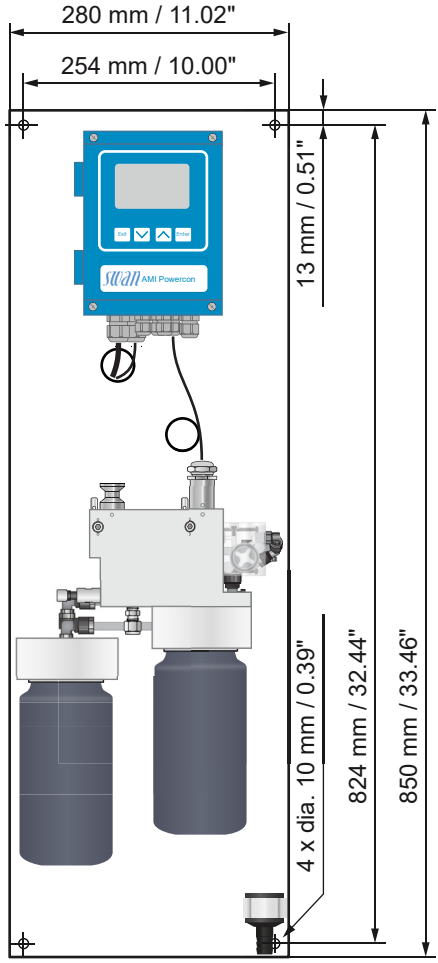
Automatic range switching.
Accuracy: ±1% of measured value or ±1 digit (whichever is greater)
Ranges and accuracy valid for a cell constant of 0.0415 cm^{-1} (Swansensor UP-Con1000).

Transmitter specifications

Aluminium with a protection degree of IP 66 / NEMA 4X.

Ambient temperature:	-10 to +50 °C
Storage and transport:	-30 to +85 °C
Humidity:	10–90% rel., non condensing
Display:	backlit LCD, 75 x 45 mm
Pollution degree:	Pollution degree 2
Installation category:	Installation category II

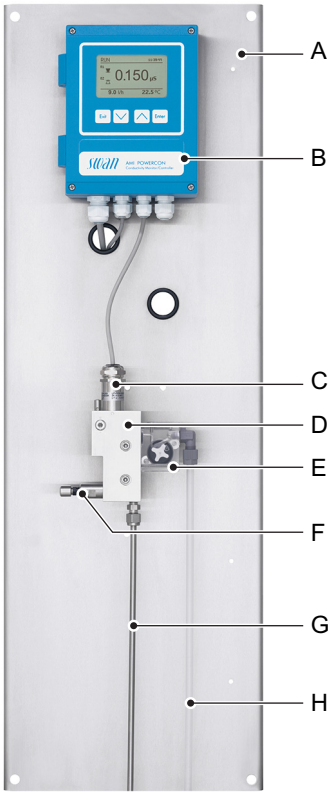
Dimensions	Panel	stainless steel
	Dimensions:	280x850x200 mm
	Screws:	8 mm diameter
	Weight:	12.0 kg



2.3. Instrument Overview

2.3.1 Monitor AMI Powercon Specific

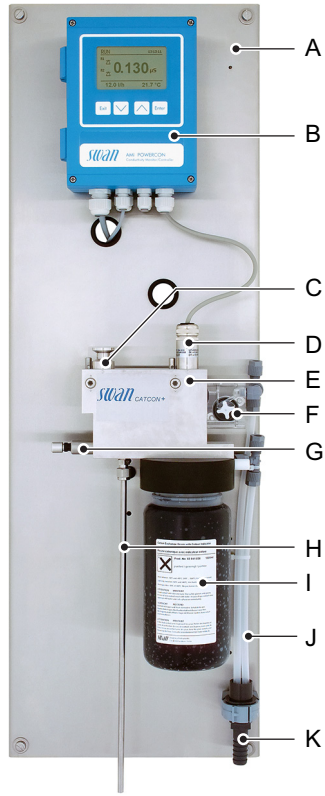
This monitor is intended for the measurement of the specific (total) conductivity in feed water, steam and condensate.



A *Panel*
B *Transmitter*
C *Slot-lock conductivity sensor*
D *Flow cell*
E *Flow sensor*
F *Flow regulating valve*
G *Sample inlet*
H *Sample outlet*

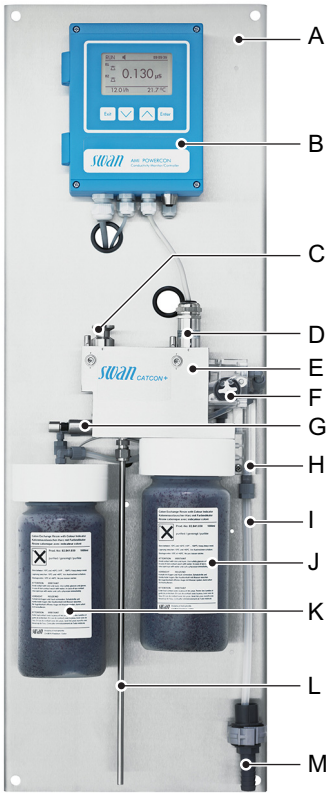
2.3.2 Monitor AMI Powercon Acid

This monitor is intended for the measurement of the acid (cation) conductivity in feed water, steam and condensate.



A *Panel*
B *Transmitter*
C *Blind plug*
D *Cation conductivity sensor*
E *Flow cell*
F *Flow meter*
G *Flow regulating valve*
H *Sample inlet*
I *Cation exchanger*
J *Sample outlet*
K *Waste funnel*

2.3.3 Monitor AMI Powercon Acid Prerinse



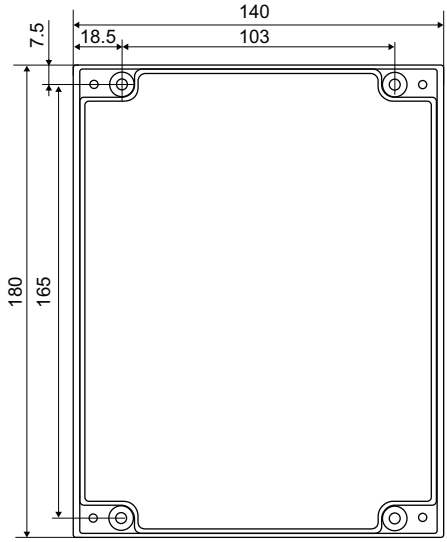
A *Panel*
B *Transmitter*
C *Blind plug*
D *Cation conductivity sensor*
E *Flow cell*
F *Flow meter*
G *Flow regulating valve*
H *Sample collector*
I *Sample outlet*
J *Cation exchanger*
K *Cation exchanger pre-rinsed*
L *Sample inlet*
M *Waste funnel*

The AMI Powercon with pre-rinse option allows fast replacement of the cation exchanger because the resin is pre-rinsed. Pre-rinsing has the effect to remove disturbing contaminations contained in the resin, which may cause incorrect measuring values. The two resin bottles are vented via small tubes connected to the sample collector [H].

2.4. Single Components

2.4.1 AMI Powercon Transmitter

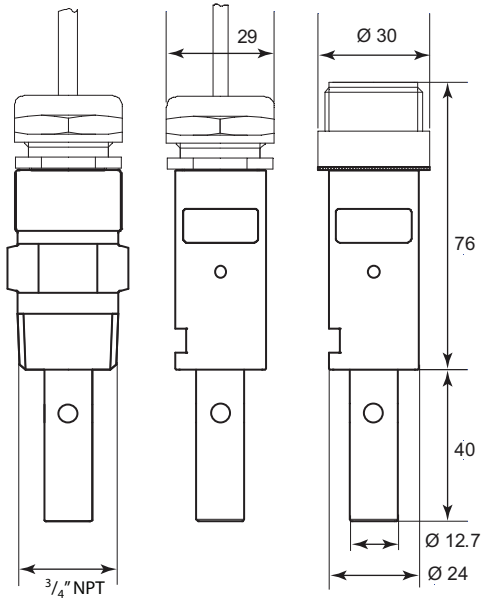
Electronic transmitter and controller for conductivity measurement.



Dimensions	
Width:	140 mm
Height:	180 mm
Depth:	70 mm
Weight:	1.5 kg
Specifications	
Electronics case:	Cast aluminum
Protection degree:	IP 66/NEMA 4X
Display:	backlit LCD, 75 x 45 mm
Electrical connectors:	screw clamps

2.4.2 Swansensor UP-Con1000

The Swansensor UP-Con1000 is a 2-electrode conductivity sensor for the continuous measurement of specific and acid conductivity with a built-in temperature sensor.



Specifications UP-Con1000

Measuring range:	0.055µS/cm–30 mS/cm
Accuracy (at 25 °C):	±1%

Measuring range and accuracy apply to the combination of Swansensor UP-Con1000 and AMI Powercon.

Operating conditions:

Continuous Temperature:	100 °C at 6.5 bar
Max. temperature:	120 °C at 6.5 bar
Pressure:	max. 30 bar at 25 °C
Temperature sensor:	Pt1000
Cell constant:	~ 0.04 cm^{-1}

Sensor mounting

- SWAN slot-lock for quick release in suitable flow cells
- 3/4" NPT thread

2.4.3 Flow Cells

The following flow cells can be used:

For a slot-lock sensor:
- B-Flow UP-CON with slot-lock
- Q-Flow L70 slot-lock
- QV-Flow UP-CON with slot-lock
- CATCON+ SL

For a 3/4” NPT thread sensor:
- B-Flow L70
- Q-flow SS316L L70
- QV-flow SS316L L70

3. Installation

3.1. Installation Checklist Monitors

On site requirements	AC variant: 100–240 VAC (±10%), 50/60 Hz (±5%) DC variant: 10–36 VDC Power consumption: 35 VA maximum Protective earth connection required Sample line with sufficient sample flow and pressure (see Instrument Specification, p. 16).
Installation	Mount the instrument in vertical position. Display should be at eye level. Connect sample inlet and outlet. Monitor: Sensors are already mounted. Single flow cell: Mount sensors (see Install the Sensor into the Flow Cell, p. 46, and connect cables (see Connection Diagram, p. 31).
Electrical wiring	Connect all external devices like limit switches and current loops see Connection Diagram, p. 31. Connect power cord; do not switch on power yet!
Cation exchanger	Only for AMI Powercon acid! Fill up cation exchanger bottle with high purity water. Remove the empty bottle and install the cation exchanger bottle. With pre-rinse set-up, install a cation exchanger bottle to the second flange.
Power-up	Open sample flow and wait until flow cell is completely filled. Switch on power. Adjust sample flow.
Instrument setup	Program all sensor parameters see Sensor parameters, p. 39 Program the required temperature compensation. Program all parameters for external devices (interface, recorders, etc.). Program all parameters for instrument operation (limits, alarms).
Run-in period	If the conductivity value of the sample is very low, the sensor might need some time until the correct reading is displayed

3.2. Mounting of Instrument Panel

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

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

Mounting requirements

The instrument is only intended for indoor installation.

3.3. Connecting Sample Inlet and Outlet

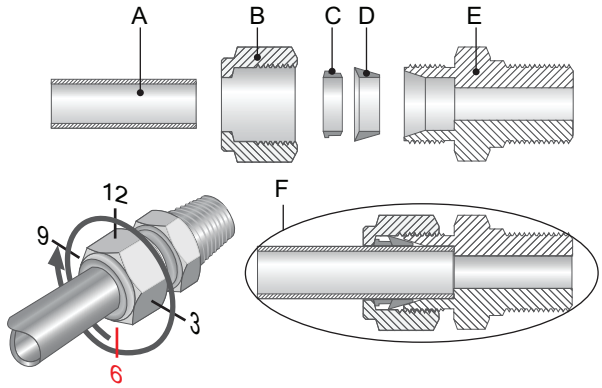
3.3.1 Swagelok Fitting Stainless Steel at Sample Inlet

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

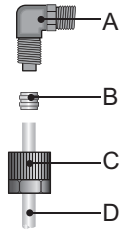
1. Insert the compression ferrule [C] and the compression cone [D] into the union nut [B].
2. Screw on the union nut onto the body, do not tighten it.
3. Push the stainless steel pipe through the union nut as far as it reaches the stop of the body.
4. Mark the union nut at 6 o'clock position.
5. While holding the fitting body steady, tighten the nut union 1¼ rotation using an open ended spanner.



A *Stainless steel tube*
B *Union nut*
C *Compression ferrule*
D *Compression cone*
E *Body*
F *Tightened connection*

3.3.2 FEP Tube at Sample Outlet

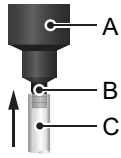
FEP flexible tube 6 mm for AMI Powercon Specific



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

Connect the tube to the serto elbow union and Insert it into an atmospheric drain of sufficient capacity.
Max. tube length is 1.5 m. Do not connect longer tubes.

1/2” Tube at waste funnel for AMI Powercon Acid



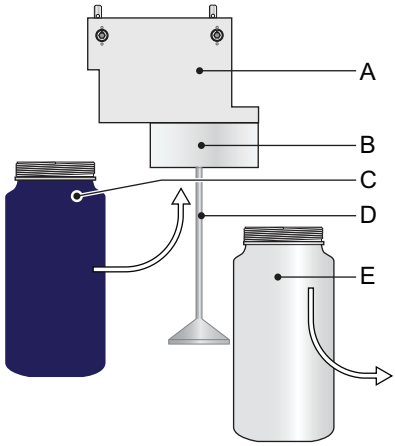
A *Waste funnel*
B *Hose nozzle*
C *1/2” tube*

Connect the 1/2” tube [C] to the hose nozzle [B] and place it into the atmospheric drain.

3.4. Installation of Cation Exchanger

Cation exchanger bottle

The bottle containing the cation exchanger is delivered, but not installed into the flow cell. For transport, an empty bottle has been installed into the flow cell.



A *Flow cell*
B *Bottle holder*
C *Cation exchanger bottle*
D *Inlet filter holder*
E *Empty bottle*

Install cation exchanger bottle

Install the resin bottle as follows:

1. Unscrew and remove the empty bottle [E] from the bottle holder [B].
2. Fill high purity water into the cation exchanger bottle [C], until the water level in the bottle reaches the beginning of the thread.
3. Carefully, without spilling water, push the cation exchanger bottle over the inlet filter holder [D] into the bottle holder [B].
4. Screw the cation exchanger bottle into the bottle holder.

   ⚠ *Do not tighten the bottle too firmly, this could damage the gasket.*

Pre-rinse setup

If you have a pre-rinse set-up, proceed according to **“Install cation exchanger bottle”** to install the second cation exchanger bottle.

3.5. Electrical Connections

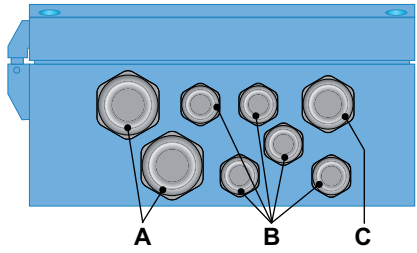
WARNING

Electrical hazard.

- Always turn off power before manipulating electric parts.
- Grounding requirements: Only operate the instrument from an power outlet which has a ground connection.
- Make sure the power specification of the instrument corresponds to the power on site.

Cable thicknesses

In order to comply with IP66, use the following cable thicknesses



A *PG 11 cable gland: cable* $Ø_{outer}$ *5–10 mm*
B *PG 7 cable gland: cable* $Ø_{outer}$ *3–6.5 mm*
C *PG 9 cable gland: cable* $Ø_{outer}$ *4–8 mm*

Note: *Protect unused cable glands*

Wire

- For Power and Relays: Use max. 1.5 mm^2 / AWG 14 stranded wire with end sleeves.
- For Signal Outputs and Input: Use 0.25 mm^2 / AWG 23 stranded wire with end sleeves.

WARNING

External Voltage.

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

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

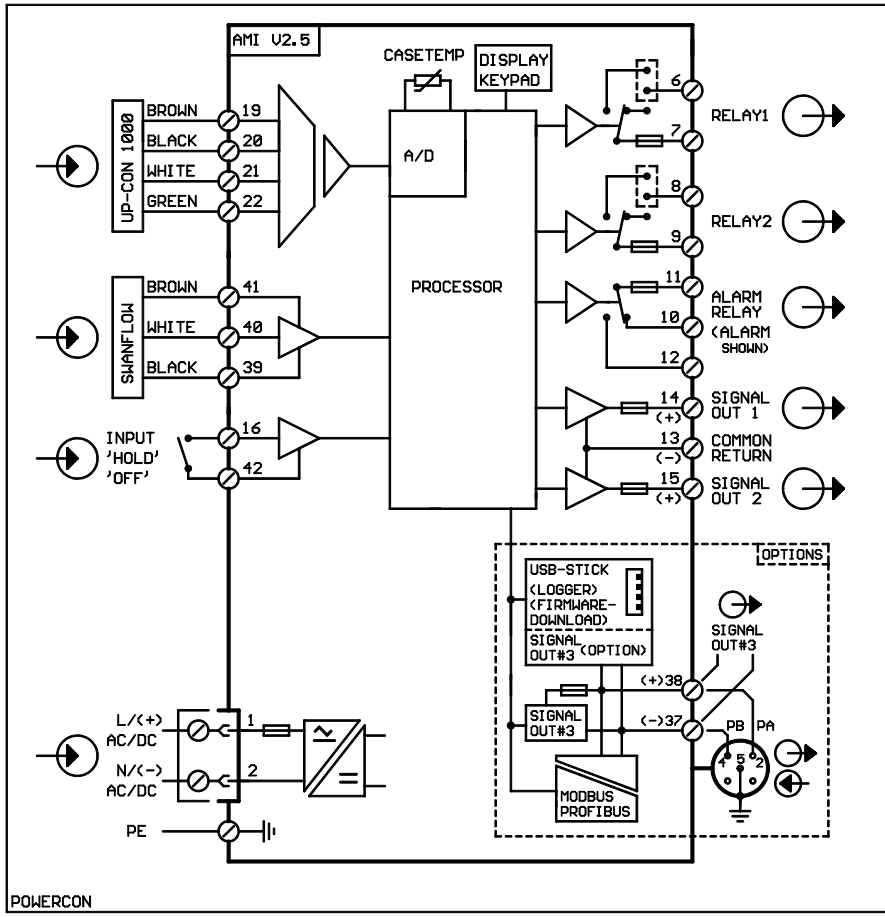
WARNING

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

WARNING

The mains of the AMI Transmitter must be secured by a main switch and appropriate fuse or circuit breaker.

3.5.1 Connection Diagram



CAUTION

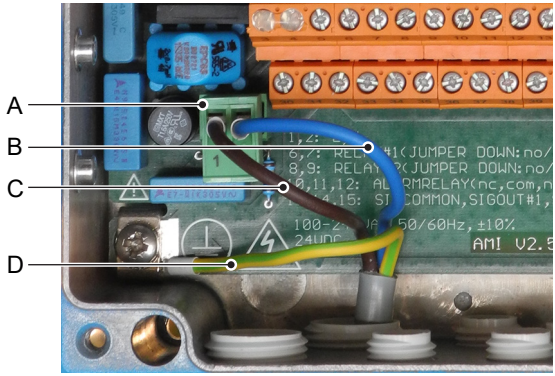
Use only the terminals shown in this diagram, and only for the mentioned purpose. Use of any other terminals will cause short circuits with possible corresponding consequences to material and personnel.

3.5.2 Power supply

WARNING

Electrical shock hazard

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



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

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

Installation requirements

The installation must meet the following requirements.

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

3.6. Relay Contacts

3.6.1 Input

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

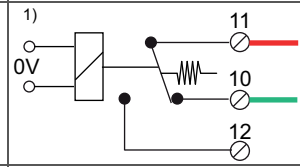
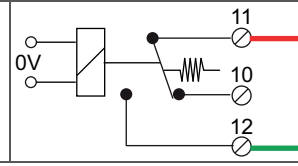
Terminals 16/42
For programming see Program List and Explanations, p. 70.

3.6.2 Alarm Relay

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

Alarm output for system errors.
Error codes see Troubleshooting, p. 61.

Note: *With certain alarms and certain settings of the AMI transmitter the alarm relay does not switch. The error, however, is shown on the display.*

	Terminals	Description	Relay connection
NC[1)] Normally Closed	10/11	Active (opened) during normal operation. Inactive (closed) on error and loss of power.	
NO Normally Open	12/11	Active (closed) during normal operation. Inactive (opened) on error and loss of power.	

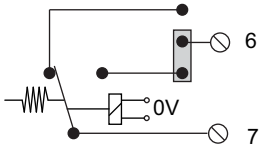
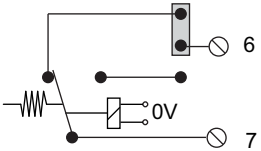
1) *usual use*

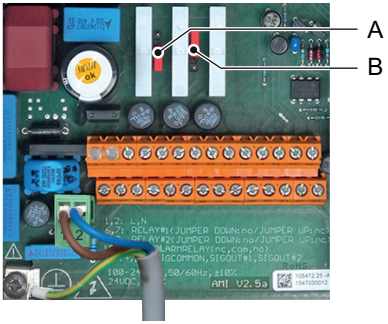
3.6.3 Relay 1 and 2

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

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

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

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



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

For programming see menu Installation Program List and Explanations, p. 70.

CAUTION

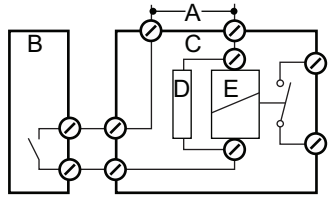
Risk of damage of the relays in the AMI Transmitter due to heavy inductive load.

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

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

Inductive load

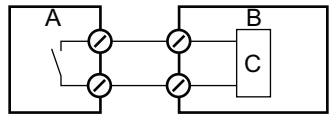
Small inductive loads (max 0.1 A) as for example the coil of a power relay can be switched directly. To avoid noise voltage in the AMI Transmitter it is mandatory to connect a snubber circuit in parallel to the load.



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

Resistive load

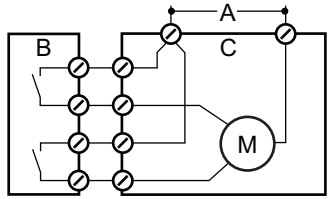
Resistive loads (max. 1 A) and control signals for PLC, impulse pumps and so on can be connected without further measures



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

Actuators

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



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

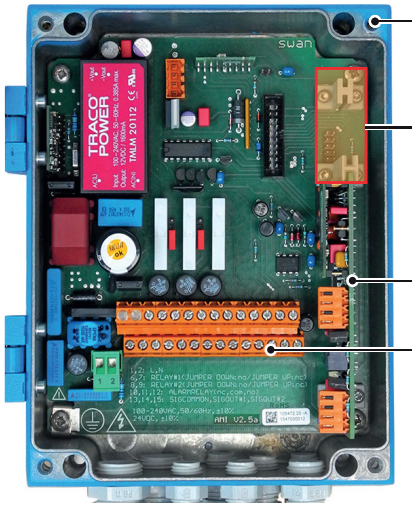
3.7. Signal Outputs

3.7.1 Signal Output 1 and 2 (current outputs)

Note: *Max. burden 510 Ω*
If signals are sent to two different receivers, use signal isolator (loop isolator).

Signal output 1: Terminals 14 (+) and 13 (-)
Signal output 2: Terminals 15 (+) and 13 (-)
For programming see Program List and Explanations, p. 70, Menu Installation

3.8. Interface Options



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

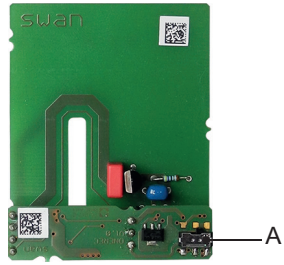
The slot for interfaces can be used to expand the functionality of the AMI instrument with either:

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

3.8.1 Signal Output 3

Terminals 38 (+) and 37 (-).
Requires the additional board for the third signal output 0/4–20 mA. The third signal output can be operated as a current source or as a current sink (switchable via switch [A]). For detailed information see the corresponding installation instruction.

Note: *Max. burden 510 Ω.*



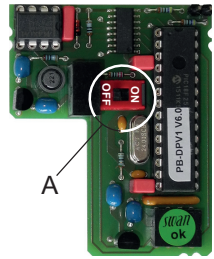
Third signal output 0/4 - 20 mA PCB

A Operating mode selector switch

3.8.2 Profibus, Modbus Interface

Terminal 37 PB, Terminal 38 PA
To connect several instruments by means of a network or to configure a PROFIBUS DP connection, consult the PROFIBUS manual. Use appropriate network cable.

Note: *The switch must be ON, if only one instrument is installed, or on the last instrument in the bus.*

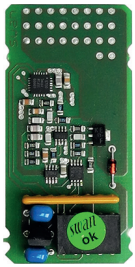


Profibus, Modbus Interface PCB (RS 485)

A *On - OFF switch*

3.8.3 HART Interface

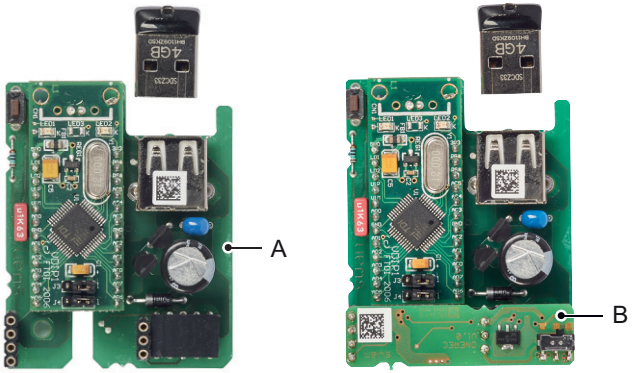
Terminals 38 (+) and 37 (-).
The HART interface PCB allows for communication via the HART protocol. For detailed information, consult the HART manual.



HART Interface PCB

3.8.4 USB Interface

The USB Interface is used to store Logger data and for Firmware upload. For detailed information see the corresponding installation instruction.
The optional third signal output 0/4 – 20 mA PCB [B] can be plugged onto the USB interface and used in parallel.



USB Interface

A USB interface PCB
B Third signal output 0/4 - 20 mA PCB

4. Instrument Setup

After the analyzer is installed according to the previous instructions, connect the power cord. Do not switch on power, yet!

4.1. Establish sample flow

1. Open flow regulating valve.
2. Wait until the flow cell has been completely filled.
3. Switch on power.
4. Adjust the sample flow to 5 - 10 l/h.
5. Let the instrument run-in for 1 h.
   ⇒ *This recommendation is valid for rinsed cation exchanger resin (nuclear grade) delivered by Swan.*
   Not rinsed cation exchanger resin from other suppliers may require a run-in period of several hours to several days.

4.2. Programming

Sensor parameters

Program all sensor parameters in Menu 5.1.2.1, <Installation>/<Sensors>/<Sensor parameters>:

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

Enter the:
- Cell constant [cm^{-1}]
- Temperature correction [°C]
- Cable length

  Note: *Cable length [m] Set the cable length to 0.0 m if the sensors are installed in the flow cell on the AMI monitor.*
- Temperature compensation: The default setting for sensor 1 (specific conductivity) is ammonia.

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. 74 and 4.2 Relay Contacts, p. 72.

Limits Alarms

Program all parameters for instrument operation (limits, alarms). See program list and explanations 4.2 Relay Contacts, p. 72.

Temp. Compensation

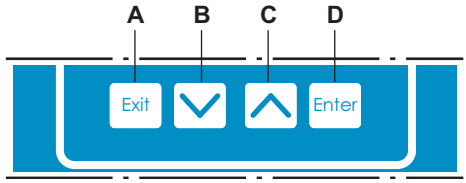
Menu 5.1.3
Choose between:
- none
- Coefficient
- Neutral salts
- High-purity water
- Strong acids
- Strong bases
- Ammonia, Ethanolamine
- Morpholine

Quality Assurance

Menu 5.1.4
Set the Level according to your requirements, details see Quality Assurance of the Instrument, p. 53.

5. Operation

5.1. Keys



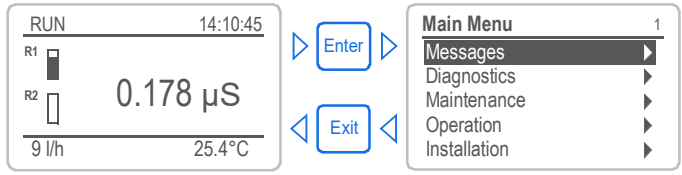
A to exit a menu or command (rejecting any changes)
to move back to the previous menu level

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

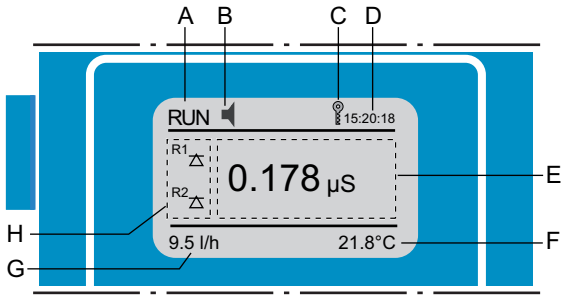
C to move UP in a menu list and to increase digits

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 Keys locked, transmitter control via Profibus

D Time

E Process values

F Sample temperature

G Sample flow

H 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

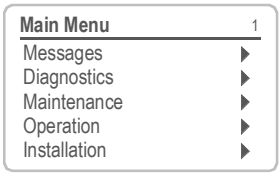
motor valve closed

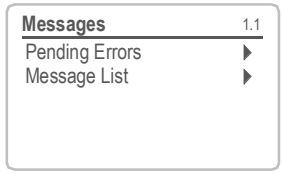
motor valve: open, dark bar indicates approx. position

timer

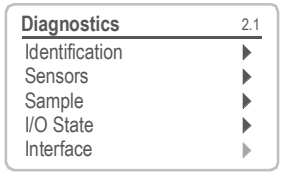
timer: timing active (hand rotating)

5.3. Software Structure

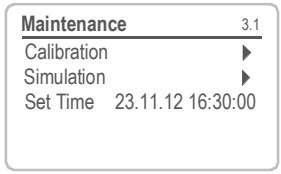




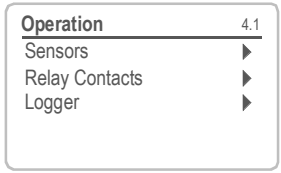
Menu **Messages 1**
Reveals pending errors as well as an event history (time and state of events that have occurred at an earlier point of time).
It contains user relevant data.



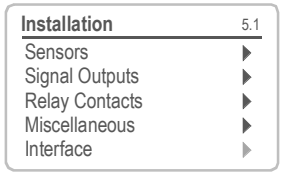
Menu **Diagnostics 2**
Provides user relevant instrument and sample data.



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.

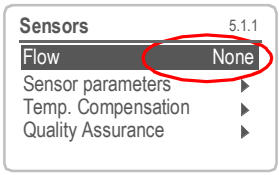


Menu **Installation 5**
For initial instrument set up by SWAN authorized person, to set all instrument parameters. Can be protected by means of password.

5.4. Changing Parameters and values

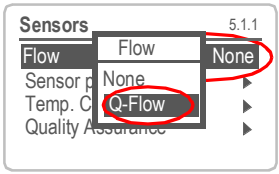
Changing parameters

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



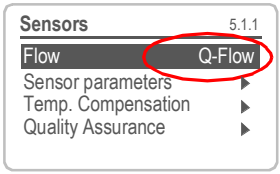
1 Select the parameter you want to change.

2 Press <Enter>.



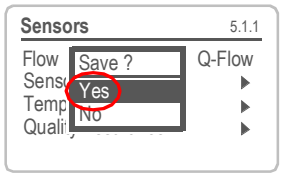
3 Press [▲] or [▼] key to highlight the required parameter.

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



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

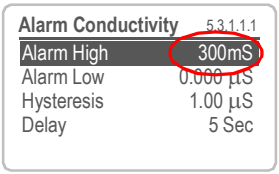
5 Press <Exit>.



⇒*Yes is highlighted.*

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

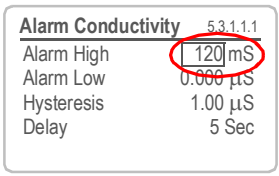
Changing values



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

Preventive maintenance frequency depends on water quality, on the application, and on national regulations.

Monthly	◆ Check sample flow. ◆ Check cation exchanger resin. The resin color changes to red/orange if exhausted.
If required	◆ Clean conductivity sensors ◆ Replace filter ◆ Replace deaeration tubes

Reagent consumption

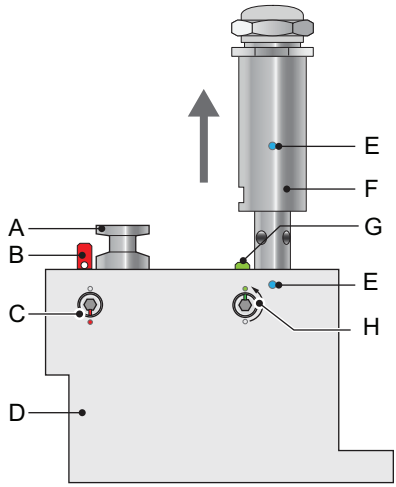
A 1 l resin bottle, delivered by Swan lasts at 1 ppm alcalizing reagent (pH 9.4) for:

- 4 months at sample flow 10 l/h
- 5 months at sample flow 5 l/h

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 *Blind plug*
B *Locking pin locked*
C *Locking screw closed*
D *Flow cell*
E *Alignment marks*
F *Conductivity sensor*
G *Locking pin unlocked*
H *Locking screw open*

6.3.1 Remove the Sensor form the Flow Cell

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

1. Press the locking pin [G] down.
2. Turn the locking screw [H] with a 5 mm allen key counterclockwise 180°.
   ⇒*The locking pin remains down.*
3. 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.

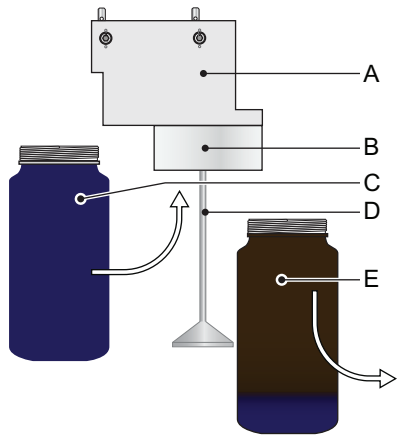
6.3.2 Install the Sensor into the Flow Cell

1. Make sure that the locking mechanism is in unlocked position (locking pin in position [G] and security screw in position [H]).
2. Put the sensor into the flow cell with the alignment marks [E] in line.
3. Turn the locking screw with a 5 mm allen key clockwise 180°.
   ⇒*The locking pin moves up in lock position.*

6.4. Changing the Ion Exchanger

The resin of the ion exchanger changes its color from dark violet to brown if the capacity is exhausted. The resin should be changed before no violet resin is left or the cation conductivity rises above the normal value. At a concentration of 1 ppm alcalizing reagent, one resin filling will last for roughly 4 months if sample flow is 10 l/h, or 5 months if sample flow is 5 l/h.

without pre-rinse option



A *Flow cell*
B *Bottle holder*
C *New cation exchanger bottle*
D *Inlet filter holder*
E *Exhausted cation exchanger bottle*

1 Stop sample flow.

2 Slightly squeeze the exhausted cation exchanger bottle [E] before removing.
⇒ *Thus no water will spill out of the flow cell when loosening the bottle.*

3 Unscrew and carefully remove the exhausted cation exchanger bottle [E].

4 Fill high purity water into the new cation exchanger bottle [C], until the water level in the bottle reaches the beginning of the thread.

5 Carefully, without spilling water, push the cation exchanger bottle over the inlet filter holder [D] into the bottle holder [B].

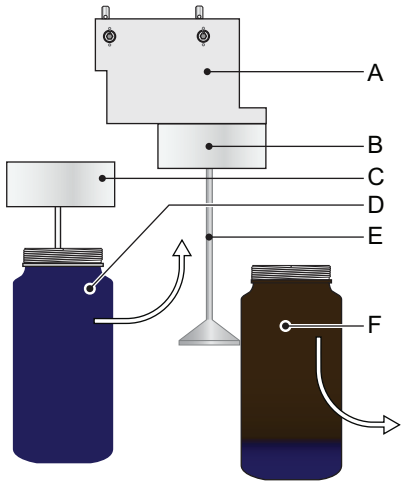
6 Screw the cation exchanger bottle into the bottle holder.
⚠ *Do not tighten the bottle too firmly, this could damage the gasket.*

7 Open and adjust the sample flow.

8 Pre-rinse the new cation exchanger resin until the display shows stable measuring values.

with pre-rinse option

Step 1 to 3 same procedure as on **“without pre-rinse option”**:



A *Flow cell*
B *Bottle holder*
C *Pre-rinse bottle holder*
D *Pre-rinsed cation exchanger bottle*
E *Inlet filter holder*
F *Exhausted cation exchanger bottle*

1 Unscrew and carefully remove the pre-rinsed cation exchanger bottle [D] from the pre-rinse holder [C].

2 Carefully, without spilling water, push the cation exchanger bottle [D] over the inlet filter holder [E] into the bottle holder [B].

3 Screw the cation exchanger bottle into the bottle holder.

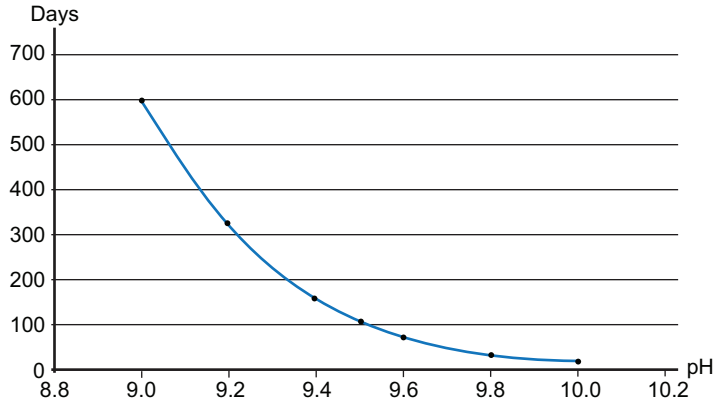
⚠ *Do not tighten the bottle too firmly, this could damage the gasket.*

4 Install a new bottle with fresh, unused resin into the pre-rinse bottle holder [C].

⇒ *The new cation exchanger resin will be pre-rinsed and ready for use if the next exchange is necessary.*

Operation time 1 liter Swan resin

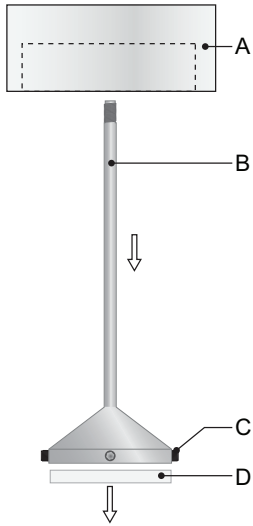
This graphic shows the average exhaust time (flow 6 l/h) and must be verified by the user.



Cation Conductivity.
Operational days for 1 l of cation exchange resin with an exchange capacity of 1.8 eq/l.
Flow rate 6 l/h alkalization with ammonia. (safety margin of 15% subtracted).

6.5. Changing the inlet filter

The inlet filter of the cation exchanger prevents the resin from entering the flow cell. It is located in the inlet filter holder [B].



A *Bottle holder*
B *Inlet filter holder*
C *Allen screws*
D *Inlet filter*

1 Stop sample flow.

2 Slightly squeeze the cation exchanger bottle [E] before removing.
⇒ *Thus no water will spill out of the flow cell when loosening the bottle.*

3 Unscrew and carefully remove the cation exchanger bottle.

4 For better access to the allen screws [C] unscrew and remove the filter holder [B] from the bottle holder [A].

5 Loosen the 4 allen screws with a 1.5 mm allen key.

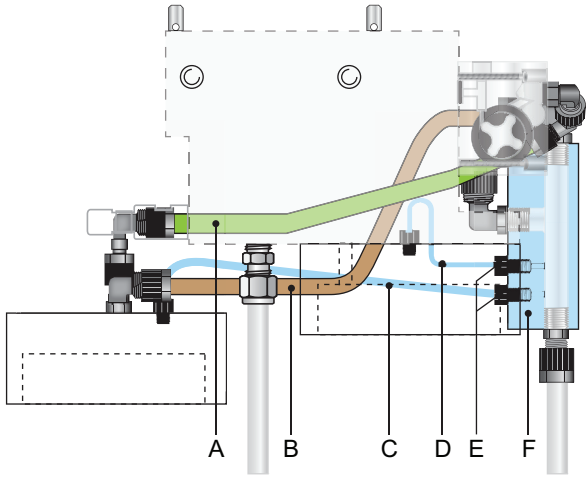
6 Carefully remove the inlet filter [D] with a screw driver no.0 from the inlet filter holder.

7 Insert a new inlet filter.

8 Tighten the 4 allen screws slightly.

9 Screw the cation exchanger bottle into the bottle holder.
⚠ *Do not tighten the bottle too firmly, this could damage the gasket.*

6.6. Tube Connections



A *Pre-rinse inlet*
B *Per-rinse outlet*
C *Venting tube pre-rinse bottle*
D *Venting tube Cation exchanger bottle*
E *Sample connector*

6.7. Replace the Deaeration Tubes

Depending on your application, it might be necessary to change the deaeration tube, e.g. when contaminated with iron.

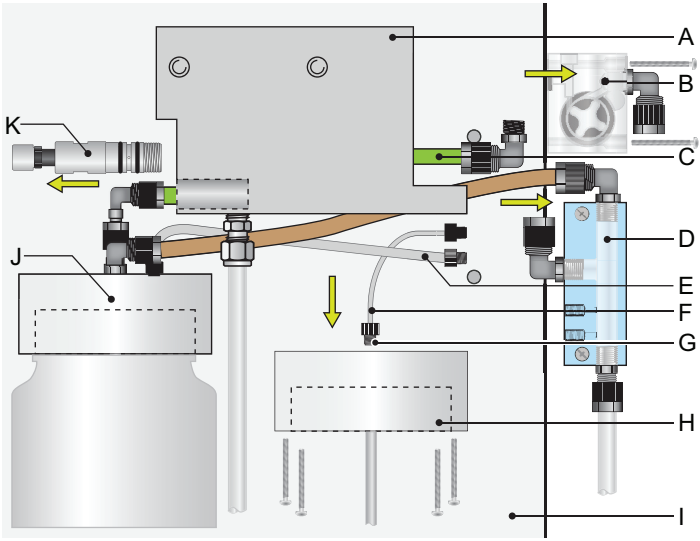
Note: *There are two different tubes:*

- The deaeration tube [F] of the cation exchanger bottle has an inner diameter of 1 mm.
- The deaeration tube [E] of the pre-rinse bottle, has an inner diameter of 2 mm.

Preparation

1 Close the main tap to stop the sample flow.

2 Remove cation exchanger bottle from the bottle holder [H].



A *Flow cell*
B *Flowmeter*
C *Pre-rinse inlet*
D *Sample collector*
E *Deaeration tube pre-rinse bottle*
F *Deaeration tube exchanger bottle*
G *Tube fitting*
H *Bottle holder cation exchanger bottle*
I *Panel*
J *Bottle holder pre-rinse bottle*
K *Flow regulating valve*

6.7.1 Exchange deaeration tube of cation exchanger bottle

1. Remove the inlet tube [C] to the pre-rinsed cation exchanger bottle form the flowmeter [B].
2. Remove the flowmeter [B] from the flow cell [A].
3. Remove the sample collector [D] form the panel [I].
4. Unscrew and remove the tube fittings of the deaeration tubes [E] and [F] from the sample connector.
5. Unscrew and remove the bottle holder [H] from the flow cell [A].
6. Unscrew and remove the tube fitting [G] from the bottle holder [H].
7. Replace the 1 mm deaeration tube [F].
8. Screw the tube fitting into the bottle holder and tighten it.
9. Screw the bottle holder to the flow cell.
10. Screw the cation exchanger bottle into the bottle holder.

    ⚠ *Do not tighten the bottle too firmly, this could damage the gasket.*
11. Before installing the sample collector [D] and the flowmeter [B] replace the deaeration tube [E], see following chapter.

6.7.2 Exchange deaeration tube of pre-rinse bottle

1. Unscrew and remove the Flow regulating valve [K], with a 14 mm open-end wrench from the flow cell.
2. Unscrew and remove the tube Fitting from the bottle holder [J].
3. Replace the 2 mm deaeration tube [E].
4. Screw the flow regulating valve into the flow cell and tighten it well.

Assemble

1. Screw the sample connector onto the panel.
2. Screw the flow meter [B] onto the flow cell [A].
3. Connect the inlet tube [C] to the pre-rinsed cation exchanger bottle with the elbow union of the flowmeter [B].

6.8. 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

Further a manual, menu driven inspection procedure can be carried out using a certified reference instrument. Running at the same sampling point as an inspection equipment, the AMI Inspector Conductivity verifies the measuring results. After enabling the quality assurance procedure by defining the quality assurance level, the instrument reminds the user periodically to run the procedure and 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 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 for the AMI Powercon

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 have 25°C +/- 5°C.

Procedure The standard workflow contains following procedures:

1 Activate SWAN Quality assurance procedure, p. 55
2 Pre-test, p. 56
3 Connecting sample lines, p. 56
4 Carry out comparison measurement, p. 58
5 Activate SWAN Quality assurance procedure, p. 55Completion of the measurement, p. 59

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

6.8.1 Activate SWAN Quality assurance procedure

Enable quality assurance procedure at each instrument 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.*

6.8.2 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: Monitor 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 alarms (as for example flow alarms). If alarms occur frequently remove cause before starting the procedure.

6.8.3 Connecting sample lines

See corresponding chapter in the manual of the process monitor which shall be checked with a reference instrument.
The choice of sampling depends strongly on local conditions on site.
Possible sampling:

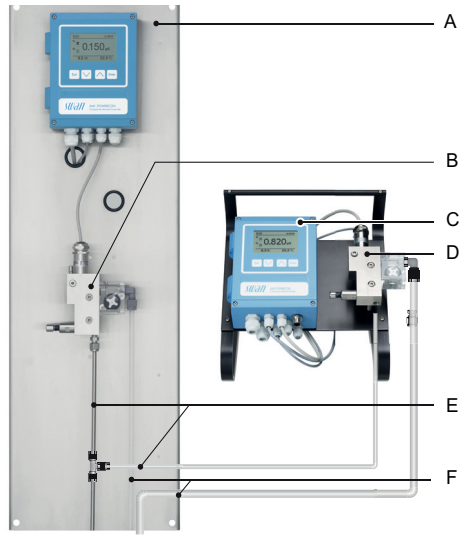
- via sample point,
- via T-fitting or
- via piggyback/downstream

Note:

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

Example

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



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

1 Stop sample flow to the monitor 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 Monitor AMI Powercon [A] with the sample inlet of the reference instrument AMI INSPECTOR Conductivity. Use the supplied tube, made of FEP.

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

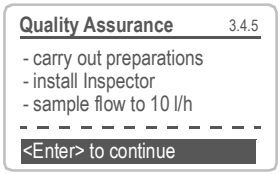
4 Switch on AMI INSPECTOR Conductivity. Open the flow regulating valve and regulate the sample flow to 5-10 l/h. The actual flow is shown on the transmitter.

6.8.4 Carry out comparison measurement

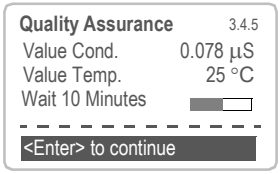
The comparison measurement is menu driven. Start by selecting Quality assurance in menu 3.4 of the monitor AMI Powercon.

1 Navigate to menu Maintenance / Calibration. Press [Enter].

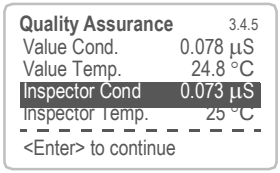
2 Follow the dialog on the Display.



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

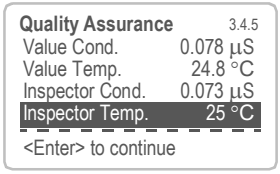


4 Wait 10 minutes whilst measurement is running.
Press [Enter] to continue.



5 Read the µS value of the reference instrument and enter under “Inspector.” by using the [▲] or [▼] keys.

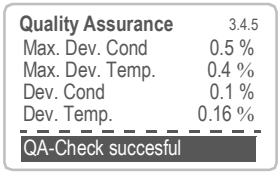
6 Press [Enter] to confirm.



7 Read temperature value of the reference instrument and enter under “Inspector Temp.” by using the [▲] or [▼] keys.

8 Press [Enter] to confirm.

9 Press [Enter] to continue.
⇒ *The results are saved in QA-History regardless if successful or not*



If QA-Check is not successful it is recommended to clean the sensor, see Maintenance of the Sensor, p. 46. If QA-Check fails again contact your local SWAN distributor for support.

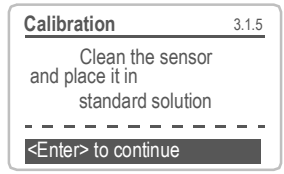
6.8.5 Completion of the measurement

1. Stop the 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 again.
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 Monitor AMI Powercon to the sample outlet funnel again.
4. Start sample flow again and regulate sample flow.
5. Shut down AMI INSPECTOR Conductivity.

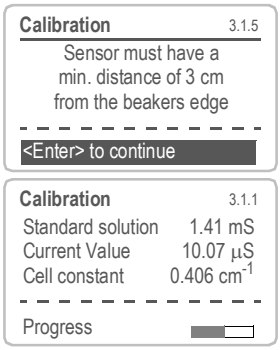
6.9. Calibration

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 the 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, p. 46.
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 Powercon 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 measuring value. Hold after calibration is indicated by Hold in the display.*

6.10. Longer Stop of Operation

1 Stop sample flow.

2 Slightly squeeze the ion exchanger bottle.
⇒ *Thus no water will spill out of the flow cell when loosening the bottle.*

3 Unscrew and carefully remove the ion exchanger bottle with the exhausted resin.

4 Close the ion exchanger bottle with the screw cover and store it in a frost-protected room.

5 Screw on an empty bottle.

6 Shut off power of the instrument.

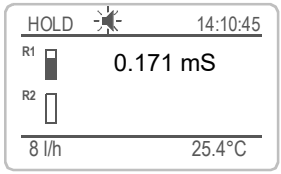
7. Troubleshooting

7.1. Error List

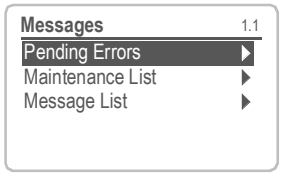
Error
Non-fatal Error. Indicates an alarm if a programmed value is exceeded.
Such Errors are marked **E0xx** (bold and black).

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:

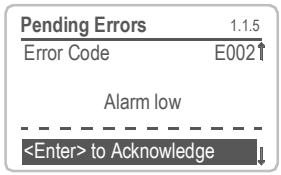
- Errors which disappear if correct measuring conditions are re-covered (i.e. Sample Flow low).
  Such Errors are marked **E0xx** (bold and orange)
- Errors which indicate a hardware failure of the instrument.
  Such Errors are marked **E0xx** (bold and red)



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	Cond. Alarm high	– check process – check programmed value, see 5.3.1.1, p. 78
E002	Cond. Alarm low	– check process – check programmed value, see 5.3.1.1, p. 78
E007	Sample Temp. high	– check process – check programmed value, see 5.3.1.3, p. 79
E008	Sample Temp. low	– check process – check programmed value, see 5.3.1.3, p. 79
E009	Sample Flow high	– check sample inlet pressure – check programmed value, see 5.3.1.2.2, p. 79
E010	Sample Flow low	– check sample inlet pressure – Check flow regulating valve – check programmed value, see 5.3.1.2.35, p. 79
E011	Temp. shorted	– Check wiring of temperature sensor – Check temperature sensor
E012	Temp. disconnected	– Check wiring of temperature sensor – Check temperature sensor
E013	Case Temp. high	– check case/environment temperature – check programmed value, see 5.3.1.4, p. 79
E014	Case Temp. low	– check case/environment temperature – check programmed value, see 5.3.1.5, p. 79
E017	Control time-out	– Check control device or programming in Installation, Relay contact, Relay 1/2 5.3.2/3, p. 80
E018	Quality Assurance	– Perform QA Procedure using reference instrument, e.g. AMI Inspector

Error	Description	Corrective action
E024	Input active	– See If Fault Yes is programmed in Menu see 5.3.4, p. 82
E026	IC LM75	– call service
E028	Signal output open	– check wiring on signal outputs 1 and 2
E030	EEProm Frontend	– call service
E031	Cal. Recout	– call service
E032	Wrong Frontend	– call service
E033	Power-on	– none, normal status
E034	Power-down	– none, normal status

7.2. Replacing Fuses

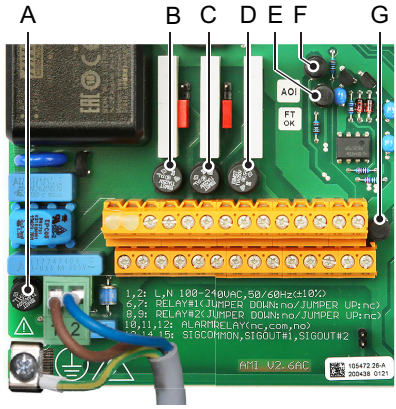
WARNING

External Voltage.

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

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

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



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

8. Program Overview

For explanations about each parameter of the menus see Program List and Explanations, p. 70.

- 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 **2.1***	Designation	AMI Powercon	
	Version	V6.20-07/16	
	Factory Test 2.1.3*	*Instrument*	2.1.3.1*
		Motherboard	
		Front End	
	Operating Time 2.1.4*	*Years / Days / Hours / Minutes / Seconds*	2.1.4.1*

Sensors 2.2*	**Cond. Sensor** 2.2.1*	*Current value*		* Menu numbers
		Raw value		
		Cell constant		
		Cal. History 2.2.1.5*	*Number, Date, Time*	2.2.1.5.1*
	Miscellaneous 2.2.2*	Case Temp.	*2.2.2.1**	
Sample 2.3*	*Sample ID*	2.3.1*		
	Temperature (Pt1000)			
	Sample Flow			
	Raw value			
I/O State 2.4*	*Alarm Relay*	2.4.1*		
	Relay 1/2	2.4.2*		
	Input			
	Signal Output 1/2			
Interface 2.5*	*Protocol*	2.5.1*		(only with RS485 interface)
	Baud rate			

8.3. Maintenance (Main Menu 3)

Calibration 3.1*	*Follow instructions*	3.1.5*
Simulation 3.2*	*Alarm Relay*	3.3.1*
	Relay 1	3.3.2*
	Relay 2	3.3.3*
	Signal Output 1	3.3.4*
	Signal Output 2	3.3.5*
Set Time 3.4*	*(Date), (Time)*	

8.4. Operation (Main Menu 4)

Sensors	*Filter Time Const.*	4.1.1*		*Menu numbers
4.10*	*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*	4.2.1.1.25*
			Hysteresis	4.2.1.1.35*
			Delay	4.2.1.1.45*
	Relay 1/2	*Setpoint*	4.2.x.100*	
	4.2.2*/4.2.3*	*Hysteresis*	4.2.x.200*	
		Delay	4.2.x.30*	
	Input	*Active*	4.2.4.1*	
	4.2.4*	*Signal Outputs*	4.2.4.2*	
		Output / Control	4.2.4.3*	
		Fault	4.2.4.4*	
		Delay	4.2.4.5*	
Logger	*Log Interval*	4.3.1*		
4.3*	*Clear Logger*	4.3.2*		

8.5. Installation (Main Menu 5)

Sensors	**Flow**	*None*	
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

	Quality Assurance	Level	*0: Off*	* Menu numbers
	5.1.4*	5.1.4.1*	*1: Trend*	
			2: Standard	
			3: Crucial	
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 Conductivity**	*Alarm High*	5.3.1.1.1.1*
5.3*	5.3.1*	5.3.1.1*	*Alarm Low*	5.3.1.1.1.25*
			Hysteresis *	5.3.1.1.1.35
			Delay	5.3.1.1.1.45*
		Sample Flow	*Flow Alarm*	5.3.1.2.1*
		5.3.1.2*	*Alarm High*	5.3.1.2.2
			Alarm Low	5.3.1.2.35
		Sample Temp.	*Alarm High*	5.3.1.3.1*
		5.3.1.3*	*Alarm Low*	5.3.1.3.25*
		Case Temp.high	5.3.1.4*	
		Case Temp.low	5.3.1.5*	
	Relay 1/2	*Function*	5.3.2.1/5.3.3.1*	
	5.3.2/5.3.3*	*Parameter*	5.3.2.20/5.3.3.20*	
		Setpoint	5.3.2.300/5.3.3.301*	
		Hysteresis	5.3.2.400/5.3.3.401*	
		Delay	5.3.2.50/5.3.3.50*	
	Input	*Active*	5.3.4.1*	
	5.3.4*	*Signal Outputs*	5.3.4.2*	
		Output/Control	5.3.4.3*	
		Fault	5.3.4.4*	
		Delay	5.3.4.5*	

Miscellaneous	*Language*	5.4.1*		
5.4*	*Set defaults*	5.4.2*		
	Load Firmware	5.4.3*		
	Password	*Messages*	5.4.4.1*	
	5.4.4*	*Maintenance*	5.4.4.2*	
		Operation	5.4.4.3*	
		Installation	5.4.4.4*	
	Sample ID	5.4.5*		
	Line Break Detection	5.4.6		
Interface	*Protocol*	5.5.1*		(only with RS485
5.5*	*Device Address*	5.5.21*		interface)
	Baud Rate	5.5.31*		
	Parity	5.5.41*		

9. Program List and Explanations

1 Messages

1.1 Pending Errors

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

1.2 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. V6.20-07/16)

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

2.2.1.4 QA History: Review the QA values (Number, Date-Time, Deviation Conductivity, Deviation Temperature) of the last quality assurance procedures. Only for diagnostic purpose. Max. 65 data records are memorized.

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 *Sample ID*: Shows the identification assigned to a sample. This identification is defined by the user to identify the location of the sample.
Temperature: Shows the current sample temperature in °C.
(Pt 1000): Shows the current temperature in Ohm.
Sample Flow: Shows the current sample flow in l/h and the 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 1 and 2:	Actual current in mA
Signal Output 3:	Actual current in mA (if option is installed)

2.5 Interface

Only available if optional interface is installed.
Review programmed communication settings.

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 1 and 2

with the [▲] or [▼] key.
Press the <Enter> key.
Change the value or state of the selected item with the [▲] or [▼] key.

Press the <Enter> key.
⇒*The value is simulated by the relay/signal output.*

Alarm Relay:	Active or inactive.
Relay 1 and 2:	Active or inactive.
Signal Output 1 and 2:	Actual current in mA
Signal Output 3:	Actual current in mA (if option is installed)

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.

3.3 Quality Assurance

3.4.5 Follow the commands on the screen. Save the value with the <enter> key.

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. 33

4.3 Logger

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

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

Interval	1 s	5 s	1 min	5 min	10 min	30 min	1 h
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 If option USB interface is installed.
Eject USB Stick: With this function all logger data are copied to the USB stick before the USB stick is deactivated.
Only visible it the optional USB interface is installed.

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 SWAN flow cell.

5.1.2 Sensor parameters

5.1.2.1 *Cell Constant*: Enter the cell constant printed on the sensor label.
Range: 0.005000 cm^{-1} – 11.00 cm^{-1}

5.1.2.2 *Temp. Corr*: Enter the temperature correction printed on the sensor label.
Range: -2 °C to 2 °C

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.
Range: 0.0 m to 30.0 m

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:

5.1.4.1 *Level.*: Choose the quality level according to your requirements.

- 0: Off; Quality Assurance is not active.
- 1: Trend (details see Quality assurance level, p. 54)
- 2: Standard (details see Quality assurance level, p. 54)
- 3: Crucial (details see Quality assurance level, p. 54)
- 4: User; edit user specific limits in menu 5.1.4.2 - 5.1.4.4

5.2 Signal Outputs

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

5.2.1 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:

- Conductivity
- Temperature
- Sample flow
- Cond. uc

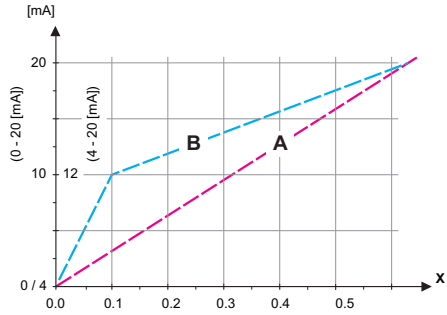
5.2.1.2 *Current Loop:* Select the current range of the signal output. Make sure the connected device works with the same current range. Available ranges: 0–20 mA or 4–20 mA

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. 75
- Control upwards or control downwards for controllers.
  See As control output, p. 76

As process values

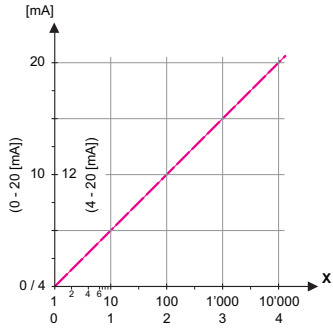
The process value can be represented in 3 ways: linear, bilinear or logarithmic. See graphs below.



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

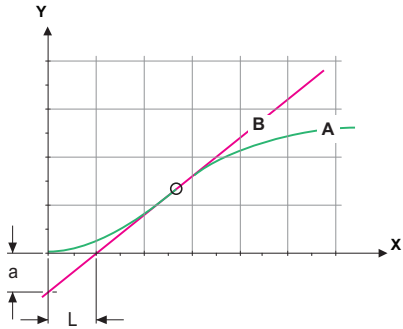
Parameter Cond. uc:
5.2.1.40.13 Range low: 0 µS–300 mS
5.2.1.40.23 Range high: 0 µS–300 mS

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

5.3.2/3 **Relay 1 and 2:** The contacts can be set as normally open or normally closed with a jumper. See Relay 1 and 2, p. 34. The function of relay contacts 1 or 2 is defined by the user.

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

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

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. 72

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 on 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. 77
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. 77
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. 77

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. Message E024 is stored in the message list.
Yes:	Message E024 is issued and stored in the message list. The Alarm relay closes when input is active.

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

5.4 Miscellaneous

5.4.1 *Language:* Set the desired language.
Available settings: German / English / French / Spanish / Italian

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

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

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

5.4.4 **Password:** Select a password different from 0000 to prevent unauthorized access to the menus “Messages”, “Maintenance”, “Operation” and “Installation”.
Each menu may be protected by a *different* password.
If you forgot the passwords, contact the closest SWAN representative.

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

5.4.6 *Line Break Detection:* Define if message E028 should be issued in case of a line break on signal output 1 or 2.
Choose between <Yes> or <No>.

5.5 Interface

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

5.5.1 *Protocol:* **Profibus**

5.5.20	Device address:	Range: 0–126
5.5.30	ID-Nr.:	Range: Analyzer; Manufacturer; Multivariable
5.5.40	Local operation:	Range: Enabled, Disabled

5.5.1 *Protocol:* **Modbus RTU**

5.5.21	Device address:	Range: 0–126
5.5.31	Baud Rate:	Range: 1 200–115 200 Baud
5.5.41	Parity:	Range: none, even, odd

5.5.1 *Protocol:* **USB-Stick:**

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

5.5.1 *Protocol:* **HART**

Device address: Range: 0–63

10. Material Safety Data sheets

10.1. Cation Exchanger Resin SWAN

Product name:	Cation Exchange Resin
Catalogue number:	A-82.841.030 and A-82.841.031

Download MSDS

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

11. Default Values

Operation:

Sensors:	Filter Time Const.:	10 s
	Hold after Cal.:	300 s
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	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 1	Parameter:	Conductivity
	Current loop:	4 –20 mA
	Function:	linear
	Scaling: Range low:	0.000 µS
	Scaling: Range high:	1 mS
Signal Output 2	Parameter:	Temperature
	Current loop:	4 –20 mA
	Function:	linear
	Scaling: Range low:	0 °C
	Scaling: Range high:	50 °C
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 1/2
Function: ..... limit upper
Parameter: ..... Conductivity
Setpoint: ..... 30 mS
Hysteresis: ..... 10 µS
Delay: ..... 30 s

If Function = Control upw. or dnw:

Parameter: ..... Cond 1(sc)
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:	- - - - - - - -
	Line break detection	no

12. Index

13. Notes

swan
ANALYTICAL INSTRUMENTS

A-96.250.341 / 170621

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 Powercon