ANALYTICAL INSTRUMENTS

A-96.150.541 / 111223

AMU-II Oxytrace

Operator's Manual

SWISS MADE

AMU-II Oxytrace

Customer Support

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This manual applies to firmware V1.00 and higher.
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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

The AMU-II Oxytrace is used to measure low levels of oxygen in high-purity water. Especially in power plant water cycles (e.g. feed-water), a very low level of oxygen is needed to prevent corrosion.

Measuring principle

Clark principle:

The sensor consists of one noble metal electrode (e.g. platinum or gold), a reference electrode (mostly Ag/AgCl) and optionally a metal guard electrode.

The Clark-type electrode is the most widely used oxygen sensor for measuring oxygen dissolved in a liquid. The basic principle is that there is a cathode and an anode submersed in an electrolyte and a voltage is applied between the two parts. Oxygen enters the sensor through a permeable membrane by diffusion, and is reduced at the cathode according to

$O_2 + 4e^- + 2\ H_2O \dashrightarrow 4\ OH^-$

This reaction creates a measurable current. There is a linear correlation between the oxygen concentration and the electrical current.

The guard electrode is on the same voltage level as the cathode but there is no current measurement. Oxygen which diffuses from the electrolyte to the cathode is consumed by the guard electrode. As a consequence, residual oxygen in the electrolyte will no more disturb the measurement signal and the response time to low oxygen levels will be shorter.

Temperature compensation

The measuring signal depends on temperature, but is automatically compensated to 25 °C. The sample temperature is determined continuously by a temperature sensor inside the oxygen electrode.

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

Relays

Two potential-free contacts programmable as limit switches for measured values, controllers or timer 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 measuring value or to interrupt control in automated installations (hold function or remote off).

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 Oxytrace 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
Sensor type	Clark-type electrode.	

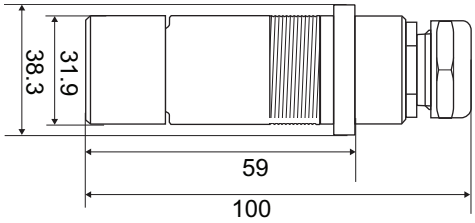
Measuring range	**Range**	**Resolution**
	0.01–9.99 ppb	0.01 ppb
	10–199.9 ppb	0.1 ppb
	200–1999 ppb	1 ppb
	2–20 ppm	0.01 ppm
	0–200 % saturation	0.1%

Automatic range switching.

Sample flow measurment with digital SWAN sample flow sensor

2.2.2 Sensor OXYTRACE G

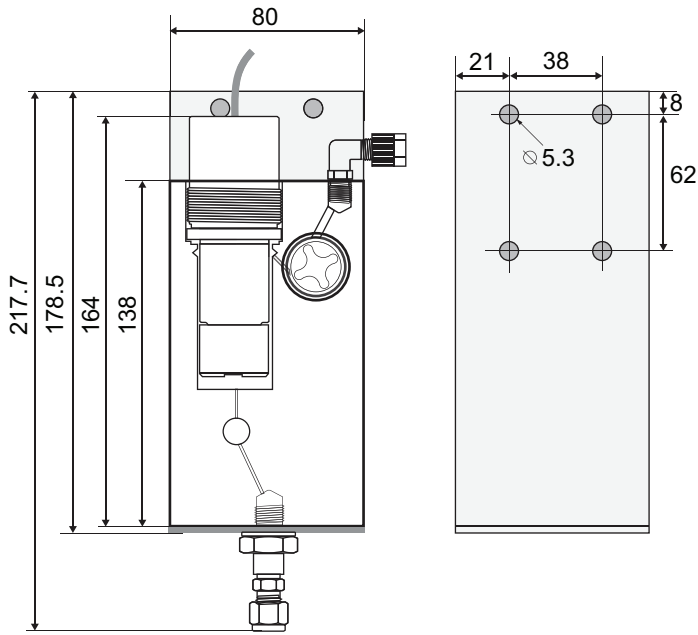
Sensor for the measurement of dissolved oxygen in ultra pure water. Precise oxygen measuring cell with integrated temperature sensor and guard electrode for faster initial response time after maintenance.



Technical data	Clark oxygen electrode Cathode gold, anode silver, guard silver Zero current-free electrode system Robust 25 µm fluoropolymer diaphragm
Temp. sensor	NT5K
Measuring range	0–20 ppm O_2 (25 °C) or 0–200% saturation
Accuracy	0,3% if calibration temperature = measuring temperature 1,5% at ±10 °C deviation to cal. temperature
Precision	±1% of reading or ±0.15 ppb
Response time	t_{90} < 30 seconds (rising concentration)
Minimal flow	50 cm/s
Pressure resistance	3 bar
Operating temp.	max. 50 °C
Material	shaft: polyacetal copolymer membrane: fluoropolymer
Protection	IP 68
Weight	150 g

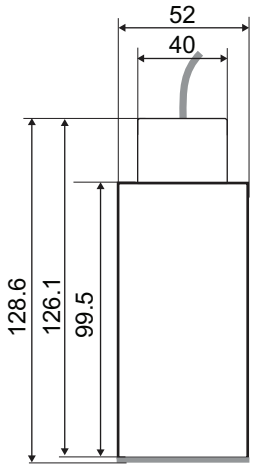
2.2.3 QV-Flow PMMA OTG

Flow cell	Flow cell made of acrylic glass with integrated flow sensor.
Sample temp.	max. 50 °C
Inlet pressure	max. 1 bar
Outlet pressure	Pressure free
Sample flow	6–25 l/h
Process connection inlet	Swagelok connection for 1/4” tube
Outlet	SERTO angle for 6 mm flexible tube
Dimensions	see picture below



2.2.4 B-Flow SS316L OTG

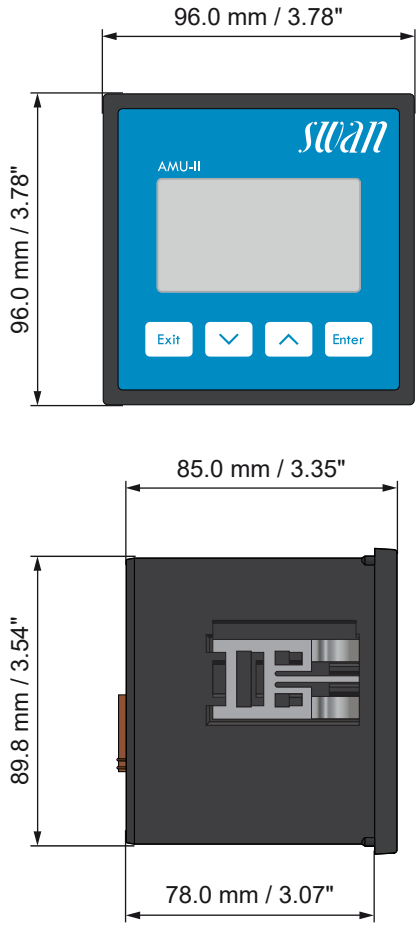
Flow cell	B-Flow SS316L OTG is made of stainless steel, comes without a flow sensor and can be used for higher operating pressures and temperatures.
Operating temp.	-10 to +130 °C
Sensor	max. 50 °C
Operating pressure	max. 5 bar at 130 °C
Sensor	max. 3 bar
Flow cell connection	2x female thread 1/8" ISO
Dimensions	see picture below



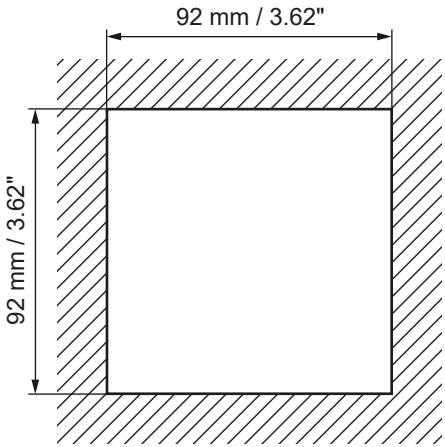
3. Installation

3.1. Mounting of the AMU-II Transmitter

Transmitter dimensions

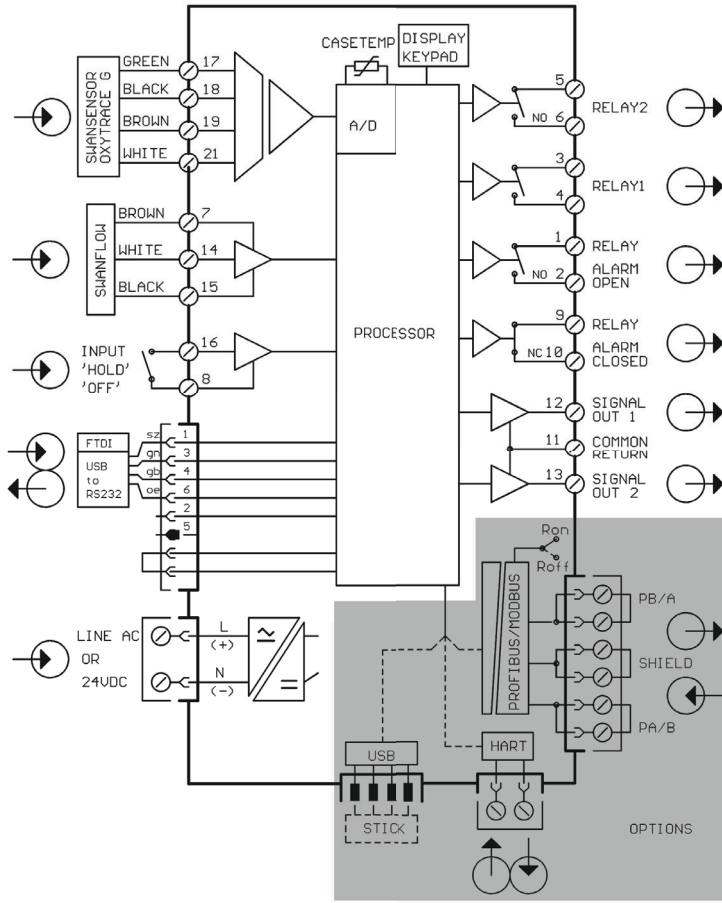


Cutout dimensions



3.2. Electrical Connections

Connection diagram



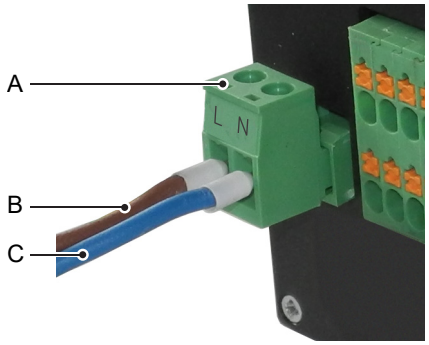
CAUTION

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 Oxytrace

3.4. Sensor

Terminals: see Connection diagram, p. 17.
Sensor settings: see Instrument Setup, p. 25.

3.5. Swan Flow Meter

Terminals: see Connection diagram, p. 17.

3.6. Input

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

Terminals 16/8
For programming see Program List and Explanations, p. 53.

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. 44.

	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. 53, 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. 53, Installation menu.

3.9. Interface Options

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

- RS485 with Modbus or Profibus protocol
- HART
- USB

3.9.1 Installation

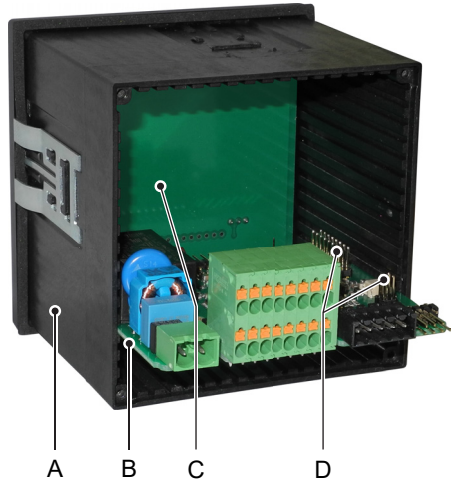
WARNING

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.

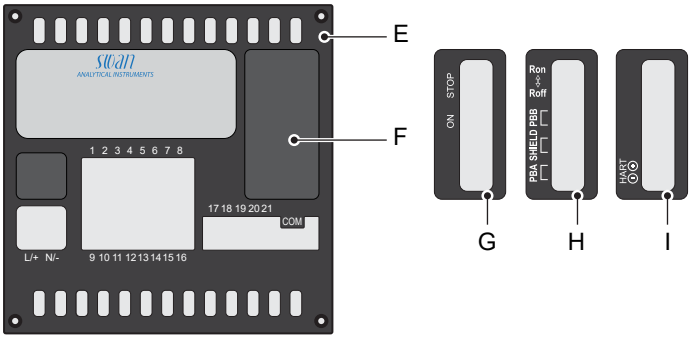
4 Plug the interface option onto the pins [D] on the mainboard.

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



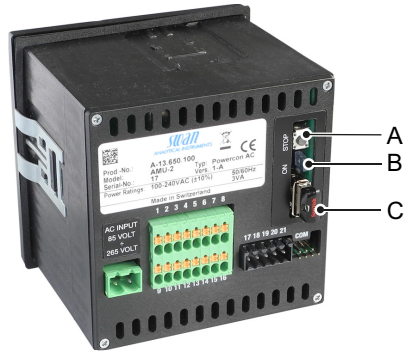
E *Backplate*
F *Covered connector field (condition at delivery)*
G *Labeling for USB option*
H *Labeling for RS485 option*
I *Labeling for HART option*

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.

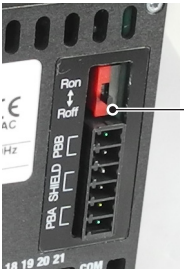
3.9.3 RS485 Option

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.

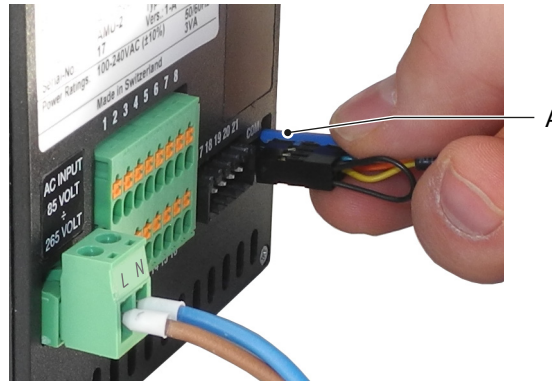
Downloading SwanTerminal

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.

4. Instrument Setup

4.1. Establish Sample Flow

1 Open the flow regulating valve and wait until the flow cell is completely filled.

2 Switch on power.

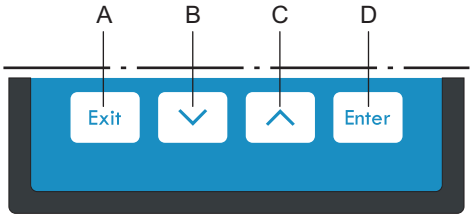
3 Adjust the sample flow.

4.2. Programming

Program all parameters for external devices (interface, recorders, etc.) and all parameters for instrument operation (limits, alarms). See Program List and Explanations, p. 53.

5. Operation

5.1. Keys



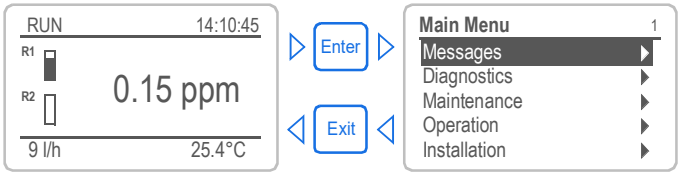
A to exit a menu or command (rejecting any changes)
to move back to the previous menu level

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

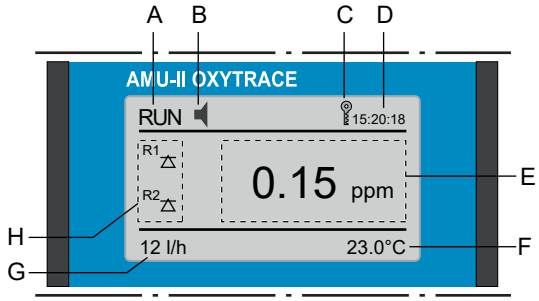
C to move UP in a menu list and to increase digits

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

Program access, exit



5.2. Display



A RUN — normal operation

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

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

B Error — Error — Fatal Error

C Keys locked, transmitter control via Profibus

D Time

E Process values

F Sample temperature

G Sample flow

H Relay status

Relay status, symbols

upper/lower limit not yet reached

upper/lower limit reached

control upw./downw. no action

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

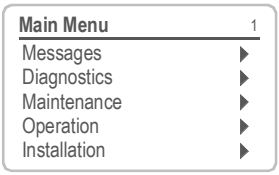
motor valve closed

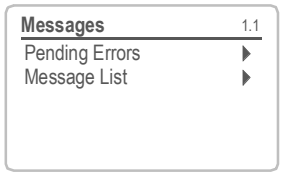
motor valve: open, dark bar indicates approx. position

timer

timer: timing active (hand rotating)

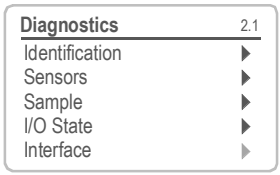
5.3. Software Structure





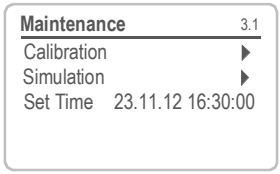
Menu **Messages 1**

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



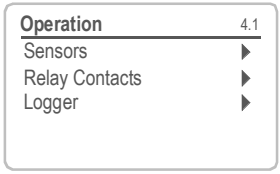
Menu **Diagnostics 2**

Provides user relevant instrument and sample data.



Menu **Maintenance 3**

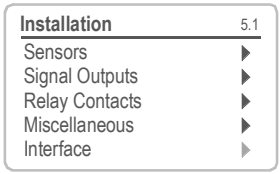
For instrument calibration, relay and signal output simulation, and to set the instrument time.
It is used by the service personnel.



Menu **Operation 4**

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

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



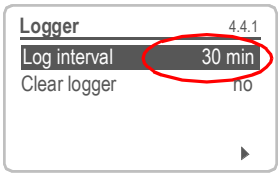
Menu **Installation 5**

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

5.4. Changing Parameters and Values

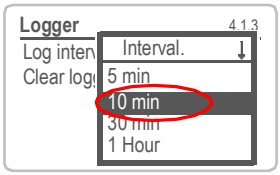
Changing parameters

The following example shows how to change the logger interval:



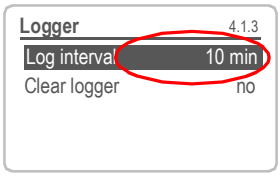
1 Select the parameter you want to change.

2 Press [Enter]



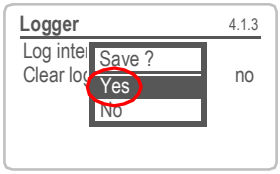
3 Press [▲] or [▼] key to highlight the required parameter.

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



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

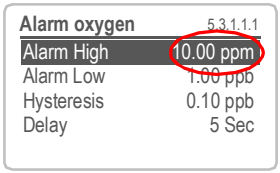
5 Press [Exit].



⇒ *Yes is highlighted.*

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

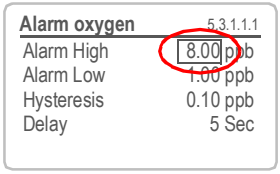
Changing values



1 Select the value you want to change.

2 Press [Enter].

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



4 Press [Enter] to confirm the new value.

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

6 Press [Enter] to save the new value.

6. Maintenance

6.1. Maintenance Table

Weekly	◆ Check sample flow.
Monthly	◆ If necessary, perform an air calibration.
Half-yearly	◆ Clean Oxytrace G membrane with a soft tissue, see Maintenance of the Oxygen Sensor, p. 32.
Yearly	◆ If necessary, replace filling electrolyte. If the sensor is exposed to air frequently and during long time intervals, the electrolyte and membrane may have to be changed earlier (see below*). ◆ Clean flow cell and flow meter, if dirty.
Every 2nd year	◆ Replace Swansensor Oxytrace G membrane by using a new, pre-filled sensor cap.

*A change of membrane and electrolyte is recommended:

- if indicated in the maintenance list (remaining amount <10%)
- if the response of the sensor is slow
- if the sensor cannot be calibrated any more and/or the instrument shows a corresponding error message
- if the sensor signal is very unstable.

6.2. Stop of Operation for Maintenance

1. Shut off power of the instrument.
2. Stop sample flow by closing the flow regulating valve.

6.3. Maintenance of the Oxygen Sensor

WARNING

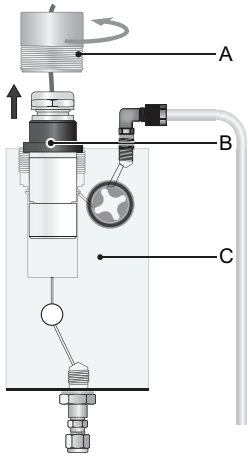
Etching liquid

The electrolyte is alkaline and caustic. It contains less than 1% of potassium hydroxide.

- Do not ingest. Wear protective goggles and gloves during handling. Avoid contact with clothes.
- In case of accidental contact with the eyes, wash immediately with clear water and contact a physician. Show them the label of the bottle or this section of the manual.
- Short contact with skin is harmless, nevertheless wash with lots of water.

6.3.1 Electrolyte exchange

An electrolyte exchange is indicated in the maintenance list as soon as the remaining amount is below 10%.

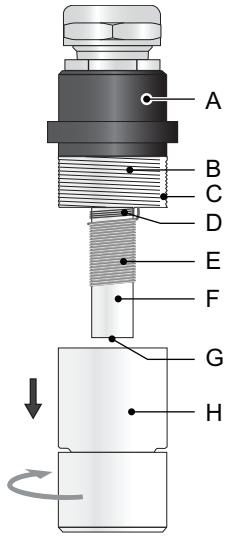


A *Fixing sleeve*
B *Sensor*
C *Flow cell*

1 Unscrew the fixing sleeve [A].

2 Remove the sensor from the flow cell.

Note: *A vacuum may form when the sensor is pulled out.*
Do not use force!
The sensor can be easily removed when the flow regulating valve is slightly opened.



A *Swansensor Oxytrace G*
B *Thread*
C *Groove*
D *Guard electrode*
E *Anode*
F *Measuring head*
G *Cathode*
H *Sensor cap with membrane*

3 Unscrew and remove the sensor cap [H] from the Swansensor Oxytrace G [A].

4 Empty the remaining electrolyte.

5 Refill the sensor cap with fresh electrolyte.

Note: *There is a groove [C] in the thread [B] of the sensor, where excessive air and electrolyte can escape while screwing the sensor cap onto the sensor. Hold the sensor in vertical position, measuring head pointing downwards.*

6 Slowly screw the sensor cap onto the sensor to allow the excess electrolyte to escape without building up too much pressure inside the electrode. Fasten sensor cap tightly.

7 Clean the sensor thoroughly and dry the sensing membrane with a soft tissue.

8 Switch on power.

9 Let the sensor run-in at air for at least 30 min, better 1 h.

10 Afterwards perform an air calibration.

11 Install the sensor into the flow cell.

12 Select <Maintenance>/<Service>/<New Filling> to reset the counter for remaining electrolyte.

6.3.2 Clean Swansensor Oxytrace G and Flow Cell

Depending on the water quality, the Swansensor Oxytrace G and the flow cell will necessitate a cleaning.

Before cleaning, proceed as described in Stop of Operation for Maintenance, p. 31.

1. Dismount the Swansensor Oxytrace G, see Electrolyte exchange, p. 32.
2. Clean the sensor with a soft tissue and rinse it with water afterwards.
3. Use a soft brush to remove the dirt which sticks on the walls of the flow cell.
4. Flush the flow cell with clean water.
5. Install the Swansensor Oxytrace G and start sample flow.

6.4. Calibration

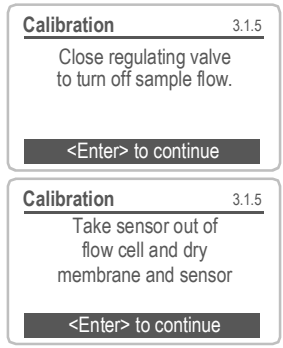
The sensing part of the sensor must not be in direct contact with water!
In the wet flow cell, the atmosphere will be saturated with water vapor. This atmosphere will produce the most accurate calibration results.

The required time for a calibration depends mainly on the difference between temperature and oxygen content in the sample and in the air. It can take 15–20 minutes. This is also the case if the electrolyte was exchanged.
As soon as the reading is stable, the microprocessor will store the calibration data in the memory.The end of the calibration is indicated on the display.

To perform a calibration proceed as follows:

1 Navigate to menu <Maintenance> / <Calibration>.

2 Press [Enter] to start the calibration and follow the dialog on the display.



3 Stop the sample flow at with the flow regulating valve.

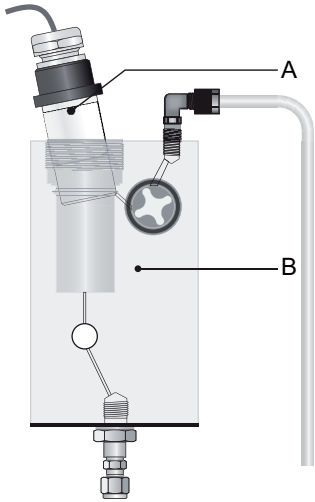
4 Unscrew and remove the threaded sleeve [A], see Electrolyte exchange, p. 32.

5 Remove the oxygen sensor [B] from the flow cell [C].

6 Dry the sensor membrane and the flow cell with a soft paper tissue.

Calibration	3.1.5
Place the electrode into the wet flow cell at a slightly tilted angle.	
<Enter> to continue	

7 Place the electrode slightly tilted into the flow cell, so that the sensor cap rests on the rim for the O-ring.



***A** Tilted sensor*
***B** Flow cell*

Calibration	3.1.5
Saturation	98.7 %
Sat. Current	32 µA
Progress	

8 Press [Enter] to start the calibration measurement.
⇒ *The saturation should reach 100%, the saturation current should be about 22 µA to 33 µA. If the measuring values are not stable during the measuring period, the calibration will be discarded.*

Calibration	3.1.5
Saturation	98.7 %
Sat. Current	32 µA
Calibration Successful	

9 Press [Enter] to confirm the calibration.

6.5. Zero Verification

1. Calibrate the sensor according to chapter Calibration, p. 35.
2. Prepare a 5% sodium sulfite solution with demineralized water.
3. Put the electrode into the sodium sulfite solution afterwards. Assure that there are no air bubbles in front of the sensor.
4. The measured value should now be <1 ppb.

Note: *Depending on the state of the electrode this process can take several hours. In case of an electrode refill, it can take days until the measured value is lower than 1 ppb.*

6.6. Quality Assurance of the Instrument

Every Swan online instrument is equipped with integrated, autonomous quality assurance functions to survey the plausibility of each measurement.

For the AMU-II Oxytrace these are:

- continuous monitoring of sample flow
- continuous monitoring of the temperature inside the transmitter case

In addition, a manual, menu-driven inspection procedure can be carried out using a certified reference instrument. After activating the quality assurance procedure by selecting the quality assurance level, the instrument regularly reminds the user to carry out the procedure. The results are saved in a history.

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. oxygen, saturation). In case of instrument failure, other parameters can be used for process monitoring.
- Level 3: **Crucial;** Monitoring of critical processes, value is used for control of another part or subsystem (valve, dosing unit, etc.).

Additional level:

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

Limits and intervals:

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

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

Procedure The standard workflow consists of the following steps:

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

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

6.6.1 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 5.1.2.1. The corresponding submenus then become visible.

The activation is necessary the first time only.

6.6.2 Pre-Test

- AMI Inspector Oxygen:
  - Check certificate: Certificate not older than one year.
  - Check battery: The battery should be completely charged. Remaining operating time on display minimum 20 hours.
  - Sensor is in working condition
- On-line instrument:
  - Good order and condition: Flow cell free of particles, sensor surface free of deposits.
  - Check message list: Review the message list in menu 1.3 and check for frequently occurring alarms (as for example flow alarms). If alarms occur frequently remove cause before starting the procedure.

6.6.3 Connect the Sample Lines

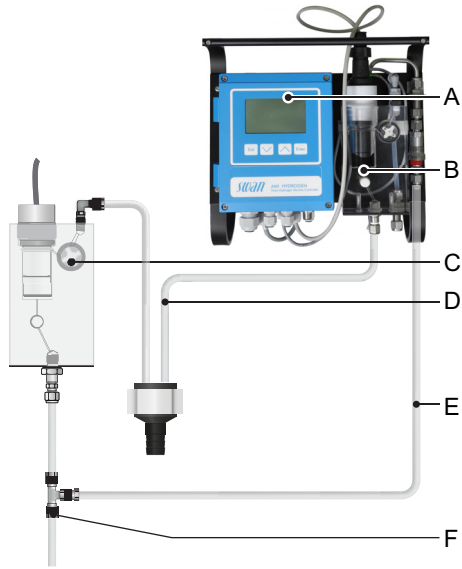
The choice of sampling depends strongly on local conditions on site. Possible sampling:

- 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 process monitor,*
- *while the measurement is running, wait approx. 10 minutes until the measured value and the temperature have stabilized.*

Example As an example, the following picture shows the connection of the AMI Inspector Oxygen via T-fitting to the process monitor.



A *AMI Inspector Oxygen*
B *Flow cell of reference instrument*
C *Flow cell of online instrument*
D *Sample outlet*
E *Sample inlet*
F *T-fitting*

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

2 Connect sample line of the online instrument with the sample inlet of the AMI Inspector Oxygen. Use the supplied tube made of PA.

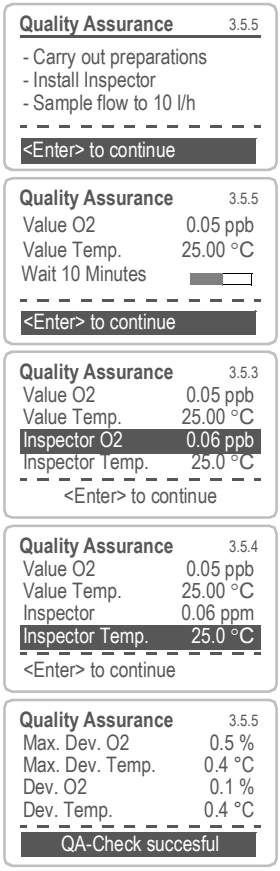
3 Connect sample outlet of the AMI Inspector Oxygen to the sample outlet funnel of the online instrument.

4 Switch on the AMI Inspector Oxygen. Open the flow regulating valve and regulate the sample flow to 10 l/h. The flow rate is shown on the display of the AMI Inspector Oxygen.

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 ppb value of the AMI Inspector Oxygen and enter it in the “Inspector O2” field.
Press [Enter] to confirm.

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

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

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

6.6.5 Completion of the Measurement

1. Stop sample flow.
2. Close the flow regulating valve of the AMI Inspector Oxygen.
3. Disconnect the AMI Inspector Oxygen from the sample line.
4. Switch off the AMI Inspector Oxygen.
5. Restart and regulate the sample flow to the online instrument.

6.7. Longer Stop of Operation

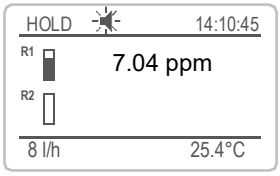
1. Shut off power of the instrument.
2. Stop sample flow.
3. Remove the Swansensor Oxytrace G from the flow cell.
4. Clean the sensor with a soft tissue and rinse it with water.
5. Use a soft brush to remove the dirt which sticks on the walls of the flow cell.
6. Fill the flow cell with water.
7. Install the Swansensor Oxytrace G.

7. Error List

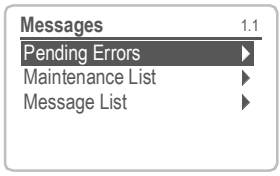
Error
Non-fatal error. Indicates an alarm if a programmed value is exceeded.
Such Errors are marked **E0xx** (bold and black).

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

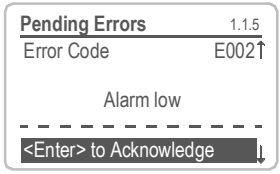
- Errors which disappear if correct measuring conditions are recovered (i.e. Sample Flow low).
  Such errors are marked **E0xx** (bold and orange)
- Errors which indicate a hardware failure of the instrument.
  Such errors are marked **E0xx** (bold and red)



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



Navigate to <Messages>/<Pending Errors>.



Press [Enter] to acknowledge a pending errors.
⇒*The error is reset and saved in the message list.*

Error	Description	Corrective action
E001	Oxygen Alarm high	– check process – check programmed value, see 5.3.1.1.1, p. 62
E002	Oxygen Alarm low	– check process – check programmed value, see 5.3.1.1.25, p. 62
E003	Saturation Alarm high	– check process – check programmed value, see 5.3.1.4, p. 63
E004	Saturation Alarm low	– check process – check programmed value, see 5.3.1.4, p. 63
E007	Sample Temp. high	– check process – check programmed value, see 5.3.1.3.1, p. 62
E008	Sample Temp. low	– check process – check programmed value, see 5.3.1.3.25, p. 62
E009	Sample Flow high	– check sample flow – check programmed value, see 5.3.1.2.2, p. 62
E010	Sample Flow low	– establish sample flow – clean instrument – check programmed value, see 5.3.1.2.35, p. 62
E011	Temp. shorted	– Check wiring of sensor – Check sensor
E012	Temp. disconnected	– Check wiring of sensor – Check sensor

Error	Description	Corrective action
E013	Case Temp. high	– check case/environment temperature – check programmed value, see 5.3.1.5.1, p. 63
E014	Case Temp. low	– check case/environment temperature – check programmed value, see 5.3.1.5.2, p. 63
E017	Control Timeout	– check control device or programming in Installation, Relay contact, Relay 1/2 see 5.3.2 and 5.3.3, p. 63
E019	Quality Assurance	– Perform QA procedure using a reference instrument, e.g. AMI Inspector
E024	Input active	– See If Fault Yes is programmed in Menu see 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
E065	Electrolyte depleted	– Refill electrolyte, see Electrolyte exchange, p. 32

8. Program Overview

For explanations about each parameter of the menus see Program List and Explanations, p. 53.

- 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
Maintenance List 1.2*	Maintenance List	1.2.5*	
Message List 1.3*	*Number*	1.3.1*	
	Date, Time		

8.2. Diagnostics (Main Menu 2)

Identification	Desig.	AMU-II Oxytrace		* Menu numbers
2.1*	Version	1.00-11/23		
	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	**Oxytrace G**	*Current Value*		
2.2*	2.2.1*	*(Raw value tc)*		
		Saturation		
		Cal. History	*Number*	2.2.1.5.1*
		2.2.1.5*	*Date, Time*	
			Sat. Current	
			Air pressure	
	Miscellaneous	*Case Temp.*	*2.2.2.1**	
	2.2.2*	*Air pressure*		
	QA History	*QA History*	*2.2.3.1**	
	2.2.3*			
Sample	*Sample ID*	2.3.1*		
2.3*	*Temperature °C*			
	Nt5K Ohm			
I/O State	*Alarm Relay*	2.4.1*		
2.4*	*Relay 1/2*	2.4.2*		
	Input			
	Signal Output 1/2			
Interface	*Protocol*	2.5.1*		
2.5*				

8.3. Maintenance (Main Menu 3)

Calibration	*Calibration*	3.1.5	
3.1*			
Service	**Electrolyte**	*Last filling*	
3.2*	3.2.1*	*Remaining amount*	
		Remaining time	
		New Filling	3.2.1.5*
Simulation	*Alarm Relay*	3.2.1*	
3.3*	*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)*		
3.4*			
Quality Assurance	Quality Assurance	3.5.5*	
3.5*			

* Menu numbers

8.4. Operation (Main Menu 4)

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

8.5. Installation (Main Menu 5)

Sensors	**Miscellaneous**	*Flow*	5.1.1.1*	* Menu numbers
5.1*	5.1.1*	*Offset*	5.1.1.2*	
	Quality Assurance	*Level*	5.1.2.1*	
	5.1.2*			
Signal Outputs	**Signal Output 1/2**	*Parameter*	5.2.1.1 - 5.2.2.1*	
5.2*	5.2.1* - 5.2.2*	*Current Loop*	5.2.1.2 - 5.2.2.2*	
		Function	5.2.1.3 - 5.2.2.3*	
		Scaling	*Range Low*	5.2.x.40.10/11*
		5.2.x.40	*Range High*	5.2.x.40.20/21*
Relay Contacts	**Alarm Relay**	**Alarm oxygen**	*Alarm High*	5.3.1.1.1*
5.3*	5.3.1*	5.3.1.1*	*Alarm Low*	5.3.1.1.25
			Hysteresis	5.3.1.1.35
			Delay	5.3.1.1.45
		Sample Flow	*Flow Alarm*	5.3.1.2.1
		5.3.1.2*	*Alarm High*	5.3.1.2.2*
			Alarm Low	5.3.1.2.35*
		Sample Temp.	*Alarm High*	5.3.1.3.1*
		5.3.1.3*	*Alarm Low*	5.3.1.3.25*
		Alarm Saturation	*Alarm High*	5.3.1.4.1*
		5.3.1.4*	*Alarm Low*	5.3.1.4.25
			Hysteresis	5.3.1.4.35
			Delay	5.3.1.4.45
		Case Temp.	*Case Temp. high*	5.3.1.5.1*
		5.3.1.5*	*Case Temp. low*	5.3.1.5.2*
	Relay 1 and 2	*Function*	5.3.2.1–5.3.3.1*	
	5.3.2* and 5.3.3*	*Parameter*	5.3.2.20–5.3.3.20*	
		Setpoint	5.3.2.300–5.3.3.301*	
		Hysteresis	5.3.2.400–5.3.3.401*	
		Delay	5.3.2.50–5.3.3.50*	
	Input	*Active*	5.3.4.1*	
	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*		* Menu numbers
5.4*	*Set defaults*	5.4.2*		
	Load Firmware	5.4.3*		
	Password	*Messages*	5.4.4.1*	
	5.4.4*	*Maintenance*	5.4.4.2*	
		Operation	5.4.4.3*	
		Installation	5.4.4.4*	
	Sample ID	5.4.5*		
Interface	*Protocol*	5.5.1*		(only with RS485
5.5*	*Device Address*	5.5.21*		interface)
	Baud Rate	5.5.31*		
	Parity	5.5.41*		

9. Program List and Explanations

1 Messages

1.1 Pending Errors

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

1.2 Maintenance List

1.2.5 Provides the list of necessary maintenance. Cleared maintenance messages are moved to the Message list.

1.3 Message List

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

2 Diagnostics

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

2.1 Identification

Desig.: Designation of the instrument.
Version: Firmware of instrument (e.g. 1.00-11/23)

2.1.3 **Factory Test**: Test date of the Instrument and Motherboard.

2.1.4 **Operating Time**: Shows the operating time in Years, Days, Hours, Minutes and Seconds.

2.2 Sensors

2.2.1 **Oxytrace G**

Current value:	Shows the measured value in ppb.
Raw value tc:	Shows the temperature-compensated measured value in mA.
Saturation	Shows the saturation in %

2.2.1.4 **Cal. History**
Review the diagnostic values of the last calibration of the oxygen sensor. Max. 64 data records are memorized.

- *Number*: Calibration counter.
- *Date, Time*: Date and time of the calibration.
- *Sat. Current*: Saturation current at that time of calibration.
- *Air pressure*: Air pressure at that time of calibration.

2.2.2 **Miscellaneous**:

2.2.2.1 *Case Temp:* Shows the actual temperature in °C inside the transmitter.

Air pressure: Shows the actual air pressure in hPa.

2.2.3 **QA History**
Review QA values (Number, Date, Time, Deviation oxygen, Deviation Temperature, Status of QA check) of the last quality assurance procedures.

2.3 Sample

2.3.301

- *Sample ID*: Shows the assigned sample identification. This identification is defined by the user to identify the location of the sample
- *Temperature:* Shows temperature in °C.
- *(Nt5K)*: Shows raw value of the temperature in Ω.
- *Sample Flow*: Shows the sample flow in l/h
- *(Raw value)* Shows the sample flow in Hz

2.4 I/O State

Shows actual status of all in- and outputs.

2.4.1

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

2.5 Interface

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

3 Maintenance

3.1 Calibration

3.1.1 Start a calibration and follow the instructions on the screen. Displayed values are saturation in % and the saturation current in µA. The indication bar shows the progress. Detailed explanation see Calibration, p. 35.

3.2 Service

3.2.1 Electrolyte

- *Last Filling*: Shows the date of the last filling of electrolyte.
- *Remaining Amount*: Remaining amount of electrolyte in %.
- *Remaining Time*: Remaining time in days until an electrolyte exchange is necessary.

3.2.1.5 *New Filling*: Select “Yes” after electrolyte exchange to reset the counter.

3.3 Simulation

In this menu the following relays and signal outputs can be tested:

- Alarm relay
- Relay 1 and 2
- Signal output 1 and 2

Select a relay or signal output with the [▲] or [▼] keys, press the [Enter]> key to confirm. Then change the value with the [▲] or [▼] keys. After confirming the setting with the [Enter] key, the value is simulated by the relay/signal output.

Alarm Relay:	Active or inactive.
Relay 1 and 2:	Active or inactive.
Signal Output 1 and 2:	Current in mA

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

3.4 Set Time

Adjust date and time.

3.5 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: 0–6‘000 Sec

4.2 Relay Contacts

See 5.3 Relay Contacts, p. 61

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. The Records consists of: Date, time, alarms, measuring values, raw values, case temperature, flow.

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

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

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

5 Installation

5.1 Sensors

5.1.1 Miscellaneous

5.1.1.1 *Flow*: If a flow cell without flow measurement (e.g. B-Flow) is used, choose none. With flow measurement select Q-Flow

5.1.1.2 *O2 Offset*: Manual, small correction of the offset.
Range -5 to 5 ppb

5.1.2 Quality Assurance: Switch the Quality Assurance on or off.

5.1.2.1 *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 menu 5.1.2.2

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

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

- Oxygen
- Temperature
- Sample Flow (if a flow sensor is selected)
- Saturation

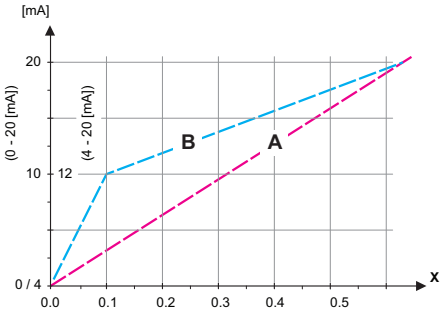
5.2.1.2 *Current Loop:* Select the current range of the signal output.
Make sure the connected device works with the same current range.
Available ranges: 0–20 mA or 4–20 mA

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:

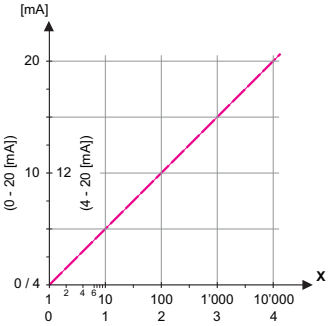
- Linear, bilinear or logarithmic for process values.
  See As process values, p. 58
- Control upwards or control downwards for controllers.
  See As control output, p. 59

As process values

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



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



X *Measured value (logarithmic)*

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

Parameter: Oxygen

Range low: 0.00 ppb – 20.00 ppm
Range high: 0.00 ppb – 20.00 ppm

Parameter: Temperature

Range low: -30 to + 130 °C
Range high: -30 to + 130 °C

Parameter: Sample flow

Range low: 0 – 50 l/h
Range high: 0 – 50 l/h

Parameter: Saturation

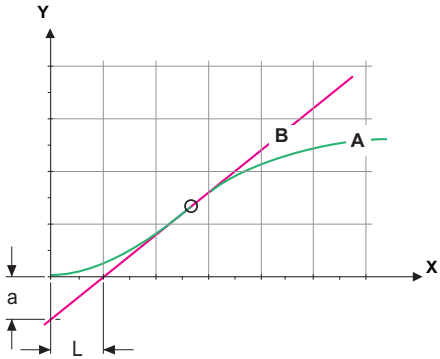
Range low: 0 – 200 %
Range high: 0 – 200 %

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.

Setpoint: User defined precess value for the selected parameter.

P-Band: Range below (upwards control) or above (downwards control) the set-point, within which the dosing intensity is reduced from 100% to 0% to reach the set-point without overshooting.

5.2.1.43 **Control Parameters**: if Parameter = Oxygen
5.2.1.43.10 Setopint:
Range: 0.00 ppb – 20.00 ppm
5.2.1.43.20 P-Band:
Range: 0.00 ppb – 20.00 ppm

5.2.1.43 **Control Parameters**: if Parameter = Temperature
5.2.1.43.11 Setopint:
Range: -30 to + 130 °C
5.2.1.43.21 P-Band:
Range: 0 to + 100 °C

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

5.2.1.43.12 Setopint:
Range: 0–50 l/h

5.2.1.43.22 P-Band:
Range: 0–50 l/h

5.2.1.43 **Control Parameters**: if Parameter = Saturation

5.2.1.43.13 Setopint:
Range: 0–200 %

5.2.1.43.23 P-Band:
Range: 0–200 %

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

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

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

5.3 Relay Contacts

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

The contact is inactive at:

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

Program alarm levels for the following parameters:

- Oxygen
- Temperature
- Sample Flow
- Case Temperature high
- Case Temperature low

5.3.1.1 Alarm oxygen

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: 0.00 ppb – 20.00 ppm

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: 0.00 ppb – 20.00 ppm

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. 0.00 ppb – 20.00 ppm

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. The flow alarm will always be indicated in the display, pending error list, saved in the message list and the logger.
Available values: Yes or no

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

5.3.1.2.2 *Alarm High:* If the measuring values rises above the programmed value E009 will be issued.
Range: 12 – 50 l/h

5.3.1.2.35 *Alarm Low:* If the measuring values falls below the programmed value E010 will be issued.
Range: 8 – 11 l/h

5.3.1.3 Sample Temp.: Define at which sample temperature an alarm should be issued.

5.3.1.3.1 *Alarm High:* If the measured value rises above the alarm high value, the alarm relay is activated and E007 is issued.
Range: 30 – 100 °C

5.3.1.3.25 *Alarm Low:* If the measured value rises above the alarm high value, the alarm relay is activated and E008 is issued.
Range: -10 to + 20 °C

5.3.1.4 Alarm Saturation

5.3.1.4.1 *Alarm High:* If the measured value rises above the alarm high value, the alarm relay is activated and E003, is displayed in the message list.
Range: 0.00 – 200 %

5.3.1.4.25 *Alarm Low:* If the measured value falls below the alarm low value, the alarm relay is activated and E004 is displayed in the message list.
Range: 0.00 – 200 %

5.3.1.4.35 *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. 0.00 – 200 %

5.3.1.4.45 *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

5.3.1.5 Case Temp.

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

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

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

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

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

2 Then enter the necessary data depending on the selected function. The same values may also be entered in menu 4.2 Relay Contacts, p. 56

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:* choose one of the following process values

- Oxygen
- Temperature
- Sample Flow
- Saturation

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

Parameter	Range
Oxygen	0.00 ppb – 20.00 ppm
Temperature	-30 to +130 °C
Sample flow	0 – 50 l/h
Saturation	0 – 200%

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
Oxygen	0.00 ppb – 20.00 ppm
Temperature	0 – 100 °C
Sample flow	0 – 50 l/h
Saturation	0 – 200%

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

5.3.2.1 Function = Control upwards/downwards

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

5.3.2.22 *Parameter:* choose one of the following process values
- Oxygen
- Temperature
- Sample Flow
- Saturation

5.3.2.32 Settings

Choose the respective actuator:
- Time proportional
- Frequency
- Motor valve

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. 60

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. 60

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. 60

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 [▼] keys.

3 Press [Enter], to set the minutes.

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

5 Press [Enter], to set the seconds.

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

Range: 00:00:00–23:59:59

5.3.2.44 *Run Time*: see Interval

5.3.2.54 *Delay*: see Interval

5.3.2.6 *Signal Outputs*: see Interval

5.3.2.7 *Output/Control*: see Interval

5.3.2.24 weekly

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

5.3.2.342 Calendar:

5.3.2.342.1 *Start time*: The programmed start time is valid for each of the programmed days. To set the start time see 5.3.2.341, p. 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 **Password:** Select a password different from 0000 to prevent unauthorized access to the menus “Messages”, “Maintenance”, “Operation” and “Installation”.

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

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

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

5.5 Interface

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

5.5.1	*Protocol:* **Profibus**	
5.5.20	Device address:	Range: 0–126
5.5.30	ID-Nr.:	Range: Analyzer; Manufacturer; Multivariable
5.5.40	Local operation:	Range: Enabled, Disabled
5.5.1	*Protocol:* **Modbus RTU**	
5.5.21	Device address:	Range: 0–126
5.5.31	Baud Rate:	Range: 1200–115200 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**	
	Address:	0–63

10. Default Values

Operation:

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

Installation:

Sensors	Miscellaneous:
	Flow: ..... Q-Flow
	O2 Offset: ..... 0.0 ppb
	Quality Assurance:
	Level: ..... 0: Off
Signal Output 1	Parameter: ..... Oxygen
	Current loop: ..... 4 –20 mA
	Function: ..... linear
	Scaling: Range low: ..... 0.00 ppb
	Scaling: Range high: ..... 10.00 ppm
Signal Output 2	Parameter: ..... Temperature
	Current loop: ..... 4 –20 mA
	Function: ..... linear
	Scaling: Range low: ..... 0.0 °C
	Scaling: Range high: ..... 50.0 °C
Alarm Relay:	Alarm oxygen; Alarm high: ..... 10.00 ppm
	Alarm oxygen; Alarm low: ..... 0.00 ppb
	Alarm oxygen; Hysteresis: ..... 100 ppb
	Alarm oxygen; Delay: ..... 5 s
	Sample Flow, Flow Alarm: ..... yes
	Sample Flow, Alarm high: ..... 25.0 l/h
	Sample Flow, Alarm low: ..... 8.0 l/h
	Sample Temp., Alarm High: ..... 50 °C
	Sample Temp., Alarm Low: ..... 0 °C
	Alarm Saturation; Alarm high ..... 120 %
	Alarm Saturation; Alarm low ..... 0.0 %
	Alarm Saturation; Hysteresis ..... 2 %
	Alarm Saturation; Delay ..... 5 s

	Case temp. high:	65 °C
	Case temp. low:	0 °C
Relay 1	Function:	limit upper
	Parameter:	Oxygen
	Setpoint:	10.00 ppm
	Hysteresis:	100 ppb
	Delay:	30 s
Relay 2	Function:	limit upper
	Parameter:	Temperature
	Setpoint:	50.0 °C
	Hysteresis:	1.0 °C
	Delay:	30 s
	If Function = Control upw. or dnw:	
	Parameter:	Oxygen
	Settings: Actuator:	Frequency
	Settings: Pulse Frequency:	120/min
	Settings: Control Parameters: Setpoint:	10.00 ppm
	Settings: Control Parameters: P-band:	100.0 ppb
	Settings: Control Parameters: Reset time:	0 s
	Settings: Control Parameters: Derivative Time:	0 s
	Settings: Control Parameters: Control Timeout:	0 min
	Settings: Act. Time prop.: Cycle time:	60 s
	Settings: Act. Time prop.: Response time:	10 s
	Settings: Act. Motor valve: Run time:	60 s
	Settings: Act. Motor valve: Neutral zone:	5%
	If Function = Timer:	
	Mode:	Interval
	Interval:	1 min
	Mode:	daily
	Start time:	00.00.00
	Mode:	weekly
	Calendar; Start time:	00.00.00
	Calendar; Monday to Sunday:	Off
	Run time:	10 s
	Delay:	5 s
	Signal output:	cont
	Output/Control:	cont
Input:	Active	when closed
	Signal Outputs	hold
	Output/Control	off
	Fault	no
	Delay	10 s

Miscellaneous	Language:	English
	Set default:	no
	Load firmware:	no
	Password:	for all modes 0000
	Sample ID:	- - - - - - - -
Interface	Protocol:	Hyperterminal

11. Notes

swan
ANALYTICAL INSTRUMENTS

A-96.150.541 / 111223

Swan Products - Analytical Instruments for:

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

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SWISS MADE

AMU-II Oxytrace