ANALYTICAL INSTRUMENTS

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AMI-II Pharmacon

Operator's Manual

SWISS MADE

AMI-II Pharmacon

Customer Support

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

Table of Contents

Operator's Manual

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

1. Safety Instructions

General

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

Target audience

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

OM location

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

Qualification, training

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

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

1.1. Warning Notices

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

DANGER

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

- Follow the prevention instructions carefully.

WARNING

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

- Follow the prevention instructions carefully.

CAUTION

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

- Follow the prevention instructions carefully.

Mandatory signs

The mandatory signs in this manual have the following meaning:

Safety goggles

Safety gloves

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


Electrical shock hazard


Corrosive


Harmful to health


Flammable


General warning


Attention

1.2. General Safety Regulations

Legal requirements

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

Spare parts and disposables

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

Modifications

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

WARNING

Electrical shock hazard

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

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

WARNING

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

2. Product Description

2.1. Description of the System

Application range

The conductivity is a parameter for the total quantity of ions present in the solution.
The AMI-II Pharmacon transmitter can be used together with the two-electrode inline sensors Pharmacon NPT or Pharmacon SAN for applications in

- purified water (PW) and
- water for injection (WFI).

Displayed values

The compensated value (tc), the uncompensated value (uc) and the USP alarm value can be displayed.

Temperature compensation

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

USP<645>

Alarm function for limit values according to USP<645> Stage 1. By editing the limit (100% to 20%), an action limit can be set.

Transmitter test

Check the correct function of the transmitter using high precision resistors (available as accessory).

QA procedure

A menu-driven inspection procedure can be carried out using a certified reference instrument (e.g. AMI Inspector).

Sensor connection

Sensor connections for a two-electrode sensor with built-in Pt1000 temperature probe (e.g. Swansensor Pharmacon) and for an optional digital sample flow meter.

Signal outputs

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

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

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

Relays

Two potential-free contacts programmable as limit switches for measured values, controllers or timers with automatic hold function.
Maximum load: 100 mA/50 V resistive

Alarm relay

Two potential-free contacts (one normally open and one normally closed contact). Summary alarm indication for programmable alarm values and instrument faults.

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

Maximum load: 100 mA/50 V resistive

Input

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

Communication interface (optional)

- Two additional signal outputs
- RS485 with fieldbus protocol Modbus RTU or Profibus DP
- HART

Safety features

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

2.2. Single Components

2.2.1 AMI-II Pharmacon 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
	Humidity:	10–90% rel., non condensing
	Display:	backlit LCD, 74 x 53 mm
Conductivity sensor type	2-electrode sensor.	

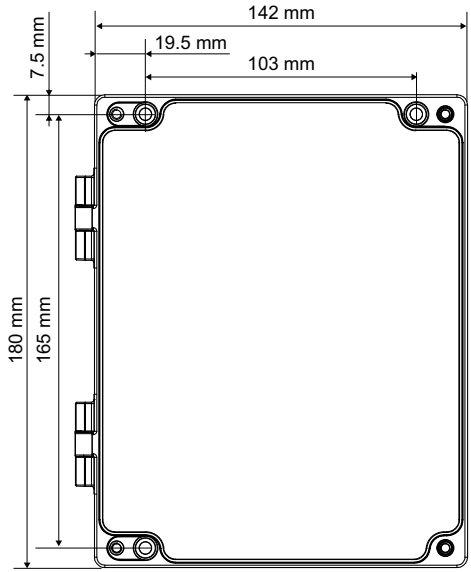
Measuring range	Range	Resolution
	0.055 to 0.999 µS/cm	0.001 µS/cm
	1.00 to 9.99 µS/cm	0.01 µS/cm
	10.0 to 99.9 µS/cm	0.1 µS/cm
	100 to 999 µS/cm	1 µS/cm
	1.00 to 2.00 mS/cm	0.01 mS/cm

System accuracy		
	0.05 to 500 µS/cm	±2%
	500 to 2000 µS/cm	±3%

or ±0.001 µS/cm, whichever is greater.
Ranges and accuracy with Swansensor Pharmacon (cell constant ~0.08 cm-1).

Sample flow measurement With digital Swan sample flow meter.

Dimensions AMI-II transmitter with mounting holes.



Width:	142 mm
Height:	180 mm
Depth:	94 mm
Weight:	1.7 kg

2.2.2 Swansensor Pharmacon

Two-electrode conductivity sensor for the inline measurement of purified water and water for injection in the pharmaceutical industry. Available in two different models:

- Swansensor Pharmacon SAN, with sanitary flange
- Swansensor Pharmacon NPT, with NPT ¾" thread

Swansensor Pharmacon SAN

Polished surface, no dead volume.
Equipped with fixed cable (~30 cm, PTFE) with M16 male plug.

Accompanying certificates:

- Calibration traceable to national standards.
- Material specifications of wetted parts.
- Inspection certificates 3.1 (EN 10204) of sensor body and electrode.

Specifications

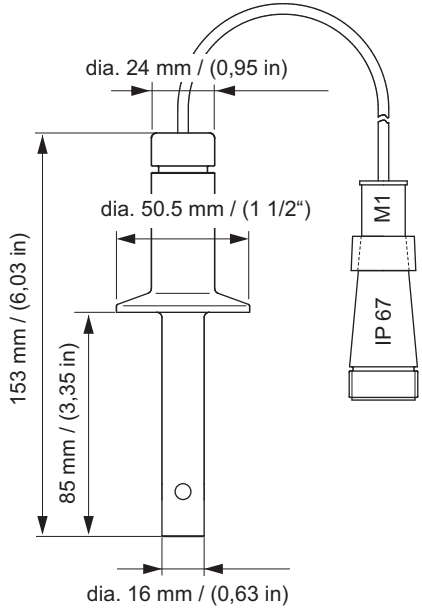
Measuring range:	0.055–1'000 µS/cm
Accuracy (at 25 °C):	±2% up to 500 µS/cm ±3% above 500 µS/cm up to 1'000 µS/cm
Cell constant:	0.1 cm^{-1}

Material

Shaft and electrode:	SS 316L (1.4435) stainless steel
Isolator:	PEEK
Roughness:	R_a < 0.4 µm
Temperature sensor:	Pt1000 (Class A, DIN EN 60751)
Sensor mounting:	sanitary flange 1 ½"
Operating temperature:	-10 to 120 °C
Sterilization temp.:	up to 155 °C
Operating pressure:	17 bar at 25 °C, 7 bar at 95 °C

Dimensions

Total length:	153 mm
Insertion length:	85 mm



Swansensor Pharmacon NPT

Equipped with fixed cable (~30 cm, PTFE) with M16 male plug.

Accompanying certificates:

- Calibration traceable to national standards.
- Material specifications of wetted parts.
- Inspection certificates 3.1 (EN 10204) of sensor body and electrode.

Specifications

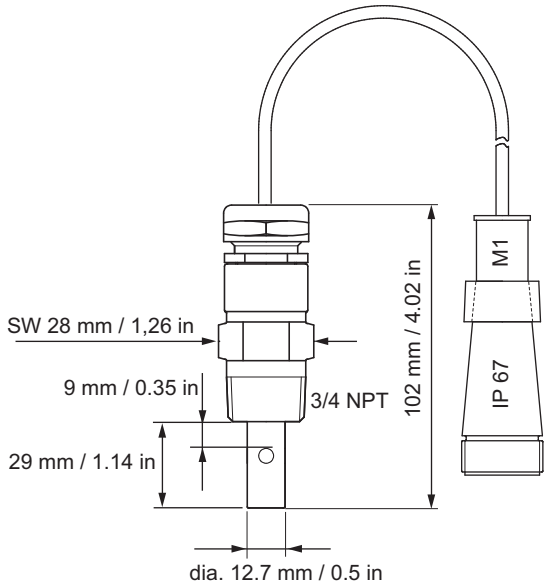
Measuring range	0.055–1’000 µS/cm
Accuracy (at 25°C):	±2% up to 500 µS/cm
	±3% above 500 µS/cm up to 1’000 µS/cm
Cell constant:	0.1 cm^{-1}

Material

Shaft and electrode:	SS 316L (1.4435) stainless steel, titanium
Isolator:	PEEK
Temperature sensor:	Pt1000 (Class A, DIN EN 60751)
Sensor mounting:	NPT thread ¾”
Operating temperature:	-10 to 120 °C
Sterilization temp.:	up to 155 °C
Operating pressure:	17 bar at 25 °C, 7 bar at 95 °C

Dimensions

Total length:	102 mm
Insertion length:	29 mm



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	Mount the transmitter Install Swansensor Pharmacon SAN or Swansensor Pharmacon NPT
Electrical wiring	Connect all external devices like limit switches and current loops. Connect power cord.
Power-up	Turn on sample flow Switch on power
Instrument setup	Program all sensor specific parameters (cell constant, temp. correction, cable length), all parameters for external devices (interface, recorders, etc.) and all parameters for instrument operation (USP mode and setpoint, limits, alarms).
Run-in period	Let the instrument run continuously for 1 h.

3.2. Mounting of the AMI-II Transmitter

Mounting requirements

Mount the transmitter in vertical position. The display should be at eye level to simplify operation and maintenance.
Use four 4x30 mm screws.
For dimensions, see p. 12.

3.3. Electrical Connections

WARNING

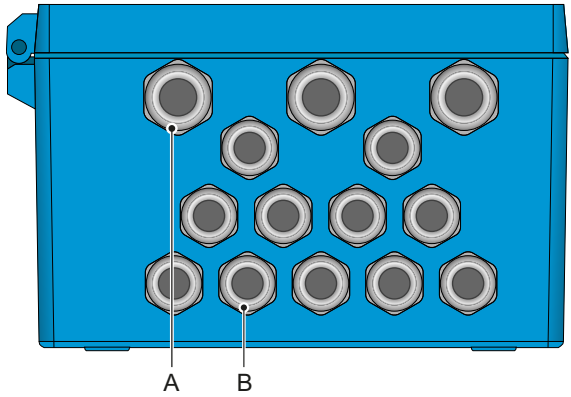
Risk of electrical shock

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

- Always turn off power before manipulating electric parts.
- Do not connect the instrument to power unless the ground wire (PE) is connected.
- Make sure the power specification of the instrument corresponds to the power on site.

Cable thicknesses

In order to comply with IP66, use the following cable thicknesses. Protect unused cable glands.

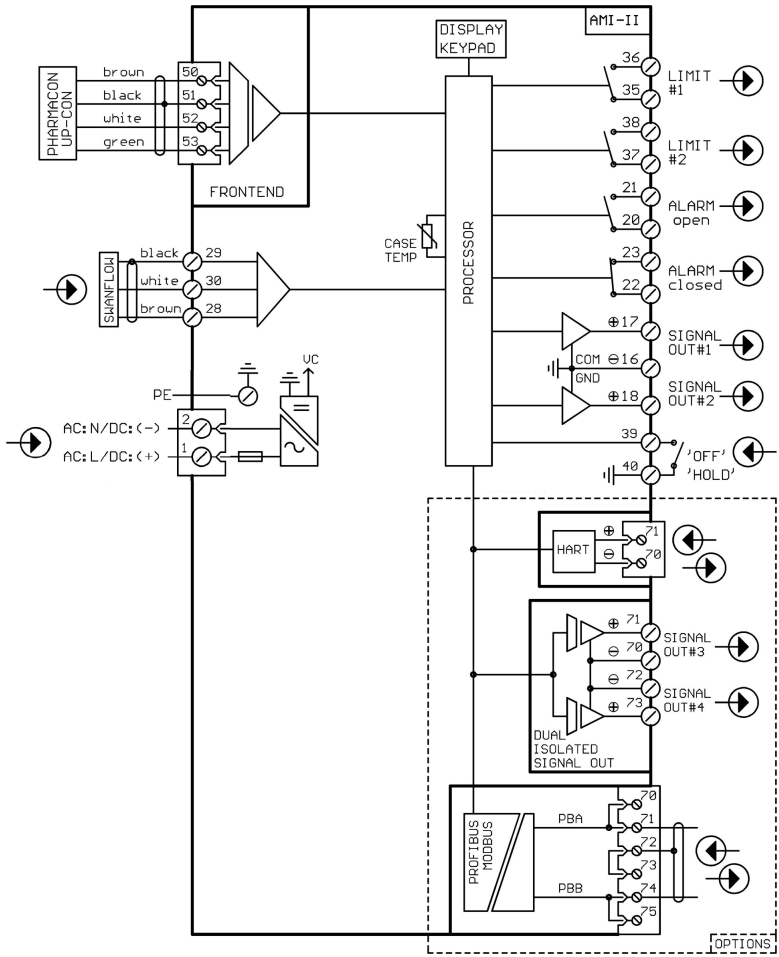


A *M16 cable glands (3x): cable* $Ø_{outer}$ *5–10 mm*
B *M12 cable glands (11x): cable* $Ø_{outer}$ *3–6 mm*

Wires

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

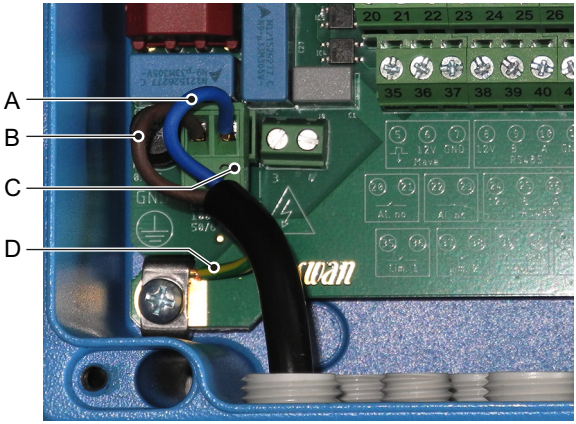
3.3.1 Connection Diagram



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.

3.3.2 Power Supply



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

Installation requirements

The installation must meet the following requirements.

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

3.4. Relay Contacts

3.4.1 Input

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

3.4.2 Alarm Relay

Two alarm outputs for system errors.

- Normally closed contact (terminals: 22/23):
  Active (opened) when no error is present. Inactive (closed) on error and loss of power.
- Normally open contact (terminals: 20/21):
  Active (closed) when no error is present. Inactive (opened) on error and loss of power.

Max. load 100 mA/50 V resistive

3.4.3 Relay 1 and 2

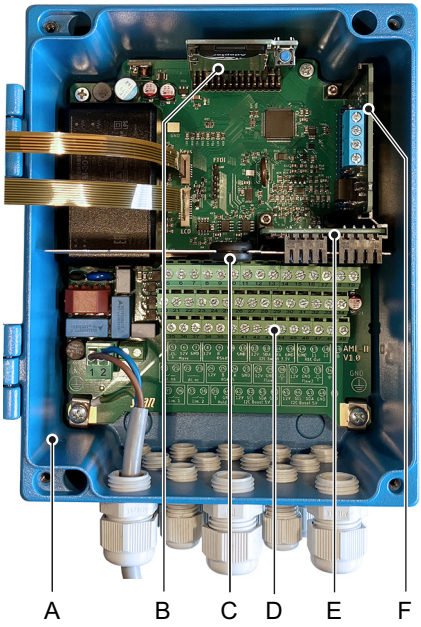
Max. load 100 mA/50 V resistive
Relay 1: terminals 35/36.
Relay 2: terminals 37/38.

3.5. Signal Outputs

3.5.1 Signal Output 1 and 2 (Current Outputs)

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

3.6. Interface Options



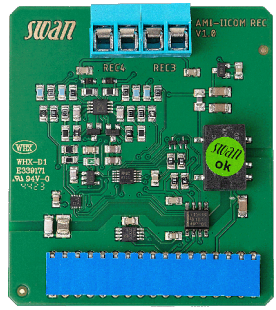
A *AMI-II transmitter*
B *SD card slot*
C *Cable grommet*
D *Screw terminals*
E *Frontend*
F *Communication option*

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

- Two additional signal outputs
- Profibus or Modbus
- HART

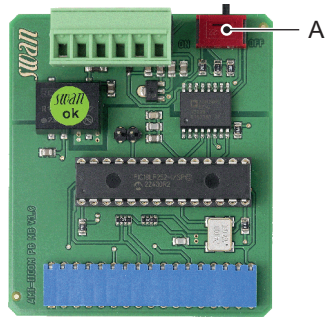
3.6.1 Signal Outputs 3 and 4

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



3.6.2 RS485 (Profibus or Modbus Protocol)

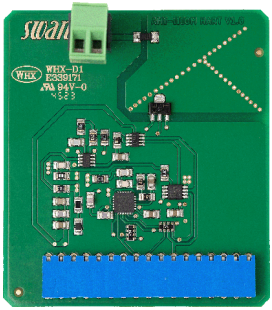
Terminal 74/75 PB, terminal 70/71 PA, terminal 72/73 shield
The switch [A] must be set to “ON” if only one instrument is installed or on the last instrument in the bus.



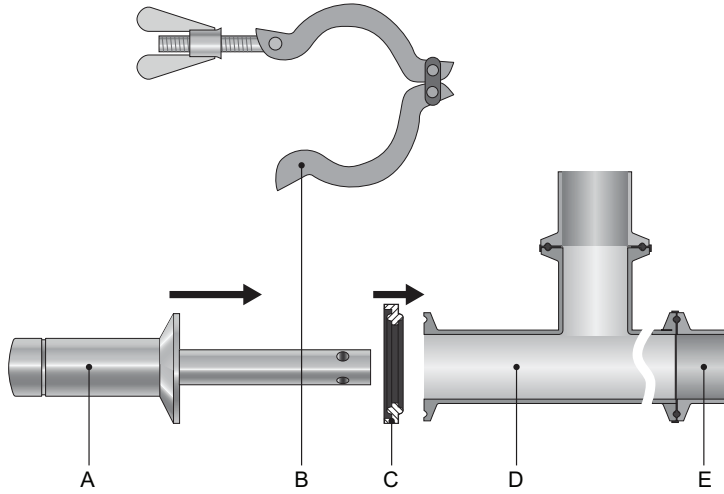
A *On/off switch*

3.6.3 HART

Terminals 71 (+) and 70 (-).



3.7. Install the Swansensor Pharmacon SAN



A *Swansensor Pharmacon SAN*
B *Clamp*
C *Gasket*
D *T-Pipe*
E *Pipe*

To install the Swansensor Pharmacon SAN into a pipe flange proceed as follows:

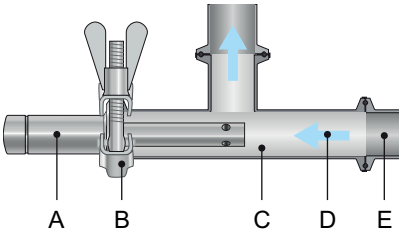
1 Make sure that the surface of the T-pipe flange [D] is clean.

2 Put the gasket [C] onto the flange.

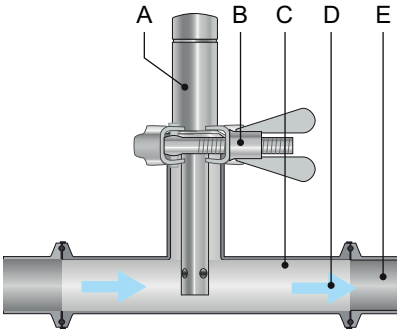
3 Insert the Swansensor Pharmacon SAN into the T-pipe [D].

4 Install the clamp [B] and tighten it well.

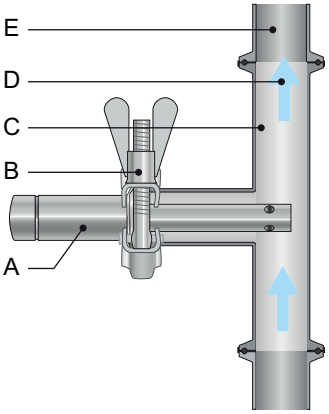
Recommended Installation



The flow direction should be towards the sensor tip. This avoids air or solids becoming trapped in the sensor.



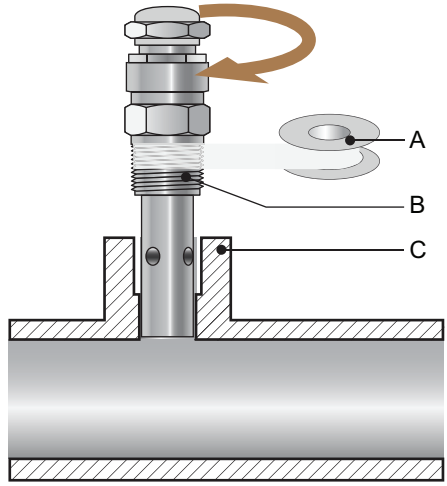
Vertical installation is possible if the pipe is always full and no air can be trapped between the electrodes.



Install the sensor in a vertical pipe with upward flow direction.

A *Swansensor Pharmacon SAN*
B *Clamp*
C *T-piece*
D *Flow direction*
E *Pipe*

3.8. Install the Swansensor Pharmacon NPT



A *Teflon tape*
B *Swansensor Pharmacon NPT*
C *Flange*

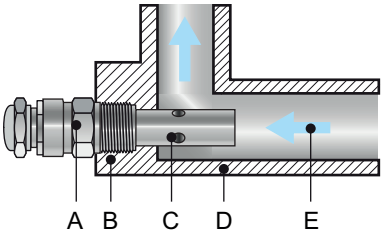
To install the Swansensor Pharmacon NPT into a pipe flange proceed as follows:

1 Wrap 7 turns of teflon tape around the sensor thread.

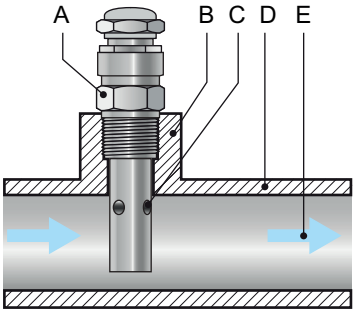
2 Screw the sensor into the pipe flange.

3 Tighten the sensor well with a 28 mm open-ended spanner.

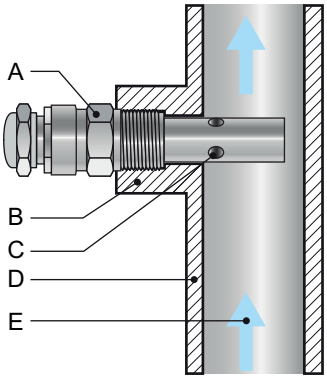
Recommended Installation



The flow direction should be towards the sensor tip. This avoids air or solids becoming trapped in the sensor.



Vertical installation is possible if the pipe is always full and no air can be trapped between the electrodes.



Install the sensor in a vertical pipe with upward flow direction.

A *Swansensor Pharmacon NPT*
B *Flange*
C *Air holes*
D *Pipe*
E *Flow direction*

4. Instrument Setup

4.1. Programming

USP parameters

Menu 5.1.2 (activate if required)
Set Operating mode to ON
Set the limit according your requirements.

Sensor parameters

Menu 5.1.3
Enter the:

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

The cell constant and the temperature correction are printed on the label of each sensor.

SW-xx-xx-xx	ZK = 0.0417	Cell constant
SWAN AG	DT = 0.06 °C	Temperature correction

Temperature compensation

Menu 5.1.4
Select the temperature compensation.

Quality assurance

Menu 5.1.5 (activate if required)
Set the level according to your requirements.

Display

Menu 4.4.1, Screen 1
Menu 4.4.2, Screen 2
Select the values to be displayed on screens 1 and 2.

External devices

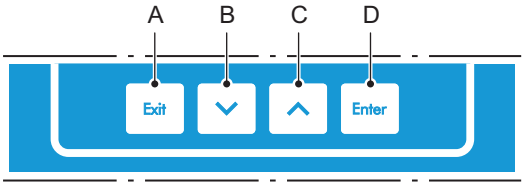
Menu 5.2 Signal Outputs
Menu 5.5 Interface

Limits and alarms

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

5. Operation

5.1. Keys



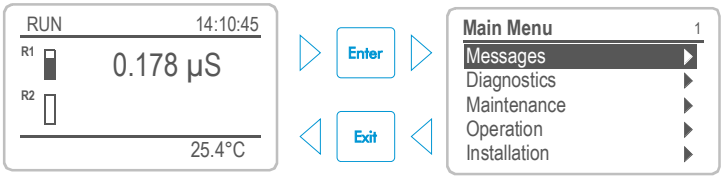
A to exit a menu or command (rejecting any changes)
to move back to the previous menu level

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

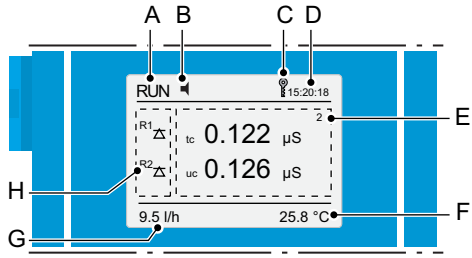
C to move up in a menu list and to increase digits
to switch between display1 and 2

D to open a selected menu item
to accept an entry

Program access, exit



5.2. Display



A	RUN	Normal operation
	HOLD	Input active or cal delay: Instrument on hold (shows status of signal outputs).
	OFF	Input active: Signal outputs go to 4 mA.
B	ERROR	Non-fatal error / Fatal error
C	Keys locked, transmitter control via Profibus	
D	Time	
E	Process value	
F	Sample temperature	
G	Sample flow	
H	Relay status	

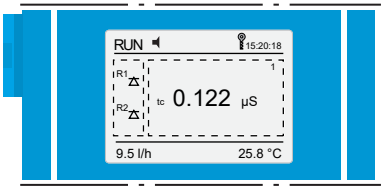
Symbols used for relay status:

- Upper/lower limit not yet reached
- Upper/lower limit reached
- Control upw./downw. no action
- Control upw./downw. active, dark bar indicates control intensity
- Timer
- Timer: timing active (hand rotating)

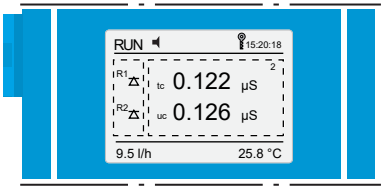
Switching between screens

Toggle between screens 1 and 2 using the ^ key.

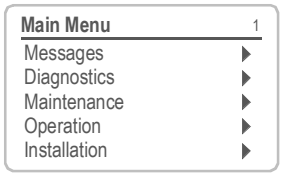
Example of screen 1:

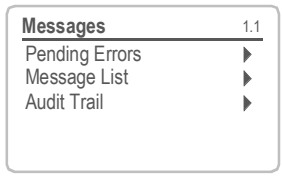


Example of screen 2:



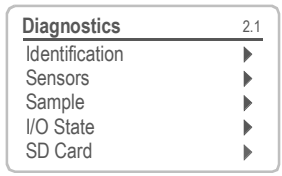
5.3. Software Structure





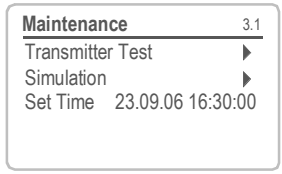
Menu Messages 1

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



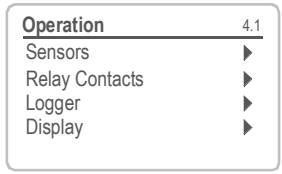
Menu Diagnostics 2

Provides user-relevant instrument and sample data.



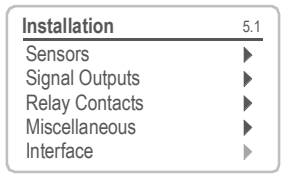
Menu Maintenance 3

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



Menu Operation 4

User-relevant parameters that might need to be modified during daily routine. Normally password protected and used by the process operator.
Subset of menu 5 - Installation, but process related.



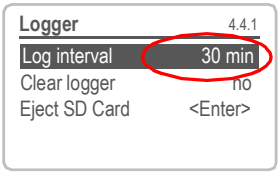
Menu Installation 5

For initial instrument set up by Swan authorized person. Can be protected by means of a password.

5.4. Changing Parameters and Values

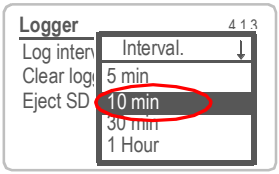
Changing parameters

The following example shows how to change the logger interval:



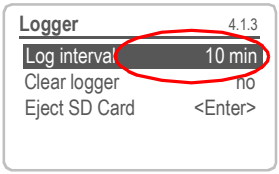
1 Select the parameter you want to change.

2 Press [Enter].



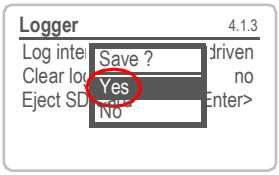
3 Press ^ or v to highlight the required parameter.

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



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

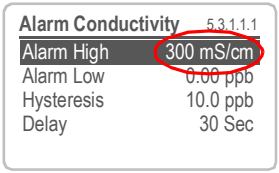
5 Press [Exit].



⇒ *Yes is highlighted.*

6 Press [Enter] to save the new parameter.

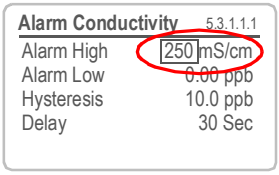
Changing values



1 Select the value you want to change.

2 Press [Enter].

3 Set required value with ^ or v.



4 Press [Enter] to confirm the new value.

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

6 Press [Enter] to save the new value.

5.5. Data Logger

Overview

The instrument has an integrated data logger. The following data is recorded:

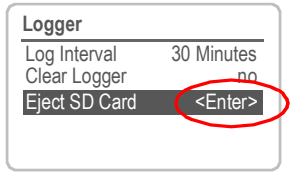
Data type	Number of data sets in internal buffer	Elements of each data set
Event history	64	Error messages with date, time. code, description and state (active, acknowledged).
Audit Trail	256	Menu calls with date, time and user name.
QA history	64	Comparison measurements with-date, time, deviation coductivity, deviation temperature and test result.
Transmitter test history	64	Transmitter tests with date, time, deviation conductivity, deviation temperature and test result.
Measured values	approx. 1500	Measured values with date, time, active alarms, measured values and sample flow rate.

The data is stored in an internal buffer per data type. As soon as a buffer is full, the oldest data set is deleted to make room for the newest data set (circular buffer).
The contents of the internal buffers can be copied to an SD card at any time.

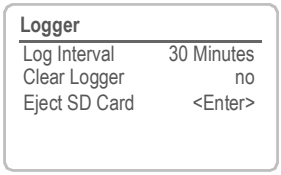
Limitations

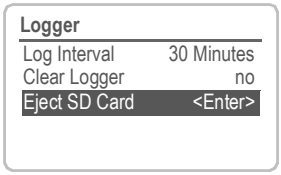
The data is only written to the SD card when the SD card is ejected. The amount of available data records is therefore limited to the size of the internal buffers.
An exception is the logging of measured values: If the SD card is inserted, measured values are also written directly to the SD card in parallel with storage in the internal buffer.

Writing data to SD card



1 Select **Operation** > **Logger** > **Eject SD Card**.





⇒ *While the data is being written to the SD card, the gray background of the "Eject SD Card" menu item disappears.*

2 Remove the SD card as soon as the background of the Eject SD Card menu item is gray again.

3 Copy the log files to a another medium for permanent storage.

Any log files already present on the SD card will be overwritten the next time the SD card is ejected.

Contents of the SD card

After removing the SD card, the following files can be found on it:

- PHAADT.SEF: Audit Trail.
- PHAEVT.SEF: Event history.
- PHAQS.SEF: Quality assurance history.
- PHAUSP.SEF: Transmitter test history.
- Measured values:
  - A2PHA_I.TXT: Data from internal buffer.
  - A2PHA.TXT: Data written directly to SD card.
  - A2PHA[number].TXT: Archived version of A2PHA.TXT. The file is automatically archived and a new instance of it created, for example, when the SD card is ejected and reinserted.

Files with the extension *.sef are encrypted text files. These can be used to create signed PDF files with the SwanGuard program.

6. Maintenance

6.1. Maintenance Schedule

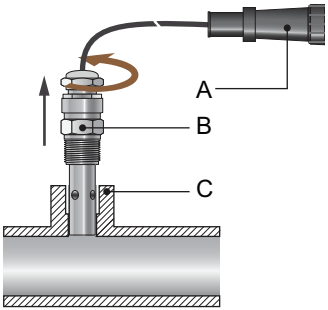
As required	Clean sensor. If a test resistor is available, perform a transmitter test.

6.2. Stop of Operation for Maintenance

Shut off power of the instrument.

6.3. Cleaning the Sensor

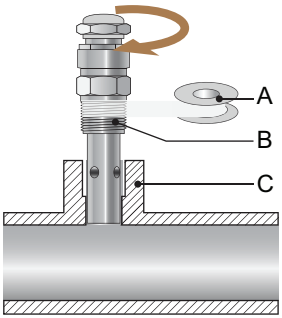
The Swansensor Pharmacon NPT/SAN is largely maintenance free. However, depending on the application, it can be contaminated, which may cause problems.
If the sensor is contaminated proceed as follows to clean the sensor.



A *Sensor plug*
B *Conductivity sensor*
C *Pipe flange*

Remove and clean the sensor

1. Disconnect the sensor cable plug [A].
2. Unscrew and remove the sensor [B] from the pipe flange [C] with a 28 mm open-ended spanner.
3. Remove the teflon tape from the sensor thread.
4. Clean the sensor with a small brush or a soft tissue and soapy water.
5. Rinse the sensor well with high purity water.



A *Teflon tape*
B *Conductivity sensor*
C *Pipe flange*

Install the sensor

1. Wrap 7 turns of teflon tape around the sensor thread.
2. Screw the sensor into the pipe flange.
3. Tighten the sensor well with a 28 mm open-ended spanner.

6.4. Alarm Function According USP<645>

Display
Set the display to show all available conductivity values, i.e:
- tc: Temperature compensated conductivity
- uc: Uncompensated conductivity
- usp: Conductivity limit at given temperature

Setpoint
Setpoint of the USP limit can be modified from 100 % to 20 % (<Installation>/<Sensors>/<USP parameters>).
If the programmed limit is overstepped error E015 will be issued..

6.5. Transmitter Test

Using high precision test resistors (available as accessory) the transmitter function can be checked.

Test Resistor
Two test plugs consisting of two high precision resistors for conductivity and temperature each.
- Test plug 1:
  1'500 Ω ±0.1 % for temperature (130.45 °C)
  600'000 Ω ±0.01 % for conductivity (0.1333 µS/cm)
- Test plug 2:
  1'000 Ω ±0.1 % for temperature (0.0 °C)
  10'000 Ω ±0.01 % for conductivity (8.0 µS/cm)

Keep the test resistor kit absolutely dry.

Procedure
Navigate to **Maintenance** > **Transmitter Test** and follow the instructions on the display.

6.6. Quality Assurance of the Instrument

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 and one user-defined level. By selecting a level, the test interval and the permissible deviations of temperature and measured value between the reference instrument and the on-line instrument are defined.

- Level 1 (trend): Measurement is used as an additional information to follow the process indicating trends.
- Level 2 (standard): Monitoring of several parameters of a process. 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 (acceptance, dosing, etc.).

Additional level:

- Level 4 (user): User-defined inspection interval, maximal deviations of temperature and measured value.

Limits and intervals

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

a) sample temperature must be 25 °C ±5 °C.

6.6.1 Activate Swan Quality Assurance Procedure

Enable quality assurance procedure on the on-line instrument(s) which shall be checked by selecting the quality level in menu 5.1.5.1. The corresponding submenus are then activated.

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

6.6.2 Pre-Test

- Reference instrument: AMI Inspector Pharma
  - The reference instrument certificate should not be older than one year.

- The battery of the AMI Inspector Pharma should be completely charged. Remaining operating time on display minimum 20 hours.
- Disable temperature compensation (set to “none”)

◆ In-line instrument: AMI-II Pharmacon:
- Good order and condition. Sensor surface free of deposits.
- Check message list; Review the message list in menu 1.2 and check for alarms. If alarms occur frequently remove cause before starting the procedure.

6.6.3 Connecting Sample Lines

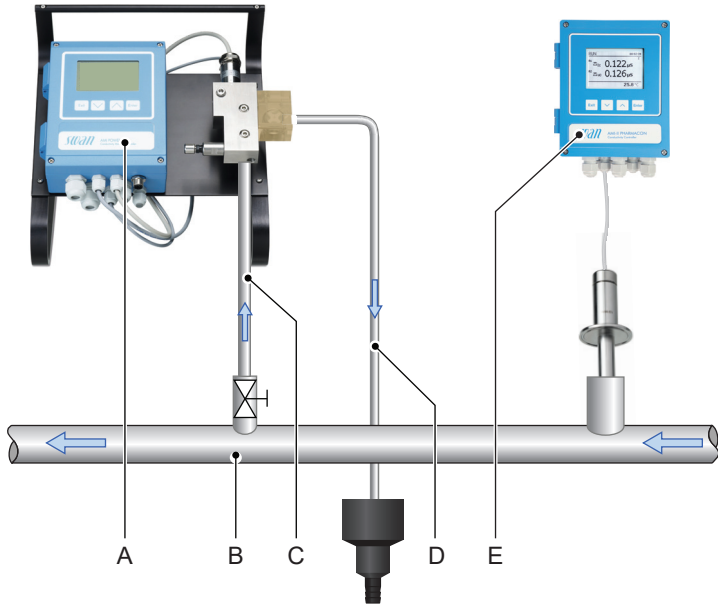
The choice of sampling depends strongly on local conditions on site. Possible sampling:

◆ 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 in-line sensor.*
- *While the measurement is running, wait approximately 10 minutes until the measured value and temperature have stabilized.*

Example The AMI Inspector Pharma is connected upstream to the in-line sensor Pharmacon at a sampling point (grab sample).



A *AMI Inspector Pharma*
B *Sample line*
C *Sample inlet to AMI Inspector Pharma*
D *Sample outlet from AMI Inspector Pharma*
E *AMI-II Pharmacon*

1. Connect the AMI Inspector Pharma to the sample line [B]. Use the supplied FEP tube. The connection must be leak-proof against fluids and air.
2. Connect sample outlet [D] of the AMI Inspector Pharma to waste.
3. Switch on AMI Inspector Pharma and open its flow regulating valve completely.
4. Start sample flow again and regulate sample flow. Run in time >15min.

6.6.4 Carry Out Comparison Measurement

1 Navigate to menu **Maintenance** > **Quality Assurance** and follow the dialog on the display.

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

6.7. Longer Stop of Operation

Shut off power of the instrument.

7. Troubleshooting

7.1. Error List

Two categories of messages are distinguished:

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

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

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

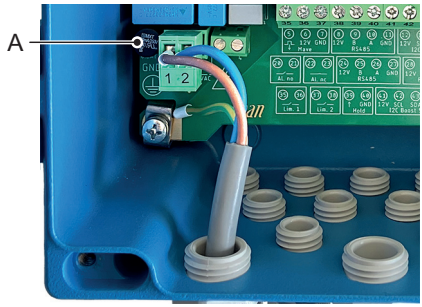
Error	Description	Corrective action
E001	Cond. Alarm high	– Check process. – Check programmed value.
E002	Cond. Alarm low	– Check process. – Check programmed value.
E007	Sample Temp. high	– Check sample temperature. – Check programmed value.
E008	Sample Temp. low	– Check sample temperature. – Check programmed value.
E009	Sample Flow high	– Check sample flow. – Check programmed value.
E010	Sample Flow low	– Establish sample flow. – Check programmed value.
E011	Temp. shorted	– Check wiring of temperature sensor. – Check temperature sensor.
E012	Temp. disconnected	– Check wiring of temperature sensor. – Check temperature sensor.
E013	Case Temp. high	– Check case/environment temperature – Check programmed value.
E014	Case Temp. low	– Check case/environment temperature – Check programmed value.
E015	USP Error	– Measured value above programmed USP limit (% setpoint).
E017	Control Timeout	– Check control device or programming in menus **Installation** > **Relay contacts** > **Relay 1** and **Installation** > **Relay contacts** > **Relay 2**.
E018	Quality Assurance	– Perform QA procedure using reference instrument, e.g. AMI Inspector.
E024	Input active	– Message informing that the relay input has been actuated. – Can be deactivated in menu **Installation** > **Relay contacts** > **Input** > **Fault**.
E026	IC LM75	– Call support.
E030	EEprom Frontend	– Call support.

Error	Description	Corrective action
E031	Calibration Recout	– Call support.
E032	Wrong Frontend	– Call support.
E033	Power-on	– None, normal status.
E034	Power-down	– None, normal status.

7.2. Replacing Fuses

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

AMI-II transmitter



A *0.8 AT/250V Instrument power supply*

8. Program Overview

All menus are password-protected as soon as an administrator password has been defined.

- Menu 1 **Messages** informs about pending errors and maintenance tasks and shows the error history. Access by users with the authorization levels administrator, service and operator. No settings can be changed.
- Menu 2 **Diagnostics** Access by users with the authorization levels administrator, service and operator. No settings can be modified.
- Menu 3 **Maintenance**: Calibration, simulation of outputs and set time/date. Access by users with the authorization levels administrator and service.
- Menu 4 **Operation** Allows to set limits, alarm values, etc. Access by users with the authorization levels administrator and service.
- Menu 5 **Installation**: Defining assignment of all inputs and outputs, measuring parameters, interface, passwords, etc. Access by users with the authorization level administrator only.

8.1. Messages (Main Menu 1)

Pending Errors 1.1*	*Pending Errors*	1.1.5*	* Menu numbers
Message List 1.2*	*Maintenance List*	1.2.1*	
Audit Trail 1.3*	*Audit Trail*	1.3.1*	

8.2. Diagnostics (Main Menu 2)

Identification 2.1*	*Designation*			* Menu numbers
	Version			
	Factory Test 2.1.3*	*Motherboard*	2.1.3.1*	
		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*		
		(Raw value)		
		Cell constant		
		Test History 2.2.1.4*	*Number*	2.2.1.4.1*
			Date, Time	
			Deviation Cond.	
			Deviation Temp.	
			Check successful	
		QA History 2.2.1.5*	*Number*	2.2.1.5.1*
			Date, Time	
			Deviation Cond.	
			Deviation Temp.	
			Check successful	
	Miscellaneous 2.2.2*	*Case Temp.*	2.2.2.1*	
Sample 2.3*	*Sample ID*	2.3.1*		
	Temperatur			
	(Pt 1000)			
	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)

Transmitter Test	*Mount Test*	3.1.5*		* Menu numbers
3.1*	*(Progress)*			
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*				
Quality Assurance	*Quality Assurance*	3.4.x*		
3.4*	*(Progress)*			

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.x*
			Hysteresis	4.2.1.1.x*
			Delay	4.2.1.1.x*
	Relay 1/2	*Setpoint*	4.2.x.x*	
	4.2.2* - 4.2.3*	*Hysteresis*	4.2.x.x*	
		Delay	4.2.x.x*	
	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*		
Display	**Screen 1**	*Row 1/2/3*	4.4.1.x*	
4.4*	4.4.1*			
	Screen 2	*Row 1/2/3*	4.4.2.x*	
	4.4.2*			

8.5. Installation (Main Menu 5)

Sensors	*Flow*	5.1.1*		* Menu numbers
5.1*				
	USP parameters	*Operating Mode*	5.1.2.1*	
	5.1.2*	*Limit*	5.1.2.2*	
	Sensor parameters	*Cell Constant*	5.1.3.1*	
	5.1.3*	*Temp. Corr.*	5.1.3.2*	
		Cable length	5.1.3.3*	
		Meas. unit	5.1.3.4*	
	Temp. Compensation	*Comp.*	5.1.4.1*	
	5.1.4*			
	Quality Assurance	*Level*	5.1.5.1*	
	5.1.5*	*Deviation Cond.*	5.1.5.2*	
		Deviation Temp.	5.1.5.3*	
		Interval	5.1.5.4*	
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.x*
		5.2.x.40	*Range High*	5.2.x.40.x*
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.x*
			Hysteresis	5.3.1.1.x*
			Delay	5.3.1.1.x*
		Sample Flow	*Flow Alarm*	5.3.1.2.1*
		5.3.1.2*	*Alarm High*	5.3.1.2.x*
			Alarm Low	5.3.1.2.x*
		Sample Temp.	*Alarm High*	5.3.1.3.1*
		5.3.1.3*	*Alarm Low*	5.3.1.3.x*
		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.x* - 5.3.3.x*	
		Setpoint	5.3.2.x* - 5.3.3.x*	
		Hysteresis	5.3.2.x* - 5.3.3.x*	
		Delay	5.3.2.x* - 5.3.3.x*	

	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*		
	Access	*Administrator*	5.4.4.1*	
	5.4.4*	*User 1-9*	5.4.4.2*- 5.4.4.5*	
	Sample ID	5.4.5*	*Name/Function/Password*	
Interface	*Protocol*	5.5.1*		(only with RS485
5.5*	*Baud Rate*	5.5.x*		interface)

9. Program List and Explanations

1 Messages

1.1 Pending Errors

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

1.2 Message List

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

1.3 Audit Trail

1.3.1 Shows the audit trail: event, menu, date and time of issue. 256 events are memorized. Then the oldest event is cleared to save the newest error (circular buffer).

2 Diagnostics

2.1 Identification

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

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

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

2.2 Sensors

2.2.1 Cond. Sensor

Current value in µS
Raw value in µS
Cell Constant

2.2.1.4 *Test History:* Review the transmitter test values (number, date, time, deviation conductivity, deviation temperature, test result) compared to the high precision test resistors.

2.2.1.4 *QA History:* Review the QA values (number, date and time, deviation conductivity, deviation temperature) of the last quality assurance procedures. Only for diagnostic purpose.

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 ID used 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.

2.4 I/O State

2.4.1 Relays:

2.5.1.1	*Alarm Relay:*	Active or inactive
	Relays 1 and 2:	Active or inactive
	Input:	Open or closed

2.4.2 Signal Outputs:

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

2.5 SD Card

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

2.6 Interface

Settings of the installed communication option (if any).

3 Maintenance

3.1 Transmitter Test

See Transmitter Test, p. 39.

3.2 Simulation

To simulate a value or a relay state, select

- alarm relay
- relay 1 and 2
- signal outputs 1 and 2
- signal outputs 3 and 4 (if option is installed)

Change the value or state of the selected item with the arrow keys. Press [Enter].

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

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

3.2.1	**Relays**	
3.2.1.1	Alarm relay:	Active or inactive
3.2.1.2	Relay 1:	Active or inactive
3.2.1.3	Relay 2	Active or inactive
3.2.2	**Signal outputs**	
3.2.2.1	Signal outputs 1 and 2:	Current in mA
3.2.2.2	Signal outputs 3 and 4:	Current in mA

3.3 Set Time

Adjust date and time.

3.4 Quality Assurance

Follow the commands on the screen.

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 5.3 Relay Contacts, p. 62.

4.3 Logger

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

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

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

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

4.4 Display

Process values are displayed on two screens. Toggle screens with the ^ key. Each screen displays a maximum of three process values.

4.4.1 Screen 1:

4.4.1.1 *Row 1*

4.4.1.2 *Row 2*

4.4.1.3 *Row 3*

Possible settings for all rows are:

- None
- Cond. comp. (tc)
- Cond. uncomp. (uc)
- Cond USP (usp)

4.4.2 Screen 2:

See screen 1.

5 Installation

5.1 Sensors

5.1.1 *Flow:* Select “Q-Flow” if a Swan flow meter is connected.
Available values: Q-Flow or None

5.1.2 USP parameter: Alarm (E015) according to limits of USP <645>.

5.1.2.1 *Operating Mode:* Enable USP mode. Available values: off/on

5.1.2.2 *Limit:* Possibility to lower the official USP limits in % of the USP values.
Range: 20–100%

5.1.3 Sensor parameters:

5.1.2.1.1 *Cell Constant:* Enter the cell constant (ZK) printed on the sensor label.

5.1.2.1.2 *Temp. Corr:* Enter the temperature correction (DT) printed on the sensor label.

5.1.2.1.3 *Cable length:* Enter the cable length. If the transmitter and the flow cell are mounted together on one panel, set the cable length to 0.0 m.

5.1.3.4 *Measuring unit:* Select measuring unit.
Available values: µS/cm or µS/m

5.1.4 Temp. Compensation:

5.1.4.1 *Compensation:* Select temperature compensation.
Available values: Coefficient, neutral salts, high-purity water, strong acids, strong bases, ammonia, ethanolamine, morpholine or none.

5.1.5 Quality Assurance: Switch quality assurance on or off.

5.1.5.1 *Level*: Select quality level:

- Level 0: Off
  Quality assurance procedure switched off. Any additional QA menus are hidden.
- Level 1: Trend
- Level 2: Standard
- Level 3: Crucial
- Level 4: User

Edit user specific limits in menus 5.1.5.2 to 5.1.5.4.

5.2 Signal Outputs

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

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

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

- Conductivity
- Temperature
- Sample flow
- Conductivity uncompensated

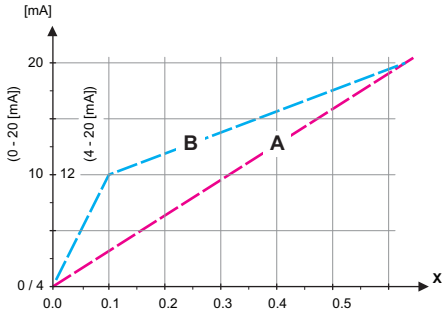
5.2.1.2 *Current Loop:* Select the current range of the signal output. Make sure the connected device works with the same current range. Available ranges: 0–20 mA or 4–20 mA

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

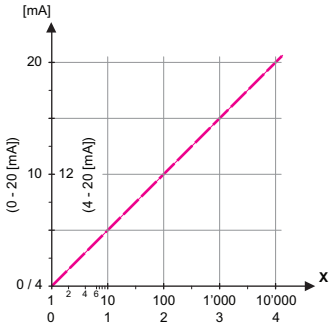
- Linear, bilinear or logarithmic for process values.
- Control upwards or control downwards.

As process values

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



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



X *Measured value (logarithmic)*

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

Parameter 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

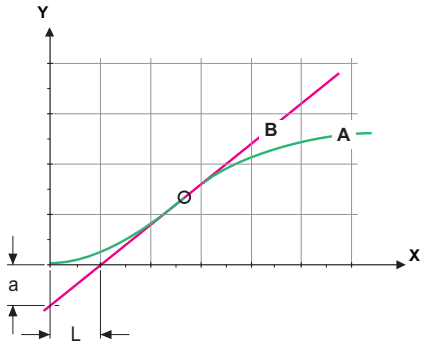
5.2.1.40.23 *Range high*: 0 µS–300 mS

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 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*
Range: 0.000 µS–300 mS

5.2.1.43.20 *P-Band*:
Range: 0.000 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: -25 to +270 °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:

- 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: 0.000 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: 0.000 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: 0.000 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 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.x *Alarm High:* If the measuring values rises above the programmed value E009 will be issued.
Range: 10.0–50.0 l/h

5.3.1.2.x *Alarm Low:* If the measuring values falls below the programmed value E010 will be issued.
Range: 0.0–9.0 l/h

5.3.1.3 Sample temperature

5.3.1.3.1 *Alarm High:* If the sample temperature rises above the programmed value E007 is issued.
Range: 30–200 °C

5.3.1.3.x *Alarm Low:* If the sample temperature falls below the programmed value E008 is issued.
Range: -10 to +20 °C

5.3.1.4 *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

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

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

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

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

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

5.3.2.1 Function = Limit upper/lower:

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

5.3.2.20 *Parameter:* select a process value

5.3.2.300 *Setpoint:* If the measured value rises above respectively falls below the 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	-25 to 270 °C
Sample flow	0–50 l/h
Cond. uc	0 µS–300 mS

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

5.3.2.1 Function = Control upwards/downwards:

The relays can be used to drive control units such as solenoid valves or membrane dosing pumps.

5.3.2.22 *Parameter:* Choose one of the following process values.
- Conductivity)
- Temperature
- Sample Flow
- Cond. uc

5.3.2.32 Settings: Choose the respective actuator:
- Time proportional
- Frequency

5.3.2.32.1 Actuator = Time proportional

Dosing is controlled by the operating time.

5.3.2.32.20 *Cycle time:* duration of one control cycle (on/off change).
Range: 0–600 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.

5.3.2.32.1 Actuator = Frequency

Dosing is controlled by the repetition speed of dosing shots.

5.3.2.32.21 *Pulse frequency:* Max. pulses per minute the device is able to respond to. Range: 20–300/min.

5.3.2.32.31 Control Parameters
Range for each parameter same as 5.2.1.43.

5.3.2.1 Function = Timer

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

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

5.3.2.24 Interval

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

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

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

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

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

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

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

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

Cont.: Controller continues normally.

Hold: Controller continues based on the last valid value.

Off: Controller is switched off.

5.3.2.24 daily

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

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

1 Press [Enter], to set the hours.

2 Set the hour with the ^ or v keys.

3 Press [Enter], to set the minutes.

4 Set the minutes with the ^ or v keys.

5 Press [Enter], to set the seconds.

6 Set the seconds with the ^ or v 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. 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 is switched via Profibus or Modbus. 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 when the input relay is closed
	When open: Input is active when the input relay is open
5.3.4.2	*Signal Outputs:* Select the operation mode of the signal outputs when the relay is active:
	Continuous: Signal outputs continue to issue the measured value.
	Hold: Signal outputs hold the last valid measured value. Errors, except fatal errors, are not issued.
	Off: Sets the signal outputs to 0 or 4 mA. Errors, except fatal errors, are not issued.
5.3.4.3	*Output/Control:* (relay or signal output):
	Continuous: Controller continues normally.
	Hold: Controller continues based on the last valid value.
	Off: Controller is switched off.

5.3.4.4 *Fault:*

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

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

5.4 Miscellaneous

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

5.4.2 *Set defaults:* The instrument can be reset 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 **Access:** To activate password protection, perform the following steps:

1. Activate the required number of users 1 to 9 by setting a password different from "00000000".
2. Enter a meaningful name for each user.
3. Set the function of each user to Administrator, Service or Operator.
4. Set a password different from "00000000" for the predefined administrator user in menu 5.4.4.1.
   ⇒ *After this, the Messages, Diagnosis, Maintenance, Operation and Installation menus can no longer be accessed without entering a password.*

5.4.4.1 **Administrator**
Pre-defined administrator user.

5.4.4.1.1 *Name:* not changeable.

5.4.4.1.2 *Function:* not changeable.

5.4.4.1.3 *Password:* Set a password with eight characters, containing at least one upper case letter, one lower case letter and one number.

5.4.4.2 User 1

5.4.4.2.1 *Name:* Enter the name of the user.

5.4.4.2.2 *Function:*

Function
Administrator
Service
Operator

- Administrator: Access to all menus. Only an administrator can assign user rights and passwords to users 1 to 9.
- Service: Access to all menus except Installation.
- Operator: Access to the Messages and Diagnostic menus.

5.4.4.2.3 *Password:* Set a password containing at least one upper case letter, one lower case letter and one number.

5.4.4.3 User 2
See User 1.

5.4.4.4 User 3
See User 1.

5.4.4.5 User 4
See User 1.

5.4.4.6 User 5
See User 1.

5.4.4.7 User 6
See User 1.

5.4.4.8 User 7
See User 1.

5.4.4.9 User 8
See User 1.

5.4.4.10 User 9
See User 1.

5.4.5 *Sample ID:* Enter a meaningful text, e.g. the KKS number.

5.4.6 *Screen Timeout:* Time after which password-protected menus are automatically exited if no button has been pressed and no process is running.
Range: 2–20 min

5.5 Interface

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

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

10. Default Values

Operation

Sensors	Filter Time Const.: 10 s Hold after Cal.: 300 s
Alarm Relay	same as in Installation
Signal Output	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

Sensor	Flow: None USP parameters: Operating Mode off USP parameters: Limit: 100% Sensor parameters: Cell Constant: 0.08000 cm $^{-1}$ Sensor parameters: Temp. corr.: 0.00 °C Sensor parameters: Cablel lenght: 0.0 m Sensor parameters: Meas. unit: µS/cm Temp. Compensation: Comp. none Quality Assurance: Level 0: off
Signal Output 1/2	Parameter: Conductivity Current loop: 4–20 mA Function: linear Scaling: Range low: 0.000 µS Scaling: Range high: 1.00 mS Scaling: Temperature: Range low: 0.0 °C Scaling: Temperature: Range high: 50.0 °C Scaling: Conductivity uc: Range low: 0.000 µS Scaling: Conductivity uc: Range high: 1.00 mS Scaling: Sample Flow: Range low: 0 l/h Scaling: Sample Flow: Range high: 200 l/h
Alarm Relay	Alarm Conductivity: Alarm high: 300 mS Alarm Conductivity: Alarm low: 0.000 µS Alarm Conductivity: Hysteresis: 1.00 µS Alarm Conductivity: Delay: 5 s Sample Flow: Flow Alarm: yes Sample Flow: Alarm High: 20 l/h Sample Flow: Alarm Low: 5 l/h Sample Temp.: Alarm High: 160 °C Sample Temp.: 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: ..... 10.0 µS
	Delay: ..... 30 s
	If Function = Control upw. or dnw:
	Parameter: ..... Conductivity
	Settings: Actuator: ..... Frequency
	Settings: Pulse Frequency: 120/min
	Settings: Control Parameters: Setpoint: ..... 30 mS
	Settings: Control Parameters: P-band: ..... 10.0 µS
	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: ..... 1 min
	Mode: daily/weekly: ..... Starting time: 00:00:00
	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
	Access: Password: Administrator 00000000
	Access: Password: User 1 ... 9 00000000
	Menu timeout: ..... 10 min

swan
ANALYTICAL INSTRUMENTS

A-96.210.561 / 091024

Swan Products - Analytical Instruments for:

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SWISS MADE

AMI-II Pharmacon