ANALYTICAL INSTRUMENTS

A-96.150.691 / 131223

AMU-II Pharmacon

Operator's Manual

SWISS MADE

Customer Support

Swan and its representatives maintain a fully trained staff of technical specialists around the world. For any technical question, contact your nearest Swan representative, or the manufacturer:

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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

Mains voltage

Electrical shock hazard

- Maintenance on electronic parts shall be performed by authorized personnel only.
- Whenever maintenance on electronic parts is required, disconnect instrument power and power of devices connected to.
  - relay 1,
  - relay 2,
  - alarm relay
- 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.

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 AMU-II Pharmacon transmitter is used together with the two-electrode inline sensors Pharmacon NPT or Pharmacon SAN for applications in

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

Measured value

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 scaleable, linear or bilinear) or as continuous control output (control parameters programmable).

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

Relays

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

Maximum load:	100 mA/50 V

Alarm relays

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

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

Maximum load: 100 mA/50 V

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 (option)

- RS485 interface (galvanically separated) for communication via Modbus or Profibus DP
- USB interface for logger download
- HART interface
- RS232 interface for logger download with HyperTerminal

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 AMU-II Pharmacon Transmitter

General

Electronics housing:	Noryl® resin
Protection degree:	up to IP54 (front)
Ambient temperature:	-10 to +50 °C
Humidity:	10–90% rel., non condensing
Display:	backlit LCD, 75 x 45 mm
Dimensions:	96 x 96 x 85 mm
Cutout size	92 x 92 mm (DIN IEC 61554:2002-08)
Weight:	0.30 kg

Power supply

AC variant:	100–240 VAC (±10%) 50/60 Hz (±5%)
DC variant:	10–36 VDC
Power consumption:	max. 3 VA

Conductivity sensor type

2-electrode sensor

Measuring range

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

Sample flow measurement

with digital SWAN sample flow sensor

2.2.2 Swansensor Pharmacon

Two-electrode conductivity sensor for the inline measurement of purified water and water for injection.
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 (~30cm, PTFE) with M16 male plug.

The sensor is accompanied with the following certificates:

- Cell constant,
- Material specification
- Inspection certificate according to EN 10204, surface roughness with SS Pharmacon SAN.

Specifications

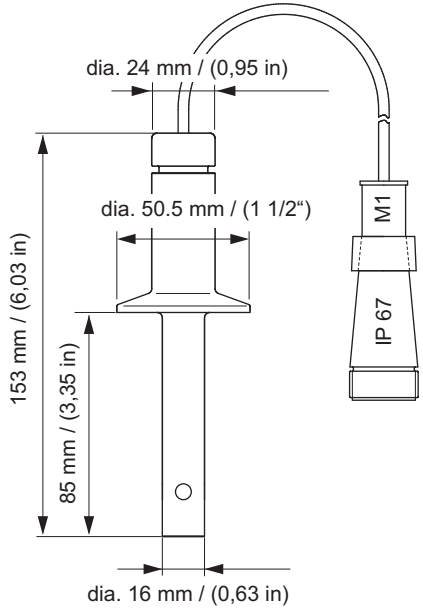
Measuring range:	0.055–1'000 µS/cm
Accuracy (at 25°C):	±2% up to 500 µS/cm ±3% above 500 µS/cm up to 1'000 µS/cm
Cell constant:	0.1 cm^{-1}

Material:

Shaft and electrode:	SS 316L (1.4435) stainless steel
Isolator:	PEEK
Roughness:	R_a < 0.4 µm
Temperature sensor:	Pt1000, accuracy ±0.2 °C
Sensor mounting:	sanitary flange 1 ½"
Operating temperature:	-10 to +120 °C
Sterilization temp.:	-10 to +155 °C
Operating pressure:	17 bar at 25 °C, max. 7 bar at +95 °C

Dimensions

Total length:	153 mm
Insertion length:	85 mm



Swansensor Pharmacon NPT

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

The sensor is accompanied with the following certificates:

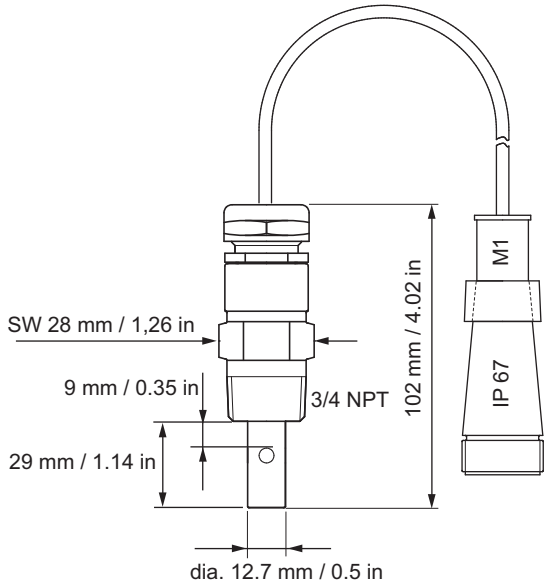
- Cell constant
- Material specification
- Inspection certificate according to EN 10204 (surface roughness with SS Pharmacon NPT).

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 & Electrode:	SS 316L (1.4435) stainless steel, titan
	Isolator:	PEEK
	Roughness:	R_a < 0.4 µm
	Temperature sensor:	Pt1000, accuracy ±0.2 °C
	Sensor mounting:	NPT thread ¾”
	Operating temperature:	-10 to +120 °C
	Sterilization temp.:	-10 to +155 °C
	Operating pressure:	17 bar at 25 °C, max. 7 bar at +95 °C

Dimensions

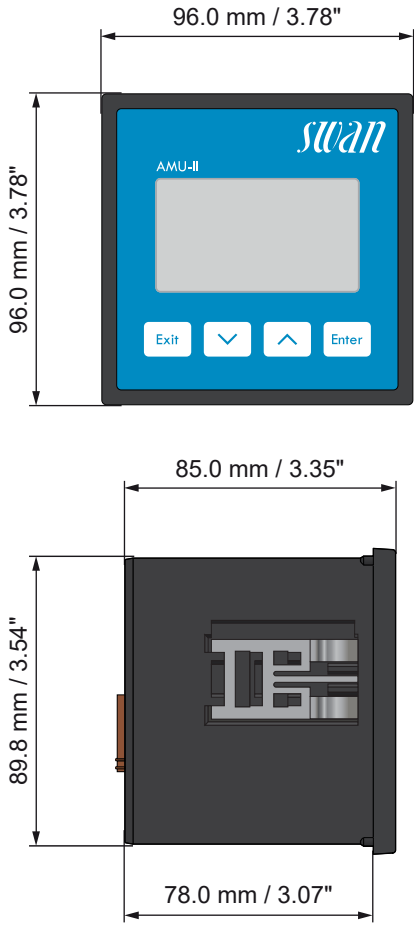
Total length:	102 mm
Insertion length:	29 mm



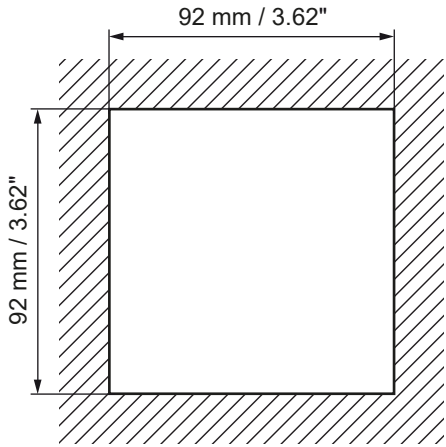
3. Installation

3.1. Mounting of the AMU-II Transmitter

Transmitter dimensions

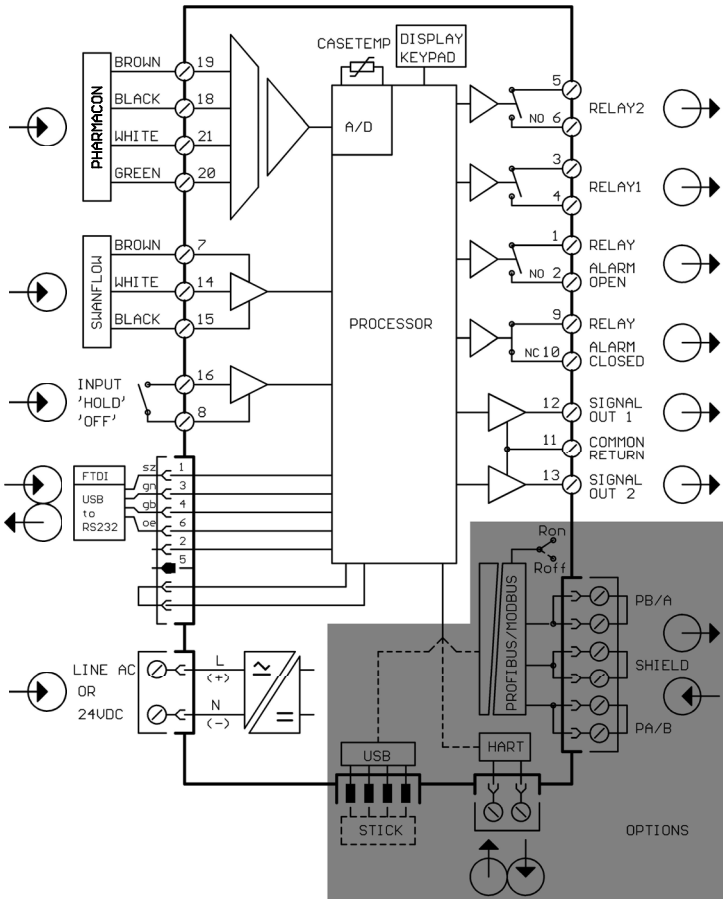


Cutout dimensions



3.2. Electrical Connections

Connection diagram



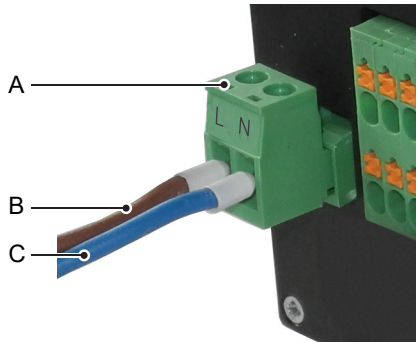
CAUTION

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. Power Supply

CAUTION

Do not apply power to the transmitter until all electrical connections have been made.



A *Pluggable terminal block*
B *Phase/(+) conductor*
C *Neutral/(-) conductor*

Installation requirements

The installation must meet the following requirements:

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

3.4. Sensor

Terminals: see Connection diagram, p. 18.
Sensor settings: see Instrument Setup, p. 25.

3.5. Swan Flow Meter

Terminals: see Connection diagram, p. 18.

3.6. Input

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

Terminals 16/8
For programming see Program List and Explanations, p. 51.

3.7. Relay Contacts

3.7.1 Alarm Relay

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

Alarm output for system errors. For error codes see Error List, p. 43.

	Terminals	Description
NC Normally Closed	9/10	Active (opened) during normal operation. Inactive (closed) on error and loss of power.
NO Normally Open	1/2	Active (closed) during normal operation. Inactive (opened) on error and loss of power.

3.7.2 Relay 1 and 2

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

Terminals 3/4: Relay 1
Terminals 5/6: Relay 2
For programming see Program List and Explanations, p. 51, Installation menu.

3.8. 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 12 (+) and 11 (-)
Signal output 2: Terminals 13 (+) and 11 (-)
For programming see Program List and Explanations, p. 51, Installation menu.

3.9. Interface Options

The functionality of the AMU-II Pharmacon can be expanded with one of the following interface options:

- RS485 with Modbus or Profibus protocol
- HART
- USB

3.9.1 Installation

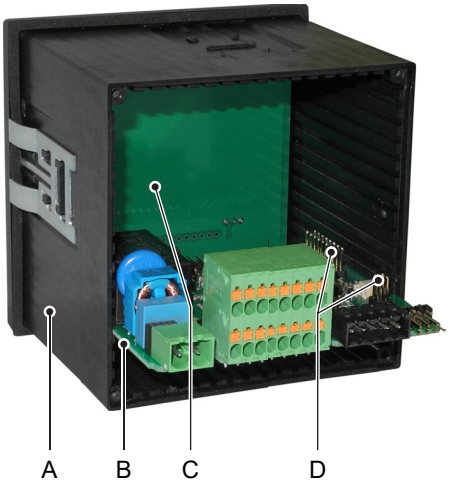
WARNING

Electrical shock hazard

Before opening the housing, disconnect the AMU-II transmitter from the power supply.

CAUTION

Observe precautions for handling electrostatic discharge sensitive devices.



A *Housing*
B *Mainboard*
C *Display board*
D *Pins for interface option*

To install an interface option, proceed as follows:

1 Switch power off.

2 Loosen the four screws at the back of the AMU-II transmitter and remove the backplate.

3 Pull the mainboard [B] completely out of the housing.

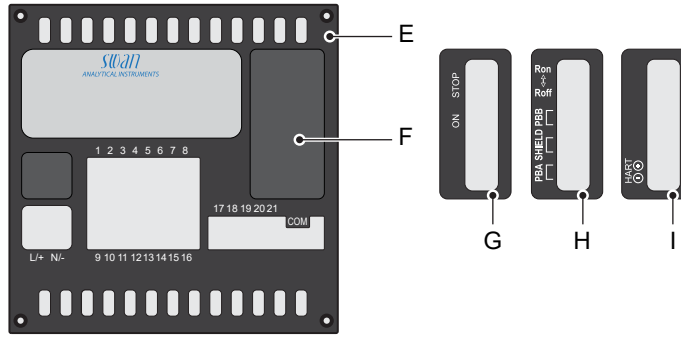
4 Plug the interface option onto the pins [D] on the mainboard.

5 Reinsert the mainboard into the housing, making sure to insert both boards into the correct guide grooves.

Mainboard:	Fourth guide groove from the bottom
Interface option:	First guide groove from the right

6 Carefully press the mainboard [B] against the display board [C] until it snaps into place.

Connector field



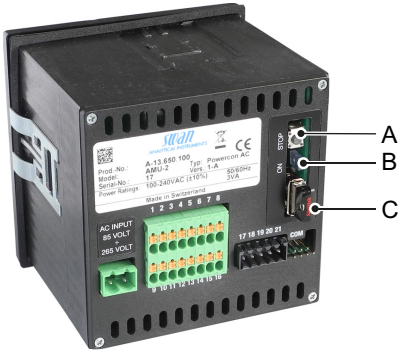
E *Backplate*
F *Covered connector field (condition at delivery)*
G *Labeling for USB option*
H *Labeling for RS485 option*
I *Labeling for HART option*

7 Remove the cover [F] from the connector field.

8 Apply the supplied sticker [G], [H] or [I] to the connector field.

9 Reinstall the backplate [E] onto the housing.

3.9.2 USB Option



A *Pushbutton*
B *Blue LED*
C *USB stick*

Menu item

Calling up the <Operation>/<Eject USB Stick> menu item performs the following actions:

- the calibration history and the event history are copied to the USB stick,
- the logger file is completed (the next time the USB stick is inserted, a new file will be created),
- the USB stick is deactivated and can be removed.

Pushbutton

Pressing the pushbutton [A] has the same effect as calling up the <Eject USB Stick> menu item.

Blue LED

The blue LED is **on** if the USB stick is plugged in and ready to record data.
The blue LED is **off** when the USB stick has been deactivated and is ready to be removed.

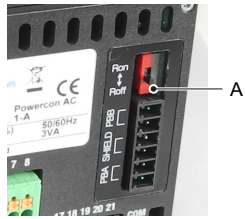
3.9.3 RS485 Option

Menu items

After the RS485 option has been installed, the <Installation>/<Interface> menu item becomes visible. Select Modbus RTU or Profibus as protocol.

Terminating resistor

On the last RS485 interface in the network, move the switch to the position marked “Ron” to activate the terminating resistor.



A *Switch for terminating resistor*

Interface Description

The Modbus and Profibus interface descriptions can be downloaded from www.swan.ch.

3.9.4 HART Option

Menu items

The configuration is done via the following menu items:
<Installation>/<Signal Outputs>/<Signal Output 3>:
<Installation>/<Interface>/<Device Address>:

Field Device Description

The HART® 7.x Field Device Specification can be downloaded from www.swan.ch.

3.10. RS232 Interface

The RS232 interface is located on the back of the AMU-II transmitter. Use the USB to RS232 interface converter available from Swan.

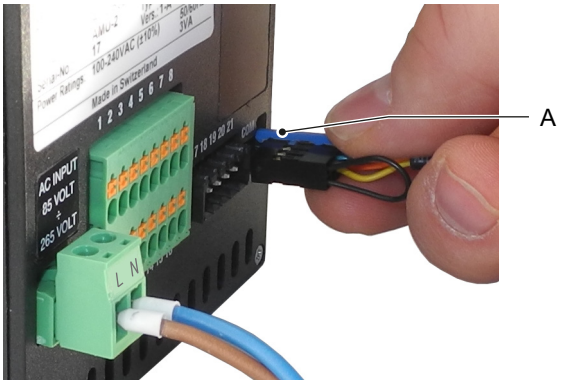
Downloading SwanTerminal

To use the functions provided via the RS232 interface, the SwanTerminal program is required, which can be downloaded from www.swan.ch.

Establishing a connection

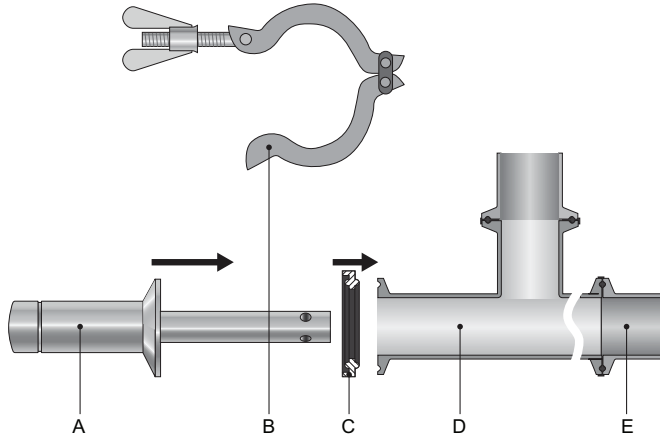
To establish a connection between the PC and the AMU-II transmitter, proceed exactly in the following order:

1. Apply power to the AMU-II transmitter.
2. First connect the interface converter to the USB port of the PC without the AMU-II connected to the other end of the cable.
3. Wait a few seconds for the interface converter to be detected by the operating system.
4. Connect the other end of the cable to the pins labeled “COM” on the back of the AMU-II transmitter. The blue coding pin [A] must be at the top right corner.
   ⇒ *The AMU-II transmitter reboots automatically.*



5. Start the SwanTerminal program on the PC and select the correct COM port.
6. Click the button in SwanTerminal to connect to the AMU-II transmitter.

3.11. 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:

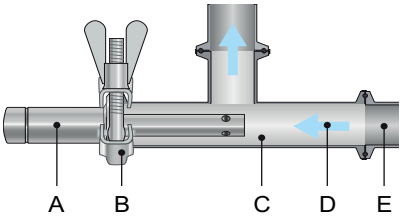
1 Make sure that the surface of the T-Piece flange [D] is clean.

2 Put the gasket [C] onto the flange.

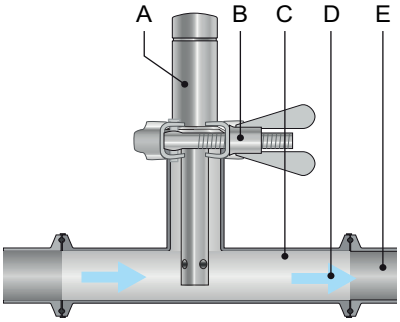
3 Insert the Swansensor Pharmacon SAN into the T-Piece [D].

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

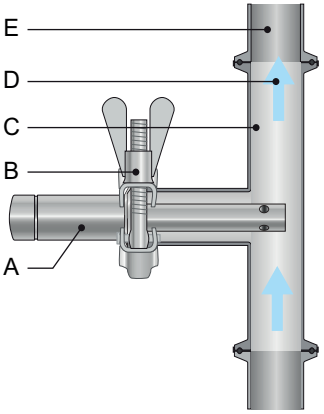
Recommended Installation



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



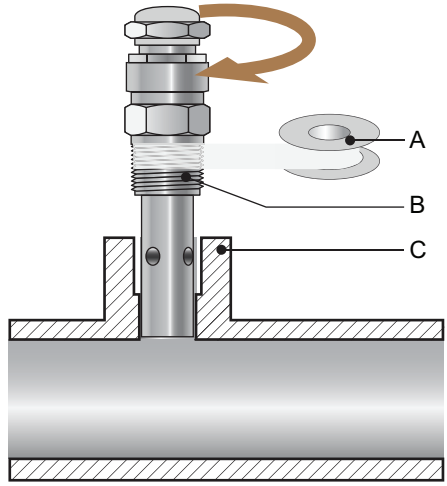
Vertical installation is possible if the pipe is always full and no air can be trapped between the electrodes.



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*

3.12. Install the Swansensor Pharmacon NPT



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

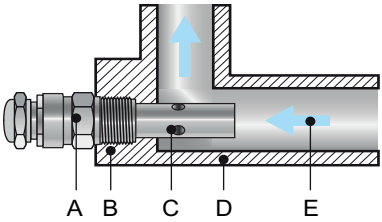
To install the Swansensor Pharmacon NPT into a pipe flange proceed as follows:

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

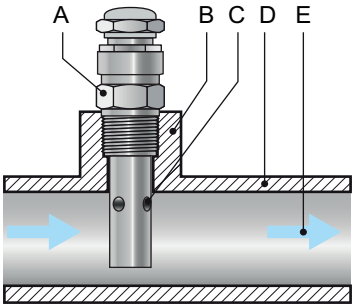
2 Screw the sensor into the pipe flange.

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

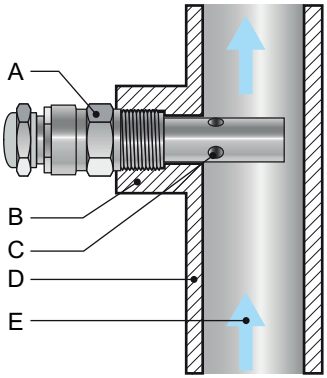
Recommended Installation



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

1 Switch on power.

2 Let the instrument run in for 1 h.

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

Program all sensor parameters in Menu 5.1.3
<Installation>/<Sensors>/<Sensor parameters>:
Enter the:

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

Cell constant

Menu 5.1.3.1
The sensor characteristics 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

Temp. corr

Menu 5.1.3.2
Enter the temperature correction DT printed on the label.

Cable length

Menu 5.1.3.3
Enter the length of the cable between the transmitter and the sensor.

Measuring unit

Menu 5.1.3.4
Set the <Measuring unit> according to your requirements:

- µS/cm
- µS/m

Temp. Compensation

Menu 5.1.4
Choose between:

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

Quality assurance

Menu 5.1.5 (Activate if required).
Set the Level according to your requirements, details see Quality Assurance of the Instrument, p. 40.

External devices

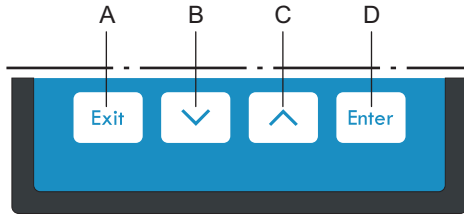
Program all parameters for external devices (interface, recorders, etc.) See program list and explanations 5.2 Signal Outputs, p. 58 and 5.3 Relay Contacts, p. 62.

Limits Alarms

Program all parameters for instrument operation (limits, alarms). See program list and explanations 5.3 Relay Contacts, p. 62.

5. Operation

5.1. Keys



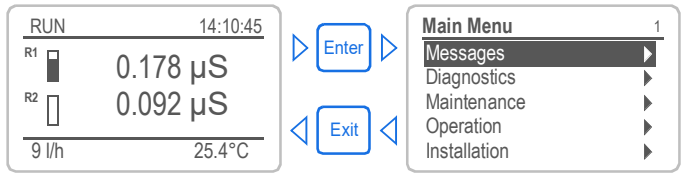
A to exit a menu or command (rejecting any changes)
to move back to the previous menu level

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

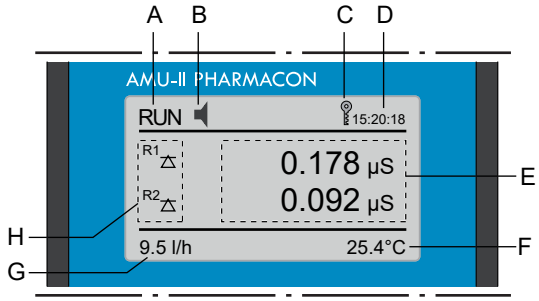
C to move UP in a menu list and to increase digits

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

Program Access, Exit



5.2. Display



A	RUN	normal operation	
	HOLD	input closed or cal delay: Instrument on hold (shows status of signal outputs).	
	OFF	input closed: control/limit is interrupted (shows status of signal outputs).	
B	Error	Error	Fatal Error

C Keys locked, transmitter control via Profibus

D Time

E Process values

F Sample temperature

G Sample flow

H Relay status

Relay status, symbols

upper/lower limit not yet reached

upper/lower limit reached

control upw./downw. no action

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

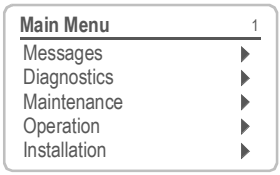
motor valve closed

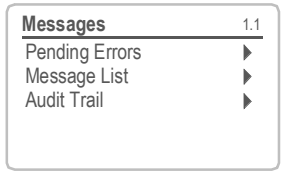
motor valve: open, dark bar indicates approx. position

timer

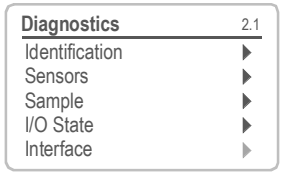
timer: timing active (hand rotating)

5.3. Software Structure

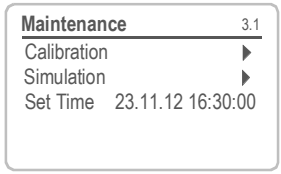




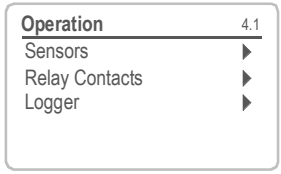
Menu **Messages 1**
Reveals pending errors as well as an event history (time and state of events that have occurred at an earlier point of time).
It contains user relevant data.



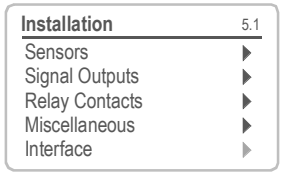
Menu **Diagnostics 2**
Provides user relevant instrument and sample data.



Menu **Maintenance 3**
For instrument calibration, relay and signal output simulation, and to set the instrument time.
It is used by the service personnel.



Menu **Operation 4**
User relevant parameters that might need to be modified during daily routine. Normally password protected and used by the process-operator.
Subset of menu 5 - Installation, but process-related.

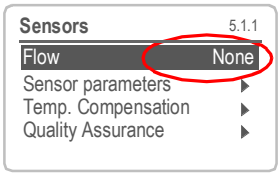


Menu **Installation 5**
For initial instrument set up by SWAN authorized person, to set all instrument parameters. Can be protected by means of password.

5.4. Changing Parameters and values

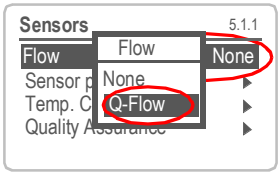
Changing parameters

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



1 Select the parameter you want to change.

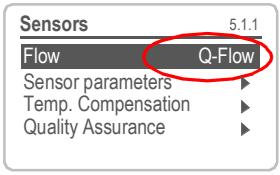
2 Press <Enter>



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

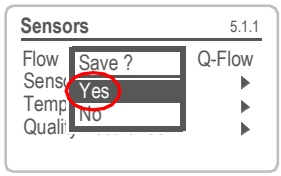
4 Press <Enter> to confirm the selection or <Exit> to keep the previous parameter).

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



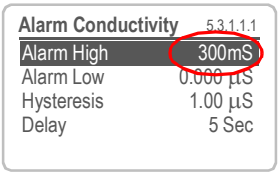
5 Press <Exit>.

⇒ *Yes is highlighted.*



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

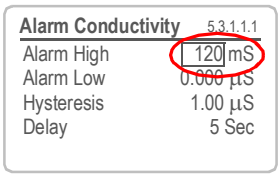
Changing values



1 Select the value you want to change.

2 Press <Enter>.

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



4 Press <Enter> to confirm the new value.

5 Press <Exit>.
⇒ *Yes is highlighted.*

6 Press <Enter> to save the new value.

6. Maintenance

6.1. Maintenance Schedule

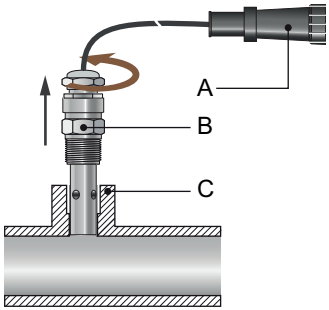
As required	Clean sensor. If a test resistor is available, perform a transmitter test.

6.2. Stop of Operation for Maintenance

Shut off power of the instrument.

6.3. Cleaning the Sensor

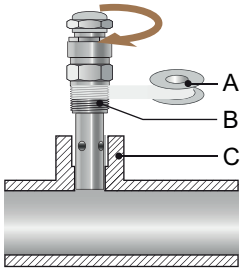
The Swansensor Pharmacon NPT/SAN is largely maintenance free. Depending on the application, however, the sensor may become contaminated, which can lead to problems.
If the sensor is contaminated proceed as follows to clean the sensor.



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 an 28 mm open-ended spanner.

6.4. Alarm Function According to 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

USP parameter

The 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)

Note: *Keep the test resistor kit absolute 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 plus a user level. Hereby the inspection interval, the deviation limits of temperature and measuring result between the inspection equipment and the monitoring instrument are defined.

- Level 1: **Trend;** Measurement used as an additional information to follow the process indicating trends.
- Level 2: **Standard;** Monitoring of several parameters of a process (e.g. Temp., TOC, etc.). 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:

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

Tab. 8-1 *Limits and interval for AMU-II Pharmacon*

Quality level	max. deviation temperature [°C][a)]	max. deviation result [%]	min. inspection interval
0: Off	**Off**	**Off**	Off
1: Trend	**0.5 °C**	**10.0 %**	annual
2: Standard	**0.4 °C**	**5.0 %**	quarterly
3: Crucial	**0.3 °C**	**3.0 %**	monthly
4: User	**0 - 2.0 °C**	**0 - 20 %**	annual, quarterly, monthly, weekly

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

Procedure The standard workflow contains following procedures:

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

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

6.6.1 Activate Swan Quality Assurance Procedure

Activate the quality assurance procedure for the process monitor(s) to be checked by selecting the quality level in menu 5.1.5. The corresponding submenus then become visible.
The activation is necessary the first time only.

6.6.2 Pre-Test

- AMI Inspector Pharma:
  - Check certificate; Certificate not older than one year.
  - Check battery; The battery should be completely charged. Remaining operating time on display minimum 20 hours.
  - Disable temperature compensation (set to “none”)
- In-line instrument: AMU-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 (as for example flow 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:

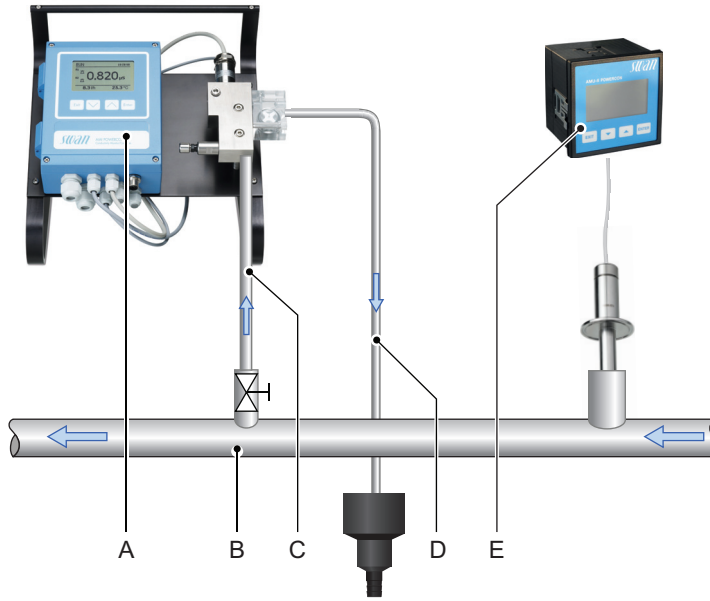
- via Sample point,
- via T-fitting or
- as piggyback / downstream

Note: *Important for correct measurements are in any case:*

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

Example: sampling via sampling point

The AMI Inspector Pharmacon, is connected up-stream 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 *AMU-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.

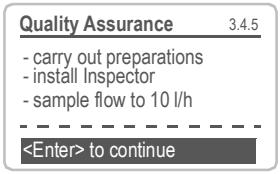
3 Switch on AMI Inspector Pharma and open its flow regulating valve completely.

4 Start sample flow again and regulate sample flow. Run in time >15min.

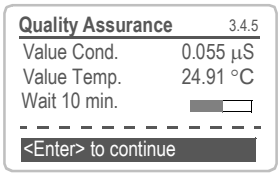
6.6.4 Carry Out Comparison Measurement

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

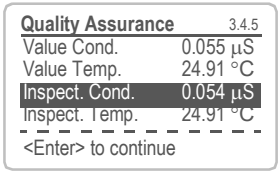
2 Follow the dialog on the Display.



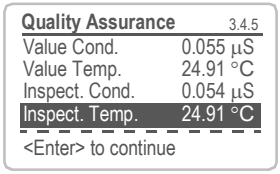
3 Carry out pre test preparations.
Connect instruments.
Regulate sample flow to 10 l/h using the appropriate valve.



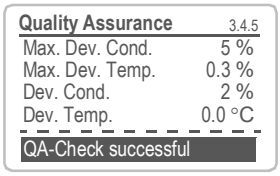
4 Wait 10 minutes whilst measurement is running.
Press [Enter] to continue.



5 Read the µS value of the AMI Inspector Pharma and enter it in the “Inspector Cond.” field.
Press [Enter] to confirm.



6 Read the temperature value of the AMI Inspector Pharma and enter it in the “Inspector Temp.” field.
Press [Enter] to confirm.
Press [Enter] to continue.



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

6.7. Longer Stop of Operation

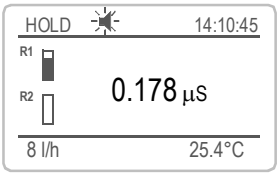
1. Shut off power of the instrument.
2. Close the flow regulating valve of the AMI Inspector Pharma.
3. Disconnect the AMI Inspector Pharma by removing the tubes.

7. Error List

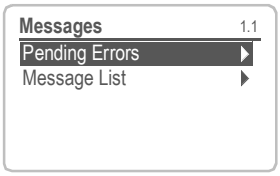
Error
Non-fatal error. Indicates an alarm if a programmed value is exceeded.
Such errors are marked **E0xx**.

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:

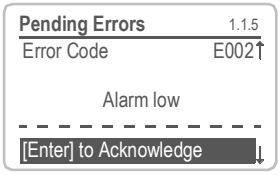
- Errors which disappear if correct measuring conditions are recovered (i.e. Sample Flow low).
  Such errors are marked **E0xx**
- Errors which indicate a hardware failure of the instrument.
  Such errors are marked **E0xx**



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 a pending error.
⇒ *The error is reset and saved in the message list.*

Error	Description	Corrective action
E001	Cond. Alarm high	– check process – check program value 5.3.1.1, p. 63
E002	Cond. Alarm low	– check process – check program value 5.3.1.1, p. 63
E007	Sample Temp. high	– check sample temperature – check program value 5.3.1.3, p. 63
E008	Sample Temp. low	– check sample temperature – check program value 5.3.1.3, p. 63
E009	Sample Flow high	– check sample flow – check program value 5.3.1.2, p. 63
E010	Sample Flow low	– establish sample flow – clean instrument – check program value 5.3.1.2, p. 63
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 program value 5.3.1.4, p. 63
E014	Case Temp. low	– check case/environment temperature – check program value 5.3.1.5, p. 64
E015	USP Error	– Measured value above programmed USP limit (% setpoint)
E017	Control Timeout	– check control device or programming in Installation, Relay contact, Relay 1/2 5.3.2/3, p. 64
E018	Quality Assurance	– Perform QA Procedure using reference instrument, e.g. AMI Inspector.

Error	Description	Corrective action
E024	Input active	– See If Fault Yes is programmed in Menu 5.3.4, p. 68
E026	IC LM75	– call service
E030	EEprom Frontend	– call service
E031	Calibration Recout	– call service
E032	Wrong Frontend	– call service
E033	Power-on	– none, normal status
E034	Power-down	– none, normal status

8. Program Overview

For explanations about each parameter of the menus see Program List and Explanations, p. 54.

- 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* *Date, Time*	1.2.1*	
Audit Trail 1.3*	*Audit Trail* *Number, Date, Time*	1.3.1*	

8.2. Diagnostics (Main Menu 2)

Identification	Designation	*AMU-II Pharmacon*		* Menu numbers
2.1*	Version	*V1.00 – 06/20*		
	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)*		
		Test History	*Number*	2.2.1.4.1*
		2.2.1.4*	*Date, Time*	
			Deviation Cond.	
			Deviation Temp.	
			Check successful	
		QA History	*Number*	2.2.1.5.1*
		2.2.1.5*	*Date, Time*	
			Deviation Cond.	
			Deviation Temp.	
			Check successful	
	Miscellaneous	*Case Temp.*	2.2.2.1*	
	2.2.2*			
Sample	*Sample ID*	2.3.1*		
2.3*	*Temperatur*			
	(Pt 1000)			
	Sample flow			
	(Raw value)			
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*		
2.5*	*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 1-4*	5.4.4.2*- 5.4.4.5*	
	Sample ID	5.4.5*	*Name/Function/Password*	
Interface	*Protocol*	5.5.1*		
5.5*	*Baud Rate*	5.5.x*		

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).

1.3 Audit Trail

1.3.1 Shows the audit trail: event, menu, date and time of issue.

2 Diagnostics

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

2.1 Identification

Designation: View the Designation of instrument.
Version: Firmware of instrument (e.g. V1.00–06/20)

2.1.3 **Factory Test**: Test date of the instrument, motherboard and frontend quality control factory test.

2.1.4 **Operating Time**: Years, days, hours, minutes, seconds

2.2 Sensors

2.2.1 **Cond. Sensor:**
Current value: Current conductivity value [µS].
Raw value: Uncompensated current conductivity value [µS].

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.

2.2.1.5 **QA History:** Review QA values (number, date, time, deviation conductivity, deviation temperature, status of QA check) of the last quality assurance procedures.

2.2.2 Miscellaneous:

2.2.2.1 *Case Temp:* Shows the temperature [°C] inside the transmitter.

2.3 Sample

2.3.1 **Sample ID:** Review the programmed code. The code is defined by the user to identify the sample point in the plant.
Temperature: Actual temperature [°C] and [Ohm] (Pt 1000)
Sample flow: Only available if flow meter is used. Sample flow [l/h] and raw value [Hz].

2.4 I/O State

Shows current status of all in- and outputs.

2.4.1/2.4.2

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

2.5 Interface

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

3 Maintenance

3.1 Transmitter Test

3.1.5 Follow the commands on the screen.
See Transmitter Test, p. 39

3.2 Simulation

To simulate a value or a relay state, select
- alarm relay,
- relay 1/2,
- signal output 1/2

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

Alarm Relay:	Active or inactive
Relay 1/2:	Active or inactive
Signal Output 1/2:	The preset current is simulated in mA

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

3.3 Set Time

Adjust date and time.

3.4 Quality Assurance

Performs a quality assurance according to your settings. 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: 5–6‘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 downloaded to a PC using the built-in RS232 interface.
The logger can save approx. 1500 data records. Records consist of: Date, time, alarms, measured value, measured value uncompensated, temperature, flow.

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

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

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

4.4 Display

4.4.1-4.4.2 **Screen 1/2**: Assign available measurement values to screen 1 or 2.

4.4.1/2.x *Row 1/2/3:* Assign available measurement values to row 1 to 3 for each screen.
Available values: Conductivity compensated (tc), Conductivity uncompensated (uc) or USP conductivity alarm (usp) or None.

5 Installation

5.1 Sensors

5.1.1 *Flow:* Select “Q-Flow” if the sample flow should be measured using a Swan flow meter.
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:**

5.1.3.1 *Cell Constant:* Enter the cell constant (ZK). It is printed on the label of the used sensor.
Range: 0.005000–11.00 cm^{-1}

5.1.3.2 *Temperature Correction:* Enter the temperature correction (DT). It is printed on the label of the used sensor.
Range: -1.00 to +1.00 °C

5.1.3.3 *Cable length:* Enter the cable length
Range: 0.0–30.0 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, Eth. am., 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 menu <Signal Output 1> and <Signal Output 2> is equal. For reason of simplicity only the menu numbers of Signal Output 1 are used in the following*

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

5.2.1.1 *Parameter:* Assign one of the process values to the signal output.
Available values: Conductivity, Temperature, Sample flow, and Conductivity uc

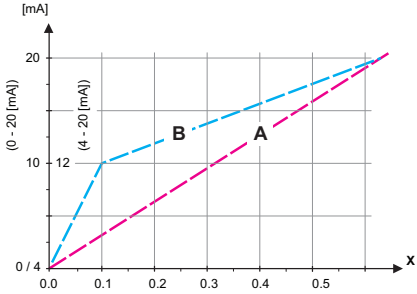
5.2.1.2 *Current Loop:* Select the current range of the signal output.
Make sure the connected device works with the same current range.
Available ranges: 0–20 [mA] or 4–20 [mA]

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

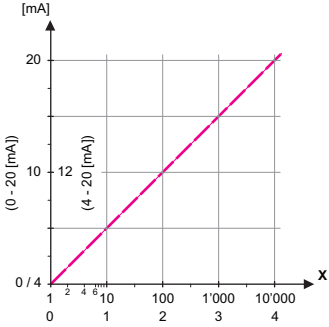
- Linear, bilinear or logarithmic for process values.
  See As process values, p. 59
- Control upwards or control downwards for controllers.
  See As control output, p. 60

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.x.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

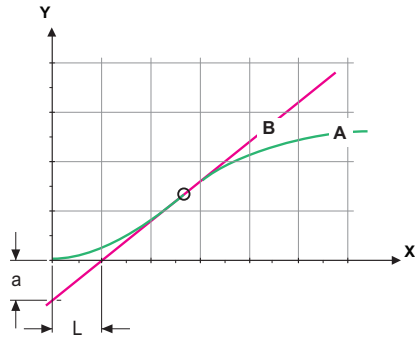
Parameter Cond. uc:
5.2.1.40.13 *Range low*: 0 µS–300 mS
5.2.1.40.23 *Range high*: 0 µS–300 mS

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:



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

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

Control upwards or downwards

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

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

5.2.1.43.10 *Setpoint*
Range: 0.000 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
- Lack of reagents
- Process values out of programmed ranges.

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

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

5.3.1.1 Alarm Conductivity

5.3.1.1.1 *Alarm High:* If the measured value rises above the alarm high value, the alarm relay is activated and E001 is displayed in the message list.
Range: 0.000 µS–300 mS

5.3.1.1.x *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.x *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.x *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: Define the measuring value, which should issue an alarm high respectively low.

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

5.3.2/3 **Relay 1 and 2:** The function of relay contacts 1 or 2 is defined by the user.

Note: *The navigation in the menu <Relay 1> and <Relay 2> is 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.

5.3.2.1 Function = Limit upper/lower:

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

5.3.2.20 *Parameter:* select a process value

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

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

5.3.2.400 *Hysteresis:* within the hysteresis range, the relay does not switch. This prevents damage of relay contacts when the measured value fluctuates around the alarm value.

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

5.3.2.50 *Delay:* Duration, the activation of the alarm relay is retarded after the measuring value has risen above/fallen below the programmed alarm.
Range. 0–600 Sec

5.3.2.1 Function = Control upwards/downwards:

The relays may be used to drive control units such as solenoid valves, membrane dosing pumps or motor valves. When driving a motor valve both relays are needed, relay 1 to open and relay 2 to close the valve.

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

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

5.3.2.32.1 Actuator = Time proportional

Examples of metering devices that are driven time proportional are solenoid valves, peristaltic pumps.
Dosing is controlled by the operating time.

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

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

5.3.2.32.4 **Control Parameters**
Range for each Parameter same as 5.2.1.43, p. 61

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. 61
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. 61
5.3.2.1	Function = Timer:
	The relay will be closed 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 closed. Range: 5–6000 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 closed 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 closed 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. 67.
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:

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.
Available settings: German, English, French, Spanish, Chinese.

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

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

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

5.4.4 **Access:** Select a password to prevent unauthorized access to the menus <Messages>, <Diagnostics>, <Maintenance>, <Operation> and <Installation>.

Note: *The password protection becomes active under the following conditions:*

- *Enter an administrator password different from <0000>.*
- *After defining the administrator password, users 1–4 are also automatically activated. The default password for all users is <1234>. If necessary, change the passwords.*

5.4.4.1 **Administrator:** The administrator owns all rights and has access to all menus. Only an administrator can assign user rights for the users 1 to 4.

Name:	Admin	predefined, not changeable
Function:	Administrator	predefined, not changeable

5.4.4.1.3 Password: The password is set to <0000> by default. If an administrator password different from <0000> is set, it is not longer possible to enter a menu without entering the password.
If you have forgotten the administrator password, contact your nearest SWAN representative or the manufacturer.

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: All rights
Service: Access to all menus except menu <Installation>
Operator: Access to the menus <Messages> and <Diagnostic>

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

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

5.5 Interface

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

5.5.1	*Protocol:* **Profibus**	
5.5.20	Device address:	Range: 0–126
5.5.30	ID No.:	Range: analyzer; manufacturer; multivariable
5.5.40	Local operation:	Range: enabled, disabled
5.5.1	*Protocol:* **Modbus RTU**	
5.5.21	Device address:	Range: 0–126
5.5.31	Baud rate:	Range: 1200–115200 baud
5.5.41	Parity:	Range: none, even, odd
5.5.1	Protocol: **HyperTerminal**	
	Baud rate:	Range: 1200–115200 baud
5.5.1	*Protocol:* **HART**	
5.5.23	Device address:	Range: 0–64

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
	Password: for all modes 0000
	Sample ID: - - - - - - - -

11. Notes

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ANALYTICAL INSTRUMENTS

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