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ANALYTICAL INSTRUMENTS

AMI Oxysafe

Version 6.20 and higher

Operator's Manual

A-96.250.651 / 060720

Customer Support
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AMI Oxysafe–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

The AMI Operator's Manual shall be kept 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 significance:

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 can be the consequence if such warnings are ignored.

- Follow the prevention instructions carefully.

Mandatory Signs

The importance of the mandatory signs in this manual.

Safety goggles

Safety gloves

Warning Signs The importance of the warning signs in this manual.


Electrical shock hazard


Corrosive


Harmful to health


Flammable


Warning general


Attention general

1.2. General Safety Regulations

Legal Requirements

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

Spare Parts and Disposables

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

Modifications

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

WARNING

Risk of Electrical Shock

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

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

WARNING

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

WARNING

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

2. Product Description

Application Range

The OXYSAFE 1000 is a membrane-covered oxygen sensor based on the approved Clark method with built-in temperature sensor. It has a large-surface cathode for high measuring safety and a large-surface anode with long-term stable reference potential.

It can be used to measure dissolved oxygen in water, especially

- in sewage treatment (aeration basins),
- fish rearing and
- surface water such as lakes, rivers and ponds.

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

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

Relay

Two potential-free contacts programmable as limit switches for measuring values, controllers or timer for system cleaning with automatic hold function. Both contacts can be used as normally open or normally closed.

Maximum load: 1 A/250 VAC

Alarm Relay

One potential free contact.

Alternatively:

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

Summary alarm indication for programmable alarm values and instrument faults.

Input

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

Safety Features

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

Communication Interface (optional)

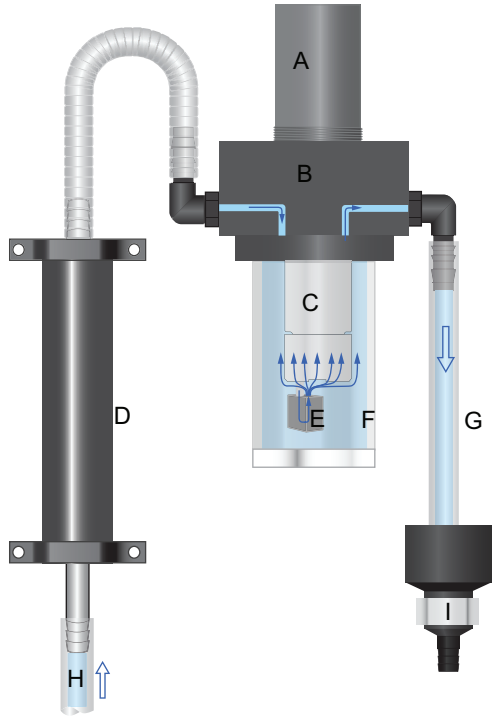
- USB Interface for logger download
- Third signal output (can be used in parallel to the USB interface)
- RS485 with Fieldbus protocol Modbus or Profibus DP
- HART interface

Sensor features

Precise oxygen measuring cell with integrated temperature measurement (Pt1000).
Easy calibration, excellent life time (up to 2 years of operation between refilling in activated sludge tank).
Easy and fast exchange of diaphragm and electrolyte.
High electric reliability.
Pressure equilibration membrane to compensate rapid pressure changes.
No exposed metallic surfaces, no corrosion in saline measuring media.

Fluidics

The sample flows through the sample inlet [H] and the flow sensor deltaT [D] where the flow rate is measured. From there the sample flows through the inlet nozzle [E] to achieve a high flow rate on the sensor membrane of the Oxysafe 1000 sensor [C]. The high flow rate ensures an optimal response time. The sample leaves the flow cell through the sample outlet [G] and flows into the drain funnel [I].



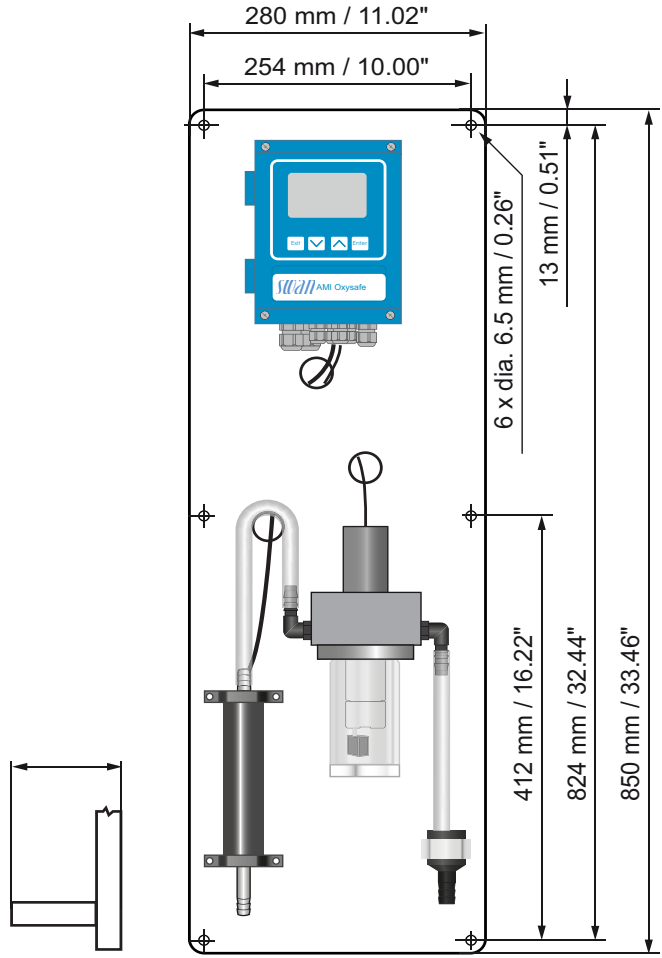
A *Fixing sleeve*
B *Flow cell block*
C *Oxysafe 1000 sensor*
D *Flow sensor DeltaT*
E *Inlet nozzle*
F *Flow cell vessel*
G *Sample outlet*
H *Sample inlet*
I *Drain funnel*

2.1. Instrument Specification

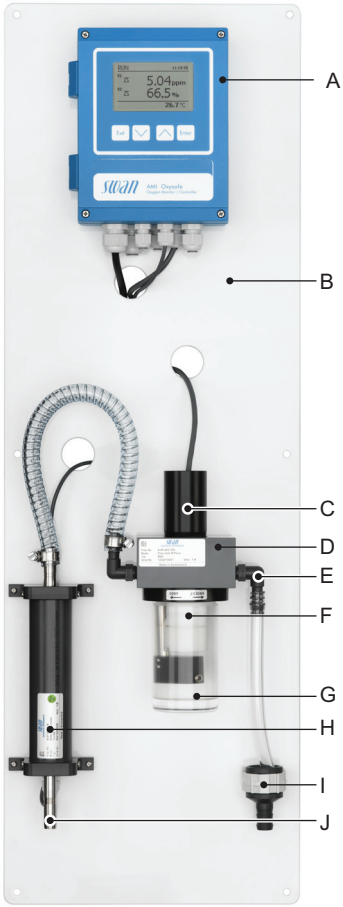
Power Supply	AC variant:	100–240 VAC (± 10%) 50/60 Hz (± 5%)
	DC variant	10–36 VDC
	Power consumption:	max. 35 VA
Transmitter specifications	Housing:	aluminum, with a protection degree of IP 66 / NEMA 4X
	Ambient temperature:	−10 to +50 °C
	Storage and transport:	−30 to +85 °C
	Humidity:	10–90% rel., non condensing
	Display:	backlit LCD, 75 x 45 mm
Sample requirements	Flow rate:	min. 4 to 15 l/h
	Temperature:	up to 50 °C (122 °F)
	Inlet pressure:	up to 1 bar (14.5 PSI)
	Outlet pressure:	pressure free
	pH:	not lower than pH 4
	Suspended solids:	less than 10 ppm
On-site requirements	The analyzer site must permit connections to:	
	Sample inlet:	Tube 1/4” (10 mm tube)
	Sample outlet:	1/2” hose nozzle for flexible tube diam. 20x15 mm
Measuring Range	Dissolved Oxygen	
	0.01–20 ppm	± 0.01 ppm
	0–200% saturation	± 0.1% saturation

Dimensions

Panel:	PVC
Dimensions:	280x850x200 mm
Screws:	5 mm or 6 mm diameter
Weight:	12.0 kg



2.2. Instrument Overview

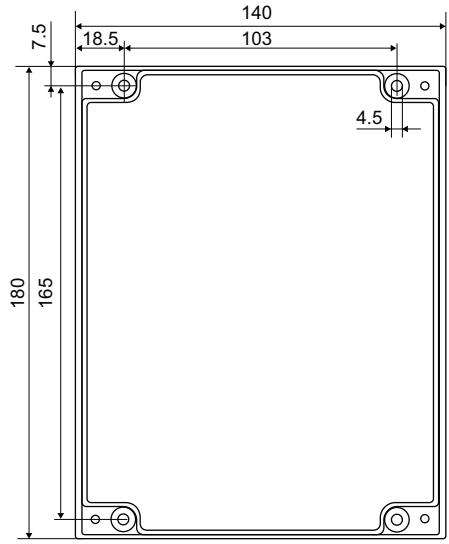


A *Transmitter*
B *Panel*
C *Fixing sleeve*
D *Flow cell block*
E *Sample outlet*
F *Oxysafe 1000 sensor*
G *Flow cell vessel*
H *Flow sensor DeltaT*
I *Drain funnel*
J *Sample inlet*

2.3. AMI Oxysafe Single Components

2.3.1 Transmitter

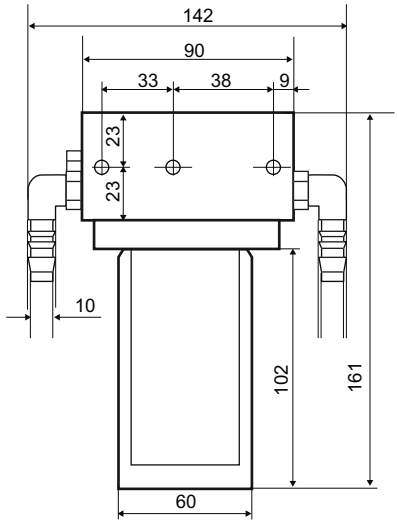
Electronic transmitter & controller for the measurement of the dissolved oxygen in potable or waste water.



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

2.3.2 Flow Cell M-Flow M40

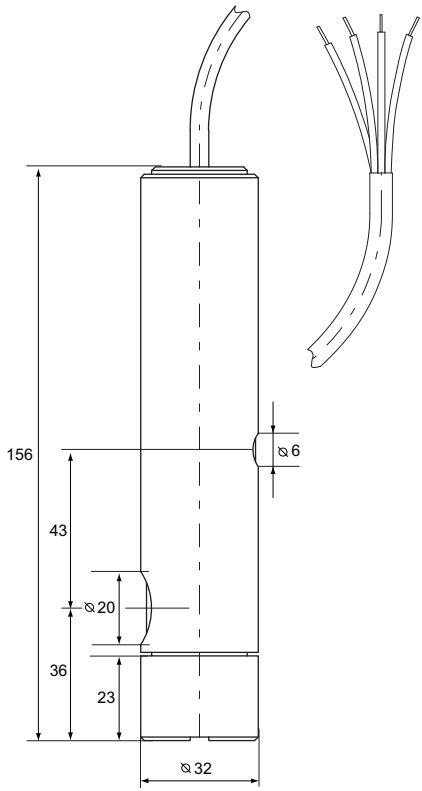
Flow cell made of PVC and acrylic glass with one M40 x 1.5 sensor opening. Suitable for Ø 32 mm sensors with M40 adapter.



Dimensions	Width:	142 mm
	Front-to-back:	138 mm
	Height:	161 mm
	Panel mounting:	3 screws M5
Sample connections	Sample:	G 1/4” thread
	Inlet and Outlet:	Equipped with elbow hose nozzle for 10 mm tube.

2.3.3 Sensor

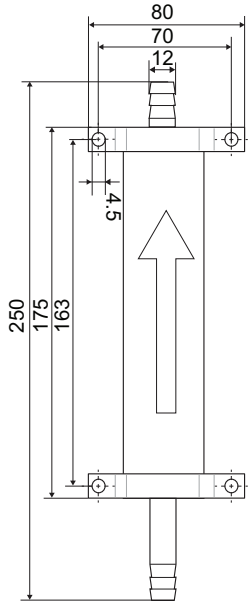
The Swansensor Oxysafe 1000 is used for the measurement of the dissolved oxygen in potable or waste water.



Dimensions	Length:	156 mm
	Diameter:	32 mm
	Weight:	350 g
Specifications	Material:	polyacetal copolymer
	Protection:	IP68.

2.3.4 Swansensor DeltaT

Calorimetric flow meter based on heat dissipation. For applications in potable water, surface water treatment and effluent.



Specifications

Measuring range/Flow rate:	0–40 l/h
Accuracy:	± 20%
Response time t_{90}:	ca. 1 min
Sample temperature:	5–35 °C
Sample inlet and outlet:	for tubing diam. 10–11 mm
Max. cable length:	1 m

3. Installation

3.1. Installation Check List

On-site requirements	AC variant: 100–240 VAC (± 10%), 50/60 Hz (± 5%) DC variant: 10–36 VDC Power consumption: 35 VA maximum. Protective earth connection required. Sample line: with 4 to 15 l/h and up to 1 bar. Waste line with atmospheric drain. pH: not lower than 4 Suspended solids: less than 10 ppm
Installation	Mount the Instrument Panel, p. 18. Connect Sample and Waste, p. 18. Install Swansensor Oxysafe 1000, p. 19. Install Swansensor deltaT (Option), p. 20
Electrical Wiring	Connect all external devices like limit switches, current loops and pumps. Connect power cord, see Connection Diagram, p. 25 or Power Supply, p. 26.
Sensor	Connect sensor Oxysafe 1000 to the transmitter. Make sure, that the sensor is clean and dry. Leave the sensor at the air.
Power-up	Switch on power.
Instrument Setup	Program all parameters for external devices (interface, recorders, etc.). Program all parameters for instrument operation (limits, alarms, measuring interval).
Run-in period	Operate the sensor at the air for at least 30 min better 1h.
Calibration	Perform a calibration, see Calibration, p. 41. After calibration install the sensor into the flow cell. See Install Swansensor Oxysafe 1000, p. 19.

3.2. Mount the Instrument Panel

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

- The instrument must only be installed by trained personnel.
- Mount the instrument in vertical position.
- For ease of operation mount it so that the display is at eye level.
- For the installation a kit containing the following installation material is available:
  - 6 Screws 6x60 mm
  - 6 Dowels
  - 6 Washers 6.4/12 mm

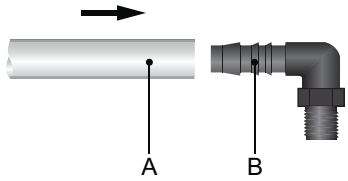
Mounting requirements

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

3.3. Connect Sample and Waste

3.3.1 Elbow Hose Nozzle

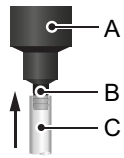
Use plastic tube (FEP, PA, or PE 10 x 12 mm) to connect the sample inlet and outlet.



A *Plastic tube 10 x 12*
B *Elbow hose nozzle*

Waste

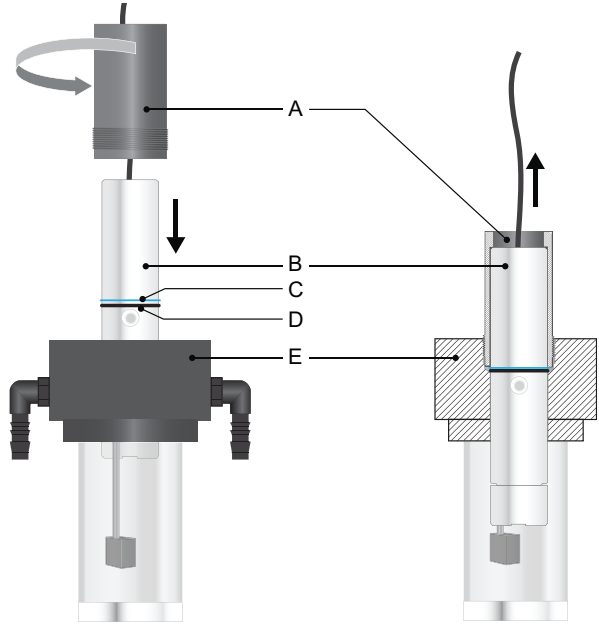
Connect the 20 x 15 mm tube to the nozzle of the waste funnel and place it into an atmospheric drain of sufficient capacity.



A *Drain funnel*
B *Hose nozzle*
C *Plastic tube 20 x 15*

3.4. Install Swansensor Oxysafe 1000

NOTICE: *Before the sensor is installed into the flow cell, calibrate it at the air, see* *Calibration, p. 41*.



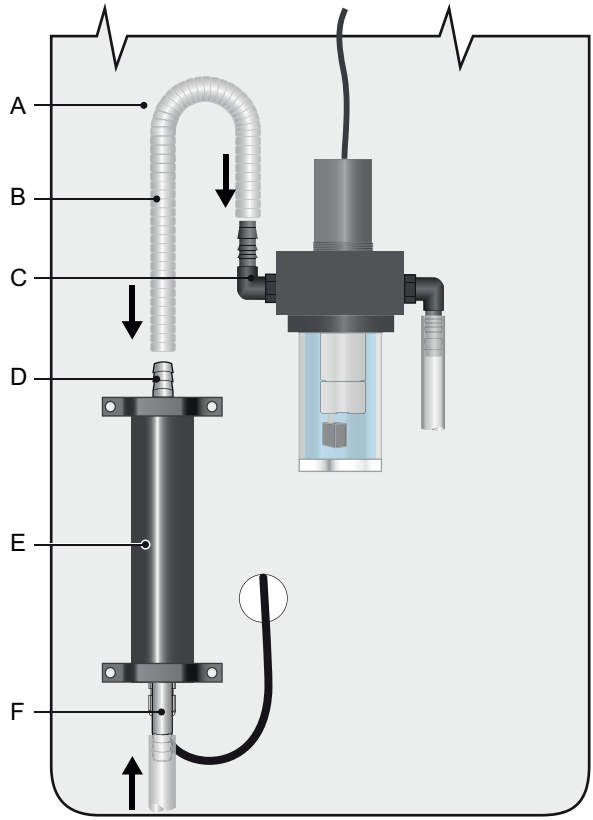
A *Fixing sleeve*
B *Oxysafe 1000 sensor*
C *Plastic washer*
D *O-ring*
E *Flow cell block*

1. Slide the plastic washer [C] and the o-ring [D] over the Swansensor Oxysafe 1000 [B].
2. Insert the Swansensor Oxysafe 1000 into the flow cell.
3. Screw the fixing sleeve into the flow cell block [E] and slightly tighten it.
4. Pull the Swansensor Oxysafe 1000 on its cable out up to the stop of the fixing sleeve.
5. Tighten the fixing sleeve.
6. Connect the sensor cable, see Connect the Sensor Cables to the Transmitter, p. 21

3.5. Install Swansensor deltaT (Option)

The following description assumes that the installation of the deltaT sensor takes place after commissioning of the monitor.

Install the deltaT sensor in vertical position with the sample inlet [F] and cable gland looking downwards.
To ensure laminar flow, the sample inlet must not be restricted; e.g. any fitting which creates turbulences.



A *Panel*
B *Tube connection*
C *Elbow hose nozzle*
D *Hose nozzle at deltaT sensor outlet*
E *deltaT sensor*
F *Hose nozzle at deltaT sensor inlet*

Before starting the installation of the deltaT sensor, stop operation according to chapter Stop of Operation for Maintenance, p. 43.

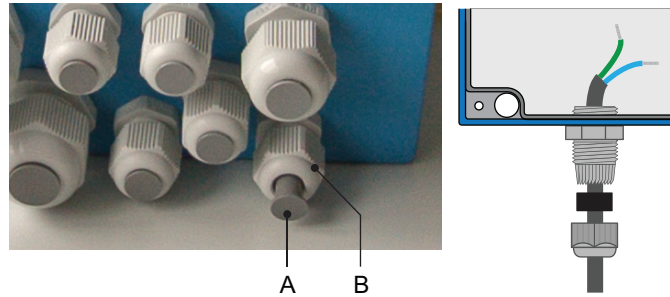
1 Mount the deltaT sensor [E] in vertical position to the panel [A].
2 Connect the sample inlet tube to the hose nozzle [F] of the deltaT sensor inlet.
3 Install the hose connection [B], enclosed in the installation kit, from the hose nozzle [D] at the deltaT sensor outlet to the elbow hose nozzle [C].

3.5.1 Connect the Sensor Cables to the Transmitter

WARNING

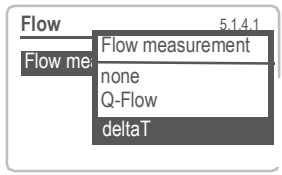
Electrical shock hazard!

- Before opening the AMI Transmitter switch power off.

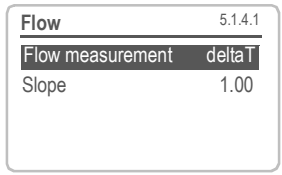


1 For each sensor cable (Swansensor Oxysafe 1000 and Swansensor deltaT) remove a plug [A] from a cable gland [B]
2 Open the AMI transmitter housing.
3 Feed the sensor cables through the cable glands into the transmitter housing.
4 Connect the cables to the terminals according to the connecting diagram see Connection Diagram, p. 25.
5 Close the AMI transmitter housing.
6 Switch on power.

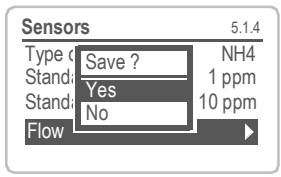
3.5.2 Change Firmware Settings



1 Navigate to <Installation> <Sensors> <Flow> <Flow measurement>.
2 Press <Enter>
3 Select <deltaT>



4 Press <Enter>
5 Press 2 x <Exit>



6 Press <Enter> to confirm with Yes
7 Press <Exit> until the display shows the measuring values.

3.5.3 Adjust the deltaT sensor

The deltaT flow measurement depends on the sample temperature and the ambient temperature. Therefore it is necessary to adjust the flow measurement with the sample temperature on site. To adjust the flow measurement proceed as follows:

1 Put an empty bucket under the sample outlet.
2 Switch on the sample flow for 10 min.
3 Observe the displayed sample flow on the transmitter display.
4 Calculate the quantity of sample in liters based on the displayed sample flow.
5 Compare the calculated quantity of sample with the quantity in the bucket.
6 Adjust the deltaT sensor by increasing or decreasing the slope value.

Starting from an average sample temperature of 25 °C:

- increase the slope value if the sample temperature falls below 25 °C.
- decrease the slope value if the sample temperature rises above 25 °C.

3.6. Electrical Connections

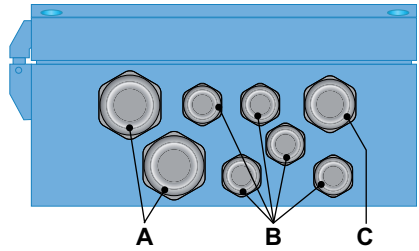
WARNING

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

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

Cable thicknesses

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



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

NOTICE: *Protect unused cable glands*

Wire

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

WARNING

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

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

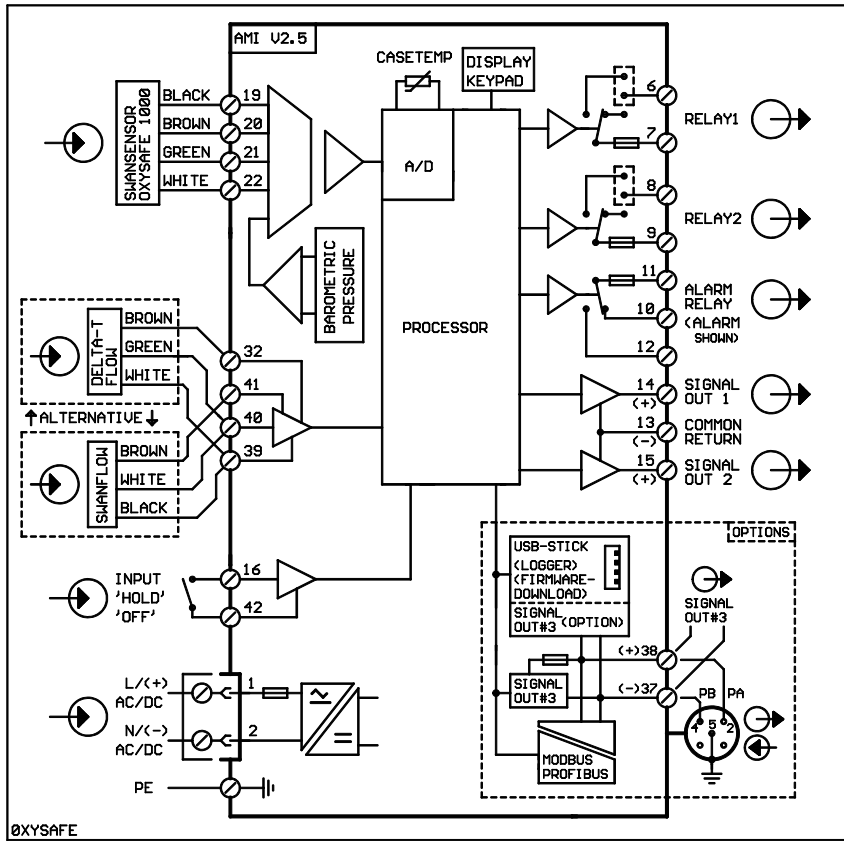
WARNING

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

WARNING

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

3.7. Connection Diagram



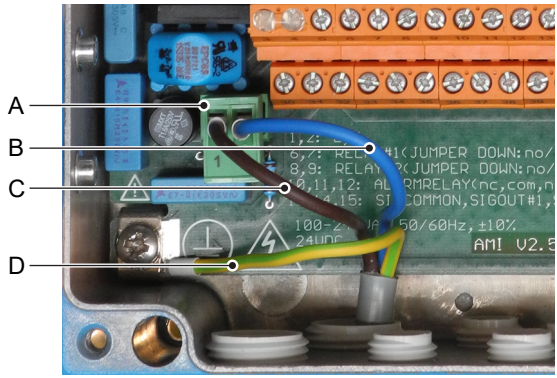
CAUTION

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.

3.7.1 Power Supply

WARNING

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



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

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

Installation requirements

The installation must meet the following requirements.

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

3.8. Input

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

Terminals 16/42

For programming see chap. 9, menu Installation, 5.3.4, p. 68.

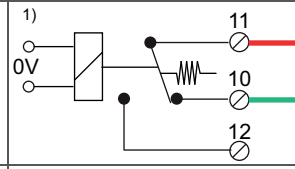
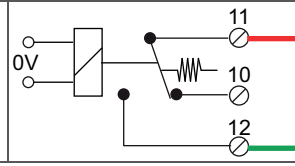
3.9. Relay Contacts

3.9.1 Alarm Relay

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

Alarm output for system errors.
Error codes see Error List, p. 46.

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

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

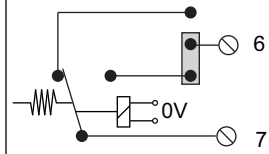
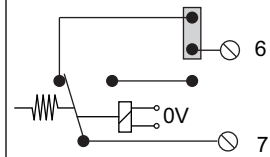
1) *usual use*

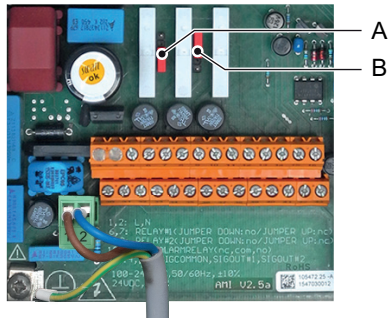
3.9.2 Relay 1 and 2

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

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

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

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



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

For programming see menu Installation 5.3.2 and 5.3.3, p. 64.

CAUTION

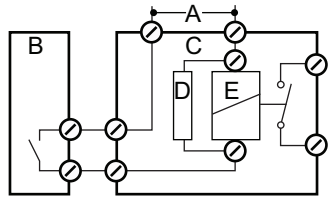
Risk of damage of the relays in the AMI Transmitter due to heavy inductive load.

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

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

Inductive load

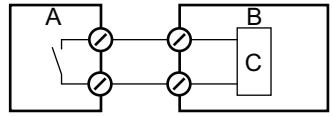
Small inductive loads (max 0.1 A) as for example the coil of a power relay can be switched directly. To avoid noise voltage in the AMI Transmitter it is mandatory to connect a snubber circuit in parallel to the load.
A snubber circuit is not necessary if an AMI relaybox is used.



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

Resistive load

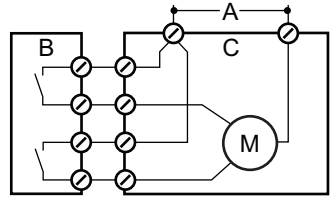
Resistive loads (max. 1 A) and control signals for PLC, impulse pumps and so on can be connected without further measures



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

Actuators

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



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

3.10. Signal Outputs

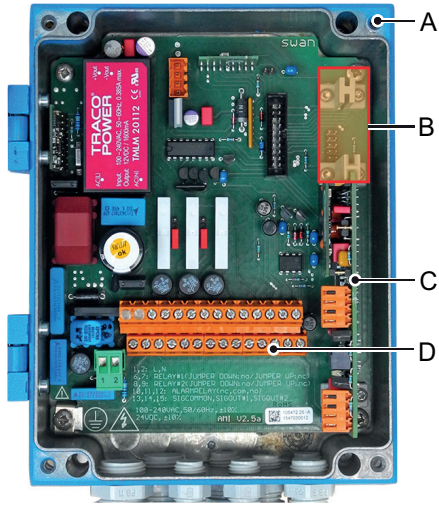
3.10.1 Signal Output 1 and 2 (current outputs)

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

Signal output 1: Terminals 14 (+) and 13 (-)
Signal output 2: Terminals 15 (+) and 13 (-)

For programming see Program List and Explanations, p. 55, Menu Installation

3.11. Interface Options



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

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

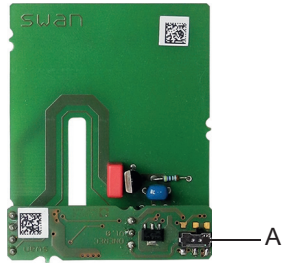
- Third signal output
- a Profibus or Modbus connection
- a HART connection
- an USB Interface

3.11.1 Signal Output 3

Terminals 38 (+) and 37 (-).

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

NOTICE: *Max. burden 510 Ω.*



Third signal output 0/4 - 20 mA PCB

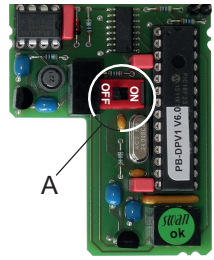
A Operating mode selector switch

3.11.2 Profibus, Modbus Interface

Terminal 37 PB, Terminal 38 PA

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

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



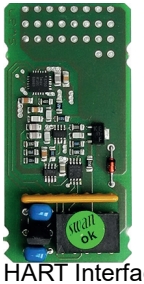
Profibus, Modbus Interface PCB (RS 485)

A *On - OFF switch*

3.11.3 HART Interface

Terminals 38 (+) and 37 (-).

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

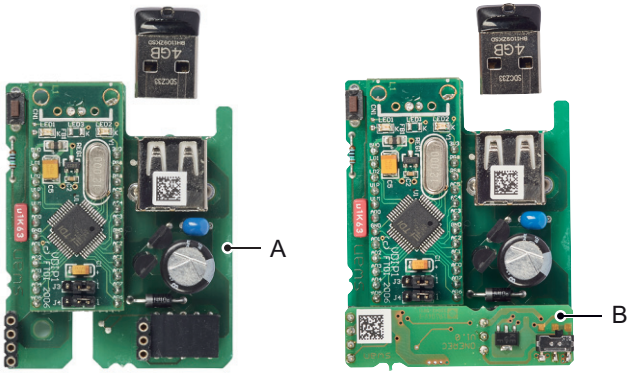


HART Interface PCB

3.11.4 USB Interface

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

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



USB Interface

A USB interface PCB

B Third signal output 0/4 - 20 mA PCB

4. Instrument Setup

After installation according to checklist proceed as following:

1 Switch on the instrument.
2 Do not open the sample tap.
3 If the sensor is already installed in the flow cell, remove it and if necessary gently dry it with a soft tissue.
4 Operate it at the air for at least 30 min better 1h.

4.1. Calibration

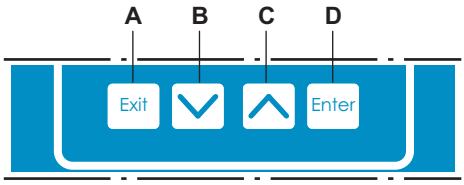
1 Open the sample tap and wait until the flow cell is filled.
2 Close the sample tap.
3 Place the Swansensor Oxysafe 1000 slightly tilted into the flow cell block [C], see Calibration, p. 41.
4 Perform a calibration, see Calibration, p. 41.
5 Install the sensor into the flow cell, see Install Swansensor Oxysafe 1000, p. 19.
6 Open the sample tap.

4.2. Programming

Program all parameters for external devices (interface, recorders, etc.)
Program all parameters for instrument operation (limits, alarms).

5. Operation

5.1. Keys



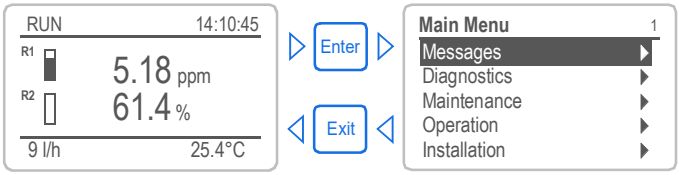
A to exit a menu or command (rejecting any changes)
to move back to the previous menu level

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

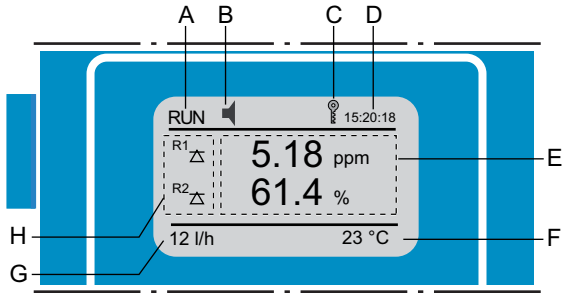
C to move UP in a menu list and to increase digits

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 in l/h

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

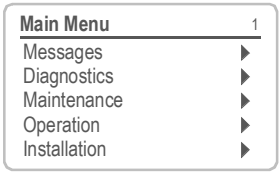
motor valve closed

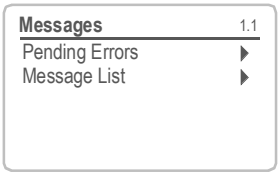
motor valve: open, dark bar indicates approx. position

timer

timer: timing active (hand rotating)

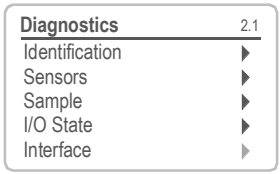
5.3. Software Structure





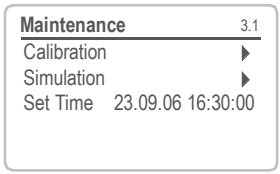
Menu **Messages 1**

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.



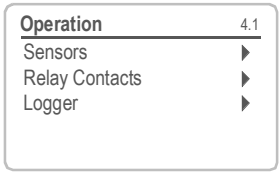
Menu **Diagnostics 2**

Provides user relevant instrument and sample data.



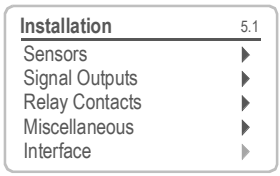
Menu **Maintenance 3**

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.



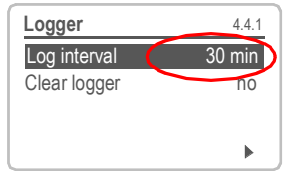
Menu **Installation 5**

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

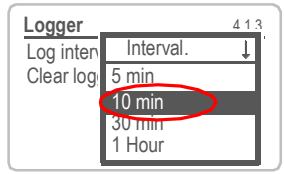
Changing parameters

The following example shows how to change the logger interval:



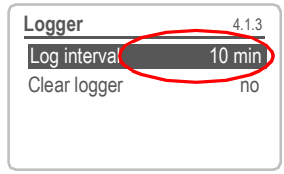
1 Select the parameter you want to change.

2 Press [Enter]



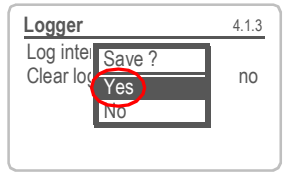
3 Press [▲] or [▼] key to highlight the required parameter.

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



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

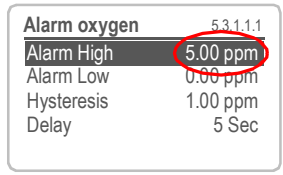
5 Press [Exit].

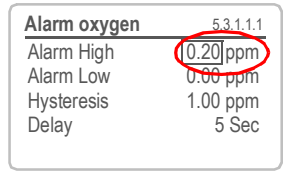


⇒ *Yes is highlighted.*

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 Schedule

WARNING

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

Daily (dirty water) **up to every** **2 weeks (clean water)**	Check sample supply for dirt. Check sample flow. Clean sensor. See Sensor Cleaning, p. 39.
Monthly	Check saturation at air (100%). If necessary calibrate the sensor.
Yearly	Calibrate sensor. Replace membrane and electrolyte*.
By occurrence:	Clean flow cell and, if any, flow meter, if dirty.

*Membrane and electrolyte replacement is necessary if:

- the response of the sensor is slow.
- the sensor can not be calibrated any more and/or the instrument shows a corresponding error message.
- the sensor signal is very unstable.

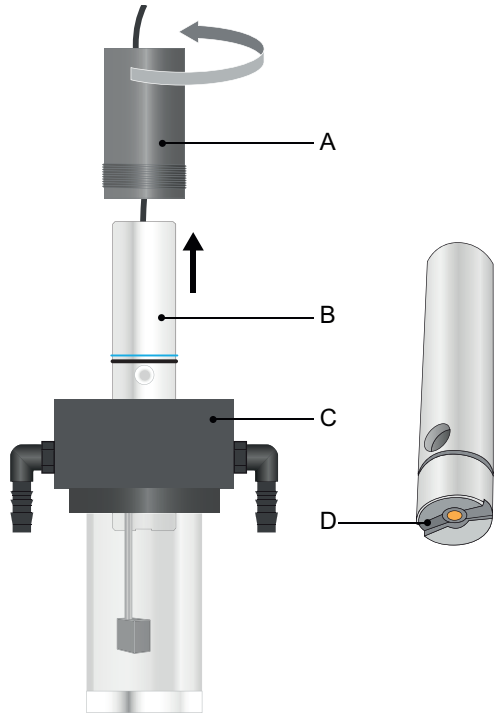
6.2. Stop of Operation for Maintenance

1 Stop sample flow.

2 Shut off power of the instrument.

6.3. Sensor Cleaning

For correct operation, the membrane must be clean. The frequency of cleaning and calibration intervals depends on the facility and the pollution of the sample. Normally, monthly cleaning is adequate, in many cases, you can extend the interval.



A *Fixing sleeve*
B *Oxysafe 1000 sensor*
C *Flow cell block*
D *Sensor membrane*

CAUTION

Damage of the membrane
Do not touch the membrane with sharp or pointed objects.

To clean the Swansensor Oxysafe 1000 proceed as follows:

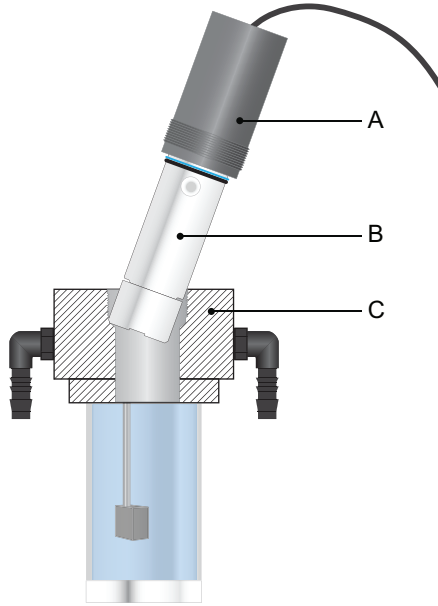
1. Turn off the sample flow by closing the valve.
2. Switch off power of the AMI Oxysafe.
3. Unscrew and remove the fixing sleeve [A] from the flow cell block.
4. Remove the Swansensor Oxysafe 1000 sensor [B] from the flow cell.
5. Wipe it gently dry and clean the membrane [D] with a soft paper towel.
6. Install the Swansensor Oxysafe, see Install Swansensor Oxysafe 1000, p. 19.

After finishing the cleaning, inspect the membrane. If there are holes or fractures, you have to change it. If the membrane looks all right, leave the Swansensor Oxysafe 1000 at the air and check the calibration value:
The display should read roughly 100% (+/- 10%).

6.4. Calibration

In the wet flow cell, the atmosphere is saturated with water vapour. This atmosphere leads to the most accurate calibration results. The sensing part of the electrode must not be in direct contact with water!

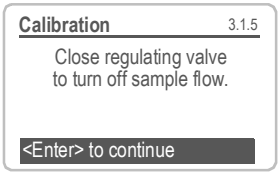
The time required for a calibration depends mainly on the difference between the temperature and oxygen content in the sample and in the air. It can take 15 - 20 minutes. This is also the case if the electrolyte has been exchanged. The end of the calibration is shown on the display.



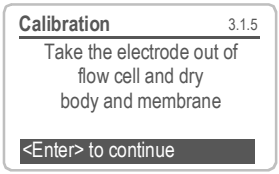
A *Fixing sleeve*
B *Oxysafe 1000 sensor*
C *Flow cell block*

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

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



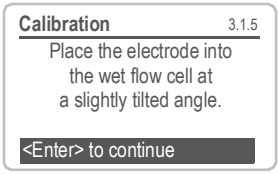
3 Stop the sample flow at the main tap.



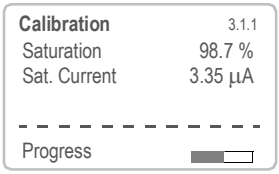
4 Unscrew and remove the fixing sleeve [A].

5 Remove the Swansensor Oxysafe 1000 [B] from the flow cell.

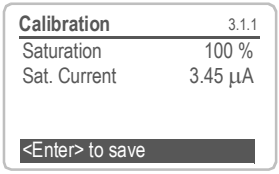
6 Dry the sensor membrane with a soft paper tissue.



7 Place the Swansensor Oxysafe 1000 slightly tilted into the flow cell block [C].
⇒ *The sensor membrane must not be in the water.*



The saturation should reach 100%, the saturation current should be about 2 µA to 8 µA. If the measuring values are not stable during the measuring period, the calibration will be discarded.



If this is the case, check and if necessary correct your measurement arrangement and try again.

If the calibration was successful press [Enter] to save.

Possible error message

Calibration Error!:

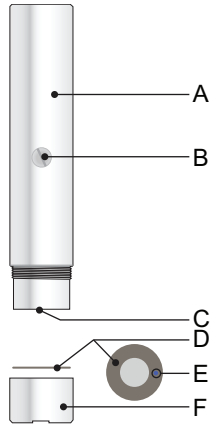
Possible reason

- Air bubbles in the electrolyte.
- Electrolyte depleted.
- Membrane wet.
- Membrane broken.

6.5. Replace Membrane and Electrolyte

WARNING

Electrolyte will pour out.
Electrolyte is slightly alkaline and slightly caustic.
- Protect eyes, skin, and clothes carefully.
- Rinse well immediately.
- Short contact with the skin is not dangerous.



A *Swansensor Oxysafe 1000*
B *Filling hole to refill the electrolyte*
C *Gold cathode*
D *Membrane*
E *Dot marking the upper membrane side*
F *Membrane cap*

Refill the Swansensor Oxysafe 1000 with electrolyte over a sink. For that reason disconnect the Swansensor Oxysafe 1000 from the transmitter.

Disconnect the sensor

1. Switch off power of the AMI Oxysafe.
2. Open the transmitter housing and disconnect the Swansensor Oxysafe 1000.
3. Release the cable gland and pull the sensor cable out.

Remove and open the sensor

1. Unscrew and remove the fixing sleeve from the flow cell block.
2. Remove the Swansensor Oxysafe 1000 [A] from the flow cell.
3. Unscrew and remove the screw plug of the filling hole [B].
4. Screw off the membrane cap [F] of the electrode.
   ⚠ *Caution: Electrolyte flows out*
5. Remove the old membrane [D].
6. Rinse the sensor well several times with clean water. Clean the thread of the sensor and the membrane cap.
7. Check if the gold cathode [C] in the centre of the sensor has a bright golden color. If there is any coating, it has to be cleaned.

Clean the gold cathode

1. Dry the sensor tip with a soft tissue.
2. Polish the gold cathode with polishing cloth.
   ⚠ *Caution: The surrounding circular sealing surface has to be treated with care.*
3. Rinse the sensor well again after polishing.

Insert the new membrane

1. Fill in some electrolyte through the filling hole [B] and rinse the inside of the sensor [A] by slightly shaking it.
2. Pour out the electrolyte.
3. Put the membrane with the dot [E] facing towards the gold cathode into the clean membrane cap.
4. Put three drops of electrolyte in the middle of the membrane.
5. Hold the sensor with the gold cathode pointing downwards.
6. Screw the membrane cap onto the sensor and tighten it well by hand.

Refill electrolyte

1. Hold the sensor at a slight angle with the gold cathode pointing downwards.
2. Fill in the electrolyte through the filling hole [B].
3. Hold the sensor with the gold cathode pointing downwards and close the filling hole with your thumb.
4. With your arm stretched, firmly swing the sensor several times to get the air bubbles to the filling hole.
5. Again fill in electrolyte and swing it again until the sensor is bubble-free filled with electrolyte up to the edge of the filling hole.
6. Slowly screw in the screw plug to allow excessive electrolyte to escape. Tighten the screw plug until the o-ring is sealing.

7 Clean the Swansensor Oxysafe 1000 with a paper towel.

8 Wash your hands well under running water.

NOTICE: *After each change of the membrane and electrolyte the sensor has to run-in on the powered instrument for at least 30 minutes, better one hour. Leave the sensor at the air. The membrane should be clean and dry. Afterwards, the sensor can be calibrated.*

Connect the Sensor

1 Feed the sensor cable through the cable gland and connect it to the terminals, see Connection Diagram, p. 25.

2 Place the sensor slightly tilted into the flow cell block, see Calibration, p. 41.

3 Switch the instrument on.

4 Let the sensor run-in for at least 30 minutes up to 1 h.

5 Afterwards calibrate the sensor see Calibration, p. 41.

6.6. Longer Stop of Operation

1 Stop sample flow.

2 Shut off power of the instrument.

3 Empty the flow cell completely.

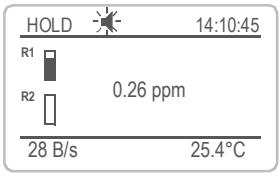
4 Clean sensor and membrane with a soft paper towel.

7. Troubleshooting

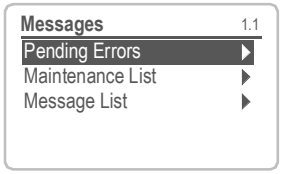
7.1. Error List

Error
Non-fatal Error. Indicates an alarm if a programmed value is exceeded.
Such Errors are marked **E0xx** (bold and black).
Fatal Error (blinking symbol)
Control of dosing devices is interrupted.
The indicated measured values are possibly incorrect.
Fatal Errors are divided in the following two categories:

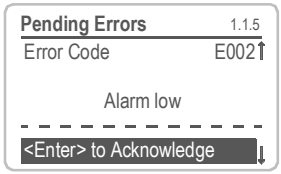
- Errors which disappear if correct measuring conditions are recovered (i.e. Sample Flow low).
  Such Errors are marked E0xx (bold and orange)
- Errors which indicate a hardware failure of the instrument.
  Such Errors are marked **E0xx** (bold and red)



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



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



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

Error	Description	Corrective action
E001	Oxygen Alarm high	– check process check programmed value 5.3.1.1.1, p. 62
E002	Oxygen Alarm low	– check process check programmed value 5.3.1.1.25, p. 62
E003	Saturation Alarm high	– check process check programmed value 5.3.1.4.1, p. 63
E004	Saturation Alarm low	– check process check programmed value 5.3.1.1.25, p. 62
E007	Sample Temp. high	– check sample temperature – check programmed value 5.3.1.3.1, p. 63
E008	Sample Temp. low	– check sample temperature – check programmed value 5.3.1.3.2, p. 63
E009	Sample Flow high	– check Inlet pressure – readjust sample flow – check programmed value 5.3.1.2.2, p. 63
E010	Sample Flow low	– check Inlet pressure – readjust sample flow – clean instrument, see – check programmed value 5.3.1.2.35, p. 63
E011	Temp. shorted	– check wiring of temperature sensor, see Connection Diagram, p. 25.
E012	Temp. disconnected	– check wiring of temperature sensor, see Connection Diagram, p. 25.

Error	Description	Corrective action
E013	Case Temp. high	– check case/environment temperature – check programmed value 5.3.1.5.1, p. 64
E014	Case Temp. low	– check case/environment temperature – check programmed value 5.3.1.5.2, p. 64
E017	Control Timeout	– check control device or programming in Installation, Relay contact, Relay 1 and 2 5.3.2 and 5.3.3, p. 64
E024	Input active	– See If Fault Yes is programmed in Menu 5.3.4, p. 68
E026	IC LM75	– call service
E028	Signal output open	– check wiring on signal outputs 1 and 2
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

7.2. Replace Fuses

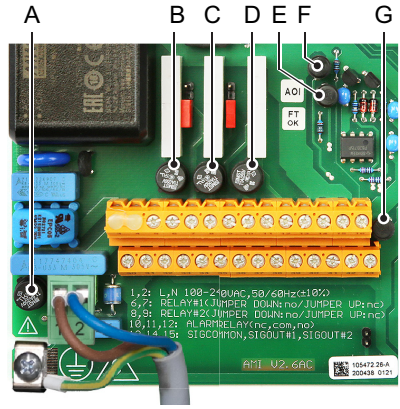
WARNING

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

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

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

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



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

8. Program Overview

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

- Menu 1 **Messages** informs about pending errors and maintenance tasks and shows the error history. Password protection possible. No settings can be modified.
- Menu 2 **Diagnostics** is always accessible for everybody. No password protection. No settings can be modified.
- Menu 3 **Maintenance** is for service: Calibration, simulation of outputs and set time/date. Please protect with password.
- Menu 4 **Operation** is for the user, allowing to set limits, alarm values, etc. The presetting is done in the menu Installation (only for the System engineer). Please protect with password.
- Menu 5 **Installation**: Defining assignment of all inputs and outputs, measuring parameters, interface, passwords, etc. Menu for the system engineer. Password strongly recommended.

8.1. Messages (Main Menu 1)

Pending Errors 1.1*	*Pending Errors*	1.1.5*	* Menu numbers
Message List 1.2*	*Number*	1.2.1*	
	Date, Time		

8.2. Diagnostics (Main Menu 2)

Identification	Designation	*AMI Oxysafe*		* Menu numbers
2.1*	Version	*V6.20 - 08 /16*		
	Factory Test	*Instrument*	2.1.3.1*	
	2.1.3*	*Motherboard*		
		Front End		
	Operating Time	*Years / Days / Hours / Minutes / Seconds*		2.1.4.1*
	2.1.4*			
Sensors	**Oxysafe 1000**	*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*		
Sample	*Sample ID*	2.3.1*		
2.3*	*Temperature*			
	(Pt 1000)			
	Sample Flow			
	(Raw value)			
I/O State	*Alarm Relay*	2.4.1*		
2.4*	*Relay 1 and 2*	2.4.2*		
	Input			
	Signal Output 1/2			
Interface	*Protocol*	2.5.1*		(only with RS485
2.5*	*Baud rate*			interface)

8.3. Maintenance (Main Menu 3)

Calibration	**Calibration**	
3.1*	3.1.5*	
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)*	
3.4*		

* Menu numbers

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 Oxygen**	*Alarm High*	4.2.1.1.x*
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*
		Alarm Saturation	*Alarm High*	4.2.1.2.x*
		4.2.1.2*	*Alarm Low*	4.2.1.2.x*
			Hysteresis	4.2.1.2.x*
			Delay	4.2.1.2.x*
	Relay 1 and 2	*Setpoint*	4.2.x.1x*	
	4.2.2* and 4.2.3*	*Hysteresis*	4.2.x.2x*	
		Delay	4.2.x.3x*	
	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*		

* Menu numbers

8.5. Installation (Main Menu 5)

Sensors	**Flow**	*Flow measurement*	5.1.1.1*	* Menu numbers
5.1*	5.1.1*			
	Salinity	5.1.2*		
Signal Outputs	**Signal Output 1 and 2**	*Parameter*	5.2.1.1 - 5.2.2.1*	
5.2*	5.2.1* and 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*	5.3.1.1.2x*
			Hysteresis	5.3.1.1.3x*
			Delay	5.3.1.1.4x*
		Sample Flow	*Flow Alarm*	5.3.1.2.1*
		5.3.1.2*	*Alarm High*	5.3.1.2.2*
			Alarm Low	5.3.1.2.3*
		Sample Temp.	*Alarm High*	5.3.1.3.1*
		5.3.1.3*	*Alarm Low*	5.3.1.3.2*
		Alarm Saturation	*Alarm High*	5.3.1.4.1*
		5.3.1.4*	*Alarm Low*	5.3.1.4.2x*
			Hysteresis	5.3.1.4.3x*
			Delay	5.3.1.4.4x*
		Case Temperature	*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*	5.3.2.2x - 5.3.3.2x*	
		Setpoint	5.3.2.3xx-5.3.3.3xx*	
		Hysteresis	5.3.2.4xx-5.3.3.4xx*	
		Delay	5.3.2.5x - 5.3.3.5x*	
	Input	*Active*	5.3.4.1*	
	5.3.4*	*Signal Outputs*	5.3.4.2*	
		Output/Control	5.3.4.3*	
		Fault	5.3.4.4*	
		Delay	5.3.4.5*	

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

9. Program List and Explanations

1 Messages

1.1 Pending Errors

1.1.1 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 and 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

Designation: Shows the Designation of instrument.

Version: Firmware of instrument (e.g. V6.20 - 08 /16)

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

2.1.4 **Operating Time**: Years, Days, Hours, Minutes, Seconds

2.2 Sensors

2.2.1 **Oxysafe 1000:**

- *Current value*: Shows the actual oxygen sensor signal in ppm
- *Raw value tc*: Shows the actual raw value in µA, temperature compensated
- *Saturation*: Shows the actual saturation in %

2.2.1.5 **Cal. History:** Review diagnostic values of the last calibrations of the oxygen sensor. Only for diagnostic purpose. Max. 64 data records are memorized.

- *Number*: Calibration counter (max. 64)
- *Date, Time*: Date and time of the calibration
- *Sat. Current*: Saturation current during calibration
- *Air Pressure*: Actual air pressure during calibration

2.2.2 **Miscellaneous**:
o *Case Temp*: Read actual temperature in °C inside the transmitter.
o *Air Pressure*: Displaying of the actual air pressure in hPa

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 in °C and in Ohm *(Pt1000)*
Sample Flow: Read the actual sample flow in l/h and additionally the raw value of the flow sensor in Hz

2.4 I/O State

Shows current status of all in- and outputs.

2.4.1 and 2.4.2

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

2.5 Interface

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

3 Maintenance

3.1 Calibration

3.1.1 *Calibration*: Start a calibration and follow the instructions on the screen. Displayed values are:
Saturation: in %
Saturation current: in µA.
The indication bar shows the progress.

3.2 Simulation

3.2.1-3.2.5 To simulate a value or a relay state, select the

- alarm relay,
- relay 1 or 2
- signal output 1 or 2
- valve 1 or 2

with the [▲] or [▼] key.

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

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

3.3 Set Time

Adjust date and time.

4 Operation

4.1 Sensors

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

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

4.2 Relay Contacts

See 5.3 Relay Contacts, p. 62

4.3 Logger

The instrument is equipped with an internal logger. The logger data can be copied to a PC with an USB stick if option USB interface is installed.
The logger can save approx. 1500 data records. Records consists of: Date, time, alarms, oxygen in ppm, temperature in °C, sample flow in l/h, saturation in%, air pressure in hpa and case temperature in °C.
Range: 1 Second to 1 hour

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

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

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

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 from the list:

Flow measurement
None
Q-Flow
deltaT

Q-Flow

deltaT

5.1.1.2 *Salinity*: Correction value if the water is salty, enter the expected concentration of NaCl [g/l]
Range: 0–50 g/l

5.2 Signal Outputs

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.

> ***NOTICE:*** *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.*

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

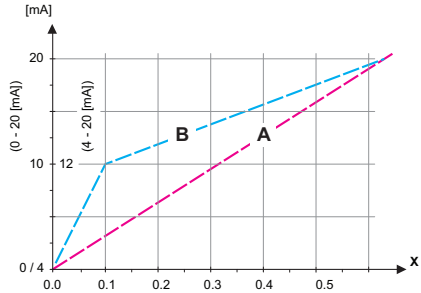
range.
Available ranges: 0 - 20 [mA] or 4 - 20 [mA]

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:

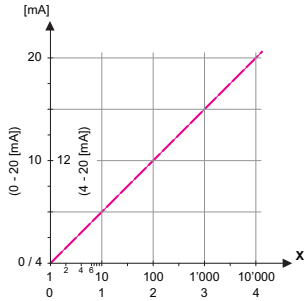
- Linear, bilinear or logarithmic for process values.
  See As process values, p. 59
- Control upwards or control downwards for controllers.
  See As control output, p. 60

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)*

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

Parameter Free Oxygen

5.2.1.40.10 *Range low*: 0–20 ppm

5.2.1.40.20 *Range high:* 0–20 ppm

Parameter Total Temperature

5.2.1.40.11 *Range low*: -30 to +130 °C

5.2.1.40.21 *Range high:* -30 to +130 °C

Parameter Total Sample folw

5.2.1.40.12 *Range low*: 0–50 l/h

5.2.1.40.22 *Range high:* 0–50 l/h

Parameter Saturation

5.2.1.40.13 *Range low*: 0–200%

5.2.1.40.23 *Range high:* 0–200%

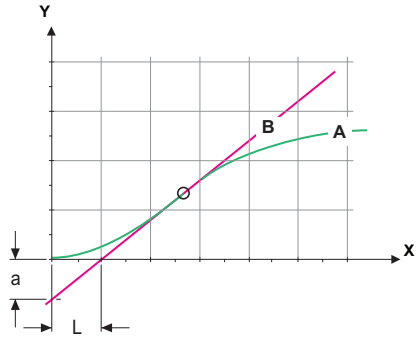
As control output

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.

Control upwards/downwards

- *Setpoint:* User-defined process value (Measured value or flow)
- *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 set-point without overshooting.

5.2.1.43 **Control Parameters**: if Parameters = Oxygen
5.2.1.43.10 *Setpoint*: 0–20 ppm
5.2.1.43.20 *P-Band*: 0–20 ppm

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

5.2.1.43 **Control Parameters**: if Parameters = Sample Flow
5.2.1.43.12 *Setpoint*: 0–50 l/h
5.2.1.43.22 *P-Band*: 0–50 l/h

5.2.1.43 **Control Parameters**: if Parameters = Saturation
5.2.1.43.13 *Setpoint*: 0–200 %
5.2.1.43.23 *P-Band*: 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, hysteresis values and delay times for the following parameters:

Oxygen, Sample Temp, Sample Flow, Saturation and Case Temp.

The alarm values of Oxygen and Saturation can also be programmed in menu 4.2.1.1 or 4.2.1.2

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: 0.000–20.00 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: 0.00–20.00 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: 0.00–20.00 ppm

5.3.1.1.45 *Delay:* Duration, the activation of the alarm relay is retarded after the messuring 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

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

5.3.1.2.2 *Alarm High:* If the measuring values rises above the programmed value E009 will be issued.
Range: 10–50 l/h

5.3.1.2.35 *Alarm Low:* If the measuring values falls below the programmed value E010 will be issued.
Range: 0–9 l/h

5.3.1.3 Sample 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: 30–100 °C

5.3.1.3.2 *Alarm Low:* If the sample temperature falls below the programmed value E008 is issued.
Range: -10–20 °C

5.3.1.4 Alarm Saturation: Define the measuring value, which should issue an alarm high respectively low.

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: 0–200%

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: 0–200%

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 fluc-

tuates around the alarm value
Range: 0–200 %

5.3.1.4.45 *Delay:* Duration, the activation of the alarm relay is retarded after the messuring value has risen above/fallen below the programmed alarm.
Range: 0–28‘800 sec

5.3.1.5 Case Temperature:

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: -10–20 °C

5.3.2 and 5.3.3 **Relay 1 and 2:** The contacts can be set as normally open or normally closed with a jumper. See Relay 1 and 2, p. 28.
The function of relay contacts 1 or 2 are defined by the user.

> ***NOTICE:*** *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
Oxygen	0–20 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	0–20 ppm
Temperature	0 to +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 messuring 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.

- Oxygen
- Temperature
- Sample flow
- Saturation

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 active repetitively depending on the programmed time scheme.

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

5.3.2.24 *Interval*

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

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

5.3.2.54 *Delay*: during run time plus the delay time the signal and control outputs are held in the operating mode programmed below.
Range: 0–6000 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:
The measurement is interrupted during the time the input is active.

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

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

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

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

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

5.3.4.4 *Fault:*

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

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

5.4 Miscellaneous

5.4.1 *Language:* Set the desired language.

Language
German
English
French
Spanish

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

Set defaults
no
Calibration
In parts
Completely

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

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

Load Firmware
no
yes

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

5.4.4.1 Messages

5.4.4.2 Maintenance

5.4.4.3 Operation

5.4.4.4 Installation.

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

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

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

5.4.6 *Line Break Detection:* Define if message E028 should be issued in case of a line break on signal output 1 or 2.

Choose between <Yes> or <No>.

5.5 Interface

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

5.5.1 *Protocol:* **Profibus**

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

5.5.1 *Protocol:* **Modbus RTU**

5.5.21	Device address:	Range: 0–126
5.5.31	Baud Rate:	Range: 1200–115200 Baud
5.5.41	Parity:	Range: none, even, odd

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

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

5.5.1 *Protocol:* **HART**

Device address: Range: 0–63

10. Material Safety Data sheets

10.1. Reagents

Catalogue No.: A-87.290.060
Product name: Filling solution 1ALK

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

11. Default Values

Operation:

Sensors:	Filter Time Const.: ..... 20 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; flow measurement: ..... none Salinity: ..... 0 g/l
Signal Output 1 and 2	Parameter (Signal Output 1: ..... Oxygen Parameter (Signal Output 2: ..... Temperature Current loop: ..... 4–20 mA Function: ..... linear Scaling: Range low: ..... 0.00 ppm Scaling: Range high: ..... 10.00 ppm Scaling: Temperature: Range low: ..... 0.0 °C Scaling: Temperature: Range high: ..... 50.0 °C Scaling: Sample flow: Range low: ..... 0 l/h Scaling: Sample flow: Range high: ..... 50 l/h Scaling: Saturation: Range low: ..... 0 % Scaling: Saturation: Range high: ..... 100 %
Alarm Relay:	Alarm Oxygen: High: ..... 10.00 ppm Alarm Oxygen: Low: ..... 0.00 ppm Alarm Oxygen: Hysteresis: ..... 0.10 ppm Alarm Oxygen: Delay: ..... 30 s Sample Flow: Flow Alarm: ..... yes Sample Flow: Alarm High: ..... 15 l/h Sample Flow: Alarm Low: ..... 5 l/h Sample Temperature: Alarm High: ..... 50 °C Sample Temperature: Alarm Low: ..... 0 °C Alarm Saturation: Alarm high: ..... 120.0 % Alarm Saturation: Alarm low: ..... 0.0 %

Alarm Saturation: Hysteresis: 2.0%
Alarm Saturation: Delay: ..... 30 s

Case Temperature: High: ..... 65 °C
Case Temperature: Low: ..... 0 °C

Relay 1 and 2

Function: ..... limit upper
Parameter; Relay 1: ..... Oxygen
Parameter; Relay 2: ..... Temperature

Parameter: ..... Oxygen
Setpoint: ..... 10.0 ppm
Hysteresis: ..... 0.10 ppm
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: ..... 0.10 ppm

Parameter: ..... **Temperature**
Settings: Actuator: ..... Frequency
Settings: Pulse Frequency: 120/min
Settings: Control Parameters: Setpoint: ..... 50 °C
Settings: Control Parameters: P-band: ..... 1 °C

Parameter: ..... **Sample flow**
Settings: Actuator: ..... Frequency
Settings: Pulse Frequency: 120/min
Settings: Control Parameters: Setpoint: ..... 25 l/h
Settings: Control Parameters: P-band: ..... 1 l/h

Parameter: ..... **Saturation**
Settings: Actuator: ..... Frequency
Settings: Pulse Frequency: 120/min
Settings: Control Parameters: Setpoint: 100%
Settings: Control Parameters: P-band: 1%

Common settings:

Settings: Control Parameters: Reset time: ..... 0 s
Settings: Control Parameters: Derivative Time: ..... 0 s
Settings: Control Parameters: Control Timeout: ..... 0 min
Settings: Actuator: ..... Time proportional
Cycle time: ..... 60 s
Response time: ..... 10 s

Settings: Actuator ..... Motor valve
Run time: ..... 60 s
Neutral zone: 5%

	If Function = Timer:	
	Mode:	Interval
	Interval:	1 min
	Mode:	daily
	Start time:	00.00.00
	Mode:	weekly
	Calendar; Start time:	00.00.00
	Calendar; Monday to Sunday:	Off
	Run time:	10 s
	Delay:	5 s
	Signal output:	cont
	Output/Control:	cont
Input:	Active	when closed
	Signal Outputs	hold
	Output/Control	off
	Fault	no
	Delay	10 s
Miscellaneous	Language:	English
	Set default:	no
	Load firmware:	no
	Password:	for all modes 0000
	Sample ID:	- - - - - - - -
	Line break detection	no

12. Index

13. Notes

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- Feedwater, Steam and Condensate
- Potable Water
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