

# AMI-II Pool

## Operator's Manual



 **MADE IN  
SWITZERLAND**



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## Operator's Manual

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

### 1. Safety Instructions

|                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|--------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>General</b>                 | <p>The instructions included in this section explain the potential risks associated with instrument operation and provide important safety practices designed to minimize these risks.</p> <p>If you carefully follow the information contained in this section, you can protect yourself from hazards and create a safer work environment.</p> <p>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.</p> |
| <b>Target audience</b>         | <p>Operator: Qualified person who uses the equipment for its intended purpose.</p> <p>Instrument operation requires thorough knowledge of applications, instrument functions and software program as well as all applicable safety rules and regulations.</p>                                                                                                                                                                                                                                                                                   |
| <b>OM location</b>             | <p>Keep the Operator's Manual in proximity of the instrument.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| <b>Qualification, training</b> | <p>To be qualified for instrument installation and operation, you must</p> <ul style="list-style-type: none"><li>♦ read and understand the instructions in this manual as well as the Material Safety Data Sheets,</li><li>♦ know the relevant safety rules and regulations.</li></ul>                                                                                                                                                                                                                                                          |

## 1.1. Warning Notices

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



### **DANGER**

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

- ♦ Follow the prevention instructions carefully.



### **WARNING**

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

- ♦ Follow the prevention instructions carefully.



### **CAUTION**

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

- ♦ Follow the prevention instructions carefully.

### **Mandatory signs**

The mandatory signs in this manual have the following meaning:



Safety goggles



Safety gloves

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



Electrical shock hazard



Corrosive



Harmful to health



Flammable



General warning



Attention



## 1.2. General Safety Regulations

### **Legal requirements**

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

### **Spare parts and disposables**

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

### **Modifications**

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



### **WARNING**

#### **Electrical shock hazard**

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

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



### **WARNING**

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

## 2. Product Description

### 2.1. Description of the System

|                                           |                                                                                                                                                                                                                                                                                                                                                |
|-------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Application range</b>                  | The AMI-II Pool is applicable for the measurement of pH and redox (ORP) in pool water.                                                                                                                                                                                                                                                         |
| <b>Signal outputs</b>                     | <p>Two signal outputs programmable for measured values (freely scalable, linear, bilinear, log) or as continuous control output (control parameters programmable).</p> <p>Current loop: 0/4–20 mA</p> <p>Maximal burden: 510 <math>\Omega</math></p> <p>Two additional signal outputs with the same specifications available as an option.</p> |
| <b>Relays</b>                             | Two potential-free contacts programmable as limit switches for measured values, controllers or timers with automatic hold function. Maximum load: 1 A/250 VAC                                                                                                                                                                                  |
| <b>AMI-II Relay Box (option)</b>          | <p>The AMI-II Relay Box adds two additional relays to the AMI-II transmitter (displayed as relays 3 and 4 in the menu).</p> <p>It is intended for the direct power supply (AC) and control of dosing devices, e.g. two solenoid valves, two dosing pumps or one motor valve.</p> <p>Maximum load: 1.5 A/250 VAC</p>                            |
| <b>Alarm relay</b>                        | One potential-free contact. Summary alarm indication for programmable alarm values and instrument faults. Maximum load: 1 A/250 VAC                                                                                                                                                                                                            |
| <b>Input</b>                              | One input for potential-free contact to freeze the measured value or to interrupt control in automated installations. Programmable as HOLD or OFF function.                                                                                                                                                                                    |
| <b>Communication interface (optional)</b> | <ul style="list-style-type: none"><li>♦ Two additional signal outputs</li><li>♦ RS485 with fieldbus protocol Modbus RTU or Profibus DP</li><li>♦ HART</li></ul>                                                                                                                                                                                |
| <b>Safety features</b>                    | 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.                                                                                                                                                         |

**pH measuring  
principle  
(simplified)**

The pH measurement is based on a voltage measurement. A voltage can only be measured between two different potentials, therefore, the pH measuring chain contains a measuring electrode and a reference electrode. The reference electrode maintains a constant potential whereas the potential of the measuring electrode changes with the pH value. The voltage which results from this potential difference is measured and displayed on the transmitter as pH value. The measuring chain is designed so that the voltage is zero at pH 7.

**ORP measuring principle  
(simplified)**

The ORP (redox) measurement is based on a voltage measurement. A voltage can only be measured between two different potentials, therefore, the ORP (redox) measuring chain contains a measuring electrode and a reference electrode. The reference electrode maintains a constant potential whereas the potential of the measuring electrode changes with the ORP value. The voltage which results from this potential difference is measured and displayed on the transmitter as ORP value in millivolt (mV).

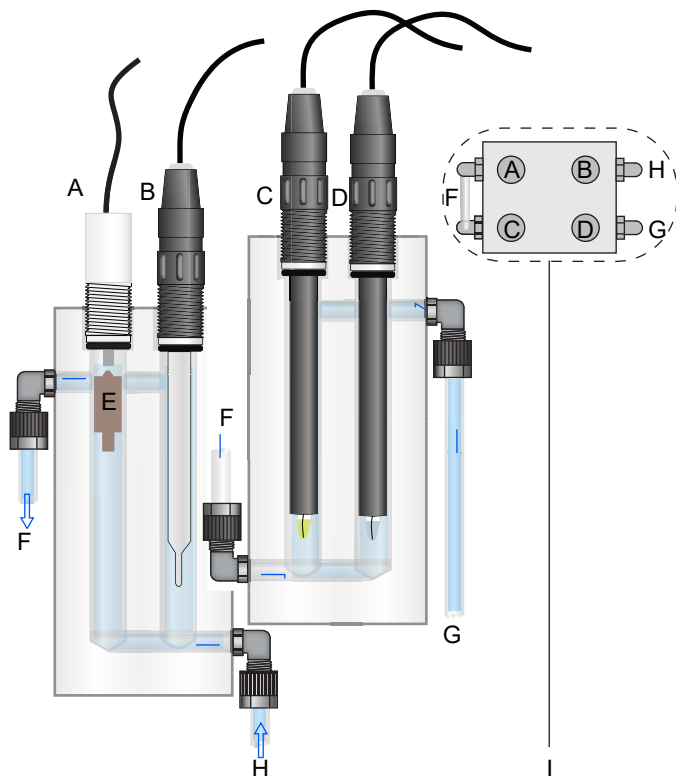
**Fluidics**

The flow cell is divided into a rear and a front flow cell, which are connected to each other via a pipe [F].

The sample enters the flow cell via the sample inlet [H] and first flows through the rear part of the flow cell, where the sample flow is monitored and the temperature is measured. From there, the sample flows through the connection pipe [F] into the front flow cell, where the pH value and redox potential are measured.

Depending on the application, the flow cell is connected parallel to the circulation pump or directly to the pool.

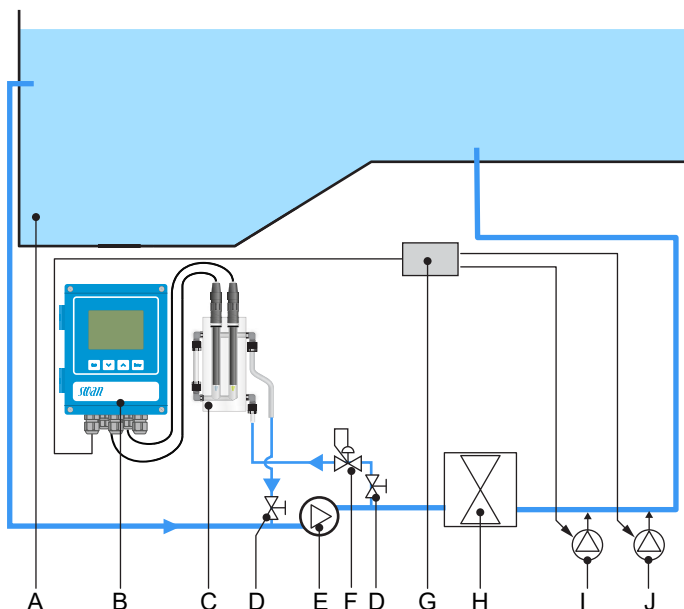
**Flow cell**



**A** Hall effect flow detector  
**B** Temperature sensor  
**C** pH sensor  
**D** ORP (redox) sensor  
**E** Float

**F** Connection pipe  
**G** Sample outlet  
**H** Sample inlet  
**I** Flow cell top view

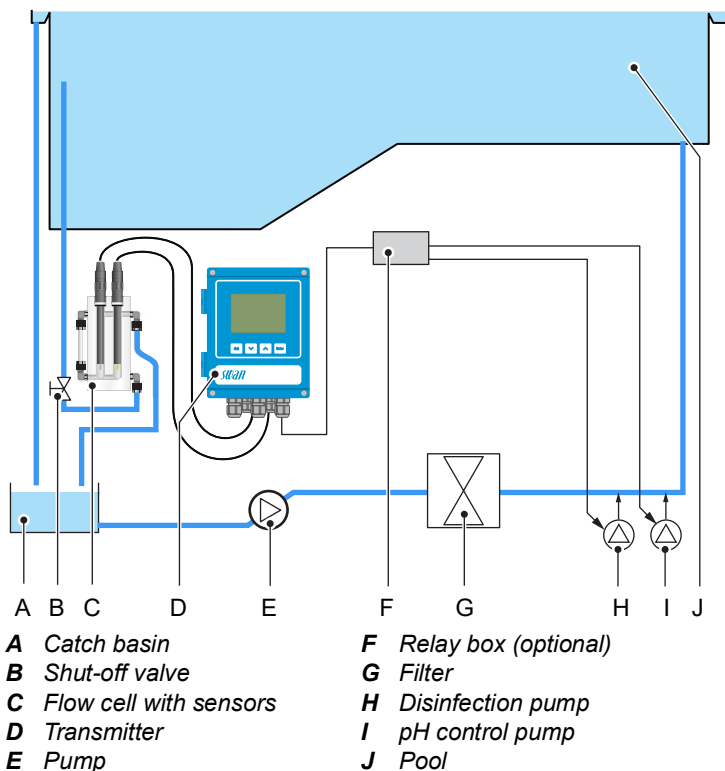
**Application 1:  
private pool  
water  
treatment**



- |                                 |                                      |
|---------------------------------|--------------------------------------|
| <b>A</b> Pool                   | <b>F</b> Pressure regulator          |
| <b>B</b> Transmitter            | <b>G</b> AMI-II Relay Box (optional) |
| <b>C</b> Flow cell with sensors | <b>H</b> Filter                      |
| <b>D</b> Shut-off valves        | <b>I</b> Disinfection pump           |
| <b>E</b> Pump                   | <b>J</b> pH control pump             |

The flow cell is connected in parallel to the circulation pump. The sample inlet of the flow cell is connected to the pipe on the outlet side of the circulation pump, and the sample outlet is connected to the pipe on the inlet side of the circulation pump.

**Application 2:  
public pool  
water  
treatment**



The sample inlet of the flow cell is directly connected to the pool and the sample outlet leads to the catch basin.

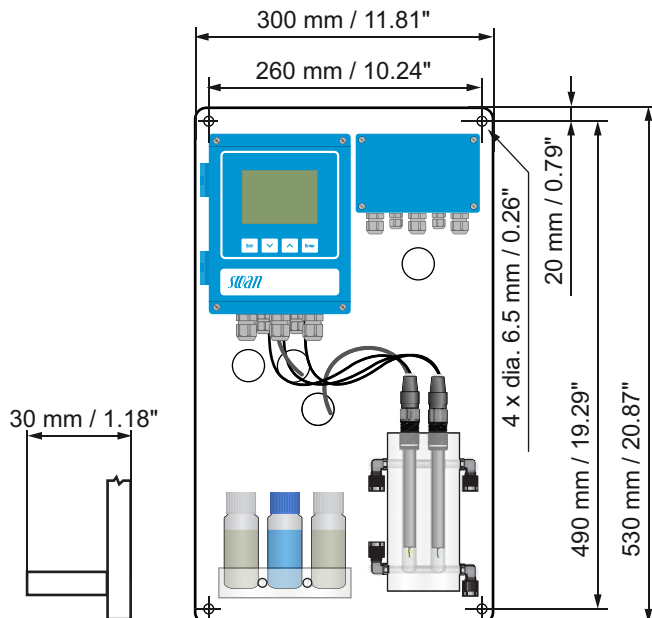
2.2. Instrument Specification

|                                                                       |                      |                                                       |            |
|-----------------------------------------------------------------------|----------------------|-------------------------------------------------------|------------|
| Power supply                                                          | AC variant:          | 100–240 VAC (±10%)<br>50/60 Hz (±5%)                  |            |
|                                                                       | DC variant:          | 10–36 VDC                                             |            |
|                                                                       | Power consumption    | max. 35 VA                                            |            |
| Transmitter specifications                                            | Housing:             | aluminum, with a protection degree of IP 66 / NEMA 4X |            |
|                                                                       | Ambient temperature: | -10 to +50 °C                                         |            |
|                                                                       | Humidity:            | 10–90% rel., non condensing                           |            |
|                                                                       | Display:             | backlit LCD, 74 × 53 mm                               |            |
| Sample requirements                                                   | Flow rate:           | min. 30 l/h                                           |            |
|                                                                       | Temperature:         | max. 50 °C                                            |            |
|                                                                       | Operating pressure:  | max. 2 bar                                            |            |
| On-site requirements                                                  | Sample inlet:        | 8 mm Serto tube adapter (PA)                          |            |
|                                                                       | Sample outlet:       | 8 mm Serto tube adapter (PA)                          |            |
| Measuring range                                                       | Parameter            | Range                                                 | Resolution |
|                                                                       | pH:                  | 1.00–13.00 pH                                         | 0.01 pH    |
|                                                                       | Redox (ORP)          | -1500–1500 mV                                         | 1 mV       |
|                                                                       | Temperature sensor:  | Pt1000 (DIN class A)                                  |            |
|                                                                       | Range:               | -30–250 °C                                            |            |
|                                                                       | Accuracy (0–50 °C)   | ±0.25 °C                                              |            |
|                                                                       | Resolution           | 0.1 °C                                                |            |
| The operating temperature is limited by the flow cell and the sensor. |                      |                                                       |            |

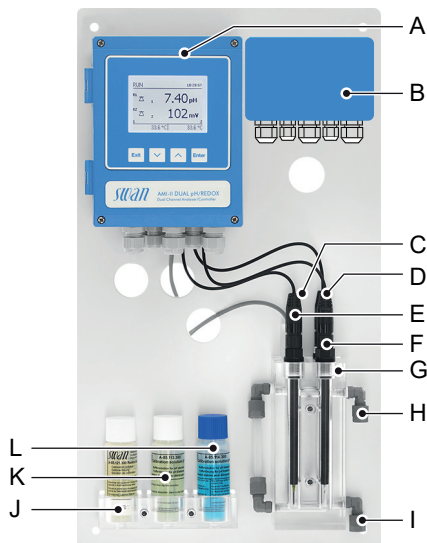
**Dimensions**

Panel:  
Dimensions:  
Screws:  
Weight:

PVC  
300×530×150 mm  
5 or 6 mm  
5 kg



## 2.3. Instrument Overview



- |                                                  |                                     |
|--------------------------------------------------|-------------------------------------|
| <b>A</b> Transmitter                             | <b>F</b> Redox sensor               |
| <b>B</b> AMI-II Relay Box (option)               | <b>G</b> Flow cell                  |
| <b>C</b> Hall effect flow detector (not visible) | <b>H</b> Sample outlet              |
| <b>D</b> Temperature sensor (not visible)        | <b>I</b> Sample inlet               |
| <b>E</b> pH sensor                               | <b>J</b> Calibration solution pH 7  |
|                                                  | <b>K</b> Calibration solution pH 9  |
|                                                  | <b>L</b> Calibration solution Redox |

## 2.4. Swansensor pH and Redox Standard

|                           |                        |                                          |
|---------------------------|------------------------|------------------------------------------|
| <b>General properties</b> | Type:                  | Combined electrodes with gel electrolyte |
|                           | Pressure:              | < 2 bar                                  |
|                           | Conductivity:          | > 150 $\mu\text{S}/\text{cm}$            |
|                           | Connection:            | plug PG 13.5                             |
|                           | Operating temperature: | 0–50 °C                                  |
| <b>pH sensor</b>          | Measuring range:       | 1 to 13 pH                               |
| <b>ORP sensor</b>         | Measuring range:       | -1500 to 1500 mV                         |



## 3. Installation

### 3.1. Installation Checklist

|                             |                                                                                                                                                                                                                                                                                         |
|-----------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>On-site requirements</b> | AC variant: 100–240 VAC ( $\pm 10\%$ ), 50/60 Hz ( $\pm 5\%$ ).<br>DC variant: 10–36 VDC.<br>Power consumption: 35 VA maximum.<br>Protective earth connection required.<br>Sample line with sufficient sample flow and pressure (see <a href="#">Instrument Specification</a> , p. 14). |
| <b>Installation</b>         | Mount the instrument in vertical position.<br>Display should be at eye level.                                                                                                                                                                                                           |
| <b>Electrodes</b>           | Install the sensors and connect the sensor cables.<br>Store the protective caps for later use.                                                                                                                                                                                          |
| <b>Electrical wiring</b>    | Connect all external devices like limit switches and current loops according to the connection diagram.<br>Connect power cord.                                                                                                                                                          |
| <b>Power-up</b>             | Start sample flow and wait until the flow cell is completely filled.<br>Switch on power.                                                                                                                                                                                                |
| <b>Instrument setup</b>     | Adjust sample flow.<br>Program all sensor parameters.<br>Program all parameters for external devices (interface, recorders, etc.).<br>Program all parameters for instrument operation (limits, alarms).                                                                                 |
| <b>Run-in period</b>        | Let the instrument run continuously for 1 h.                                                                                                                                                                                                                                            |
| <b>Calibration</b>          | Calibrate the pH and redox electrodes.                                                                                                                                                                                                                                                  |

### 3.2. Mounting the Instrument

**Mounting requirements**

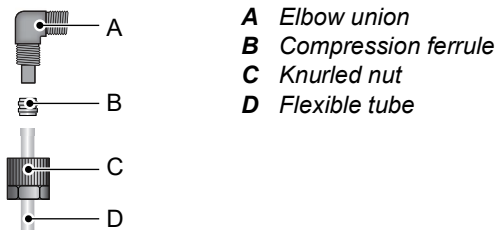
Mount the instrument in vertical position. The display should be at eye level to simplify operation and maintenance.  
The instrument is intended for indoor installation or weather-protected installation in cabinets.

**Dimensions**

For dimensions, see [p. 15](#).

### 3.3. Connecting Sample Inlet and Outlet

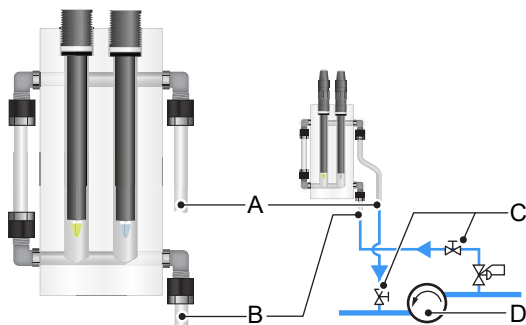
Use plastic tube (FEP, PA, or PE 6 x 8 mm) to connect the sample line.



**Application 1,  
private pool**

The flow cell of the AMI-II Pool is connected in parallel to the pump [D].

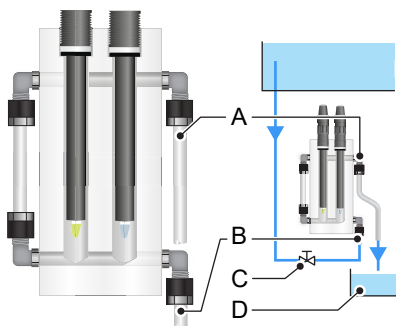
- 1 Connect the sample inlet [B] to the sample line at the pump outlet.
- 2 Connect the sample outlet [A] to the sample line at the pump inlet.



**Application 2,  
public pool**

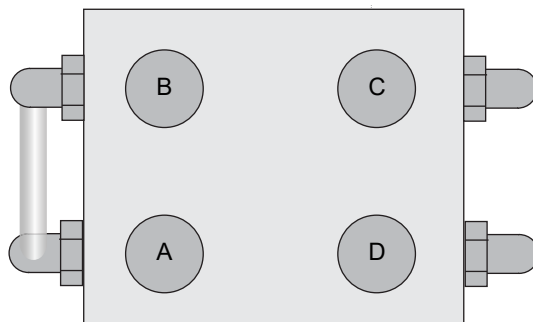
The flow cell of the AMI-II Pool is connected directly to the pool and the outlet is connected to the catch basin [D].

- 1 Connect the sample inlet [B] to the sample line of the pool.
- 2 Connect the sample outlet [A] to the catch basin.



### 3.4. Installing Electrodes

**Overview** The sensors and electrodes are installed as shown in the figure shown below.



**A** *pH sensor*

**B** *Hall effect flow detector*

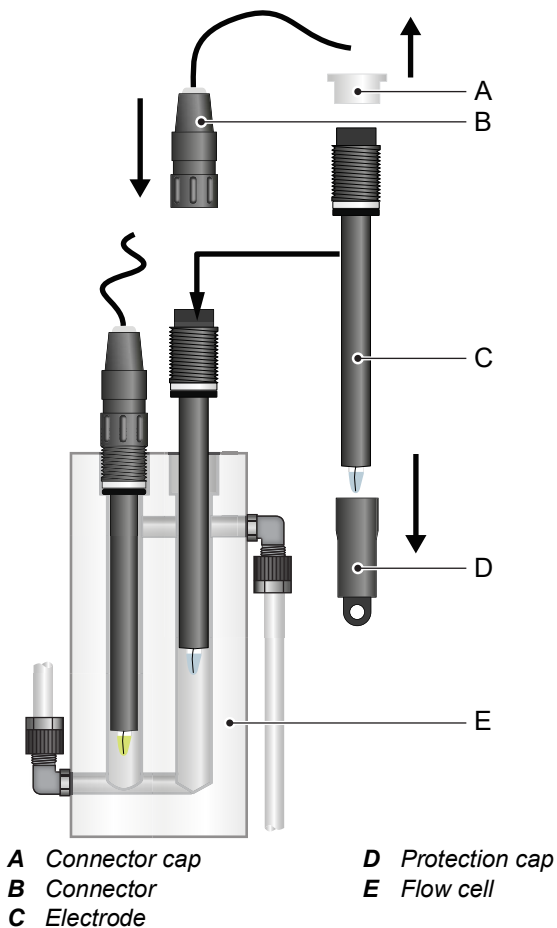
**C** *Temperature sensor*

**D** *Redox sensor*

**Temperature sensor** The temperature sensor is already installed and connected to the transmitter.

**Hall effect sensor** The hall effect flow detector is already installed and connected to the transmitter.

**Electrodes** This instruction applies for both the pH and the ORP electrode. The sensor cables are marked with “pH” for the pH sensor and with “R” for the redox sensor. Do not interchange them.



Recommended personal protective equipment:

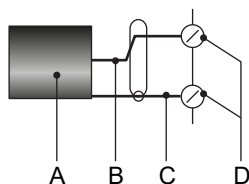


- 1 Carefully remove the protection cap [D] from the sensor tip. Turn it clockwise only.
- ❗ *Be careful not to spill KCl when removing the protection cap.*
- 2 Rinse the sensor tip with clean water.
- 3 Insert the electrode into the corresponding hole of the flow cell block [E].
- 4 Tighten it hand-tight.
- 5 Remove the connector cap [A].
- 6 Screw the connector [B] onto the sensor.
- 7 Keep the protection caps in a safe place for later use.

**Connection to transmitter**

Connect the sensor cable to the transmitter according to the electrical connection scheme.

The coaxial cable of the sensor consists of an inner conductor [B] and a shield [C]. Do not interchange the conductors when connecting the cable to the terminals.



- A** Coaxial cable
- B** Inner conductor (blue)
- C** Shield (white)
- D** Terminals

### 3.5. Electrical Connections



#### WARNING

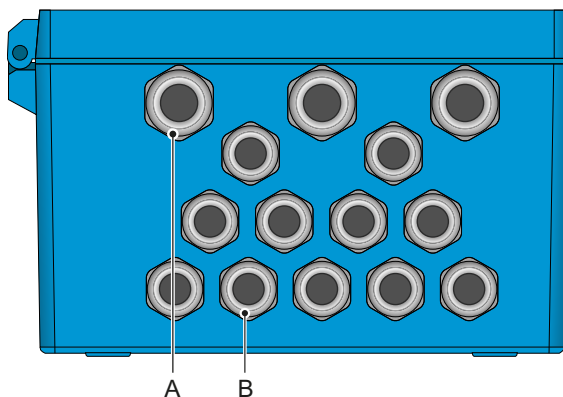
##### Risk of electrical shock

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

- ♦ Before working on electrical components, turn off power to the instrument. External power sources connected to relay 1 or 2 or to the alarm relay must also be turned off.
- ♦ Do not connect the instrument to power unless the ground wire (PE) is connected.
- ♦ Make sure the power specification of the instrument corresponds to the power on site.

#### Cable thicknesses

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



**A** M16 cable glands (3x): cable  $\varnothing_{outer}$  5–10 mm

**B** M12 cable glands (11x): cable  $\varnothing_{outer}$  3–6 mm

#### Wires

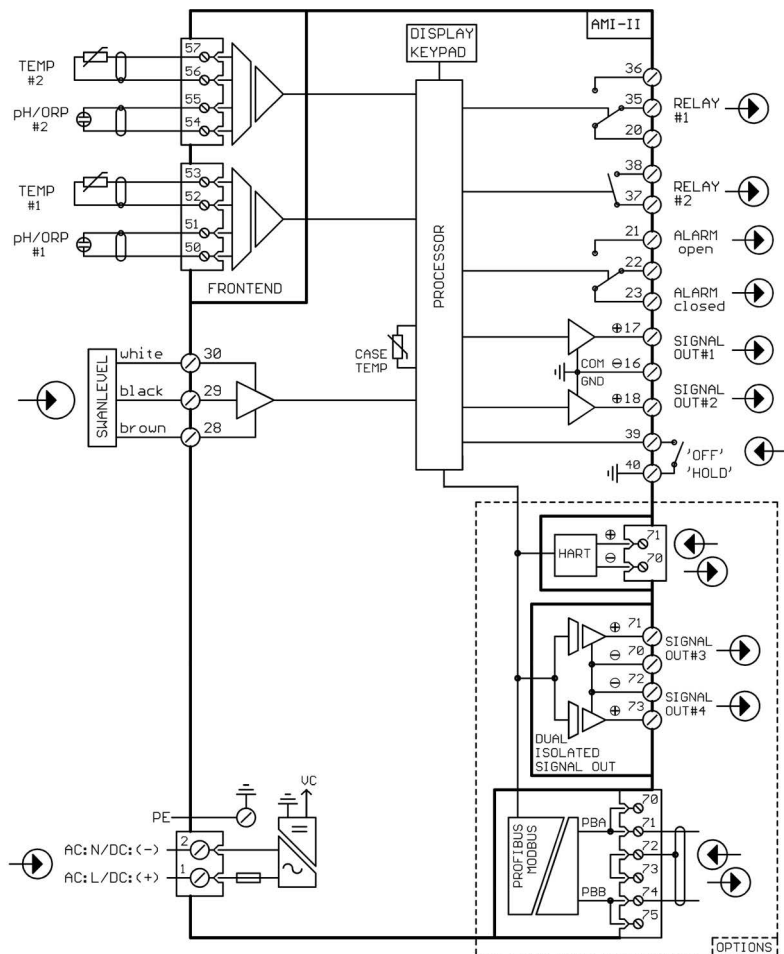
For power and relays: Use max. 1.5 mm<sup>2</sup> / AWG 14 stranded wire with end sleeves.

For signal outputs and input: Use 0.25 mm<sup>2</sup> / AWG 23 stranded wire with end sleeves.

#### AMI-II Relay Box

The connections of the AMI-II Relay Box are described in the enclosed instructions.

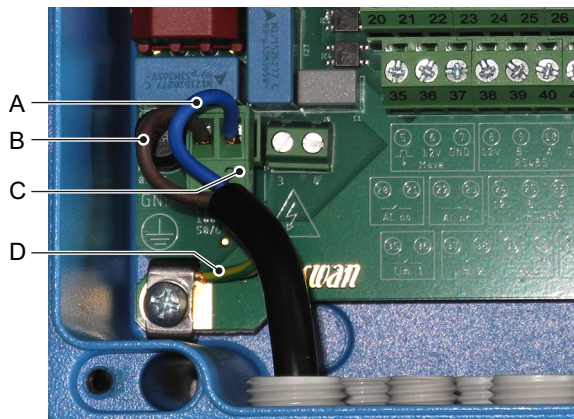
### 3.5.1 Connection Diagram



#### CAUTION

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

### 3.5.2 Power Supply



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

#### **Installation requirements**

The installation must meet the following requirements.

- ♦ Mains cable 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 AMI-II Pool

## **3.6. Relay Contacts**

### **3.6.1 Input**

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

### **3.6.2 Alarm Relay**

One alarm output for system errors.

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

Max. load: 1 A/250 VAC.

For switching inductive loads, please observe the information in section [Types of Loads, p. 28](#).

### **3.6.3 Relay 1 and 2**

- ♦ Relay 1:
  - terminals 35/36 (normally open) or
  - terminals 35/20 (normally closed).
- ♦ Relay 2: terminals 37/38 (normally open).

Max. load 1 A/250 VAC.

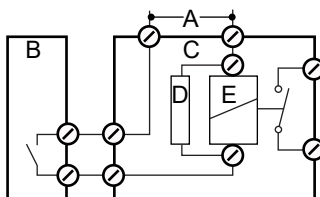
For switching inductive loads, please observe the information in section [Types of Loads, p. 28](#).



### 3.6.4 Types of Loads

#### Inductive loads

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-II transmitter it is mandatory to connect a snubber circuit in parallel to the load.

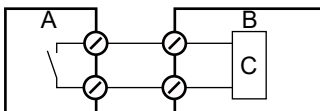


- A** AC or DC power supply
- B** AMI-II transmitter
- C** External power relay
- D** Snubber
- E** Power relay coil

To switch inductive loads higher than 0.1 A, use an AMI-II Relay Box (available as option) or suitable power relays.

#### Resistive loads

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



- A** AMI-II transmitter
- B** PLC or controlled pulse pump
- C** Logic

## 3.7. Signal Outputs

### 3.7.1 Signal Output 1 and 2 (Current Outputs)

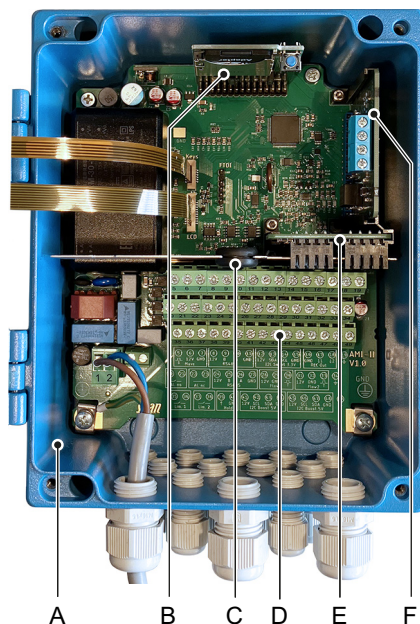
Max. burden 510  $\Omega$ .

If signals are sent to two different receivers, use signal isolator (loop isolator).

Signal output 1: Terminals 17 (+) and 16 (-)

Signal output 2: Terminals 18 (+) and 16 (-)

### 3.8. Interface Options



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

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

- ♦ Two additional signal outputs
- ♦ Profibus or Modbus
- ♦ HART

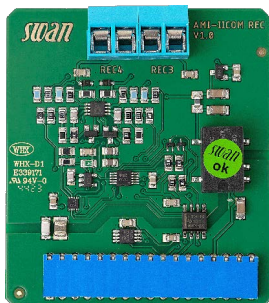
### 3.8.1 Signal Outputs 3 and 4

Max. burden 510  $\Omega$ .

If signals are sent to two different receivers, use signal isolator (loop isolator).

Signal output 3: terminals 71 (+) and 70 (-).

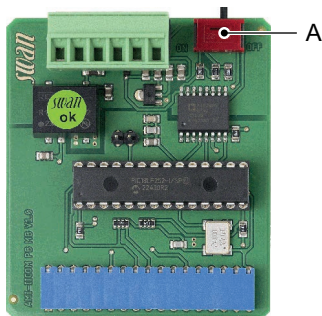
Signal output 4: terminals 73 (+) and 72 (-).



### 3.8.2 RS485 (Profibus or Modbus Protocol)

Terminal 74/75 PB, terminal 70/71 PA, terminal 72/73 shield

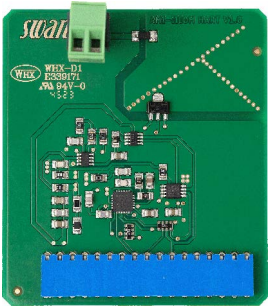
The switch [A] must be set to "ON" if only one instrument is installed or on the last instrument in the bus.



**A** On/off switch

**3.8.3 HART**

Terminals 71 (+) and 70 (-).



## **4. Instrument Setup**

### **4.1. Establish Sample Flow**

- 1 Open the sample tap.
- 2 Wait until the flow cell is completely filled.
- 3 Switch on power.

### **4.2. Programming**

**Sensors** Menu 5.1.1

The parameters must be set as follows:

- ♦ Electrodes: pH - mV
- ♦ Flow measurement: Level switch
- ♦ Temperature: 1 sensor

**External devices** Menu 5.2 Signal Outputs  
Menu 5.4 Interface

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

**Calibration solutions** Menu 5.1.4 Standards  
If necessary, enter the values of the calibration solutions used. The temperature curves for the buffer solutions Standard 1 (pH7) and Standard 2 (pH9) available from Swan are preset in the transmitter firmware. To program the temperature curve for the buffer solution pH4 overwrite standard 2.

Please note that this table is only valid for Swan buffers. If you use different buffers, refer to the manufacturer's documentation.

| Temperature           | Value pH7 | Value pH9 | Value pH4 |
|-----------------------|-----------|-----------|-----------|
| Buffer value at 0 °C  | 7.13      | 9.24      | 3.99      |
| Buffer value at 5 °C  | 7.07      | 9.19      | 3.99      |
| Buffer value at 10 °C | 7.05      | 9.14      | 3.99      |
| Buffer value at 15 °C | 7.03      | 9.08      | 3.99      |
| Buffer value at 20 °C | 7.01      | 9.05      | 3.99      |
| Buffer value at 25 °C | 7.00      | 9.00      | 4.00      |
| Buffer value at 30 °C | 6.99      | 8.96      | 4.01      |
| Buffer value at 35 °C | 6.98      | 8.93      | 4.01      |
| Buffer value at 40 °C | 6.98      | 8.90      | 4.03      |
| Buffer value at 50 °C | 6.98      | 8.84      | 4.05      |

### 4.3. Calibration of pH and/ Redox Electrodes

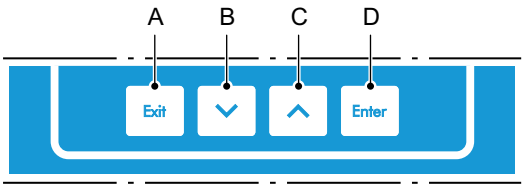
Let the instrument run for at least one hour before calibrating the electrodes.

See [Process Calibration, p. 41](#) and [Standard Calibration, p. 42](#).



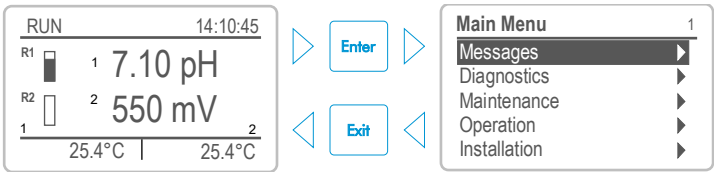
# 5. Operation

## 5.1. Keys

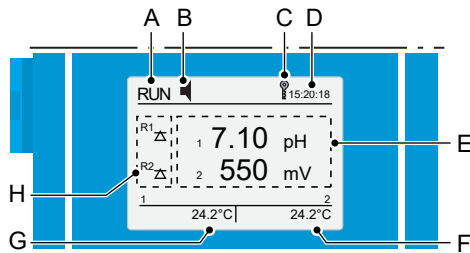


- A** to exit a menu or command (rejecting any changes)  
to move back to the previous menu level
- B** to move down in a menu list and to decrease digits
- C** to move up in a menu list and to increase digits
- D** to open a selected menu item  
to accept an entry

**Program  
access, exit**



## 5.2. Display



- A** RUN      Normal operation  
           HOLD      Input active or cal delay: Instrument on hold (shows status of signal outputs)  
           OFF      Input active: Signal outputs go to 0/4 mA.
- B** Error      Non-fatal error      Fatal error
- C** Keys locked, transmitter control via Profibus
- D** Time
- E** Process values
- F** Sample temperature
- G** Sample temperature
- H** Relay status  
 If the optional AMI-II Relay Box is installed, press the key to display the status of relays 3 and 4.  
 Press the key again to return to the status of relays 1 and 2.

Symbols used for relay status:

- Upper/lower limit not yet reached
- Upper/lower limit reached
- Control upw./downw. no action
- Control upw./downw. active, dark bar indicates control intensity
- Motor valve closed
- Motor valve open, dark bar indicates approximate position
- Timer
- Relay inactive (controlled via fieldbus)
- Relay active (controlled via fieldbus)

5.3. Software Structure

|                  |   |
|------------------|---|
| <b>Main Menu</b> | 1 |
| Messages         | ▶ |
| Diagnostics      | ▶ |
| Maintenance      | ▶ |
| Operation        | ▶ |
| Installation     | ▶ |

|                 |     |
|-----------------|-----|
| <b>Messages</b> | 1.1 |
| Pending Errors  | ▶   |
| Message List    | ▶   |

Menu 1 Messages

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

|                    |     |
|--------------------|-----|
| <b>Diagnostics</b> | 2.1 |
| Identification     | ▶   |
| Sensors            | ▶   |
| Sample             | ▶   |
| I/O State          | ▶   |
| SD Card            | ▶   |

Menu 2 Diagnostics

Provides user-relevant instrument and sample data.

|                    |                   |
|--------------------|-------------------|
| <b>Maintenance</b> | 3.1               |
| Electrode 1        | ▶                 |
| Electrode 2        | ▶                 |
| Simulation         | ▶                 |
| Set Time           | 23.09.06 16:30:00 |

Menu 3 Maintenance

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

|                  |     |
|------------------|-----|
| <b>Operation</b> | 4.1 |
| Sensors          | ▶   |
| Relay Contacts   | ▶   |
| Logger           | ▶   |

Menu 4 Operation

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.

|                     |     |
|---------------------|-----|
| <b>Installation</b> | 5.1 |
| Sensors             | ▶   |
| Signal Outputs      | ▶   |
| Relay Contacts      | ▶   |
| Miscellaneous       | ▶   |
| Interface           | ▶   |

Menu 5 Installation

For initial instrument set up by Swan authorized person.  
Password protection strongly recommended.

## 5.4. Changing Parameters and Values

### Changing parameters

The following example shows how to change the logger interval:

Logger 4.4.1  
Log interval 30 min  
Clear logger no  
Eject SD Card <Enter>

1 Select the parameter you want to change.

2 Press [Enter].

Logger 4.1.3  
Log interval Interval. ↓  
Clear log 5 min  
Eject SD 10 min  
30 min  
1 Hour

3 Press ▲ or ▼ to highlight the required parameter.

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

Logger 4.1.3  
Log interval 10 min  
Clear logger no  
Eject SD Card <Enter>

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

5 Press [Exit].

Logger 4.1.3  
Log interval Save ? driven  
Clear log no  
Eject SD Yes  
No

⇒ Yes is highlighted.

6 Press [Enter] to save the new parameter.

### Changing values

Alarm 5.3.1.1.1  
Alarm High 12.0 pH  
Alarm Low 3.0 pH  
Hysteresis 0.1 pH  
Delay 5 Sec

1 Select the value you want to change.

2 Press [Enter].

3 Set required value with ▲ or ▼.

Alarm 5.3.1.1.1  
Alarm High 9.0 pH  
Alarm Low 3.0 pH  
Hysteresis 0.1 pH  
Delay 5 Sec

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

Swansensor pH or Redox Standard:

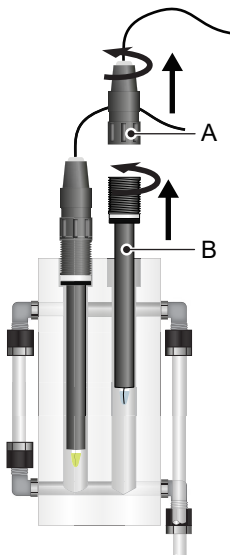
|                    |                                                                                                                                                                             |
|--------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Every three months | <ul style="list-style-type: none"><li>♦ If necessary, clean electrode.</li><li>♦ Check expiration date of calibration solution(s).</li><li>♦ Calibrate electrode.</li></ul> |
| Yearly             | <ul style="list-style-type: none"><li>♦ Replace electrode.</li></ul>                                                                                                        |

## 6.2. Cleaning Electrodes

To remove the electrodes from the flow cell, proceed as follows:

### pH electrode

- 1 Stop sample flow.
- 2 Switch off power to the instrument.
- 3 Unscrew and remove the connector [A] from the electrode [B].
- 4 Unscrew and remove the electrode [B] from the flow cell block.



- 5 If necessary wipe the electrode shaft and the tip cautiously with a soft, clean, and damp paper tissue.
- 6 Remove grease with a tissue moistened with alcohol.
- 7 If the electrode is very dirty, put its tip into 1% diluted hydrochloric acid for roughly 1 min.
- 8 Afterwards rinse the electrode tip thoroughly with clean water.
- 9 Install the electrode in the flow cell again.
- 10 Let the electrode run-in for 1 h before the first calibration.

### ORP electrode

- 1 Stop sample flow.
- 2 Switch off power to the instrument.
- 3 Take the electrode out of the flow cell.

- 4 If necessary, wipe off dirt cautiously with a soft, clean, and damp paper tissue.  
⇒ *Dull platinum surfaces indicate a contamination.*
- 5 If the electrode is very dirty, put its tip into 1% diluted hydrochloric acid for roughly 1 min.
- 6 Afterwards rinse the electrode tip thoroughly with clean water.
- 7 Install the electrode in the flow cell again.
- 8 Let the electrode run-in for 1 h before the first calibration.

## 6.3. Process Calibration

The process calibration is based on a comparative measurement of the on-line instrument with a reference instrument.

**Process pH  
or redox  
calibration**

|               |       |
|---------------|-------|
| Electrode 1   | 3.1.1 |
| Process Cal.  | ▶     |
| Standard Cal. | ▶     |

|               |         |
|---------------|---------|
| Process Cal   | 3.1.1.1 |
| Current Value | 7.78 pH |
| Offset        | 0.00 mV |
| Process Value | 7.60 pH |
| Save          | <Enter> |

|               |          |
|---------------|----------|
| Process Cal   | 3.1.1.1  |
| Current Value | 7.78 pH  |
| Offset        | -8.15 mV |
| Process Value | 7.60 pH  |
| Save          | <Enter>  |

|                        |         |
|------------------------|---------|
| Process Cal            | 3.1.1.1 |
| Current Value          | 7.60 pH |
| Offset                 | y mV    |
| -----                  |         |
| Calibration successful |         |

**1** Navigate to **Maintenance > Electrode 1/2 > Process Cal.**

**2** Press [Enter].

**3** Enter the value of the comparative measurement using the arrow keys.

**4** Press [Enter] to save.

⇒ *The process value is saved and the new offset in mV is displayed.*

**Error  
messages**

**Possible reason for offset error:**

Last calibration incorrect.

Electrode old or dirty.

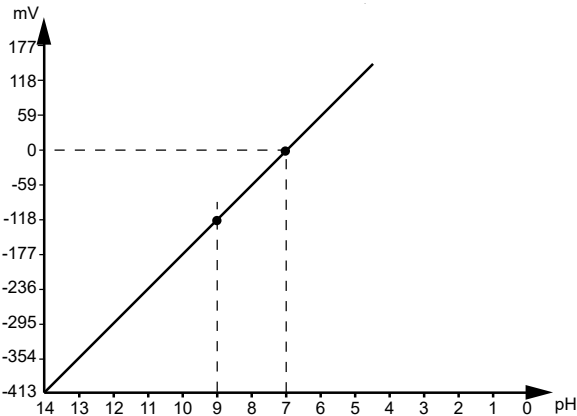
Cable wet or broken.

Reference measurement incorrect.

6.4. Standard Calibration

Standard  
pH calibration

The ideal pH electrode has an offset of 0 mV at pH 7 and a slope of 59.16 mV/pH unit. Real electrodes differ from this ideal. Therefore, pH electrodes are calibrated with two buffer solutions of different pH values.



Standard ORP  
calibration

The reference electrode system used is Ag/AgCl. The measured value is roughly 50 mV higher than the calomel reference system. The slope of the ORP electrode is not defined. To compensate the offset of gel electrodes, a calibration can be done with one buffer solution. Because ORP electrodes are slow, it can take some time after calibration until the measured value is stable again.

Procedure

To perform a standard calibration navigate to menu **Maintenance > Electrode 1/2 > Standard Cal.** and follow the dialog on the screen.

**Note:**

- Calibration must be performed with a clean sensor. If necessary apply the cleaning procedure described in [Cleaning Electrodes, p. 39](#).
- Calibration solutions have to be clean. Do not use if expired.
- Always rinse and dry electrodes before immersing them into the calibration solutions.

Error  
messages

**Possible reason for offset or slope error:**

Old, dirty or wrong buffer solutions.  
Electrode old or dirty.  
Cable wet or broken.

## **6.5. Longer Stop of Operation**

- 1** Stop sample flow.
- 2** Shut off power of the instrument.
- 3** Unscrew and remove the connectors from the electrodes.
- 4** Place the caps on the sensor plugs.
- 5** Remove the electrodes from the flow cell.
- 6** Rinse the electrodes well with clean water.
- 7** Fill 3.5 molar KCl (if not available: clean water) into the protection caps and put them on the tips of the electrodes.
- 8** Store the electrodes with the tips pointing downwards in a frost-protected room.
- 9** Empty the flow cell.



## 7. Troubleshooting

This chapter provides some hints to make troubleshooting easier. For information on how to handle/clean parts refer to [Maintenance, p. 38](#).

For information on how to program the instrument refer to [Program List and Explanations, p. 56](#).

If you need help please contact your local distributor. Note serial number of instrument and all diagnostic values before.

## 7.1. Error List

Two categories of messages are distinguished:

### Non-fatal error ◀

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

### Fatal error ⚡ (flashing symbol)

Fatal instrument error. Control is interrupted and the displayed measured values may not be correct.

Fatal errors are divided into the following two subcategories:

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

| Error       | Description          | Corrective action                                                                                                                                                                                                                       |
|-------------|----------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>E001</b> | Alarm 1 high         | <ul style="list-style-type: none"> <li>– Check process.</li> <li>– Check programmed value.</li> </ul>                                                                                                                                   |
| <b>E002</b> | Alarm 1 low          | <ul style="list-style-type: none"> <li>– Check process.</li> <li>– Check programmed value.</li> </ul>                                                                                                                                   |
| <b>E003</b> | Alarm 2 high         | <ul style="list-style-type: none"> <li>– Check process.</li> <li>– Check programmed value.</li> </ul>                                                                                                                                   |
| <b>E004</b> | Alarm 2 low          | <ul style="list-style-type: none"> <li>– Check process.</li> <li>– Check programmed value.</li> </ul>                                                                                                                                   |
| <b>E005</b> | Temp. 1 high         | <ul style="list-style-type: none"> <li>– Check process.</li> <li>– Check programmed value.</li> </ul>                                                                                                                                   |
| <b>E006</b> | Temp. 1 low          | <ul style="list-style-type: none"> <li>– Check process.</li> <li>– Check programmed value.</li> </ul>                                                                                                                                   |
| <b>E007</b> | Temp. 2 high         | not applicable                                                                                                                                                                                                                          |
| <b>E008</b> | Temp 2 low           | not applicable                                                                                                                                                                                                                          |
| <b>E009</b> | Sample Flow 1 high   | not applicable                                                                                                                                                                                                                          |
| <b>E010</b> | Sample Flow 1 low    | <ul style="list-style-type: none"> <li>– Check process.</li> <li>– Check programmed value.</li> </ul>                                                                                                                                   |
| <b>E011</b> | Temp. 1 shorted      | <ul style="list-style-type: none"> <li>– Check wiring of temperature sensor.</li> <li>– Check temperature sensor.</li> </ul>                                                                                                            |
| <b>E012</b> | Temp. 1 disconnected | <ul style="list-style-type: none"> <li>– Check wiring of temperature sensor.</li> <li>– Check temperature sensor.</li> </ul>                                                                                                            |
| <b>E013</b> | Case Temp. high      | <ul style="list-style-type: none"> <li>– Check case/environment temperature.</li> <li>– Check programmed value.</li> </ul>                                                                                                              |
| <b>E014</b> | Case Temp. low       | <ul style="list-style-type: none"> <li>– Check case/environment temperature.</li> <li>– Check programmed value.</li> </ul>                                                                                                              |
| <b>E017</b> | Control timeout      | <ul style="list-style-type: none"> <li>– Check control device or programming in menus<br/> <b>Installation &gt; Relay contacts &gt; Relay 1 and<br/>                     Installation &gt; Relay contacts &gt; Relay 2.</b> </li> </ul> |
| <b>E019</b> | Temp. 2 shorted      | not applicable                                                                                                                                                                                                                          |
| <b>E020</b> | Temp. 2 disconnected | not applicable                                                                                                                                                                                                                          |

| Error       | Description        | Corrective action                                                                                                                                          |
|-------------|--------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>E021</b> | Sample Flow 2 high | not applicable                                                                                                                                             |
| <b>E022</b> | Sample Flow 2 low  | not applicable                                                                                                                                             |
| <b>E024</b> | Input active       | – Message informing that the relay input has been actuated.<br>– Can be deactivated in menu <b>Installation &gt; Relay contacts &gt; Input &gt; Fault.</b> |
| <b>E026</b> | IC LM75            | – Call support.                                                                                                                                            |
| <b>E030</b> | I2C Frontend       | – Call support.                                                                                                                                            |
| <b>E031</b> | Calibration Recout | – Call support.                                                                                                                                            |
| <b>E032</b> | Wrong Frontend     | – Call support.                                                                                                                                            |
| <b>E049</b> | Power-on           | – None, normal status.                                                                                                                                     |
| <b>E050</b> | Power-down         | – None, normal status.                                                                                                                                     |

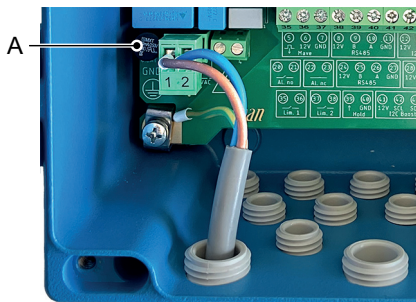


## 7.2. Replacing Fuses

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

Use original fuses provided by Swan only.

**AMI-II  
transmitter**



**A** 0.8 AT/250V Instrument power supply

## 8. Program Overview

Explanations of each parameter in the menus can be found in chapter [Program List and Explanations](#), p. 56.

- ♦ 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 accessible to anyone at any time. No password protection. No settings can be modified.
- ♦ Menu 3 **Maintenance** is intended for service technicians: Calibration, simulation of outputs and set time/date. Please protect with password.
- ♦ Menu 4 **Operation** is intended for the user and allows setting of limit values, alarm values, etc. The presetting is made in the Installation menu (for the system engineer only). 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)

|                       |                       |        |                |
|-----------------------|-----------------------|--------|----------------|
| <b>Pending Errors</b> | <i>Pending Errors</i> | 1.1.5* | * Menu numbers |
| 1.1*                  |                       |        |                |
| <b>Message List</b>   | <i>Number</i>         | 1.2.1* |                |
| 1.2*                  | <i>Date, Time</i>     |        |                |



8.2. Diagnostics (Main Menu 2)

| Identification | Designation    | * Menu numbers                       |             |
|----------------|----------------|--------------------------------------|-------------|
| 2.1*           | Version        |                                      |             |
|                | Bootloader     |                                      |             |
|                | Factory Test   | Motherboard                          | 2.1.4.1*    |
|                | 2.1.4*         | Front End                            |             |
|                | Operating Time | Years, days, hours, minutes, seconds | 2.1.5.1*    |
|                | 2.1.5*         |                                      |             |
| Sensors        | Electrode 1    | Current Value                        | 2.2.1.1*    |
| 2.2*           | 2.2.1*         | (Raw value) mV                       |             |
|                | Cal. History   | Number                               |             |
|                | 2.2.1.5*       | Date, Time                           |             |
|                |                | Offset                               |             |
|                |                | Slope                                |             |
|                | Electrode 1    | Current Value                        | 2.2.2.1*    |
|                | 2.2.2*         | (Raw value) mV                       |             |
|                | Cal. History   | Number                               |             |
|                | 2.2.2.5*       | Date, Time                           |             |
|                |                | Offset                               |             |
|                |                | Slope                                |             |
|                | Miscellaneous  | Case Temp.                           | 2.2.3.1*    |
|                | 2.2.3*         |                                      |             |
| Sample         | Sample ID      | 2.3.1*                               |             |
| 2.3*           | Temperature    | Temperature 1                        | 2.3.2.1*    |
|                | 2.3.2*         | (PT1K)                               |             |
|                |                | Temperature 2                        |             |
|                |                | (PT1K)                               |             |
|                | Flow           | Flow 1                               | Sensor      |
|                | 2.3.3*         | 2.3.3.1*                             | Sample flow |
|                |                |                                      | (Raw value) |
|                |                | Flow 2                               | Sensor      |
|                |                | 2.3.3.2*                             | Sample flow |
|                |                |                                      | (Raw value) |

|                   |                          |                                       |                                |
|-------------------|--------------------------|---------------------------------------|--------------------------------|
| I/O State<br>2.4* | Relays<br>2.4.1*         | Alarm Relay<br>Relay 1/2/3/4<br>Input | 2.4.1.1*                       |
|                   | Signal Outputs<br>2.4.2* | Signal Output 1/2/3/4                 | 2.4.2.1*                       |
| SD Card<br>2.5*   | State                    | 2.5.1*                                |                                |
| Interface<br>2.6* | Protocol<br>Baud rate    | 2.6.1*                                | (only with RS485<br>interface) |

8.3. Maintenance (Main Menu 3)

|             |                |                 |          |                |
|-------------|----------------|-----------------|----------|----------------|
| Electrode 1 | Process Cal    |                 |          | * Menu numbers |
| 3.1*        | 3.1.1*         |                 |          |                |
|             | Standard Cal   |                 |          |                |
|             | 3.1.2*         |                 |          |                |
| Electrode 2 | Process Cal    |                 |          |                |
| 3.2*        | 3.2.1*         |                 |          |                |
|             | Standard Cal   |                 |          |                |
|             | 3.2.2*         |                 |          |                |
| Simulation  | Relays         | Alarm Relay     | 3.3.1.1* |                |
| 3.3*        | 3.3.1*         | Relay 1         | 3.3.1.2* |                |
|             |                | Relay 2         | 3.3.1.3* |                |
|             | Signal Outputs | Signal Output 1 | 3.3.2.1* |                |
|             | 3.3.2*         | Signal Output 2 | 3.3.2.2* |                |
| Set Time    | (Date), (Time) |                 |          |                |
| 3.4*        |                |                 |          |                |

8.4. Operation (Main Menu 4)

|                       |                           |                         |                   |                |
|-----------------------|---------------------------|-------------------------|-------------------|----------------|
| <b>Sensors</b>        | <i>Filter Time Const.</i> | 4.1.1*                  |                   | * Menu numbers |
| 4.10*                 | <i>Hold after Cal</i>     | 4.1.2*                  |                   |                |
| <b>Relay Contacts</b> | <b>Alarm Relay</b>        | <b>Meas. Value 1/2</b>  | <i>Alarm High</i> | 4.2.1.1.1*     |
| 4.2*                  | 4.2.1*                    | 4.2.1.1*                | <i>Alarm Low</i>  | 4.2.1.1.25*    |
|                       |                           |                         | <i>Hysteresis</i> | 4.2.1.1.35*    |
|                       |                           |                         | <i>Delay</i>      | 4.2.1.1.45*    |
|                       | <b>Relay 1/2</b>          | <i>Setpoint</i>         | 4.2.x.200*        |                |
|                       | 4.2.2*/4.2.3*             | <i>Hysteresis</i>       | 4.2.x.300*        |                |
|                       |                           | <i>Delay</i>            | 4.2.x.40*         |                |
|                       | <b>Input</b>              | <i>Active</i>           | 4.2.4.1*          |                |
|                       | 4.2.4*                    | <i>Signal Outputs</i>   | 4.2.4.2*          |                |
|                       |                           | <i>Output / Control</i> | 4.2.4.3*          |                |
|                       |                           | <i>Fault</i>            | 4.2.4.4*          |                |
|                       |                           | <i>Delay</i>            | 4.2.4.5*          |                |
| <b>Logger</b>         | <i>Log Interval</i>       | 4.3.1*                  |                   |                |
| 4.3*                  | <i>Clear Logger</i>       | 4.3.2*                  |                   |                |
|                       | <i>Eject SD Card</i>      | 4.3.3*                  |                   |                |

8.5. Installation (Main Menu 5)

| Sensors        | Electrodes        | 5.1.1*          |                      | * Menu numbers  |
|----------------|-------------------|-----------------|----------------------|-----------------|
| 5.1*           | Temperature       | Temp. Sensor    | 5.1.2.1*             |                 |
|                | 5.1.2*            | Default Temp.   | 5.1.2.2*             |                 |
|                | Flow              | Flow 1          | Sensor               | 5.1.3.1.1*      |
|                | 5.1.3*            | 5.1.3.1*        |                      |                 |
|                |                   | Flow 2          | Sensor               | 5.1.3.1.1*      |
|                |                   | 5.1.3.2*        |                      |                 |
|                | Standards         | pH Standard 1   | @ 0 °C–50 °C         | 5.1.5.1.1–10*   |
|                | 5.1.4*            | 5.1.4.1*        |                      |                 |
|                |                   | pH Standard 2   | @ 0 °C–50 °C         | 5.1.5.2.1–10*   |
|                |                   | 5.1.4.2*        |                      |                 |
|                |                   | Redox Standard  | 5.1.4.3*             |                 |
| 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       | Meas. Value 1   | 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*     |
|                |                   | Meas. Value 2   | Alarm High           | 5.3.1.2.1*      |
|                |                   | 5.3.1.2*        | Alarm Low            | 5.3.1.2.25*     |
|                |                   |                 | Hysteresis           | 5.3.1.2.35*     |
|                |                   |                 | Delay                | 5.3.1.2.45*     |
|                |                   | Temperature 1   | Alarm High           | 5.3.1.3.1*      |
|                |                   | 5.3.1.3*        | Alarm Low            | 5.3.1.3.25*     |
|                |                   | Temperature 2   | Alarm High           | 5.3.1.4.1*      |
|                |                   | 5.3.1.4*        | Alarm Low            | 5.3.1.4.25*     |
|                |                   | Case Temp. high | 5.3.1.5*             |                 |
|                |                   | Case Temp. high | 5.3.1.60*            |                 |
|                | Relay 1/2         | Function        | 5.3.2.1/5.3.3.1*     |                 |
|                | 5.3.2/5.3.3*      | Parameter       | 5.3.2.20/5.3.3.20*   |                 |
|                |                   | Setpoint        | 5.3.2.300/5.3.3.301* |                 |
|                |                   | Hysteresis      | 5.3.2.400*           |                 |
|                |                   | Delay           | 5.3.2.50*            |                 |

|                              |                       |                       |          |                                |
|------------------------------|-----------------------|-----------------------|----------|--------------------------------|
|                              | <b>Input</b>          | <i>Active</i>         | 5.3.4.1* | * Menu numbers                 |
|                              | 5.3.4*                | <i>Signal Outputs</i> | 5.3.4.2* |                                |
|                              |                       | <i>Output/Control</i> | 5.3.4.3* |                                |
|                              |                       | <i>Fault</i>          | 5.3.4.4* |                                |
|                              |                       | <i>Delay</i>          | 5.3.4.5* |                                |
| <b>Miscellaneous</b><br>5.4* | <i>Language</i>       | 5.4.1*                |          |                                |
|                              | <i>Set defaults</i>   | 5.4.2*                |          |                                |
|                              | <i>Load Firmware</i>  | 5.4.3*                |          |                                |
|                              | <b>Password</b>       | <i>Messages</i>       | 5.4.4.1* |                                |
|                              | 5.4.4*                | <i>Maintenance</i>    | 5.4.4.2* |                                |
|                              |                       | <i>Operation</i>      | 5.4.4.3* |                                |
|                              |                       | <i>Installation</i>   | 5.4.4.4* |                                |
| <b>Interface</b><br>5.5*     | <i>Sample ID</i>      | 5.4.5*                |          |                                |
|                              | <i>Protocol</i>       | 5.5.1*                |          | (only with RS485<br>interface) |
|                              | <i>Device Address</i> | 5.5.21*               |          |                                |
|                              | <i>Baud Rate</i>      | 5.5.31*               |          |                                |
|                              | <i>Parity</i>         | 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). When all active errors have been acknowledged, the alarm relay is active again. Cleared errors are moved to the message list.

#### 1.2 Message List

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

### 2 Diagnostics

#### 2.1 Identification

*Design.*: Designation of the instrument.  
*Version*: Version of the instrument firmware.  
*Bootloader*: Version of the bootloader.

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

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

#### 2.2 Sensors

##### 2.2.1 Electrode 1

*Current value*: Shows the measured value (pH or redox potential).  
*Raw value*: Shows the raw value in mV.

- 2.2.1.5 *Cal. History*: Shows previous calibrations of the pH or redox electrode. 64 data records are memorized.

##### 2.2.2 Electrode 2

*Current value*: Shows the measured value (pH or redox potential).  
*Raw value*: Shows the raw value in mV.

- 2.2.2.5 *Cal. History*: Shows previous calibrations of the pH or redox electrode. 64 data records are memorized.

##### 2.2.3 Miscellaneous

- 2.2.3.1 *Case Temp*: Shows the current temperature in °C inside the transmitter.

2.3.1xx *Sample ID*: Shows the ID used to identify the location of the sample.

**Temperature 1:** Shows the current sample temperature in °C.

(Pt1000): Shows the current sample temperature in Ohm.

*Temperature 2:* Not applicable.

(Pt1000): Not applicable.

*Flow 1:* Shows the type of flow sensor (level switch).

*Flow 2:* Not applicable.

### 2.4.1 Relays

2.4.1.1 *Alarm Relay:* Active or inactive

Relays 1 and 2: Active or inactive

**Relays 3 and 4:** Active or inactive (if optional AMI-II Relay Box is installed)

*Input:* Open or closed

### 2.4.2 Signal Outputs

#### 2.4.2.1 Signal Outputs 1 and 2: Current in mA

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

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

Settings of the installed communication option (if any).

## 3 Maintenance

### 3.1 Electrode 1

- 3.1.1 *Process Cal.:* See [Process Calibration](#), p. 41.
- 3.1.2 *Standard Cal.:* See [Standard Calibration](#), p. 42.

### 3.2 Electrode 2

- 3.2.1 *Process Cal.:* See [Process Calibration](#), p. 41.
- 3.2.2 *Standard Cal.:* See [Standard Calibration](#), p. 42.

### 3.3 Simulation

To simulate a value or a relay state, select

- ♦ alarm relay
- ♦ relay 1 or 2
- ♦ relay 3 or 4 (if optional AMI-II Relay Box is installed)
- ♦ signal outputs 1 or 2
- ♦ signal outputs 3 or 4 (if option is installed)

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

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

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

#### 3.3.1 Relays

- |         |                     |                    |
|---------|---------------------|--------------------|
| 3.3.1.1 | <i>Alarm relay:</i> | Active or inactive |
| 3.3.1.2 | <i>Relay 1:</i>     | Active or inactive |
| 3.3.1.3 | <i>Relay 2:</i>     | Active or inactive |
| 3.3.1.4 | <i>Relay 3:</i>     | Active or inactive |
| 3.3.1.5 | <i>Relay 4:</i>     | Active or inactive |

#### 3.3.2 Signal outputs

- |         |                          |               |
|---------|--------------------------|---------------|
| 3.3.2.1 | <i>Signal outputs 1:</i> | Current in mA |
| 3.3.2.2 | <i>Signal outputs 2:</i> | Current in mA |
| 3.3.2.3 | <i>Signal outputs 3:</i> | Current in mA |
| 3.3.2.4 | <i>Signal outputs 4:</i> | Current in mA |

### 3.4 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 s
- 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: 0–6000 s

### 4.2 Relay Contacts

See [Relay Contacts](#), p. 65.

### 4.3 Logger

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

- 4.3.1 *Log Interval:* Select a convenient log interval.  
Range: 1 s, 5 s, 1 min, 5 min, 10 min, 30 min or 1 h.
- 4.3.2 *Clear Logger:* If confirmed with yes, the complete logger data is deleted. A new data series is started.
- 4.3.3 *Eject SD Card:* With this function all logger data are copied to the SD card and the SD card can be removed.

## 5 Installation

### 5.1 Sensors

#### 5.1.1 Electrodes

5.1.1.1 *Electrodes*: Must be set to "pH - mV".

#### 5.1.1.2/3 Temp. compensation 1

5.1.3.x.1 *Comp.*: Must be set to "Nernst".

#### 5.1.2 Temperature

5.1.2.1 *Temp. sensor*: Must be set to "1 Sensor".

5.1.2.2 *Default Temp.*: Not applicable.

#### 5.1.3 Flow

##### 5.1.3.1 Flow 1

5.1.3.1.1 *Sensor*: Must be set to "Level switch".

##### 5.1.3.2 Flow 2

5.1.3.2.1 *Sensor*: Not applicable.

#### 5.1.4 Standards: If you want to use standard solutions different from the recommended Swan standard solutions, enter the values.

5.1.4.1 *pH Standard 1*: Range: pH 1 to pH 13.

5.1.4.2 *pH Standard 2*: Range: pH 1 to pH 13.

5.1.4.3 *Redox Standard*: Range: 400 to 500 mV.

### 5.2 Signal Outputs

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

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

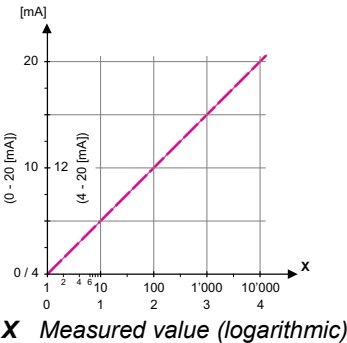
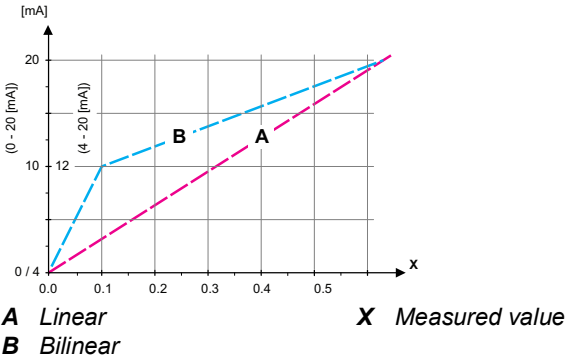
5.2.1.1 *Parameter*: Assign one of the process values to the signal output.  
Available values:

- ♦ Measured value 1
- ♦ Measured value 2
- ♦ Temperature

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

- 5.2.1.3 *Function:* Define if the signal output is used to transmit a process value or to drive a control unit. Available functions are:
- ♦ Linear, bilinear or logarithmic for process values.
  - ♦ Control upwards or control downwards.

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



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

Parameter Meas. value 1:

- 5.2.1.40.10 *Range low:* -3 pH–15 pH  
5.2.1.40.20 *Range low:* -3 pH–15 pH

Parameter Meas. value 2:  
5.2.1.40.11 *Range low:* -1500–1500 mV

5.2.1.40.21 *Range low:* -1500–1500 mV

Parameter Temperature 1:  
5.2.1.40.11 *Range low:* -25–270 °C

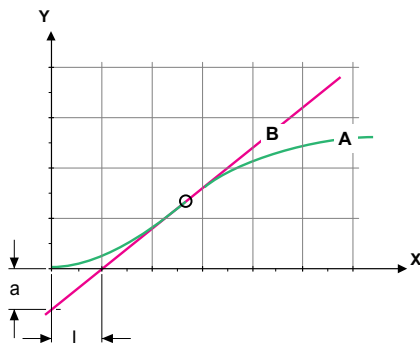
5.2.1.40.21 *Range high:* -25–270 °C

### As control output

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

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

Ziegler-Nichols method for the optimization of a PID controller:  
**Parameters:** Setpoint, P band, reset time, derivative time.



**A** Response to maximum control output  $Xp = 1.2/a$

**B** Tangent on the inflection point  $Tn = 2L$

**X** Time  $Tv = L/2$

The point of intersection of the tangent with the respective axis will result in the parameters a and L.

Consult the manual of the control unit for connecting and programming details. Choose control upwards or downwards.

### Control upwards or downwards

**Setpoint:** User-defined process value for the selected parameter.

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

**5.2.1.43 Control Parameters:** if Parameter = Meas. Value 1

5.2.1.43.10 Setpoint: -3.00 pH to +15.00 pH

5.2.1.43.20 P-Band: 0.00 pH to +2.00 pH

**5.2.1.43 Control Parameters:** if Parameter = Meas. Value 2

5.2.1.43.11 Setpoint: -1500 mV to +1500 mV

5.2.1.43.21 P-Band: 0 mV to 200 mV

**5.2.1.43 Control Parameters:** if Parameter = Temperature 1

5.2.1.43.12 Setpoint: -30 °C to +120 °C

5.2.1.43.22 P-Band: 0 °C to +100 °C

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: 0–9000 s

- 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: 0–9000 s
- 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:

- ♦ Measured value 1
- ♦ Measured value 2
- ♦ Temperature 1
- ♦ Case Temperature high
- ♦ Case Temperature low

### 5.3.1.1 Meas. Value 1

- 5.3.1.1.1 *Alarm High:* If the measured value rises above the alarm high value, the alarm relay becomes inactive and E001 is displayed in the message list.

Range: -3 to 15 pH or -1500 mV to 1500 mV

- 5.3.1.1.25 *Alarm Low:* If the measured value falls below the alarm low value, the alarm relay becomes inactive and E002 is displayed in the message list.

Range: -3 to 15 pH or -1500 mV to 1500 mV

- 5.3.1.1.35 *Hysteresis:* Within the hysteresis range, the relay does not switch. This prevents damage to the relay contacts when the measured value fluctuates around the limit.

Range: 0 to 2.00 pH or 0 mV to 200 mV

- 5.3.1.1.45 *Delay:* Waiting time before the alarm relay becomes inactive after the measured value has risen above or fallen below the programmed alarm value.

Range: 0–28'800 s

### 5.3.1.2 Meas. Value 2

- 5.3.1.2.1 *Alarm High:* If the measured value rises above the alarm high value, the alarm relay becomes inactive and E003 is displayed in the message list.

Range: -3 to 15 pH or -1500 mV to 1500 mV

- 5.3.1.2.25 *Alarm Low:* If the measured value falls below the alarm low value, the alarm relay becomes inactive and E004 is displayed in the message list.

Range: -3 to 15 pH or -1500 mV to 1500 mV

5.3.1.2.35 *Hysteresis:* Within the hysteresis range, the relay does not switch. This prevents damage to the relay contacts when the measured value fluctuates around the limit.  
 Range: 0 to 2.00 pH or 0 mV to 200 mV

5.3.1.2.45 *Delay:* Waiting time before the alarm relay becomes inactive after the measured value has risen above or fallen below the programmed alarm value.  
 Range: 0–28'800 s

### **5.3.1.x Temperature 1**

5.3.1.x.1 *Alarm High:* If the measured value rises above the alarm high value, the alarm relay becomes inactive and E005 is displayed in the message list.  
 Range: -25–270 °C

5.3.1.x.26 *Alarm Low:* If the measured value falls below the alarm low value, the alarm relay becomes inactive and E006 is displayed in the message list.  
 Range: -25–270 °C

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

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

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

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

**1** First select the functions as:

- Limit upper/lower,
- Control upwards/downwards,
- Timer
- Fieldbus

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

5.3.5.3.2.1 Function = Limit upper/lower

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

- 5.3.2.20 *Parameter:* select a process value.
- 5.3.2.300 *Setpoint:* If the measured value rises above respectively falls below the setpoint, the relay is activated.

| Parameter     | Range             |
|---------------|-------------------|
| Meas. value 1 | -3.00 to 15.00 pH |
| Meas. value 2 | -1500 to 1500 mV  |
| Temperature 1 | -30–120 °C        |

- 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 limit.

| Parameter     | Range           |
|---------------|-----------------|
| Meas. value 1 | 0.00 to 2.00 pH |
| Meas. value 2 | 0 to 200 mV     |
| Temperature 1 | 0–100 °C        |

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

- 5.3.2.1 Function = Control upwards/downwards

If the relays are used to control dosing units, program the following.

- 5.3.2.22 *Parameter:* Choose one of the following process values.

- ♦ Measured value 1
- ♦ Measured value 2
- ♦ Temperature 1

- 5.3.2.32 **Settings:** Choose the respective actuator:

- ♦ Time proportional
- ♦ Frequency
- ♦ Motor valve

- 5.3.2.32.1 Actuator = Time proportional

Dosing is controlled by the operating time.

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

- 5.3.2.32.30 *Response time:* Minimal time the dosing device needs to react.  
 Range: 0–240 s.

- 5.3.2.32.4 **Control Parameters**

Range for each parameter same as 5.2.1.43.

**5.3.2.32.1 Actuator = Frequency**

Dosing is controlled by the repetition speed of dosing shots.

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

**5.3.2.32.31 Control Parameters**

Range for each parameter same as 5.2.1.43.

**5.3.2.32.1 Actuator = Motor valve**

**Note:** This function is only available for relays 3 and 4 (AMI-II Relay Box).

Dosing is controlled by the position of a motor-driven mixing valve using two relays (i.e. two relays are needed to control one motor valve).

5.3.2.32.22 *Run time:* Time needed to open a completely closed valve. Range: 5–300 s.

5.3.2.32.32 *Neutral zone:* Minimal response time in percent 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.

**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 1–1440 min.

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

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 s.

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. 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:* Time of day at which the relay is activated.

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 on one or several days of a week.

**5.3.2.342 Calendar**

5.3.2.342.1 *Start time:* The programmed start time is valid for each of the programmed days.

Range: 00:00:00–23:59:59

5.3.2.342.2 *Monday:* Possible settings, on or off.  
to

5.3.2.342.8 *Sunday:* Possible settings, on or off.

5.3.2.44 *Run Time:* see Interval.

5.3.2.54 *Delay:* see Interval.

5.3.2.6 *Signal Outputs:* see Interval.

5.3.2.7 *Output/Control:* see Interval.

5.3.2.1 **Function = Fieldbus**

The relay is switched via Profibus or Modbus. No further parameters are needed.

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

5.3.4.1 *Active:* Define when the input should be active:

*No:* Input is never active.

*When closed* Input is active when the input relay is closed

*When open:* Input is active when the input relay is open

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

*Continuous:* Signal outputs continue to issue the measured value.

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

*Off:* Sets the signal outputs to 0 or 4 mA. Errors, except fatal errors, are not issued.

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

*Continuous:* Controller continues normally.

*Hold:* Controller continues based on the last valid value.

*Off:* Controller is switched off.

5.3.4.4 *Fault:*

*No:* No message is issued in pending error list and the alarm relay does not become inactive when the input is active. Message E024 is stored in the message list.

*Yes:* Message E024 is issued and stored in the message list and the alarm relay becomes inactive when the input is active.

5.3.4.5 *Delay:* Time that the instrument waits after the input is deactivated, before returning to normal operation.

Range: 0–6'000 s

## 5.4 Miscellaneous

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

### 5.5.1 Protocol: **Profibus**

- 5.5.20 Device address: Range: 0–126
- 5.5.30 ID no.: Range: Analyzer; Manufacturer; Multivariable
- 5.5.40 Local operation: Range: Enabled, Disabled

### 5.5.1 Protocol: **Modbus RTU**

- 5.5.21 Device address: Range: 0–126
- 5.5.31 Baud rate: Range: 1 200–115 200 Baud
- 5.5.41 Parity: Range: none, even, odd

### 5.5.1 Protocol: **HART**

- Device address: Range: 0–63

## 10. Material Safety Data Sheets

**Download  
MSDS**      The current Material Safety Data Sheets (MSDS) for the reagents listed below are available for download at **[www.swan.ch](http://www.swan.ch)**.

Catalogue no.:      A-85.112.300  
Product name:      Calibration solution pH4

Catalogue no.:      A-85.113.300, A-85.113.500, A-85.113.700  
Product name:      Calibration solution pH7

Catalogue no.:      A-85.114.300, A-85.114.500, A-85.114.700  
Product name:      Calibration solution pH9

Catalogue no.:      A-85.121.300  
Product name:      Redox calibration solution



# 11. Default Values

## Operation

|                |                           |                         |
|----------------|---------------------------|-------------------------|
| Sensors:       | Filter Time Const.: ..... | 30 s                    |
|                | Hold after Cal.: .....    | 300 s                   |
| Relay Contacts | 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         | Electrodes: .....                | pH - mV                                          |
|                 | Temperature: Temp. Sensor .....  | 2 sensors                                        |
|                 | Temperature: Default Temp. ....  | 25 °C                                            |
|                 | Flow: Flow 1: .....              | none                                             |
|                 | Flow: Flow 2: .....              | none                                             |
|                 | Standards: pH Standard 1 .....   | see <a href="#">Calibration solutions, p. 47</a> |
|                 | Standards: pH Standard 2 .....   | see <a href="#">Calibration solutions, p. 47</a> |
| Signal Output 1 | Standards: Redox Standard .....  | 475 mV                                           |
|                 | Parameter: .....                 | Meas. Value 1                                    |
|                 | Current loop: .....              | 4 –20 mA                                         |
|                 | Function: .....                  | linear                                           |
|                 | Scaling: Range low: .....        | 0.00 pH                                          |
|                 | Scaling: Range high: .....       | 14.00 pH                                         |
| Signal Output 2 | Parameter: .....                 | Meas. Value 2                                    |
|                 | Current loop: .....              | 4 –20 mA                                         |
|                 | Function: .....                  | linear                                           |
|                 | Scaling: Range low: .....        | 0 mV                                             |
|                 | Scaling: Range high: .....       | 1400 mV                                          |
| Alarm Relay     | Meas. value 1: Alarm high: ..... | 15.00 pH                                         |
|                 | Meas. value 1: Alarm low: .....  | -3.00 pH                                         |
|                 | Meas. value 1: Hysteresis: ..... | 0.10 pH                                          |
|                 | Meas. value 1: Delay: .....      | 5 s                                              |
|                 | Meas. value 2: Alarm high: ..... | 1500 mV                                          |
|                 | Meas. value 2: Alarm low: .....  | -1500 mV                                         |
|                 | Meas. value 2: Hysteresis: ..... | 10 mV                                            |
|                 | Meas. value 2: Delay: .....      | 5 s                                              |
|                 | Temperature 1: Alarm high: ..... | 55 °C                                            |
|                 | Temperature 2: Alarm low: .....  | 5 °C                                             |
|                 | Temperature 1: Alarm high: ..... | 55 °C                                            |

|               |                                                      |                    |
|---------------|------------------------------------------------------|--------------------|
|               | Temperature 2: Alarm low: .....                      | 5 °C               |
|               | Case temp. high: .....                               | 65 °C              |
|               | Case temp. low: .....                                | 0 °C               |
| Relay 1/2     | Function: .....                                      | limit upper        |
|               | Parameter: .....                                     | Meas. value        |
|               | Setpoint: .....                                      | 14.00 pH/1400 mV   |
|               | Hysteresis: .....                                    | 0.10 pH/10 mV      |
|               | Delay: .....                                         | 30 s               |
|               | <b>If Function = Control upw. or dnw:</b>            |                    |
|               | Settings: Actuator: .....                            | Frequency          |
|               | Settings: Pulse Frequency: .....                     | 120/min            |
|               | Settings: Control Parameters: Setpoint: .....        | 14.00 pH/1400 mV   |
|               | Settings: Control Parameters: P-band: .....          | 0.10 pH/10 mV      |
|               | 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               |
|               | <b>If Function = Timer:</b>                          |                    |
|               | 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: .....                                     | - - - - -          |

[illegible]

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