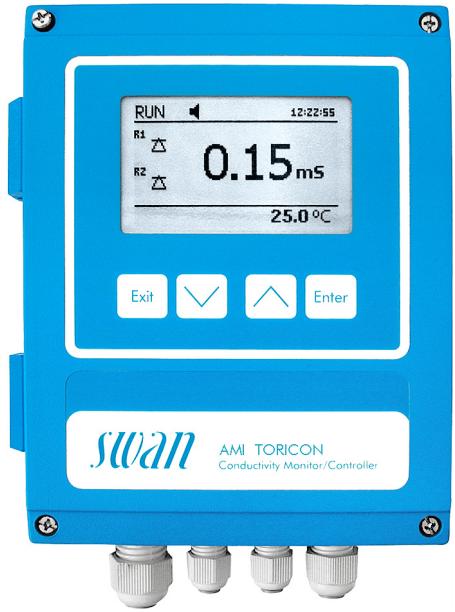
ANALYTICAL INSTRUMENTS

A-96.250.471 / 010625

AMI Toricon

Operator's Manual



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02	June 2017	Update to FW Release 6.20, Mainboard V2.5
03	July 2020	Mainboard V2.6
04	June 2025	Changed product name

This manual applies to firmware V6.22 and higher.
The information contained in this document is subject to change without notice.

Table of Contents

Operator's Manual

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

1. Safety Instructions

General

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

Target audience

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

OM Location

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

Qualification, Training

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

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

1.1. Warning Notices

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

DANGER

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

- Follow the prevention instructions carefully.

WARNING

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

- Follow the prevention instructions carefully.

CAUTION

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

- Follow the prevention instructions carefully.

Mandatory Signs

The mandatory signs in this manual have the following meaning:

Safety goggles

Safety gloves

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


Electrical shock hazard


Corrosive


Harmful to health


Flammable


Warning general


Attention general

1.2. General Safety Regulations

Legal Requirements

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

Spare Parts and Disposables

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

Modifications

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

WARNING

Electrical Shock Hazard

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

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

WARNING

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

WARNING

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

2. Product Description

2.1. Description of the System

This instrument is applicable for the measurement of the specific conductivity, concentration, salinity and Total Dissolved Solids (TDS).

Application range

The conductivity is a parameter for the total quantity of ions present in the solution.

The AMI Toricon transmitter together with the sensor Toricon1000 is used for applications in:

- chemical
- food & dairy
- refinery
- pulp & paper
- metal finishing
- and waste water industries.

Measuring Principle

Inductive conductivity measurements are done as follows:
The transmitter gives a constant drive to one of the toroidal coils which induces a current in the solution. This induced solution current produces a current in the second toroid. The signal measured by the second toroid is proportional to the solution conductivity.

Inductive conductivity measurements are performed without using any electrodes in contact with the solution.

Concentration Measurements

- NaCl: max. 17.9–21% 0–50 °C
- HCl: max. 10–12% 0–50 °C
- NaOH: max. 6.5–9% 0–50 °C
- H_2SO_4: max. 16–22% 0–50 °C
- HNO_3: max. 17–20.8% 0–50 °C
- Salinity (as NaCl) in %
- TDS (Total Dissolved Solids) in %

Signal Outputs

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

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

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

Relays

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

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

Communication Interface (optional)

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

Measuring Range

Conductivtiy range	Resolution
0.00 to 9.99 mS/cm	0.01 mS/cm
10.0 to 99.9 mS/cm	0.1 mS/cm
100 to 2000 mS/cm	1 mS/cm
Measurement error	< 1%

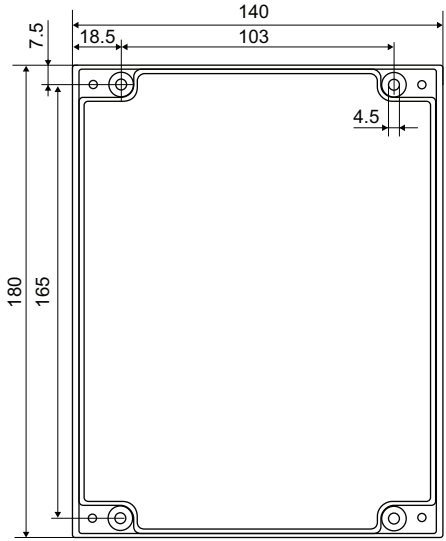
Safety Features

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

2.2. Single components

2.2.1 AMI Toricon Transmitter

Power Supply	AC variant:	100–240 VAC (± 10%) 50/60 Hz (± 5%)
	DC variant	10–36 VDC
	Power consumption:	max. 35 VA
Transmitter Specifications	Housing:	aluminum, with a protection degree of IP 66 / NEMA 4X
	Ambient temperature:	−10 to +50 °C
	Storage and transport:	−30 to +85 °C
	Humidity:	10–90% rel., non condensing
	Display:	backlit LCD, 75 x 45 mm
	Electrical connectors:	screw clamps
Dimensions	Width:	140 mm
	Height:	180 mm
	Depth:	70 mm
	Weight:	1.5 kg

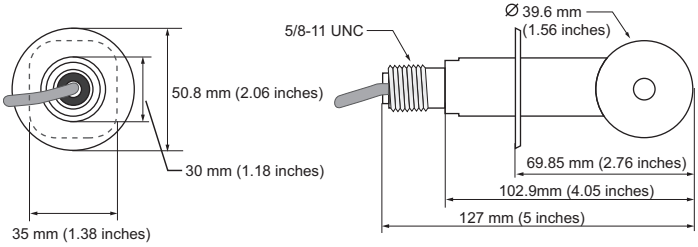


2.2.2 Swansensor Toricon1000

Technical Data

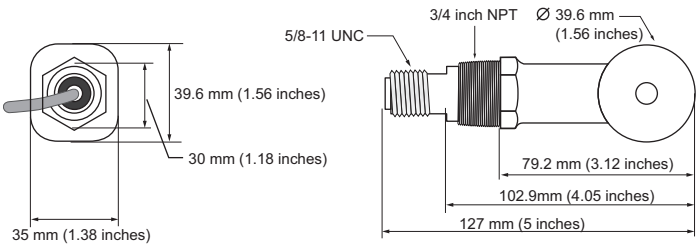
Measuring range	0.2 to 2.000 mS/cm
Temperature sensor	Pt1000
Max. flow rate	3 m/s
Electrical connections	Directly attached cable with end sleeves

Sanitary Style (CIP) Sensor



Materials:	PFA Teflon® (Perfluoroalkoxy Teflon®) for all wetted parts.
Process connections:	Sanitary mounting, diameter 2”, with stainless steel cap
Temperature and pressure limit:	150 °C at 13.8 bar

Convertible Style Sensor



Materials:	Polypropylene (PP) for all wetted parts.
Process connections:	3/4” NPT
Temperature and pressure limit:	100 °C at 6.9 bar

3. Installation

3.1. Installation Checklist

On-site requirements	AC variant: 100–240 VAC (± 10%), 50/60 Hz (± 5%) DC variant: 10–36 VDC Power consumption: 35 VA maximum. Protective earth connection required.
Installation	Mounting of Transmitter, p. 14
Electrical wiring	Connect all external devices like limit switches, current loops and pumps. Connect power cord.
Sensor	Connect the Conductivity Sensor, p. 15.
Power-up	Switch on power.
Instrument setup	Program all parameters for sensor and external devices (interface, recorders, etc.) and for instrument operation (limits, alarms).
Calibration	Calibrate the sensor if needed. See Calibration, p. 32 for more details.

3.2. Mounting of Transmitter

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

- The transmitter must only be installed by trained personnel.
- Mount the transmitter in vertical position.
- For ease of operation mount it so that the display is at eye level.
- For the installation use 4 Screws 4x30 mm

Mounting requirements

The instrument is only intended for indoor installation.
For dimensions see 11.

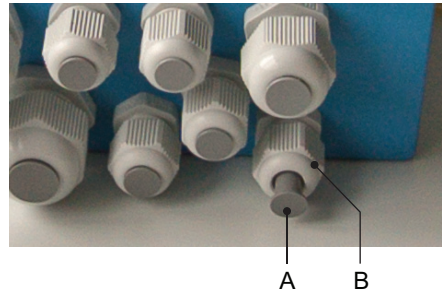
3.3. Connect the Conductivity Sensor

Connect the Sensor Cable

To connect the conductivity sensor cable to the AMI Transmitter, proceed as follows:

WARNING

Electrical shock hazard!
Before opening the AMI Transmitter switch power off.



1. Choose a suitable cable gland, see chapter Electrical Connections, p. 16
2. Remove the plug [A] from the cable gland [B]
3. Open the AMI transmitter housing.
4. Feed the sensor cable through the cable gland [B] into the transmitter housing.
5. Connect the cable to the terminals according to the connecting diagram see Connection Diagram, p. 18.
6. Close the AMI transmitter housing.
7. Switch on power.

3.4. Electrical Connections

WARNING

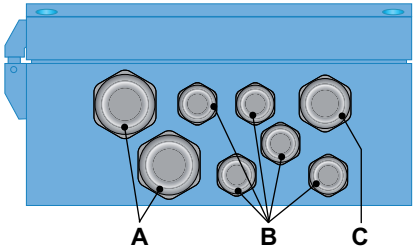
Risk of electrical shock.

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

- 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

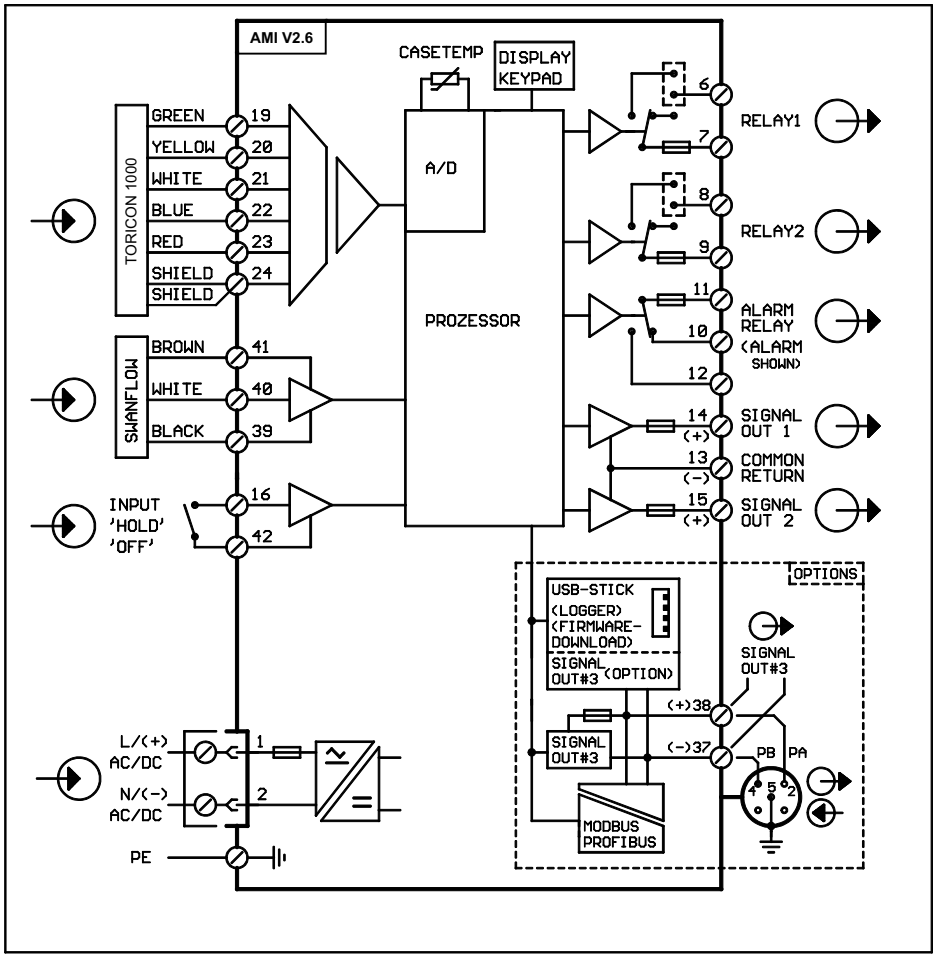
To prevent from electrical shock, do not connect the instrument to the power unless the ground wire (PE) is connected.

- Do not connect unless specifically instructed to do so.

WARNING

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

3.4.1 Connection Diagram



CAUTION

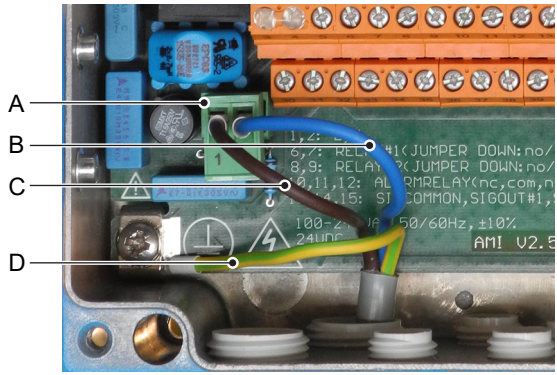
Use only the terminals shown in this diagram, and only for the mentioned purpose. Use of any other terminals will cause short circuits with possible corresponding consequences to material and personnel.

3.4.2 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 Toricon

3.5. Relay Contacts

3.5.1 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. 44.

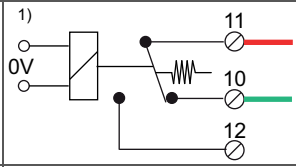
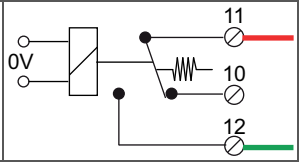
3.5.2 Alarm Relay

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

Alarm output for system errors.

Error codes see Troubleshooting, p. 35.

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.	

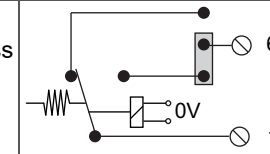
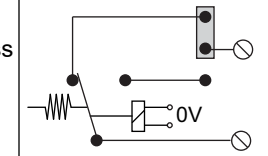
1) *usual use*

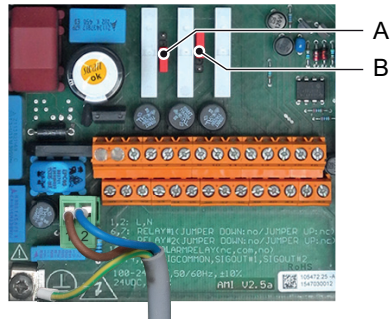
3.5.3 Relay 1 and 2

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

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

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

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



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

For more information see Program List and Explanations, p. 44.

CAUTION

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

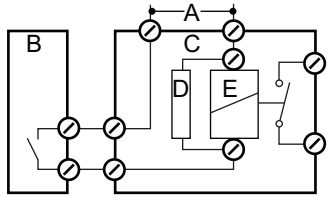
Heavy inductive or directly controlled loads (solenoid valves, dosing pumps) may destroy the relay contacts.

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

Inductive load

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

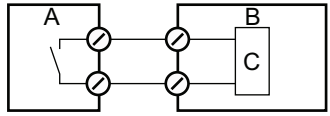
A snubber circuit is not necessary if an AMI relaybox is used.



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

Resistive load

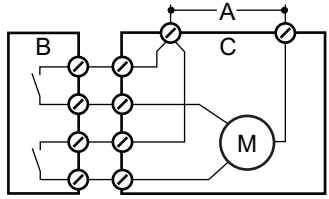
Resistive loads (max. 1 A) and control signals for PLC, impulse pumps and so on can be connected without further measures



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

Actuators

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



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

3.6. Signal Outputs

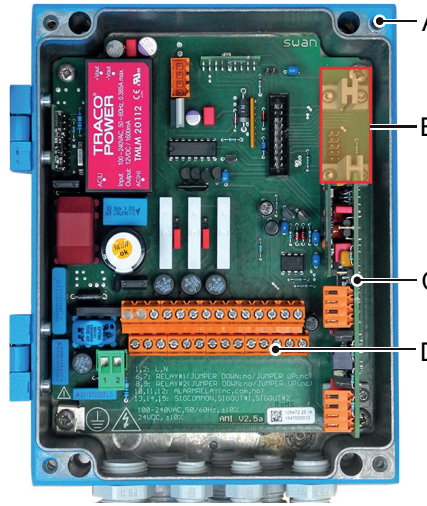
3.6.1 Signal Output 1 and 2 (current outputs)

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. 44, Menu Installation.

3.7. Interface Options



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

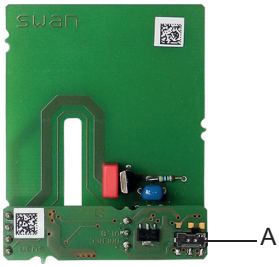
The slot for interfaces can be used to expand the functionality of the AMI instrument with either:

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

3.7.1 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.*



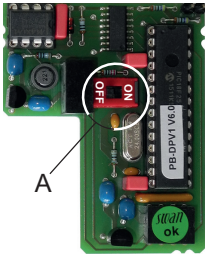
Third signal output 0/4 - 20 mA PCB

A *Operating mode selector switch*

3.7.2 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.*



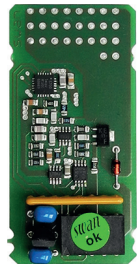
Profibus, Modbus Interface PCB (RS 485)

A *On - OFF switch*

3.7.3 HART Interface

Terminals 38 (+) and 37 (-).

The HART interface PCB allows for communication via the HART protocol. For detailed information, consult the HART manual.

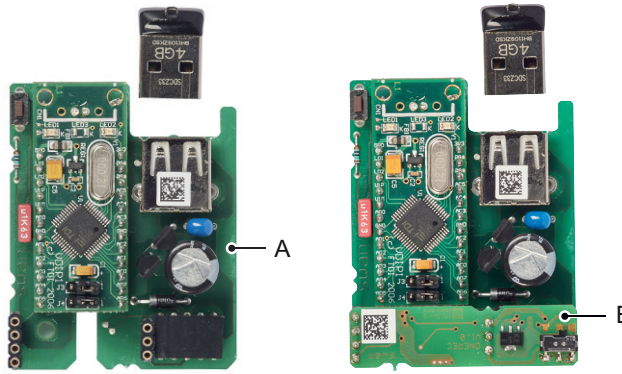


HART Interface PCB

3.7.4 USB Interface

The USB Interface is used to store Logger data and for Firmware upload. For detailed information see the corresponding installation instruction.

The optional third signal output 0/4 – 20 mA PCB [B] can be plugged onto the USB interface and used in parallel.



USB Interface

A *USB interface PCB*

B *Third signal output 0/4 - 20 mA PCB*

4. Instrument Setup

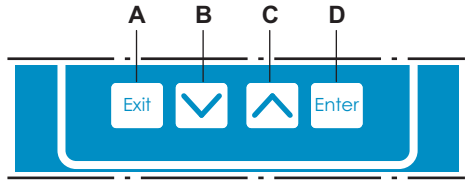
4.1. Programming

After the AMI Transmitter has been installed and all components have been connected to the transmitter, switch on power. Navigate to menu <Installation>/<Sensors> and program the following parameters:

- Menu 5.1.1:Sensor parameters
  - *Cell Factor*: Set the cell factor according to the printed value on the sensor label.
  - *Temp. corr.*: Leave this setting at 0.00 °C.
  - You can choose between 0.01 mol/l, 0.1 mol/l and 1 mol/l KCl solution. For higher conductivity measurements (100 mS) 1 mol/l should be set.
  - *Meas. unit*: Set the measuring unit to mS/cm or mS/m
- Menu 5.1.2: Temp. compensation
  You can chose between none, coefficient and non-linear DIN. Set “no compensation” if you want to measure the conductivity at a certain temperature.
  The temperature coefficient is 2.00% for saline solutions. If the coefficient of the solutions is known, it can be set here. The programmable range is 0.00 to 20%/°C.
- The non-linear temperature compensation should be set for the conductivity measurement of natural waters (EN 27888, ISO 7888)
- Menu 5.1.3: Flow
  Set flow to <None> or <Q-Flow>
- Menu 5.1.4: Conc.
  In this menu different concentration measurements can be chosen. Set the parameter according to your application.
  Parameters:
  - none,
  - nitric acid,
  - hydrochloric acid,
  - sodium chloride,
  - caustic soda,
  - sulfuric acid,
  - salinity
  - (TDS) total dissolved solids as NaCl.

5. Operation

5.1. Keys



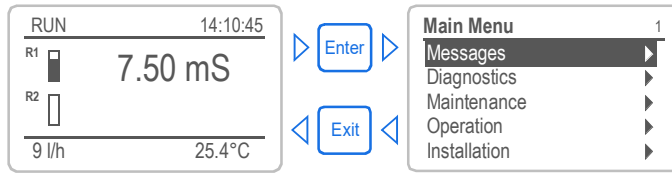
A *to exit a menu or command (rejecting any changes)*
to move back to the previous menu level

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

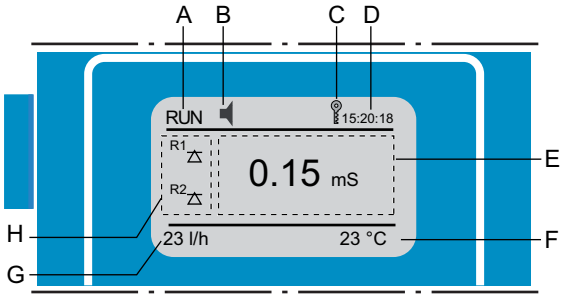
C *to move UP in a menu list and to increase digits*

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

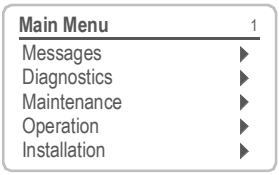
motor valve closed

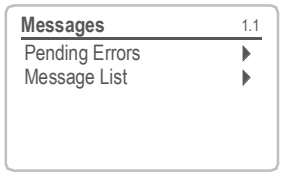
motor valve: open, dark bar indicates approx. position

timer

timer: timing active (hand rotating)

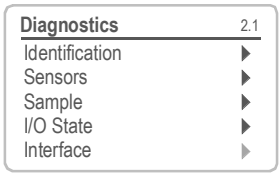
5.3. Software Structure





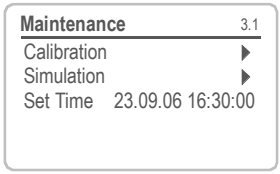
Menu **Messages 1**

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.



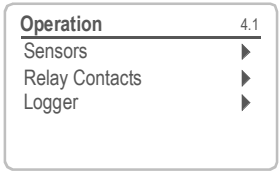
Menu **Diagnostics 2**

Provides user relevant instrument and sample data.



Menu **Maintenance 3**

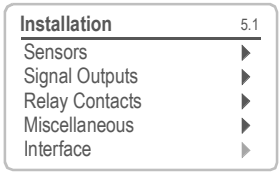
For instrument calibration, relay and signal output simulation, and to set the instrument time.
It is used by the service personnel.



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.



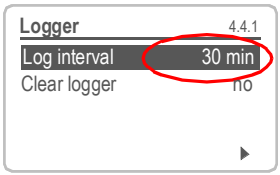
Menu **Installation 5**

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

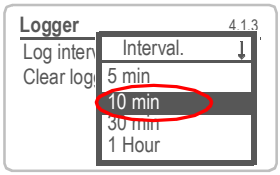
Changing parameters

The following example shows how to change the logger interval:



1 Select the parameter you want to change.

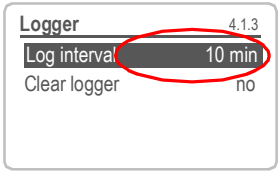
2 Press [Enter]



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

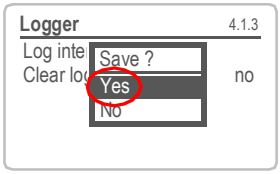
4 Press [Enter] to confirm the selection or [Exit] to keep the previous parameter).

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



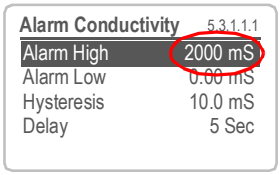
5 Press [Exit].

⇒*Yes is highlighted.*



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

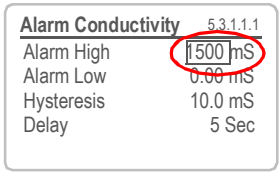
Changing values



1 Select the value you want to change.

2 Press [Enter].

3 Set required value with [▲] or [▼] key.



4 Press [Enter] to confirm the new value.

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

6 Press [Enter] to save the new value.

6. Maintenance

6.1. Maintenance Table

If required	Clean the sensor. Perform a calibration.

6.2. Stop of Operation for Maintenance

1 Stop sample flow.

2 Shut off power of the instrument.

6.3. Clean the Sensor

The Swansensor Toricon1000 is largely maintenance-free. Depending on the application, however, it can become dirty, which can lead to problems.

If the sensor is dirty, take a small brush or a soft tissue and clean it with water and detergents.

Note: *After each cleaning, the sensor has to be rinsed with clean water.*

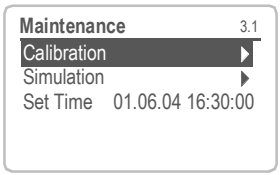
6.4. Calibration

How often a calibration is necessary depends on your application. Usually, a calibration must be done if the cell factor is not known, the sensor has been contaminated or the maintenance measurement shows a discrepancy.

If the sensor is contaminated, you first have to clean it.

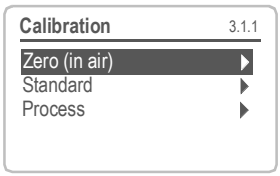
The sensor is extremely reliable and will keep its calibration for a long time.

Zero Calibration



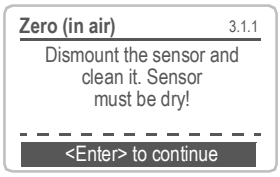
1 Navigate to menu <Maintenance>/<Calibration>/<Zero (in air)>.

2 Press [Enter].



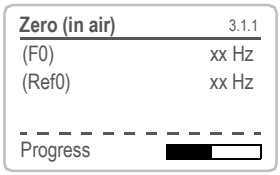
3 Press [Enter].

4 Follow the instructions on the display.

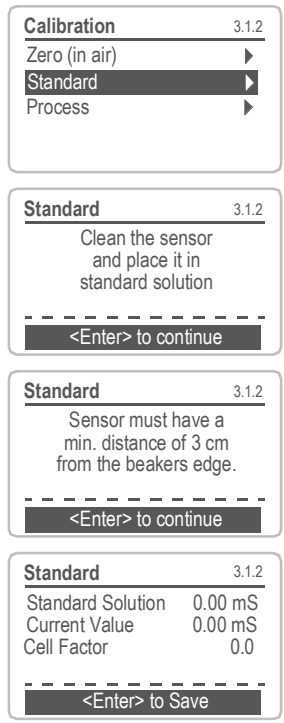


5 Clean the sensor according to chapter Clean the Sensor, p. 31.

6 Press [Enter] to start the calibration.



Standard Calibration

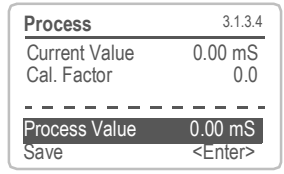


1. Navigate to menu <Maintenance>/<Calibration>/<Standard>.
2. Press [Enter].
3. Follow the instructions on the display.
4. Clean the sensor according to chapter Clean the Sensor, p. 31.
5. Press [Enter].
6. Press [Enter] to start the calibration.

Process Calibration

Enter the known conductivity value of the sample determined by laboratory analysis or a comparison measurement.

Note: *During calibration control is interrupted. The signal outputs are frozen if hold has been programmed. Otherwise the outputs track the measuring value. Hold after calibration is indicated by Hold in the display.*



1. Navigate to menu <Maintenance>/<Calibration>/<Process>.
2. Press [Enter].

6.5. Longer Stop of Operation

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

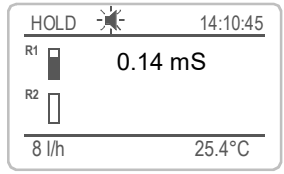
7. Troubleshooting

7.1. Error List

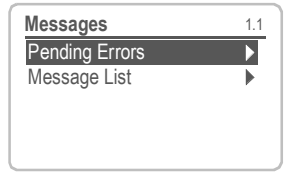
Error
Non-fatal Error. Indicates an alarm if a programmed value is exceeded.
Such Errors are marked **E0xx** (bold and black).

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:

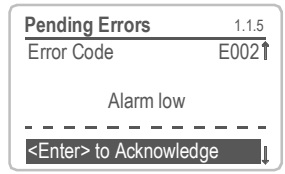
- Errors which disappear if correct measuring conditions are recovered (i.e. Sample Flow low).
  Such Errors are marked **E0xx** (bold and orange)
- Errors which indicate a hardware failure of the instrument.
  Such Errors are marked **E0xx** (bold and red)



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



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



Press [ENTER] to acknowledge the Pending Errors.
⇒ *The Error is reset and saved in the Message List.*

Error	Description	Corrective action
E001	Conductivity Alarm high	– check process – check programmed value, see 5.3.1.1.1, p. 53
E002	Conductivity Alarm low	– check process – check programmed value, see 5.3.1.1.25, p. 53
E003	Concentration Alarm high	– check process – check programmed value, see5.3.1.5.1, p. 54
E004	Concentration Alarm low	– check process – check programmed value, see5.3.1.5.25, p. 54
E007	Sample Temp. high	– check process – check programmed value, see 5.3.1.3.1, p. 54
E008	Sample Temp. low	– check process – check programmed value, see 5.3.1.3.25, p. 54
E009	Sample Flow high	– check sample flow – check programmed value, see 5.3.1.2.2, p. 54
E010	Sample Flow low	– establish sample flow – clean instrument – check programmed value, see 5.3.1.2.35, p. 54
E011	Temp. shorted	– Check wiring of temperature sensor, see Connection Diagram, p. 18 – Check temperature sensor
E012	Temp. disconnected	– Check wiring of temperature sensor, see Connection Diagram, p. 18 – Check temperature sensor
E013	Case Temp. high	– check case/environment temperature – check programmed value, see 5.3.1.4.1, p. 54

Error	Description	Corrective action
E014	Case Temp. low	– check case/environment temperature – check programmed value, see 5.3.1.4.2, p. 54
E017	Control Timeout	– check control device or programming in Installation, Relay contact, Relay 1 and 2 see 5.3.2 and 5.3.3, p. 55
E018	Temp. out of table range	–
E019	Conc. out of table range	–
E024	Input active	– See If Fault Yes is programmed in Menu see 5.3.4, p. 59
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

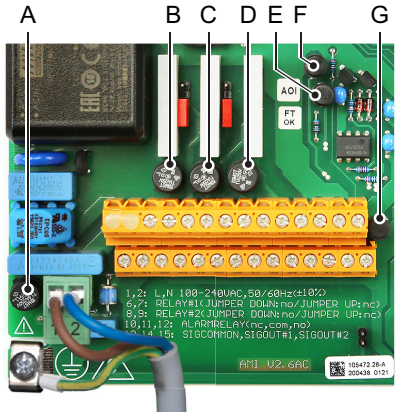
External Voltage.

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

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

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

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



A *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. 44.

- 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	Desig.	AMI Toricon		* Menu numbers
2.1*	Version	V6.20-09/16		
	Factory Test	*Instrument*	2.1.3.1*	
	2.1.3*	*Motherboard*		
		Front End		
	Operating Time	*Years / Days / Hours / Minutes / Seconds*		2.1.4.1*
	2.1.4*			
Sensors	Cond. Sensor	*Current Value*		
2.2*	2.2.1*	*(Raw value)*		
		Zero History	*Number*	2.2.1.4.1*
		2.2.1.4*	*Date, Time*	
			F0	
		Cal. History	*Number*	2.2.1.5.1*
		2.2.1.5*	*Date, Time*	
			Cell Factor	
	Miscellaneous	*Case Temp.*	*2.2.2.1**	
	2.2.2*			
Sample	*Sample ID*	2.3.1*		
2.3*	*Temperature*			
	(PT 1000 in Ohm			
I/O State	*Alarm Relay*	2.4.1*		
2.4*	*Relay 1/2*	2.4.2*		
	Input			
	Signal Output 1/2			
Interface	*Protocol*	2.5.1*		(only with RS485
2.5*	*Baud rate*			interface)

8.3. Maintenance (Main Menu 3)

Calibration	Zero (in air)	*Zero (in air)*	3.1.1.5*	* Menu numbers
3.1*	3.1.1*			
	Standard	*Standard*	3.1.2.5*	
	3.1.2*			
	Process	*Process*	3.1.3.4*	
	3.1.3*			
Simulation	*Alarm Relay*	3.2.1*		
3.2*	*Relay 1*	3.2.2*		
	Relay 2	3.2.3*		
	Signal Output 1	3.2.4*		
	Signal Output 2	3.2.5*		
Set Time	*(Date), (Time)*			
3.3*				

8.4. Operation (Main Menu 4)

Sensors	*Filter Time Const.*	4.1.1*		
4.1*	*Hold after Cal.*	4.1.2*		
Relay Contacts	**Alarm Relay**	**Alarm Conductivity**	*Alarm High*	4.2.1.1.1*
4.2*	4.2.1*	4.2.1.1*	*Alarm Low*	4.2.1.1.25*
			Hysteresis	4.2.1.1.35*
			Delay	4.2.1.1.45*
		Alarm Concentration	*Alarm High*	4.2.1.2.1*
		4.2.1.2*	*Alarm Low*	4.2.1.2.25*
			Hysteresis	4.2.1.2.35*
			Delay	4.2.1.2.45*
	Relay 1 and 2	*Setpoint*	4.2.x.100*	
	4.2.2* and 4.2.3*	*Hysteresis*	4.2.x.200*	
		Delay	4.2.x.30*	
	Input	*Active*	4.2.4.1*	
	4.2.4*	*Signal Outputs*	4.2.4.2*	
		Output / Control	4.2.4.3*	
		Fault	4.2.4.4*	
		Delay	4.2.4.5*	
Logger	*Log Interval*	4.3.1*		
4.3*	*Clear Logger*	4.3.2*		

8.5. Installation (Main Menu 5)

Sensors	**Sensor Parameters**	*Cell Factor*	5.1.1.1*	* Menu numbers
5.1*	5.1.1*	*Temp. Corr.*	5.1.1.2*	
		Standard Solution	5.1.1.3*	
		Meas. Unit	5.1.1.4*	
	Temp. Compensation	*Comp.*	5.1.2.1*	
	5.1.2*			
	Flow	5.1.3*		
	Conc.	5.1.4*		
Signal Outputs	**Signal Output 1 and 2**	*Parameter*	5.2.1.1 - 5.2.2.1*	
5.2*	5.2.1* - 5.2.2*	*Current Loop*	5.2.1.2 - 5.2.2.2*	
		Function	5.2.1.3 - 5.2.2.3*	
		Scaling	*Range Low*	5.2.x.40.10/10*
		5.2.x.40	*Range High*	5.2.x.40.20/20*
Relay Contacts	**Alarm Relay**	**Alarm Conductivity**	*Alarm High*	5.3.1.1.1*
5.3*	5.3.1*	5.3.1.1*	*Alarm Low*	5.3.1.1.25
			Hysteresis	5.3.1.1.35
			Delay	5.3.1.1.45
		Sample Flow	*Flow Alarm*	
		5.3.1.2*	*Alarm High*	
			Alarm Low	
		Sample Temp.	*Alarm High*	5.3.1.3.1*
		5.3.1.3	*Alarm Low*	5.3.1.3.25*
		Case Temp	*Case Temp. high*	5.3.1.4.1*
		5.3.1.4*	*Case Temp. low*	5.3.1.4.2*
		Alarm Concentration	*Alarm High*	5.3.1.5.1*
		5.3.1.5*	*Alarm Low*	5.3.1.5.25
			Hysteresis	5.3.1.5.35
			Delay	5.3.1.5.45
	Relay 1 and 2	*Function*	5.3.2.1–5.3.3.1*	
	5.3.2* and 5.3.3*	*Parameter*	5.3.2.20–5.3.3.20*	
		Setpoint	5.3.2.300–5.3.3.301*	
		Hysteresis	5.3.2.400–5.3.3.401*	
		Delay	5.3.2.50–5.3.3.50*	

	Input	*Active*	5.3.4.1*	* Menu numbers
	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. V6.20-09/16).

2.1.3 **Factory Test**: Test date of the instrument and motherboard.

2.1.4 **Operating Time:** Years / days / hours / minutes / seconds.

2.2 Sensors

2.2.1 **Conductivity Sensor:**

- *Current value:* Shows the actual measuring value in mS.
  (Raw value): Shows the actual measuring value in mS.

2.2.1.4 **Zero History:** shows the diagnostic values of the last calibrations.

- *Number*: Counter of the Zero calibrations.
- *Date, Time*: Date and time assigned to a number.
- *F0*: Frequency of the Zero calibration.

2.2.1.4 **Cal. History:** shows the diagnostic values of the last calibrations.

- *Number*: Counter of the calibrations.
- *Date, Time*: Date and time assigned to a number.
- *Cell Factor*: Sensor specific value.

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 actual temperature in °C inside the transmitter.

2.3 Sample

2.3.1
- o *Sample ID*:
- o *Temperature:* Shows the actual temperature in °C (*Pt1000*) raw value in Ohm
- o *Sample flow:* Shows the actual sample flow in l/h (*Raw value*) in Hz

2.4 I/O State

Shows the actual status of all in- and outputs.

2.4.1

o *Alarm Relay*:	Active or inactive
o *Relay 1 and 2*:	Active or inactive
o *Input*:	Open or closed
o *Signal Output 1 and 2*:	Actual current in mA
o *Signal Output 3 (option)*:	Actual current in mA

2.5 Interface

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

3 Maintenance

3.1 Calibration

3.1.1 **Zero (in air):** Performs a zero calibration. Follow the instruction on the screen.

3.1.2 **Standard:** Performs a standard calibration. Follow the instruction on the screen.

3.1.3 **Process:** The process calibration is based on a comparative measurement of the current electrode with a calibrated comparative electrode. See Calibration, p. 32.

3.1.3.4 *Process Value*: Enter the measured value.

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

3.3.1	*Alarm Relay:*	Active or inactive
3.3.2	*Relay 1*	Active or inactive
3.3.3	*Relay 2:*	Active or inactive
3.3.4	*Signal Output 1:*	Actual current in mA
3.3.5	*Signal Output 2:*	Actual current in mA
3.3.6	*Signal Output 3:*	Actual current in mA (option)

At the absence of any key activities, the instrument will switch back to normal mode after 20 min. If you quit the menu, all simulated values will be reset.

3.3 Set Time

Adjust date and time.

4 Operation

4.1 Sensors

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

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

4.2 Relay Contacts

See Relay Contacts, p. 20

4.3 Logger

The instrument is equipped with an internal logger. The logger data can be copied to a PC with an USB stick if option USB interface is installed.

The logger can save approx. 1500 data records. Records consists of: Date, time, alarms, measured value, measured value uncompensated, temperature, flow.
Range: 1 second to 1 hour

4.4.1 *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

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

5 Installation

5.1 Sensors

5.1.1 Sensor parameters

5.1.1.1 *Cell factor*: Enter the value written on the sensor label.
Range: 500 –2000

5.1.1.2 *Temp. Corr.*:
Range: +1°C to -1 °C

5.1.1.3 *Standard Solution*:

Standard Solution
0.01 mol/l
0.1 mol/l
1 mol/l

5.1.1.4 Meas. unit

Meas. unit
mS/cm
mS/m

5.1.2 Temp. Compensation:

5.1.2.1 *Comp.*: Choose the compensation model which fits best to your application. Available compensation models:

Comp.
None
coefficient
non-linear DIN

- *None*: No compensation should be set if you want to measure the conductivity at a certain temperature.
- *Coefficient*: The temperature coefficient is 2.00 % for well known solutions, especially for saline solutions. Range: 0.00 - 19.99%/°C
- *non-linear DIN*: the non-linear temperature compensation should be set for the conductivity measurement of natural waters (EN 27888, ISO 7888)

5.1.3 *Flow*:

Flow
None
Q-Flow

5.1.4 Concentration: According your application, choose between:

Conc.	
None	
nitric acid	
hydrochloric acid	
sodium chloride	
caustic soda	
sulfuric acid	
salinity	
TDS as NaCl	
TDS	Total dissolved solids

The calculated value is displayed in %. As an exception, TDS is displayed in mg/l.

5.2 Signal Outputs

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

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

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

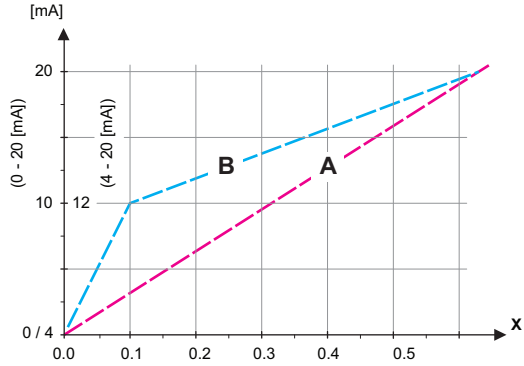
- Conductivity
- Temperature
- Sample Flow (if a flow sensor is selected)
- Conductivity uc (uncompensated)
- Concentration

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

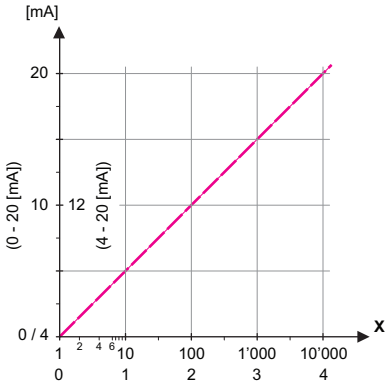
5.2.1.3 *Function:* Define if the signal output is used to transmit a process value or to drive a control unit. Available functions are:

- Linear, bilinear or logarithmic for process values.
  See As process values, p. 49
- Control upwards or control downwards for controllers.
  See As control output, p. 51

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*: 0–2000 mS

5.2.1.40.20 *Range high*: 0–2000 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 (Conductivity uncompensated)

5.2.1.40.13 *Range low*: 0–2000 mS

5.2.1.40.23 *Range high*: 0–2000 mS

Parameter Concentration

5.2.1.40.14 *Range low:* 0–100% or 0.0 mg/l–2000 g/l

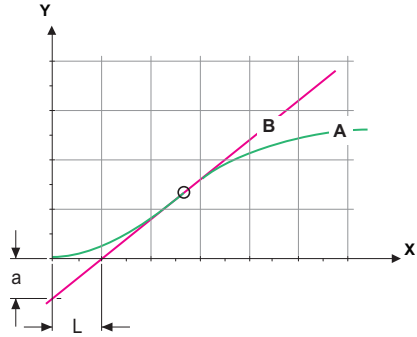
5.2.1.40.24 *Range high:* 0–100% or 0.0 mg/l–2000 g/l

As control output

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

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

Ziegler-Nichols method for the optimization of a PID controller:
Parameters: Setpoint, P-Band, Reset time, Derivative time



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

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

If Control upwards or Control downwards is active:

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

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

5.2.1.43.10 *Setpoint*: 0–2000 mS

5.2.1.43.20 *P-Band:* 0–2000 mS

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

5.2.1.43.11 *Setpoint*: -25 °C to +270 °C

5.2.1.43.21 *P-Band:* 0 °C to +100 °C

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

5.2.1.43.12 *Setpoint*: 0.0 l/h–50 l/h

5.2.1.43.22 *P-Band:* 0.0 l/h–50 l/h

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

5.2.1.43.13 *Setpoint*: 0–2000 mS

5.2.1.43.23 *P-Band:* 0–2000 mS

5.2.1.43 **Control Parameters:** if Parameters = Concentration

5.2.1.43.13 *Setpoint*: 0–100% or 0.0 mg/l–2000 g/l

5.2.1.43.23 *P-Band:* 0–100% or 0.0 mg/l–2000 g/l

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 for the following parameters:

- Meas. Value
- Temperature
- Sample Flow (if a flow sensor is programmed)
- Case Temperature high
- Case Temperature low
- Alarm Concentration (visible if a Conc. parameter has been selected)

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: 0–2000 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: 0–2000 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: 0–2000 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 a flow alarm should be issued.

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

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

5.3.1.2.2 *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.: Define at which sample temperature an alarm should be issued.

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

5.3.1.3.25 *Alarm Low:* If the measured value rises above the alarm high value, the alarm relay is activated.
Range: -10 to 20 °C

5.3.1.4 Case Temp.

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

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

5.3.1.5 Alarm Concentration

5.3.1.5.1 *Alarm High:* If the measured value rises above the alarm high value, the alarm relay is activated and E003, is displayed in the message list.
Range: 0–100 %

5.3.1.5.25 *Alarm Low:* If the measured value falls below the alarm low value, the alarm relay is activated and E004 is displayed in the message list.
Range: 0–100 %

5.3.1.5.35 *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: 0–100 %

5.3.1.5.45 *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

5.3.2 and 5.3.3 **Relay 1 and 2:** The contacts can be set as normally open or normally closed with a jumper. See Relay 1 and 2, p. 21.
The function of relay contacts 1 or 2 are defined by the user

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

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

2 Then enter the necessary data depending on the selected function.

5.3.2.1 Function = Limit upper/lower:

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

5.3.2.20 *Parameter:* select a process value:
- Meas. Value
- Temperature
- Sample flow

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

Parameter	Range:
Conductivity	0–2000 mS
Temperature	-25 °C to +270 °C
Sample flow	0.0–50 l/h
Cond uc	0–2000 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	0–2000 mS
Temperature	0–100 °C
Sample flow	0.0–50 l/h
Cond uc	0–2000 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
- Concentration

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. 52

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. 52

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. 52

5.3.2.1 Function = Timer:

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

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

5.3.2.24 *Interval*

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

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

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

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

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

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

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

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

Cont.: Controller continues normally.

Hold: Controller continues based on the last valid value.

Off: Controller is switched off.

5.3.2.24 *daily*

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

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

1 Press [Enter], to set the hours.

2 Set the hour with the [▲] or [▼] keys.

3 Press [Enter], to set the minutes.

4 Set the minutes with the [▲] or [▼] keys.

5 Press [Enter], to set the seconds.

6 Set the seconds with the [▲] or [▼] keys.

Range: 00:00:00–23:59:59

5.3.2.44 *Run Time*: see Interval

5.3.2.54 *Delay*: see Interval

5.3.2.6 *Signal Outputs*: see Interval

5.3.2.7 *Output/Control*: see Interval

5.3.2.24 *weekly*

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

5.3.2.342 Calendar:

5.3.2.342.1 *Start time*: The programmed start time is valid for each of the programmed days. To set the start time see 5.3.2.341, p. 58.
Range: 00:00:00–23:59:59

5.3.2.342.2 *Monday*: Possible settings, on or off
to
5.3.2.342.8 *Sunday*: Possible settings, on or off

5.3.2.44 *Run Time*: see Interval

5.3.2.54 *Delay*: see Interval

5.3.2.6 *Signal Outputs*: see Interval

5.3.2.7 *Output/Control*: see Interval

5.3.2.1 Function = Fieldbus:

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

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

5.3.4.1 *Active:* Define when the input should be active:
The measurement is interrupted during the time the input is active.

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

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

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

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

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

5.3.4.4 *Fault:*

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

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

5.4 Miscellaneous

5.4.1 *Language:* Set the desired language.

Language
German
English
French
Spanish

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

Set defaults
no
Calibration
In parts
Completely

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

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

Load Firmware
no
yes

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

5.4.4.1 Messages

5.4.4.2 Maintenance

5.4.4.3 Operation

5.4.4.4 Installation.

Each menu may be protected by a *different* password.

If you forgot the passwords, contact the closest SWAN representative.

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

5.4.6 *Line Break Detection:* 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: 1200–115200 Baud
5.5.41	Parity:	Range: none, even, odd

5.5.1 *Protocol:* **USB stick**

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

5.5.1 *Protocol:* **HART**

Device address: Range: 0–63

10. Default Values

Operation:

Sensors:	Filter Time Const.: ..... 20 s
	Hold after Cal.: ..... 300 s
Alarm Relay	..... same as in Installation
Relay 1 and 2	..... same as in Installation
Input	..... same as in Installation
Logger:	Logger Interval: ..... 30 min
	Clear Logger: ..... no

Installation:

Sensors	Sensor parameters
	Cell Factor: 1000
	Temp. Corr. ..... 0.00 °C
	Standard Solution ..... 1 Mol/l
	Meas. unit ..... mS/cm
	Temp. Compensation
	Comp ..... None
	Flow: ..... None
	Conc. ..... None
Signal Output 1	Parameter: ..... Conductivity
	Current loop: ..... 4 –20 mA
	Function: ..... linear
	Scaling: Range low: ..... 0.000 mS
	Scaling: Range high: ..... 1000 mS
Signal Output 2	Parameter: ..... Temperature
	Current loop: ..... 4 –20 mA
	Function: ..... linear
	Scaling: Range low: ..... 0.0 °C
	Scaling: Range high: ..... 50.0 °C
Alarm Relay:	Alarm Conductivity:
	Alarm high: ..... 2000 mS
	Alarm low: ..... 0.000 mS
	Hysteresis: ..... 10.00 mS
	Delay: ..... 5 Sec
	Sample Flow
	Flow Alarm ..... yes
	Alarm high ..... 20 l/h
	Alarm low ..... 5 l/h

	Sample Temp
	Alarm high: 125 °C
	Alarm low: 10 °C
	Case temp. high: 65 °C
	Case temp. low: 0 °C
	Alarm concentration
	Alarm high 100 %
	Alarm low 0 %
	Hysteresis: 5.0 %
Relay 1 and 2	Function: limit upper
	Parameter: Meas. Value
	Setpoint: 100 mS
	Hysteresis: 10.0 mS
	Delay: 30 s
	If Function = Control upw. or dnw:
	Parameter: **Conductivity**
	Settings: Actuator: Frequency
	Settings: Pulse Frequency: 120/min
	Settings: Control Parameters: Setpoint: 100 mS
	Settings: Control Parameters: P-band: 10.0 mS
	Parameter: **Temperature**
	Settings: Actuator: Frequency
	Settings: Pulse Frequency: 120/min
	Settings: Control Parameters: Setpoint: 50 °C
	Settings: Control Parameters: P-band: 1 °C
	Parameter: **Sample flow**
	Settings: Actuator: Frequency
	Settings: Pulse Frequency: 120/min
	Settings: Control Parameters: Setpoint: 25.0 l/h
	Settings: Control Parameters: P-band: 1 l/h
	Parameter: **Cond. uc**
	Settings: Actuator: Frequency
	Settings: Pulse Frequency: 120/min
	Settings: Control Parameters: Setpoint: 100 mS
	Settings: Control Parameters: P-band: 10.0 mS
	Parameter: **Concentration**
	Settings: Actuator: Frequency
	Settings: Pulse Frequency: 120/min
	Settings: Control Parameters: Setpoint: 100 %
	Settings: Control Parameters: P-band: 10.0 %

Settings: Control Parameters: Reset time:.....0 s
Settings: Control Parameters: Derivative Time: .....0 s
Settings: Control Parameters: Control Timeout:.....0 min
Settings: Actuator: .....Time proportional
Cycle time: .....60 s
Response time: .....10 s
Settings: Actuator ..... Motor valve
Run time: .....60 s
Neutral zone: 5%

If Function = Timer:
Mode:.....Interval
Interval: .....1 min
Mode: .....daily
Start time:..... 00.00.00
Mode:..... weekly
Calendar; Start time: 00.00.00
Calendar; Monday to Sunday:.....Off
Run time: .....10 s
Delay: .....5 s
Signal output:.....cont
Output/Control: .....cont

Input: Active..... when closed
Signal Outputs .....hold
Output/Control ..... off
Fault..... no
Delay .....10 s

Miscellaneous Language:.....English
Set default: ..... no
Load firmware:..... no
Password:.....for all modes 0000
Sample ID:.....- - - - - - - -
Line break detection ..... no

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12. Notes

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